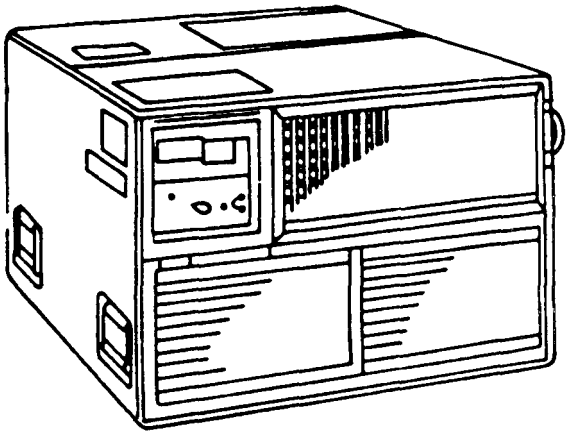
TECHNICAL MANUAL

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

AIR CONDITIONER, HORIZONTAL, COMPACT

9,000 BTU/HR,
115 VOLT,
SINGLE PHASE
50/60 HZ



MODEL A9KH-115P (EIC: VWH
NSN 4120-01-136-2214
MODEL F9000H-1S
NSN 4120-01-250-3719

* This manual supersedes TM 5-4120-378-14, dated 31 Oct 86.

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 JULY 1993

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 7 June 1995

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

AIR CONDITIONER, HORIZONTAL, COMPACT 9,000 BTU/HR, 115 VOLT, SINGLE PHASE, 50/60 HZ MODEL A9KH-115P (EIC:VWH), NSN 4120-01-136-2214 MODEL F9000H-1S, NSN 4120-01-250-3719

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

TM 9-4120-378-14, 15 July 1993, is changed as follows:

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

Remove pages	Insert pages
i and ii	i and ii
4-85 through 4-88	4-85 through 4-88

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

By Order of the Secretary of the Army:

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

Official:

JOEL B. HUDSON
Acting Administrative Assistant to the Secretary of the Army
00442

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6084, requirements for TM 9-4120-378-14.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 FEBRUARY 1994

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

AIR CONDITIONER, HORIZONTAL, COMPACT
9,000 BTU/HR,
115 VOLT, SINGLE PHASE 50/60 HZ
MODEL A9KH-115P (EIC:VWH)
NSN 4120-01-136-2214
MODEL F9000H-1S
NSN 4120-01-250-3719

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

TM 9-4120-378-14, 15 July 1993, 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
FP-1/(FP-2 blank)	FP-1/(FP-2 blank)
FP-3/(FP-4 blank)	FP-3/(FP-4 blank)

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

By Order of the Secretary of the Army:

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

Official:

Milton H. Hamilton

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
06363

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6084, requirements for TM 9-4120-378-14.

Notices in this manual must be obeyed by all personnel. Failure to do so can result in serious injury, or death.

Do not use steam, open flame, heat gun, or any other high temperature source to thaw an iced coil. Thaw an iced coil by operating unit in HIGH HEAT mode, or by leaving unit shutdown until ice melts.

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

Avoid inhaling fumes from acid formed by burn out of oil and refrigerant. Wear gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands. Use care to avoid spilling compressor bum out sludge. If sludge is spilled, clean area thoroughly.

Clean parts in well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly. Dry cleaning solvent P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 “F to 138 ‘F (38 ‘C to 59°c).

DEATH ON CONTACT or severe injury may result if personnel fail to observe safety precautions. Always disconnect the air conditioner from power source before performing maintenance on this equipment. If power must remain on for troubleshooting, exercise extreme care to avoid contact with any electrical component, fan, fan motor, etc.

Whenever possible, input power supply to the equipment must be shut off before

beginning work. Take particular care to ground every capacitor likely to hold a dangerous potential charge. When working inside after power has been turned off, always ground every part before touching it.

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

TECHNICAL MANUAL
NO. 9-4120-378-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D. C., 15 July 1993

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

AIR CONDITIONER, HORIZONTAL, COMPACT 9,000 BTU/HR, 115 Volt, SINGLE PHASE, 50/60 HZ MODEL A9KH-115P (EIC:VWH), NSN 4120-01-136-2214 MODEL F9000H-1S, NSN 4120-01-250-3719

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommmended changes by E-mail directly to ahf2028@st-louis-emh7.army.mil>. A reply will be furnished directly to you.

TABLE OF CONTENTS

*** This manual supersedes TM 5-4120-378-14, dated 31 0ct 86.**

TABLE OF CONTENTS - Continued

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1.1 SCOPE.

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

1.1.2 Model Number and Equipment Name. A9KH–115P Air Conditioner, Compact Horizontal, 9,000 BTU/HR, 115 Volt Single Phase, 50/60 Hertz.

F9000H-1S Air Conditioner, Compact, Horizontal, 9,000 BTU/HR, 115 Volt, Single Phase, 50/60 Hertz.

1.1.3 Purpose of Equipment. Provides filtered, cooled or heated air to a desired range and circulates the air to provide cooling or heating of equipment or personnel within the area.

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

1.3 DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE. Refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use, for information about destruction.

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 do not like about your equipment. Let us know why you do not like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it directly to Commander, U.S. Army Aviation and Troop Command ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis,MO63120- 1798. A reply will be furnished directly to you.

1.5 LIST OF ABBREVIATIONS.

A	ampere
Btu/hr	British thermal units per hour
C	Celsius
COMPR	compressor
DB	dry bulb
F	Fahrenheit
hp	horsepower
in	inch
kg	kilogram
kg/m^2	kilogram per square meter
kg/cm^2	kilogram per square centimeter
l	liter
lb	pound
OD	outside diameter
psi	pounds force per square inch
psig	pounds force per square gage
pt	pint
rpm	revolutions per minute
SHR	sensible heat ratio
V	volts
Vac	volts alternating current
Vdc	volts direct current

Section II. EQUIPMENT DESCRIPTION

1.6 PURPOSE OF AIRCONDITIONER. The air conditioner is used primarily in van type enclosures to provide filtered, cooled or heated air, as required, to maintain the service conditions necessary for the efficient operation of electronic equipment in the vans. The air conditioner also provides for the comfort of operating personnel housed within the vans.

1.6.1 Capabilities and Features.

a. Light-weight, compact horizontal.

b. Floor-mounted and ah-cooled.

c. Electric motor driven and designed for continuous operation under varying loads.

d. Furnishes 10,000 Btu/hr for cooling; 7,000 Btu/hr for heating.

e. Handles for lifting.

f. Auxiliary power input source (Jl1).

g. Roll up condenser cover.

1.7 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

a. Canvas Cover (l). Protects condenser coil from extreme cold temperatures during winter months.

b. Fresh Air Screen (2). Filters fresh (make-up) air for evaporator compartment.

c. Condenser Guard (3). Protects condenser from external damage.

d. Evaporator, Inlet Louver (4). Horizontal adjustable louver and directs room air into air conditioner for filtering and recycling.

e. Evaporator, Outlet Louver (5). Vertical and horizontal louvers; individually hand adjustable; and directs conditioned air into room.

f. Condenser Louver (6). Directs air exhaust from condenser for minimizing overheating.

g. Ventilation Actuator (7). Opens and closes fresh air inlet passage.

h. Drain Tubes (8). Allow discharge of condensate during operation.

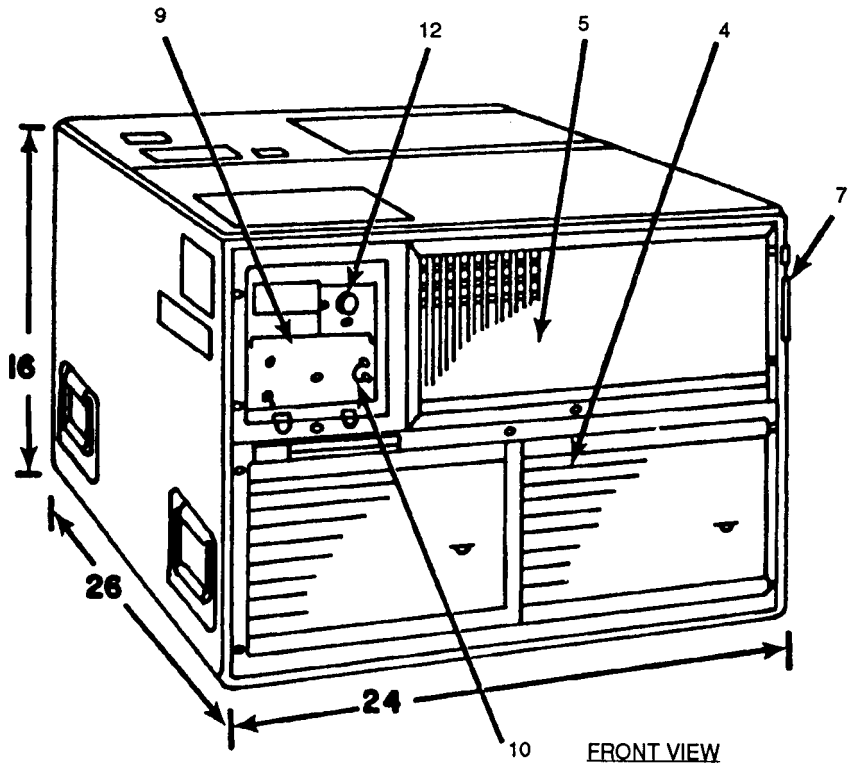
i. Control Module Panel (9). Contains operator control switches; and includes compressor circuit breaker.

j. Compressor Circuit Breaker (10). Protects compressor from electrical current overload.

