TECHNICAL MANUAL

TM 5-4120-347-14

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

AIR CONDITIONER

HORIZONTAL, COMPACT

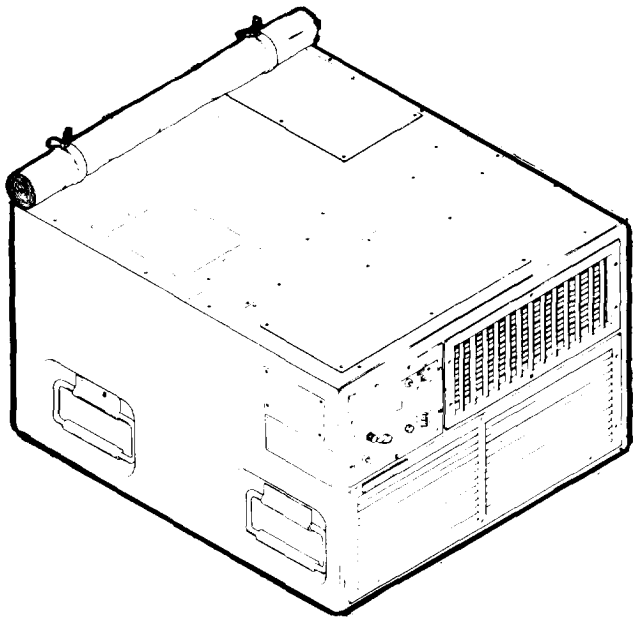
9,000 BTU/HR

208 VOLT, 3 PHASE

60 HERTZ

MODEL F9000H-3

(4120-01-088-3791)



HEADQUARTERS, DEPARTMENT OF THE ARMY

25 JUNE 1981

CHANGE

NO. 2

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

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

AIR CONDITIONER, HORIZONTAL, COMPACT, 9,000 BTU/HR 206 VOLTS, 3 PHASE, 60 HERTZ MODEL F9000H-3 NSN 4120-01-088-3791

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TM 5-4120-347-14, 25 June 1981 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
5-7 and 5-8	5-7 and 5-8
5-13 and 5-14	5-13 and 5-14
C-7 and C-8	C-7 and C-8
E-1 and E-2	E-1 and E-2

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

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

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CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 30 September 1982

Operator's, Organizational
Direct Support, and General Support
Maintenance Manual
for
Air Conditioner, Horizontal, Compact,
9,000 BTU/HR
208 Volts, 3 Phase, 60 Hertz
Model F9000H-3 (4120-01-088-3791)

TM 5-4120-347-14, 25 June 1981, is changed as follows:

1. Remove and insert pages as indicated below:

	Remove pages	**Insert pages**
Chapter 4	4-61 and 4-62	4-61 and 4-62
	4-65 thru 4-68	4-65 thru 4-68
Chapter 5	5-3 and 5-4	5-3 thru 5-4.2
	5-5 and 5-6	5-5 and 5-6

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To be distributed in accordance with DA Form 12-25C, Operator Maintenance requirements for Environmental Equipment, Air Conditioner, 9000 BTU.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1982—564-029/1427

WARNING

The panels, doors and screens on this unit are there for a purpose.

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

- All electrical connections can shock and sometimes kill.
- Moving parts can cut off fingers or hands.
- Do not wear loose clothing in the vicinity of moving parts such as fans and shafts.

Read all Warnings and instructions carefully before operating or working on this unit. Read and understand all Warnings listed in the front of this manual.

WARNING

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

DEATH

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

Never use a heating torch on any part that contains Refrigerant R-22. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

WARNING

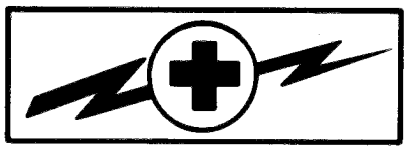
DANGEROUS CHEMICAL is used in this equipment.

DEATH

Death or severe damage may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin — eye — contact is possible.

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

WARNING



HIGH VOLTAGE is used in the 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 the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

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

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

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

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

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

WARNING

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

WARNING

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

WARNING

Clean parts in a well ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly.

Dry cleaning solvent (Fed Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property.

Do not use near open frame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 50°C).

Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 psig (2.1 kg/cm^2).

WARNING

The burning of polyurethane foams is dangerous.

Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. if it is burned or heated indoors, such as during a welding operation nearby, you should take care to ventilate the area thoroughly. An exhaust system like that of a paint spray booth should be used.

Air-supplied respirators, approved by the National Institute for Occupational Safety and Health or the U.S. Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate.

Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

TECHNICAL MANUAL
No. 5-4120-347-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 25 June 1981

OPERATOR'S, ORGANIZATIONAL DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR AIR CONDITIONER, HORIZONTAL, COMPACT, 9,000 BTU/HR 208 VOLT, 3 PHASE, 60 HERTZ

MODEL F9000H-3 (4120-01-088-3791)

REPORTING OF ERRORS

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

TABLE OF CONTENTS

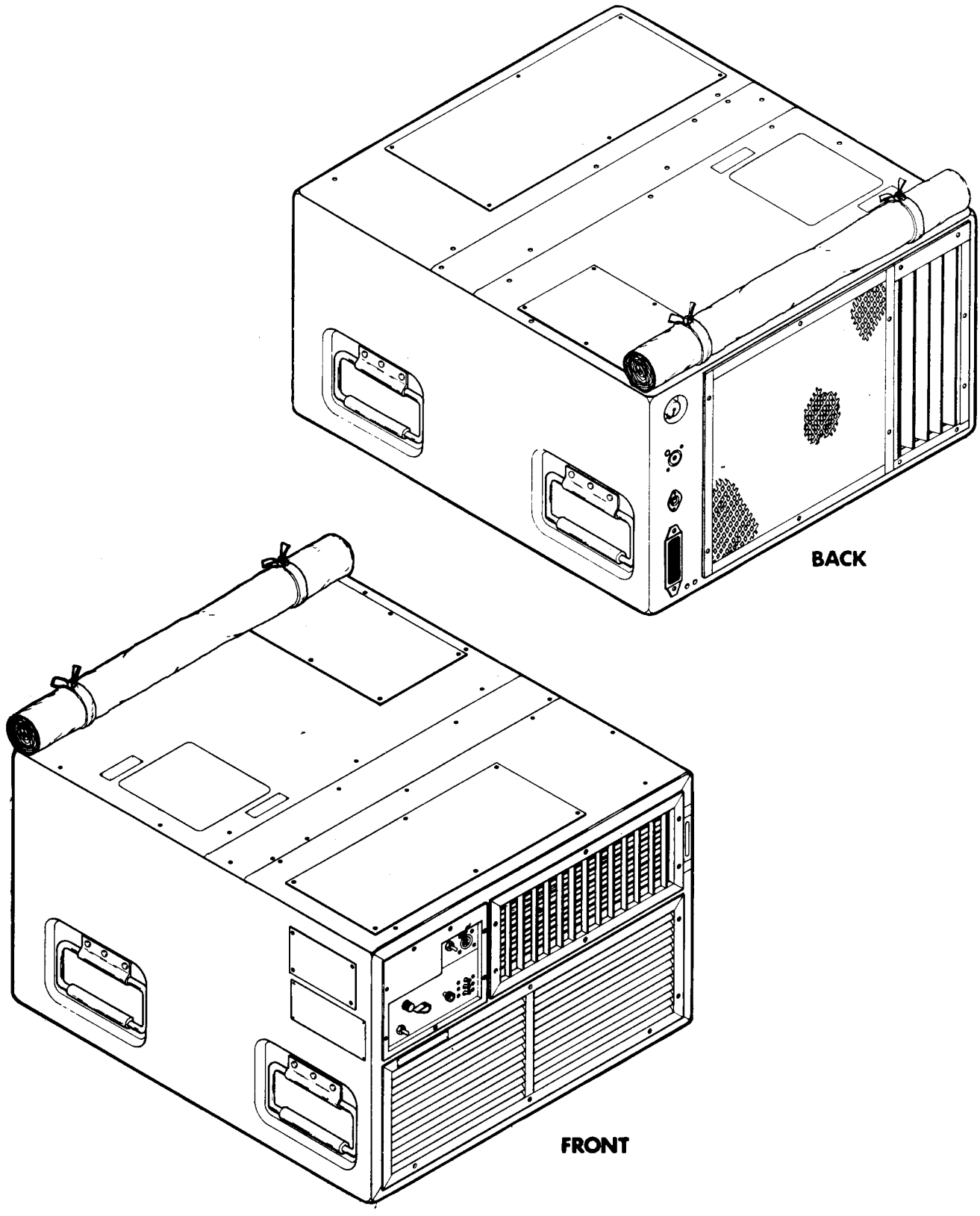


Figure 1-1. Air Conditioner

CHAPTER 1

INTRODUCTION

Section I.

GENERAL INFORMATION

1-1. SCOPE

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

b.Model Numberand Equipment Name. Keco Model F9000H-3, Horizontal, Compact, 9,000 BTU/HR, 208 Volt, 3 Phase, 60 Hertz, Air Conditioner.

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

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1-3. HAND RECEIPT MANUAL

Hand receipts for the End Item/Components of End Items (COEI), Basic Issue Items (BII) and Additional Authorizations Lists (AAL) items are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, U.S. Army Adjutant General Publications Center, Attention: AG DL-OD, 1655 Woodson Road, St. Louis, Missouri 63114.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS(EIRs)

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. Tell us why a procedure is hard to perform. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at Commander, Headquarters, U.S. Army Troop Support and Aviation Materiel Readiness Command, Attention: DRSTS-MEM, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120, We will send you a reply.

Section II.

EQUIPMENT DESCRIPTION

1-5. PURPOSE, CAPABILITIES AND FEATURES

a. The Model F9000H-3 Air Conditioner is designed to circulate, filter and cool or heat air in the room or enclosure in which it is installed.

b. The Model F9000H-3 has a capability of providing a maximum of 10,000 BTU/HR of cooling or 7,000 BTU/HR of heating. It is designed to automatically maintain the air in the room or enclosure at the desired temperature selected on the control panel.

c. The unit is self-contained in a single cabinet that is ideally suited for van or shelter type installations. The only external requirements are a source of 208 volt ac. 3 phase, 60 hertz, 9 amp input power, a suitable ground and an entry to a suitable drain, lower than the base of the cabinet in its operating location, for disposal of condensate waste water. It is designed to operate in almost any environmental condition from arctic to tropic and is fully portable for movement from one location to another.

d. The primary installation requirement is that the exhaust air from the compressor/condenser section must be vented to the outside atmosphere. This subject is fully covered in the installation instructions contained in Chapter 4, “Organizational Maintenance Instructions.”

e. When using this equipment in a secure area, caution must be exercised in meeting the established electromagnetic radiation standards. These standards may limit the use of the equipment’s remote capability and require additional shielding for the ducts.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

See figure 1-2 (Sheets 1 and 2)

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

(2) Conditioned Air Supply Louver. Provides directional control of conditioned air.

(3) Conditioned (Evaporator) Air Fan. Draws the room or enclosure air in over the filter and blows it out over the evaporator and heaters to supply conditioned air. The speed is adjustable. See Item 16.

(4) Temperature Selector (Thermostat) Sensing Bulb. Senses the temperature of the room or enclosure air as it is drawn back into the air conditioner. This bulb is part of the temperature selector control (thermostat) hat is located on the control panel module.

(5) Conditioned Air Filter. Filters room or enclosure air as it is recirculated.

(6) Conditioned Air Fan Motor. Drives the conditioned air fan.

(7) Return Air Louver with Filter Clamps. The recirculated air from the room or enclosure is drawn in through this louver. The filter, item 5, is mounted on clips on the inside of this louver.

(8) Junction Box and Control Panel Module. Contains major unit controls. See items 9 thru 16 for a description of some of these controls.

(9) Control Circuit Breaker. Protects control circuit.

(10) Input Power Receptacle (Primary Location), Connection point for main input power cable. See item 37 for alternate receptacle.

(11) Control Panel Module. Contains switches and controls for operating the air conditioner. See items 13, 14, 16 and 17 for a description of these switches and controls.

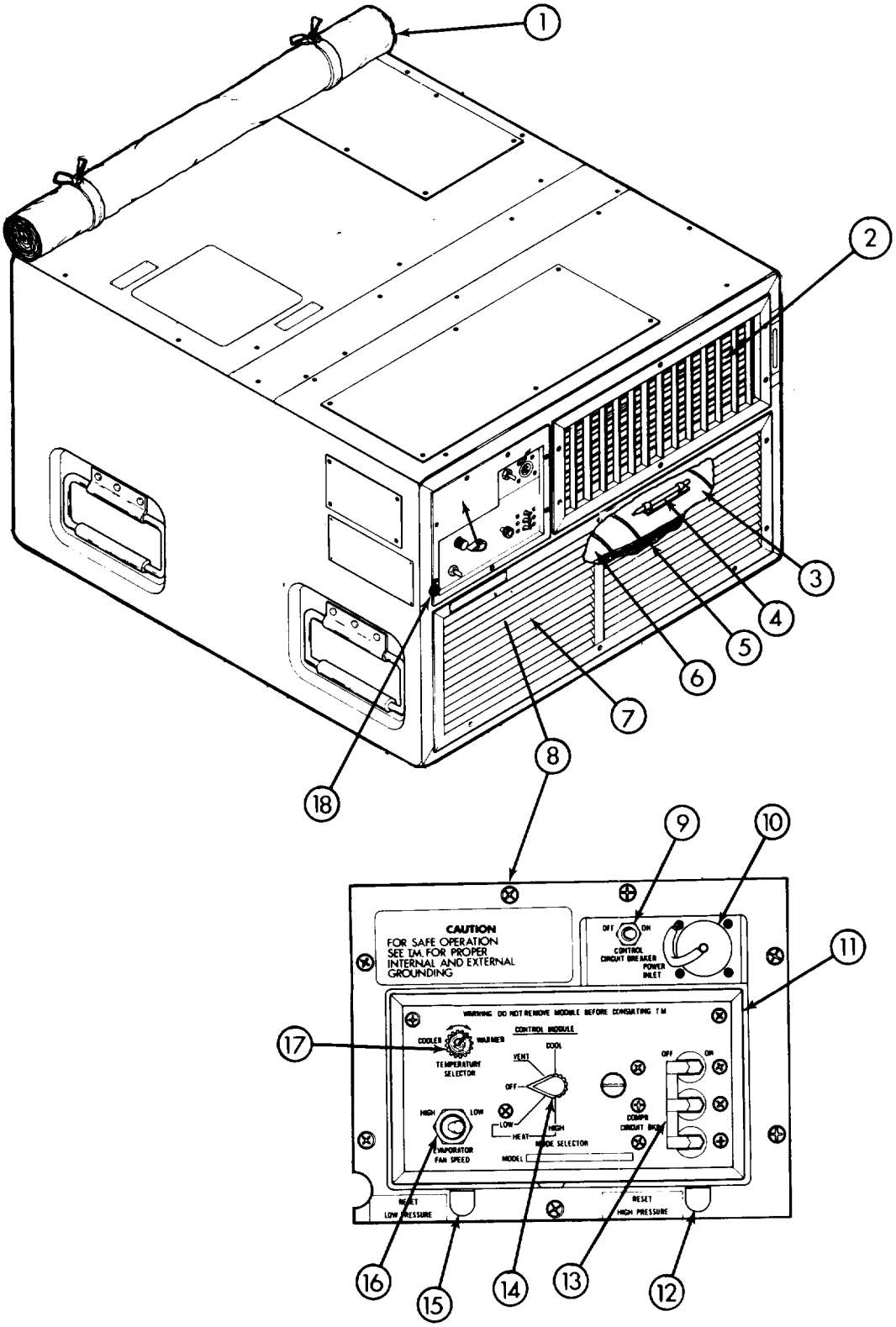


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Figure 1-2. Location of Major Components (Sheet 1 of 2)

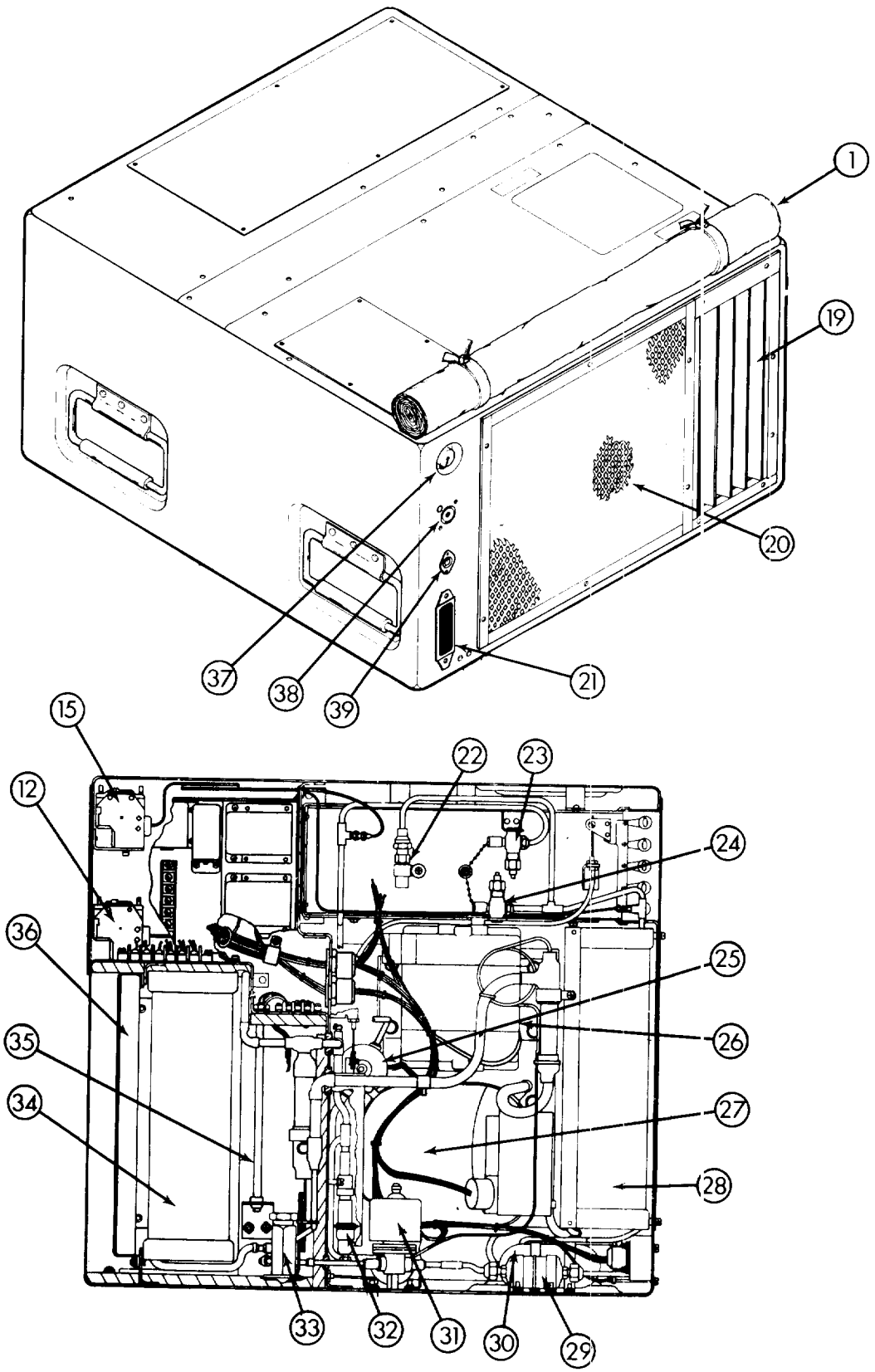

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Figure 1-2. Location of Major Components (Sheet 2 of 2)

(12) High Refrigerant Pressure Cutout Switch. This switch is factory set to shut the compressor off if the refrigerant discharge line pressure rises to 435 to 455 psig (30.58 to 31.99 kg/cm^2).

NOTE

This switch must be hand reset after the pressure drops to 320 psig (22.50 kg/cm^2).

(13) Compressor Circuit Breaker. Protects the compressor.

(14) Mode Selector Switch. Allows selection of unit operating mode.

(15) Low Refrigerant Pressure Cutout Switch. This switch is factory set to shut the compressor off if the refrigerant suction line pressure drops to 10 to 20 psig (0.703 to 1.406 kg/cm^2). This switch must be hand reset after the pressure rises above 40 psig (2.812 kg/cm^2).

(16) Evaporator Fan Speed. Allows selection of unit conditioned (evaporator) fan speed.

(17) Temperature Selector (Thermostat) Switch. This switch allows selection of the desired temperature while operating in the cool or heat modes.

(18) Ground Connection Point. Shelter or van electrical ground connection point.

(19) Condenser Discharge Air Louver Assembly. This louver assembly is automatically controlled by the actuating cylinder, item 40.

(20) Condenser Air Inlet Guard. This expanded metal screen protects the condenser from damage.

(21) Fresh Air Ventilation Guard. Screens and filters fresh air entering the unit.

NOTE

The air conditioner can be equipped for operation in chemical-biological-radiological (CBR) environment by connecting filtering equipment to the fresh air filter.

(22) Relief Valve. This safety valve opens when the refrigerant discharge line pressure rises above 540 psig 37.97 kg/cm^2).

(23) Charging Valve, Refrigerant Suction Line. Provides a connection point for charging and checking suction line pressure.

(24) Charging Valve, Refrigerant Discharge Line. Provides a connection point for charging and checking discharge line pressure.

(25) Solenoid Valve, Pressure Equalizing. This valve is normally open when the compressor is NOT running to equalize the pressure at the suction and discharge sides of the compressor. It closes when the compressor starts.

(26) Condenser Fan and Motor. This fan and motor draws outside air over the condenser coil to remove heat from the refrigerant passing through the tubes of the condenser coil.

(27) Compressor. Consists of a reciprocating compressor driven by an electrical motor, hermetically sealed inside a steel container with lifetime charge of oil. An external (crankcase) heater surrounds the lower part of the container. The purpose of the heater is to prevent possible damage to the compressor caused by liquid refrigerant accumulation in the cylinders during a period of shut down. The heater is connected directly to input power and is thermostatically controlled to prevent overheating.

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

(29) Dehydrator, Desiccant, Refrigerant (Filter Drier). Removes moisture and contaminants from the refrigerant.

(30) Receiver. The receiver acts as a storage tank for the liquid refrigerant.

(31) Solenoid Valve, Liquid Line. This valve is normally open when the compressor is NOT running and is thermostatically controlled during cooling cycles when operating in the COOL mode.

(32) Pressure Regulating Valve. This valve regulates the suction pressure by recirculating a part of the compressor discharge hot gas to the suction line when the suction pressure drops below a preset value. This action prevents frosting of the evaporator coil.

(33) Expansion Valve. Meters refrigerant flow to the evaporator during cooling cycles when operating in the COOL mode.

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

(35) Heating Elements. Consists of two banks of heating elements. Only one bank operates in the "LOW HEAT" mode. Both banks operate in the "HIGH HEAT" mode. One bank shuts off when the thermostat is satisfied in both HIGH and LOW HEAT modes.

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

(37) Input Power Receptacle (Alternate Location). The main power cable may be connected here. See item 10 for primary location. See installation instructions for switch over instructions if this power receptacle is used.

(38) Refrigerant Sight Glass. Visually indicates the condition of the refrigerant flowing in the refrigerant lines during cooling cycles when operating in the COOL mode.

(39) Condenser Fan Switch. Controls fan speed. At temperatures above 100°F (38°C) closes to allow high speed; below 100°F (38°C) opens to allow only low speed operation.

(40) Actuating Cylinder. This hydraulic cylinder operates discharge louver assembly. It will start to open the louver assembly at 150 to 180 psig (10.55 to 12.66 kg/cm^2) and fully open louver assembly at 220 to 260 psig (15.74 to 18.28 kg/cm^2) compressor discharge pressure to allow unit operation when outside temperature is low.

1-7. PERFORMANCE DATA

OPERATING TEMPERATURES	
LOW	-50°F (-45°C)
HIGH	+120°F (+49°C)
PERFORMANCE	
COOLING CAPACITY	10.000 BTU/HR
HEATING CAPACITY	7,000 BTU/HR
POWER REQUIRED	
VOLTAGE	208
PHASE	3
HERTZ	60
AMPERAGE	9

DIMENSIONS	
WIDTH	24.0 in. (60.96 cm)
DEPTH	26.5 in. (67.31 cm
HEIGHT	16.0 in. (40.64 cm)
WEIGHT	200 pounds (90.7 kg)
REFRIGERANT	
TYPE	R-22
CHARGE	2.88 pounds (1 .31 kg)

Section III.

PRINCIPLES OF OPERATION

1-8. REFRIGERATION CYCLE See figure 1-3.

a. Cooling Cycle

● 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 split condenser coil (3) and receiver (4).

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

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

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

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

● The expansion valve (8) controls the amount and pressure of liquid refrigerant to the evaporator coil (9). The expansion valve (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of the sensing bulb in the bulb well (10) and “external equalizer line” the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (9).

● As the liquid refrigerant leaves the expansion valve (8) it enters the evaporator coil (9). 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 or “flash” to a gas. The evaporator blower circulates the warm air from the conditioned space over and through the evaporator coil. Liquid absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with evaporator coil (9), the air is cooled.

● To prevent compressor overload and damage during start up, solenoid valve (16) is open at start of cooling cycle to equalize pressure on both sides of the compressor.

b. Bypass System. This unit has a bypass system which allows cooling operation at low cooling loads without cycling the compressor on and off. In bypass the refrigerant is piped from the discharge to the suction side of the compressor, bypassing the evaporator coil (9).

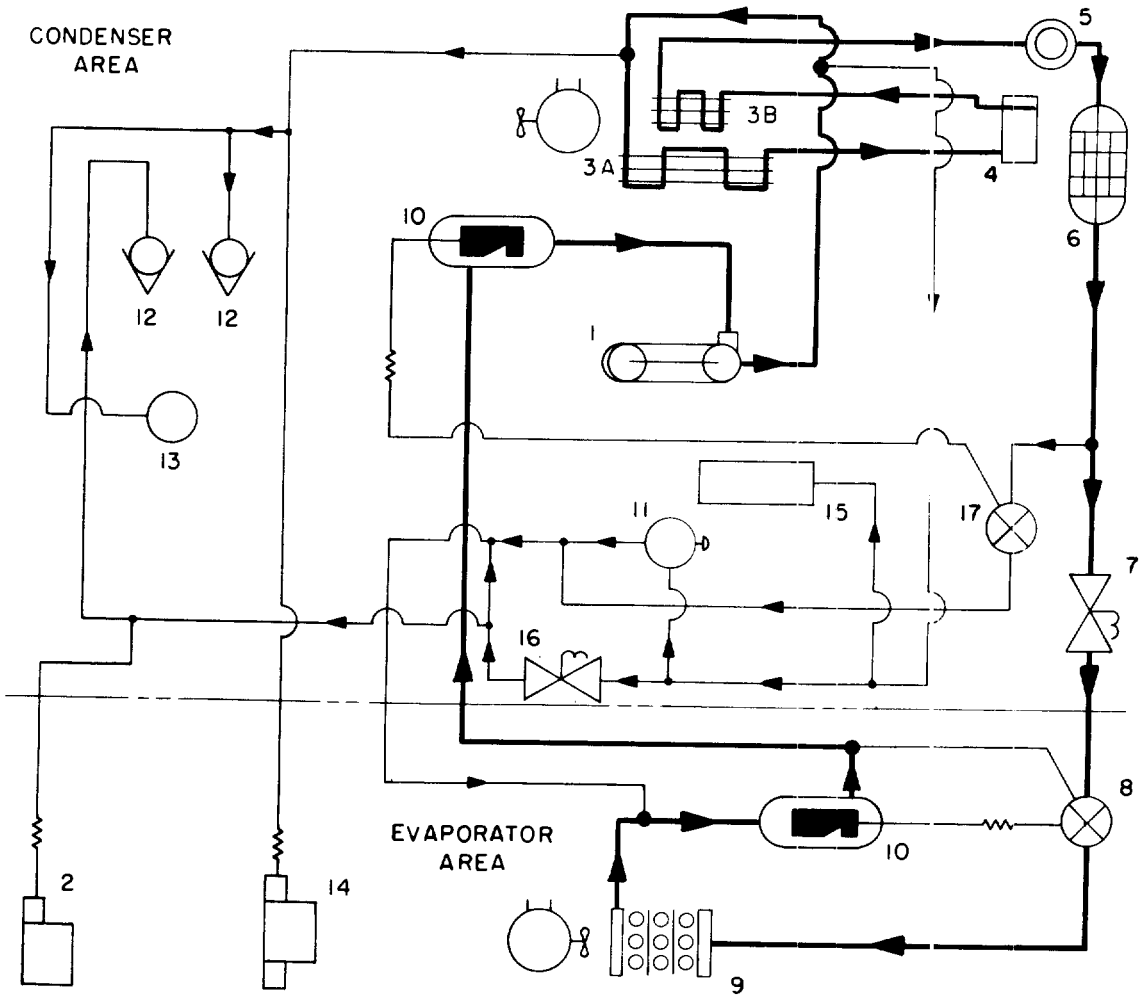
● When the temperature selector on the control panel senses that cooling conditions have reached the set point, it closes the solenoid valve (7) to shut off refrigerant flow to the evaporator coil (9).

● As the compressor suction pressure starts to drop, the pressure regulator (11) opens to allow flow of hot gas from the compressor.

● The quench valve (17) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor the quench valve (17) opens to allow liquid refrigerant to mix with the hot gas.

● The linear actuating cylinder assembly (15) automatically controls the condenser discharge louver assembly.

● The service valves (12) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.



FIND NO.	QTY	NOMENCLATURE
1	1	COMPRESSOR, RECIPROCATING
2	1	SWITCH, PRESSURE (LOW)
3A	1	COIL CONDENSER WITH ANGLE
3B	1	SUBCOOLER
4	1	RECEIVER, LIQUID REFRIGERANT
5	1	INDICATOR, SIGHT, LIQUID
6	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	1	SOLENOID VALVE WITH LEADS
8	1	VALVE, EXPANSION (PRIMARY)
9	1	COIL, EVAPORATOR
10	2	BULB WELL
11	1	REGULATOR, FLUID PRESSURE
12	2	VALVE, SERVICE
13	1	VALVE, PRESSURE RELIEF
14	1	SWITCH, PRESSURE (HIGH)
15	1	CYLINDER ASSY. ACTUATING, LINEAR
16	1	SOLENOID VALVE WITH LEADS
17	1	VALVE, EXPANSION (QUENCH)

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Figure 1-3. Refrigeration Schematic

● The low pressure switch (2), the high pressure switch (14) and the pressure relief valve (13) are provided to protect the unit from damage due to pressure extremes.

1-9. HEATING

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

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

CHAPTER 2

OPERATING INSTRUCTIONS

Section I.

DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

The Model F9000H-3 Air Conditioner is designed for a wide 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 external filtering equipment for operation under chemical-biological-radiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation.

2-2. OPERATOR'S CONTROLS

See figures 2-1 and 2-2.

CAUTION

Under normal operating conditions, before starting the air conditioner in any mode, make sure that the fabric cover on the back of the cabinet is rolled up and secured, that the condenser fan intake screen and fan guard are in place and unobstructed, and the evaporator fan intake and discharge grille louvers are fully open. EXCEPTIONS: Under extreme climatic conditions, such as blowing snow, which might enter the compressor section, the unit may be operated in the VENTILATE, LO HEAT or HI HEAT mode with the fabric cover rolled down and snapped in place. When operated in this manner, outside air cannot be drawn through the fresh air damper, which should be positioned fully closed. The fabric cover cannot be rolled down if the unit is connected to a CBR filter.

DO NOT OPERATE IN THE COOL MODE WITH THE FABRIC COVER ROLLED DOWN.

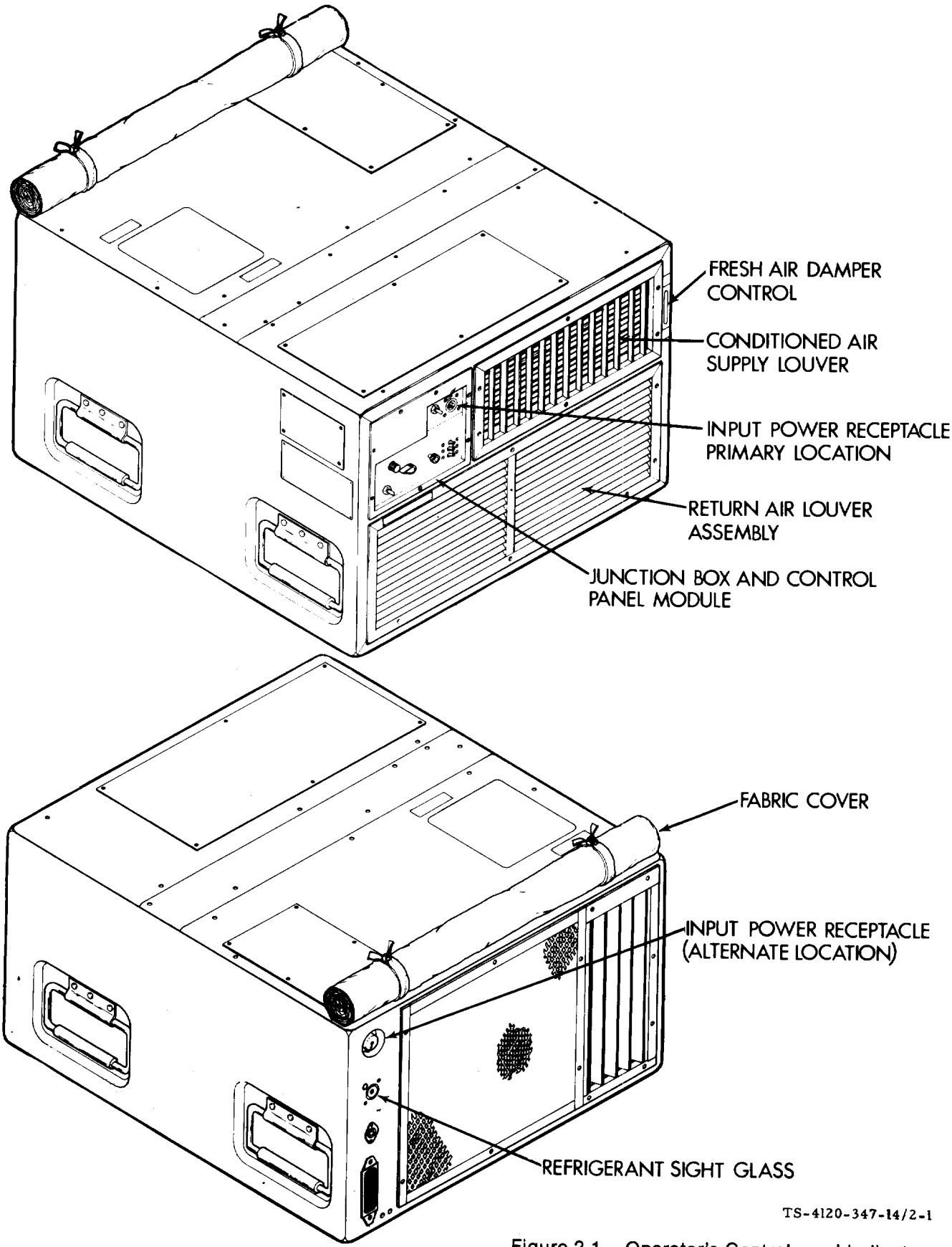

Figure 2-1. Operator's Controls and Indicators

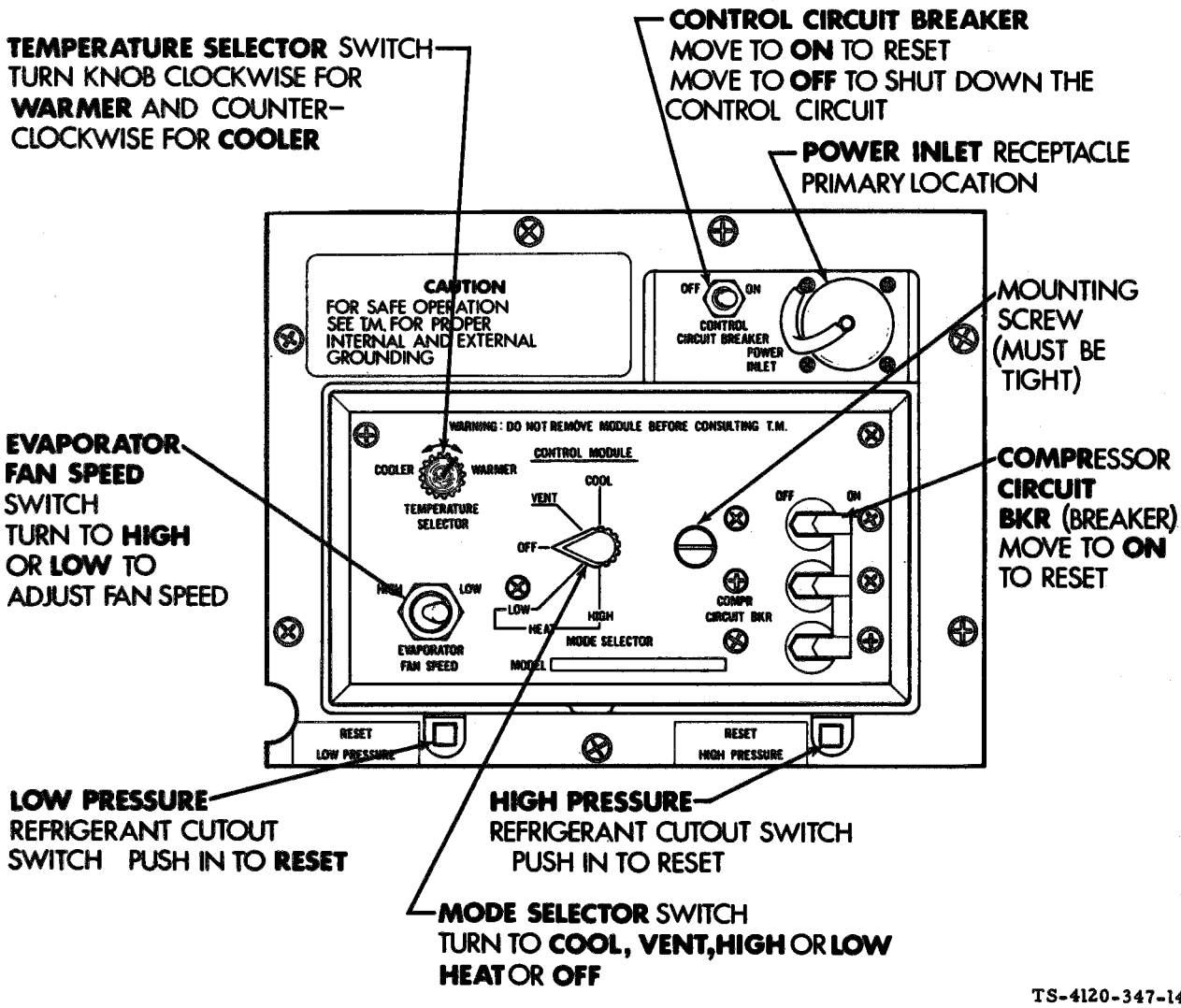

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Figure 2-2. Control Module

2-3. INDICATORS See figure 2-1.

The refrigerant sight glass is the only visual indicator incorporated in the Model F9000H-3 Air Conditioner. The refrigerant sight glass has a small chamber with a glass window through which the refrigerant condition can be observed. It is installed in the liquid refrigerant line downstream from the condenser coil. Liquid refrigerant actually flows through the sight glass chamber only during cooling cycles when the air condition is in operation in the COOL mode. 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 for appropriate

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 rechecked after each four hours of operation to Insure that the condition has not become worse.

Section II.

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. GENERAL

Preventive maintenance checks and services (PMCS) are essential to the efficient operation of the air conditioner and to prevent possible damage that “might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to those functions which can be accomplished from the outside of the cabinet.

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

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

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

d. If Your Equipment Fails to Operate. Troubleshoot within your capabilities. Report any deficiencies as appropriate using the proper form as specified in TM 38-750.

NOTE

Within designated intervals, these checks are to be performed in the order listed.

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

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

Table 2-1.
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Item No.	Interval B	D	A	W	M	Items to be Inspected	Procedures. Check for and have repair or adjusted as necessary.	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.	
					•		Roll down cover and check for condition of snaps, mildew, tears or worn edges.	Cover is missing, or damaged.
3	•					Panels	Check for cracks, dents, or missing hardware.	Panels missing or damaged.
4	•					Screens and Guards	Check for obstructions, damage, loose or missing hardware.	Screens or guard damaged or missing.
5	•					Louvers	Check for obstructions, damage, proper adjustment, loose or missing hardware.	Louvers are damaged or missing.
					•		Check louvers for freedom of operations. Lubricate as requ i red.	
6	•	•	•		•	Air Filter	Check that filter is clean.	Filter is totally clogged or missing.
7	•					Fresh Air Damper	Check for proper adjustment.	
					•		Freedom of operation.	Control wheel missing or inoperable.
8		•				Condensate Drain	No water dripping anywhere except drain.	Water is leaking in an area that would cause damage or be a hazard.
9	•					Control Module	Inspect for damage, secure mounting and proper operation in accordance with paragraph 2-6.	Control module damaged or operating improperly.
10		•				Refrigerant Sight Glass	After 15 minutes of operation in maximum cooling, check for bubbles or milky flow indicating low refrigerant charge. Check for yellow color which indicates presence of moisture.	Bubbles, milky flow or yellow color is observed.

Section III.

OPERATION UNDER USUAL CONDITIONS

2-5. ASSEMBLY AND PREPARATION FOR USE

The Model F9000H-3 Air Conditioner is a completely assembled, self-contained unit as received. Unpackaging and installation may involve some modification of the unit itself, modification of the room or enclosure in which it is to be installed, and/or the fabrication and installation of ducting. Such requirements are beyond the capabilities of operators. No specific operator preparation for use is required once the unit is in place.

2-6. OPERATIONAL CHECKS

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

CAUTION

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

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

b. Individually adjust all louvers in conditioned air supply louver assembly to the fully open (horizontal) position.

c. Using the operating levers, adjust the louvers in both sections of the return air louver assembly to the fully open position.

d. Turn the fresh air damper control to the fully closed (up) position.

e. Check that the unit is connected to the proper power source and that power has been connected to the unit for four hours.

f. Check to see that the CONTROL CIRCUIT BREAKER and the COMPR CIRCUIT BKR are in the ON position.

g. Turn the mode selector switch to VENTILATE, The evaporator fan should start immediately. Use a paper streamer or smoke to check the airflow into the return air louver and out of the conditioned air supply louver. Check the EVAPORATOR FAN SPEED switch at both the HIGH and LOW speed settings. There should be noticeably more airflow at the HIGH speed setting.

h. To check maximum ventilation with fresh air, first turn the fresh air damper knob to fully open (down) then adjust the louvers in both sections of the return air louver fully closed. Check the fresh air inlet located on the lower left corner of the back of the unit using a paper streamer or smoke to be sure that air is being drawn in.

NOTE

For maximum ventilation with fresh air, it is necessary that room or enclosure air have a means of exit through an open door or window. If the room or enclosure is tightly closed, an overpressure will build up and decrease the volume of fresh air drawn in.

i. Fully open the return air louvers and fully close the fresh air damper.

j. Turn the TEMPERATURE SELECTOR (thermostat) knob to the full HEAT (clockwise) position. Then turn the MODE SELECTOR switch to LOW HEAT, Place your hand in the airflow from the conditioned air supply louver and feel for a temperature rise. When the supply air temperature has reached a relatively stable level, turn the MODE SELECTOR switch to HIGH HEAT and feel for a further temperature rise. Next, turn the temperature thermostat control knob to the fully COOLER (counterclockwise) position. Feel that supply air temperature drops to approximately the same relatively stable level previously noted in LOW HEAT. Finally, turn the MODE SELECTOR switch to LOW HEAT and feel the discharge air temperature drop to ambient level (room temperature).

NOTE

The temperature thermostat control has an effective functional range between 60°F and 90°F (16°C and 32°C). In extreme conditions when ambient air temperature is below 60°F (16°C) or above 90°F (32°C), the operation in either LOW HEAT or HIGH HEAT mode will vary from that described above.

CAUTION

If a knocking or pounding noise is heard when the compressor starts in the following check, immediately turn the MODE SELECTOR out of the COOL position. Leave input power connected and wait at least two hours before attempting another start in COOL mode.

k. Turn the TEMPERATURE SELECTOR control knob to the fully WARMER (clockwise) position, then turn the MODE SELECTOR switch to COOL. Note that the evaporator and condenser fans start immediately and that the compressor starts approximately 30 seconds later. Hold your hand in the airflow from the conditioned air supply louver; there should be no change in temperature. Now turn the TEMPERATURE SELECTOR control knob to the fully COOLER (counterclockwise) position and feel the supply air temperature begin to drop almost immediately. Leave controls in the present position and perform the next check.

l. After 15 minutes of operation, check the sight glass and check the refrigerant condition. 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 for appropriate refrigeration system action.

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 maybe continued with the refrigerant color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse.

m. Turn the MODE SELECTOR switch to OFF and observe that all air conditioner functions cease.

2-7. GENERAL OPERATING PROCEDURES

The Model F9000H-3 air conditioner is designed for operation in a wide range of climatic conditions either continuously or intermittently. The amount of operator attention required will vary depending on specific local conditions for each installation. Under usual conditions, the air conditioner will be set up for the appropriate mode of operation at the beginning of a season and will only need starting and stopping and minor adjustments for the rest of the season.

Table 2-2 provides the recommended initial control settings to establish the desired mode of operation. Minor adjustments may be required to obtain the desired mixture of recirculated and fresh air and the airflow patterns of conditioned air.

TABLE 2-2
INITIAL OPERATOR CONTROL SETTINGS

Mode	Mode Selector	Temperature Selector	Fresh Air Damper	Return Air Louver	Conditioned Air Supply Louver	Fabric Cover
Ventilation with 100% recirculated Air	VENTILATE	Any Setting	Fully Closed	Fully Open	Optional	Optional
Ventilation with make-up fresh air	VENTILATE	Any Setting	Partially Open	Partially Closed	Optional	Open (Rolled)
Ventilation with 100% Fresh Air	VENTILATE	Any Setting	Fully Open	Fully Closed	Optional	Open (Rolled)
Heating with 100%. Recir-culated Air	LOW HEAT or HIGH HEAT	Desired Temperature	Fully Closed	Fully Open	Slightly Downward	Open (Rolled)
Heating with make-up Fresh Air	LOW HEAT or HIGH HEAT	Desired Temperature	Partially or Fully Open	Partially or Fully Closed	Slightly Downward	Open (Rolled)
Cooling-with 100%. Recir-culated Air	COOL	Desired Temperature	Fully Closed	Fully Open	Slightly Upward	Open (Rolled)
Cooling with make-up Fresh Air	COOL	Desired Temperature	Partially or Fully Open	Partially or Fully Closed	Slightly Upward	Open (Rolled)
Any Mode-with make-up Air Through CBR Filter	Desired Mode	Desired Temperature	Fully Open	Partially or Fully Closed	Optional	Open (Rolled)

NOTE

Under some climatic conditions, local practices mav be established to close the fresh air dapermere and/or roll down and snap in place the fabric cover during shutdown periods. If such practices are in effect, the operator must first unsnap, roll up and secure the fabric cover and appropriately adjust the fresh air damper before turning the mode selector switch to the desired operating mode.

2-8. INFORMATION PLATES

A number of information plates are provided on the exterior of the air conditioner cabinet. These plates are located on, or adjacent to, the control or device to which they apply. See figure 2-3 for locations and printed information.

2-9. PREPARATION FOR MOVEMENT

No special operator preparation is required when the air conditioner is to be moved to another location. Simply close the louvers in the evaporator intake and discharge grilles, close the fresh air damper, and roll down and snap in place the fabric cover on the back of the cabinet.