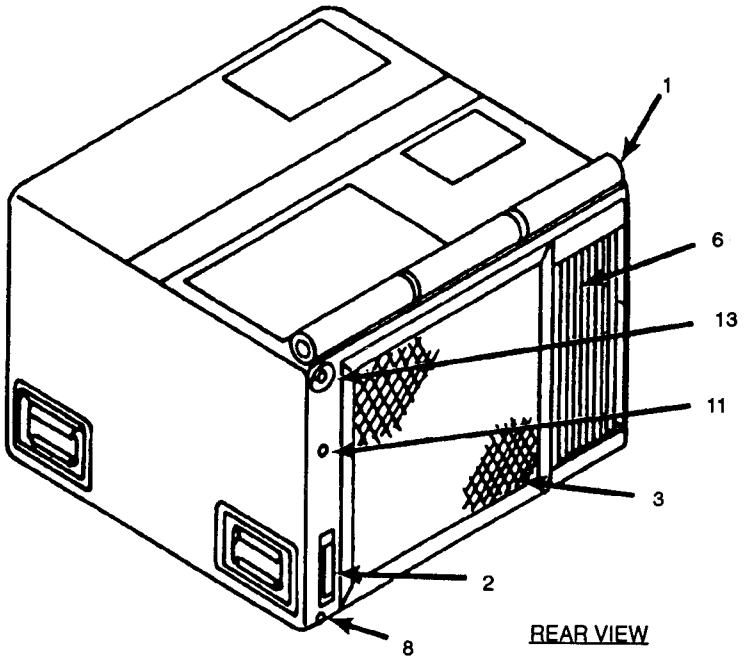
k. Liquid Sight Indicator (11). Indicates condition and level of refrigerant.

l. Main Power Connector (12). For connections to 115 volt, 50/60 Hz, single-phase power source.

m. Auxiliary Power Input Connector (13). Provides auxiliary power input.



FRONT VIEW



REAR VIEW

1.8 PERFORMANCE DATA. The following listing contains the performance and dimensional data applicable to the air conditioner.

1.8.1 **Air Conditioner Model A9KH-115P and F9000H-1S.**

a. Nomenclature . . . . . Air conditioner. horizontal, compact 9,000 Btu/Hr, 115 volt single phase, 50/60 Hz.

b. Manufacturers . . . . . A.R.E. Manufacturing Co., Inc. and KECO Industries, respectively

c. Capacity
Cooling . . . . . 10,000 Btu/hr
Heating . . . . . 7,000 Btu/hr

d. Phase . . . . . Single

e. Hertz 50/60

f. A/C Volts 115

g. Current input, full load, amperes:
Cooling . . . . . 33(maximum)
High Heat . . . . . 20(maximum)
Low Heat . . . . . 12(maximum)
Ventilating . . . . . 5(maximum)

h. Refrigerant R-22

i. Amount of Charge . . . .2.1875 lbs.(.98kg)

1.8.2 Dimensions and Weight.

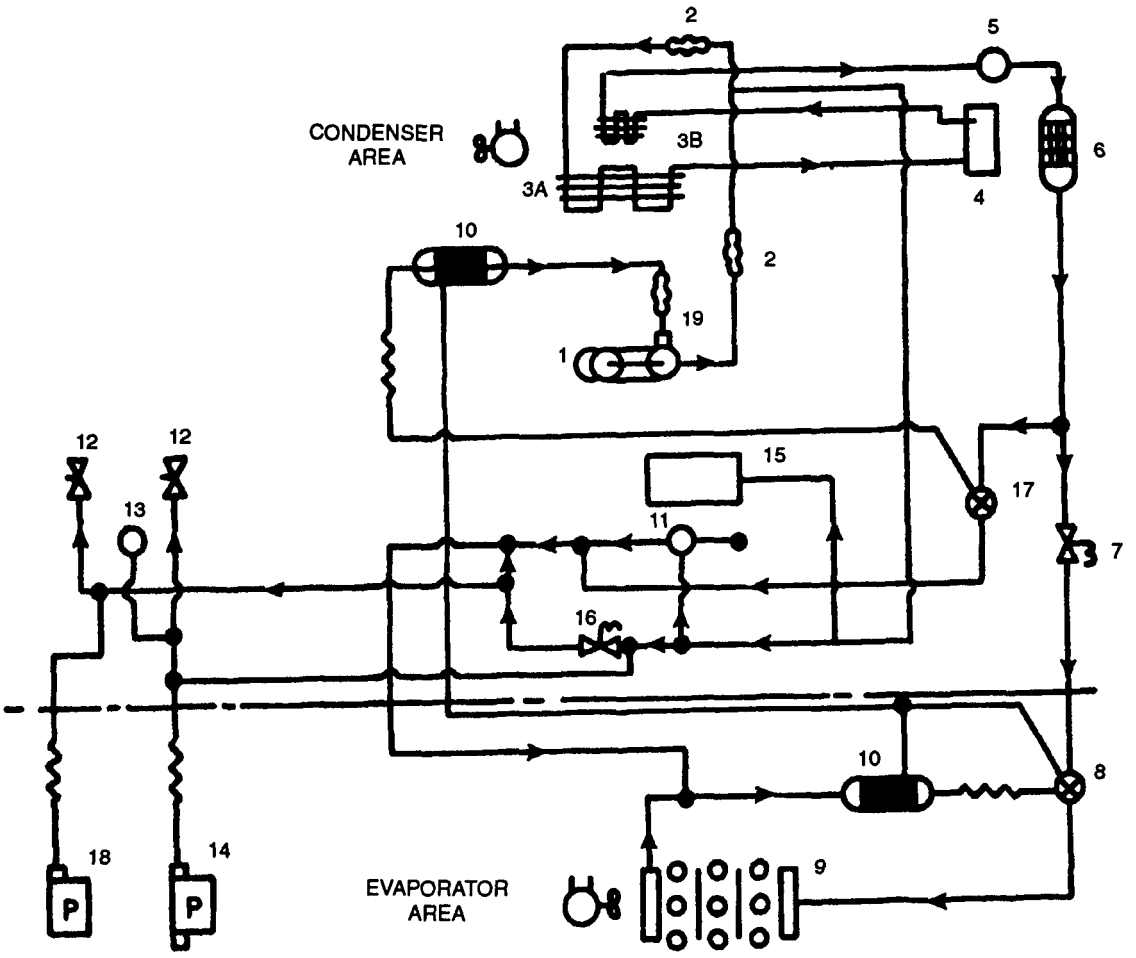
Length . . . . 26 inches(66.04cm)
Height . . . . . 16 inches(40.64cm)
Width . . . . . 23 3/4 inches(60.33 cm)
Weight . . . . 200 pounds(90.80kg) (maximum)

1.8.3 Normal Operating Temperature Range. -50°F to + 125 °F.

Section III. TECHNICAL PRINCIPLES OF OPERATION

1.9 REFRIGERATION CYCLE.

1.9.1 The Refrigeration Cycle. The refrigeration system removes heat from a given area.



a. The compressor (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the copper tubing and metal hose assembly (2) to the condenser coil (3A) and receiver (4).

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

c. The sight indicator (5) indicates the presence of moisture and quantity of refrigerant in the system.

d. The dehydrator (6) removes any moisture (water vapor) or dirt that maybe carried by the liquid refrigerant.

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

f. The expansion valve (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of the feeler bulb in the bulb well (10) and "external equalizer line:' the valve constantly adjusts the flow of liquid refrigerant to the evaporator coil (9).

g As the high pressure liquid refrigerant leaves the expansion valve (8), it enters the evaporator coil (9). As the liquid enters the coil, due to the size difference between the coil and the tubing, the pressure is suddenly decreased. As the pressure decreases, the liquid refrigerant "flashes" to a gas. The evaporator blower circulates the warm air from the conditioned space over and through the evaporator coil (9). Liquid refrigerant absorbs heat when it changes from a liquid to a gas. As the air from the conditioned spaces comes in contact with the evaporator coil (9), the air is cooled.

h. To prevent compressor damage during start-up, the solenoid valve (16) is normally open to equalize pressure on both sides of the compressor.

1.9.2 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 flow is from the discharge to the suction of the compressor, bypassing the evaporator coil (9).

a. 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).

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

c. 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.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF CONTROLS

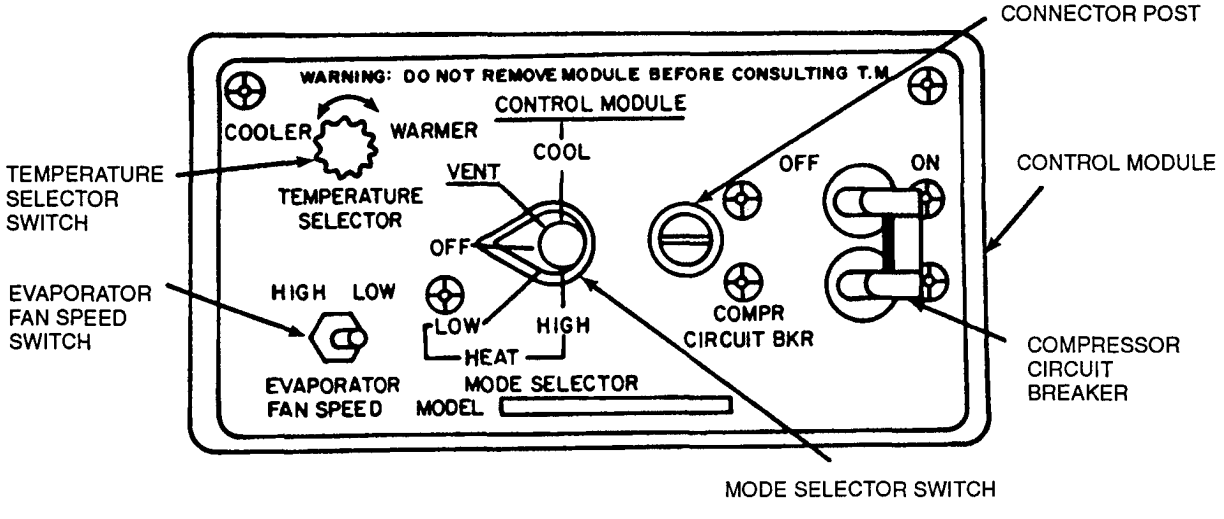
2.1 GENERAL. The air conditioner is a self-contained and electric powered unit that provides 10,000 Btu/hr for cooling or 7,000 Btu/hr for heating. Once started, it operates automatically due to the relationship of the components, controls and instruments.