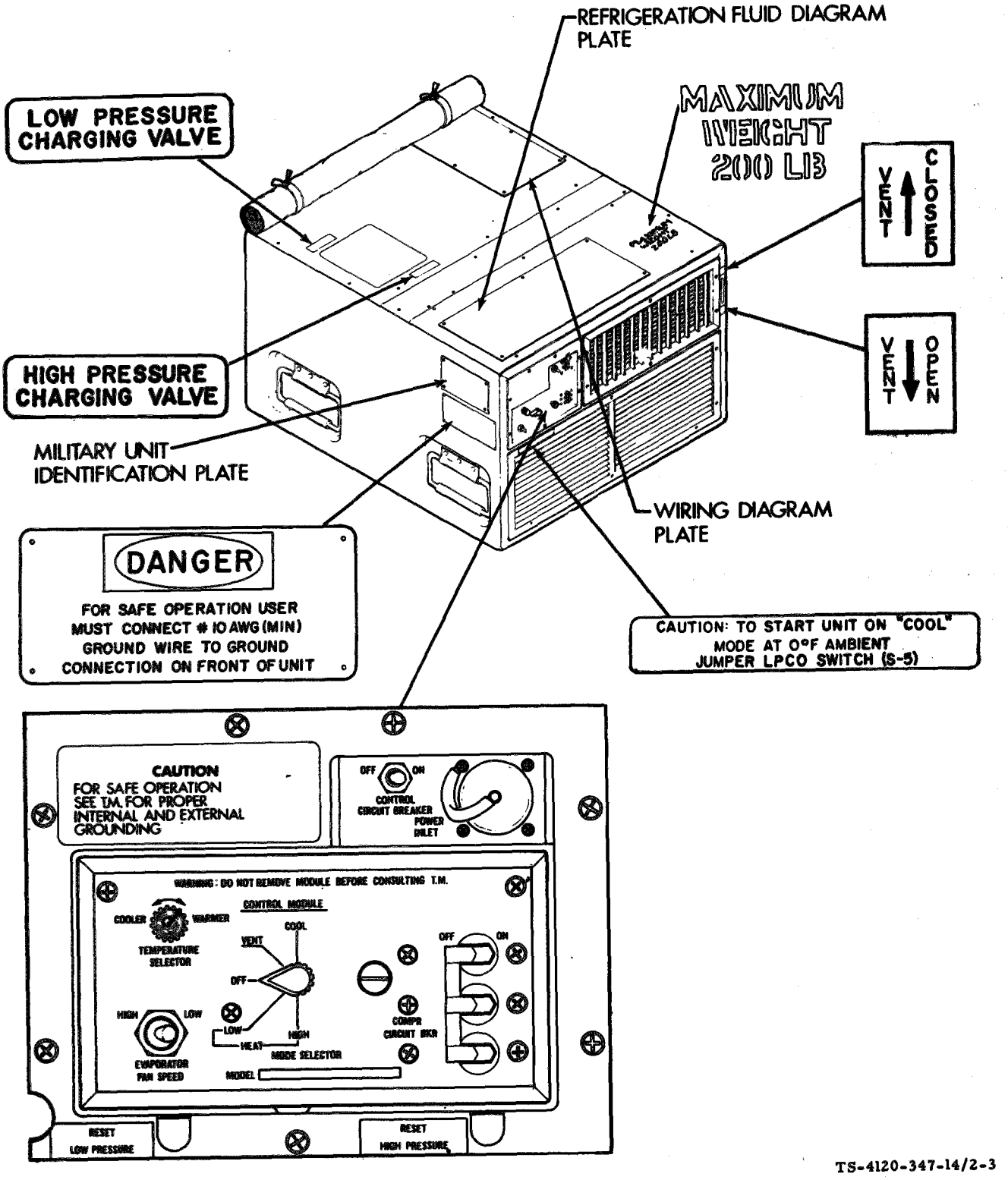


Figure 2-3. Instruction Plates and Stencil Marking Information and Locations

Section IV.

OPERATION UNDER UNUSUAL CONDITIONS

2-10. GENERAL

The Model F9000H-3 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.

2-11. OPERATION IN EXTREME HEAT

The air conditioner is designed to operate in temperatures up to 120°F (40°C). Extra care should be taken to minimize the cooling load when operating in extremely high temperatures. Some of the steps that may be taken are:

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

b. 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 essential for ventilation.

NOTE

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

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

2-12. OPERATION IN EXTREME COLD

CAUTION

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

The air conditioner is designed to operate in the HEAT mode at temperatures down to -50°F (-45°C) and in the COOL mode at outside temperatures down to 0°F (-18°C). Extra care should be taken to minimize the heating load when operating in extremely low temperatures. Some of the steps that may be taken are:

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

b. Open shades and awnings to permit entry of direct rays of the sun, if appropriate.

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

NOTE

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

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

e. When the unit is to be used at low temperatures in the COOL mode, the low refrigerant pressure cutout switch must be jumpered. Contact organizational maintenance.

f. Be sure that all dampers are operating freely,

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

2-13. OPERATION IN DUSTY OR SANDY CONDITIONS

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

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

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

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

2-14. 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.

2-15. 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 encrustations. 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.

2-16. OPERATION UNDER EMERGENCY CONDITIONS

a. CBR Hazard. When operation is anticipated under potential chemical-biological-radiological (CBR) conditions, a CBR filtering unit should be connected to the fresh air intake. It maybe necessary to remove the

guard and fabricate a special adapter for this connection. Adjust the return air louvers in conjunction with the CBR filter controls to provide a higher overpressure within the room or enclosure.

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

2-17. ADMINISTRATIVE STORAGE

a. Store the air conditioner so as to provide maximum protection from the elements but still provide access for inspection, maintenance, and periodic exercising. Anticipate removal or deployment problems, and take suitable precautions.

b. Take into account the effect of environmental conditions, such as extreme cold or heat, high humidity, blowing snow, or any combination of factors, and take adequate precautions.

c. Establish a fire plan and provide for adequate precautions.

d. Refer to TM 740-90-1 for further information on Administrative Storage of the air conditioner.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section/Paragraph

Section I.

LUBRICATION INSTRUCTIONS

3-1. GENERAL

The Model F9000H-3 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 motors.

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

Section II.

TROUBLESHOOTING

3-2. USE OF TROUBLESHOOTING TABLE

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

a. The Troubleshooting Table lists the common malfunction symptoms operators are most likely to encounter during operation of the air conditioner; test and inspection steps to be followed to determine the cause; and the corrective action that should be taken for each possible cause listed.

b. The operator should first find the malfunction symptom which most closely describes the immediate situation, and then perform the test and inspection, and corrective action steps in the order in which listed.

c. This manual cannot list all possible malfunction symptoms that may be encountered, nor can it list all possible test and inspection, and corrective action steps that may be taken. If a malfunction occurs for which no symptom is listed, or if the listed corrective actions do not resolve the trouble, supervision should be notified.

d. Troubles or corrective actions beyond the scope of operator capabilities must be reported, to organizational maintenance.

TABLE 3-1. — OPERATOR 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.

CAUTION

During cool weather do not start in COOL mode for four hours.

Step 2. Check to see if control or compressor circuit breaker is tripped.
Reset circuit breaker(s).

2. REDUCED COOLING CAPACITY.
Step 1. Check to be sure the MODE SELECTOR switch is turned to COOL.
Turn switch to COOL.
Step 2. Check operation of TEMPERATURE SELECTOR.
Set control at maximum COOLER, then, if condition improves, adjust properly.
Step 3. Check that the supply and return air louvers are properly adjusted.
Adjust louvers properly.
Step 4. Check to be sure that excessive hot, outside air is not being introduced through the fresh air damper.
Fully close damper, then, if condition improves, adjust properly.
Step 5. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.
Step 6. Check to see if EVAPORATOR FAN SPEED switch is set at LOW speed.
Set switch to HIGH speed.
Step *7.* Check to be sure condenser air inlet guard or discharge air louver are not obstructed.
Remove obstruction.
Step *8.* Check condition of refrigerant in sight glass.
If refrigerant color is in the yellow zone or numerous bubbles appear in window, turn selector to OFF and contact direct support maintenance.

3. REDUCED HEATING CAPACITY.
Step 1. See that the MODE SELECTOR switch is properly set.
Set switch on LOW or HIGH HEAT.
Step 2. Check operation of TEMPERATURE SELECTOR switch.
Set control to fully WARMER then, if condition improves, adjust properly.
Step 3. Check that the supply and return air louvers are properly adjusted,
Adjust louvers to open position.
Step 4. Check to be sure that excessive cold, outside air is not being introduced through the fresh air damper.
Fully close damper, then, if condition improves, adjust properly.
Step 5. Check that all doors, windows, and other openings in the room or enclosure are tightly closed.
Tightly close all openings.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section/Paragraph

Section I.

REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL

a. Repair parts are listed and illustrated in TM5-4120-347-24P, No special tools are required for maintenance of the equipment. Test, maintenance and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment found in any organizational maintenance electric shop.

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

c. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-596-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	National Stock Number
Brush, Bristle	7520-00-223-8000
Brush, Wire	7920-00-282-9246
Bucket	7240-00-137-1609
Heat Gun	4940-01-042-4855
Multimeter	6625-00-553-0142
Pliers, Long Round Nose	5120-00-268-3579
Rubber Gloves	8415-00-266-8677
Safety Goggles	4240-00-052-3776
Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293
Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014

Section II.

SERVICE UPON RECEIPT OF EQUIPMENT

4-2. UNLOADING

The Model F9000H-3 Air Conditioner is packaged in a container designed for shipment and handling with the cabinet in an upright position. The base of the container is constructed as a shipping pallet with provisions for the insertion of the tongs of a fork on materials handling equipment.

a. Remove all blocking and tiedowns 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 packaged unit from the carrier.

CAUTION

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

4-3. UNPACKING

a. General. 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 for mobility purposes if frequent relocation of the air conditioner is anticipated.

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

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

NOTE

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

4-4. RECEIVING INSPECTION

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 DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies In accordance with the instructions of TM 38-750 (The Army Maintenance Management System).

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

NOTE

The unit weight (less shipping pallet) is 200 pounds (90.7 kg). When lifting or moving the unit on the shipping pallet, a forklift may be used. When lifting the unit into position use four people, one at each lifting handle.

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

4-5. INSTALLATION SITE PREPARATION

a. General. The air conditioner is designed so that it is adaptable to a variety of installation arrangement. 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 within 5° from front to back and side to side. See figure 4-1, Sheets 1, 2 and 3 for mounting dimensions.

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

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

(4) An unobstructed flow of air from outside the conditioned area to the fresh air intake (back face of air conditioner).

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

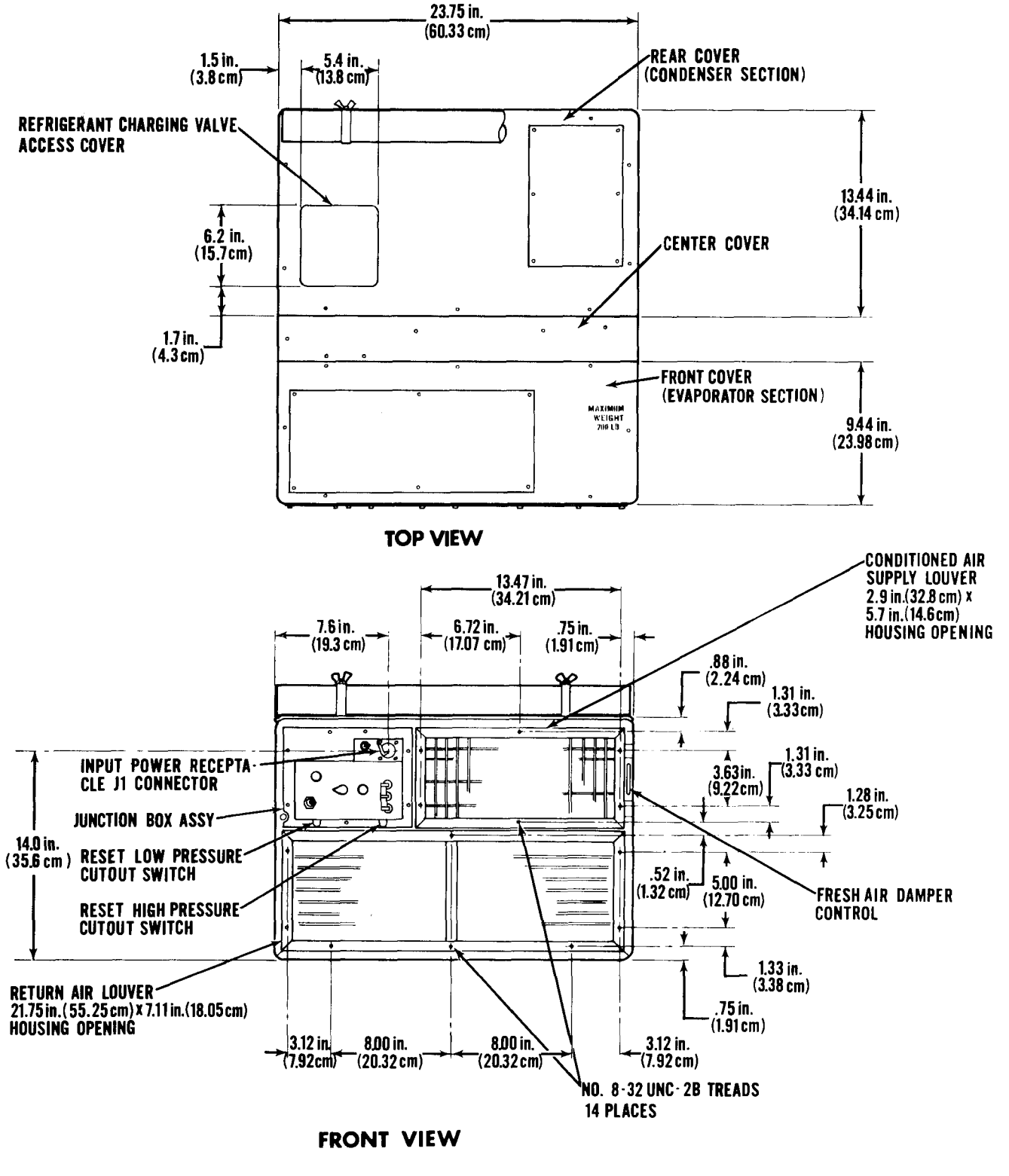


Figure 4-1. Installation Dimensions (Sheet 1 of 3)

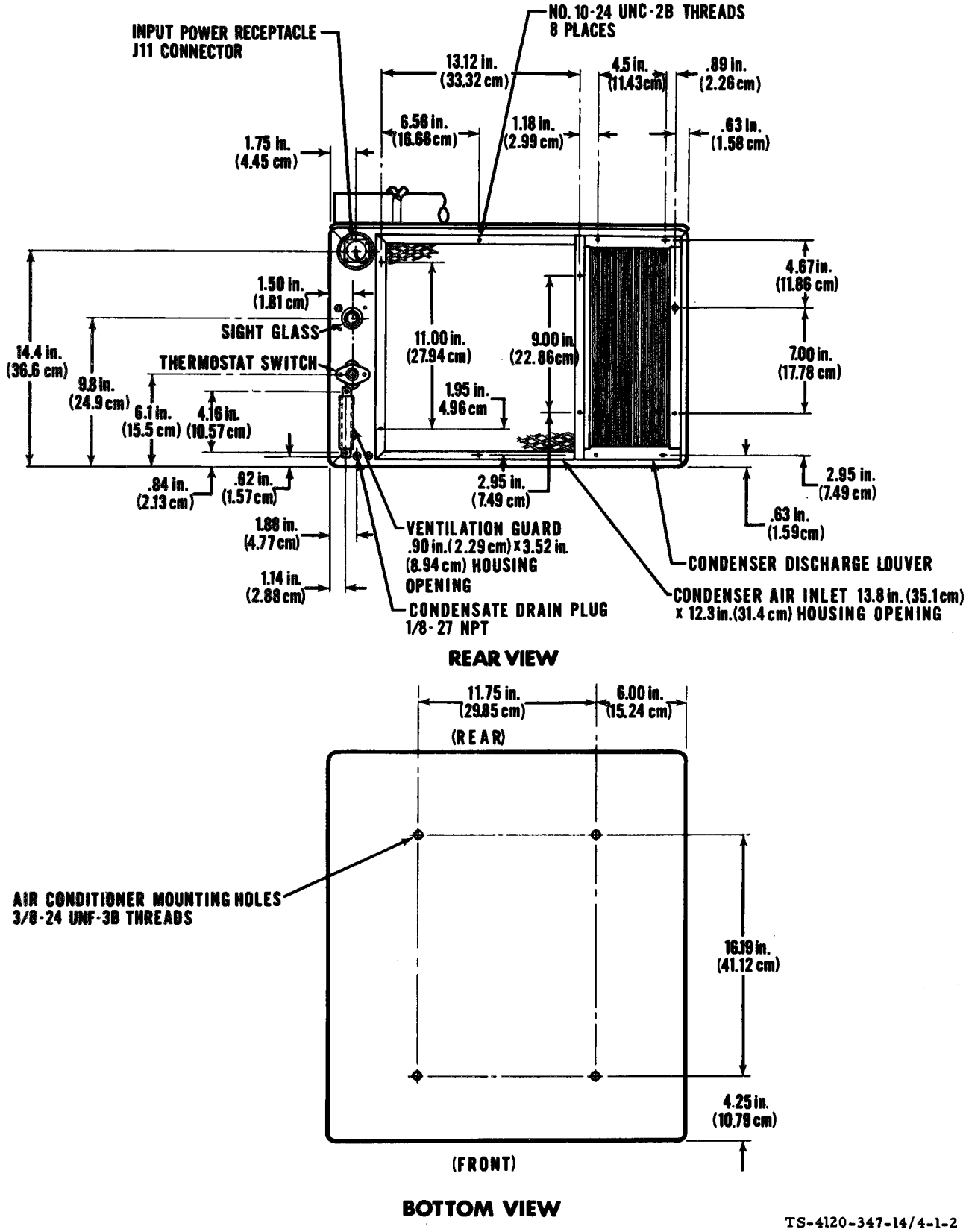
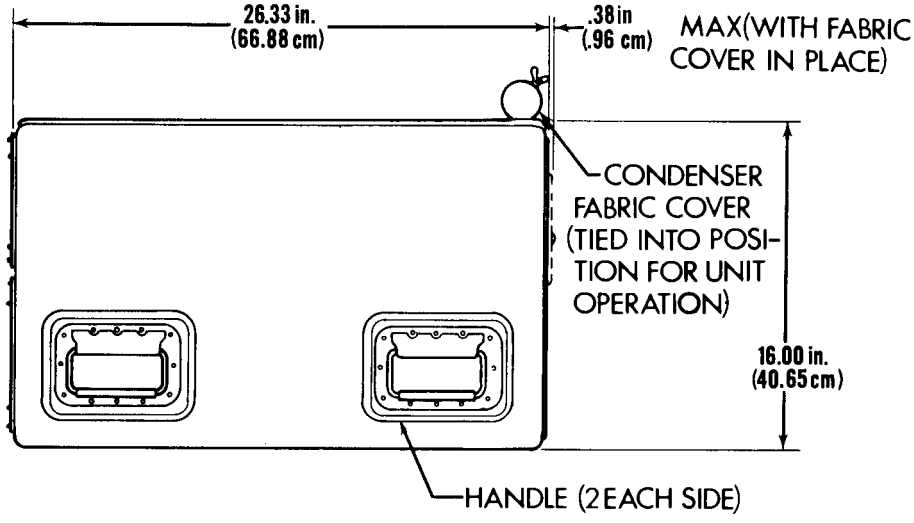
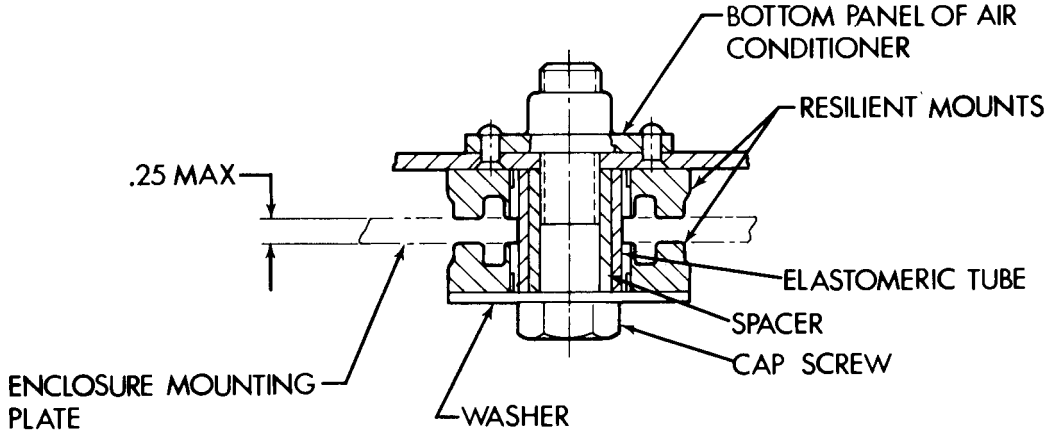


Figure 4-1. Installation Dimensions (Sheet 2 of 3)



RIGHT SIDE VIEW



CROSS SECTION OF BOTTOM MOUNTING HOLE AND HARDWARE (TYPICAL 4 PLACES)

TS-4120-347-14/4-1-3

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

(6) Access to and sufficient headroom to allow removal of the front and rear top panels is necessary, if the unit is to be serviced when installed.

(7) A source of 208 volt, 3 phase, 60 hertz input power rated at 9 amps. The power source outlet should be located as near as possible to the installed location of the air conditioner. The power source wiring must include a disconnect switch. However, provisions should be made to insure that power is not disconnected during normal operation and that the disconnect is not used to turn off the air conditioner for normal shutdown,

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

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

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

4-6. AIR CONDITIONER PREPARATION FOR INSTALLATION

a. Two input power connectors are provided on the air conditioner. (See figure 4-1.) Connector J1 is located on the front of the air conditioner above the control panel module, Connector J11 is located on the rear of the air conditioner in the upper left corner. Determine which connector best suits your installation. If power source is inside of conditioned area use J1. If power source is outside of conditioned area use J11.

(1) Air conditioners are shipped from the factory wired for the use of the J1 power connector. If this connector is used no change is necessary. (See figure 4-2.)

(2) If the J11 connector is to be used leads X1B12A, X2B12B and X3B12C on terminal strip TB3 must be moved from terminals 1, 2 and 3 to terminals 4, 5 and 6 respectively. Leads X4A12N on TB4 terminal 2 and X43B12N on TB4 terminal 3 must be reversed.

(a) Remove the top covers from the air conditioner.

(b) Disconnect wire X1B12A from TB3 terminal 1 and reconnect it to terminal 4.

(c) Disconnect wire X2B12B from TB3 terminal 2 and reconnect it to terminal 5.

(d) Disconnect wire X3B12C from TB3 terminal 3 and relocate it to terminal 6.

(e) Disconnect wire X4A12N from TB4 terminal 2 and X43B12N from TB4 terminal 3. Reconnect X4A12N to terminal 3 and X43B12N to terminal 2.

(f) If neutral is to be isolated from ground go to paragraph 4-6b below prior to installing top covers.

(g) Install the top covers.

b. If your installation requires isolation of neutral from ground the jumper between terminals 1 and 2 of TB4 must be disconnected. (See figure 4-3.)

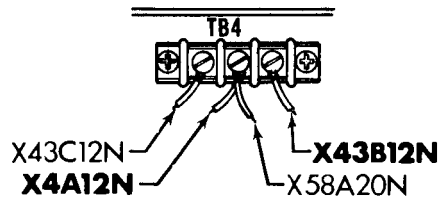
(1) Remove the top covers.

(2) Remove the jumper beween terminals 1 and 2 on TB4.

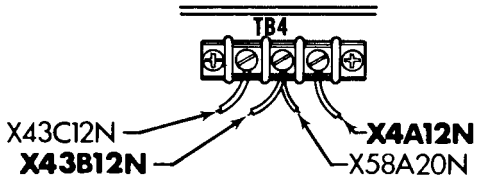
(3) Place a tag on the air conditioner to indicate that the unit has been modified to remove the neutral jumper between terminals 1 and 2 of TB4.

(4) Install the top covers.

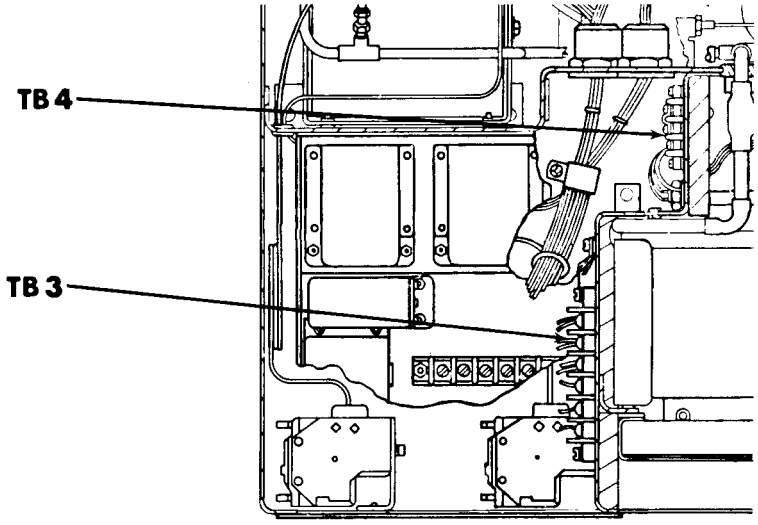
c. Connectors are provided to permit remote installation of the control module. If it is determined that it is desirable to mount the control module in a remote (mounted elsewhere in the conditioned space) location the following steps must be taken. (See figure 4-4.)



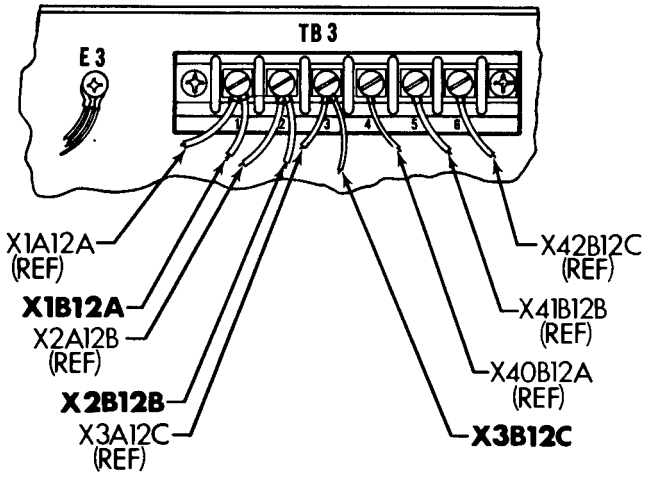
TB4 WIRED FOR J1 INPUT POWER CONNECTOR (STANDARD)



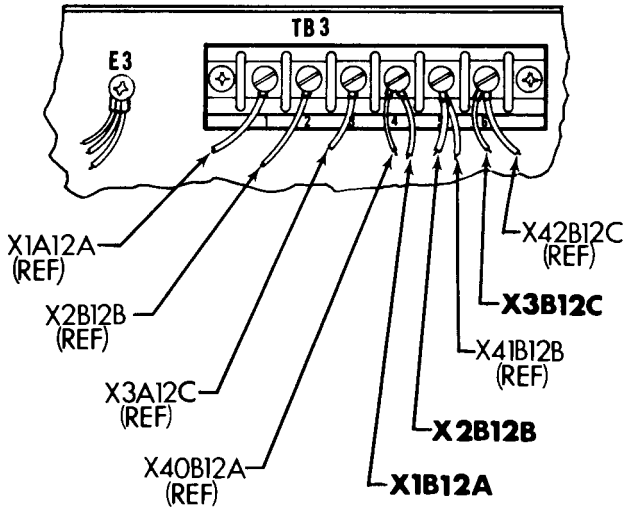
TB4 WIRED FOR J11 INPUT POWER CONNECTOR



UPPER LEFT CORNER WITH TOP COVERS REMOVED



TB3 WIRED FOR J1 INPUT POWER CONNECTOR (STANDARD)



TB3 WIRED FOR J11 INPUT POWER CONNECTOR (ALTERNATE)

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Figure 4-2. Wiring Connection Changes for J1/J11 Power Input Connector

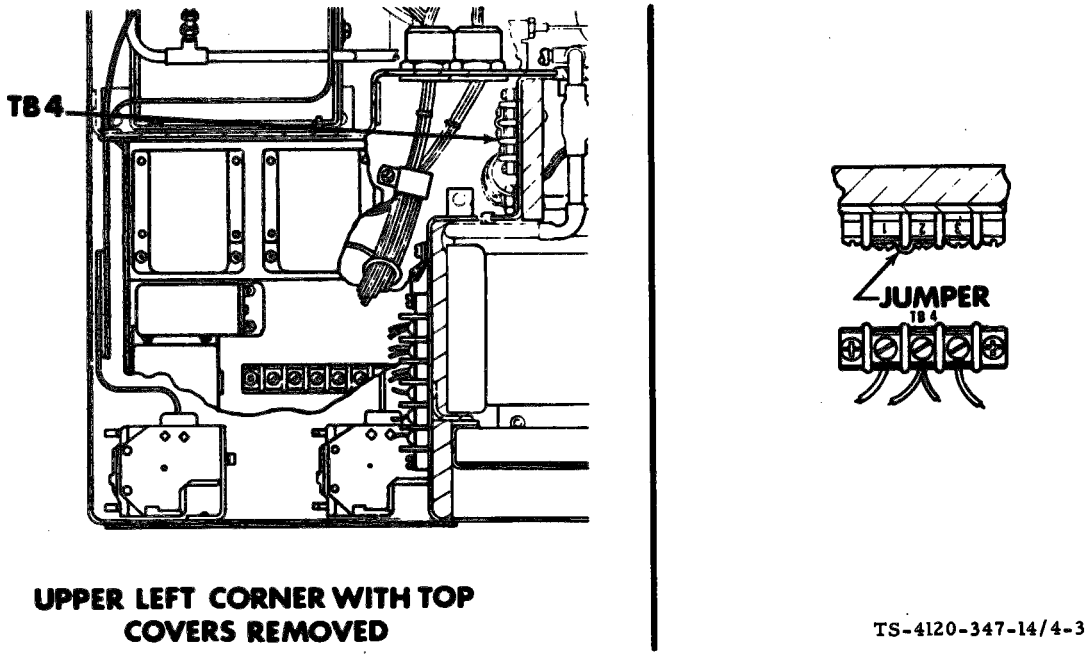

Figure 4-3. Neutral Jumper

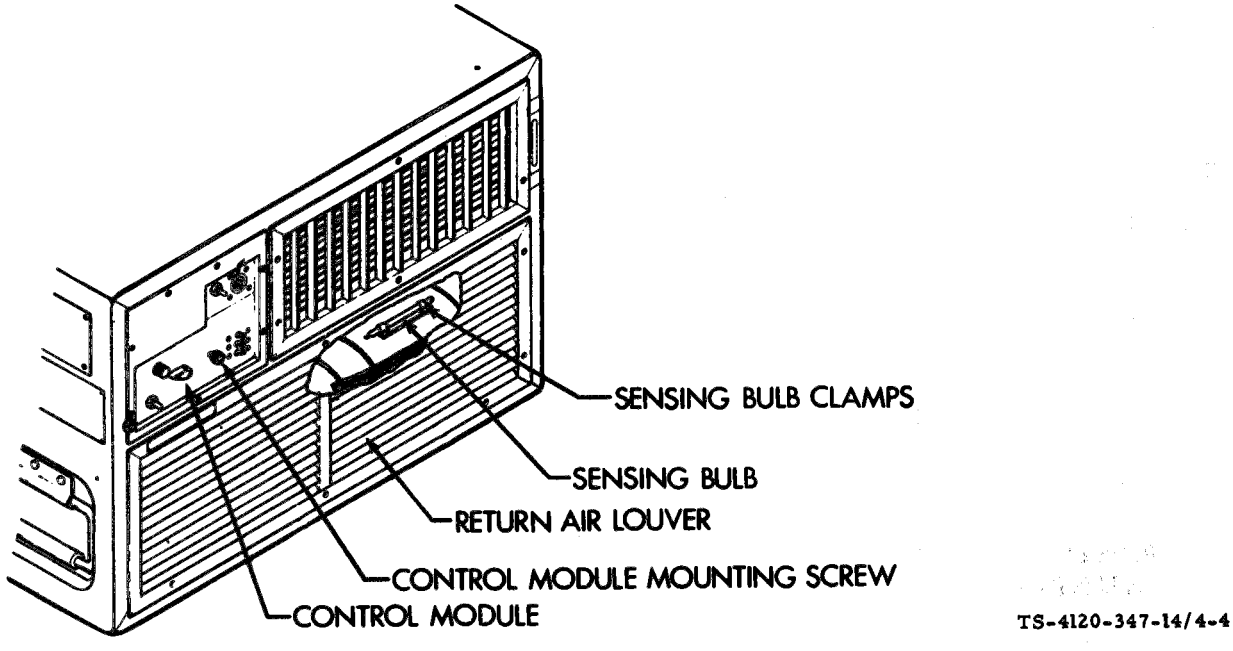

Figure 4-4. Control Module Removal

(1) Remove the return air louver.

(2) Loosen the sensing bulb clamp screws and slip the sensing bulb out of the clamps.

(3) Loosen the control module mounting screw and carefully pull the control module out of the unit. Use care to avoid damage to the sensing line.

(4) Carefully work the sensing bulb through the frame and out of the unit.

(5) Determine where the control module is to be located. Note that the sensing bulb controls the thermostatic action of the TEMPERATURE SELECTOR. It should be mounted where a true room or enclosure temperature will be indicated. Do not place near heat or cool producing items. A false temperature control would be the result.

(6) Secure the control module and sensing bulb.

(7) The receptacle and plug needed to fabricate the interconnecting cable are provided with the unit. Determine the length of wire needed to connect the plug and receptacle between the unit and control module.

(8) See the wiring diagram, figure 4-5, and fabricate the interconnecting cable so that wire size used matches the internal wires in the unit. This cable will connect between P2A/B and J2A/B.

(9) Connect the cable.

(10) Install the return air louver.

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

4-7. INSTALLATION INSTRUCTIONS

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

a. Shelter/Enclosure Preparation. The following information describes a typical through the wall type installation. You may want to alter these instructions to suit your specific application. See figure 4-6 for a through the wall installation that allows removal of the front and rear top panels for service with the unit installed.

(1) Determine the most desirable location.

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

(3) Fabricate a mounting platform or braces. Be sure to provide mounting holes to match holes in the bottom of the air conditioner. See figure 4-1, Sheet 2.

b. Lift the air conditioner into position. Be sure to use adequate equipment or four people to lift the unit into position.

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

WARNING

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

COMPONENT REFERENCE LIST	
ELEC. REF. DES.	DESCRIPTION
B1	COMPRESSOR , RECIPROCATING
B2	MOTOR , CONDENSER FAN
B3	MOTOR , EVAPORATOR FAN
C1	CAPACITOR , FILTER
C2	CAPACITOR
CB1	CIRCUIT BREAKER , COMPRESSOR
CB2	CIRCUIT BREAKER , CONTROL
CR1	RECTIFIER , SEMICONDUCTOR DEVICE
E1	TERMINAL STUD (CONTROL MODULE GND)
E2	TERMINAL STUD (JUNCTION BOX GND)
E3 AND E4	TERMINAL STUD (SYSTEM GND)
HR1 THRU 6	HEATER ELEMENT
J1 AND J11	CONNECTOR , RECEPTACLE , POWER INPUT
J2	CONNECTOR , RECEPTACLE , JUNCTION BOX
J3	CONNECTOR , RECEPTACLE , EVAPORATOR FAN
J4	CONNECTOR , RECEPTACLE , COMPRESSOR
J5	CONNECTOR , RECEPTACLE , CONDENSER FAN
J6	CONNECTOR , RECEPTACLE , POWER INPUT
J7	CONNECTOR , RECEPTACLE , THERMOSTATIC SWITCH
J8	CONNECTOR , RECEPTACLE , SOLENOID VALVE BY-PASS
J9	CONNECTOR , RECEPTACLE , SOLENOID VALVE EQUALIZER
J10	CONNECTOR , RECEPTACLE , COMPRESSOR
K1	RELAY , TIME DELAY
K2	RELAY , HEATER
K3	RELAY , COMPRESSOR MOTOR
K4	RELAY , CONDENSER FAN
K5	RELAY , PHASE SEQUENCE
L1	VALVE , SOLENOID , BY-PASS
L2	VALVE , SOLENOID , PRESSURE EQUALIZER
P1	CONNECTOR , PLUG , POWER INPUT
P2	CONNECTOR , PLUG , CONTROL MODULE
P3	CONNECTOR , PLUG , EVAPORATOR FAN
P4	CONNECTOR , PLUG , COMPRESSOR
P5	CONNECTOR , PLUG , CONDENSER FAN
P6	CONNECTOR , PLUG , POWER INPUT
P7	CONNECTOR , PLUG , THERMOSTATIC SWITCH
P8	CONNECTOR , PLUG , SOLENOID VALVE BY-PASS
P9	CONNECTOR , PLUG , SOLENOID VALVE EQUALIZER
P10	CONNECTOR , PLUG , COMPRESSOR
R1	RESISTOR
S1	SWITCH , ROTARY SELECTOR
S2	SWITCH , TOGGLE
S3	SWITCH , TEMPERATURE CONTROL
S4	SWITCH , HIGH PRESSURE CUTOUT
S5	SWITCH , LOW PRESSURE CUTOUT
S6	SWITCH , HEATER CUTOUT
S7	SWITCH , THERMOSTATIC
T1	TRANSFORMER
TB1	TERMINAL BOARD , JUNCTION BOX
TB2	TERMINAL BOARD
TB3	TERMINAL BOARD , POWER INPUT
TB4	TERMINAL BLOCK

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11) , THE LEADS X1B12A , X2B12B , AND X3B12C ON TB3-1 ,-2 ,AND-3 MUST BE CHANGED TO TB3-4,-5,AND -6 RESPECTIVELY.

THE RUN AND START COMPRESSOR CAPACITOR ARE SIZED IN ACCORDANCE TO THE COMPRESSOR MANUFACTURER RECOMMENDATIONS FOR PROPER CAPACITOR CHECK THE MAINTENANCE MANUAL .

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Figure 4-5. Wiring Diagram (Sheet 1 of 3)

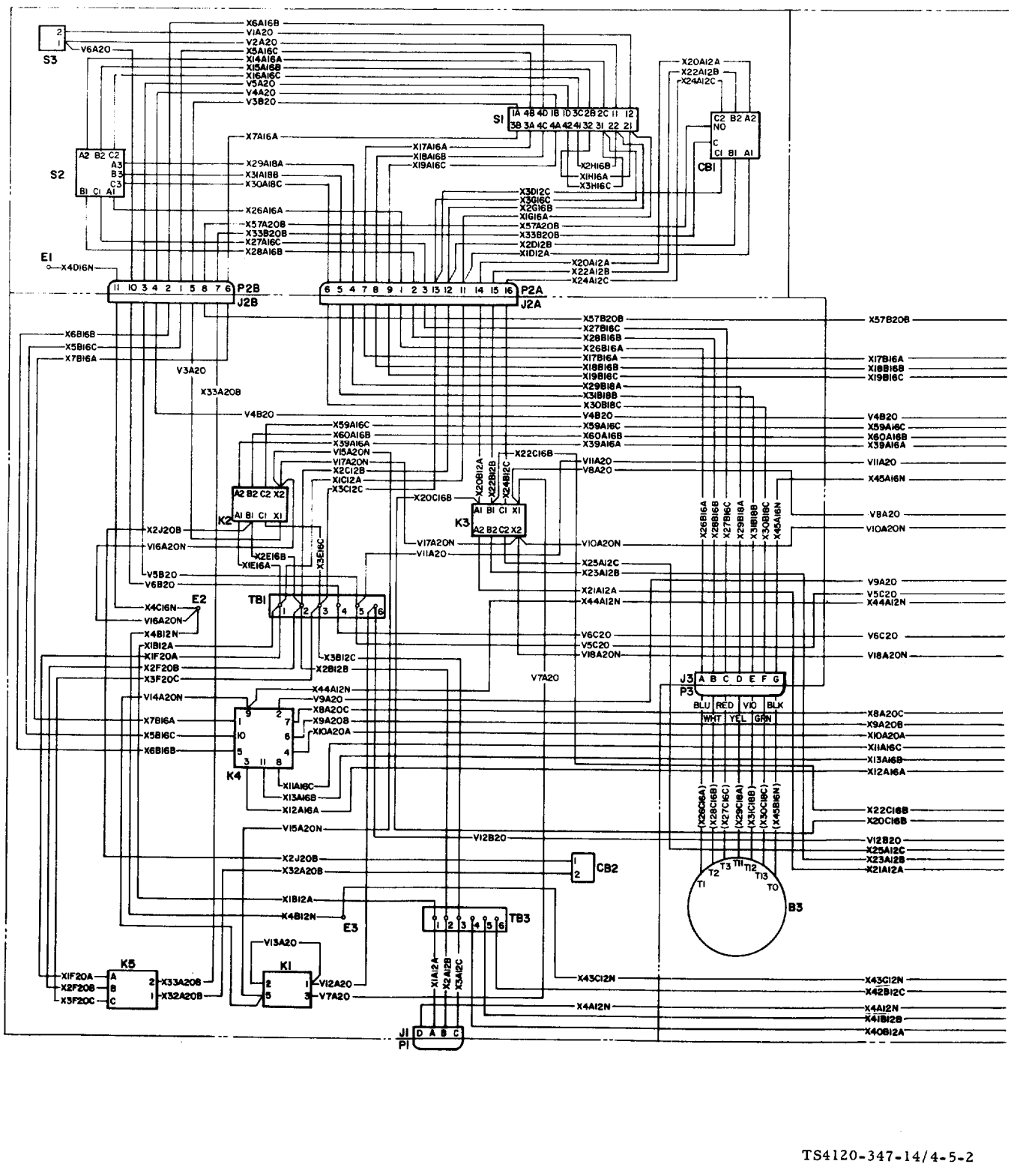

Figure 4-5. Wiring Diagram (Sheet 2 of 3)

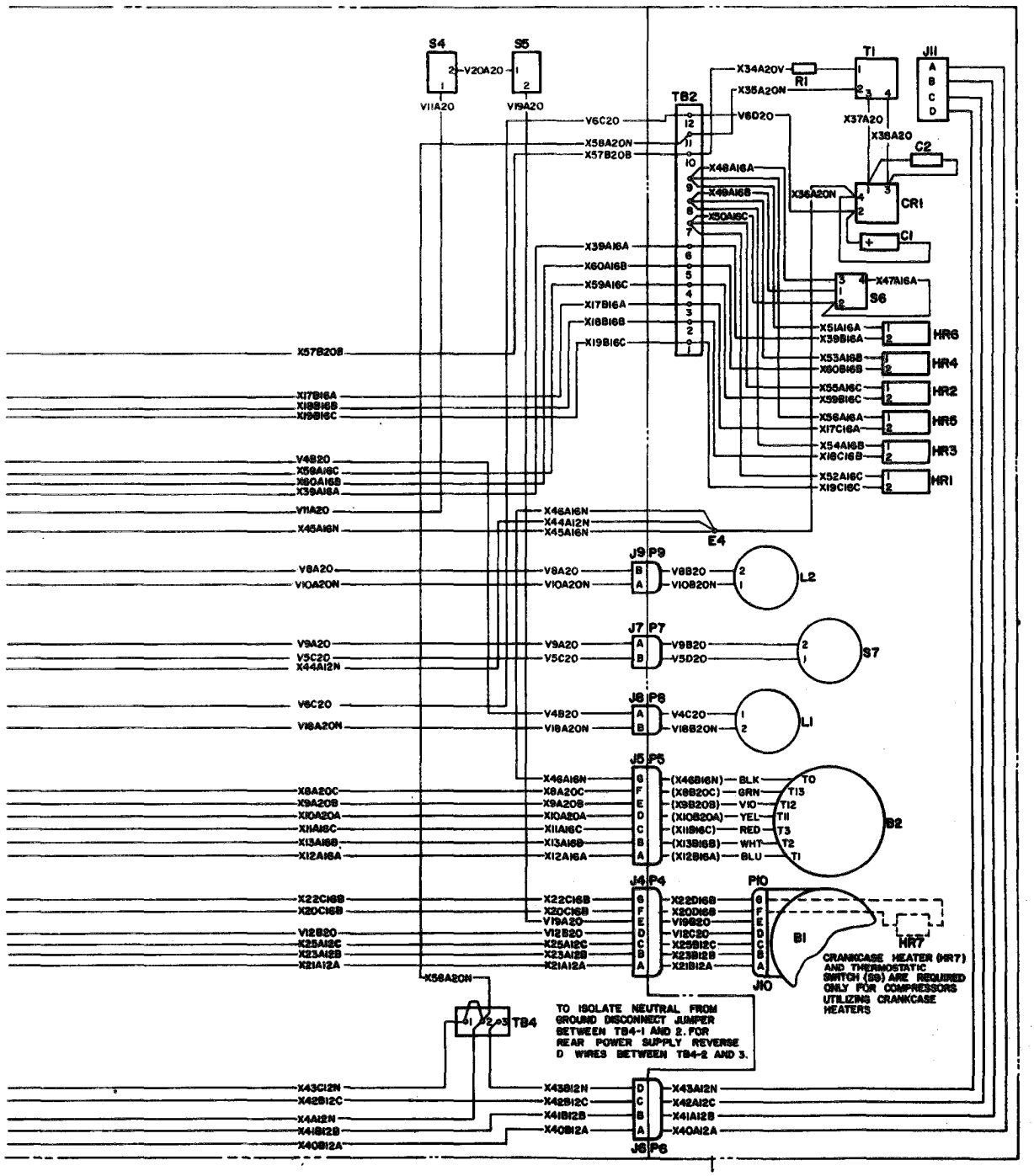

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Figure 4-5. Wiring Diagram (Sheet 3 of 3)

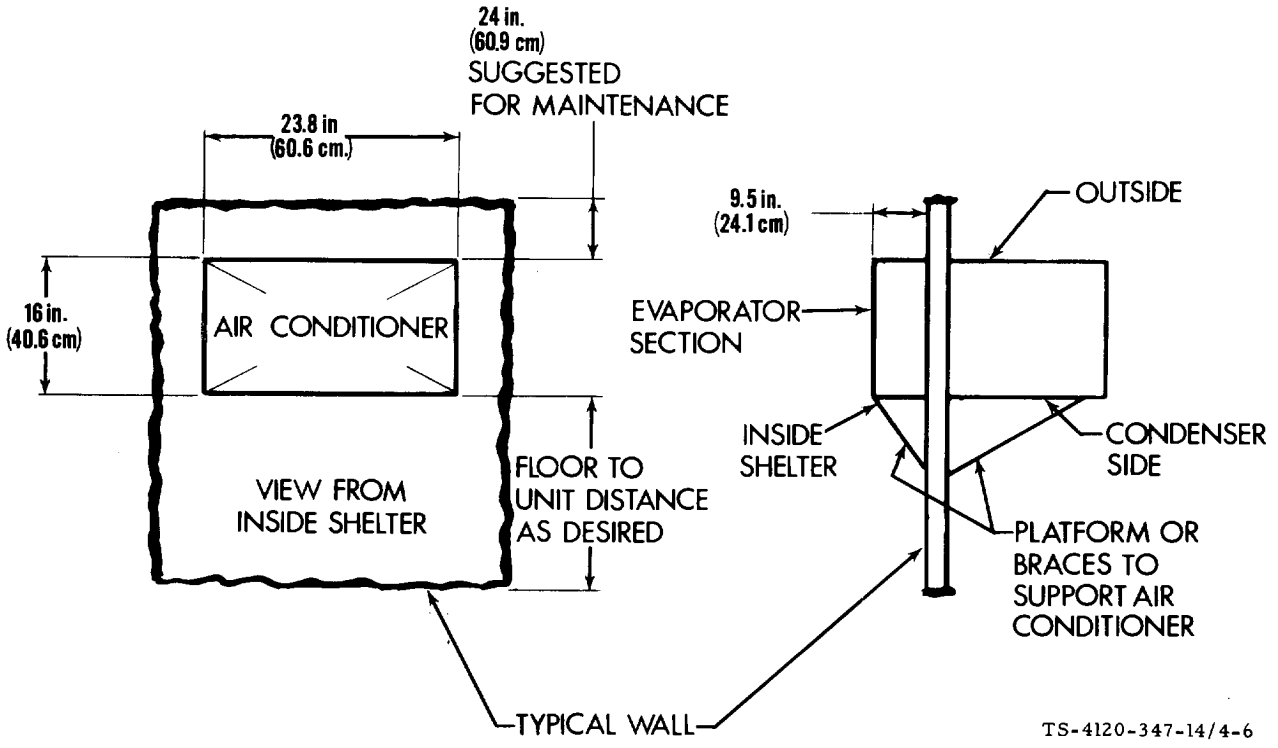

Figure 4-6. Typical Through the Wall Installation

d. Connect a 10 AWG ground wire from the shelter ground to the air conditioner external ground. The air conditioner external ground is located on the front face to the left of the control module. See figure 1-2, item 18.