2.2 OPERATORS CONTROLS.

2.2.1 Cooling. With the Mode Selector switch in COOL position, the fan motors and the compressor are energized. The fan motors and compressor run continuously. The flow within the refrigerant circuit determines the cooling mode of unit. With the fan motor and compressor operating, the flow within the refrigerant circuit is controlled by the Temperature Selector switch. The evaporator fan speed is controlled by a HIGH or LOW speed switch. The compressor is protected from current overload by a circuit breaker in the control module.

2.2.2 Heating. With the Mode Selector switch in the HEAT position, air is blown by the evaporator fan as in cooling, but the heating elements are energized instead of the refrigeration system.

2.2.3 Ventilation. Placing the Mode Selector switch in the VENT position energizes the evaporator fan motor which forces air out of the evaporator outlet louver into the room. The amount of outdoor air used for ventilation is determined by the position of the ventilation damper actuator.



Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2.3 GENERAL.

2.3.1 Before You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform PMCS before you operate.

2.3.2 While You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform PMCS while you operate.

2.3.3 After You Operate. Be sure to perform PMCS after operation.

2.3.4 If Your Equipment Fails To Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA PAM 738-750.

2.4 OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS).

NOTE

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

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS)

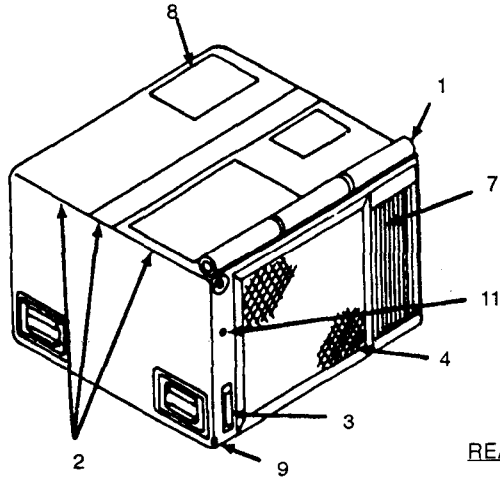
NOTE

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

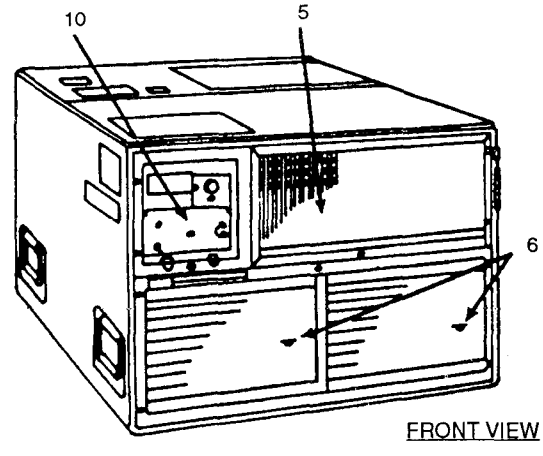
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
1	Before	Canvas Cover	With cover rolled up for operation, check securing ties for damage. Report damage to Unit Maintenance personnel.	Cover cannot be secured.
2	Before	Panels	Inspect for security of attachment and cleanliness. Report damaged condition to Unit Maintenance personnel.	Panels missing or severely damaged.
3	Before	Fresh Air Screen	Inspect for obstructions and insecure mountings. Remove obstructions.	Screen missing, loose or damaged.
4	Before	Condenser Guard	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Guard requires cleaning, is obstructed, damaged, loose or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS) - Continued

Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
5	Before	Evaporator Outlet Louver	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged, loose or missing.
6	Before	Evaporator Inlet Louver	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged, loose or missing.
7	Before	Condenser Louver	Check for insecure mountings and damaged louver blades. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged or loose.
8	Before	Information Plates	Check for security and legibility.	
9	Before	Condensate Drain Tubes	Inspect drains for obstructions. Remove obstructions as required.	Obstructions cannot be removed.
10	Before	Control Module	Ensure knobs are in place and check to see that switches function properly. Report damaged condition to Unit Maintenance personnel.	Knobs are missing or switches do not function properly.
11	During	Liquid Sight Indicator	After approximately 5 minutes of operation, check for moisture and low refrigerant charge. Yellow indicates moisture; bubbles or milky appearance indicates low charge. Report abnormal condition to Direct Support Maintenance personnel.	Moisture or low charge is indicated.



REAR VIEW



FRONT VIEW

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS) - Continued

Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If
12	After	Panels	Inspect for security of attachment and cleanliness. Report damaged condition to Unit Maintenance personnel.	Panels missing or severely damaged.
13	After	Fresh Air Screen	Inspect for obstructions and insecure mountings. Remove obstructions.	Screen missing, loose or damaged.
14	After	Condenser Guard	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Guard requires cleaning, is obstructed, damaged, loose or missing.
15	After	Evaporator Outlet Louver	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged, loose or missing.
16	After	Evaporator Inlet Louver	Inspect for cleanliness, obstructions, damage, and security of attachment. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged, loose or missing.
17	After	Condenser Louver	Check for insecure mountings and damaged louver blades. Report damaged condition to Unit Maintenance personnel.	Louver requires cleaning, is obstructed, damaged or loose.
18	After	Information Plates	Check for security and legibility.	
19	After	Condensate Drain Tubes	Inspect drains for obstructions. Remove obstructions as required.	Obstructions cannot be removed.

Section III. OPERATION UNDER USUAL CONDITIONS

2.5 STARTING AND NSTRUCTIONS FOR COOLING.

CAUTION

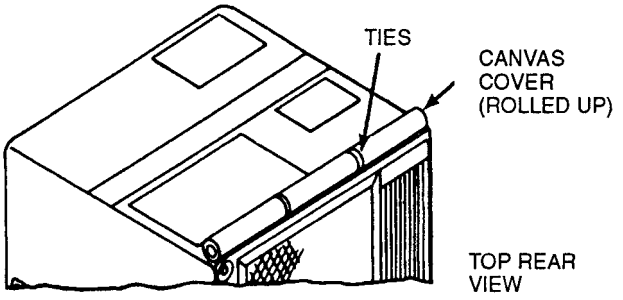
Unit should have power applied for 4 hours prior to operating in the cooling mode in order to heat compressor oil.

2.5.1 Starting.

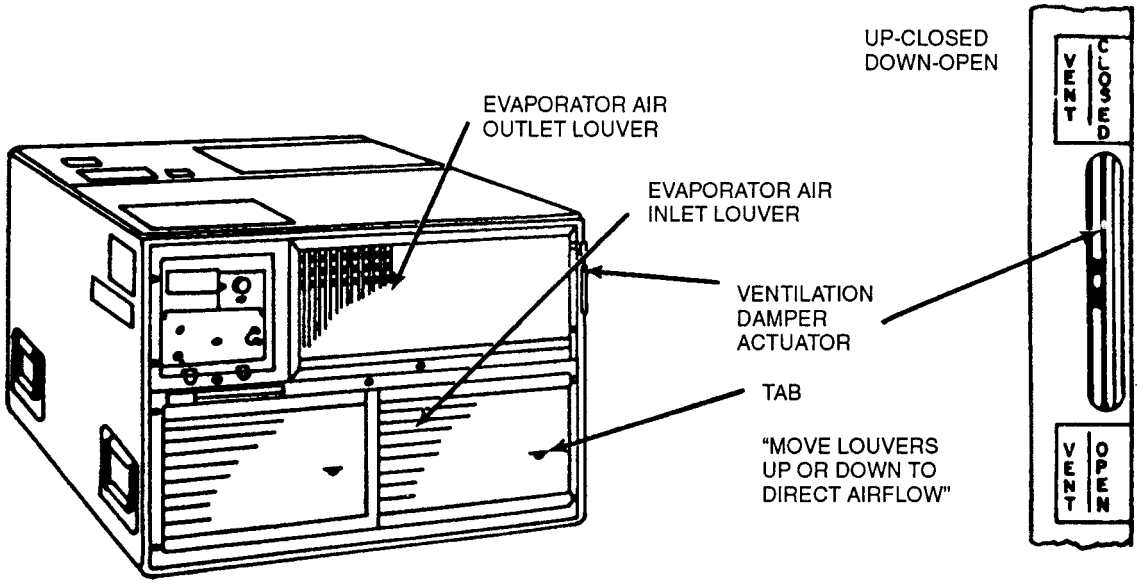
a. Refer to the Preventive Maintenance Checks and Services table before operation.

b. Check for correct voltage at power source (115 volts, 50/60 Hz). Connect the main power to the unit.

c. Roll up and tie the fabric cover.

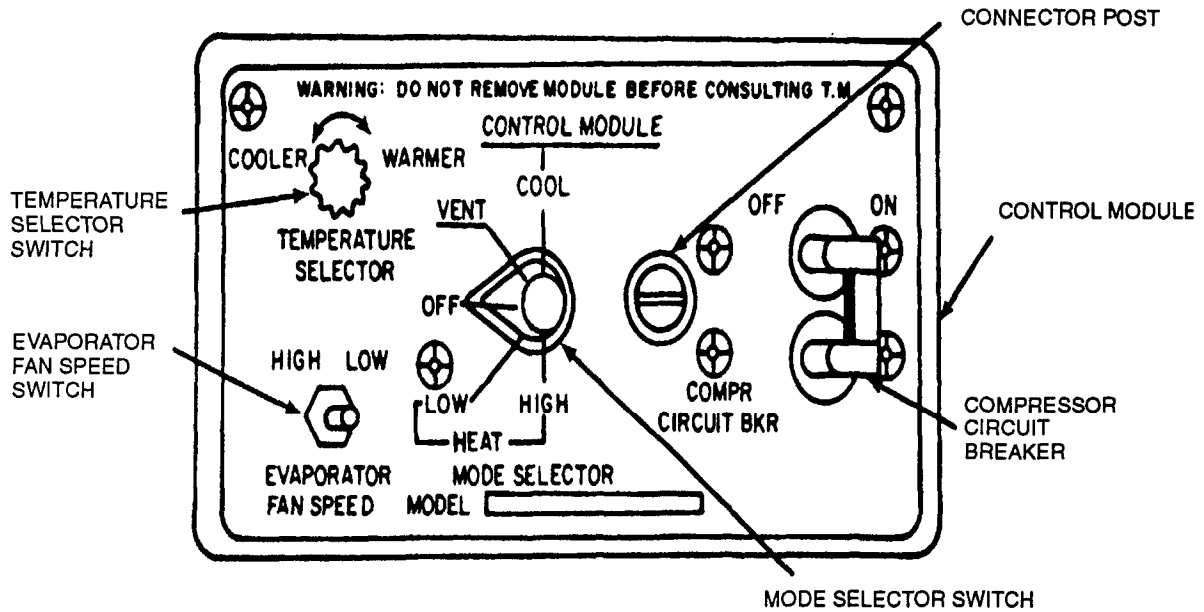


d. Open the evaporator inlet louvers by moving the tabs up or down as required. Ensure evaporator outlet louvers are open by adjusting each louver individually.



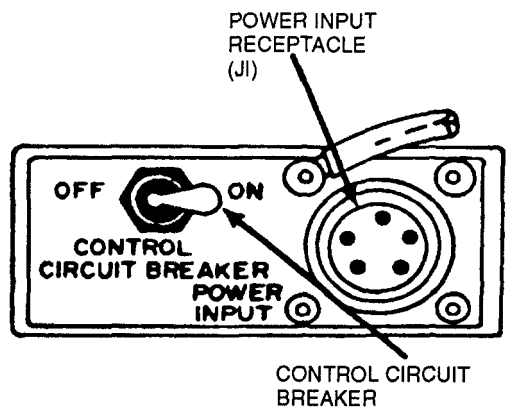
e. Turn the ventilation damper actuator to close the damper door.

f. Turn the Temperature Selector switch to WARMER (lowest cooling position clockwise).



g. Position COMPRESSOR CIRCUIT BREAKER to “ON.”

h. Position the Control Circuit Breaker to “ON.”



i. Position the Mode Selector switch to VENT, then position the Mode Selector switch to COOL. (Allow a 30- to 45-second delay for compressor to begin operating.)

2.5.2 Cooling Operation. After stating the air conditioner for cooling operation, adjust for amount of air and degree of cooling.

a. Leave the Mode Selector switch on COOL.

b. Adjust the Temperature Selector switch from WARMER to the degree of cooling desired. See Table 2-2. for operator control settings.

c. Set the Evaporator Fan Speed switch to the desired position.

d. Adjust the evaporator outlet louvers individually to direct the airflow as desired.

NOTE

Cool air is denser than warm air, so it has a tendency to flow downward. To offset this tendency, it is often advisable to adjust the evaporator outlet louvers to direct the cool air slightly upward.

2.5.3 Cooling With Fresh Air.

a. When the vent damper door is open to admit fresh air, partially close the evaporator inlet louver to balance the incoming air.

b. Keep the vent damper door closed during heavy rain.

2.6 STOPPING THE AIR CONDITIONER.

a. Position the Mode Selector switch to OFF.

b. Close the evaporator inlet louver blades by pushing tabs down.

c. Close the ventilation damper by turning the ventilation damper actuator.

WARNING

Make sure power is de-energized to power cable before disconnecting.

d. If a shutdown is to be for an extended period, cover condenser side of unit with fabric cover and disconnect the power cable.

2.7 STARTING AND OPERATING INSTRUCTIONS FOR HEATING.

2.7.1 Starting.

a. Perform the preventive maintenance checks and services (Table 2-1.).

b. Check for the correct voltage (115 volts, 50/60 Hz).

c. Roll up and tie fabric cover.

d. Open the evaporator inlet louver by moving the tabs up or down as required.

e. Open the evaporator outlet louvers

f. Turn the ventilation damper actuator to close the damper door.

g. Turn the Temperature Selector switch to COOLER (lowest heating position - counterclockwise).

h. Position the Control Circuit Breaker to ON.

i. Position the Mode Selector switch to LOW HEAT. Position it to HIGH HEAT if more heat is wanted. (Wait 3 to 5 minutes for heat).

2.7.2 Heating Operation. After starting the air conditioner in the heating mode, adjust it as follows:

a. Position the Mode Selector switch to HIGH HEAT or LOW HEAT as desired.

b. Adjust the Temperature Selector switch from COOLER to the desired temperature. See Table 2-2. for operator control settings.

c. Adjust the evaporator outlet louver blades to direct the airflow as desired.

NOTE

Warm air is less dense than cool air, so it has a tendency to rise. To obtain comfortable temperatures near the floor and lower parts of the room, it is often advisable to adjust the evaporator louver blades to direct the air slightly downward.

2.7.3 Heating Operation With Fresh Air.

a. Open the damper door by turning the ventilation damper actuator if fresh air is desired.

b. Partially close the evaporator inlet louver blades.

2.8 STOPPING THE AIR CONDITIONER.

a. Position the Mode Selector switch to OFF.

b. Close the evaporator inlet louver blades by pushing tabs down.

c. Close the ventilation damper by turning the ventilation damper actuator.

d. If a shutdown is to be for an extended period, cover condenser side of unit with fabric cover and disconnect the power cable.

2.9 VENTILATING OPERATION. To operate the air conditioner as a ventilating blower, without affecting temperature, proceed as follows:

a. Perform the preventive maintenance checks and services (Table 2-1.).

b. Check for the correct voltage (115 volts, 50/60 Hz),

c. Roll up and tie the fabric cover.

d. Turn the ventilation damper actuator to open the damper door.

e. Partially close the evaporator inlet louver blades.

f. Position the Mode Selector switch to VENT.

g. Open evaporator outlet louvers.

2.10 STOPPING THE AIR CONDITIONER.

a. Position the Mode Selector switch to OFF.

b. Close the evaporator inlet louver blades by pushing tabs down.

c. Close the ventilation damper by turning the ventilation damper actuator.

d. If a shutdown is to be for an extended period, cover condenser side of unit with fabric cover and disconnect the power cable.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

NOTE

The air conditioner can be equipped for operation in chemical, biological, radiological (CBR) environment by connecting filtering equipment to the rectangular covered opening at the lower left side of the rear surface of the unit.

2.11 OPERATION IN EXTREME COLD.

2.11.1 General. The air conditioner is designed to operate on the heating cycle in ambient temperatures as low as -50° F (-45 “C) and on the cooling cycle with O “F (- 18 ‘C) air entering the condenser and with 70°F (21 ‘C) air entering the evaporator.

CAUTION

To start unit in COOL mode at O “F (- 18 “C) ambient, have Unit Maintenance personnel jumper Low Pressure Cutout (LPCO) switch (S-5).

2.11.2 Before Operation. Before starting on cooling cycle be sure fabric cover is rolled up and secured. Clear all ice and snow from openings. Be sure all dampers are in operating condition.

2.11.3 After Operation. Roll down and snap on fabric cover over condenser intake and outlet,

CAUTION

Do not disturb wiring during cold weather unless absolutely necessary. Cold temperatures make wiring and insulation brittle and easy to break.

2.12 OPERATION IN EXTREME HEAT.

NOTE

Unit Preventive Maintenance Checks and Services (PMCS) should be performed at daily intervals.

2.12.1 General. The air conditioner is designed to operate in temperatures up to 120 ‘F (49 “C). Extra care should be taken to minimize the cooling load when operating in extreme high temperatures.

2.12.2 Protection.

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

b. When appropriate, use shades or awnings to shutout direct rays of the sun.

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

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

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.

2.12.3 Cleaning. Clean outside grilles, coils, filters, and mist eliminator more frequently.

2.13 OPERATION IN DUSTY OR SANDY AREAS.

NOTE

Unit Preventive Maintenance Checks and Services (PMCS) should be performed at daily intervals.

2.13.1 General. Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filter, mist eliminator, and coils. This will cause a restriction in 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.

CAUTION

Never operate the air conditioner without having the air filters in place.

2.13.2 Protection.

a. Shield the air conditioner from dust as much as possible.

b. Take advantage of any natural barriers which offer protection.

c. Limit the amount of dusty or sandy outside air introduced through the fresh air damper.

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

2.13.3 Cleaning.

a. Keep the air conditioner as clean as possible.

b. Pay particular attention to the outside grilles, condenser, filters, mist eliminator, louvers, and electrical components.

c. In extreme conditions, daily cleaning of condenser, filters, and outside grilles maybe necessary.

2.14 OPERATION UNDER RAINY OR HUMID CONDITIONS. Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture. Keep vent damper actuator closed during heavy rain.

WARNING

Make sure power is disconnected from air conditioner before touching any wiring or other electrical parts.

2.15 OPERATION IN SALT WATER AREAS.

WARNING

Disconnect power source prior to washing the air conditioner,

2.15.1 General. Wash the exterior and condenser section of the unit, particularly the condenser outlet louver control cable, with clean fresh water at frequent intervals. Be careful not to damage electrical system with water. Special attention must be given to prevent rust and corrosion.

2.15.2 Painting. Paint all exposed mess where paint has cracked, peeled or blistered, or report condition to Unit Maintenance. Coat all exposed areas of polished metal with a light coat of grease.