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

f. Fabricate an input power cable of the required length using the MS3106R18-11S connector supplied with the air conditioner for connection to the J1 or J11. If the J11 connector is used, be sure the wiring tothe TB3 and TB4 terminal boards is relocated in accordance with paragraph 4-6.

Pin	Internal wiring connection J1 and J11
A	Phase A
B	Phase B
C	Phase C
D	Ground
E	Blank (not used)

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

WARNING

Check to be sure that the source of power for the shelter and the air conditioner are compatible.

h. Connect the power cable to the input power source (208 volt, 3 phase, 60 hertz) and the air conditioner.

i. Run operational checks in accordance with paragraph 2-6.

Section III.

LUBRICATION

4-8. GENERAL

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

4-9. MECHANICAL LUBRICATION

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

Section IV.

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-10. GENERAL

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

4-11. INSPECTION AND SERVICE

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

b. Table 4-1 lists the organizational preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. Figure 4-7 shows the location of PMCS items. The PMCS items

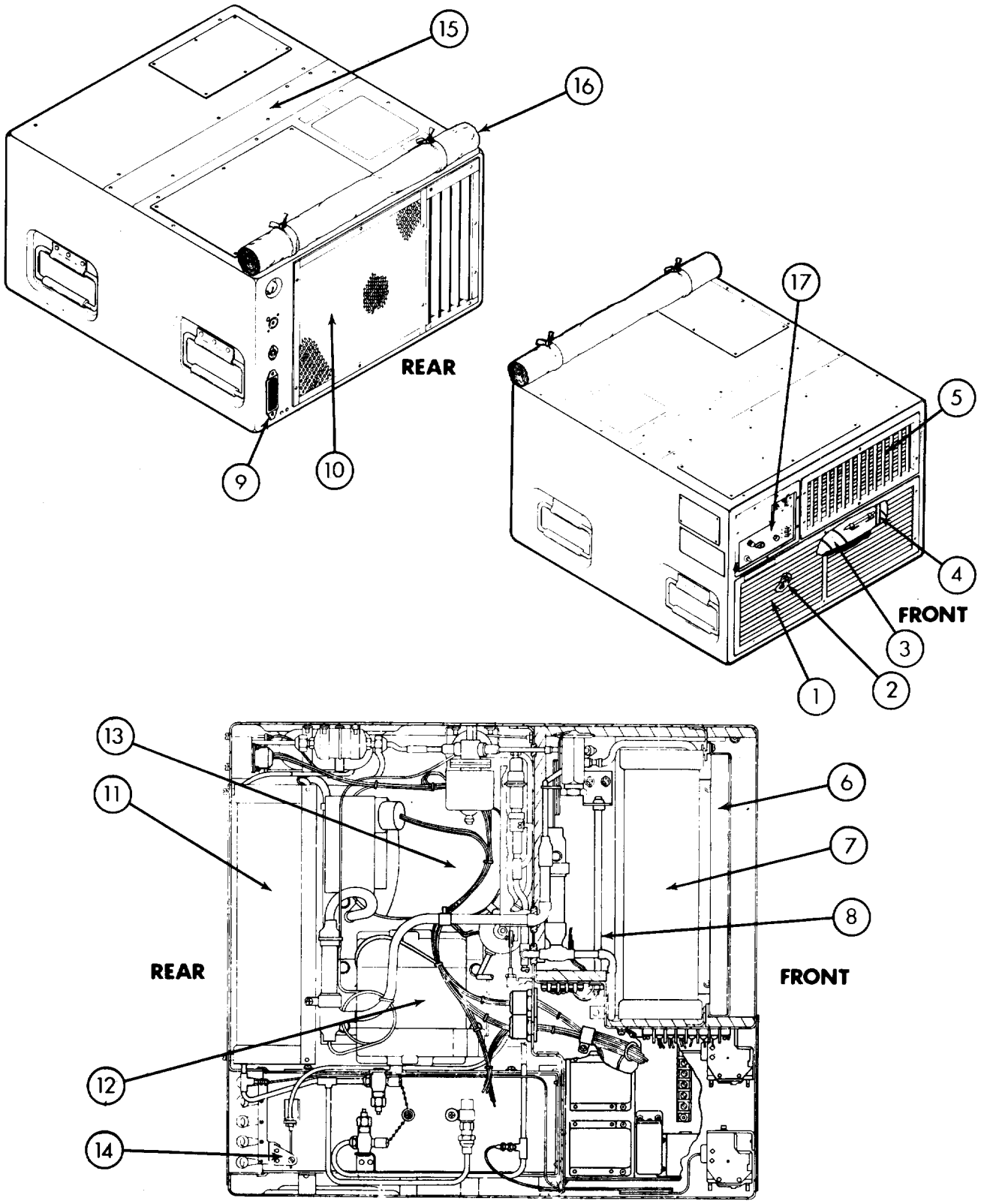

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Figure 4-7. Location of PMCS Items

in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime. The "Para Ref" (Paragraph Reference) column on the right side of the table provides the paragraph number where detailed, step-by-step disassembly/reassembly maintenance procedures may be found.

WARNING

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

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

Item No.	Iterm To Be Inspected/Serviced	Procedures	Para Ref.
1	Return Air Louver	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate as necessary c. Set aside for the present and reinstall after item 4.	4-19
2	Conditioned Air Filter	a. Remove, clean, inspect, and service filter. b. Discard filter and obtain replacement, if damaged. c. Place filter aside for the present and reinstall after item 4.	4-19
3	Conditioned Air (Evaporator) Fan and Motor	a. Wipe or vacuum all dust or dirt from the fans, motor, and all other components and surfaces in the area. b. Inspect the fans for damage or bent blades, the motor for signs of overheating, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	4-40
4	Condensate Drain Tubing	a. Check for loose connections, missing clamps, indications of water leaks and damaged or missing tubing. b. Repair or replace as indicated. c. Install filter and return air louver.	4-25
5	Conditioned Air Supply Louver	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair and lubricate as necessary. c. Set aside for the present and reinstall after item 8.	4-20
6	Mist Eliminator	a. Remove, clean, and inspect the top front cover. Set aside for the present and reinstall after item 8. b. Remove, clean, inspect, and service the mist eliminator filter, c. Replace the mist eliminator if it is damaged. d. Set it aside for the present and reinstall after item 8.	4-22

Item No.	Item To Be Inspected/Serviced	Procedures	Para Ref.
		WARNING Compressed air used for cleaning purposes will not exceed 30 psi (2.1 Kg (cm^2)	
7	Evaporator Coil	a. Blow accumulated dust and dirt out of the air passages in the evaporator coil using compressed air or the discharge side of a portable vacuum cleaner. Blow from front to back in the opposite direction from operational airflow. b. Inspect coil for obvious damage and all mounting hardware for tightness and security.	4-44
8	Heating Elements	a. Wipe or vacuum any remaining dust or dirt from the heating elements, the heater thermostat, and all other components and surfaces in the area. **NOTE** Use a clean, dry cloth (or one slightly moistened with water) for all wiping operations, NEVER use an oily or greasy cloth, any oily residue left on any surface will attract and accumulate much more dust and dirt than dry surfaces. b. Inspect heating elements and thermostat for obvious damage, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness. d. Install the mist eliminator and the top front cover.	4-42
9	Fresh Air Ventilation Guard	a. Remove, clean, inspect, and service. b. Discard and obtain replacement, if damaged. c. Reinstall.	4-21
10	Condenser Air Inlet Guard	a. Remove, clean, inspect, and repair guard, as necessary. b. Place guard aside for the present and reinstall after item 14. c. Remove, clean and inspect the top rear cover. Set aside and reinstall after item 14. **WARNING** Compressed air used for cleaning purposes will not exceed 30 psi (2.1 Kg (cm^2)	4-21
11	Condenser Coil	a. Blow dust and dirt from the condenser coil in the same manner as used for the evaporator coil in item 7. In this case, blow from the inside for reverse airflow direction. b. Inspect coil for obvious damage, and all mounting hardware for tightness and security.	4-46

Item No.	Item To Be Inspected/Serviced	Procedures	Para Ref.
12	Condenser Fan and Motor	a. Wipe or vacuum all dust and dirt from fan and motor, and all other components and surfaces in the immediate area. b. Inspect the fan for damage or bent blades, the motor for signs of overheating, and all mounting hardware for tightness and security. c. inspect the wiring harness for damage or chafing, and all electrical connections for tightness.	4-43
13	Compressor	a. Wipe or vacuum all dust or dirt from the compressor canister, and all other remaining components and surfaces in the lower section of the cabinet. b. Inspect the compressor crankcase heating element and associated thermostat for condition. c. Inspect wiring harness for damage or chafing, and all electrical connections for tightness. d. Check all mounting hardware for the compressor for tightness and security.	— — 4-37 —
14	Condenser Discharge Air Louver, Linkages and Actuator	a. Check all mounting hardware and linkage connections for tightness, b. Clean and lubricate as necessary. c. Install the condenser air inlet guard and the top rear cover.	4-23
15	Covers, Nameplates and Housing	a. Wipe all surfaces clean. b. Check that all Warning and instruction plates are in place and legible. c. Replace missing or illegible plates. d. Check that all covers are in place, that there is no missing or loose hardware and no dents, breaks or damage that would be a hazard or interfere with unit operation.	4-15, 4-18 and 4-47
16	Fabric Cover	a. Roll down the cover and inspect for tears, cracks, or any other sign of damage or deterioration. b. If the necessity of washing is indicated, use fresh water with a small amount of a mild detergent, c. Reroll and secure the cover in the stowed position. If the cover was washed, be sure it is thoroughly dry before rerolling.	4-17
17	Operational Checks	**CAUTION** Do not check operation in COOL mode until after input power has been reconnected for a sufficient time to eliminate any danger of liquid refrigerant accumulation in the	2 - 6

Item No.	Item To Be Inspected/Serviced	Procedures	Para Ref.
		compressor cylinder. Except in extremely cold conditions, if input power has been disconnected for a period of less than four hours, an equal warm-up period should be allowed, If the disconnected period has been more than four hours, a full four hour warm-up period is necessary. a. Be sure the mode selector switch is in the OFF position and reconnect input power. b. Perform functional check of the air conditioner in all operational modes in accordance with the instructions in paragraph 2-6. c. Set-up the air conditioner for the desired operational mode, d. Record performance of quarterly PMCS, including all corrective act ions taken.	
NOTE: If the air conditioner has been in operation under unusual conditions, the above PMCS items must be modified as necessary to meet the further requirements due to the unusual conditions.			

Section V.

TROUBLESHOOTING

4-12. USE OF TROUBLESHOOTING TABLE

Table 4-2 contains troubleshooting information useful to organizational maintenance technicians in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. The troubleshooting table lists the. common malfunction symptoms and unsatisfactory performance characteristics technicians are most likely to encounter; test and inspection steps to be followed to determine the cause; and the corrective action(s) that should be performed for each possible cause listed.

b. The technician should first find the malfunction symptom or unsatisfactory performance characteristic in the table which most closely describes the immediate situation; then perform the test and inspections, and corrective action steps in the order in which they are listed.

c. This manual cannot list all possible situations which may be encountered, nor can it list all test and inspection, and corrective action steps which may be taken. If a condition is encountered which cannot be resolved within the capabilities and experience of organizational maintenance personnel, assistance should be requested from direct support maintenance.

TABLE 4-2. TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR CONDITIONER WILL NOT START IN ANY MODE.
   Step 1. Check to see if the circuit breakers are tripped.
   Reset circuit breakers.
   Step 2. Check to see if input power has been disconnected.
   Connect input power.

WARNING

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

CAUTION

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

   Step 3. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses.
   Tighten or replace connectors, or repair damaged wires.
   Step 4. Check that internal wiring at terminal boards TB3 and TB4 are wired for the connector to which input power is connected.
   See paragraph 4-6 and move wires if necessary.
   Step 5. Check for defective circuit breaker.
   Replace circuit breaker if defective.
   Step 6. Check for defective mode selector switch.
   Replace switch if defective.

2. CONDITIONED (EVAPORATOR) AIR FAN DOES NOT START OR STOP DURING OPERATION IN ANY MODE.

WARNING

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

   Step 1. Check operation of evaporator fan motor.
   Test motor. Contact direct support maintenance if motor is defective.
   Step 2. Check operation of mode selector switch.
   Test switch. Replace switch if defective.
   Step 3. Check electrical connections and wiring.
   Tighten or replace connectors, or repair or replace damaged wires.
   Step 4. Check fan for binding.
   Relieve binding or replace fan.

TABLE 4-2. TROUBLESHOOTING (cont.)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. CONDENSER FAN FAILS TO OPERATE.

WARNING

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

Step 1. Check operation of condenser fan motor.
Test motor. Contact direct support maintenance if motor is defective,
Step 2. Check electrical connections and wiring.
Tighten or replace connectors, or repair or replace damaged wires.
Step 3. Check fan for binding.
Relieve binding or replace fan.
Step 4. Check for bad high/low condenser speed fan thermostatic switch, (Refer to paragraph 4-39.)
Replace bad thermostatic switch.
Step 5. Disconnect condenser fan relay. Actuate primary with 24 volt d-c source, then check continuity of contacts that should be closed.
Replace bad relay. (Refer to paragraph 4-35.)

4. INSUFFICIENT COOLING.
Step 1. Check to see that mode selector switch is properly positioned.
Set switch to COOL.
Step 2. Check sight-glass liquid level indicator to see that refrigerant is colorless and clear. Yellow, milky or bubbly refrigerant indicates low level or excessive moisture.
Report condition to direct support maintenance.
Step 3. Inspect condenser coil for dirt.
Clean coil with 25-30 psi compressed air.
Step 4. Inspect evaporator return air filter for dirt.
Clean filter. (Refer to paragraph 4-19.)
Step 5. See whether temperature selector switch is set incorrectly or is no good.
Adjust setting or replace switch, or other corrective action (Refer to paragraph 4-28.)
Step 6. Check supply air outlet louver to see whether it is bent or stuck in the closed position.
Repair or replace louver. (Refer to paragraph 4-20.)
Step 7. Observe evaporator fan motor to see whether it is worn or no good.
Report fault to direct support maintenance or replace motor. (Refer to paragraph 4-40.)
Step 8. Check to see whether evaporator fan is loose or no good,
Tighten setscrew or replace fan. (Refer to paragraph 4-40.)

5. COMPRESSOR WILL NOT START.
Step 1. Make sure that compressor or control circuit breakers or selector switch is properly set.
Reset controls properly.
Step 2. See whether contacts of high-or-low pressure cut-out switch are open.
Reset pressure switches. Report fault to direct support maintenance if condition continued.
Step 3. Check for loose electrical connections or faulty wiring.
Tighten loose connections. Fix wiring if necessary.
Step 4. Make continuity check of control circuit to determine whether open circuit exists.
Fix open circuit or replace wire.

TABLE 4-2. TROUBLESHOOTING (cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 5. Check continuity across primary winding and across secondary winding of control transformer to see whether windings are good. (See figure 4-38.)
Replace bad transformer. (Refer to paragraph 4-38.)

Step 6. Apply 30 volts a-c across side terminals; check for 24-28 volts d-c across end terminals (marked + and -) of rectifier.
Replace bad rectifier. (Refer to paragraph 4-38.)

Step 7. Observe operation of time delay relay.
Replace bad relay. (Refer to paragraph 4-35.)

Step 8. Substitute compressor relay known to be good, and check operation.
Replace bad relay. (Refer to paragraph 4-35.)

Step 9. Substitute starting relay or capacitor known to be good and check operation.
Replace bad capacitor or relay. (Refer to paragraph 4-14.)

Step 10. Tape an accurate thermometer or thermocouple to the discharge tube of the compressor, and check for too high an operating temperature which would trip the compressor's internal temperature overload switch.
Let compressor cool. Report fault to direct support maintenance if condition continues.

Step 11. Test compressor motor by checking continuity of the following pins at the compressor electrical receptacle (See figure 4-5 for pin identifications).
(1) Pins A and B, B and C, and C and A. Continuity should exist.
(2) Pins A, B and C and compressor housing. No continuity should exist.
(3) Pins D and E. Continuity should exist when compressor is cool enough for internal thermostat to be closed. If compressor is hot, let cool and retest.
Report faulty motor to direct support maintenance.

6. COMPRESSOR STARTS, BUT GOES OUT ON OVERLOAD.

Step 1. Observe condenser fan motor for failure.
Replace bad motor. (Refer to paragraph 4-43.)

Step 2. Check for high head pressure.
Clean condenser coil and louvers. Check fan for proper operation.

7. EVAPORATOR AIR OUTPUT VOLUME LOW.

Step 1. Check for dirty or damaged filter or louvers.
Clean or replace filter. Clean or replace louvers as required.

Step 2. Check for dirty or iced evaporator coil.
De-ice and clean coil.

Step 3. Inspect evaporator fan for damage.
Replace fan. (Refer to paragraph 4-40.)

Step 4. Check for bad fan motor.
Replace motor. (Refer to paragraph 4-40.)

Step 5. Check to be sure that evaporator fan speed switch is not set at low speed.
Reset switch to high speed.

8. CONDENSER AIR OUTLET VOLUME LOW.

Step 1. Check for dirty condenser coil or guard.
Clean coil and guard.

Step 2. Check for bad high-low condenser fan thermostatic switch, using lamp bulb or heat gun and ohmmeter to check continuity.
Replace bad switch. (Refer to paragraph 4-39.)

TABLE 4-2. TROUBLESHOOTING (cont.)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 3. Inspect condenser fan for damage
Replace fan. (Refer to paragraph 4-43.)
Step 4. Make sure that air outlet louvers are not stuck or jammed in closed position.
Free louvers and control cable. Adjust control, or report to direct support maintenance if actuating cylinder is not working properly.

9. AIR CONDITIONER FAILS TO HEAT.
Step 1. Check selector switch for improper setting.
Set selector switch to LOW HEAT or HIGH HEAT.
Step 2. Make sure that temperature control switch is set properly.
Reset switch, if necessary.
Step 3. Check for dirty evaporator return air filter.
Clean filter.
Step 4. Check evaporator fan motor for proper operation,
Replace bad motor. (Refer to paragraph 4-40.)
Step 5. Make continuity check of temperature selector switch or mode selector switch.
Replace bad switch. (Refer to paragraphs 4-28 and 4-30.)
Step 6. Inspect heaters and wiring for loose connections or damage.
Tighten connections and fix bad wiring. Replace bad heater elements. (Refer to paragraph 4-42.)
Step 7. Check continuity of heater relay coils.
Replace bad relay. (Refer to paragraph 4-35.)
Step 8. Check operation of heater high-temperature cutout thermostatic switch. It should open when temperature rises above setting.
Replace bad thermostatic switch. (Refer to paragraph 4-41.)

10. EXCESSIVE NOISE.
Step 1. Check evaporator or condenser fan for vibration.
Tighten fans on shafts. Tighten all mounting screws.
Step 2. Check evaporator or condenser fan motor for wear, as indicated by noisy operation or excessive side or end play.
Replace worn or bad motor. (Refer to paragraphs 4-40 and 4-43.) (Refer to direct support maintenance for repairs.)
Step 3. Listen for compressor knocks or chatter.
Stop air conditioner and report condition to direct support maintenance.

Section VI.

MAINTENANCE PROCEDURES

4-13. GENERAL

The procedures in this section have been arranged in the order in which the items appear in the organizational (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix C. Step-by-step procedures have been provided for all actions authorized to be performed by organizational maintenance in the order in which they appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapters 5 and 6 respectively.

4-14 INSTALLATION CONNECTORS See Figure 4-8.

a. There are three connectors supplied with each air conditioner,

(1) Input power cable connector (P1). This connector is used at the unit end of the input power cable, It can be connected to the J1 receptacle located above the control module or the J11 receptacle located on the upper left rear corner of the unit.

NOTE

If the J11 receptacle is used see paragraph 4-6 and figure 4-2 for wiring changes.

(2) Remote control module cable connectors. The other two connectors are used when the control module is to be installed remote from the air conditioner. See paragraph 4-6.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(3) Disconnect power at power source.

(4) Inspect. The power cable connector and the remote control cable connectors (when used) should be inspected for;

- Loose, missing or damaged pins.
- Loose, damaged, cut or broken wires to the connector.
- Loose or bad solder connections
- Excessive corrosion.
- Obvious damage.

(5) Repair loose wires and solder connections.

(6) Replace damaged wires or connectors and connectors with missing, loose or damaged pins.

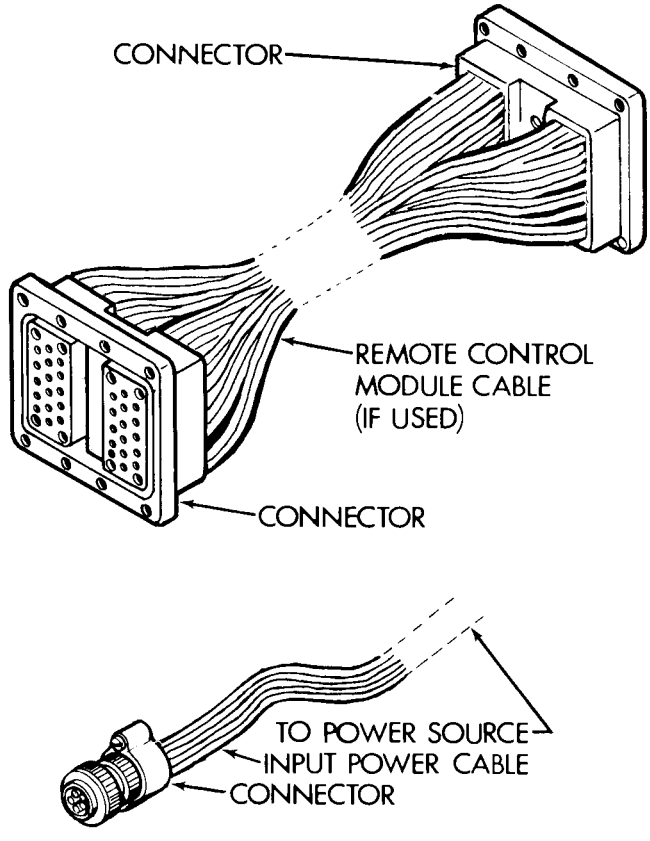

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Figure 4-8. Installation Connectors.

4-15. INFORMATION PLATES

See figure 2-3 for location and information contained on Warning and instruction plates. If any plates are missing, damaged or illegible, they should be replaced.

a. Obtain replacement plate.

b. Remove old plate by drilling rivets out. Use a drill stop or similar tool to avoid damage to internal parts.

c. Install new plate with proper size rivets.

4-16. INSTALLATION HARDWARE

Each unit is supplied with mounting hardware for the four base attachment points. See figure 4-1, sheet 3, cross section.

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

b. Replace missing, damaged or defective parts.

4-17. FABRIC COVER See figure 4-9

The fabric cover is made of vinyl impregnated nylon cloth. It is used to cover the exposed condenser (rear) openings during periods of shutdown or storage.

a. lnspection Repair. lnspect for rips, cuts, tears, or punctures in the fabric, and for damaged or missing snap fasteners and eyelets. Refer repair or replacement to direct support maintenance.

b. Lubrication. Apply a silicone spray lubricant or wax stick to the snap fasteners, if they are difficult to open and close.

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

d. Removal.

(1) Unsnap the four snap fasteners.

(2) Remove the three sets of screws, lockwashers and flat washers and lift the fabric cover from the unit,

e. Installation

(1) Secure the fabric cover to the unit with the three sets of screws, lockwashers and flat washers.

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

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

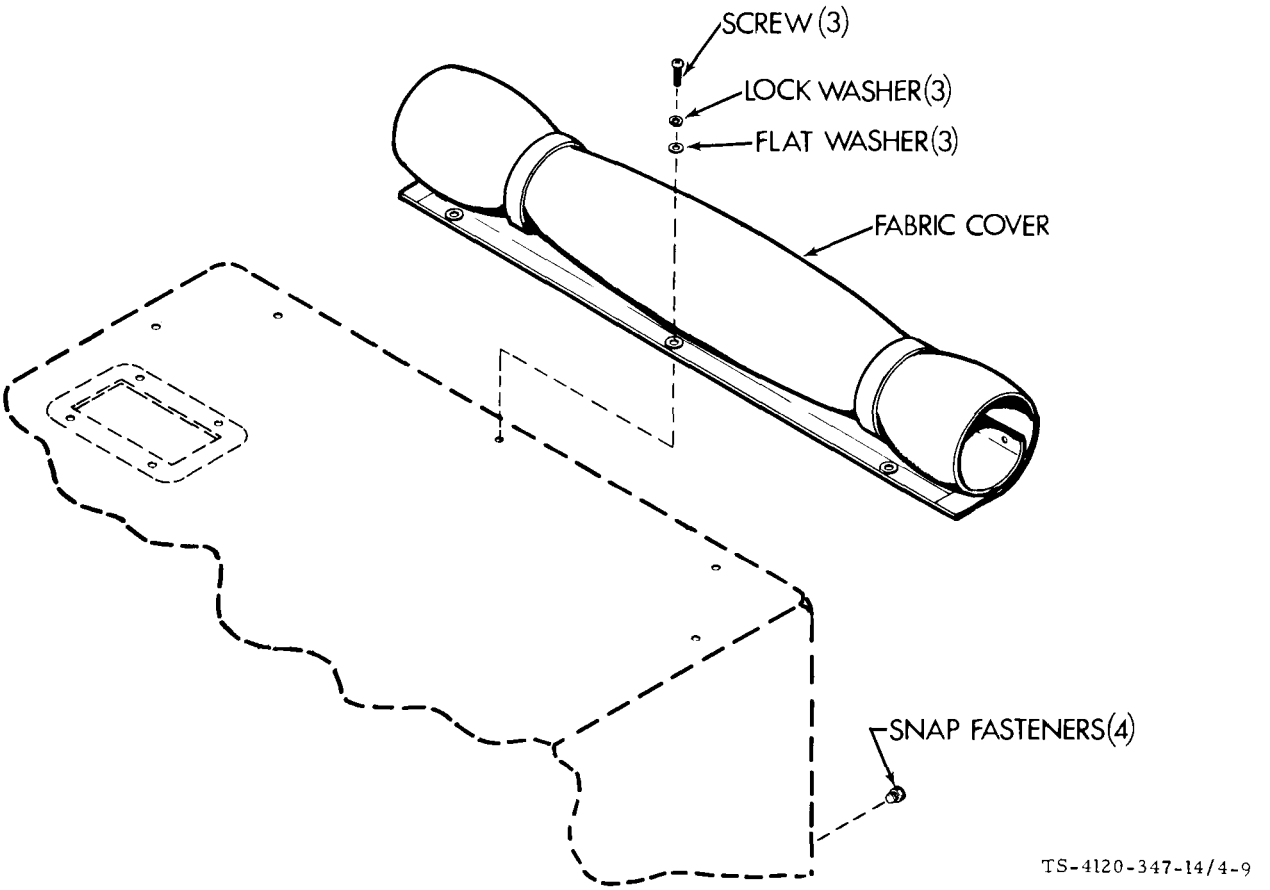

Figure 4-9. Fabric Cover

4-18. TOP COVERS See figure 4-10.

The top of the unit is enclosed with easily removed top covers.

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) The top front cover and the access cover can be removed independently.

(3) To totally remove the rear cover it is also necessary to remove the fabric cover.

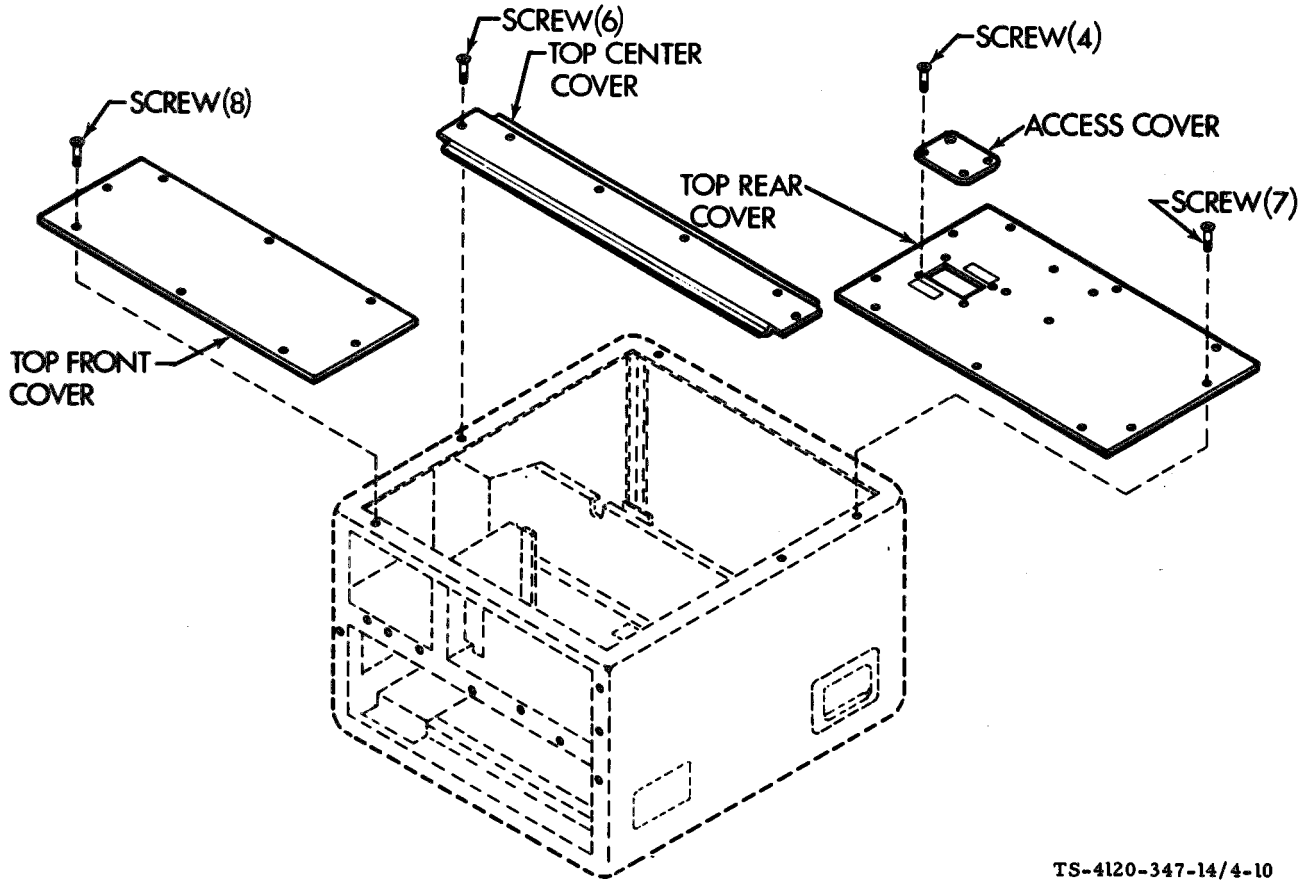

Figure 4-10. Top Covers

(4) The top front and rear covers must be removed prior to removal of the top center panel.

WARNING

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

c. Cleaning. Clean the covers with a cloth dampened with a detergent solution or dry cleaning solvent (Fed Spec P-D-680). Use a soft brush if necessary to dislodge caked on dirt. Dry the items thoroughly,

d. Inspect. Inspect top covers for breaks, cracks, dents, loose or missing mounting hardware or other defects. Refer repairs or replacement to direct support maintenance.

e. Installation.

(1) Install center cover first.

(2) Install remaining top covers and fabric cover.

(3) Connect power at power source.

4-19. RETURN AIR LOUVER AND AIR FILTER

The return air louver is located on the lower front of the unit. The air filter is clipped to the back side of the louver. (See figure 4-11.)

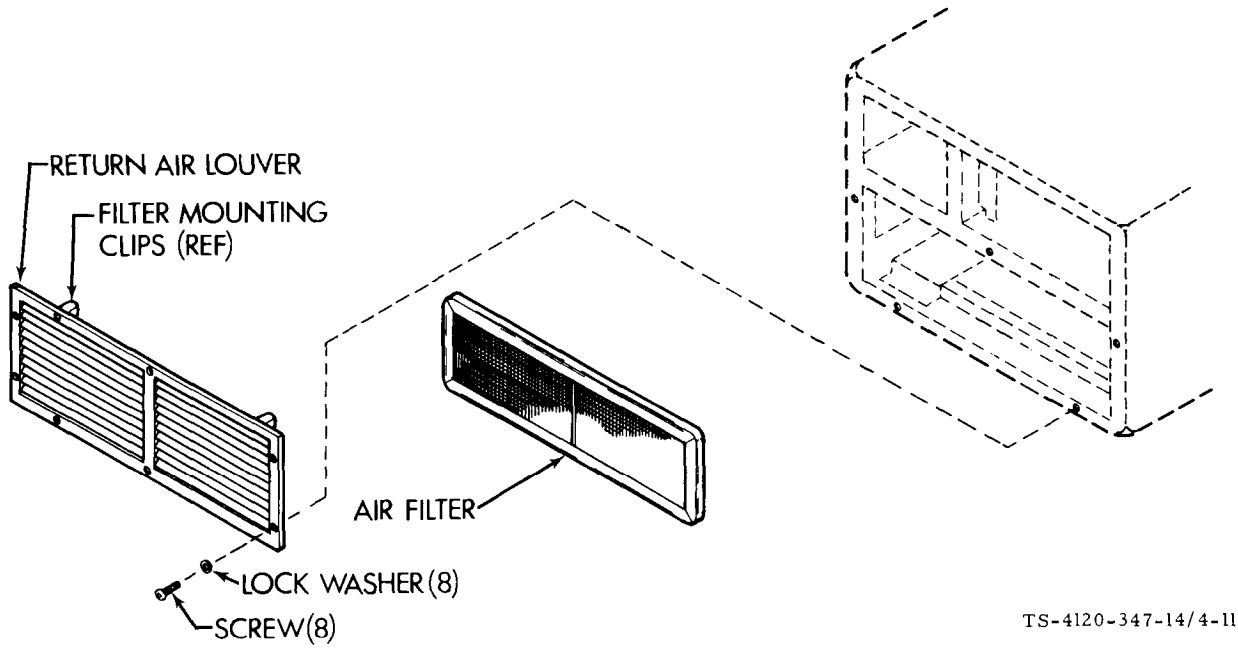

Figure 4-11. Return Air Louver and Air Filter

a. Removal.

(1) Remove the 8 screws and lockwashers and pull the louver from the unit.

(2) Pull the filter from the clips on the back side of the louver.

b. Clean.

(1) Usually it is only necessary to wipe or brush the dirt from the louver. If the louver is extremely dirty, it can be washed following the same procedure as the filter.

WARNING

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

(2) Immerse the filter in detergent solution or dry cleaning solvent (Fed Spec P-D-680).

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

(4) Rinse in clear water or clean dry cleaning solvent.

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

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

c. Inspect.

(1) (Check the louver for general condition. Bent louvers can usually be straightened with the fingers. Refer requirements for further repair or replacement to direct support.

(2) Inspect the filter for damage such as perforations or punctures in the screen and aluminum foil maze that could permit passage of unfiltered air.

(3) Inspect for areas of packed or crushed maze material that would obstruct airflow through the filter.

(4) Check for deformation of the frame, and straighten if possible without crushing maze material.

(5) Replace filter if crushed, punctured, badly deformed, or broken.

d. Servicing.

(1) Louvers. Apply a few drops of light oil to all pivot points and bearing surfaces of the louvers. Wipe or blot up all excess oil with a cloth.

(2) Filter. Apply coater (Item 1, Section II, Appendix E) to the media in the filter element. Let dry and wipe off excess coater.

e. installation.

(1) Air flow arrows should point away from louver.

(2) Place filter in retainer clips.

(3) Secure louver with screws and lock washers.

4-20. SUPPLY AIR LOUVER

The supply air louver is located on the upper right front corner of the unit.

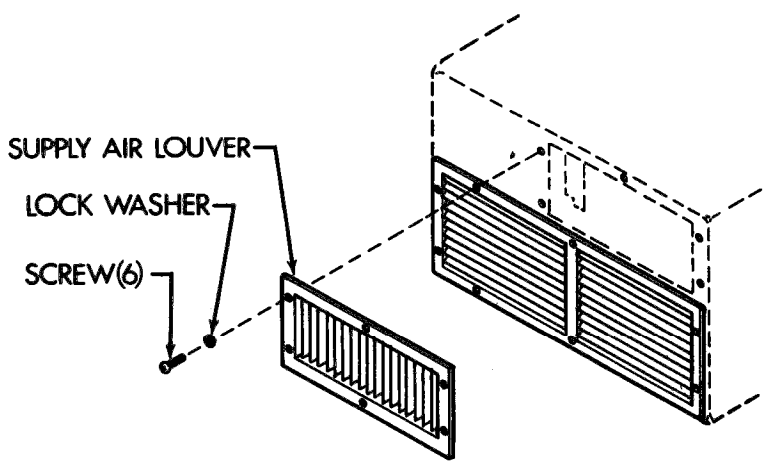

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Figure 4-12. Supply Air Louver

a. Removal. Remove the 6 screws and lockwashers and pull the louver from the unit.

b. Clean.

(1) Usually it is only necessary to wipe or brush the dirt from the louver.

WARNING

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

(2) If the louver is extremely dirty, immerse in a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

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

(4) Rinse in clear water or clean dry cleaning solvent.

(5) Dry thoroughly.

c. Inspect. Check the louver for general condition. Bent louvers can usually be straightened with the fingers. Refer requirements for further repair or replacement to direct support maintenance.

d. Servicing. Apply a few drops of light oil to all pivot points and bearing surfaces of the louvers. Wipe or blot up all excess oil with a cloth.

e. Installation. Secure the louver with screws and Iockwashers.

4-21. SCREENS AND GUARDS

The condenser air inlet guard is located on the center rear of the unit. The fresh air ventilation guard is located on the lower left rear of the unit. (See figure 4-13).

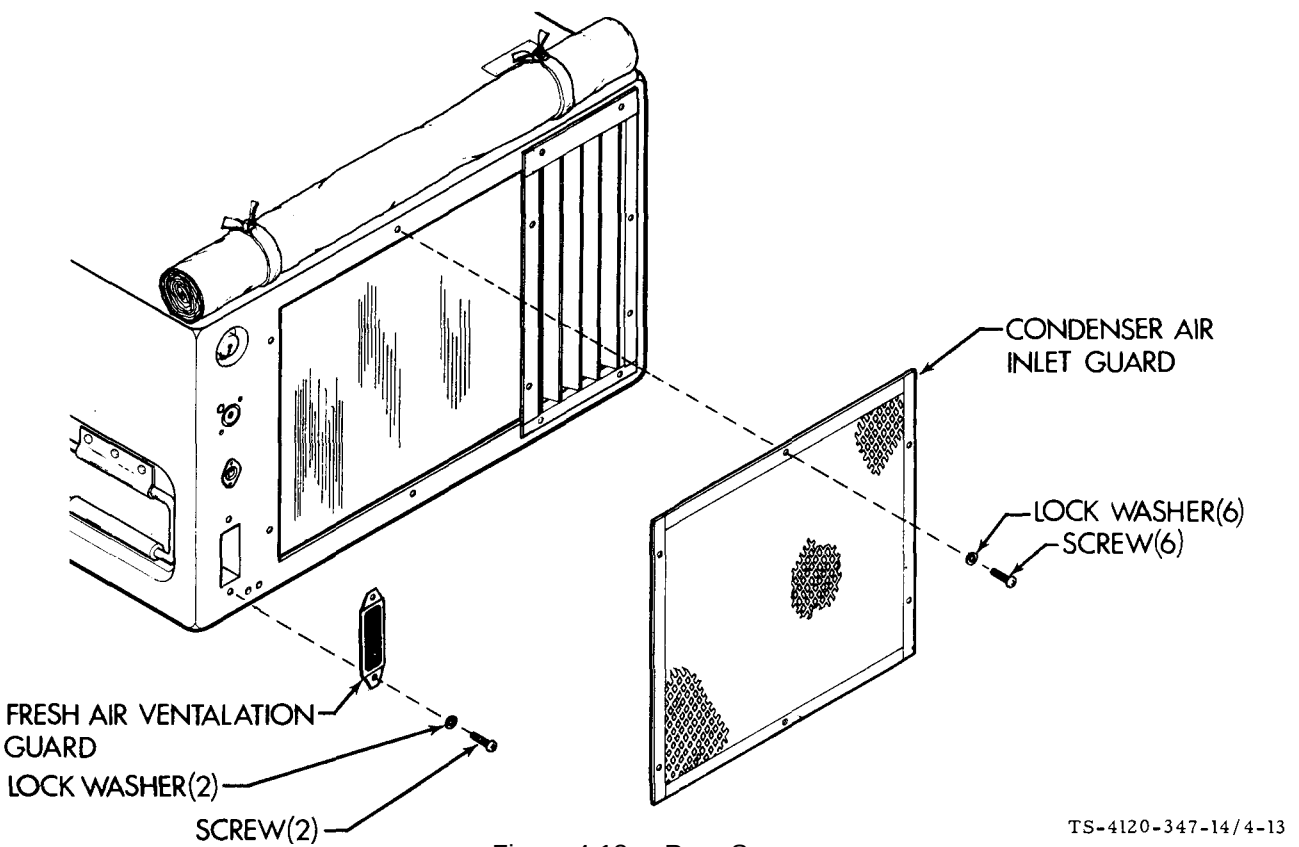


Figure 4-13. Rear Screens

NOTE

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

a. Removal.

(1) Remove the 2 each screws and lockwashers and remove the fresh air ventilation guard.

2. Remove 6 each screws and lockwashers and remove the condenser air inlet guard.

b. Clean.

(1) Usually it is only necessary to wipe or brush the dirt from the guards.

WARNING

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

(2) If the guards are extremely dirty, clean with a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

c. Inspect. Check for general condition. Refer requirements for repair or replacement to direct support maintenance.

d. Installation. Secure the guards with screws and lockwashers.

4-22. MIST ELIMINATOR

The mist eliminator traps moisture blown from the evaporator coil. It is located below the top front cover, between the evaporator coil and the supply air louver. (See figure 4-14).

a. Removal.

(1) Disconnect power at power source.

(2) Remove the top front cover.

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

WARNING

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

b. Clean.

(1) Immerse in a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

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

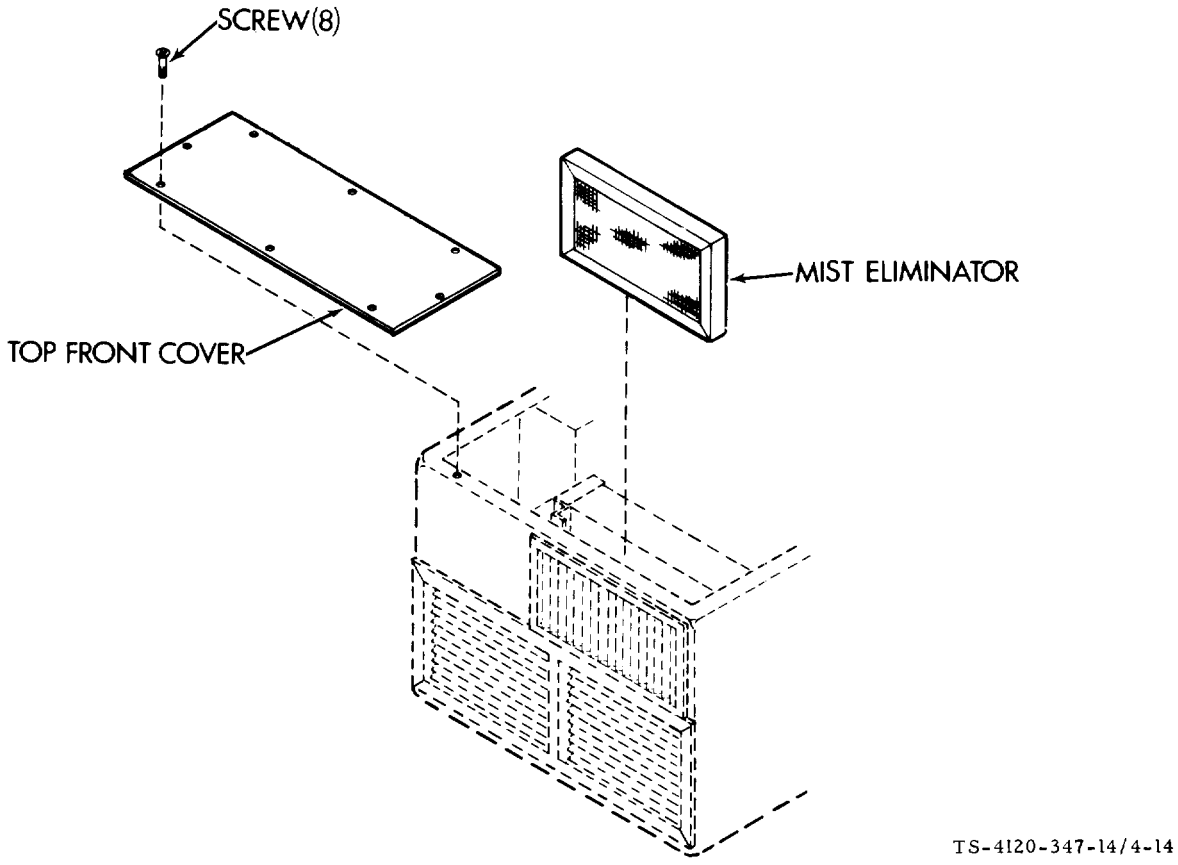


Figure 4-14. Mist Eliminator

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

(4) Drain, then hold horizontal andtapeach edge on bench or floorto dislodge droplets.

c. Inspect.

(1) Inspect for damage such as perforations or punctures in the screen and aluminum.

(2) Inspect for areas of packed or crushed material that would obstruct air flow.

(3) Check for deformation of the frame, and straighten if possible without crushing aluminum.

(4) Replace if crushed, punctured, badly deformed, or broken.

(5) Replace rubber insulation strip which is across top of mist eliminator, if it is torn, partly missing, missing, or damaged.

d. Installation.

(1) TOP mark must be up and airflow arrows must point outward away from coil.

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

(3) Install the top front cover.

(4) Connect power at power source.

4-23. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE

This louver is automatically operated by a refrigerant pressure actuated cylinder and a push-pull cable. The louvers open as refrigerant pressure in the condenser coil increases. This causes the louver to open more fully to increase the flow of cooler air across the condenser coil.

a. Access.

(1) Disconnect power at power source.

(2) Remove the top rear cover.

b. Clean/Inspect.

(1) The louver can be cleaned with a soft brush or washed with water and a mild detergent solution.

(2) Check the louvers for bent blades, missing or damaged gaskets, and missing hardware or bearings.

(3) Clean the linkage with a soft brush and damp rag.

(4) Check push-pull cable connections to be sure they are tight.

c. Adjustment.

WARNING

DANGEROUS CHEMICAL is used in this equipment.

DEATH

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

Do not attempt to loosen or remove any of the connections to the copper tubing.

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.

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

(2) Loosen mechanical post screw.