Table 2-2. Operator Control Settings

Mode	Mode Selector Switch	Temperature Control Thermostat	Fresh Air Damper	Evaporator Inlet Louver	Evaporator Outlet Louver	Fabric Cover
Ventilate with 100% recirculated air.	VENT	Does not operate	Closed	Open	Adjust to suit	Rolled up or snapped closed
Ventilate with makeup (fresh air)	VENT	Does not opcrate	Open	Partially closed	Adjust to suit	Rolled up or secured
Ventilate with 100% fresh air	VENT	Does not opcrate	Open	Closed	Adjust to suit	Rolled up and secured
Heating with 1009'0 recirculated air	LO HEAT or HI HEAT	Desired temperature	Closed	Open	Slightly down for best re-Suits	Rolled up or snapped closed
Heating with makeup (fresh air)	LO H EAT or HI H EAT	Desired temperature	Open	Partially closed	Slightly down for best re-Suits	Rolled up and secured
Cooling with 10070 recirculated air	COOL	Desired temperature	Closed	Open	Slightly up for best results	Rolled up and secured
Cooling with makeup (fresh air)	COOL	Desired temperature	Open	Partially closed	Slightly up for best results	Rolled up and secured
Any mode with makeup air through CBR filter	Desired mode	Desired temperature	Closed and sealed	Partially closed	Adjust to suit	Rolled up and secured

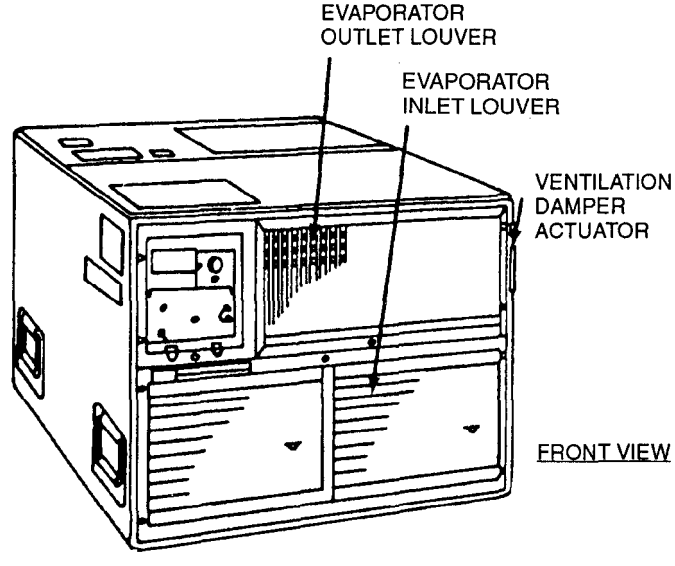
CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3.1 FAN AND COMPRESSOR MOTOR LUBRICATION. Motors driving the evaporator fan, condenser fan and compressor are permanently lubricated. The compressor is a sealed unit complete with lubricant. The rotating parts do not need any lubrication.

3.2 AIR LOUVERS. The evaporator louvers should operate freely. If they bind, lubricate with a small amount of lightweight general purpose machine oil.



Section II. OPERATOR TROUBLESHOOTING

3.3 GENERAL.

3.3.1 This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner. Each malfunction is followed by a list of probable causes and actions to take to remedy the malfunction. You should perform the tests/inspections and corrective actions in the order listed.

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

3.4 TROUBLESHOOTING TABLE. See Table 3-1.

Table 3-1. Operator Troubleshooting

Malfunction Test or Inspection Corrective Action	
1.	AIR CONDITIONER FAILS TO OPERATE
Step 1.	Verify that power cable is connected to proper voltage.
	Connect power cable to receptacle.
Step 2.	Check to be sure that Control or COMPRESSOR CIRCUIT BREAKER is ON.
	Reset circuit breaker.
Step 3.	Make sure that Mode Selector switch is not in OFF position,
	Turn selector knob to desired operation,
Step 4.	Check that high and low pressure switches have been reset,
	Reset pressure switches and wait for compressor to start,
2,	INSUFFICIENT COOLING
Step 1,	Check to be sure that Mode Selector switch is properly positioned,
	Set switch to COOL,
Step 2.	Make sure that Temperature Selector switch is set correctly.
	Adjust setting to COOLER,
Step 3.	Determine that sufficient air is passing across evaporator coil by placing a piece of paper in front of the evaporator inlet louver. The paper should be held against the louver blades by the air.
	Open evaporator inlet louver blades. Remove any obstructions from evaporator inlet and outlet louvers.
Step 4.	Make sure that there is not too much outside air entering unit.
	Close or adjust damper door.
Step 5.	Check liquid sight indicator to see whether there is sufficient refrigerant in the system.
	If sight glass is not full and clean, report to Direct Support Maintenance personnel.
Step 6.	Check to see whether Evaporator Fan Speed switch is set at LOW speed.
	Reset switch to HIGH speed.

Table 3-1. Operator Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action	
2.	INSUFFICIENT COOLING - Continued
Step 7,	Check to see that sufficient air is passing through condenser coil by placing a piece of paper on the condenser guard. The paper should be held against the guard by the air. a. Remove any obstructions from condenser inlet and outlet. b, Make sure that condenser louver outlet is open.
3.	NO HEAT OR LOW HEAT
Step 1.	See that Mode Selector switch is properly set, Set switch on LOW HEAT or HIGH HEAT,
Step 2,	Make sure that Temperature Selector switch is set correctly. Reset switch.
Step 3,	Check for sufficient air movement over heaters by placing a piece of paper in front of the evaporator inlet louver. The paper should be held against the louver by the air. a. Remove any obstructions from evaporator inlet and discharge louvers. b. Make sure that evaporator inlet louver blades are open.

Section III. OPERATOR MAINTENANCE INSTRUCTIONS

3.5 GENERAL. Operator maintenance consists primarily of the following procedures:

a. Servicing screens and guards; and

b. Adjusting louvers, dampers and actuators, and control module.

3.6 SCREENS AND GUARDS-SERVICE. This task covers cleaning.

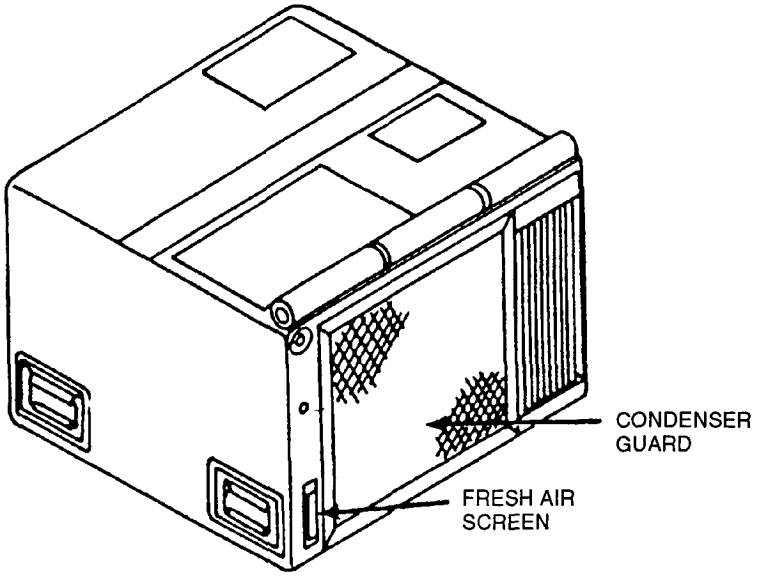
INITIAL SETUP

Materials/Parts:
Dry cleaning solvent (Item 16, Appendix E)
Brush
Cleaning cloth

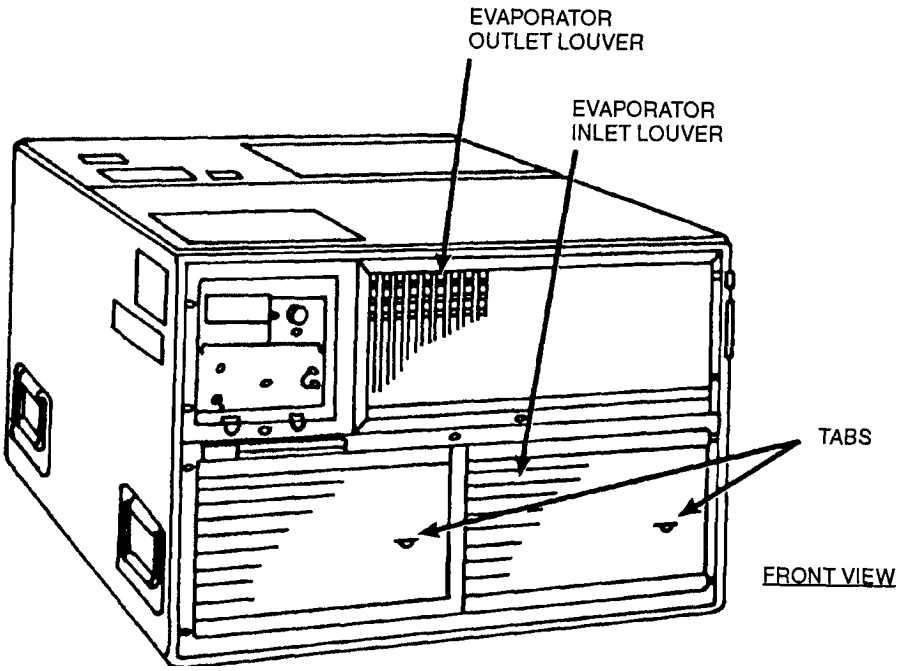
Location/Item	Action	Remarks
	WARNING Disconnect the power source before performing any maintenance function. **WARNING** Do not use compressed air for cleaning purposes except where reduced to less than 30 psi (2.1 kg/cm^2) and then only with effective chip guarding and personnel protective equipment. **WARNING** Dry cleaning solvent (Item 16, Appendix E) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact, Do not use near open flame or excessive heat. Flash point of solvent is 100" F (38°C).	

3.6 SCREENS AND GUARDS-SERVICE. - Continued

Location/Item	Action	Remarks
Service **Rear of Housing** **Clean**	**a. Brush off any loose dirt or foreign matter, and remove obstructions from the condenser guard and fresh air screen.** **b. Wipe off with a cloth moistened with dry cleaning solvent (Item 16, Appendix E).** **c. Inspect for security of attachment and damage.** **d. Report damaged condition to Unit Maintenance personnel.**	

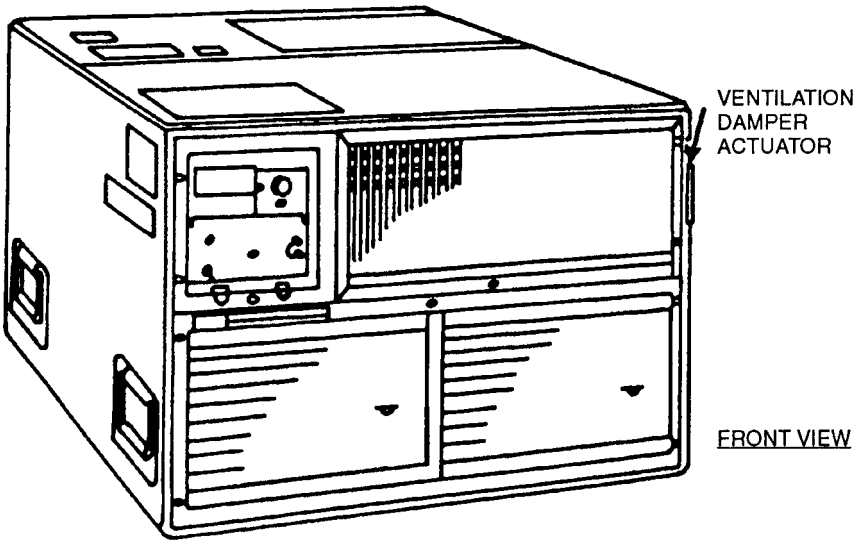


3.7 LOUVERS-ADJUST. This task covers adjust.

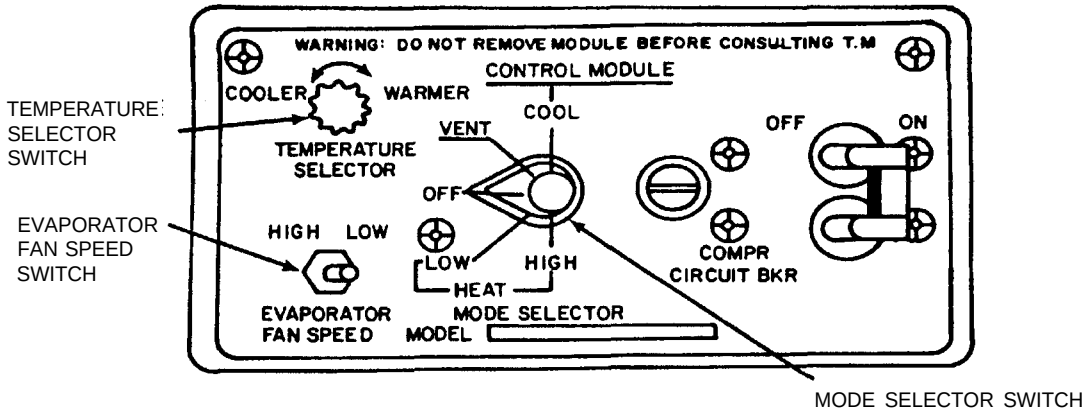
Location/Item	Action	Remarks
		
Adjust	a. Using the tabs provided, position the evaporator inlet louver so that the louvers are fully open when the ventilation damper actuator is in the CLOSED position. Partially close the evaporator inlet louver when the ventilation damper actuator is in the OPEN position. b. It is recommended that the evaporator outlet louver be adjusted to direct the airflow slightly upward when the air conditioner is operated in the COOL mode, and slightly downward when the air conditioner is operated in the HEAT mode,	

3.8 FRESH AIR DAMPER AND ACTUATOR-ADJUST. This task covers adjust.

Location/Item	Action	Remarks
ventilation Damper		
Adjust	a. Check for bindings; remove obstructions.	
	b. Brush off any loose dirt or foreign matter.	
	c. Inspect for security of attachment and damage.	
	d. Report damaged condition to Unit Maintenance personnel.	
	e. Adjust ventilation damper actuator to desired degree of fresh air.	



3.9 CONTROL MODULE-ADJUST. This task covers adjust.

Location/Item	Action	Remarks
		
Adjust	a. Rotate the Temperature Selector switch to COOLER (counterclockwise) or WARMER (clockwise) while the air conditioner is being operated in either the COOL or HEAT mode in order to achieve the desired temperature in the conditioned area. b. Position the Evaporator Fan Speed switch to HIGH or LOW, depending on the amount of airflow desired. c. Rotate the Mode Selector switch to the VENT or COOL position (clockwise), or to the LOW HEAT or HIGH HEAT position (counterclockwise).	

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

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

4.1 MAINTENANCE REPAIR PARTS. Repair parts for the air conditioner are listed and illustrated in TM 9-4120-378-24P.

4.2 COMMON TOOLS AND EQUIPMENT. For common tools and equipment refer to the Table of Organization and Equipment (TOE).

4.3 SPECIAL TOOLS AND TEST EQUIPMENT. No special tools or test equipment is required.

4.4 CONSUMABLE MATERIALS. Refer to Appendix E, Section II, for a list of expendable supplies and materials.

Section II. SERVICE UPON RECEIPT

4.5 SERVICE UPON RECEIPT.

4.5.1 Unloading. The air conditioner is shipped in a crate which has a skid pallet base. It should be handled with fork lift equipment with at least 300 pound (136.2 kg) capacity. Reasonable precaution should be taken to prevent damage by dropping or bumping. Keep the unit upright during unloading.

4.5.2 Unpacking. Move the equipment as close to the site of installation, as possible, before unpacking. Remove crating hardware and metal straps, being careful not to damage the unit with the tools used in uncrating.

4.5.3 Checking Unpacked Equipment.

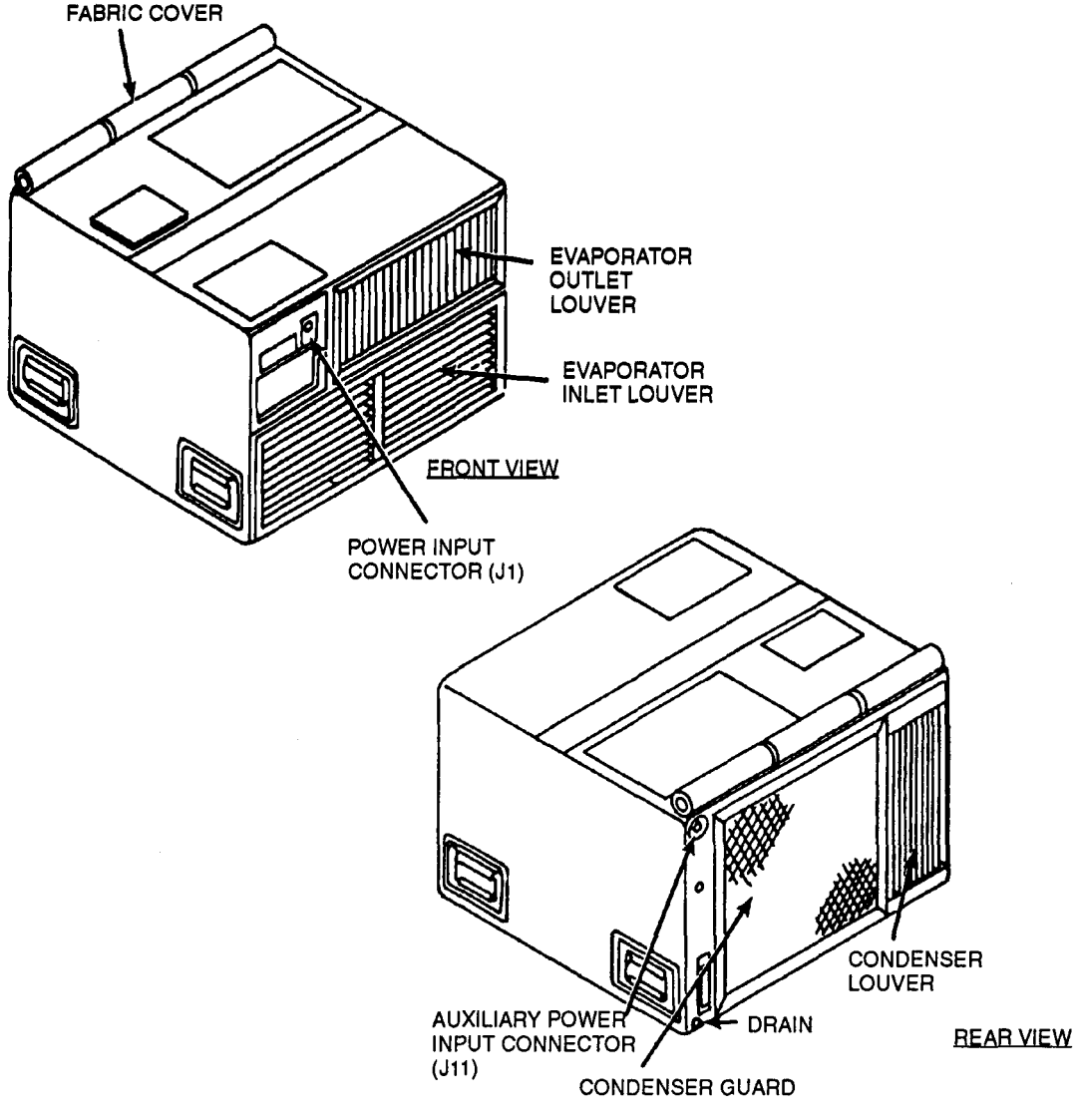
a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DA Form 368, Quality Deficiency Report (QDR).

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

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

4.6 SERVICE UPON RECEIPT CHECKLIST.

Location	Item	Action	Reference
1. Exterior	Louvers, Covers, Drain Guards, Controls, Switches	Perform operator PMCS before you operate.	Table 2-1.
2. Front	Main Power Connectors	a. Inspect connector for damage.	Table 2-1.
		b. Replace damaged connector.	Paragraph 4.39



4.7 INSTALLATION.

4.7.1 General.

a. Air conditioner is assembled and ready for operation.

b. It contains full charge of refrigerant and compressor oil.