(3) Close condenser louvers,

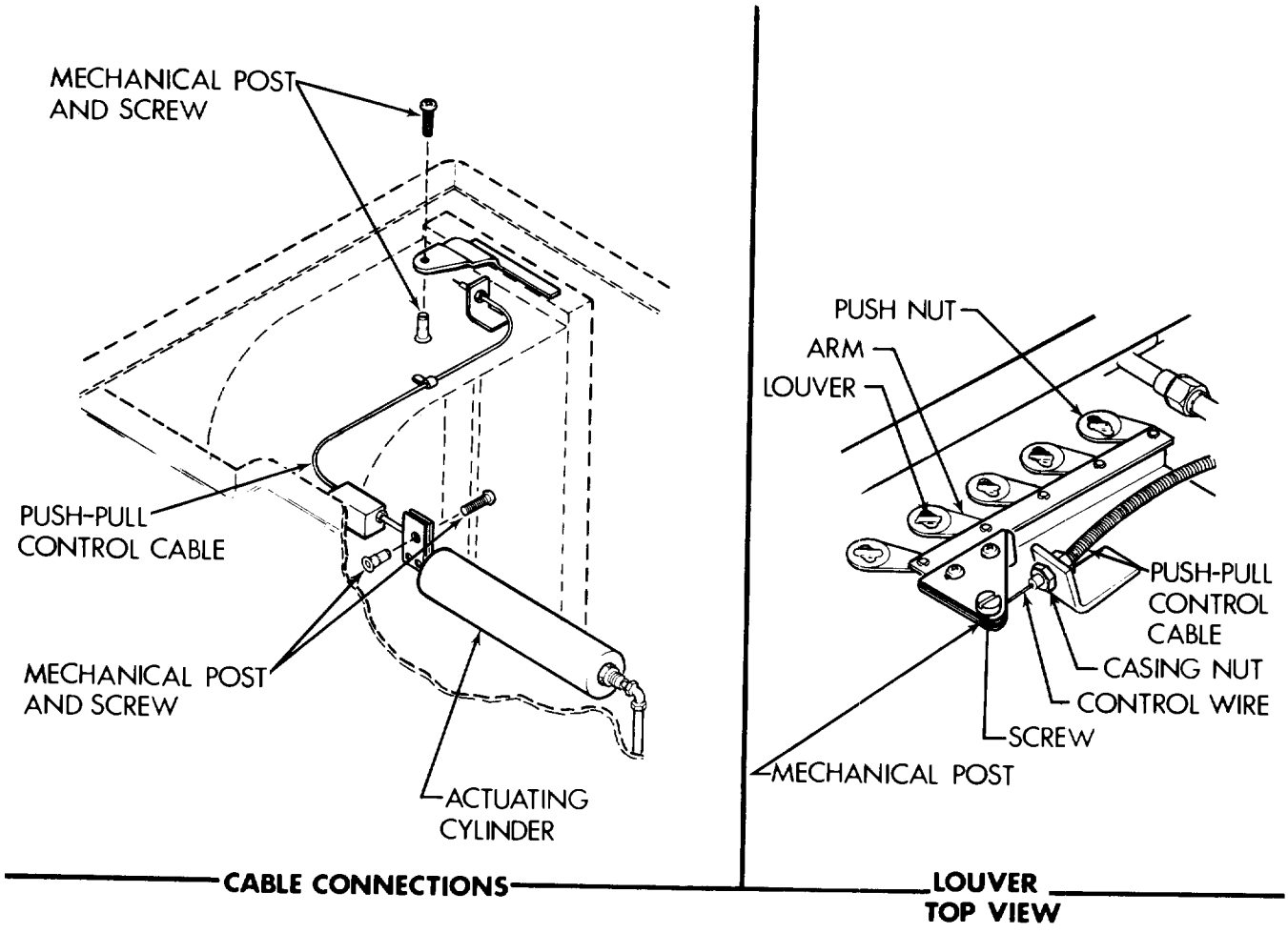
(4) Pull wire tight and tighten mechanical post screw.

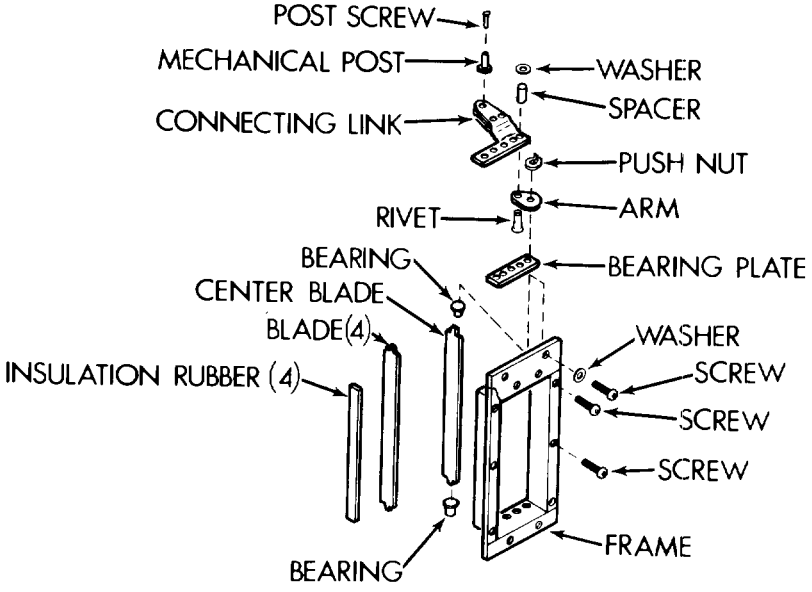
5. Louvers must be tightly closed when air conditioner is off and head pressure is below 150 psig (10.516 kg/cm^2).

d. Replacement.

(1) If actuating cylinder is suspected bad, contact direct support maintenance, Do not tamper with cylinder or refrigerant tubing connections.

(2) Louver replacement.





LOUVER ASSEMBLY

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Figure 4-15. Condenser Air Discharge Louver and Linkage

NOTE

Individual Louver Blades are flexible enough for removal.

- Remove rear top cover.
- Remove “push-on” type nut from louver blade to be removed.
- Flex or spring blade to remove ends from bearings.
- Remove blade.
- Install bearings.
- Flex or spring new blade in same manner as removal.
- Install “push-on” nut.

(3) If the complete louver assembly is to be replaced, it is first necessary to remove the condenser air inlet guard.

(4) The remaining hardware and parts can be easily individually replaced. See figure 4-15.

e. Reinstall the top rear cover.

f. Connect power at the power source.

4-24. FRESH AIR DAMPER AND ACTUATOR

The wheel type actuator plate located on the upper right front of the unit controls the internal fresh air damper. Turn up to close and down to open (See figure 4-16).

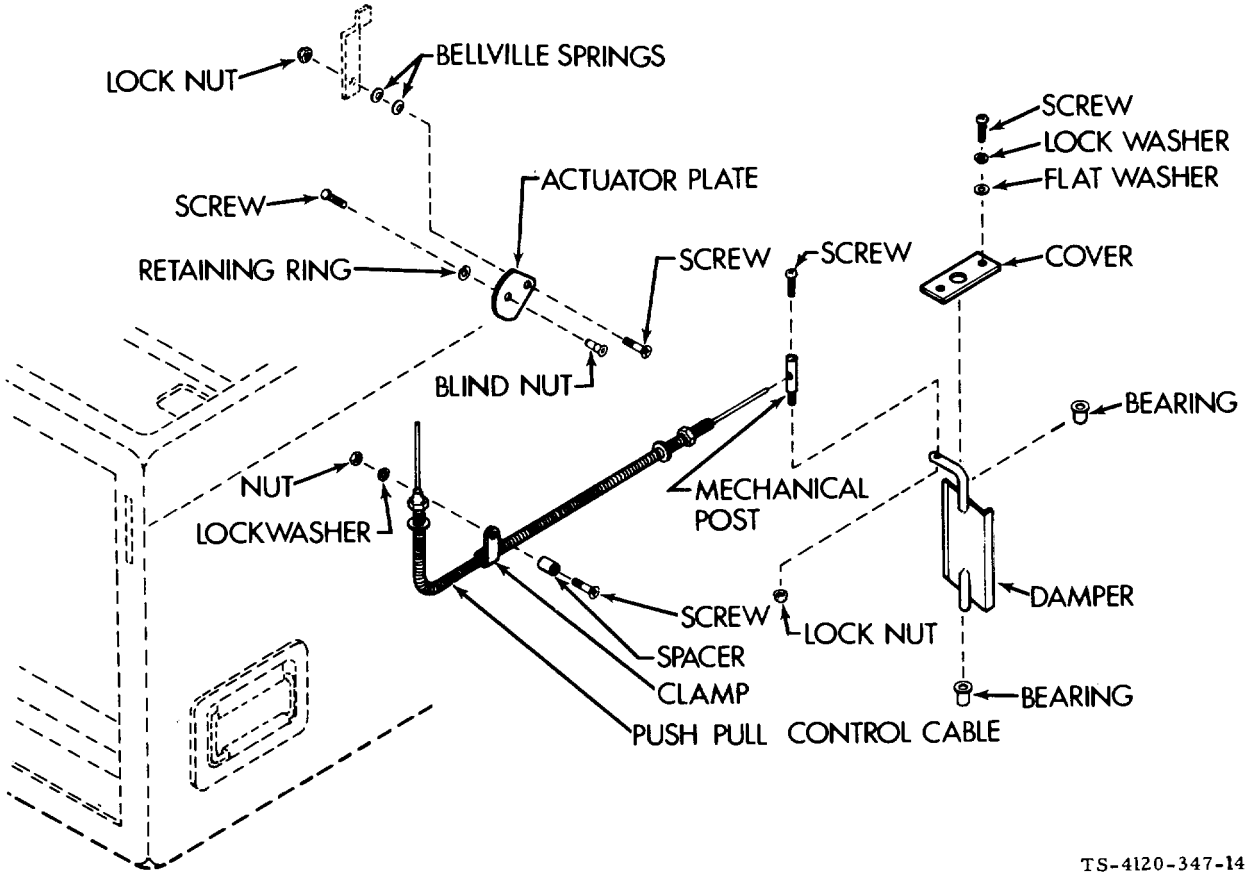


Figure 4-16. Fresh Air Damper and Actuator

a. Access.

(1) Disconnect power at power source.

(2) Remove the top covers and the conditioned air supply and return louvers.

b. Clean/Inspect.

(1) Wipe loose dirt controls and linkages with a clean cloth.

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

(3) Check that the arm on the damper is being moved when the actuator is turned.

c. Removal.

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

(2) Remove two screws, Iockwashers, and flat washers and lift vent damper from air conditioner.

(3) Remove screw, washer, nut, spacer and loop clamp.

(4) Loosen screw and mechanical post to free end of control wire core.

(5) Remove outer nuts from both ,ends of control outer casing and remove push-pull control.

(6) Remove screw, nut, two spring washers and actuator.

d. Installation,

(1) Vent Control Actuator, Install actuator, screw, two spring washers and nut.

(2) Vent Damper. Install vent damper in opening in housing.

(3) Secure vent damper cover to housing with two screws and Iockwashers and flat washers.

(4) Push-Pull Control. With one nut on each end of outer casing of push-pull control, install ends of control through opening in housing.

(5) Install outer nuts and insert ends of wire core into mechanical posts of damper and actuator.

(6) Tighten outer nuts on casing.

(7) Install clamp, spacer, screw, nut and washer.

e. Adjustment,

(1) Loosen the screw on both mechanical posts to release the push-pull control cable ends.

(2) Move the arm on the damper in both directions and determine the center between the two extreme stop points.

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

(4) Tighten the screws in both mechanical posts.

(5) Check the damper actuator for smooth operation.

(6) Install the top covers and the conditioned air supply and return louvers.

(7) Connect power at power source.

4-25. CONDENSATE DRAIN See figure 4-17.

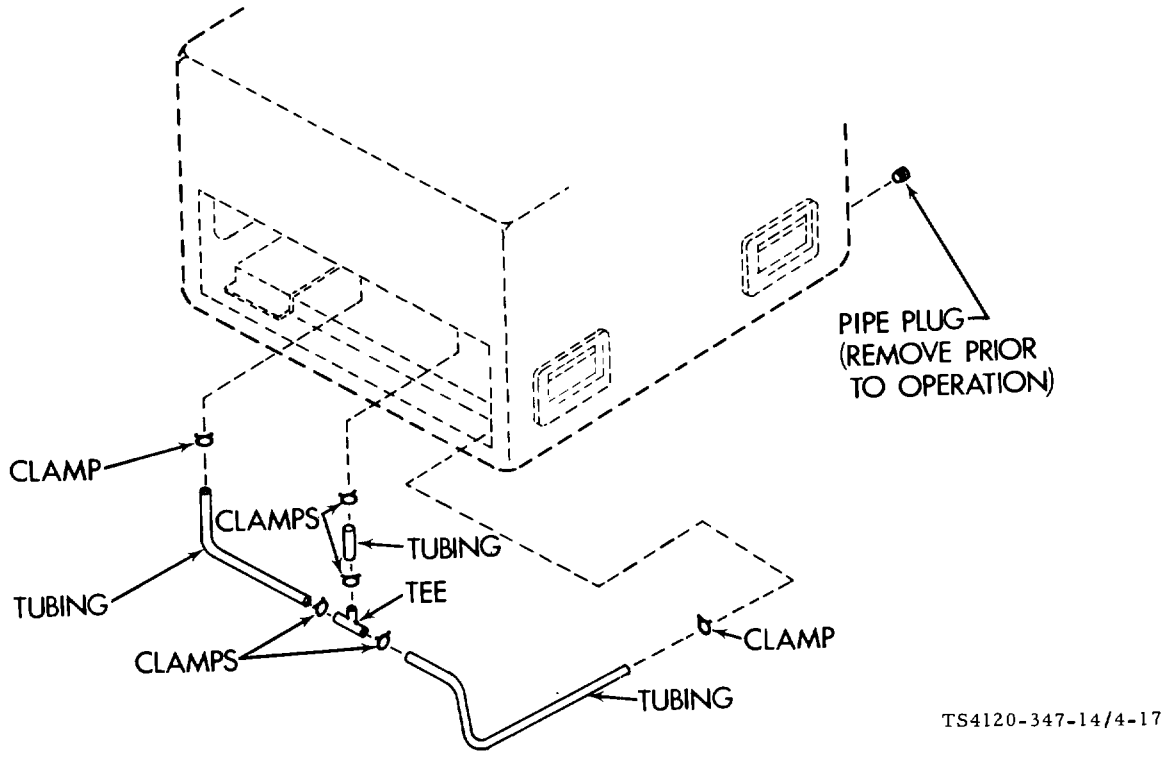


Figure 4-17. Condensate Drain Lines

a. Access.

(1) Disconnect power at power source.

(2) Remove the return air louver.

b. Removal.

(1) Remove clamps.

(2) Pull tubing loose from connection points in drain pan and housing.

c. Inspection.

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

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

d. Installation.

(1) Slide clamps onto tubes.

(2) Slip tubing and clamps into place.

(3) Install the return air louver.

(4) Connect power at power source.

4-26. 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 4-5).

a. Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-F-4995, Type 1, rosin-alcohol flux, and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical solder. If an uncored solder is used, it should be a lead-tin solder conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive 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 (1.3 cm) longer than the joint to be insulated, and slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint, and shrink 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 ends to join them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 - 1/2 inch (0.6 -1.3 cm) of insulation from the wire ends. holding the ends parallel and facing opposite directions, then twisting each end around the other wire at least three turns. 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 -1.3 cm) 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.

TABLE 4-3 WIRE LIST

IDENT NO, (Marking)	TERMINATION FROM	TERMINATION TERMINAL TYPE	TERMINATION TO	TERMINATION TERMINAL TYPE	AWG Wire Size	LENGTH IN.	LENGTH CM.
		LOOSE WIRES					
V1A20	S1-12	13216E6191-1	S3-2	MS25036-149	20	10	25.4
V2A20	S1-11	13216E6191-1	S3-1	MS25036-149	20	7	17.8
X14A16A	S1-2C	13216E6191-2	S2-A2	13216E6191-2	16	7	17.8
X15A16B	S1-2B	13216E6191-2	S2-B2	13216E6191-2	16	9	22.9
X16A16C	S1-3C	13216E6191-2	S2-C2	13216E6191-2	16	8	20,3
X47A16A	S6-4	MS25036-153	S6-2	MS25036-153	16	2	5.1
X48A16A	S6-3	MS25036-153	TB2-9	13216E6191-2	16	18	45.7
X49A16B	S6-1	MS25036-153	TB2-8	13216E6191-2	16	18	45.7
X50A16C	S6-2	MS25036-153	TB2-7	13216E6191-2	16	8	45.7
		AUXILIARY POWER CABLE ASSEMBLY					
X40A12A	J11-A	—	P6-A	—	12	40	101.6
X41A12B	J11-B	—	P6-B	—	12	40	101.6
X42A12C	J11-C	—	P6-C	—	12	40	101.6
X43A12N	J11-D	—	P6-D	—	12	40	101.6

TABLE 4-3 WIRE LIST (Continued)

IDENT NO. (Marking)	TERMINATION FROM	TERMINATION TERMINAL TYPE	TERMINATION TO	TERMINATION TERMINAL TYPE	AWG Wire Size	LENGTH IN.	LENGTH CM.
		COMPRESSOR WIRING HARNESS					
X21B12A	P4-A	—	P10-A	—	12	22	55.9
X23B12B	P4-B	—	P10-B	—	12	22	55.9
X25B12C	P4-C	—	P10-C	—	12	22	55.9
V12C20	P4-D	—	P10-D	—	20	22	55.9
V19B20	P4-E	—	P10-E	—	20	22	55.9
X20D16B	P4-F	—	P10-F	—	16	22	55.9
X22D16B	P4-G	—	P10-G	—	16	22	55.9
		TRANSFORMER AND RECTIFIER WIRING HARNESS					
X34A20V	R1	—	TB2-10	13216E6191-1	20	13	33.1
X35A20N	T1-2	—	TB2-11	13216E6191-1	20	13	33.1
V6D20	CR1-2	13216E6191-1	TB2-12	13216E6191-1	20	17	43.2
X38A20	T1-4	—	CR1-3	13216E6191-1	20	9	22.9
X37A20	T1-3	—	CR1-1	13216E6191-1	20	9	22.9
X36A20N	E3	MS25036-149	CR1-4	13216E6191-1	20	5	12.7
		CONTROL MODULE HARNESS					
X26A16A	P2A-1	—	S2-A1	13216E6191-2	16	9	22.9
X28A16B	P2A-2	—	S2-B1	13216E6191-2	16	9	22.9
X27A16C	P2A-3	—	S2-C1	13216E6191-2	16	9	22.9
X29A18A	P2A-4	—	S2-A3	13216E6191-1	18	10	25.4
X31A18B	P2A-5	—	S2-B3	13216E6191-1	18	10	25.4
X30A18C	P2A-6	—	S2-C3	13216E6191-1	18	11	27.9
X17A16A	P2A-7	—	S1-3A	13216E6-191-2	16	8	20.3
X18A16B	P2A-8	—	S1-4C	13216E6-191-2	16	9	22.9
X19A16C	P2A-9	—	S1-4A	13216E6-191-2	16	8	20.3
X1D12A	P2A-11	—	CB1-A1	13216E6-191-3	12	5	12.7
X1G16A	P2A-11	—	S1-21	13216E6-191-3	16	10	25.4
X2D12B	P2A-12	—	CB1-B1	13216E6-191-3	12	5	12.7
X2G16B	P2A-12	—	S1-22	13216E6-191-3	16	9	22.9
X3D12C	P2A-13	—	CB1-C1	13216E6-191-3	12	5	12.7
X3G16C	P2A-13	—	S1-31	13216E6-191-3	16	10	25.4
X20A12A	P2A-14	—	CB1-A2	13216E6-191-3	12	5	12.7
X22A12B	P2A-15	—	CB1-B2	13216E6-191-3	12	5	12.7
X24A12C	P2A-16	—	CB1-C2	13216E6-191-3	12	5	12.7
X5A16C	P2B-1	—	S1-4B	13216E6-191-2	16	5	12.7
X6A16B	P2B-2	—	S1-4D	13216E6-191-2	16	6	15.2
V5A20	P2B-3	—	S1-1D	13216E6-191-1	20	8	20.3
V4A20	P2B-4	—	S1-1B	13216E6-191-1	20	8	20.3
V3B20	P2B-5	—	S1-1A	13216E6-191-1	20	9	22.9
X7A16A	P2B-6	—	S1-3B	13216E6191-2	16	8	20.3
X33B20B	P2B-7	—	CB1-C	13216E6192	20	7	17.8
X57A20B	P2B-8	—	CB1-N0	13216E6192	20	7	17.8
V6A20	P2B-10	—	S3-1	MS25036-149	20	9	22.9
X4D16N	P2B-11	—	E1	MS25036-153	16	7	17.8
X1H16A	S1-21	—	S1-32	13216E6191-2	16	4	10.2
X2H16B	S1-22	—	S1-41	13216E6191-2	16	4	10.2
X3H16C	S1-31	—	S1-42	13216E6191-2	16	4	10.2

TABLE 4-3 WIRE LIST (Continued)

IDENT NO. (Marking)	TERMINATION FROM	TERMINATION TERMINAL TYPE	TERMINATION TO	TERMINATION TERMINAL TYPE	AWG Wire Size	LENGTH IN.	LENGTH CM.
	JUNCTION BOX HARNESS						
X26B16A	J2A-1	—	J3-A	—	16	15	38.1
X28B16B	J2A-2	—	J3-B	—	16	15	38.1
X27B16C	J2A-3	—	J3-C	—	16	15	38.1
X29B18A	J2A-4	—	J3-D	—	18	15	38.1
X31B18B	J2A-5	—	J3-E	—	18	15	38.1
X30B18C	J2A-6	—	J3-F	—	18	15	38.1
X17B26A	J2A-7	—	TB2-3	13216E6191-2	16	19	48.3
X18B16B	J2A-8	—	TB2-2	13216E6191-2	16	19	48.3
X19B16C	J2A-9	—	TB2-1	13216E6191-2	16	19	48.3
X1C12A	J2A-11	—	TB1-1	MS25036-156	12	14	35.6
X2C12B	J2A-12	—	TB1-2	MS25036-156	12	14	35.6
X3C12C	J2A-13	—	TB1-3	MS25036-156	12	14	35.6
X20B12A	J2A-14	—	K3-A1	MS25036-112	12	10	25.4
X22B12B	J2A-15	—	K3-B1	MS25036-112	12	12	30.5
X24B12C	J2A-16	—	K3-C1	MS25036-112	12	12	30.5
V5B20	J2B-3	—	TB1-5	MS25036-149	20	13	33.0
V4B20	J2B-4	—	J8-A	—	20	22	55.9
V3A20	J2B-5	—	K2-X1	MS25036-149	20	17	43.2
X33A20B	J2B-7	—	K5-2	—	20	17	43.2
X57B20B	J2B-8	—	TB2-10	13216E6191-1	20	25	63.5
V6B20	J2B-10	—	TB1-4	MS25036-149	20	14	35.6
X4C16N	J2B-11	—	E2	MS25036-153	16	10	25.4
V14A20N	K4-9	—	K1-5	—	20	14	35.6
X58A20N	TB4-2	MS17143-13	TB2-11	13216E6191-1	20	18	45.7
V15A20N	K1-5	—	K2-X2	MS25036-149	20	16	40.6
X1F20A	TB1-1	MS25036-149	K5-A	—	20	13	33.0
X1E16A	TB1-1	MS25036-153	K2-A1	MS25036-108	16	16	40.6
X2E16B	TB1-2	MS25036-153	K2-B1	MS25036-108	16	17	43.2
X2F20B	TB1-2	MS25036-149	K5-B	—	20	13	33.0
X3F20C	TB1-3	MS25036-149	K5-C	—	20	12	30.5
X3E16C	TB1-3	MS25036-153	K2-C1	MS25036-108	16	17	43.2
V6C20	TB1-4	MS26036-149	TB2-12	13216E6191-1	20	33	83.8
V11A20	TB1-5	MS25036-149	S4-1	13216E6191-1	20	23	58.4
V5C20	TB1-5	MS25036-149	J7-B	—	20	25	63.5
V12A20	TB1-6	MS25036-149	K1-1	—	20	7	17.8
V12B20	TB1-6	MS25036-149	J4-D	—	20	25	63.5
X44A12N	K4-9	—	E4	MS25036-156	12	21	53.3
X2J20B	K2-B1	MS25036-103	CB2-1	MS25036-101	20	16	40.6
V7A20	K1-3	—	K3-X1	MS25036-149	20	16	40.6
X5B16C	J2B-1	—	K4-10	—	16	12	30.5
X6B16B	J2B-2	—	K4-5	—	16	12	30.5
X7B16A	J2B-6	—	K4-1	—	16	12	30.5
X39A16A	K2-A2	MS25036-108	TB2-6	13216E6191-2	16	31	78.7
X60A16B	K2-B2	MS25036-108	TB2-5	13216E6191-2	16	33	83.8
X59A16C	K2-C2	MS25036-108	TB2-4	13216E6191-2	16	32	81.2
V16A20N	K2-X2	MS25036-149	E2	MS25036-149	20	11	27.9
V17A20N	K2-X2	MS25036-149	K3-X2	MS25036-149	20	10	25.4
X21A12A	K3-A2	MS25036-112	J4-A	—	12	29	73.7
X23A12B	K3-B2	MS25036-112	J4-B	—	12	29	73.7
X25A12C	K3-C2	MS25036-112	J4-C	—	12	30	76.2
V8A20	K3-X1	MS25036-149	J9-B	—	20	25	63.5
V18A20N	K3-X2	MS25036-149	J8-B	—	20	24	60.9
V10A20N	K3-X2	MS25036-149	J9-A	—	20	24	60.9

TABLE 4-3 WIRE LIST (Continued)

IDENT NO. (Marking)	TERMINATION FROM	TERMINATION TERMINAL TYPE	TERMINATION TO	TERMINATION TERMINAL TYPE	AWG Wire Size	LENGTH IN.	LENGTH CM.
JUNCTION BOX HARNESS (continued)							
X45A16N	J3-G	—	E4	MS25036-156	16	14	35.6
X46A16N	J5-G	—	E4	MS25036-156	16	11	27.9
V20A20	S5-1	13216E6191-1	S4-2	13216E6191-1	20	8	20.3
X12A16A	K4-3	—	J5-A	—	16	25	63.5
X13A16B	K4-11	—	J5-B	—	16	25	63.5
X11A16C	K4-8	—	J5-C	—	16	25	63.5
V9A20	K4-2	—	J7-A	—	20	23	58.4
X4B12N	E3	MS25036-156	E2	MS25036-156	12	28	71.1
X10A20A	K4-4	—	J5-D	—	20	25	63.5
X9A20B	K4-6	—	J5-E	—	20	25	63.5
X8A20C	K4-7	—	J5-F	—	20	25	63.5
X1B12A	TB1-1	MS25036-156	TB3-1	MS25036-156	12	33	83.8
V19A20	S5-2	13216E6191-1	J4-E	—	20	23	58.4
X32A20B	K5-1	—	CB2-2	MS25036-101	20	5	12.7
X2B12B	TB1-2	MS25036-156	TB3-2	MS25036-156	12	34	86.4
X3B12C	TB1-3	MS25036-156	TB3-3	MS25036-156	12	34	86.4
X1A12A	J1-A	—	TB3-1	MS25036-156	12	33	83.8
X2A12B	J1-B	—	TB3-2	MS25036-156	12	33	83.8
X3A12C	J1-C	—	TB3-3	MS25036-156	12	34	86.4
X4A12N	J1-D	—	TB4-2	MS17143-15	12	31	78.7
X40B12A	J6-A	—	TB3-4	MS25036-156	12	13	33.0
X41B12B	J6-B	—	TB3-5	MS25036-156	12	13	33.0
X42B12C	J6-C	—	TB3-6	MS25036-156	12	13	33.0
X43B12N	J6-D	—	TB4-3	MS17143-15	12	5	12.7
X20C16B	K3-A1	MS25036-108	J4-F	—	16	26	66.0
X22C16B	K3-B1	MS25036-108	J4-G	—	16	27	68.6
X43C12N	TB4-1	MS17143-15	E3	MS25036-156	12	13	33.0

4-27. CONTROL MODULE

The control module is normally located in the upper left front corner of the unit, H can be remote mounted (see paragraph 4-6c).

a. Removal. (See figure 4-18.)

(1) Disconnect power at power source.

(2) Remove the return air louver,

(3) Loosen the sensing bulb clamp screws and slip the sensing bulb out of the clamps.

(4) Loosen the control module mounting screw and carefully pull the control module out of the unit. Use care to avoid damage to the sensing line.

(5) Carefully work the sensing bulb through the frame and out of the unit.

b. Test/Repair (See figure 4-19.)

(1) See paragraphs 4-28 through 4-32 for testing of individual components.

(2) Repairs are limited to replacement of individual components and repair of wire connections.

c. Installation (See figure 4-18.)

(1) Carefully work the sensing bulb through the junction box frame and into the two mounting clamps behind the return air louver,

(2) Tighten clamp screws.

(3) Slip the control module into the opening in the junction box, Take care not to crush or kink the sensing bulb capillary line.

(4) Tighten the control module mounting screw.

(5) Install the return air louver.

(6) Connect power at power source.

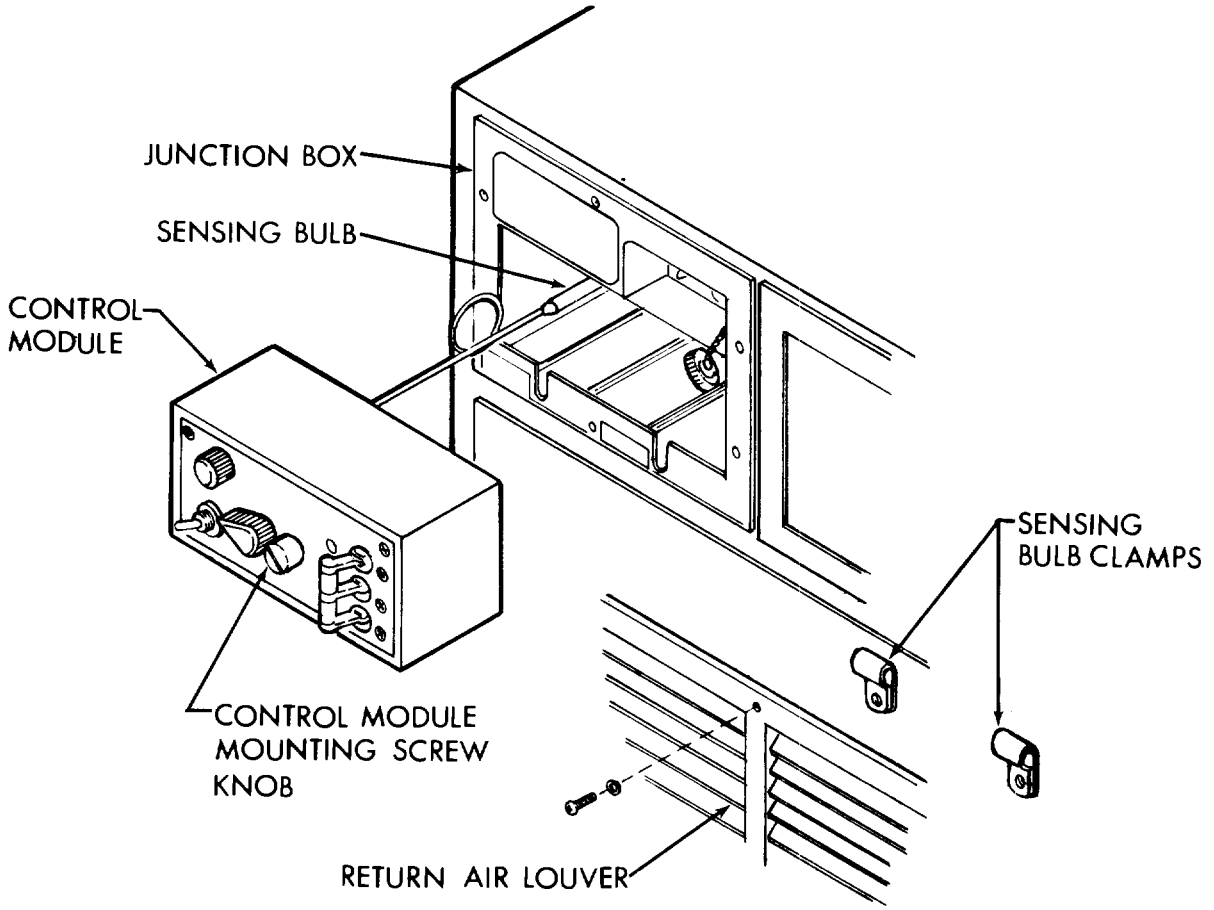


Figure 4-18. Control Module Removal

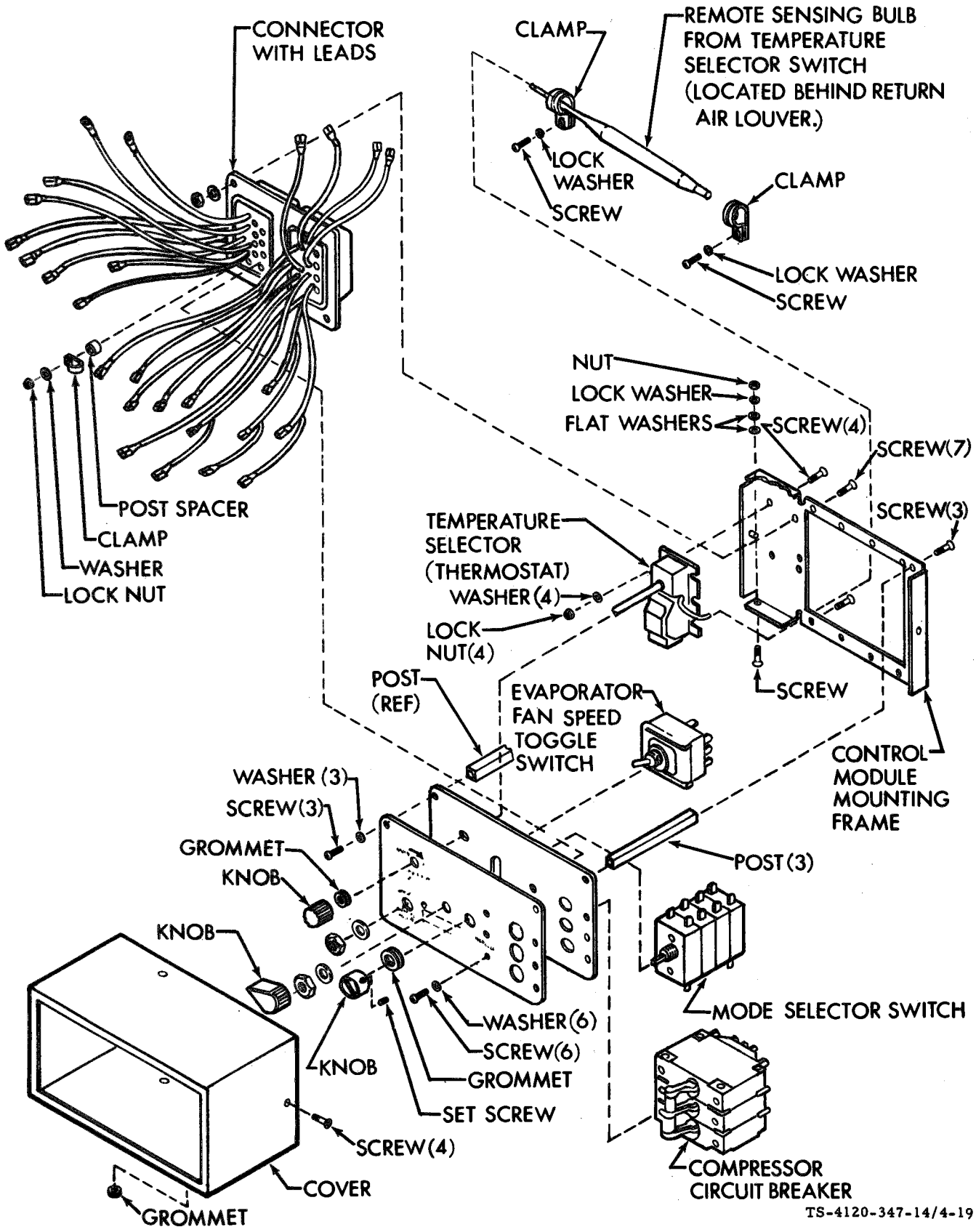


Figure 4-19. Control Module

4-28. TEMPERATURE SELECTOR (THERMOSTAT) S3

The temperature selector (thermostat) S3 is located in the control module.

a. Removal,

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) See figure 4-20 and remove four screws and pull the cover off.

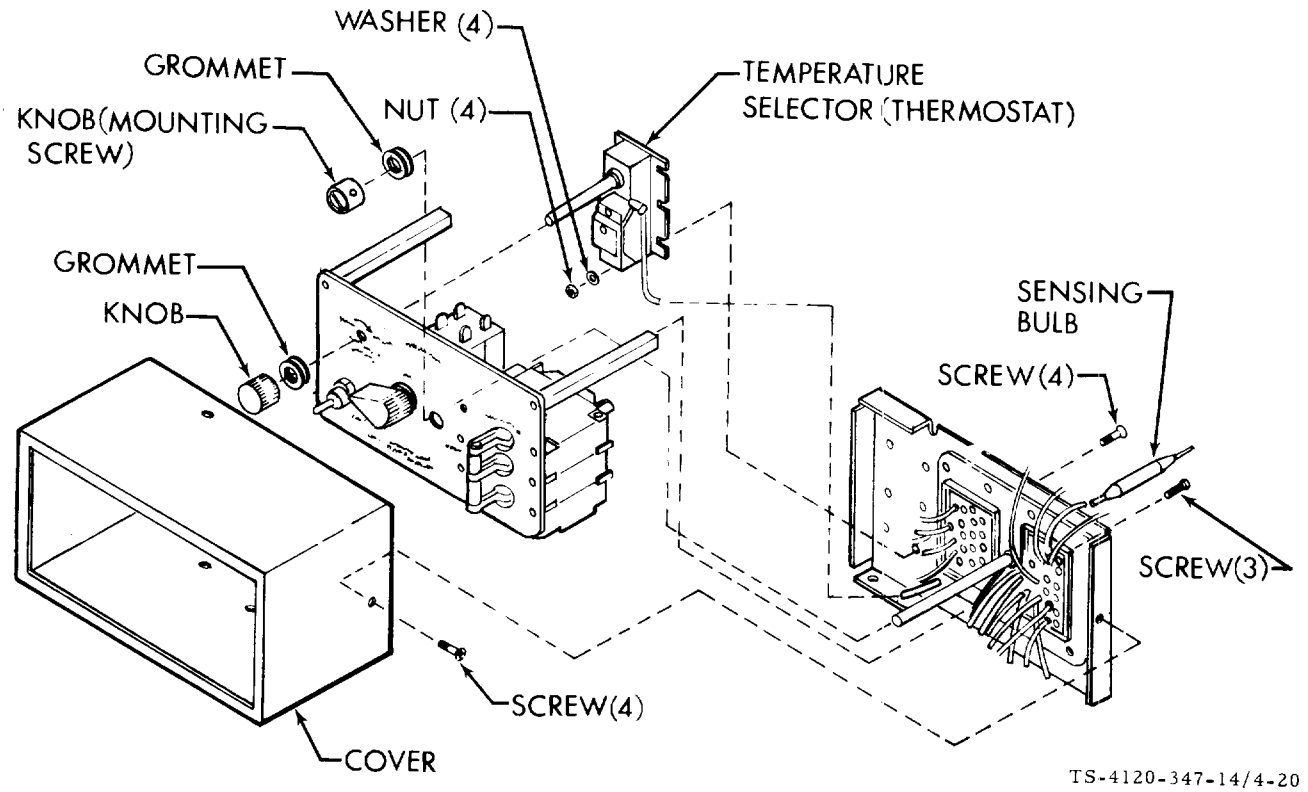


Figure 4-20. Temperature Selector Thermostat

(4) Loosen the set screws in the temperature selector and the control module mounting screw knobs. Remove these two knobs.

(5) Remove the three screws from the posts and slip the back portion off.

(6) Tag and disconnect the wires from the temperature selector (thermostat).

(7) Remove the four screws, washers and nuts and pull the temperature selector (thermostat) from the back plate.

b. Test.

(1) Place the sensing bulb in a container of warm water, 85° to 100°F (30° to 40°C). Turn the knob to the extreme COOLER position. Continuity should be indicated. Turn the knob to the extreme WARMER position. There should be no indication of continuity.

(2) Place the sensing bulb in a container of cold water 40° to 65°F (5° to 18°C). Turn the knob to the extreme WARMER position. Continuity should be indicated. Turn the knob to the extreme COOLER position. There should be no indication of continuity.

c. Assembly (See figure 4-20).

(1) Place the temperature selector (thermostat) on the back plate and secure with four screws, washers and nuts.

(2) See the wiring diagram figure 4-5 and tags and connect wire leads. Remove the tags.

(3) Align the holes in the back panel with the three posts and secure with screws.

(4) Check to be sure grommets are in place in the shaft holes. Install the two knobs and tighten the set screws.

(5) Slip the cover back in place and secure with four screws.

(6) See paragraph 4-27c and figure 4-18 and install the control module.

(7) Connect power at power source.

4-29. EVAPORATOR FAN SPEED SWITCH S2

The evaporator fan speed switch S2 is located in the control module.

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) See figure 4-21 and remove four screws and pull the cover off.

(4) Loosen the set screws in the temperature selector and the control module mounting screw knobs. Remove these two knobs.

(5) Remove the three screws from the posts and slip the back portion off.

(6) Tag and disconnect the wires from the evaporator fan speed switch.

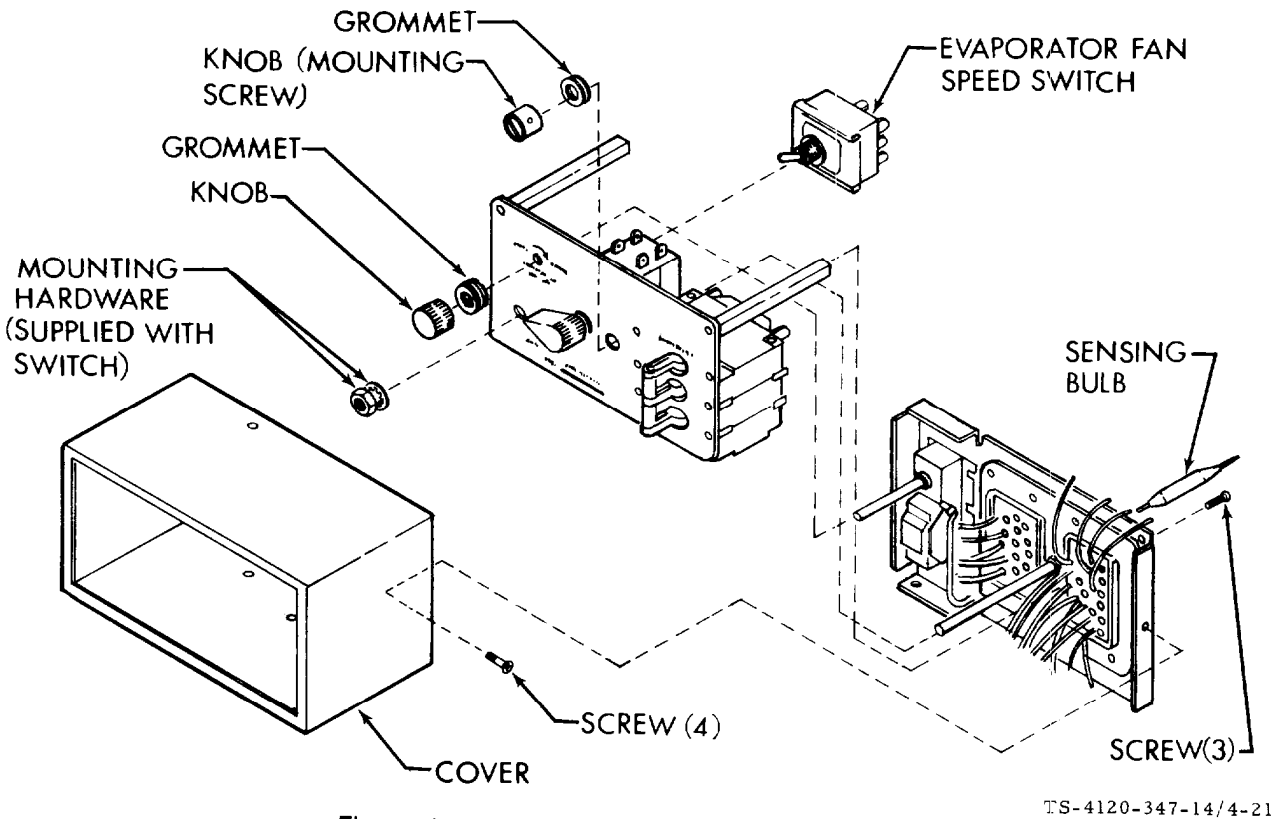


Figure 4-21. Evaporator Fan Speed Switch

(7) Remove the nut and washer and pull the switch from the panel.

b. Testing. Check continuity in both positions. Continuity should be indicated.

c. Installation.

(1) Insert switch into control panel and secure with nut and washer.

(2) See the wiring diagram figure 4-5 and tags and connect wire leads. Remove the ‘tags.

(3) Align the holes in the back panel with the three posts and secure with screws,

(4) Check to be sure grommets are in place in the shaft holes. Install the two knobs and tighten the set screws.

(5) Slip the cover back in place and secure with four screws.

(6) See paragraph 4-27c and figure 4-18 and install the control module.

(7) Connect power at power source,

4-30. MODE SELECTOR SWITCH S1

The mode selector switch S1 is a rotary type switch located in the control module.

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) See figure 4-22 and remove four screws and pull the cover off.

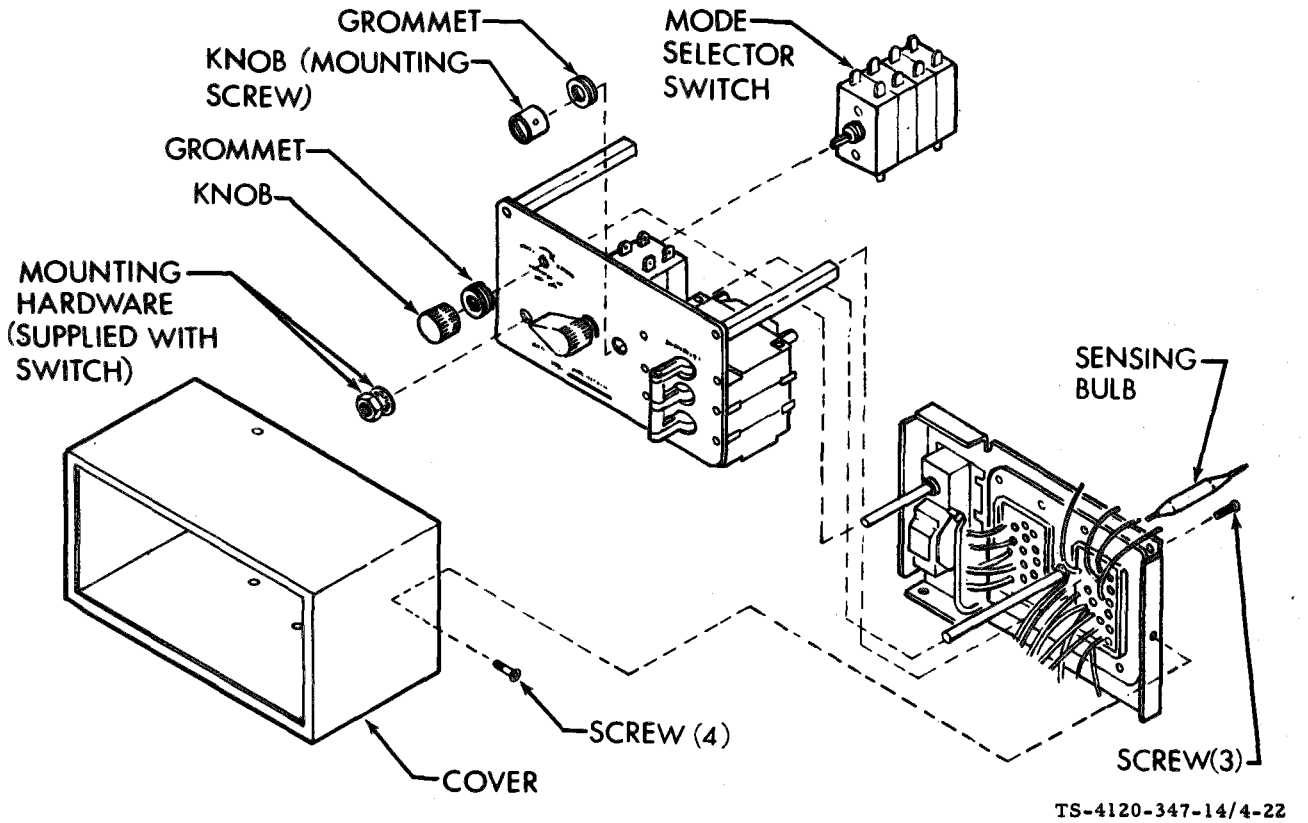


Figure 4-22. Mode Selector Switch

(4) Loosen the set screws in the temperature selector and the control module mounting screw knobs. Remove these two knobs.

(5) Remove the three screws from the posts and slip the back portion off.

(6) Tag and disconnect the wires from the mode selector switch.

(7) Loosen the set screw and pull the knob from the mode selector switch.

(8) Remove the nut and washer and pull the mode selector switch from the panel.

b. Test. See the mode position chart below and check continuity at pins indicated to each of the positions indicated. Replace the switch if continuities are not in accordance with those indicated.

MODE POSITION CHART					
		SWITCH SECTIONS AND TERMINALS CONNECTED			
POSITION	FUNCTION	S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	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	21 AND 2C 22 AND 2B	32 AND 3B 31 AND 3C	41 AND 4D 42 AND 4B

c. Assembly. (See figure 4-22).

(1) Slip the mode selector switch shaft through the panel hole and secure with mounting nut and washer supplied with the switch.

(2) Slip the knob on the mode selector switch shaft and tighten the set screw.

(3) See the wiring diagram figure 4-5 and tags and connect wire leads. Remove the tags.

(4) Align the holes in the back panel with the three posts and secure with screws.

(5) Check to be sure grommets are in place in the shaft holes. Install the two knobs and tighten the set screws.

(6) Slip the cover back in place and secure with four screws.

(7). See paragraph 4-27c and figure 4-18 and install the control module.

(8) Connect power at power source.

4-31. COMPRESSOR CIRCUIT BREAKER CB1

The compressor circuit breaker is located in the control module.

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

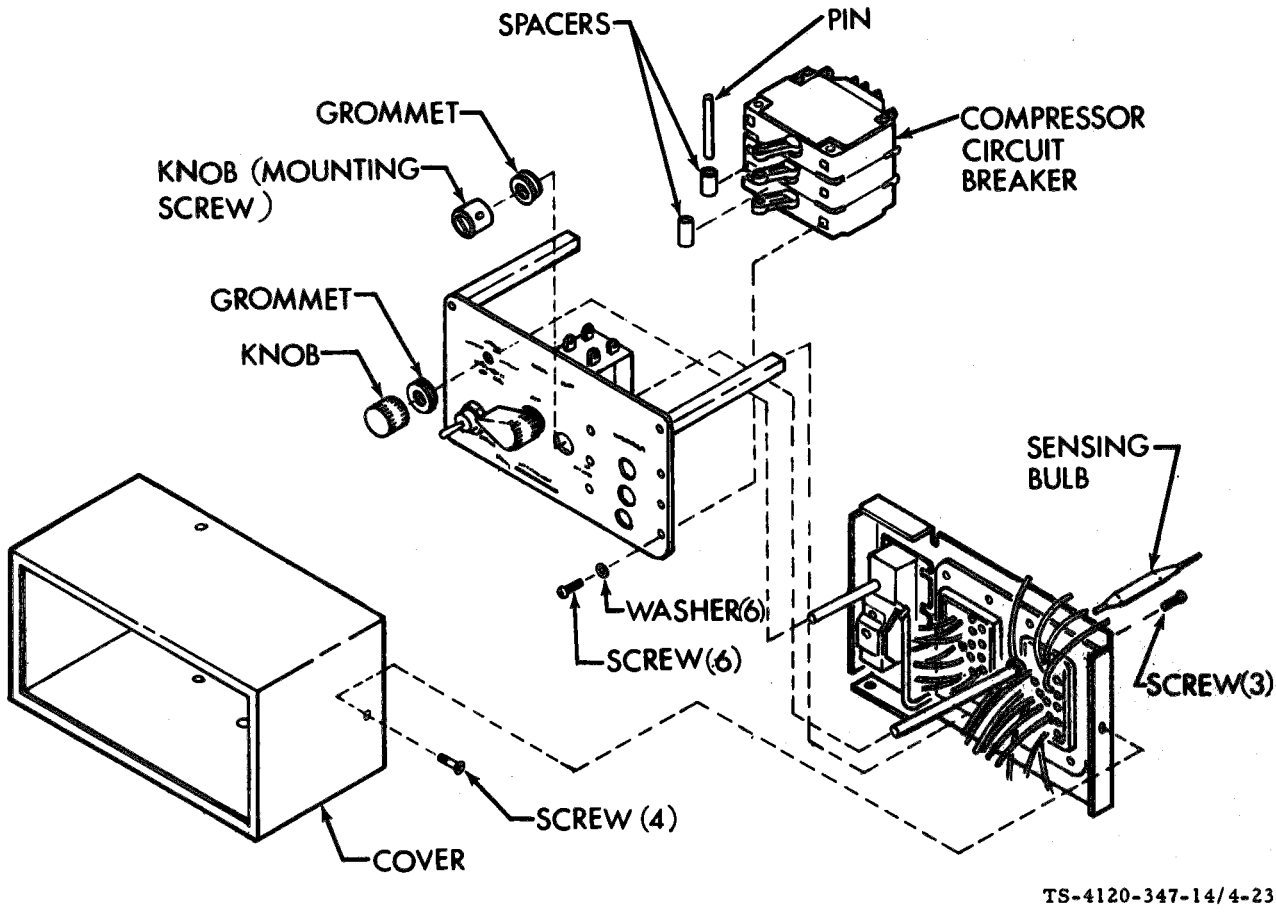


Figure 4-23. Compressor Circuit Breaker

(3) See figure 4-23 and remove four screws and pull the cover off.

(4) Loosen the set screws in the temperature selector and the control module mounting screw knobs. Remove these two knobs.

(5) Remove the three screws from the posts and slip the back portion off.

(6) Tag and disconnect the wires from the compressor circuit breaker.

(7) Remove the pin and spacers from the circuit breaker toggles.

(8) Remove the screws and pull the circuit breaker from the panel.

b. Test.

(1) Check to see that continuity exists on each pair of terminals when circuit breaker is in the on position.

(2) Check to see that there is no continuity between terminals with circuit breaker in the off position.

c. Assembly.

(1) Insert the circuit breaker toggles through the control panel. Be sure the off position matches the lettering on the panel.

(2) Secure the circuit breaker to the panel with screws and washers.

(3) Insert the pin and spacers through the circuit breaker toggles to lock them together.

(4) See the wiring diagram figure 4-5 and tags and connect wire leads. Remove the tags.

(5) Align the holes in the back panel with the three posts and secure with screws.

(6) Check to be sure grommets are in place in the shaft holes. Install the two knobs and tighten the set screws.

(7) Slip the cover back in place and secure with four screws.

(8) See paragraph 4-27c and figure 4-18 and install the control module.

(9) Connect power at power source.

4-32. CONTROL MODULE WIRING HARNESS

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module

(3) See figure 4-24 and remove the four screws and pull the cover off.

b. Inspect.

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

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

c. Removal.

(1) Loosen the set screws in the temperature selector and the control module mounting screw knobs Remove these two knobs.

(2) Remove the three screws from the posts and slip the back portion off.

(3) Tag and disconnect the wires from the components and ground stud.

(4) Remove the attaching hardware and pull the connector from the back plate.

d. Testing. See the wiring diagram figure 4-5. Continuity test individual wires to corresponding pin in connector. Replace or repair wires with no continuity.

e. Repair.

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

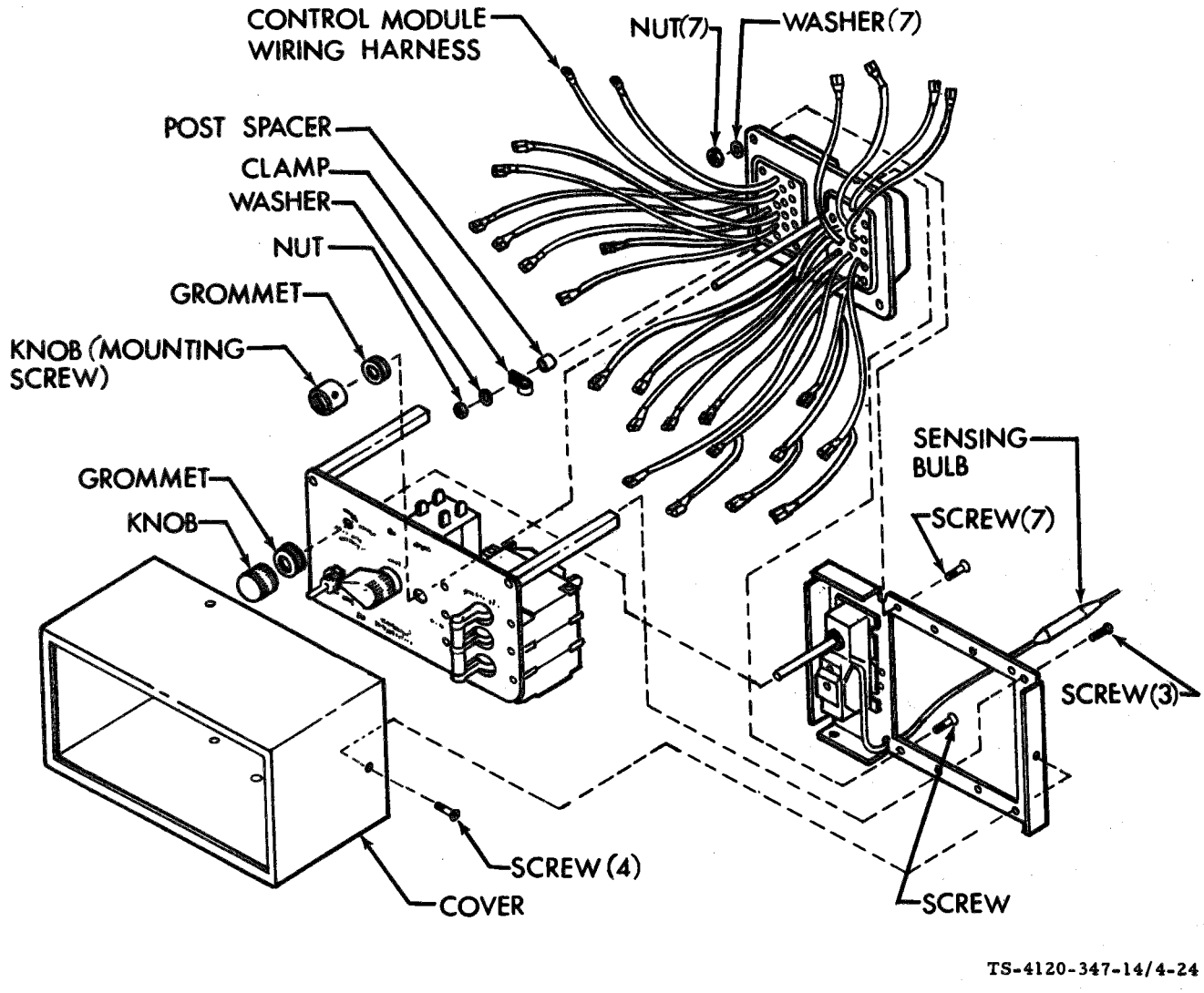


Figure 4-24. Control Module Wiring Harness

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

f. Installation.

(1) Slip connector into back plate and secure with screws, nuts and washers.

(2) See the wiring diagram figure 4-5 and tags and connect wire leads. Remove the tags.

(3) Align the holes in the back panel with the three posts and secure with screws.

(4) Check to be sure grommets are in place in the shaft holes. Install the two knobs and tighten the set screws.

(5) Slip the cover back in place and secure with four screws,

(6) See paragraph 4-27c and figure 4-18 and install the control module.

(7) Connect power at power source.

4-33. JUNCTION BOX

The junction box is located in the upper left front corner of the unit.

a. Removal. (See figure 4-25)

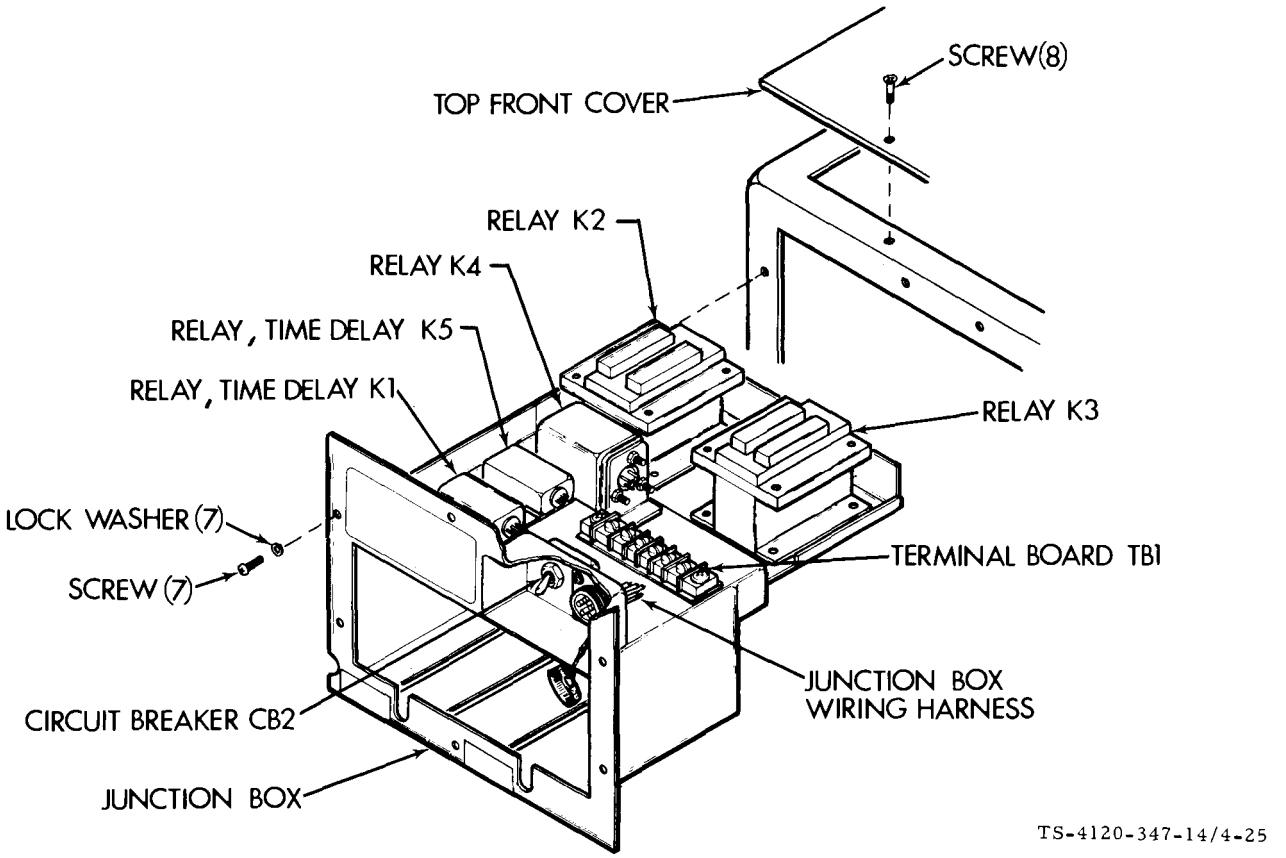


Figure 4-25. Junction Box

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) Remove the top front cover.

(4) Remove seven screws and lock washers and carefully slide the junction box out of the unit.

NOTE

Most maintenance, testing and inspection of the junction box and individual components can be done at this stage. The junction box should be supported on a stand or table to avoid damage to wire or connections. If the complete junction box is to be replaced or removed proceed to step (5).

(5) Tag and disconnect the individual wires and connectors of the junction box harness from the unit.

(6) Remove the junction box.

b. Inspect.

(1) Inspect for missing or loose attaching hardware, damaged parts and excessive corrosion. Replace missing hardware and damaged parts. Tighten loose hardware and clean or repair parts as indicated.

(2) See paragraphs 4-34 through 4-36 for inspection/testing of wiring harness and individual components.

c. Installation.

(1) If wiring harness was disconnected from the unit, see the wiring diagram figure 4-5 and tags and connect wire leads and connectors. Remove the tags.

(2) Carefully slide the junction box into place and secure with seven screws and lock washers.

(3) See paragraph 4-27c and figure 4-18 and install the control module.

(4) Install the top front cover.

(5) Connect power at power source.

4-34. JUNCTION BOX WIRING HARNESS

a. Access

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) Remove the top front cover.

(4) Remove seven screws and lock washers and carefully slide the junction box out of the unit.

b. Inspect.

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

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

c. Removal. Tag and disconnect the individual wires and connectors from the unit. (See figure 4-26.)

d. Testing. Sea the wiring diagram figure 4-5. Continuity test the individual wires. Replace or repair wires with no continuity.

e. Repair.

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

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

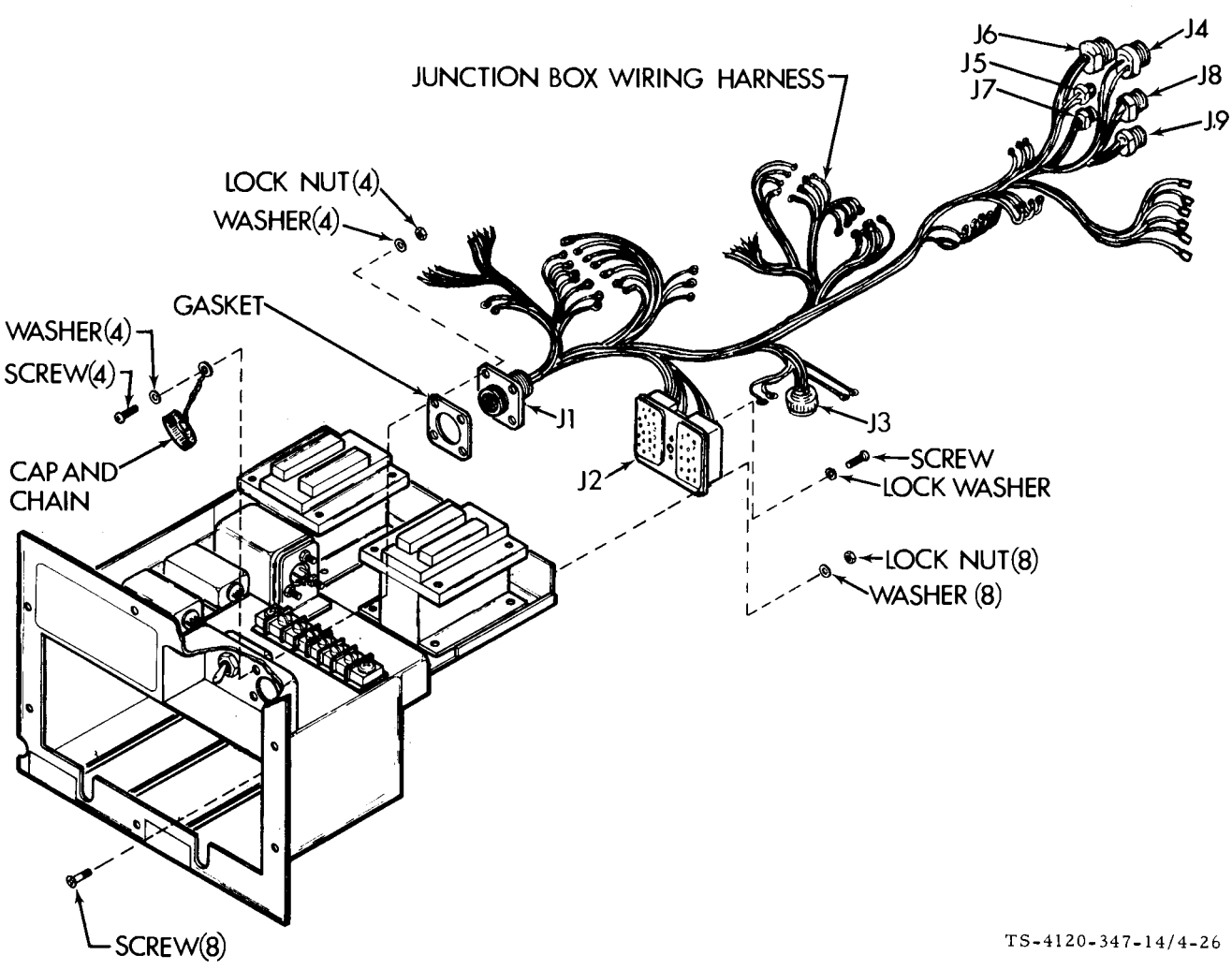


Figure 4-26. Junction Box Wiring Harness

f. Installation.

(1) See the wiring diagram figure 4-5 and tags and connect the wire leads and connectors. Remove the tags.

(2) Carefully slide the junction box into place and secure with seven screws and lock washers.

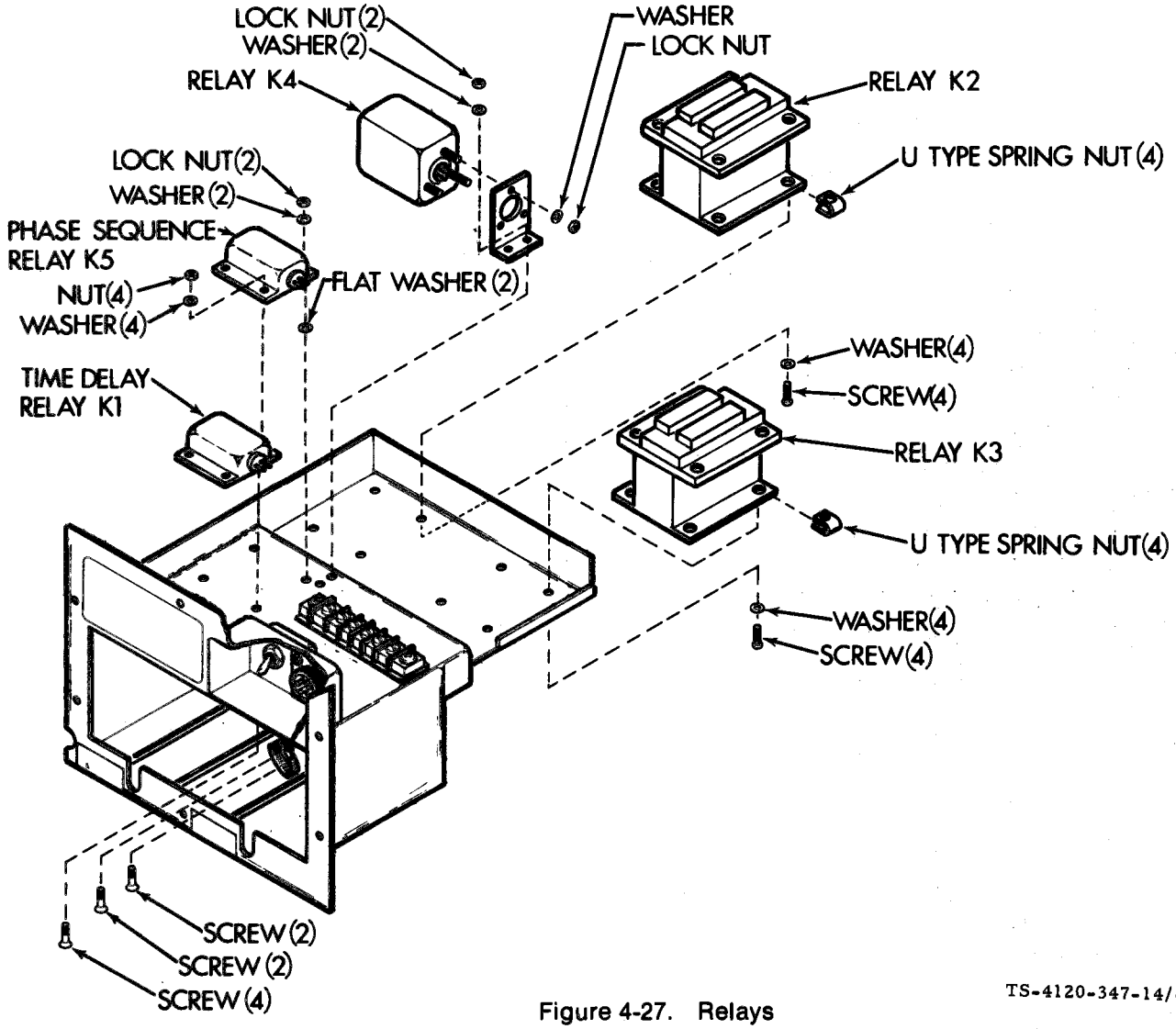
(3) See paragraph 4-27c and figure 4-18 and install the control module.

(4) Install the top front cover.

(5) Connect power at power source.

4-35. RELAYS

Relays K2, K3 and K4 and time delay relay K1 and phase sequence relay K5 are located in the junction box. See figure 4-27.



TS-4120-347-14/4-27

Figure 4-27. Relays

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) Remove the top front cover.

(4) Remove seven screws and lock washers and carefully slide the junction box out of the unit.

b. Test.

(1) Relays K2 and K3.

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

(b) Check continuity across terminals A1 and A2; B1 and B2, and C1 and C2. The multimeter must show that contacts are closed.

(c) Remove power. Multimeter must show that contacts are closed.

(2) Relay K4.

(a) Apply 28VDC to terminals 2 and 9; 2 is positive, 9 is negative.

(b) Check continuity across terminals, 1 and 3; 5 and 11; and 10 and 8.

(c) Read Multimeter. It should indicate that terminals 1 and 3,5 and 6, and 10 and 7 are open. Terminals 1 and 4, 5 and 11, and 10 and 8 are closed.

(d) Remove 28 VDC power. Multimeter should indicate that terminals 1 and 4,5 and 6, and 10 and 7 are closed and that terminals 1 and 3, 5 and 11, and 10 and 8 are open.

(3) Time delay relay K1.

(a) Connect multimeter to terminals 2 and 3.

(b) Apply 28DVC to terminals 2 and 5; Terminal 1 is positive, 5 is negative. Multimeter must show continuity across terminals 1 and 3 within 30 ± 3 seconds of applying voltage.

(4) Phase sequence relay K5.

(a) This relay will energize only when all three phases are in proper sequence and when input voltage and frequency are within 10%. of that specified (208 volt, 60 hertz).

(b) Check that power connections are properly connected and that input power is within 10% of that specified.

(c) Replace suspected bad phase sequence relay.

c. Removal.

(1) Tag and disconnect the wires to the relay.

(2) See figure 4-27 and remove the attaching hardware.

(3) Pull relay from junction box.

d. Installation.

(1) Mount relay using hardware indicated on figure 4-27.

(2) See figure 4-5 wiring diagram and tags and connect leads. Remove the tags. if relay has solder connections be sure to protect solder joints with heat shrink or equal insulation tubing.

(3) Carefully slide the junction box into place and secure with seven screws and lock washers.

(4) See paragraph 4-27c and figure 4-18 and install the control module.

(5) Install the top front cover.

(6) Connect power at power source.

4-36. CONTROL CIRCUIT BREAKER CB2

The control circuit breaker is located in the junction box. See figure 4-28.

a. Access.

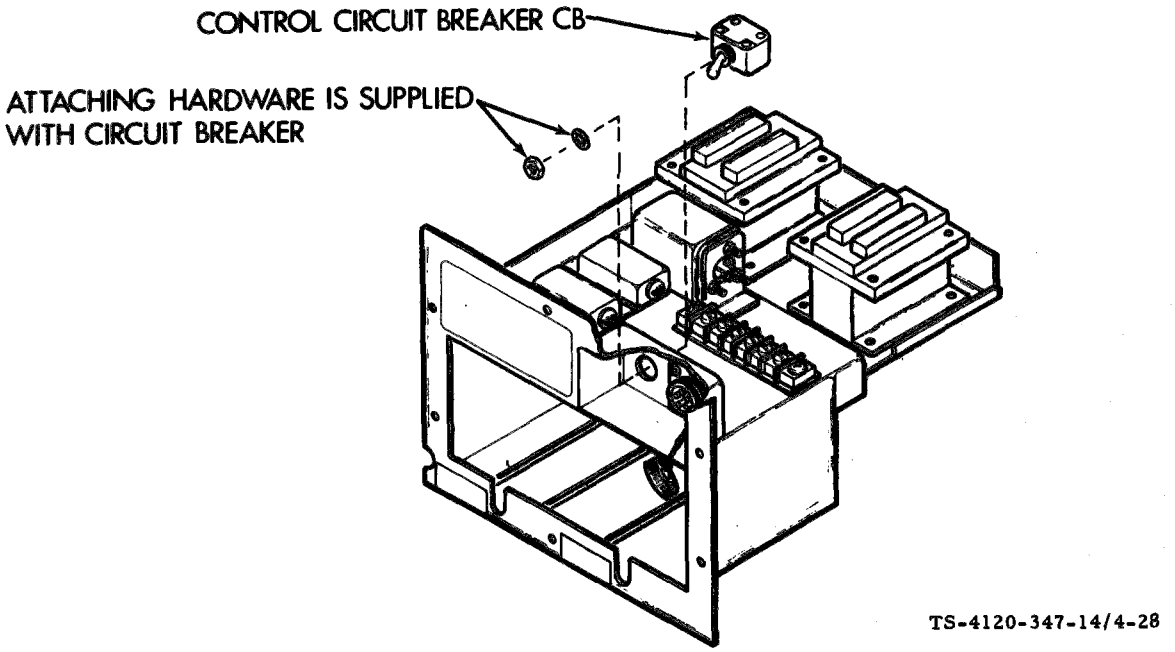


Figure 4-28. Control Circuit Breaker

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-27a and figure 4-18 and remove the control module.

(3) Remove the top front cover.

(4) Remove seven screws and lock washers and carefully slide the junction box out of the unit.

b. Test.

(1) Tag and disconnect the leads.

(2) Check to see that there is continuity between the two terminals with the circuit breaker in the on position.

(3) Check that there is no continuity between terminals with the circuit breaker in the off position.

c. Removal.

(1) Remove the attaching nut and hardware from the front of the panel.

(2) Slip the circuit breaker from the back of the panel.

d. Installation.

(1) Slip the circuit breaker into the hole in the panel and secure with. the nut and locking hardware provided with the circuit breaker.

(2) See the wiring diagram figure 4-5 and tags and connect the wire leads. Remove the tags.

(3) Carefully slide the junction box into place and secure with seven screws and lock washers.

(4) See paragraph 4-27c and figure 4-18 and install the control module.

(5) Install the top front cover.

(6) Connect power at power source.

4-37. MISCELLANEOUS CABLES, HARNESSES AND TERMINAL BOARDS. (See figure 4-29.)

a. Access

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) Remove the top rear cover to have access to the compressor and auxiliary power input cables.

(3) To have full access to terminal block TB2, 3 and 4 it is necessary to;

(a) Remove the top front cover.

(b) Remove the junction box and control module. (See paragraphs 4-27 and 4-33.)

b. Inspect/Test

(1) Check terminals on terminal boards to be sure they are tight and free of corrosion.

(2) Disconnect connectors and check them for loose, damaged or missing pins.

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

(4) See wiring diagram figure 4-5 and continuity test individual wires. Repair or replace wires with no continuity.

c. Repair.

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

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

d. Installation.

(1) Connect all disconnected connectors.

(2) Install junction box and control module. (See paragraphs 4-27 and 4-33.)

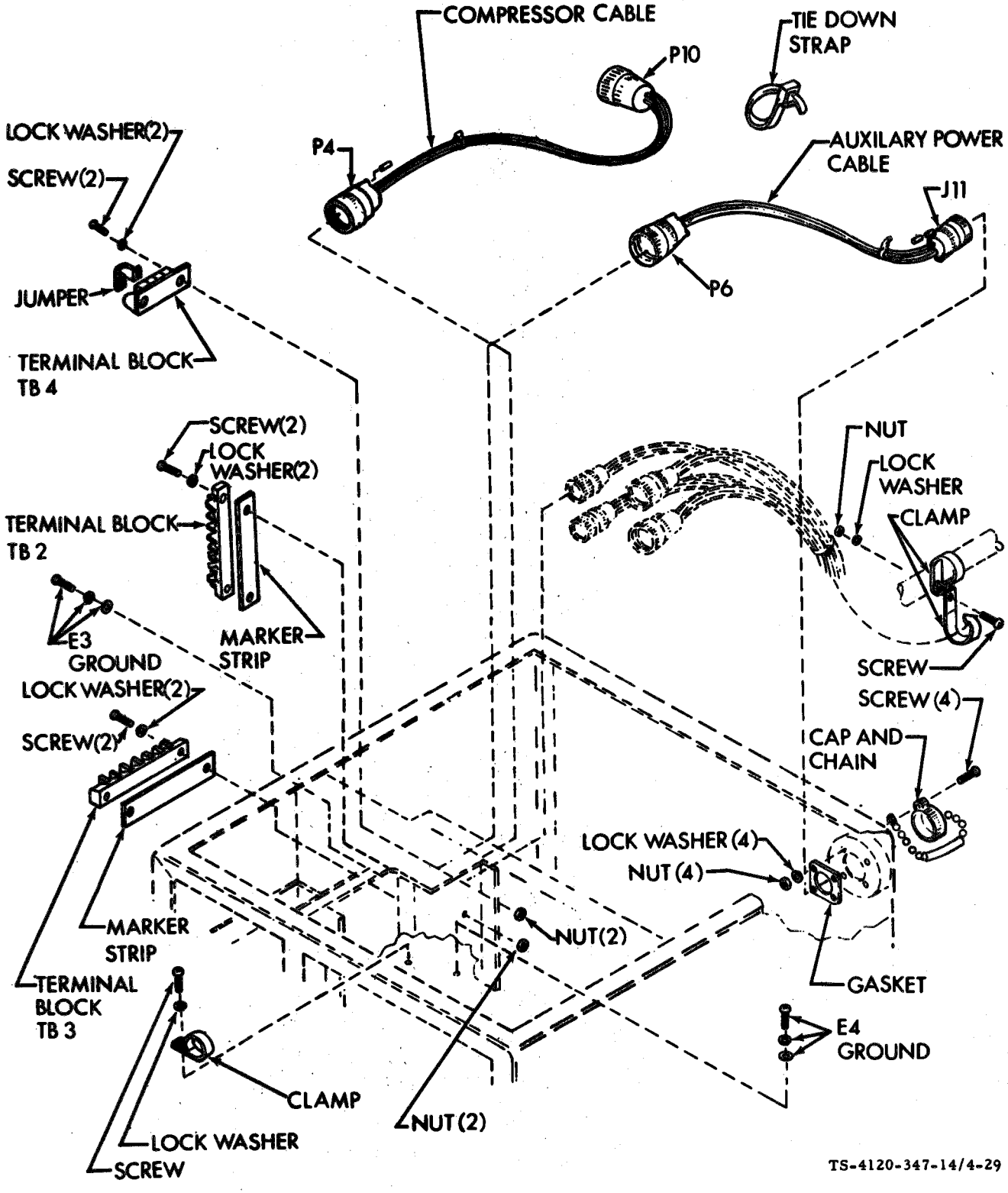


Figure 4-29. Miscellaneous Cables, Harnesses and Terminal Boards

(3) Install the top front and rear covers.

(4) Connect power at power source.

4-38. TRANSFORMER, RECTIFIER, RESISTOR, CAPACITORS AND HARNESS

The transformer, rectifier, resistor and capacitors C1 and C2 are located behind the junction box in the upper front left corner of the unit. See figure 4-30.

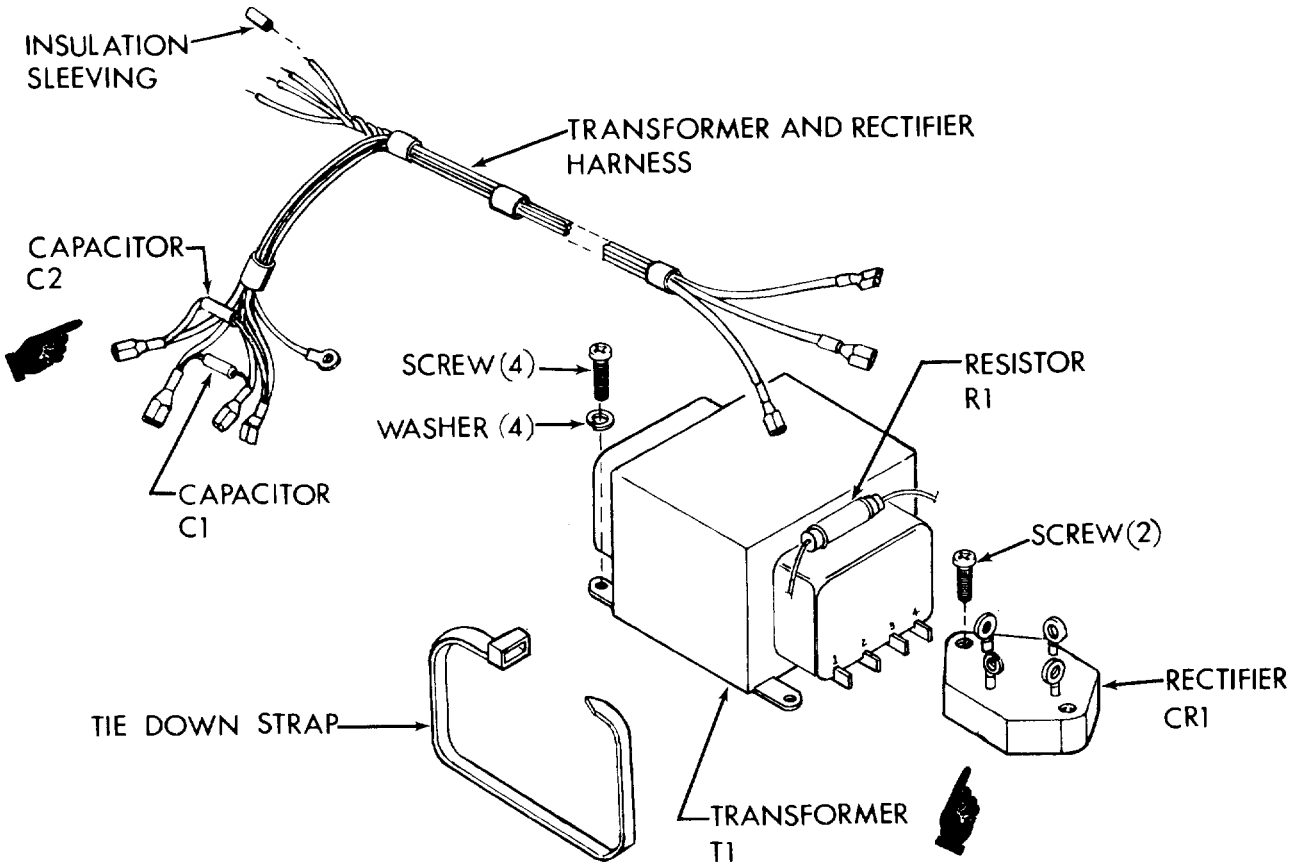


Figure 4-30. Transformer and Rectifier

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top front cover.

(3) Remove the junction box and control module. (See paragraphs 4-27 and 4-33.)

b. Inspect.

(1) Check that solder connections and terminals are tight and in good condition.

(2) Check that harness wires have no cuts, broken wires or frayed insulation.

(3) Inspect attaching hardware to be sure it is tight and in good condition.

(4) Inspect electrical parts for obvious damage such as cracks, evidence of overheating and broken terminals.

(5) Replace all damaged or broken parts.

c. Test.

(1) Transformer T1/Resistor R1.

(a) Tag and disconnect leads and check for continuity across the primary winding and then across the secondary winding. If either winding is open, replace the transformer.

(b) Check for shorts between one terminal and transformer case and also between one primary terminal and one secondary terminal using an insulation tester, megger or multimeter on high ohms setting. Replace transformer if a short is indicated.

(c) Apply 115 volts AC, 120 watts, to terminals 1 and 2 (input terminals). Voltage at transformer terminals 3 and 4 should be 28 to 30 volts AC, 4 amps. Remove power from transformer. Replace defective transformer.

(2) Rectifier CR1. Apply 28-30 volts AC to rectifier terminals 1 and 3. Output at terminals 4 and 2 should be 26 to 30 volts DC. Terminal 4 is negative, 2 is positive. Replace faulty rectifier.

(3) Capacitors.

(a) Disconnect the positive (+) lead of the capacitor from the circuit.

(b) Using an ohmmeter set to read high resistance, place the positive (+) probe on the disconnected capacitor lead. Place the negative (—) probe of the ohmmeter on the negative lead of the capacitor or on a common ground while watching the ohmmeter needle.

(c) The ohmmeter needle should move rapidly to a point about 2 to 3-3/4 up the scale, then slowly drop back. If the needle does not move, the capacitor contains an open circuit and must be replaced. If the needle moves quickly to the top of the scale and remains there, the capacitor contains a short circuit and must be replaced.

NOTE

The ohmmeter test does not show the behavior of a capacitor under load. Such testing requires special equipment which is not economically practical for testing small capacitors. If breakdown under load is suspected, replace the capacitor.

d. Remove/Install.

(1) Transformer.

(a) Tag and disconnect wire leads.

(b) Remove tie down strap and resistor.

(c) Remove the four screws and lock washers and pull the transformer from the unit.

(d) See wiring diagram figure 4-5 and install the resistor R1 on the transformer. Secure the resistor to the transformer with a tie down strap.

(e) Attach the transformer to the unit with four screws and lock washers.

(f) Slip heat shrinkable insulation tubing on the ends of all wires that are to be soldered.

(g) See wiring diagram figure 4-5 and tags and connect all wire leads. Remove the tags.

(h) Slip heat shrink tubing over all exposed solder connections and shrink in place.

(2) Rectifier/Capacitors.

(a) Tag and disconnect wire leads,

(b) Remove two screws and pull rectifier from unit.

(c) Remove capacitors.

(d) Install capacitors.

(e) Attach the rectifier to the unit with two screws.

(f) See wiring diagram figure 4-5 and tags and connect all wire leads. Remove the tags.

(3) Install the junction box and control module. (See paragraphs 4-27 and 4-33.)

(4) Install the top front cover.

(5) Connect power at the power source.

4-39. CONDENSER FAN THERMOSTATIC SWITCH

The condenser fan thermostatic switch is located on the lower left rear corner of the unit above the fresh air ventilation guard. See figure 4-31.

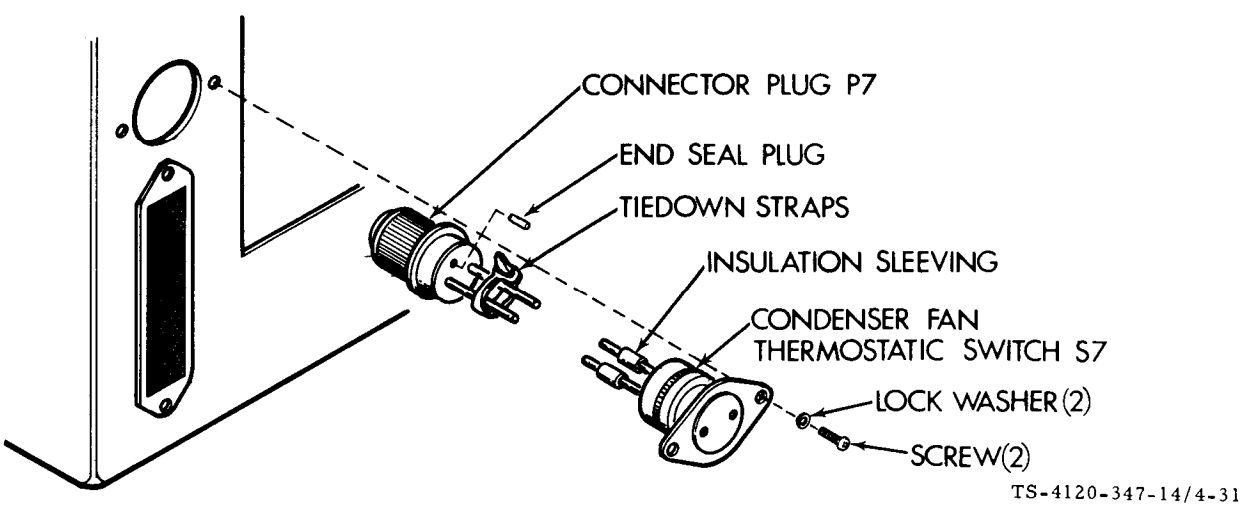


Figure 4-31. Condenser Fan Thermostatic Switch

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Disconnect connector plug P7.

(4) Loosen all clamps holding the cable assembly.

(5) Remove the two screws and lock washers and carefully remove the condenser fan thermostatic switch and plug assembly from the unit.

b. Inspect.

(1) Check the connector for loose, damaged or missing pins.

(2) Check the wires for loose connections, cuts, frayed insulation and broken wires.

c. Test.

(1) The switch is normally open. It closes on temperature rise between 95 and 105°F (35 and 41° C).

(2) Check for continuity between the pins of the connector. There should be no continuity when the temperature is below 95° F (35°C).

(3) Tape an accurate thermometer to the face of the thermostat. Hold a light bulb, heat gun or similar safe heat producing device near the surface of the thermostat face. Check for continuity at connecter pins when temperature rises to 95 to 105° F (35 to 41° C).

(4) Replace the thermostat switch if either of the above tests show a switch failure.

d. Install

(1) Slip the plug and thermostatic switch through the case and secure the switch with two screws and lock washers.

(2) Connect the cornnector plug P7 (See wiring diagram figure 4-5.)

(3) Reinstall clamps to secure wires in place.

(4) Install the top rear cover.

(5) Connect power at the power source.