4.7.2 Mounting.

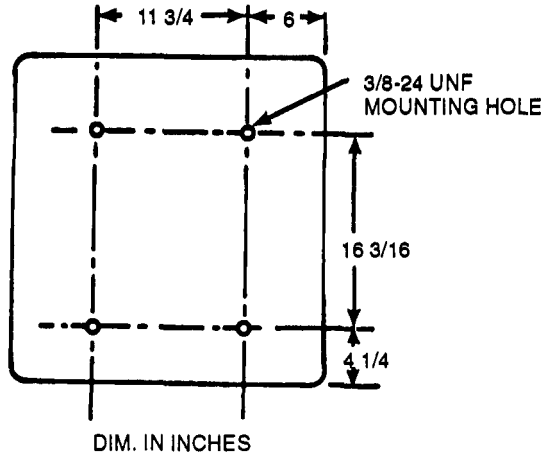
a. Place the unit on a firm, level surface to permit proper drainage of water that condenses out of the air.

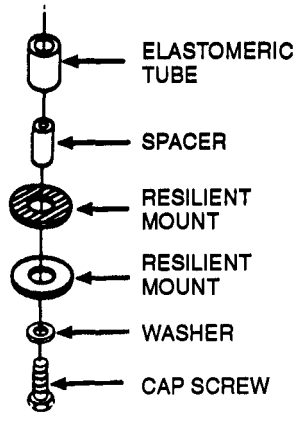
b. Position the unit so that the control panel and the condenser and the evaporator louvers are accessible to the operator and to maintenance personnel.

c. Check that there are no obstructions in front of any air inlet or outlet louvers or other openings.

d. The dimensions for base-mounting holes are shown below. The resilient mounting parts shown in the lower parts of the figure are shipped with the air conditioner.

e. Connect a drain line if necessary.





4.7.3 Grounding.

a. Clean front of ground connection to obtain a bright metal surface.

b. Remove insulation from ends of grounding wire (10 AWG) or use bare ends. Make loop at wire ends.

c. Using a 1/4-20 screw and washer, attach one end of wire to air conditioner front panel ground connection.

d. Wrap a suitable length of perforated strap around clean surface on water pipe or grounding rod.

e. Using a 1/4-20 screw, two washers and nut, attach other end of grounding wire to strap in a manner such as to securely tighten strap to pipe or grounding rod (10 AWG) and wire to strap. If vehicle chassis is use, secure other end of grounding wire to vehicle chassis using screw, nut and lockwasher. The screw shall fit in a tapped hole in the chassis or frame or it shall be held in hole by nut.

4.8 CONNECT THE POWER SOURCE.

CAUTION

Make sure the Mode Selector switch is in the OFF position.

CAUTION

For safe operation, connect aground wire (at least No. 10 AWG) to the ground connection.

a. Connect the air conditioner power cable to a 115 volt, 50/60 Hz, single-phase power source.

b. If auxiliary power input connector (J 11) is used, refer to Appendix F, Wiring Diagram, for connections.

4.9 OPERATION CHECK AND ADJUSTMENTS.

a. Check operation of unit.

b. Check for proper fan rotation. With the fan rotating, check to see that air is sucked through evaporator inlet louver and blown out through evaporator outlet louver.

Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4.10 GENERAl,. To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that the defects may be discovered and corrected before the result is serious damage or failure. Defects discovered during operation of the unit shall be noted for future corrections to be made as an operation has ceased. Stop operation which would damage the equipment if operation were to continue. All deficiencies and shortcomings shall be recorded together with the corrective action taken on DA Form 2404, Equipment Inspection and Maintenance Inspection Worksheet, at the earliest opportunity. If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies using proper forms. See DA PAM 738-750.

4.11 PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLE.

Dry cleaning solvent (Item 16, Appendix E) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 “F (38 “C).

Do not use compressed air for cleaning purposes, except where reduced to less than 30 psi (2.1 kg/cm^2) and then only with effective chip guarding and personal protective equipment.

“Interval” Column. Weekly and quarterly intervals are shown opposite the appropriate check. A weekly check is performed weekly. If the check is accomplished quarterly, it is shown as a quarterly interval.

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

Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
1	Weekly	Evaporator Inlet Filter and Evaporator Inlet Louver	a. Slide air filter (1) out of the retaining clips (2). **WARNING** Dry cleaning solvent (Item 16, Appendix E) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near flame or excessive heat. Flash point of solvent is 100 ° F (38 °C). b. Inspect air filter (1) for damage. Replace if damaged. c. Clean air filter (1). d. Inspect louver (3) for bent blades. Straighten or replace. e. Lubricate air filter (1) with filterkote (Item 17, Appendix E). Drain off excessive oil. f. Slide air filter (1) into evaporator inlet louver (3). g. Install evaporator inlet louver (3).	Items are damaged, missing or clogged.

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

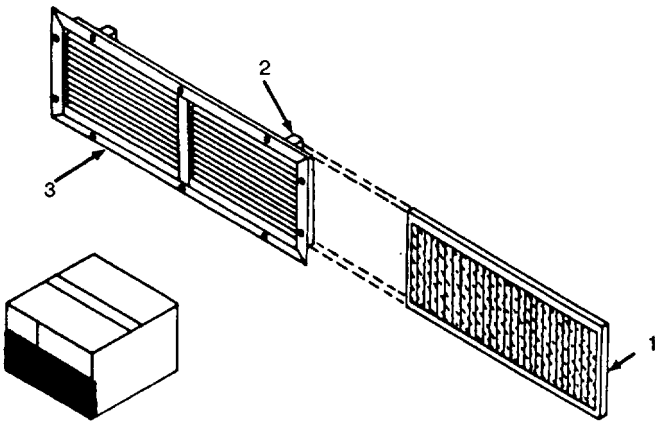
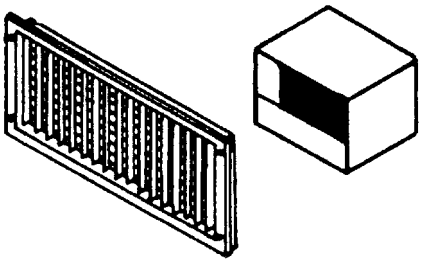
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
				
2	Weekly	Evaporator Outlet Louver	a. Check louver for dirt or damage. b. Clean or replace damaged parts. c. Inspect louver for bent blades. Straighten or replace. **WARNING** Dry cleaning solvent (Item 16, Appendix E) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C).	Louver is missing or needs to be replaced.
				

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

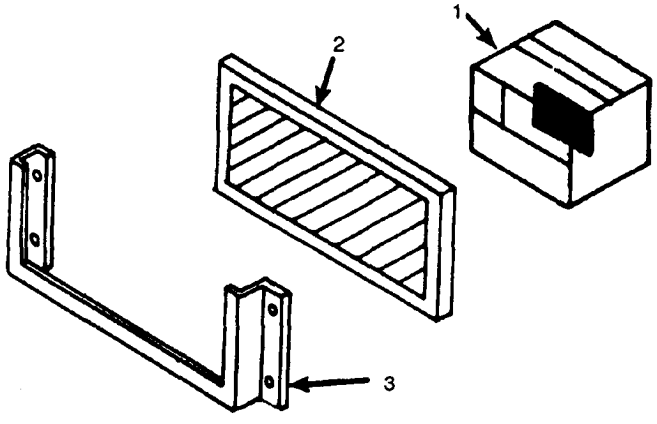
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
1	Weekly	Mist Eliminator	a. Remove top cover (1). b. Slide mist eliminator (2) out of the mist eliminator holder (3).	Items are damaged, missing or clogged.
				
			c. Inspect mist eliminator (2) for damage. Replace if damaged. d. Clean mist eliminator (2). e. Lubricate mist eliminator (2) with filter-kote (Item 17, Appendix E). Drain off excessive oil. f. install mist eliminator (2) in holder (3).	
4	Weekly	Evaporator Impeller and Motor and Housing	a. Inspect evaporator motor (1) and impeller (2) and housing (3) for security of attachment. b. Check wiring (4) for damage. c. Replace damaged fan (2) or motor (1). (Paragraphs 4.32 and 4.33)	Items are loose or damaged.

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

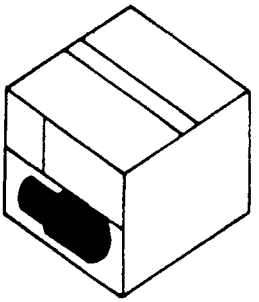
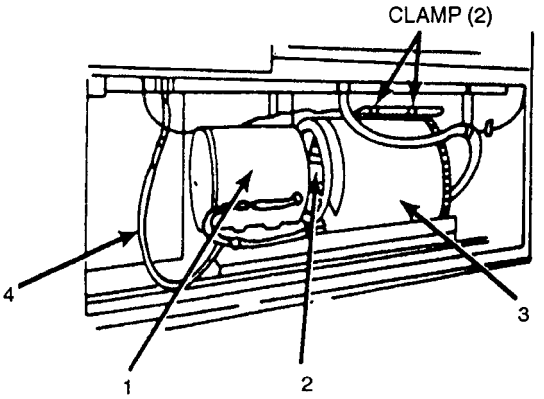
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
			 	
5	Weekly	Heaters	**WARNING** Disconnect air conditioner power supply before doing maintenance work on the electrical system. a. Check for breaks in wiring (1) and insulation (2). Tighten loose connections. b. Check heating elements (3) for damage. c. Clean heating elements (3). d. Replace heating elements (3) if damaged.	Items are loose, or wires or elements are damaged.