4-40. EVAPORATOR FAN, HOUSING AND MOTOR

The evaporator fan, housing and motor are located behind the return air louver assembly. (See figure 4-32.)

a. Access

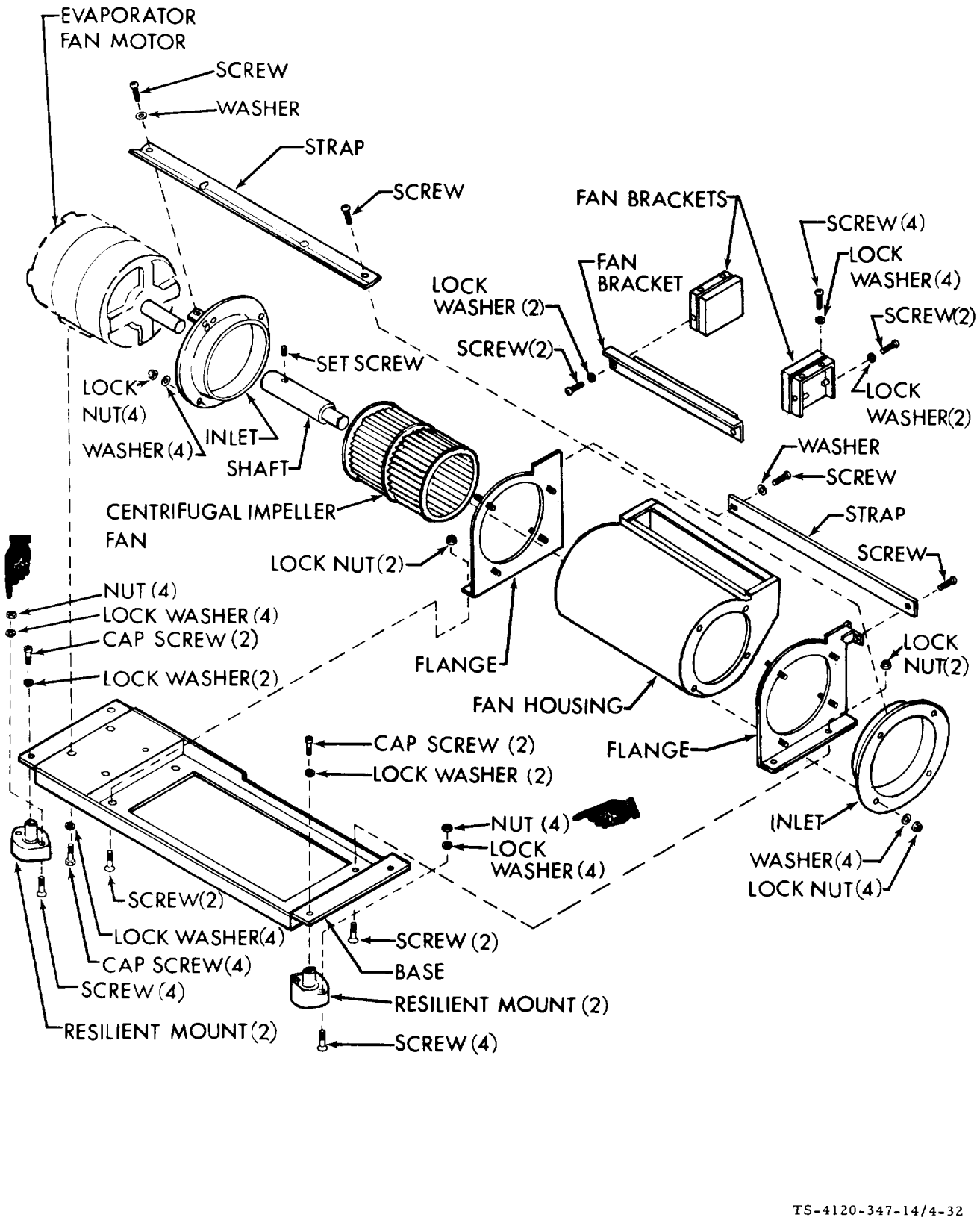


Figure 4-32. Evaporator Fan, Housing and Motor

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) Remove the return air louver assembly.

b. Inspect.

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

(2) Check mounting hardware for tightness.

(3) Check motor to see that fan rotates freely without excessive lateral or end play of the shaft.

(4) Disconnect the P3 motor connector plug and check for loose, damaged or missing pins.

c. Test.

(1) The motor is capable of operating at two speeds. Therefore there are two sets of field coils.

(2) Use an ohmmeter or continuity tester to check continuity between pins A and B and between E and F. Continuity should exist.

(3) Check continuity between pins G and A, B, E and F. Continuity should not exist.

NOTE

If all the above inspections and tests are satisfactory, but the motor will still not operate properly, notify direct support maintenance, who may desire to make further tests before it is removed.

d. Removal/Disassembly. (See figure 4-32.)

(1) Loosen the clamps and remove the temperature switch remote bulb from the top of the fan housing.

(2) Remove the straps and fan brackets from the top or outlet of the fan.

(3) Remove the four cap screws and lock washers from the four corners of the base.

(4) Lift the fan; motor and base assembly out of the unit.

(5) Remove the four nuts and lock washers from each of the inlet rings.

(6) Remove the four cap screws and lock washers and pull the motor, shaft and fan out of the housing.

(7) Loosen the set screws in the fan and the shaft and pull them from the motor.

(8) Remove the four screws and lock nuts that attach the flanges to the base and remove the flanges and fan housing from the base. The flanges and the fan housing will then slip apart.

(9) Check the condition of the resilient mounts. If any damage is detected they can be removed by tilting the air conditioner and removing screws from the bottom side of the cabinet and the nuts and lock washers from top of mount.

NOTE

Be sure that correct part number resilient mounts are ordered and installed properly. The two mounts on the motor end are different than those on the fan end.

e. Assembly/Installation.

(1) If the resilient mounts were removed, see note above and install new mounts.

(2) Align the pins in the flanges with the holes in the housing and attach the flanges to the base with four screws and locknuts.

(3) Slip the shaft extension on to the motor shaft and tighten the set screw.

(4) Slip the inlet ring on to the fan shaft before mounting the fan.

(5) Slip the fan onto the shaft extension. The hub should be turned so that it is mounted toward the motor. The direction of rotation is counter clockwise facing the motor shaft.

(6) Carefully slip the fan and motor assembly in place.

(7) Attach the motor to the base with four cap screws and lock washers.

(8) Attach the two inlets to the flanges with eight washers and lock nuts.

(9) Place the fan and motor assembly in the unit and install the four cap screws and lock washers to secure the base to the resilient mounts.

(10) Install the fan brackets and straps on the outlet side of the fan housing.

(11) Slip the temperature switch remote bulb into the clamps from the fan strap and tighten the clamps.

(12) Connect the P3 motor connector.

(13) Check that drain tubes have not been disconnected.

(14) Install the return air louver assembly.

(15) Connect power at power source.

4-41. HEATER THERMOSTAT

The heater thermostat S6 mounts on the forward inside surface of the top center cover. (See figure 4-33.)

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top front cover.

(3) Remove two screws and slip the heater thermostat and bracket forward.

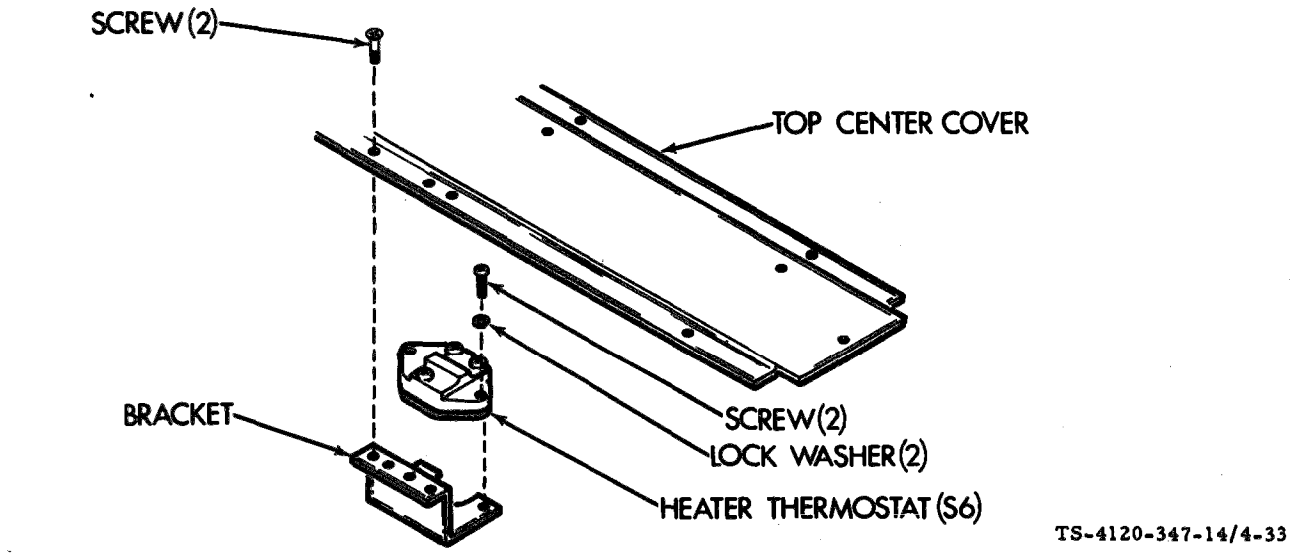


Figure 4-33. Heater Thermostat

b. Inspect/Test.

(1) Inspect for cracks, loose connections and obvious damage. Replace if defective.

(2) Remove the two screws and pull the thermostat from the bracket.

(3) Tag and disconnect leads.

(4) Using a multimeter check continuity on terminals 1 and 2 of the thermostat. Continuity should be indicated.

(5) Repeat step (4) with meter connected to terminals 3 and 4.

(6) Tape the bulb of a thermometer or junction of a thermocouple to the body of the heater thermostat, and connect the multimeter to terminals one and two. Use a 150 watt lamp bulb or a heat source. Gradually apply heat while observing both the thermometer and the multimeter. Continuity should dropout at 145 to 155° F (63 to 68°C). Remove heat source and let the thermostat cool while observing the thermostat and multimeter. Continuity should be re-establishd ed 100 to 120° F (38 to 49°C).

(7) Repeat step (6) with meter connected to terminals 3 and 4.

(8) If the thermostat does not meet the above requirements replace it.

c. Installation.

(1) See tags and wiring diagram figure 4-5 and connect leads. Remove the tags.

(2) Attach the thermostat to the bracket with two screws and lock washers,

(3) Attach the thermostat and bracket assembly to the flange of the top center cover with two screws.

(4) Install the top front cover.

(5) Connect power at the power source.

4-42. HEATER ELEMENTS

The heater elements are located in the upper front compartment behind the evaporator coil. See figure 4-34.

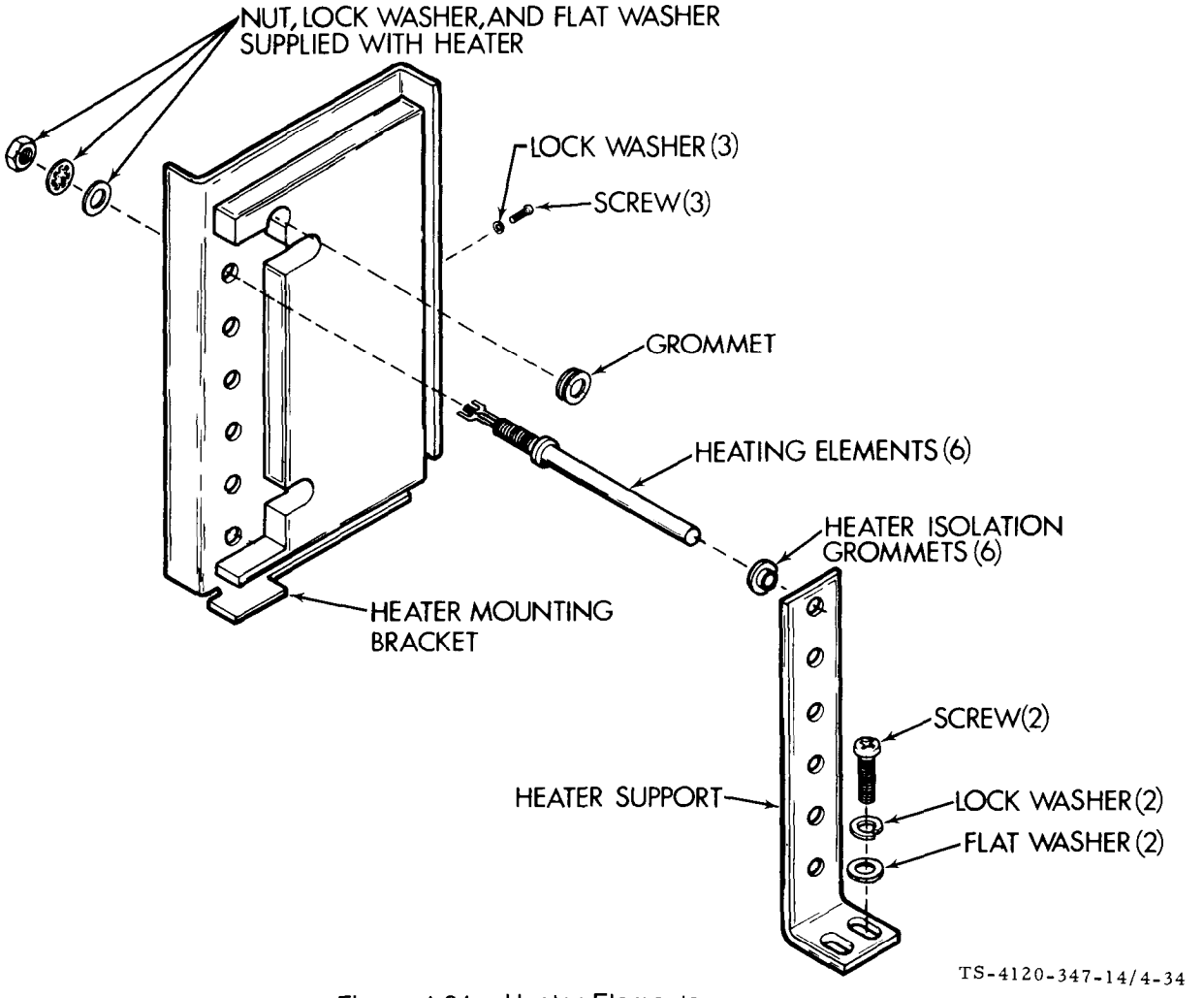


Figure 4-34. Heater Elements

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

WARNING

Allow heaters to cool before touching. Severe burns can result from touching hot heaters.

(2) Remove all three top panels.

(3) To gain access to terminal block TB2 where heater element leads are connected the junction box and control module must also be removed. See paragraphs 4-27 and 4-33.

b. Inspect/Test.

(1) Visually inspect each heater for obvious damage, deformation, cracked or broken sheath, burnt out spots and loose, broken or otherwise damaged leads. Replace if any damage is found.

(2) Use an ohmmeter, multimeter or other continuity tester. Check the continuity of each heating element. Replace heating elements that do not indicate continuity.

c. Removal.

(1) Tag and disconnect leads from terminal block TB2.

(2) Remove the two screws, lock washers and flat washers and remove the heater support.

(3) Remove the attaching hardware from the heater mounting bracket.

(4) Slip the bracket up enough to gain access to the top heater.

(5) Remove the retaining nut, lock washer and flat washer and slip the heater out of the bracket.

(6) Remove the remaining heaters using the same methods as (4) and (5) above.

d. Cleaning. Use a clean dry cloth to wipe dust and dirt from heaters. Do not use solvent or detergent.

e. Installation.

(1) Position the heater mounting bracket into the top of the unit so that heaters can be mounted one at a time.

(2) Start with the bottom most heater to be installed.

(3) Slip the heater through the bracket hole and secure with the nut, lock washer and flat washer provided with the heater.

(4) Install the remaining heaters one at a time. Slide the bracket down progressively as each new heater is installed.

(5) Be sure that heater isolation grommets are in place on the heater support,

(6) Place the heater support in the unit and slip the ends of the heaters through the isolation grommets

(7) Install mounting hardware in the heater support and the heater mounting bracket.

(6) See tags and wiring diagram figure 4-5 and connect heater leads at terminal block TB2. Remove the tags.

(9) Install the junction box and control module. See paragraphs 4-27 and 4-33.

(10) Install the top panels.

(11) Connect power at power source.

4-43. CONDENSER FAN, MOTOR AND HOUSING

The condenser fan and motor are located in the rear of condenser section of the unit. See figure 4-35.

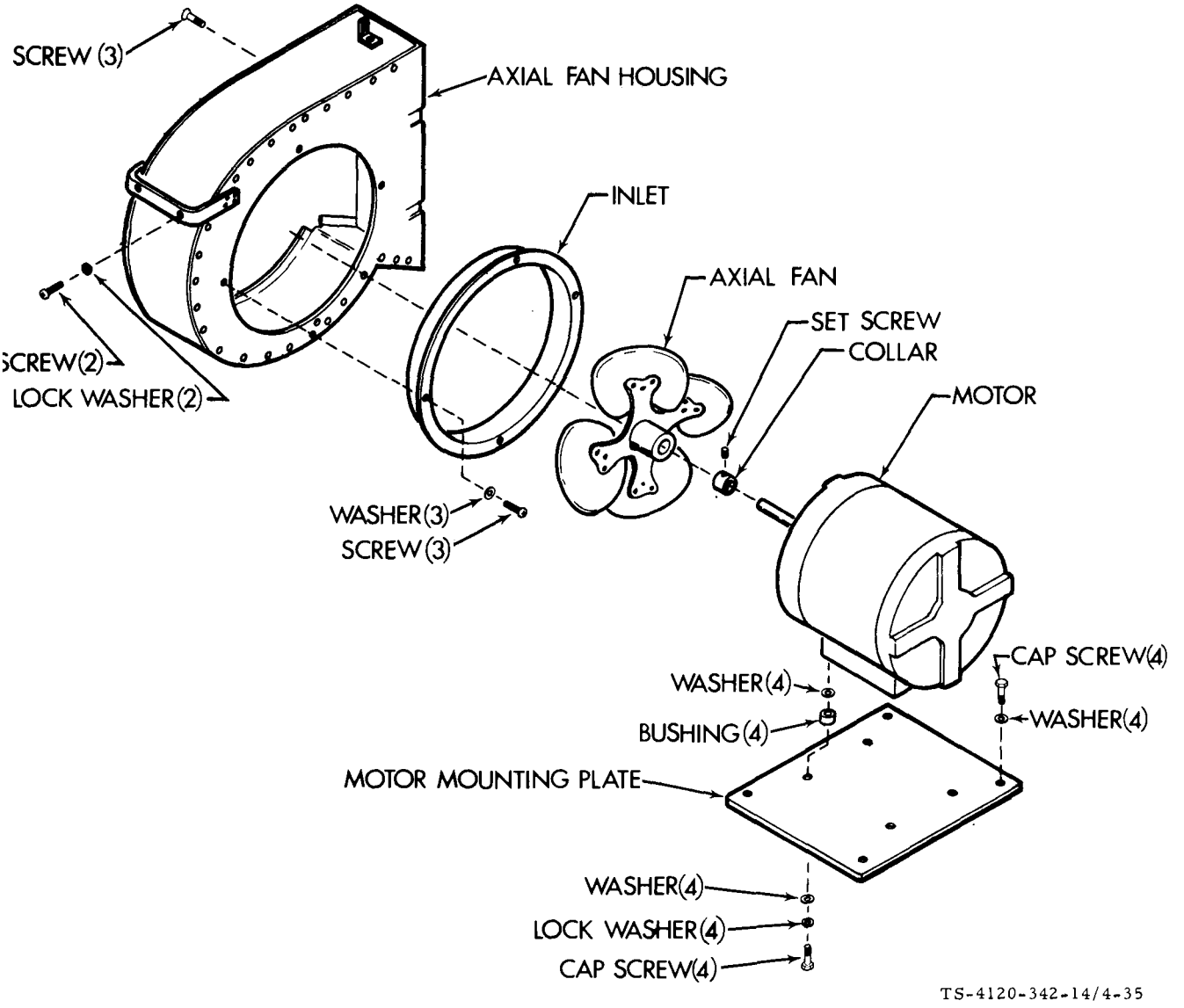


Figure 4-35. Condenser Fan, Motor and Housing

a. Access

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

b. Inspect.

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

(2) Check mounting hardware for tightness.

(3) Check motor to see that fan rotates freely without excessive lateral or end play of the shaft.

(4) Disconnect the P5 motor connector plug and check for loose, damaged or missing pins.

c. Test.

(1) The motor is capable of operating at two speeds. Therefore there are two sets of field coils.

(2) Use ohmmeter or continuity tester to check continuity between pins A and B and between E and F. Continuity should exist.

(3) Check continuity between pins G and A, B, E and F. Continuity should not exist.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Check that all parts are in place and in good condition.

(4) Check mounting hardware for tightness.

(5) Check motor to see that fan rotates freely without excessive lateral or end play of the shaft.

(6) Disconnect the P5 motor connector plug and check for loose, damaged or missing pins.

c. Test.

(1) The motor is capable of operating at two speeds. Therefore there are two sets of field coils.

(2) Use an ohmmeter or continuity tester to check continuity between pins A and B and between E and F Continuity should exist.

(3) Check continuity between pins G and A, B; E and F. Continuity should not exist.

NOTE

If all the above inspections and tests are satisfactory, but the motor will still not operate properly, notify direct support maintenance, who may desire to make further tests before it is removed.

d. Removal/Disassembly. (See figure 4-35.)

(1) Remove the four cap screws and washers from the top of the motor mounting plate.

(2) Cut the plastic tie down straps to free the cable.

(3) Carefully lift the motor, and mounting plate fan up and out of the unit.

(4) Loosen the set screw in the fan and slip the fan from the motor shaft.

(5) Loosen the set screw in the collar and slip the collar from the motor shaft.

(6) If the motor is to be repaired or replaced remove it from the base.

(7) Refer motor repairs to direct support maintenance.

e. Installation. See figure 4-35.

(1) Insert bushings into the four motor mounting holes and attach motor to base with eight flat washers and four each lock washers and cap screws.

CAUTION

Do not hammer fan on or off motor shaft; motor bearings would be damaged. Dress out roughness with a fine file, stone, or abrasive cloth. Apply a coating of light machine oil to case assembly.

(2) Slip the collar on the motor shaft and tighten the set screw.

(3) Slip the fan on the motor shaft and tighten the set screws.

(4) Carefully place the fan and motor assembly down into the unit and align the holes in the motor nounting plate with those in the unit.

(5) Install the four cap screws and washers in the motor mounting base but do not tighten them all the way.

(6) Spin the fan by hand and check to be sure there is equal clearance between the inlet ring and the tips of the fan blade. Adjust the base as necessary.

(7) Tighten the cap screws in the motor mounting base,

(8) Connect the P5 motor connector plug and secure the cable to existing harnesses with new plastic tie own straps or lacing cord.

(9) Install the top rear cover.

(10) Connect power at the power source.

4-44. EVAPORATOR COIL CLEANING

The evaporator coil is located in the upper front section of the air conditioner.

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top front cover.

(3) Remove the supply air louver.

(4) Remove the mist eliminator.

b. Inspection of installed items.

(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.

WARNING

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

CAUTION

Do not use steam to clean coil.

c. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the coil to blow the dirt out. Take care to avoid fin damage. When using compressed air wear safety glasses or goggles. Dirt can be blown into your eyes.

d. Repair/Replacement. Should a leak or major damage be evident refer to direct support maintenance.

e. Installation of removed items.

(1) Install the mist eliminator. TOP mark must be up and air flow arrows should point away from coil.

(2) Install the supply air louver.

(3) Install the top front cover.

(4) Connect power at power source.

4-45. SOLENOID VALVE COIL REMOVAL

The L1 and L2 solenoid valves are located in the rear (condenser/compressor) compartment. See figure 4-36.

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

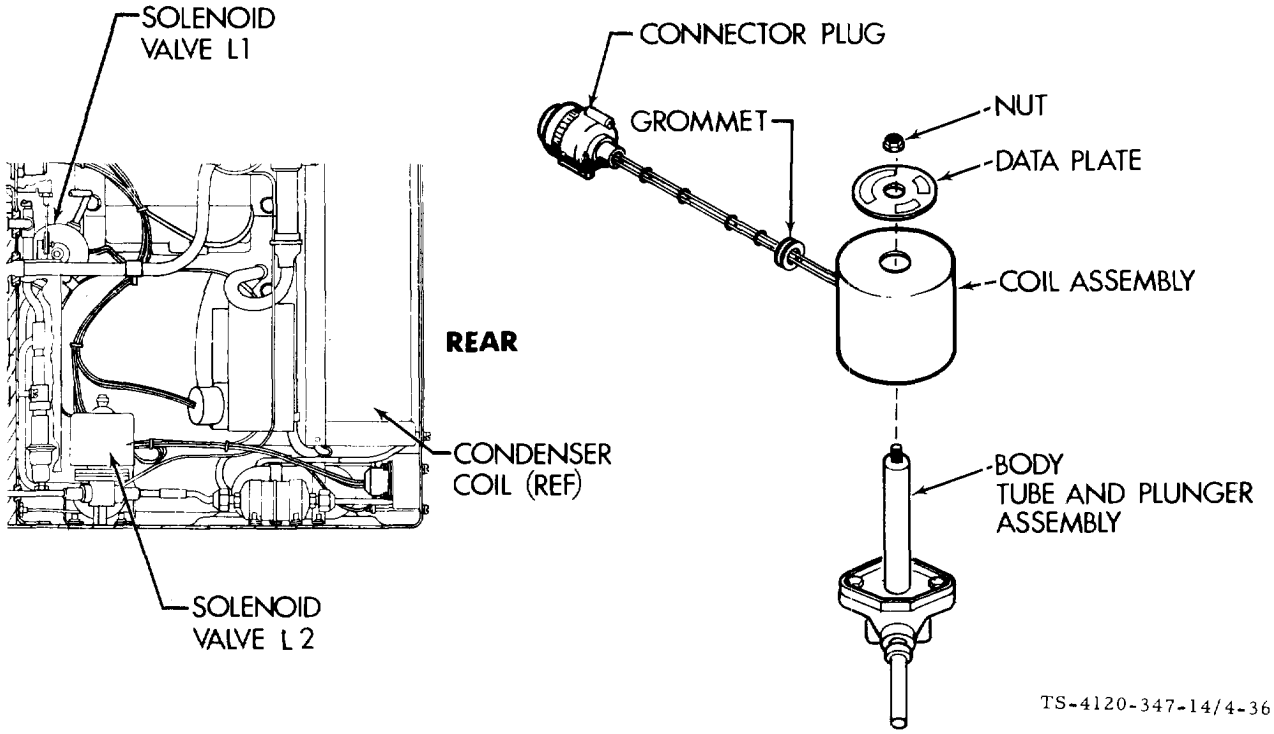


Figure 4-36. Solenoid Valve Coil Removal

(1) Disconnect power at power source.

(2) Remove the top rear cover.

NOTE

The following basic instructions apply to both the by-pass solenoid L1 and the pressure equalizer solenoid L2.

b. Test

(1) Disconnect the solenoid valve connector plug. The plug number is P8 for the L1 solenoid and F9 for the L2 solenoid valve.

(2) Use a continuity tester or a multimeter set on the lowest OHMS scale to check for continuity between pins A and B in connector plugs. If continuity is not found, the coil is open and must be replaced.

(3) Use the continuity tester or multimeter to check for continuity between each pin in connector plug and the coil casing. If continuity is found between either pin and the case, the coil is grounded and should be replaced.

(4) If continuity checks are satisfactory, apply 24 volts dc from an external power supply across pins A and B in connector plug and listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and the entire valve should be replaced. Refer to direct support maintenance.

c. Coil replacement. The coil can be replaced without opening the refrigeration pressure system. Refer to figure 4-36 and replace the coil as follows:

WARNING

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

(1) Remove the top nut that attaches the coil to the valve body, and remove the coil, data plate and connector assembly.

(2) Cut plastic tie down straps as necessary to remove the solenoid valve cable.

(3) If the connector plug is to be reused unsolder it from the leads.

(4) If the grommet is to be reused remove it from the coil assembly.

d. Reassembly.

(1) Install grommet in hole in coil assembly.

(2) Solder leads from coil assembly to connector plug.

(3) Place coil assembly and data plate on to valve body and secure with nut.

(4) Reconnect the connector plug.

(5) Secure the wires to existing harnesses with new plastic tie down straps or lacing cord.

(6) Install the top rear cover.

(7) Connect power at power source.

4-46. CONDENSER COIL

The condenser coil is located across the rear of the unit.

a. Access.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Remove the condenser air inlet guard.

b. Inspection of install items.

(1) Check for accumulate 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.

WARNING

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

WARNING

Do not use steam to clean coil.

c. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the coil to blow the dirt out. Take care to avoid fin damage. When using compressed air wear safety glasses or goggles. Dirt can be blown into your eyes.

d. Repair/Replacement. Should a leak or major damage be evident refer to direct support maintenance.

e. Installation of removed items.

(1) Install the condenser air inlet guard.

(2) Install the top rear cover.

(3) Connect power at the power source.

4-47. HOUSING

a. Inspect/Service.

(1) Check for missing, loose or damaged hardware. Replace all or damaged hardware.

(2) Inspect for dents, bends and cracked welds. Refer defects to be repaired to direct support maintenance.

b. Repair. Refer all repairs other than hardware replacement to direct support maintenance.

Section VII.

PREPARATION FOR STORAGE OR SHIPMENT

4-48. PREPARATION FOR STORAGE

a. Administrative Storage of Equipment. See TM 740-90-1. Administrative storage is short term storage — 1 to 45 days. It covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The administrative storage site should provide required protection from the elements and allow access for visual inspection when applicable.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

b. Intermediate Storage - 46 to 180 days. No special handling is required other than protection from damage and the elements.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

(3) Place the air conditioner in a dry, covered area.

c. Long Term or Flyable Storage. There is no time limit for this type of storage.

(1) Unroll the fabric cover.

(2) Snap the cover in place.

(3) Bolt the unit to a skid base, preferably the original used to ship the unit if it has been preserved.

(4) Wrap the unit with two layers of heavy plastic sheet or barrier paper,

(5) Tape and strap the wrapping in place.

(6) Mark the air conditioner per standard Army Procedures.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I.

REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. GENERAL

a. Repair parts are listed and illustrated in TM5-4120-347-24P. No special tools are required for maintenance of the equipment. Test, maintenance and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment found in any organizational maintenance electric shop.

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

c. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-596-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	National Stock Number
Brush, Bristle	7520-00-223-8000
Brush, Wire	7920-00-282-9246
Bucket	7240-00-137-1609
Heat Gun	4940-01-042-4855
Multimeter	6625-00-553-0142
Pliers, Long Round Nose	5120-00-268-3579
Rubber Gloves	8415-00-266-8677
Safety Goggles	4240-00-052-3776

Description	National Stock Number
Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293
Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014
Nitrogen Regulator	6685-00-449-7484

Section II.

REPAIRS AND REPLACEMENT OF MECHANICAL ITEMS.

5-2. ASSISTANCE TO ORGANIZATIONAL MAINTENANCE

a. Maintenance. Direct support maintenance personnel may be requested to assist organizational maintenance personnel in the performance of any of the organizational maintenance procedures covered in Chapter 4.

b. Troubleshooting. Direct support maintenance personnel may be requested to assist organizational maintenance personnel in troubleshooting to determine the cause of a malfunction or unsatisfactory performance of the air conditioner.

c. Repair. Direct support maintenance personnel may be requested to assist organizational maintenance in the performance of repair functions normally performed by organizational maintenance personnel. The specific repair functions authorized for performance by direct support maintenance on the Maintenance Allocation Chart (MAC) contained in Appendix C are covered in detail in this Chapter in the order in which they appear on the MAC.

d. Replacement. Direct support maintenance will condemn items that are beyond authorized repair and will provide appropriate replacement parts or components.

5-3. AUTHORIZED REPAIR/REPLACEMENT PROCEDURES

The following are procedures for the repair/replacement of casing covers, panels, grilles, screens, and information plates as authorized by the MAC. These procedures cover only those actions normally performed by direct support maintenance personnel. It is assumed that, where appropriate, the removal and installation of the item to be repaired or replaced will be performed by organizational maintenance personnel in accordance with procedures in Chapter 4.

5-4. FABRIC COVER

For removal, inspection, lubrication, cleaning and installation see paragraph 4-17 and figure 4-9.

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

b. Replace. For damage of greater extent, or missing eyelets or snap fasteners, replace the entire cover.

5-5. TOP COVERS

For removal, cleaning, inspection and installation see paragraph 4-18 and figure 4-10.

a. Repair. The only authorized repairs for these panels are replacement of gaskets, insulation and information plates.

(1) Use only gaskets, insulation or name plates identified in TM5-4120-347-24 P.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List (See Appendix E.)

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

WARNING

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

(3) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(4) 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.

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

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

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

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

5-6. SCREENS, GUARDS AND LOUVERS

For removal, cleaning, servicing, inspection and installation see paragraphs 4-19, 4-20 and 4-21 and figures 4-11, 4-12 and 4-13.

a. Repair. The only authorized repairs are replacement of gaskets and the straightening of bent blades.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List. (See appendix E.)

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

WARNING

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

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

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

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

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

(6) Straighten slightly bent louver blades by hand.

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

b. Replace screens, guards or louvers that are badly dented or bent so that they cannot be straightened or screens that are punctured or torn.

5-7. ELECTRIC MOTOR REPAIR

For access, inspection, testing, removal and installation, see paragraph 4-40 and figure 4-32 for the evaporator fan motor. For the condenser fan motor see paragraph 4-43 and figure 4-35.

a. Authorized Repairs. Direct support maintenance repair of the evaporator fan and condenser fan motors is limited to the replacement of the electrical connector, the thermal overloads, and the bearings.

b. Disassembly. Disassemble the motor only as necessary to affect the required repair. (See figure 5-1.)

NOTE

Motors manufactured by IMC Magnetics Corp. do not come apart the same way as those manufactured by Welco Industries, Inc. See motor name plate to determine who made the motor.

(1) To replace the connector:

(a) Loosen the cable clamp.

(b) Tag and unsolder leads.

(c) Remove the old connector.

(d) See wiring diagram and tags and solder leads to the new connector. Remove the tags.

(e) Secure the cable clamp.

(2) To replace the terminal protectors on IMC Magnetics Corp. motors:

(a) Remove the two screws and lock washers from the thermal overload housing.

(b) Remove the housing.

(c) Tag and disconnect the leads to the thermal overload.

(d) Remove the old thermal overload.

(e) See tags and connect leads to the new thermal overload. Remove the tags.

(f) Install the thermal overload housing with two screws and lock washers.

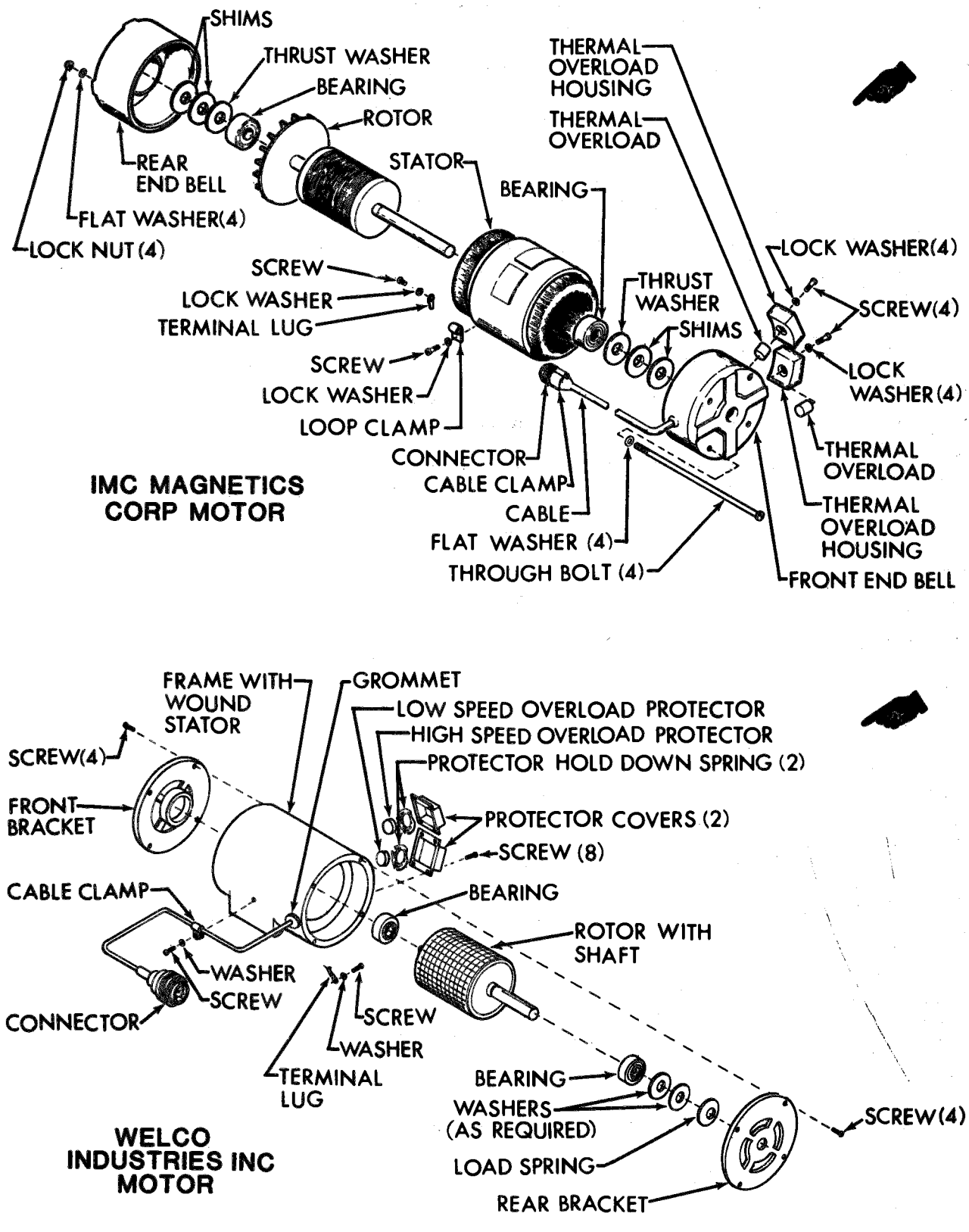


Figure 5-1. Electric Motors

(3) To replace the overload protectors on Welco Industries, Inc. motors:

(a) Remove four screws from each of the protector covers.

(b) Remove the protector covers.

(c) Remove the protector hold down springs.

(d) Tag and disconnect the leads to the overload protector.

(e) Remove the old overload protector.

(f) See tags and connect leads to the new overload protector. Remove the tags. Install the protector hold down spring and cover with four screws.

(4) To replace the bearings on IMC Magnetics Corp. motors:

(a) Match-mark the stator and both end bells to ease reassembly.

(b) Remove the four lock nuts and flat washers and pull the through bolts out of the motor.

(c) Carefully separate the end bells from the stator. Use a brass or plastic bar and hammer and tap the rear end bell away from the stator. Tap opposite sides, top and bottom in alternating sequence to break the end bells loose.

CAUTION

Remove the front end-bell carefully to avoid damaging wires. Wires may be left in place if care is taken to avoid damaging them.

(d) Unscrew the loop clamp from the side of the stator.

(e) Remove the end bells.

(f) Press out or carefully drive the bearings out of end bells. Retain the shims and the thrust washer for use at reassembly if they are not damaged.

(9) Examine rotor, stator and shafts for nicks, gouges, deformations and evidence of overheating.

(h) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace the motor.

(i) Coat the shaft surfaces of the rotor with oil (MIL-L-2104, Grade 20) and slide the bearings on the shaft ends. They should seat against the shoulders at the inner ends of the shaft.

(j) Coat the thrust washers and shims with oil (MIL-L-2104, Grade 20) and slide them over each end of the shaft with the thrust washers next to the bearings.

(k) Coat the bearing cavity of each end-bell with oil, and slide carefully into position over shaft so that OD of bearing enters ID of bearing cavity in end-bell. Work end-bells onto shaft until bore fits over end of stator, keeping the match-marks made at time of disassembly in alignment.

(1) Place a flat washer on each through bolt and insert through bolts through holes in both end-bells. Place flat washers and lock nuts on through bolts, and tighten finger-tight.

(m) Tap around both end-bells with a plastic or rawhide mallet while tightening nuts on through bolts. Tighten in 1-2 turn increments in alternating sequence until all the nuts are equally tightened. Check for freedom of rotation by turning the motor shaft by hand. There should be no drag or binding.

(n) Check end-play of shaft. End play should be 0.002-0.005 inch (0.051-0.127 mm). If end-play is not within limits, disassemble motor and add or remove shims to adjust.

(5) To replace the bearings on Welco Industries Inc. Motors:

(a) Match-mark the frame and the front and rear brackets.

(b) Remove four screws from each bracket.

(c) Carefully separate the brackets from the frame. Use a brass or plastic bar and hammer and tap the brackets away from the stator. Tap opposite sides, top and bottom in a ternating sequence to break the brackets loose.

CAUTION

Remove the brackets carefully to avoid damaging wires. Wires may be left in place if care is taken to avoid damaging them.

(d) Unscrew the loop clamp from the side of the frame.

(e) Remove the brackets.

(f) Remove load spring, washers, and bearings. Retain the load springs and washers for use at reassembly if they are not damaged.

(g) Examine rotor, stator and shafts for nicks, gouges, deformations and evidence of overheating.

(h) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace the motor.

(i) Coat the shaft surfaces of the rotor with oil (MIL-L-2104, Grade 20) and slide the bearings on the shaft ends.

(j) Coat the load spring and washers with oil (MIL-L-2104. Grade 20) and slide them on the long shaft end.

(k) Coat the bearing cavity of each bracket with oil, and slide carefully into position over shaft so that OD of bearing enters ID of bearing cavity in bracket. Work brackets into place keeping the match-marks at time of disassembly in alignment.

(l) Insert screws through holes in both brackets and tighten finger-tight.

(m) Tap around both brackets with a plastic or rawhide mallet while tightening screws. Tighten in 1-2 turn increments in alternating sequence until all the screws are equally tightened. Check for freedom of rotation by turning the motor shaft by hand. There should be no drag or binding.

(n) Check end-play of shaft. End play should be 0.002-0.005 inch (0.051-0.127 mm), If end-play is not within limits, disassemble motor and add or remove washers to adjust,

c. For further information on electric motor repair, refer to FM 20-31 (Electric Motor and Generator Repair).

5-8. REFRIGERATION SYSTEM REPAIRS GENERAL

The refrigeration system must be totally discharged before any maintenance action is performed on any system component. Leak testing and dehydrator replacement is required after any system component has been removed and replaced. The system must be evacuated before it is charged, The system must be properly charged to function properly.

WARNING

DANGEROUS CHEMICAL

is used in this equipment.

DEATH

Death or severe damage 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 the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

WARNING

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

DEATH

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

Never use a heating torch on any part that contains Refrigerant R-22. Do not let refrigerant touch you, and do not inhale refrigerant gas.

5-9. DISCHARGING THE REFRIGERANT SYSTEM

(See figure 5-2.)

WARNING

Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin-eye-contact is possible.

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

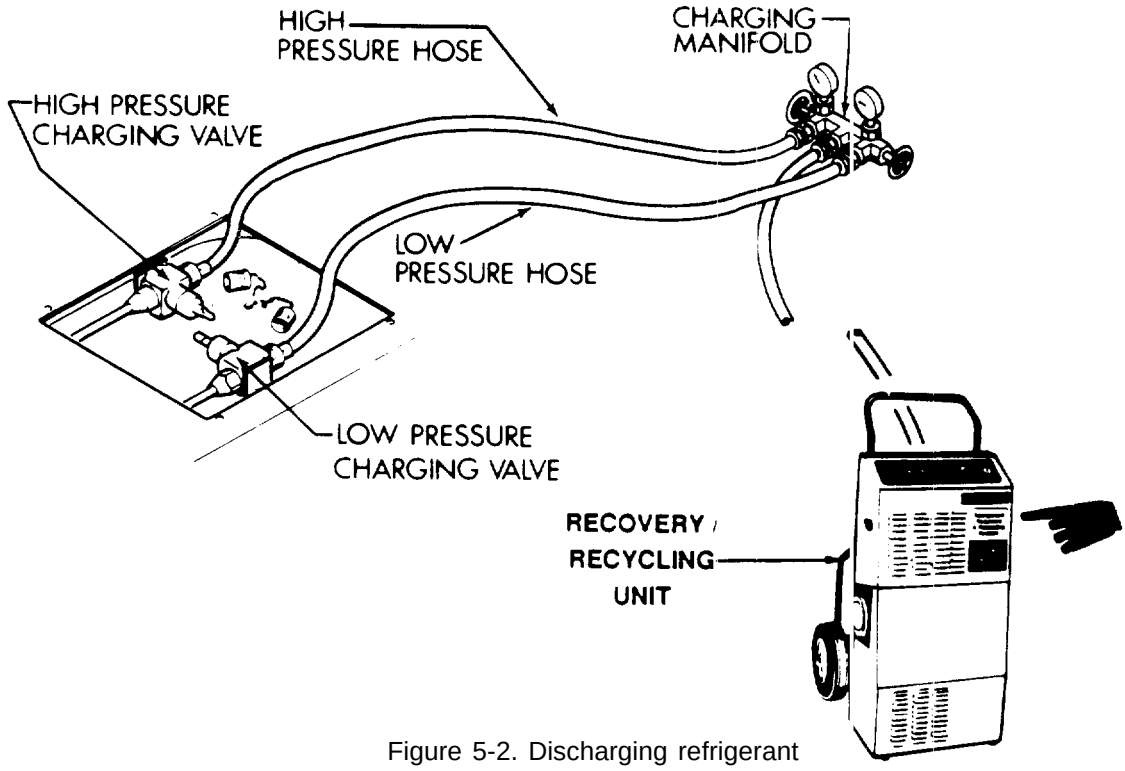


Figure 5-2. Discharging refrigerant

NOTE

In accordance with Environmental Protection Agency regulations refrigerants cannot be discharged into the atmosphere. A refrigerant recovery & recycling unit must be used whenever discharging the refrigerant system.

a. Disconnect power at the power source.

b. Remove the refrigerant charging valve access cover.

c. Remove the caps from the charging valve hose connections.

d. Connect a charging manifold to the charging valves.

e. Attach a hose assembly to the center connection of the manifold.

NOTE

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY

f. Connect and operate a recovery/recycling unit in accordance with the manufacturer's instructions.

5-10. PURGING THE REFRIGERANT SYSTEM

(See figure 5-3.)

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 1-2 cfm (0.028-0.57m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

CAUTION

Nitrogen is an inert gas; however, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

Assuming that the system has been discharged using a manifold as described in paragraph 5-9 proceed as follows:

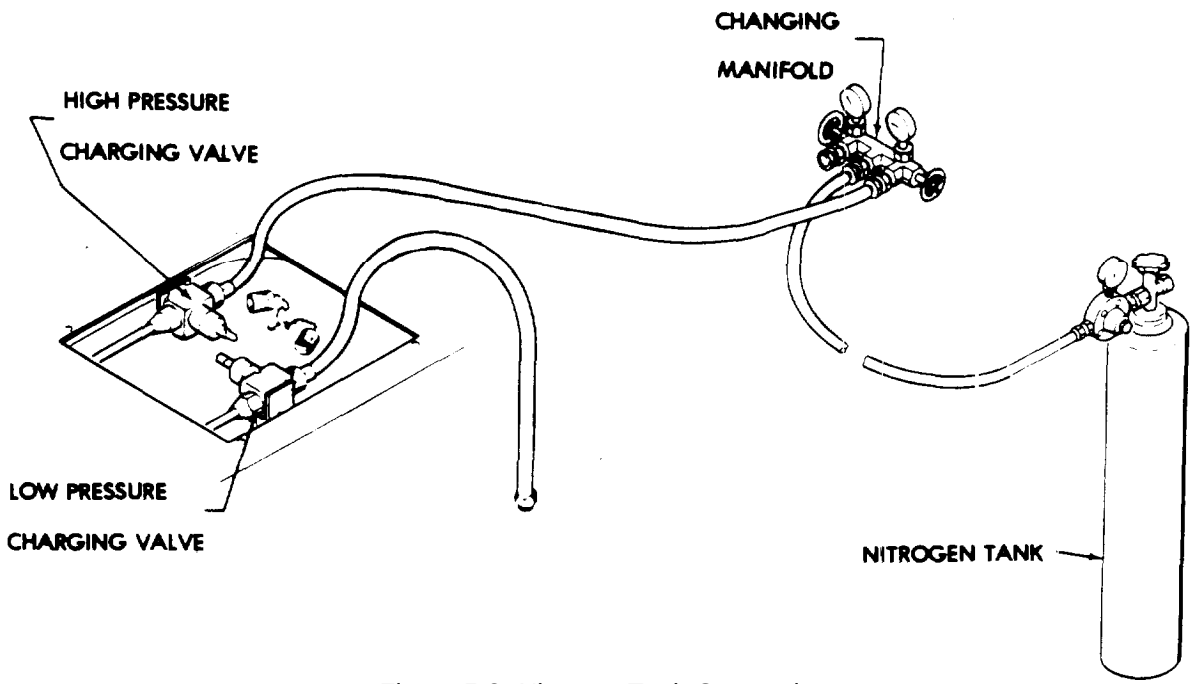


Figure 5-3. Nitrogen Tank Connection.

a. See specific component removal instructions. It may be necessary to remove the top rear cover prior to connecting hoses to the service valves.

b. Be sure that refrigerant has been discharged. See paragraph 5-9.

c. Connect the center hose from the charging manifold to a nitrogen regulator and dry nitrogen bottle.

d. The hose from the high pressure charging valve to the charging manifold should be connected.

e. The hose from the low pressure charging valve should be disconnected from the charging manifold.

f. Open both charging valves on the unit.

g. Close the unused valve on the charging manifold and open the one with the nitrogen tank hook up.

h. Own the nitrogen cylinder valve and adjust the regulator so that approximately 1-2 cfm (0.28-0.057 m^3/minute) of nitrogen flows through the system.

i. Check discharge from hose attached to the low pressure charging hose 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 1-2 cfm (0.028-0.057 m^3/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.

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 charging valves on the unit.

m. Disconnect the hose from the nitrogen tank.

n. Assuming that all repairs are completed, go to paragraph 5-12.

5-11. BRAZING/DEBRAZING PROCEDURES

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, trees, etc., are also copper. The bodies of all valves and all connectors 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 Alloy. Grade IV or VI brazing alloy and Type B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade Ill 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:

WARNING

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

(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 cloth to act as a heat sink.

WARNING

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

(3) Protect insulation, wiring harnesses, 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 1 -2 cfm (0.028-0.057 ins/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 Joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a fiber-glass cloth. Be sure no filler alloy or other debris is 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 for brazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet cloth 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 1 -2 cfm (0.028 -0.057 m^3/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.

5-12. LEAK TESTING

The entire refrigeration system should be thoroughly leak tested after repair or replacement of any component, before it is recharged with Refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

a. Access.

NOTE

The following steps cover all the disassembly actions necessary to prepare a system for complete leak testing. If the air conditioner has been partially disassembled for repair, most of these actions will already have been accomplished.

(1) Disconnect power at power source.

(2) Remove the top covers. (See paragraph 4-18.)

(3) Remove the supply air louver. (See paragraph 4-20.)

(4) Remove the mist eliminator. (See paragraph 4-22.)

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 tester 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 observing 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 map film will attract and accumulate an excessive amount of dust and dirt during operation.

c. Testing Procedures. 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 methhod, 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 caps from the high and low pressure charging valves.

(b) Connect the hoses from a charging manifold to the charging 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 in 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 center hose connection of the charging manifold.

(d) Own the unit charging valves and the charging manifold valves.

(e) Open the nitrogen tank valve and pressurize the system to 350 psi (24.7 Kg/cm^2).

(f) Perform leak tests.

(g) If a leak is found, discharge and purge the system and repair leak. See specific instructions for components to be removed.

(h) If a leak was not found and Refrigerant-22 was used to pressurize the system see charging instructions.

(2) To pressurize a system that has been discharged and purged, for leak testing with an electronic detector:

(a) Remove the caps from the high and low pressure charging valves.

(b) Connect the hoses from a charging manifold to the charging valves.

(c) Connect a drum of Refrigerant-22 to the center hose connection of the service manifold.

CAUTION

Connect the Refrigerant-22 drum so that only gas will be used for pressurization.

(d) Open both unit charging 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/cm^2).

(f) Close the charging manifold valves and the refrigerant drum valve.

(g) Remove the Refrigerant-22 drum from the center hose connection.

(h) Connect a cylinder of dry nitrogen to the center hose connection.

(i) Open the charging manifold valves and the nitrogen cylinder valve; allow system pressure to build up until gages read 350 psi (24.7 kg/cm^2).

(j) perform leak tests, then discharge and purge the system, in accordance with paragraphs 5-9 and 5-10 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.

5-13. EVACUATING THE REFRIGERATION SYSTEM (See figure 5-4.)

The refrigeration system must be evacuated to remove all moisture before it is charged with Refrigerant-22.

a. Check that system was leak tested and has NO LEAKS.

b. Check that new filter-drier was installed. If not, install one.

c. Check that both charging valves and charging manifold valves are closed.

d. Attach hose assemblies to charging valves and charging manifold valves.

e. Attach center hose assembly to vacuum pump.

f. Start vacuum pump.

g. Open charging manifold valves.

h. Open both unit charging valves.

i. Run the vacuum pump until at least 29 inches of mercury, measured on the gage, is reached.

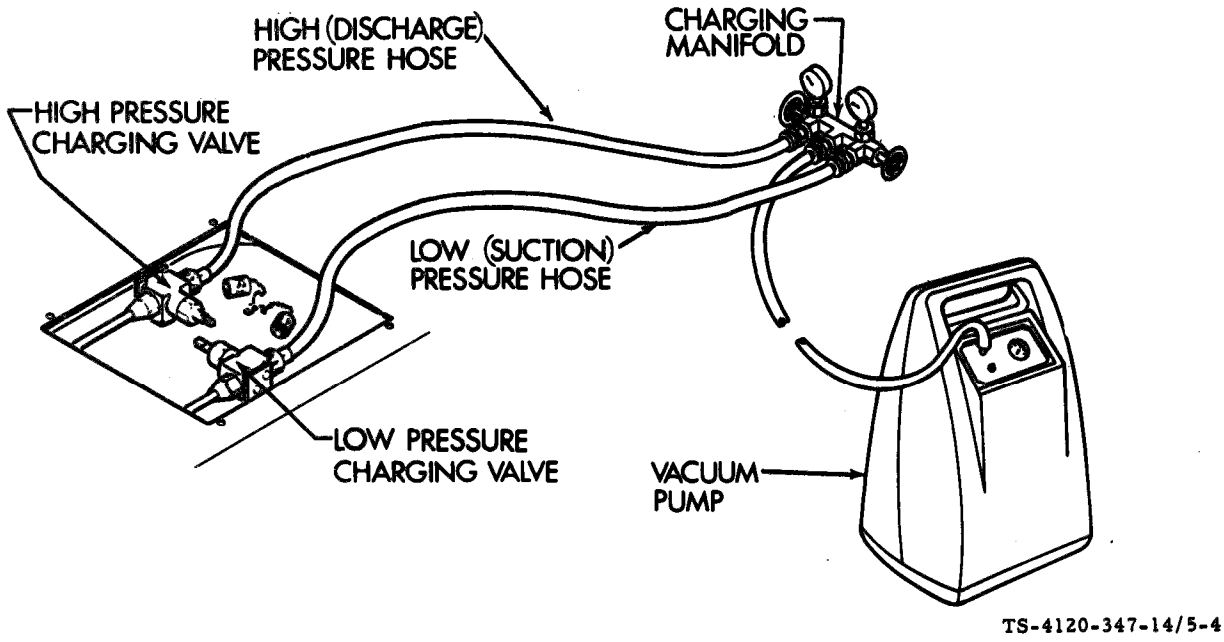


Figure 5-4. Evacuation of Refrigerant System

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 charging manifoid valves.

l. Close both unit charging valves.

m. Stop vacuum pump.

n. Disconnect pump from center hose connection.

o. Go to paragraph 5-14, charging the refrigeration system.

5-14. CHARGING THE REFRIGERATION SYSTEM (See figure 5-5.)

After the system has been satisfactorily evacuated, it must be fully charged with Refrigerant-22.

Never introduce liquid refrigerant into the low pressure (suction) charging valve.

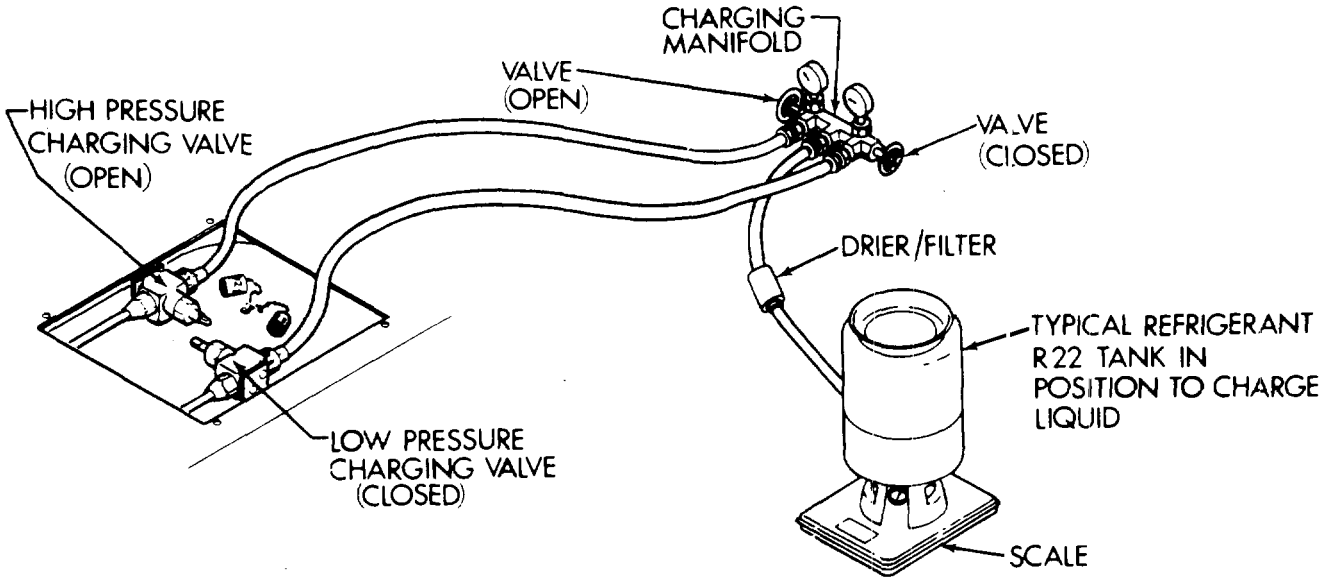


Figure 5-5. Refrigerant Charging

NOTE

The system must be evacuated before charging. Use only Refrigerant-22 to charge the unit. If available, use recycled refrigerant.

a. The charging operation should be done with all panels in place except for the refrigerant charging valve access cover.

b. 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.

c. Connect the center hose from the charging manifold to a well charged drum of Refrigerant-22.

d. Loosen the hose connections to the two air conditioner charging valves slightly.

e. Open the two charging manifold valves.

f. Open the Refrigerant-22 tank 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.

g. Close the low pressure (suction) charging manifold valve. Never introduce liquid refrigerant into the low pressure (suction) charging valve.

h. Position the Refrigerant-22 tank so that liquid will be used for charging. (Some drums must be inverted and some are equipped with a selector valve.)

i. Using accurate scales measure and record the weight of the Refrigerant-22 drum.

j. Open the Refrigerant-22 drum valve.

k. Open the high pressure charging valve on the air conditioner. Allow liquid refrigerant to enter the system until the drum weight has decreased by 2.88 pounds (1.31 Kg) or until system pressure has equalized.

l. CIose the refrigerant drum valve and the high pressure (discharge) manifold valve.

m. Reset the low pressure cut out switch.

n. Connect power at the power source.

o. Turn air conditioner on and operate in the cool mode with the temperature selector set at the maximum COOLER position.

p. If the 2.88 pound (1.31 Kg) full charge was obtained, skip steps q. through s. If the system pressure equalized prior to obtaining a full charge of 2.88 pounds (1.31 Kg) proceed with step q.

q. Switch the refrigerant drum to the gas only position.

r. Be sure that the refrigerant drum has 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 2.88 pound (1.31 Kg) charge is obtained. When the system is fully charged, immediately close the refrigerant drum valve and the air conditioner low pressure charging valve.

t. Run the air conditioner in COOL mode (with temperature control in coolest position) for 15 minutes.

CAUTION

Do not skip the next step.

u. After 15 minutes, observe the sight glass on back of condenser section.

- **Green center** means the refrigerant moisture content is acceptable.
- **Yellow center** means there is too much moisture in the system. It **must be discharged, evacuatad 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.

(2) Continue to charge until sight glass is clear and bubble-free.

(3) Close the refrigerant drum valve.

w. Turn the mode selector switch to OFF.

x. Close the high and low pressure air conditioner charging valves and remove the charging manifold hoses from the air conditioner charging valves.

y. Install the charging valve access cover.

5-15. REFRIGERATION SYSTEM TROUBLESHOOTING

The two most likely malfunction symptoms to be reported to direct support maintenance are: (1) Unsatisfactory color or bubbles observed in the sight glass; and (2) reduced cooling capacity. Discussion with operators and/or organizational maintenance personnel as to how the symptoms appeared can often be more informative than the symptoms themselves.

a. Sight Glass Indications. There are two indications that may be observed in the sight glass; color as a result of moisture content in the refrigerant, and vapor bubbles in the liquid refrigerant.

(1) Color Change. A bright green color indicates that the refrigerant is dry. As moisture content increases, the color will fade through chartreuse hues until it reaches pure yellow. A gradual fading from green into chartreuse over an extended period of time is normally an indication that the dehydrator is becoming saturated with moisture. A sudden change of color is highly unlikely unless a rupture occurs allowing all refrigerant to escape.

(2) Bubbles. The appearance of an occasional bubble in the sight glass can be expected, especially when operating in a high ambient temperature. A gradual increase in the number of frequency of bubbles is usually an indication that the refrigerant charge is being lost from the system through a small leak. The number and frequency of bubbles will also increase if the refrigeration system becomes over-heated. The sudden appearance of numerous bubbles is usually an indication of a serious leak.

b. Reduction in cooling Capacity. A reduction in cooling capacity will occur as a natural result if refrigerant is lost from the system; with a total loss of cooling if all refrigerant is lost. However, a considerable proportion of the refrigerant may be lost before the reduced cooling capacity is noticeable. Sudden or erratic reduction, or complete loss, of cooling capacity is often caused by the malfunction of one of the valves in the refrigeration system. Cooling capacity will also be reduced if the refrigeration system becomes overheated.

5-16. OVERHEATING CHECKS

Overheating of the refrigeration system is often the cause of bubbles appearing in the sight glass, or a reduction in cooling capacity. Adequate cooling of the hot, compressed refrigerant vapor in the condenser is essential to the proper operation of the air conditioner. The following checks should be made to ensure that overheating is not the cause of the symptoms before troubleshooting the pressurized portion of the refrigeration system:

a. Be sure there is no external obstruction to the air flow into the condenser intake screen and out of the condenser fan guard.

b. Be sure there is no obstruction within the intake screen and fan guard.

c. Be sure there are no obstructions or an excessive build-up of dust and dirt in the condenser coil

5-17. REFRIGERANT PRESSURE CHECK

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 the charging valve access cover.

c. Connect individual pressure gages or a refrigeration servicing manifold and hoses to the high (discharge) and low (suction) charging (service) valves.

d. Open the low (suction) and high (discharge) charging valves.

e. Both gages should read the same. Check the reading with the appropriate column in Table 5-1. If the

Table 5-1. Pressure - Temperature Relationship of Saturated Refrigerant-22

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/cm²	Deg F	Deg C	Psig	kg/cm²
10	-12.3	32.93	2.315	66	18.9	114.2	8.029
12	-11.1	34.68	2.439	68	20.0	118.3	8.318
14	-10.0	36.89	2.593				
16	- 8.9	38.96	2.739	70	21.1	122.5	8.612
18	- 7.8	41.09	2.889	72	22.2	126.8	8.915
				74	23.3	131.2	9.225
20	- 6.6	43.28	3.043	76	24.4	135.7	9.541
22	- 5.5	45.23	3.180	78	25.6	140.3	9.864
24	- 4.3	47.85	3.364				
26	- 3.4	50.24	3.532	80	26.7	145.0	10.195
28	- 2.2	52.70	3.705	82	27.8	149.8	10.522
				84	28.9	154.7	10.877
30	- 1.1	55.23	3.883	86	30.0	159.8	11.236
32	0	57.83	4.066	88	31.1	164.9	11.594
34	1.1	60.51	4.254				
				90	32.2	170.1	11.960
36	2.2	63.27	4.448	92	33.3	175.4	12.332
38	3.3	66.11	4.648				
				94	34.5	180.9	12.719
40	4.4	69.02	4.853	96	35.6	186.5	13.113
42	5.5	71.99	5.062	98	36.7	192.1	13.506
44	6.6	75.04	5.276				
46	7.7	78.18	5.497	100	37.8	197.9	13.914
48	8.8	81.40	5.723	102	38.9	203.8	14.329
				104	40.0	209.9	14.758
50	10.0	84.70	5.955	106	41.1	216.0	15.187
52	11.1	88.10	6.257	108	42.2	222.3	15.630
54	12.2	91.5	6.433				
56	13.3	95.1	6.686	110	43.3	228.7	16.080
58	14.5	98.8	6.947	112	44.4	235.2	16.537
				114	45.6	241.9	17.008
60	15.6	102.5	7.206	116	46.7	248.7	17.486
62	16.7	106.3	7.474	118	47.8	255.6	17.971
64	17.8	110.2	7.748				

Table 5-2. Normal Operating Pressures

Temperatures	Pressure Range (psig)			
Outdoor ambient	50F (10C)	75F (24C)	100F (38C)	120F (49C)
90F (32C) Return Air to Unit (Dry Blub)	55-65 Suction 125-160 Discharge	59-70 Suction 175-210 Discharge	60-75 Suction 255-295 Discharge	75-90 Suction 370-410 Discharge
80F (27C) Return Air to Unit (Dry Blub)	58-65 Suction 120-155 Discharge	58-70 Suction 170-205 Discharge	60-75 Suction 250-290 Discharge	65-75 Suction 370-410 Discharge

system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check; proceed directly to leak testing.

f. Turn the air conditioner on and operate in the COOL mode with the TEMPERATURE SELECTOR in the full COOLER setting for a few minutes.

g. With the unit operating allow gages to stabilize. Take readings of the two gages.

(1) If discharge and suction pressures are at, or near, the same valve, a pressure equalizer solenoid valve L2 malfunction, or an internal compressor failure is indicated.

(2) If discharge pressure is low and suction pressure is normal, (See table 5-2.) a low refrigerant charge is indicated.

(3) If discharge pressure is normal and suction pressure is either high or low, failure or maladjustment of the pressure regulator valve is indicated.

(4) If both discharge and suction pressures are normal, but ice forms on the evaporator coil, or the evaporator coil does not cool, during operation, failure or malfunction of evaporator expansion valve is indicated.

(5) If discharge pressure is high and suction pressure is normal, a malfunction of quench valve is indicated.

h. When pressure tests are completed, proceed with the maintenance action indicated.

5-18. EVAPORATOR COIL (See figure 5-6.)

The evaporator coil is located in the upper right front section of the air conditioner. For cleaning instructions and inspection of installed items see paragraph 4-44.

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) Remove the top front cover.

(3) Remove the supply air louver.

(4) Remove the mist eliminator.

(5) Discharge and purge the refrigerant system per paragraphs 5-9 and 5-10.

(6) Unwrap the insulation on the joints to be debrazed.

(7) Debraze tube connections at elbow and expansion valve. See paragraph 5-11. Take care that expansion valve is not damaged during debrazing operations.

(8) Remove the top two flat head screws that attach the coil to the housing. Remove the side two flat head crews and the two screws, Iockwashers and flat washers that attach the mist eliminator holder and coil to the housing.

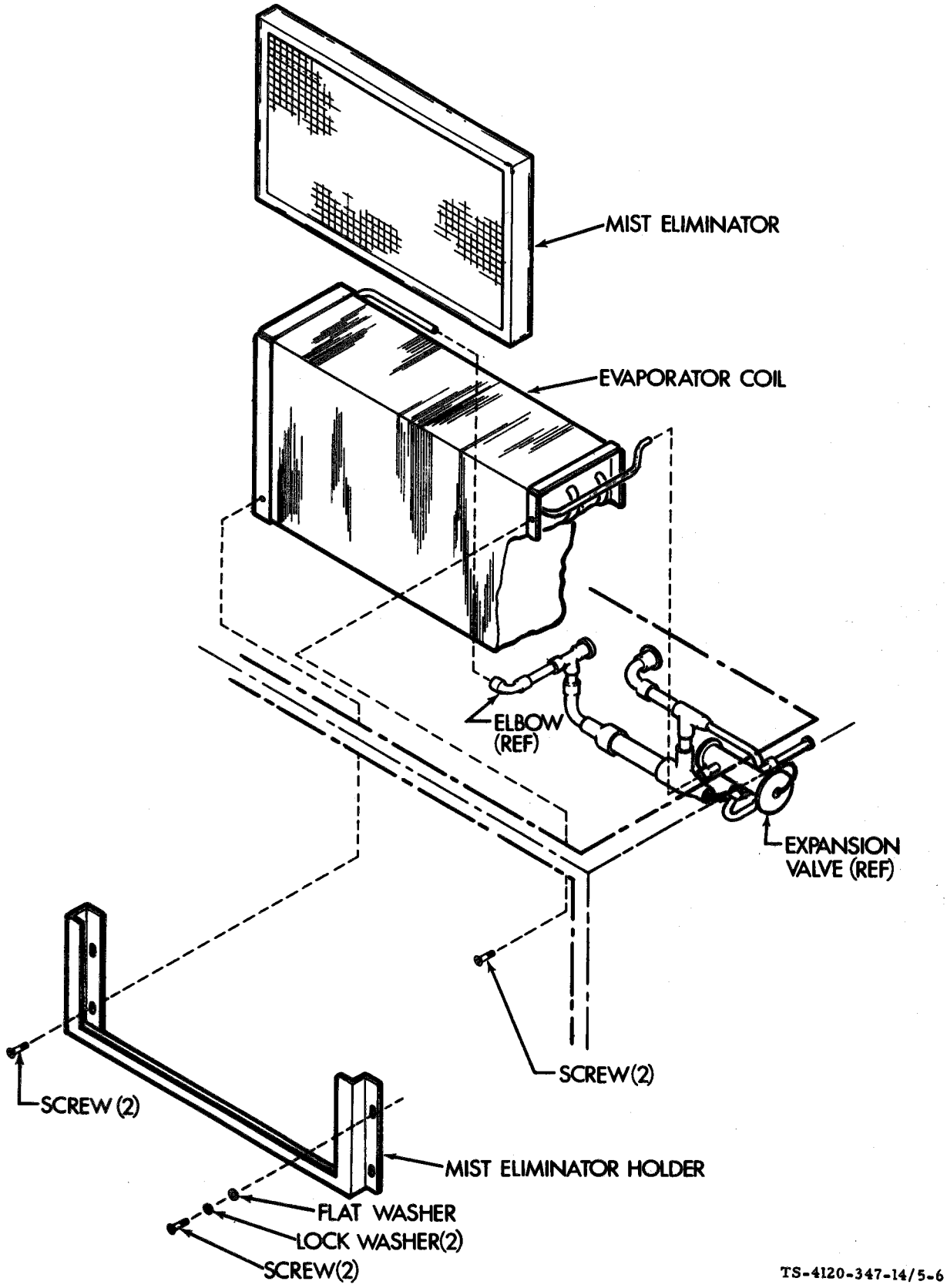


Figure 5-6. Evaporator Coil

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage on the coil.

(9) Slip the evaporator coil and the mist eliminator holder up and out of the unit.

b. Installation.

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage on the coil.

(1) Carefully position the evaporator coil and the mist eliminator holder.

(2) Secure the mist eliminator holder and the evaporator coil with four flat head screws and two each screws, lock washers and flat washers. The four holes in the mist eliminator holder match the bottom four holes in the coil.

(3) Align the tubing connections to the elbow and expansion valve. Braze the joints in accordance with paragraph 5-11. Take care that expansion valve is protected during brazing operation.

(4) Replace the dehydrator. (See paragraph 5-28.)

(5) Leak test the coil, the dehydrator, the newly brazed joints and the joints in the area of the newly brazed joints per paragraph.

(6) Rewrap the insulation that was removed prior to debrazing.

(7) Slide the mist eliminator into its holder. TOP mark must be up and air flow arrows must point away from coil.

(8) Install the supply air louver and the top front cover.

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-19. EXPANSION VALVE (PRIMARY)

The primary expansion valve is factory set at a superheat of 6± 1/2° F (3.3± 0.3° C) at 32° F (0° C) bath temperature. Do not attempt field adjustment of the valve. If it is suspected bad replace it.

a. Removal. (See figure 5-7.)

(1) Disconnect power at power source.

(2) Remove the top front cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Unwrap the insulation from the joints of the expansion valve.

(5) Soften the thermal mastic in the bulb well. Use a cloth wrung out in hot water, a heat lamp or heat gun if necessary and withdraw the bulb from the well.

(6) Debraze the three tube connections to the valve.

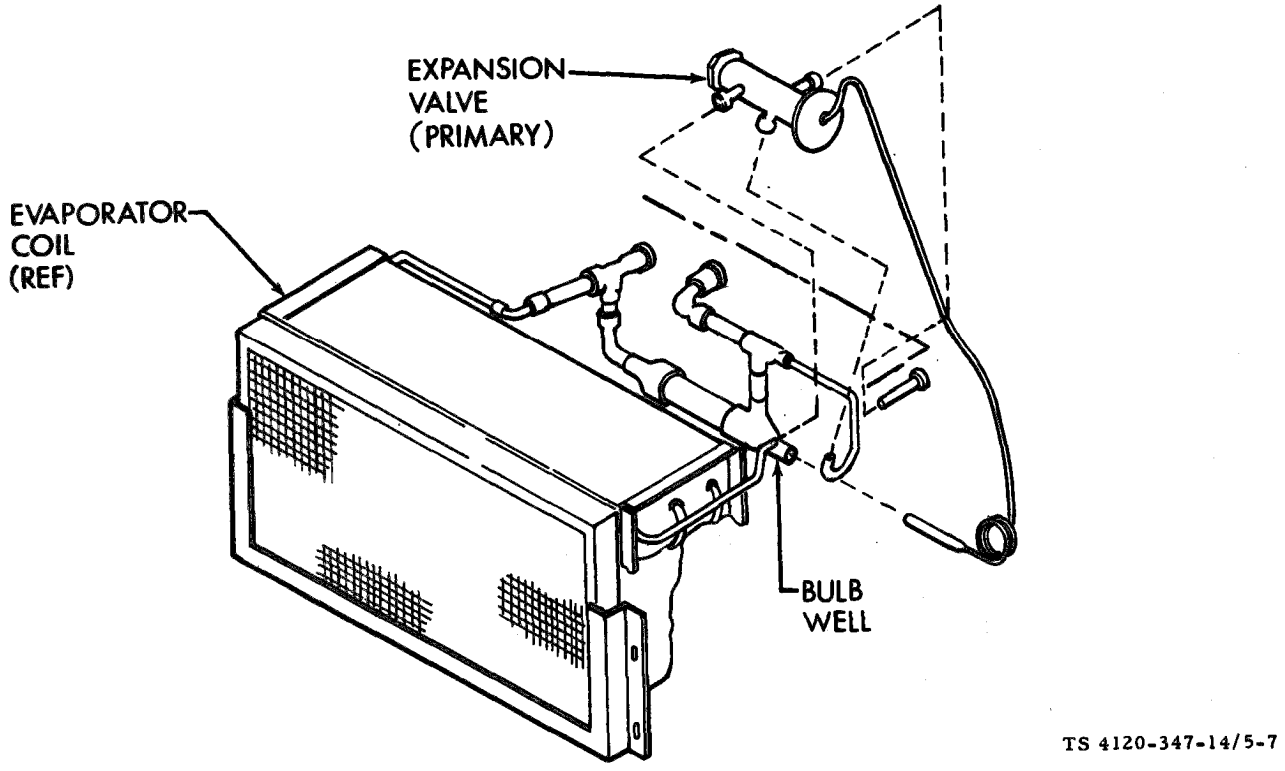


Figure 5-7. Expansion Vaive (Primary)

(7) Remove the valve from the unit.

b. installation.

(1) Place the expansion valve in the unit and align tubing ends.

(2) Protect valve from overheating during brazing operations, Direct frame away from valve body and wrap valve body with wet rag.

(3) Braze the joints in accordance with paragraph 5-11.

(4) Replace the dehydrator. (See paragraph 5-28.)

(5) Leak test all newly connected joints and all tube connections in the area.

(6) Rewrap insulation at expansion valve joints.

(7) Install the sensing bulb in the well.

- Insert approximately one ounce of thermal mastic in bulb well.
- Insert the sensing bulb from the expansion valve into the bulb well.
- Move bulb back and forth to distribute the mastic.
- Set the bulb about one inch (2.5 cm) beyond the open end of the bulb well.

(8) Install the top cover.

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-20. EXPANSION VALVE (QUENCH)

The liquid quench expansion valve is factory set at a superheat of 16 ±½° F (8.9 ± 0.3°C) at 32°F (0°C) bath temperature. Do not attempt field adjustment of this valve. If it is suspected bad replace it.

a. Removal. (See figure 5-8.)

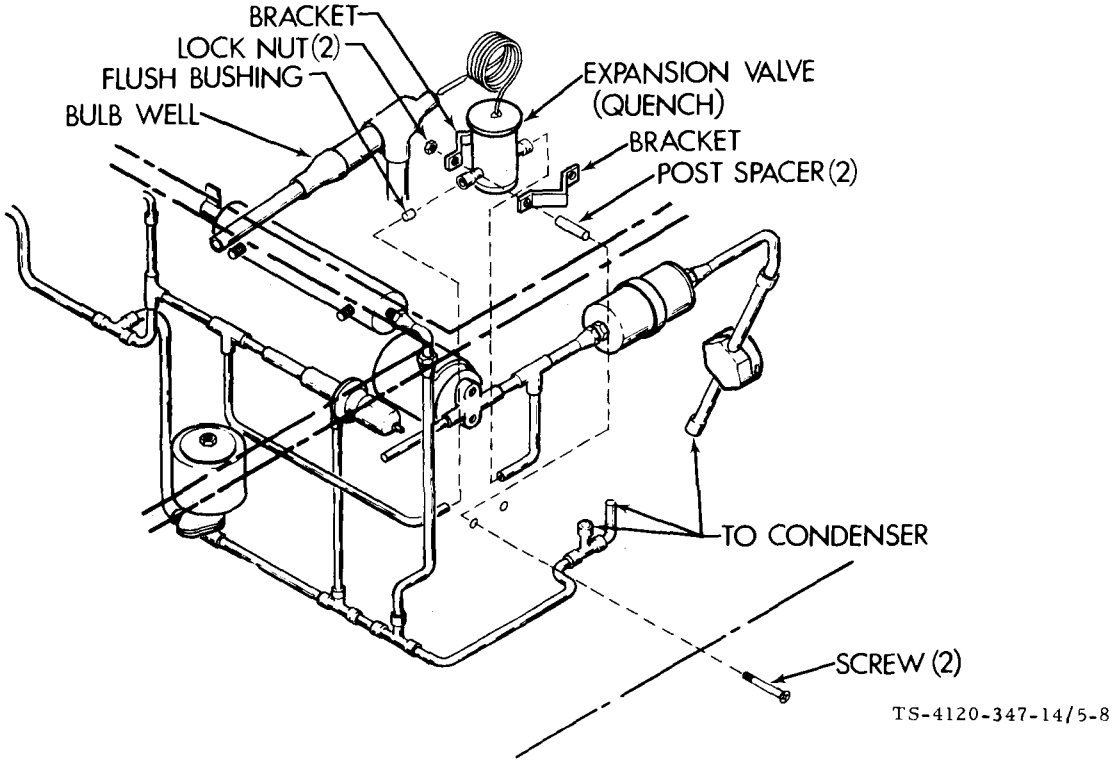


Figure 5-8. Expansion Valve (Quench)

(1) Disconnect power at power source.

(2) Remove the top rear cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Unwrap the insulation from the joints of the expansion valve.

(5) Soften the thermal mastic in the bulb well. Use a cloth wrung out in hot water, a heat lamp or heat gun if necessary and withdraw the bulb from the well.

(6) Debraze the two tube connections to the valve. If the flush bushing is to be reused, remove it from the old valve.

(7) Remove the two screws, post spacers, brackets and lock nuts.

(8) Remove the valve from the unit.

b. Installation

(1) Install the flush bushing in the valve.

(2) Place the expansion valve in the unit and align tubing ends.

(3) Protect valve from overheating during brazing operations. Direct flame away from valve body and wrap valve body with wet rag.

(4) Braze the joints in accordance with paragraph 5-11.

(5) Secure the valve to the housing with two each screws, post spacers, brackets and lock nuts.

(6) Replace the dehydrator. (See paragraph 5-28.)

(7) Leak test all newly connected joints and all tube connections in the area.

(8) Rewrap insulation at expansion valve joints.

(9) Install the sensing bulb in the bulb well.

- Insert approximately one ounce of thermal mastic in the bulb well.
- Insert the sensing bulb from the expansion valve into the bulb well.
- Move bulb back and ‘forth to distribute the mastic.
- Set the bulb about one inch (2.5 cm) beyond the open end of the bulb well,

(10) Install the top rear cover.

(11) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14,

5-21. SOLENOID VALVES

See paragraph 4-45 and figure 4-36 for access, testing and coil replacement.

a. Removal. See figure 5-9.

(1) Disconnect power at power source.

(2) Remove the top rear cover.

NOTE

If only the coil is bad, it can be replaced without breaking into the refrigerant system. See paragraph 4-45.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Disconnect the connector plug.

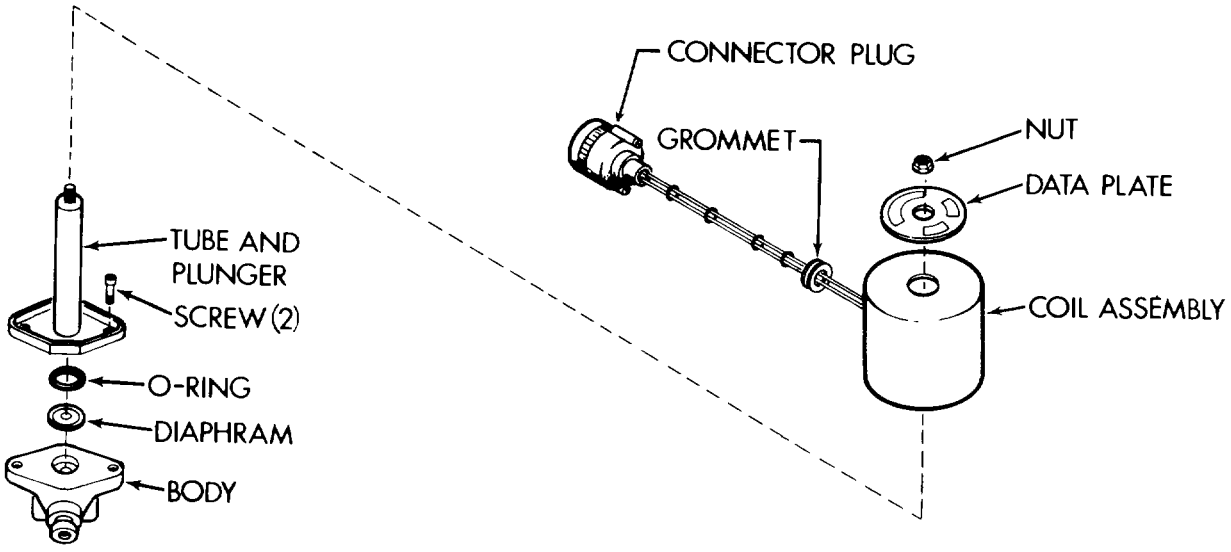
(5) Remove the top nut that attaches the coil to the valve body, and remove the coil date plate and connector assembly.

(6) Cut plastic tie down straps as necessary to remove the solenoid valve cable.

(7) If the connector plug is to be reused unsolder it from the leads.

(8) If the grommet is to be reused remove it from the old coil assembly.

(9) Be sure that the refrigerant has been discharged.



SOLENOID VALVE DISASSEMBLY

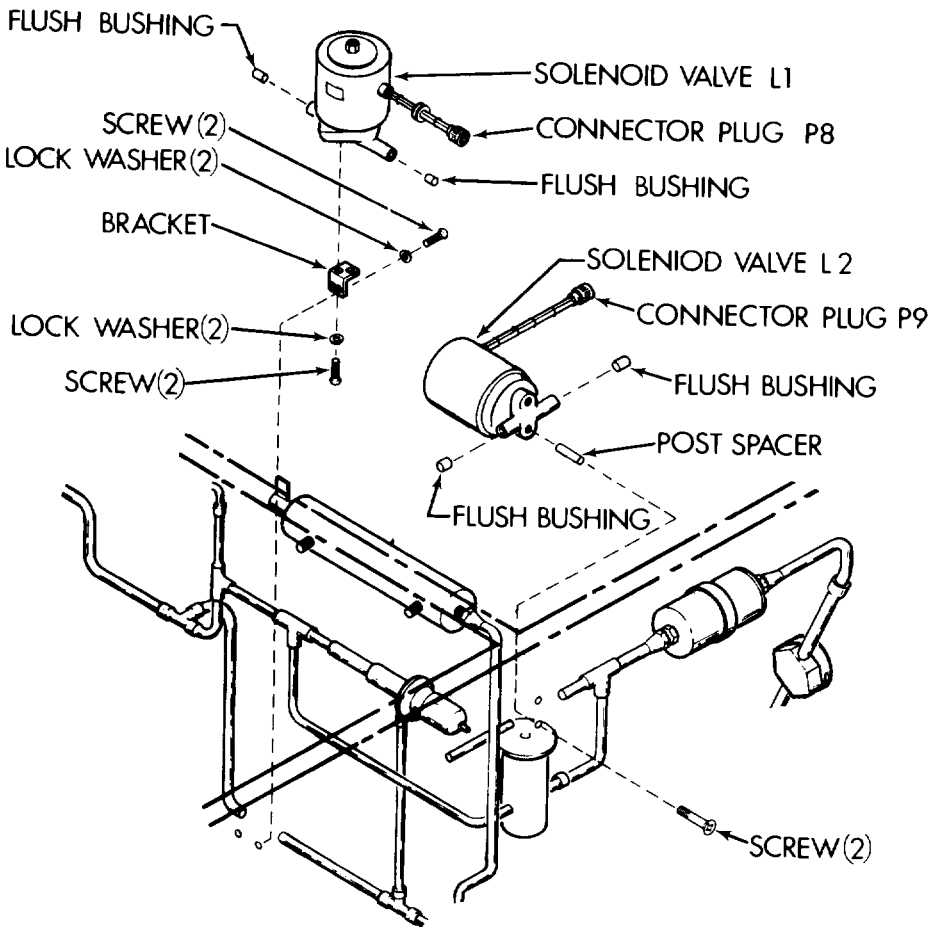


Figure 5-9. Solenoid Valves

(10) Remove the two screws that attach the tube and plunger assembly to the valve body, remove the tube and plunger assembly, and then all other removable internal components from the valve body.

(11) Remove the hardware that attaches the valve body to the housing.

(12) Debraze the joints of the refrigerant tubing from the valve body, and remove the valve body.

b. Installation

(1) Disassemble all removable components from the new valve.

(2) Install the flush bushings in the valve body. Be sure dry nitrogen is flowing through the system, then position the valve body and braze the joints of the refrigerant tubing to the valve body.

(3) Secure the valve body to the housing with hardware and brackets shown on figure 5-9.

(4) Reassemble the internal components in the valve body and install the tube and plunger assembly, and two attaching screws.

(5) Install the coil and connector assembly, and attaching nut on the valve body.

(6) Connect the connector plug.

(7) Replace the dehydrator. (See paragraph 5-28.)

(8) Leak test all newly connected joints and all tube connections in the area

(9) Secure the wires to existing harnesses with new plastic tie down straps or lacing cord.

(10) Install the top rear cover.

(11) Evacuate and charge the refrigerant system in accordance with paragraphs 5-13 and 5-14.

5-22. PRESSURE REGULATOR

The pressure regulator is located in the rear (compressor/condenser) compartment just below the actuating cylinder. The pressure regulator is factory set at 68 psig and sealed so that it is not field adjustable.

a. Removal. See figure 5-10.

(1) Disconnect power at the power source.

(2) Remove the top front and rear covers.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the screw, lockwasher, clamp and post spacer.

(5) Debraze the two tube connections and remove the pressure regulator

b. Installation.

(1) Slip the pressure regulator in place.

(2) Protect the pressure regulator from overheating during brazing operations. Direct the flame away from the valve body and wrap the valve body with a wet rag.

(3) Braze the two joints in accordance with paragraph 5-11.

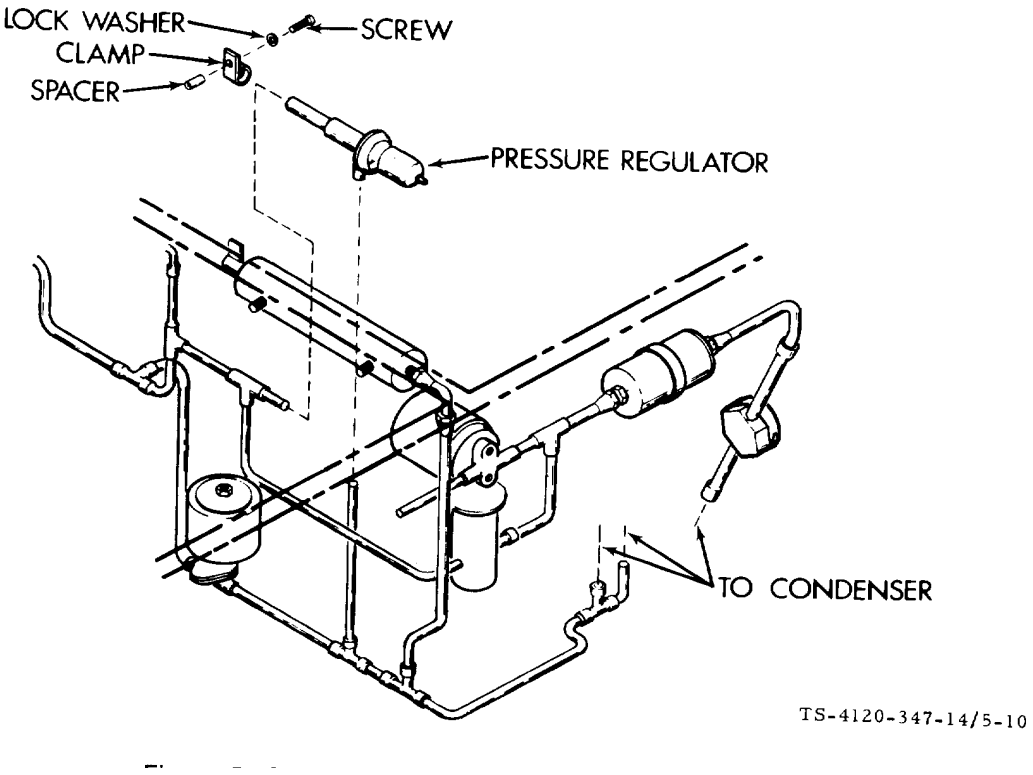


Figure 5-10. Pressure Regulator

(4) Replace the dehydrator, (See paragraph 5-28.)

(5) Leak test the newly connected joints and all connections in the area.

(6) Secure the pressure regulator with a screw, lock washer clamp and post spacer.

(7) Install the top front and rear covers.

(8) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-23. ACTUATING CYLINDER

The actuating cylinder is located in the rear (compressor/condenser) compartment.

a. Removal. See figure 5-11.

(1) Disconnect power at the power source.

(2) Remove the top front and rear covers.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the screw from the mechanical post assembly and slip the push-pull cable wire loose. Take care not to lose the mechanical post,

(5) Disconnect the actuator cylinder from the flare nut on the elbow.

(6) Remove the two nuts and lock washers and slip the actuator cylinder out of the unit.

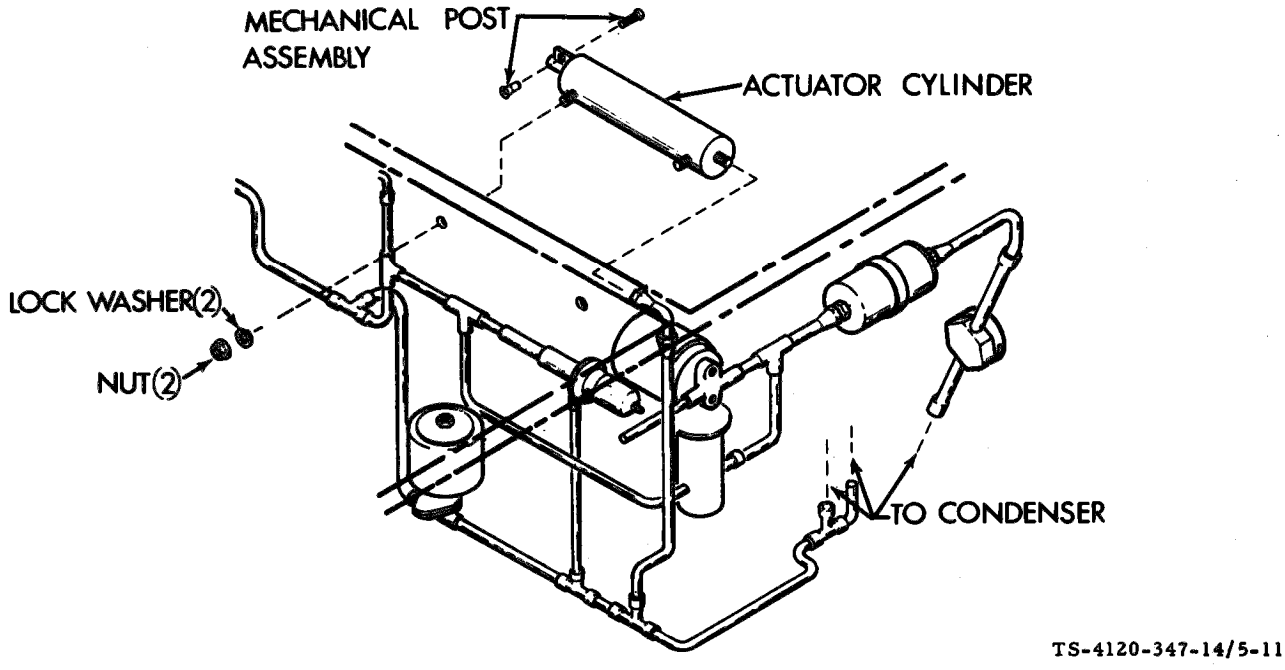


Figure 5-11. Actuating Cylinder

b. Installation/Adjustment.

(1) Align the studs on the actuating cylinder with the holes in the bulkhead and secure with two each lock washers and nuts.

(2) Connect the swivel elbow flare nut to the actuating cylinder.

(3) Loose assemble the control cable and the mechanical post.

(4) CIose the condenser discharge air louvers.

(5) Pull wire from push-pull cable tight and tighten screw in the mechanical post assembly.

(6) Replace the dehydrator. (See paragraph 5-28.)

(7) Leak test the newly connected joints and all connections in the area.

(8) Install the top front and rear covers.

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-24. PRESSURE SWITCHES

The high pressure switch S4 and low pressure switch S5 are located on the front of the unit below the control module and junction box.

a. Access.

(1) Disconnect power at the power source.

(2) Remove the control module and junction box. It is not necessary to totally remove all wire connmtlona and capillary line so long as the junction box can be pulled out enough to gain access to the pressure switches, Support the junction box so that wires and capillary line is not damaged.

(3) Remove the front and rear top covers,

b. Test.

(1) Tag and disconnect the wires to the pressure switches,

(2) Press the reset button on the switch, Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on each switch. If there is continuity, the switch is properly closed. If no continuity is found on either switch, press and release the reset button again on that switch. If there is still no continuity, that switch must be replaced.

c. Removal. (See figure 5-12.) Assuming that steps a (1), (2) and (3) and b (1) above have been done proceed as follows:

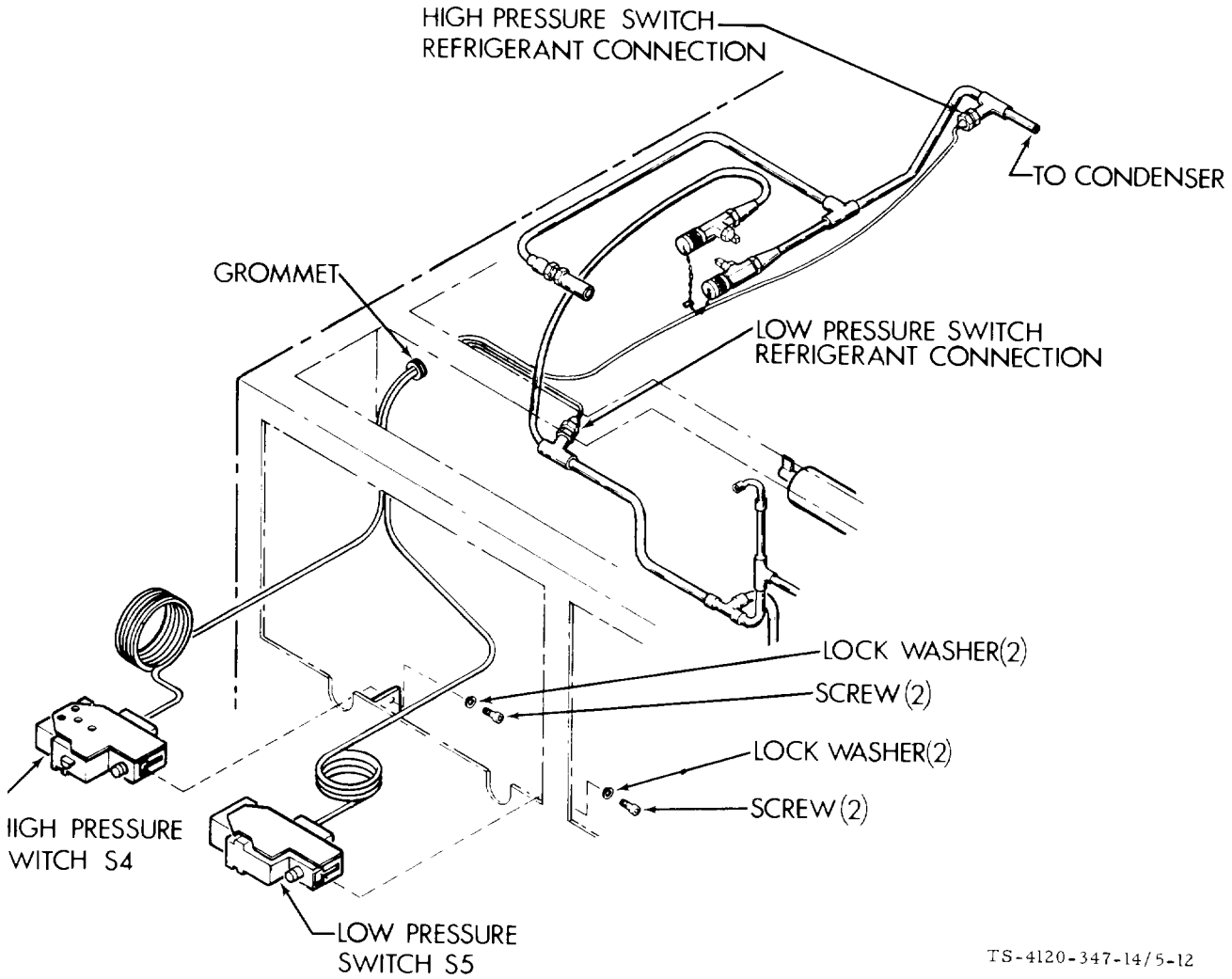


Figure 5-12. Pressure Switches

(1) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(2) If the high pressure switch is to be replaced, remove the conditioned air supply louver to have access to mounting screws.

(3) Disconnect the flare nut at the end of the capillary line from the switch to be replaced.

(4) Remove the two screws and lock washers from the switch to be replaced.

(5) Carefully remove the switch and capillary.

d. Installation.

(1) Insert the capillary through the grommeted hole in the bulkhead.

(2) Connect the flare nut.

(3) Secure the switch with two screws and lock washers.

(4) Carefully coil the capillary line and position so that it will not touch the junction box when it is reinstalled.

(5) See tags and wiring diagram figure 4-5 and connect wire leads. Remove the tags.

(6) Replace the dehydrator. (See paragraph 5-28.)

(7) Leak test the newly connected joints and all connections in the area.

(8) Install the junction box and control module.

(9) Install the conditioned air supply louver if it was removed.

(10) Install the top front and rear covers.

(11) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-25. CHARGING (SERVICE) VALVES

The charging (service) valves are located in the rear (compressor/condenser) compartment. They are accessible through the top rear cover by removing the refrigerant charging valve access cover.

a. Removal. See figure 5-13.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the two screws from the valve to be replaced.

(5) Disconnect the flare nut from the valve to be replaced and remove the valve from the unit.

b. Installation.

(1) Slip the valve in place and tighten the flare nut.

(2) Secure with two screws.

(3) Replace the dehydrator. (See paragraph 5-28.)

(4) Leak test the newly connected joints and all connections in the area.

(5) Install the top rear cover.

(6) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

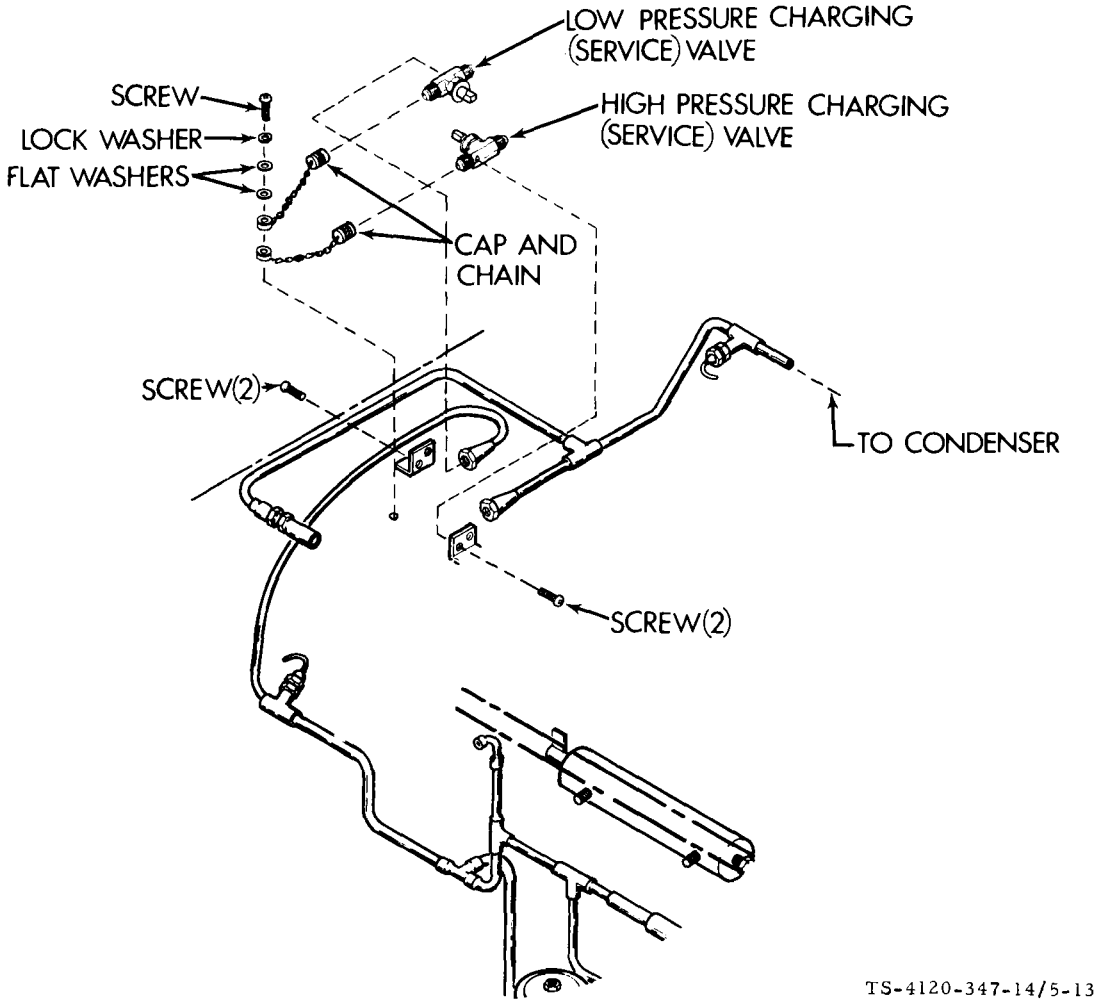


Figure 5-13. Charging (Service) Valves

5-26. PRESSURE RELIEF VALVE

The pressure relief valve is located in the rear (compressor/condenser) compartment.

a. Removal. See figure 5-14.

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the screw, lock washer, flat washer and clamp.

(5) Use two wrenches, one to hold the fitting and the other to remove the valve. Unscrew the valve and move it from the unit.

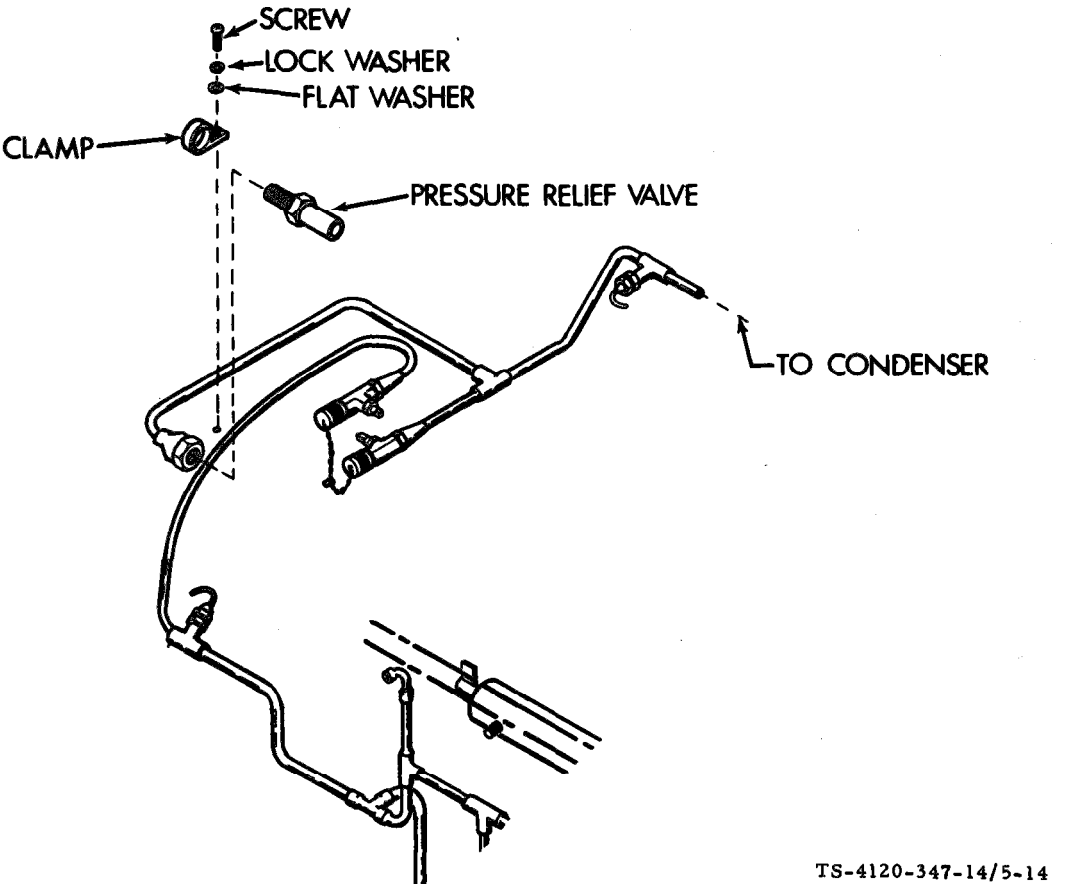


Figure 5-14. Pressure Relief Valve

b. Installation.

(1) Use two wrenches, one to hold the fitting and the other to tighten the valve. Screw the valve into the fitting.

(2) Secure the valve with a screw, lock washer, flat washer and clamp.

(3) Replace the dehydrator. (See paragraph 5-28.)

(4) Leak test the newly connected joints and all connections in the area.

(5) Install the top rear cover.

(6) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-27. CONDENSER COIL

The condenser coil is located across the rear of the unit. For cleaning instructions see paragraph 4-46.

a. Removal. (See figure 5-15.)

(1) Disconnect power at power source.

(2) Remove the top rear cover.

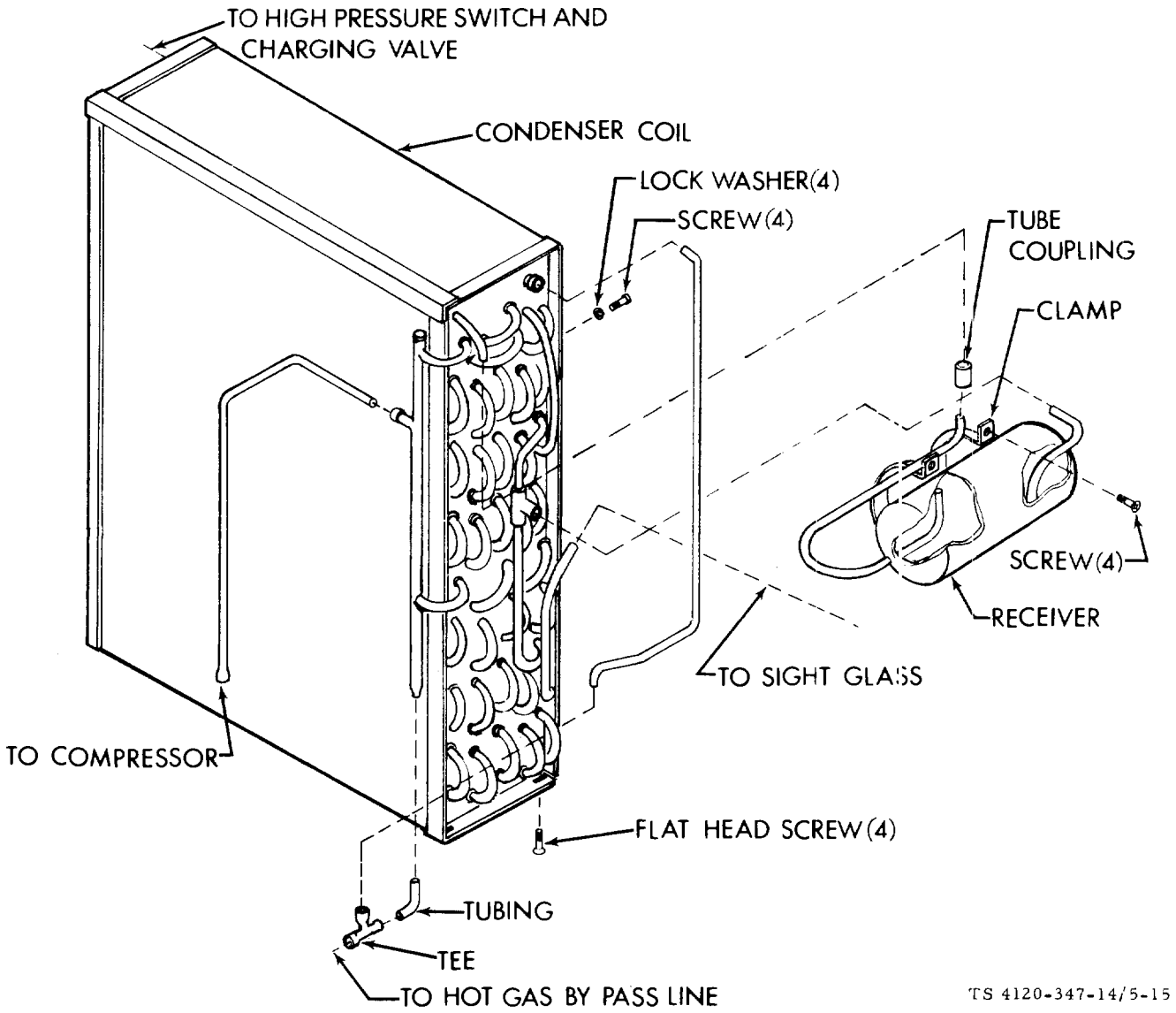


Figure 5-15. Condenser Coil

(3) Remove the condenser air inlet guard.

(4) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(5) See paragraph 5-30 and remove the compressor.

(6) Remove the auxiliary power input connector J11 from the upper rear corner and place cable end out and over the side of the unit.

(7) Disconnect the flare nut nearest the sight glass from the dehydrator.

(8) Remove the sight glass mounting plate.

(9) Remove the clamps from the receiver.

(10) Debraze the tee from the hot gas line at the lower corner of the coil.

(11) Debraze the tee from the upper connection on the coil above the fan outlet.

(12) Remove the four flat head screws from the bottom of the coil. The unit will have to be lifted or tilted to gain access to these screws.

(13) Remove the remaining screws from the rear face of the unit.

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage.

(14) Carefully lift the condenser coil and remaining parts up and out of the unit.

(15) Place the old coil along side of the new coil so that the remaining parts can be debrazed and brazed to the new coil.

b. Installation.

(1) Remove (debraze) the receiver, the sight glass and remaining tubing from the old coil. Braze these parts to the new coil.

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage,

(2) Carefully place coil into position in the unit.

(3) Align holes and secure the coil with flat head screws through the bottom of the unit housing.

(4) Braze the lower hot gas by-pass tee over the fan outlet in place.

(5) Replace the dehydrator with a new one and connect the flare fittings.

(6) Install the receiver clamps and the sight glass mounting plate.

(7) See paragraph 5-30 and install the compressor.

(8) Install the auxiliary power input connector J11.

(9) Leak test the newly connected joints and all connections in the area.

(10) Install the condenser air inlet guard and the top panel.

(11) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-28. DEHYDRATOR

The dehydrator (filter drier) is located in the rear (compressor/condenser) compartment. Replace the dehydrator whenever the refrigerant system is opened for any reason.

a. Removal. See figure 4-16.

(1) Disconnect power at the power source.

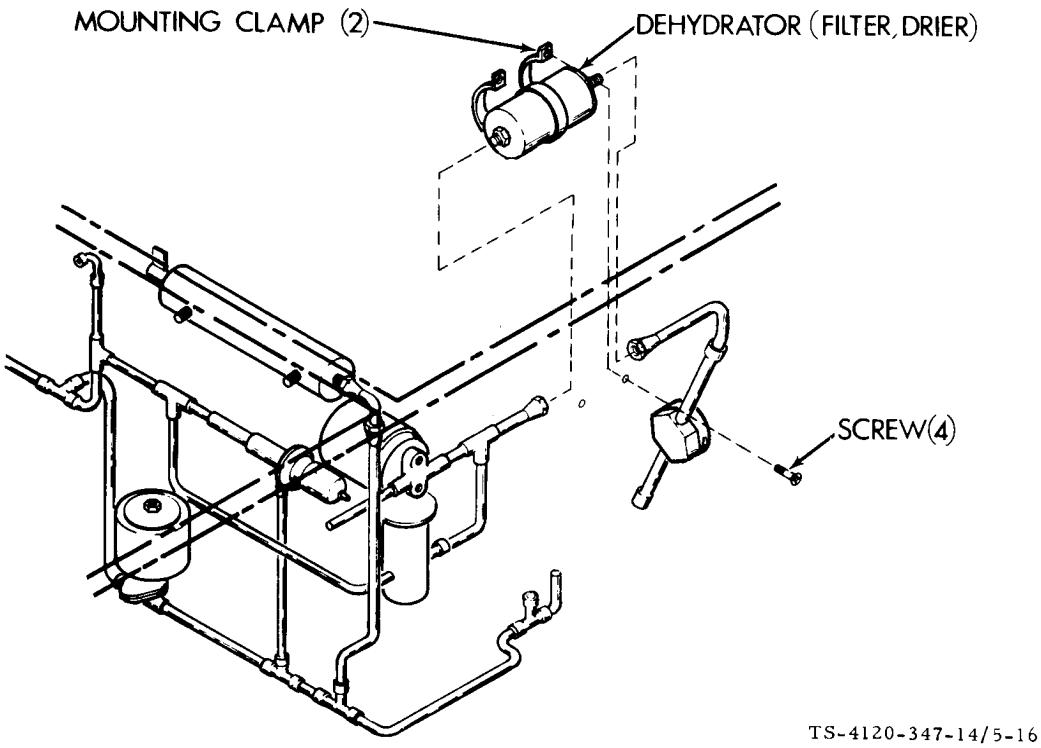


Figure 5-16. Dehydrator (Filter Drier)

(2) Remove the top rear cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the screws and mounting clamps.

(5) Disconnect the two flare nuts and remove the dehydrator from the unit.

b. Installation.

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.

(1) Connect the flare fittings to each end of the dehydrator.

(2) Install the mounting clamps.

(3) Leak test the newly connected joints and all connections in the area.

(4) Install the top rear cover.

(5) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-29. LIQUID INDICATOR (SIGHT GLASS)

The liquid indicator (sight glass) is located in the rear (compressor/condenser) compartment. It can be seen on the left rear outside face of the unit.

a. Removal. See figure 5-17.

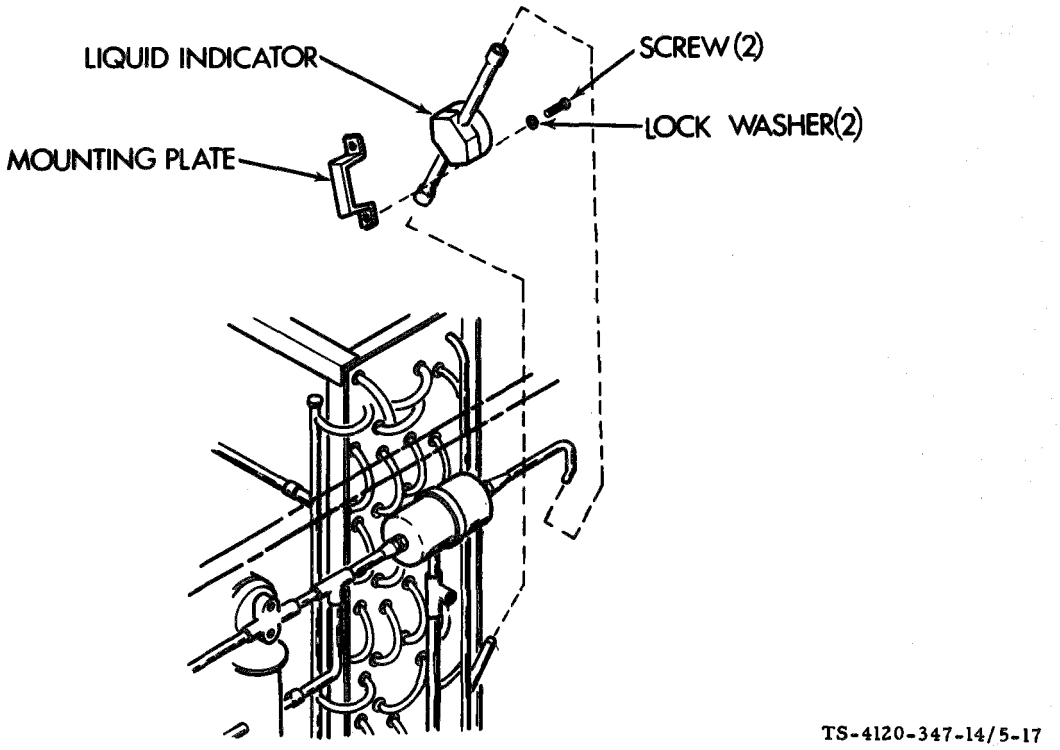


Figure 5-17. Liquid Indicator

(1) Disconnect power at the power source.

(2) Remove the top rear cover.

(3) Discharge and purge the refrigeration system per paragraphs 5-9 and 5-10.

(4) Remove the screws, lock washers and mounting plate.

(5) Debraze the joints and remove the liquid indicator.

b. Installation.

(1) Place the liquid indicator in the unit and align the tubing ends.

(2) Protect the liquid indicator from overheating during brazing operations, Direct the flame away from the liquid indicator (sight glass) body and wrap the liquid indicator (sight glass) body with wet rags.

(3) Braze the joints in accordance with paragraph 5-11.

(4) Secure the liquid indicator with screws, lock washers and mounting plate.

(5) Replace the dehydrator (See paragraph 5-28.)

(6) Leak test all newly connected joints and all tube connections in the area.

(7) Install the top rear cover.

(8) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-30. COMPRESSOR

The compressor and motor assembly are hermetically sealed in a metal canister. The crankcase heater element, and related parts, and the electrical connector are attached to the canister externally and may be replaced without opening the refrigeration pressure system.

a. Access. The compressor is located in the rear compartment.

WARNING

Disconnect input power to the air conditioner before performing any maintenance to the electrical system. Voltages used can be lethal. Shutting the unit off at the control module does not disconnect power to the compressor heater.

(1) Disconnect input power at its source.

(2) Remove the top rear cover.

b. Inspect/Test. Electrically test the heater element, heater thermostat, wiring harness, and motor as follows:

(1) Disconnect wiring harness at connectors P1O and J10 (located on the compressor junction box).

(2) Remove the compressor junction box cover.

(3) Inspect the internal wiring in the compressor junction box to ensure no wires are broken or grounded.

(4) Use a continuity tester or multimeter set on the lowest OHMS scale to check for continuity between pins G and F in connector J10. If there is no continuity between these pins, the heater is bad and should be replaced.

(5) Check continuity between pins D and E, if there is no continuity between these pins and the compressor has had time to cool down, the overload is bad.

(6) Check continuity between pins A and B, B and C, and A and C. There should be continuity between each pair of pins. If there is no continuity the compressor is bad.

(7) Check continuity between pins A, B and C and the compressor body. No continuity should exist. If continuity exists the compressor is bad.

(8) Inspect the J10 connector for loose, broken or otherwise damaged pins or threaded connections. Replace if bad.

c. Heater replacement. (Refrigerant system discharge is not required.)

(1) Assuming that the power has been disconnected at the power source and covers have been removed during access and testing proceed as follows:

(2) Tag and disconnect heater leads.

(3) Pull the heater from the mounting tube clip.

(4) Place the new heater in the mounting tube clip on the lower side of the compressor.

[5) Run wires through the grommet in the compressor junction box.

(6) wiring diagram figure 4-5 and tags on the removed heater. Connect heater leads to J10 pins F and G.

d. Connector replacement. (Refrigerant system discharge is not required.)

(1) Assuming that the power has been disconnected at the power source and covers have been removed during access and testing proceed as follows:

(2) Remove the retaining hardware from the connector. Pull the connector out of the box to gain access to the wider connections.

(3) Tag and unsolder wires.

(4) Using tags and wiring diagram figure 4-5 solder wires to new connector, Remove the tags.

(5) Secure the connector to the compressor junction box with screws and lock washers.

e. Compressor removal. (See figure 5-18.) Two people are required for compressor removal.

(1) Assuming that the power has been disconnected at the power source and that covers have been removal during access and test proceed as follows:

(2) Discharge and purge the refrigerant system per paragraphs 5-9 and 5-10.

(3) Debraze the tube connections to the compressor.

(4) Lift or tilt unit to gain access to the under side of the unit.

(5) Loosen the access cover screws and swing the four access covers out of the way.

(6) Remove the four sets of compressor attaching hardware.

WARNING

If compressor is being removed due to burnout, use care when lifting to avoid touching compressor sludge. Acid in sludge can cause burns.

(7) Carefully lift the compressor from the unit.

(8) Check the compressor to see if a motor burnout is indicated.

f. Compressor motor burnout.

(1) After removal of a bad compressor from the refrigeration system, remove all external tubing and tip the compressor toward the discharge port to drain a small quantity of oil into a clear glass container.

(2) If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burnout. If a burnout is not indicated proceed to g.

(3) If the oil is black, contains sludge and has a burnt acid odor, the compressor failed because of motor burnout.

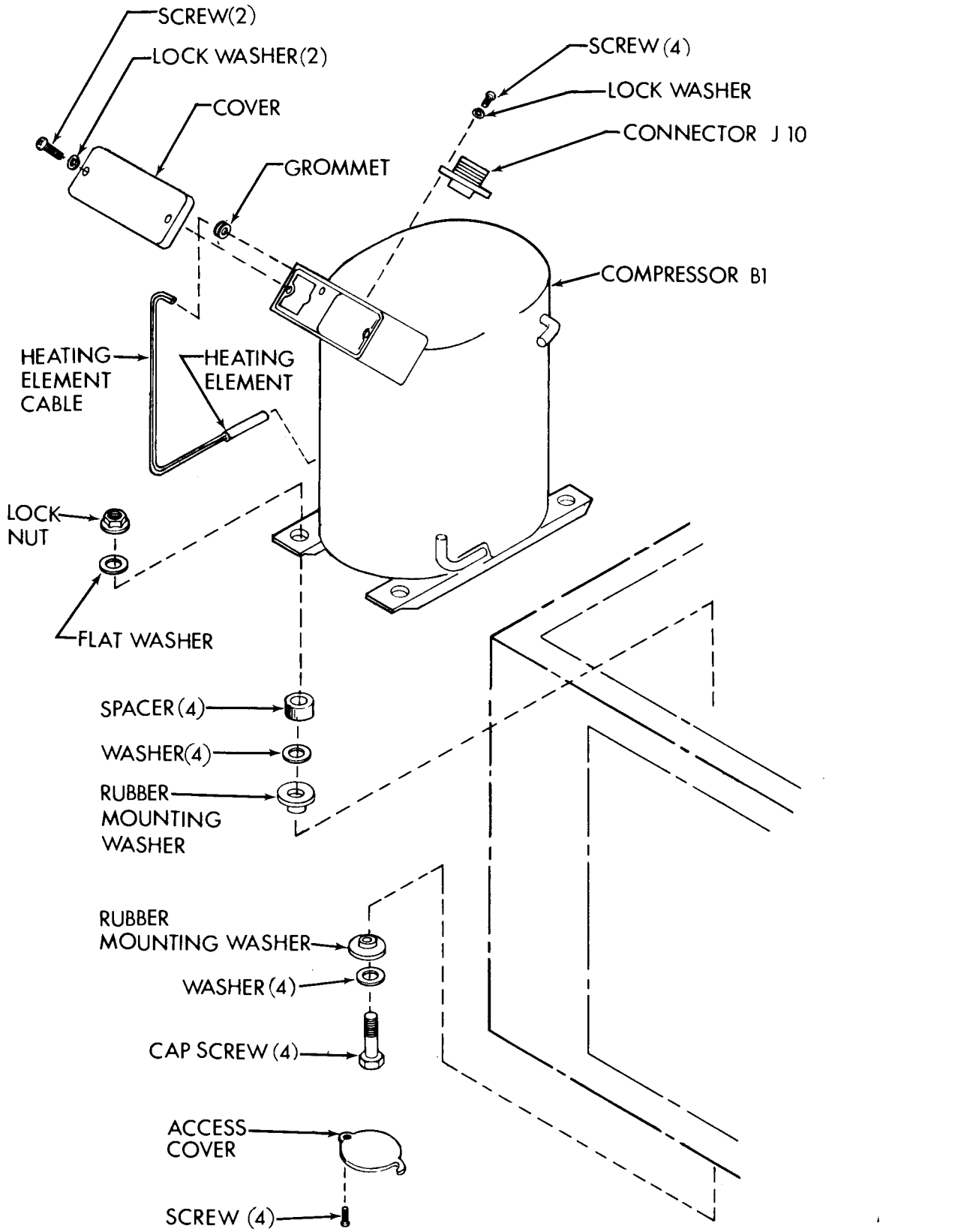


Figure 5-18. Compressor

(4) 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 refigerant gas and compressor oil to cause repeated burnouts.

(5) Remove the filter-drier, and blow down each leg of the refrigeration system. To do this, connect a cylinder of dry-nitrogen to each filter-drier connection, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm^2) pressure.

(6) Connect the two filterdrier fittings with a jumper locally manufactured from refrigerant tubing and fittings.

(7) Connect the discharge line of the refrigerant system to the discharge side of a small diaphragm-type pump.

(8) Connect a line containing a filter to the suction line in the unit.

NOTE

An unused filter-drier or other suitable medium may be used as the filter.

(9) The other end of the temporary suction line should be connected to a small drum or suitable reservoir.

(10) A line should be run from the bottom of the reservoir to the inlet of the pump.

WARNING

Be sure there is adequate ventilation during this procedure.

(11) Fill reservoir with fluorocarbon refrigerant, R-11, and start the pump. Continue filling the reservoir with refrigerant, R-11, until it begins to pour out of the return line. Continue flushing for at least 15 minutes.

(12) Reverse the pump connections, replace the filter with a new filtering medium, and backflush the system for an additional 15 minutes.

(13) Remove the pump, reservoir, filter and filter-drier jumper. Place an empty container below the compressor connations, and connect a cylinder of dry nitrogen to each filter-drier connection in turn. Blow down each leg of the system at 50 psig (3.5 kg/cm^2) for at least 30 seconds,

(14) Disconnect the dry nitrogen cylinder and immediately install a new filter-drier, making sure that the direction- of-flow arrow points toward the sight glass. Cap or plug compressor connections if compressor is not to be installed immediately.

g. Installation. (See figure 5-18.)

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

(1) Install the four sets of hardware that fit under the compressor in the order shown on figure 5-18, Tape or otherwise restrain the cap screw heads so that they do not fall out until compressor has been installed.

NOTE

If any refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor before installing it in the air conditioner.

(2) Carefully set the compressor down onto the four sets of mounting hardware.

(3) Secure the compressor in place with remaining flat washers and lock nuts.

(4) Braze tube connections in accordance with paragraph 5-11.

(5) Replace the dehydrator.

(6) Connect the P10 connector.

(7) Leak test the newly connected joints and all connections in the area.

(8) Install the top rear cover.

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14.

5-31. TUBING AND FITTINGS

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:

WARNING

Be sure the refrigeration system is fully discharged and purged, and that dry nitrogen is flowing through the system at a rate of 1-2 cfm (0.028 -0.057 m^3/minute) before brazing or debrazing.

a. Replace tubing and fittings only with equal material, grade, size, length, and shape as the item removed.

b. Leak test the entire refrigeration system in accordance with paragraph 5-12 after any replacement action that required brazing.

c. Replace the dehydrator and leak test the dehydrator flare fittings as the final step in any maintenance act ion that required the refrigeration pressure system to be opened.

d. Evacuate and charge the refrigeration system in accordance with paragraphs 5-13 and 5-14 after all other maintenance actions are completed.

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 5-4120-347-24P. No special tools are required for general support maintenance of the air conditioner. Test, maintenance, and diagnostic equipment (TMDE), and support equipment, includes standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any general support maintenance refrigeration facility.

Section II

AUTHORIZED GENERAL SUPPORT MAINTENANCE ACTIONS

6-2. GENERAL

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair or replacement of insulation or lifting fittings on the casing, and replacement of the cabinet base. However, general support maintenance may be called upon, at times, to perform any or all of the MAC items listed for organizational and direct support maintenance for rehabilitation or overhaul of an air conditioner.

6-3. HOUSING

See paragraph 4-47 for inspection and service of the housing.

a. Repair.

(1) Repairs are limited to rework of broken or cracked welds, straightening of bent or dented sheet metal and replacement of handles, gaskets, insulation and rivnuts and some small sheet metal parts by drilling out rivets and installation of replacement parts.

(2) Disassemble unit as necessary and make repair as indicated.

(3) Gasket and insulation replacement.

(a) Use only gaskets, insulation or name plates identified in TM5-4120-347-24P.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List. (See Appendix E.)

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

WARNING

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

(c) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(d) 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.

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

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

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

b. Replacement.

(1) Housing replacement requires total unit disassembly. Normally if the unit is damaged to this extent it should be replaced.

(2) If housing replacement is attempted see individual installation instructions of components for reinstallation of items removed.

APPENDIX A

REFERENCES

A-1.	**FIRE PROTECTION**	
	TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users
A-2.	**LUBRICATION**	
	C91001L	Fuels, Lubricants, Oil and Waxes
A-3.	**PAINTING**	
	TM 43-0139	Painting Instructions for Field Use
A-4.	**MAINTENANCE**	
	TM 38-750	The Army Maintenance Management System (TAMMS)
	TM5-4120-347-24P	Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List
	FM20-31	Electric Motor and Generator Repair
A-5.	**CLEANING**	
	Fed. Spec P-D-880	Dry Cleaning Solvent
A-6.	**DESTRUCTION**	
	TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
A-7.	**SHIPMENT AND STORAGE**	
	TM 740-90-1	Administrative Storage of Equipment
A-8.	**RADIO SUPPRESSION**	
	TM 11-483	Radio Interference Suppression
A-9.	**TESTING**	
	TM 9-4940-435-14	Leak Detector, Refrigerant Gas

APPENDIX B

COMPONENTS OF END ITEMS LIST (COEIL)

Section I.

INTRODUCTION

B-1 . SCOPE

This appendix lists Integral Components of and Basic Issue Hems (BII) for the Air Conditioner to help you inventory items required for safe and efficient operation.

B-2. GENERAL

This component of End Items List is divided into the following sections.

a. Section II. Integral Components of the End Item.

These items, when assembled, constitute the Air Conditioner and must accompany it whenever it is transferred or turned in. These illustrations will help you identify these items.

b. Section Ill. Basic Issue Items.

These are minimum essential items required to place the Air Conditioner in operation, to operate it and to perform emergency repairs. Although shipped separately packed, they must accompany Air Conditioner during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement Bll based on Table(s) of Organization and Equipment (TOE) /Modification Table of Organization and Equipment (MTOE) authorization of the end item.

B-3. EXPLANATION OF COLUMNS

a. Illustration: This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) Item Number. The number used to identify item called out in illustration.

b. National Stock Number (NSN): Indicates the national stock number assigned to the end item which will be used for requisitioning.

c. Part Number (P/N): Indicates the primary number used by the manufacturer which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

d. Description: Indicates the federal item name and, if required, a minimum description to identify the item.

e. Location: The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code: “USABLE ON” codes are included to help you identify which component items are used on the different models. Identification of the codes used in this list are: (Not applicable)

g. Quantity Required (Qty Reqd): This column lists the quantity of each item required for a complete major item.

h. Quantity: This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The date columns are for use when you inventory the major item at a later date, such as for shipment to another site.

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	PART NO. & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD	RCVD	DATE	DATE	DATE
			Section II INTEGRAL COMPONENTS OF END ITEM								
4-8		5935-00-482-2390	13216E6177 (97403)	Connector, Receptacle Electrical			1				
4-8		5935-00-482-2388	13216E6209-1 (97403)	Connector, Plug Electrical			1				
4-8		5935-00-725-4153	MS3106R18-11S (96906)	Connector, Plug Electrical			1				
4-1		5305-00-269-2807	MS90726-64 (96906)	Screw, Cap Hex Head			4				
4-1		5310-00-566-9504	13216E6138-2 (97403)	Washer			4				
4-1		5340-01-042-5759	13216E6137 (97403)	Mount, Resilient			8				
4-1		5365-01-044-6408	13216E6152 (97403)	Spacer			4				
4-1		4720-01-038-2334	13216E6153 (97403)	Tube, Elastomeric			4				
			Section III BASIC ISSUE ITEMS								
				Department of Army Technical Manual; Operator's, Organizational, Direct Support and General Support			1				

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(a) FIGURE NO.	(b) ITEM NO.	NATIONAL STOCK NUMBER	PART NO. & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD	RCVD	DATE	DATE	DATE
				Maintenance Manual TM5-4120-347-14 Department of Army Technical Manual; Operator's Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List TM5-4120-347-24P			1				

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I.

INTRODUCTION

C-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item of component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions or explanatory notes for a particular maintenance function.

C-2. MAINTENANCE FUNCTIONS

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. 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. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (service/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul 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.

C-3. COLUMN ENTRIES

Columns used in the maintenance allocation chart will be limited to those shown. Entries for those columns are explained below.

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph C-2).

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "work time" figure will be shown for each level. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition. The symbol designations for the various maintenance levels are as follows:

C . . . . . Operator or Crew
O . . . . . Organization Maintenance
F . . . . . Direct Support Maintenance
H . . . . . General Support Maintenance
D . . . . . Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV.

C-4. COLUMN ENTRIES USED IN TOOL AND TEST EQUIPMENT REQUIREMENTS

a. Column 1, Tool or Test Equipment Reference Code. The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of, the tool or test equipment.

d. Column 4, National/NATO Stock Number. The National or NATO stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

C-5. EXPLANATION OF COLUMNS IN SECTION IV

a. Reference Code. The code scheme recorded in column 6, Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

APPENDIX C

Section II

MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
01	FINAL ASSEMBLY								
	Connectors	Inspect		0,5					
		Replace		2.0					
	Information Plates	Inspect	0.1						
		Service	0.1						
		Replace		1.0					
	Installation Hardware	Inspect		0.5					
		Replace		1.0					
02	HOUSING COVERS, PANELS, GRILLES, SCREENS AND INFORMATION PLATES								
	Covers	Inspect	0.1						
		Service	0.5						
		Repair			2.0				Note 1
		Replace			1.0				
	Panels	Inspect	0.1						
		Service		0.5					Note 1
		Repair			2.0				
		Replace			1.0				
	Screens and Guards	Inspect	0.1						
		Service	0.2						Note 2
		Replace			0.5				
	Louvers	Inspect	0.1						
		Adjust	0.1						
		Service	0.1						
		Replace		1.0					
	Information Plates	Inspect	0.1						
		Service	0.1						
		Replace			0.5				

APPENDIX C

Section II

MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	H	D	(5) Tools & Equipment	(6) Remarks
03	AIR CIRCULATING AND CONDENSATE DRAIN SYSTEM							
	Air Filter	Inspect	0.2					
		Service	1.0					
		Replace	0.5					
	Mist Eliminator	Inspect	0.5					
		Service	1.0					
		Replace	0.5					
	Condenser Discharge Louver Linkage	Inspect	0.5					
		Service	1.0					
		Adjust	1.0					
		Replace	2.0					
	Fresh Air Damper and Actuator	Inspect	0.5					
		Service	0.5					
		Adjust	0.1					
		Replace	2.0					
	Condensate Traps and Drain Tubes	Inspect	0.1					
		Service	0.5					
		Replace	1.0					
04	ELECTRICAL							
	Control Module	Inspect	0.1					Note 3
		Adjust	0.1					
		Repair	2.0					Note 4
		Replace	2.0					
	Temperature Control (Thermostat)	Inspect	0.1					
		Adjust	0.1					
		Test	0.5					
		Replace	1.0					
	Evaporator Fan Speed Switch	Inspect	0.1					
		Adjust	0.1					
		Test	0.5					
		Replace	1.0					
	Mode Selector Switch	Inspect	0.1					
		Adjust	0.1					

APPENDIX C

Section II

MAINTENANCE ALLOCATION CHART

(1) Group Number	2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
		Test		0.5					
		Replace		1.0					
	Compressor	Inspect		0.1					
	Circuit Breaker	Test		0.5					
		Replace		1.0					
	Control Module	Inspect		0.3					
	Wiring Harness	Test		1.0					
		Repair		1.0					
		Replace		2.0					
	Junction Box	Inspect		1.0					
		Repair		2.0					Note 4
		Replace		2.0					
	Junction Box	Inspect		0.3					
	Wiring Harness	Test		1.0					
		Repair		1.0					
		Replace		2.0					
	Relays	Inspect		0.2					
		Test		0.5					
		Replace		1.0					
	Control Circuit	Inspect		0.1					
	Breaker	Test		0.5					
		Replace		1.0					
	Unit Wiring Harness	Inspect		0.5					
		Test		2.0					
		Repair		1.0					
		Replace		4.0					
	Capacitors	Inspect		0.1					
		Test		0.2					
		Replace		0.5					
	Rectifier	Inspect		0.1					
		Test		0.2					
		Replace		0.5					
	Transformer	Inspect		0.1					
		Test		0.5					
		Replace		1.0					

APPENDIX C

Section II

MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
	Condenser Fan Thermostat	Inspect		0.5					
		Test		1.0					
		Replace		1.0					
05	EVAPORATOR FAN MOTOR AND HEATER								
	Fan and Housing	Inspect		0.5					
		Service		1.0					
		Replace		2.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
	Heater Thermostat	Inspect		0.1					
		Test		0.5					
		Replace		0.5					
	Heater Elements	Inspect		0.5					
		Test		0.5					
		Replace		2.0					
06	CONDENSER FAN, AND MOTOR								
	Fan and Housing	Inspect		0.5					
		Service		0.5					
		Replace		1.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
07	REFRIGERATION SYSTEM								
	Evaporator Coil	Inspect		0.5					
		Service		1.0					
		Replace			8.0				
	Expansion Valves	Test			0.5				
		Replace			8.0				

APPENDIX C

Section II

MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level C	O	F	H	D	(5) Tools & Equipment	(6) Remarks
	Solenoid Valves	Test			0.5				
		Repair		1.0					Note 6
		Replace			8.0				
	Pressure Regulator	Test			0.5				
		Replace			8.0				
	Actuating Cylinder	Inspect			0.1				
		Adjust			1.0				
		Replace			8.0				
	Pressure Switches	Inspect			0.1				
		Test			0.5				
		Replace			8.0				
	Service Valves	Inspect			0.5				
		Replace			8.0				
	Pressure Relief Valve	Inspect			0.5				
		Replace			8.0				
	Condenser Coil	Inspect		0.1					
		Service		1.0					
		Replace			8.0				
	Dehydrator	Inspect			0.1				
		Replace			8.0				
	Liquid Indicator	Inspect	0.5						
		Replace			8.0				
	Compressor	Test			0.5				
		Repair			1.0				Note 7
		Replace			12.0				
	Tubing and Fittings	Test			0.5				
		Replace			8.0				
08	HOUSING								
	Housing	Inspect		0.5					
		Service		0.5					
		Repair				1.0			
		Replace				24.0			

APPENDIX C

Section Ill. TOOL AND TEST EQUIPMENT REQUIREMENTS
MAINTENANCE ALLOCATION CHART

(1) Reference Code	(2) Maintenance level	(3) Nomenclature	(4) Naticnal/NATO stock number	(5) Tool number
		No special tools and test equipment required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section Ill:		
1	O-F-H	Tool kit, service, refrigeration Unit (SC 5180-90-CL-N18)	5180-00-596-1474	
2	F-H	Pump, Vacuum	4310-00-289-5967	
	O-F-H	Soldering Gun Kit	3439-00-930-1638	
3	F-H	Recovery and Recycling, Unit Refrigerant	4130-01-338-2707	17500B (07295)

APPENDIX C

Section IV. REMARKS
MAINTENANCE ALLOCATION CHART

Reference Code	REMARKS
Note 1	Replace gasket insulation and information plates.
Note 2	Straighten bent blades.
Note 3	External components only (knobs and switches).
Note 4	Replace components.
Note 5	Replace bearings, thermal overloads or connector.
Note 6	Replace solenoid valve coil only.
Note 7	Replace external components only.
	Other than those items listed above there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task fuctions are with the air conditioner in off-equipment position.

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 authorized to you by CTA, MTOE, TDA or JTA.

D-3. EXPLANATION OF LISTING

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. “USABLE ON” codes are identified as follows: (Not applicable.)

Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Part Number And FSCM	Description	(3) Usable On Code	(4) U/M	Qty Auth
7520-00-559-9618		Cotton Duck Case		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I.

INTRODUCTION

E-1. SCOPE

This appendix lists expandable 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 (e.g., "Use coater air filter, Item 1, App. E").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item. (enter as applicable):

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column 3 - National Stock Number. This is the National stock number assigned to the item; use It to request or requisition the Item.

d. Column 4 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each Item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	4130-00-860-0042	Coater, Air Filter, 1 pint container	ea
2	F	3040-00-664-0439	Adhesive, General Purpose, 1 pint container	ea
3	O	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81 **NOTE** Whenever available, use recycled refrigerant for charging the refrigeration system.	gl
4	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb (Refrigerant-22) BB-F-1421, type 22 (81348)	cy
5	F	6830-00-872-5120	Trichloromonofluromethane Technical: w/cylinder 50 Lb (Refrigerant-11) BB-F-1421, Type II (81348)	cy

ALPHABETICAL INDEX

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ALPHABETICAL INDEX

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By **Order of the Secretary of the Army:**

E.C.MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, ***United States Army***
The Adjutant General

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PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-4120-347-14	25 June 81	Air Conditioner Horiz. Compact 9000 BTU/HR 208 Volt, 3 Phase, 60 Hertz

BE EXACT. . PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (262) 317-7111

SIGN HERE: John Doe
JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	mewton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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