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

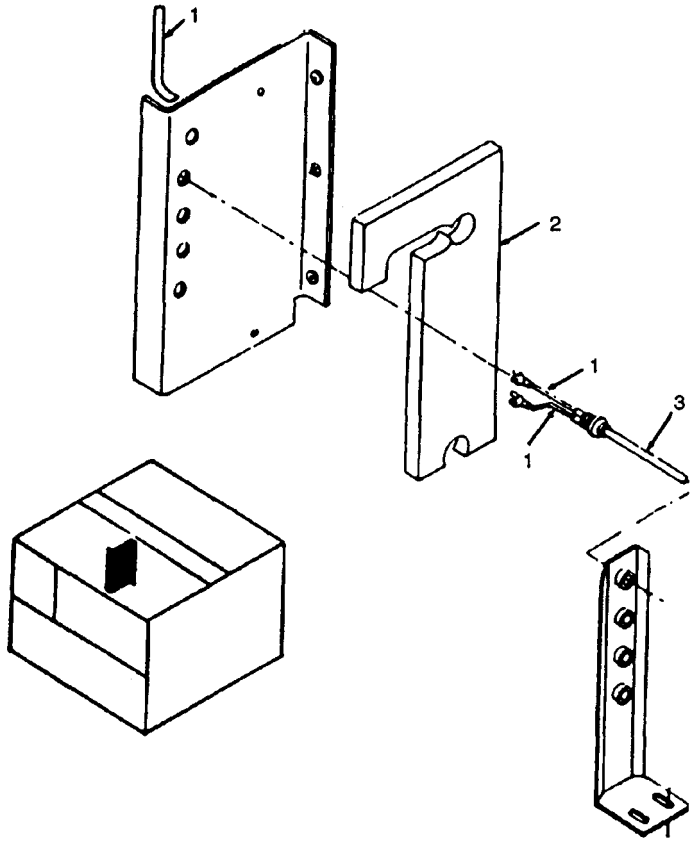
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
				
6	Weekly	Evaporator Coil	a. Inspect evaporator coil for dirt or damage. Clean or report damage to Direct Support Maintenance personnel. b. Inspect evaporator coil for leaks. Report damage to Direct Support Maintenance personnel.	Item is dirty, damaged or leaking refrigerant.

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

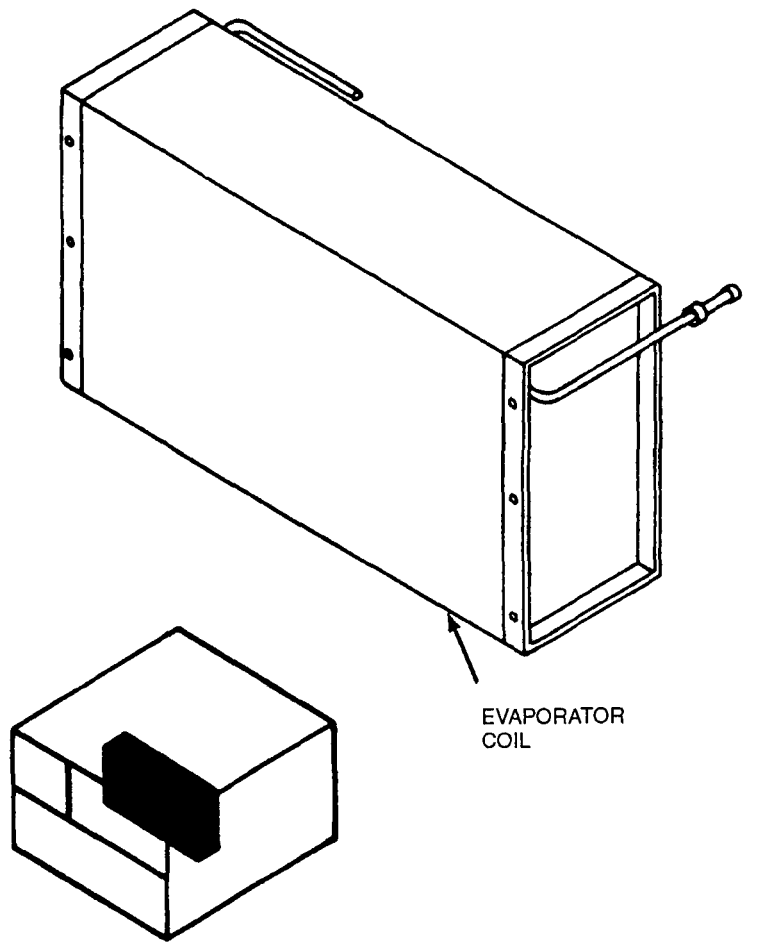
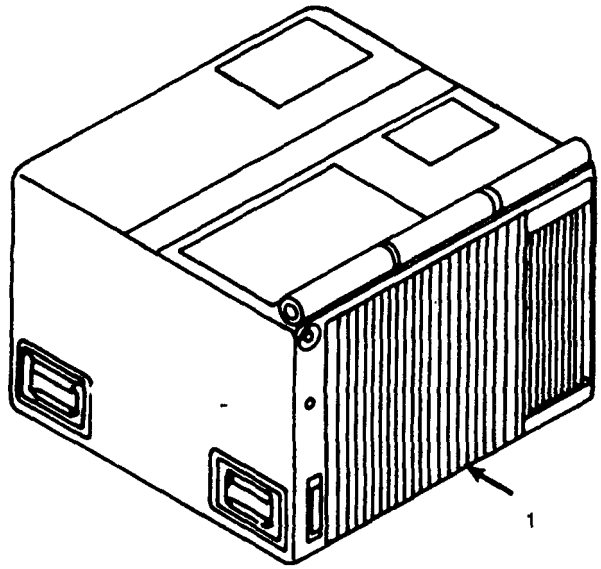
Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If:
				
7	Weekly	Condenser Coil	a. Inspect condenser coil (1) for dirt or damage. Clean or report damage to Direct Support Maintenance personnel. b. Inspect condenser coil (1) for leaks. Report damage to Direct Support Maintenance personnel.	Item is excessively dirty damaged or leaking refrigerant.

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

Item No.	Interval	Item To Be Inspected	Procedure	Not Fully Mission Capable If



Section IV. UNIT TROUBLESHOOTING

4.12 GENERAL.

4.12.1 This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner. Each malfunction is followed by a list of probable causes and actions to take to remedy the malfunction. You should perform the tests/inspections and corrective actions in the order listed.

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

4.12.3 Control Circuit. The cause of a system's failure to operate can be greatly narrowed if control that caused the failure can be isolated. It is the function of safety devices to open the circuit under certain conditions; therefore, additional checking may be required to determine whether the safety device is open because it is bad or because it is doing what it is supposed to do. The following steps contain instructions for checking the control circuit.

a. Disconnect power from the air conditioner.

b. Test continuity across each control in the affected circuit, using an ohmmeter. Refer to the appropriate schematic diagram and wiring diagram (Appendix F) as a guide to the connections in the circuit.

c. Replace defective parts.

4.12.4 Safety Devices. When testing the control circuit and other equipment you must take into consideration the fact that open safety devices may not be bad. It maybe normal for the device to be open under the existing conditions, or it may indicate trouble elsewhere in the air conditioner.

WARNING

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

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.

WARNING

Whenever possible, the input power supply to the equipment must be shut off before beginning work in the equipment.

WARNING

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.

WARNING

Be careful not to contact high voltage connections of 115 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.

WARNING

Do not operate the equipment without all 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.

4.13 UNIT TROUBLESHOOTING TABLE. See Table 4-2.

Table 4-2. Unit Troubleshooting

Malfunction Test or Inspection Corrective Action

NOTE

Before using this table, be sure you have performed all applicable operating checks.

1. AIR CONDITIONER FAILS TO OPERATE

Step 1. Check to see that main power cable is connected.

Connect cable.

Step 2. Make sure that you are using the correct voltage.

Check line voltage with voltmeter for 115 Vat, single-phase, 50/60 Hz power.

Table 4-2. Unit Troubleshooting - Continued

Malfunction / Test or Inspection	Corrective Action
1. AIR CONDITIONER FAILS TO OPERATE - Continued	
Step 3. Inspect main power receptacle connections for breaks.	Replace connector. (Refer to paragraph 4.28.)
Step 4. Check for loose electrical connections.	Tighten connections.
Step 5. Inspect rotary selector switch for incorrect setting. (See Table 2-2., Operator Control Setting,)	Turn selector switch to COOL or VENTILATE.
Step 6. Check to see whether Control or COMPRESSOR CIRCUIT BREAKER is in the OFF position or is defective.	a. Make continuity check with ohmmeter. b. Reset circuit breaker.
Step 7. Disconnect control circuit transformer and make continuity check of primary and secondary windings, and from windings-to-case, using ohmmeter. Reset circuit breaker.	If windings do not show continuity or if windings-to-case continuity exists, replace transformer. (Refer to paragraph 4.31.)
Step 8. Apply 30-volt AC to input side terminals of control circuit rectifier, and check to see that 24-28 volts DC exists at end terminals.	Replace bad rectifier. (Refer to paragraph 4.30.)
2. INSUFFICIENT COOLING	
Step 1. Check to see that Mode Selector switch is properly positioned.	
Step 2. Check liquid sight indicator level to see that refrigerant is colorless and clear. Yellow indicates moisture in system. Milky or bubbly refrigerant indicates low level refrigerant charge.	Report condition to Direct Support Maintenance personnel.
Step 3. Inspect condenser coil for dirt.	Clean coil with 25-30 psi (1 .76-2 .11 kg/cm^2) compressed air.

Table 4-2. Unit Troubleshooting - Continued

Malfunction / Test or Inspection	Corrective Action
2. INSUFFICIENT COOLING - Continued	
Step 4. Inspect evaporator inlet air filter for dirt.	
Step 5. See whether Temperature Selector switch is set incorrectly or is defective.	Adjust setting or replace switch or other corrective action. (Refer to paragraph 4.24.)
Step 6. Check evaporator outlet louver to see whether it is bent, or stuck in the CLOSED position.	Repair or replace louver. (Refer to paragraph 4.11.)
Step 7. Observe evaporator fan motor to see whether it is worn or defective.	Report fault to Direct Support Maintenance personnel or replace motor. (Refer to paragraph 4.33.)
Step 8. Check to see whether evaporator impeller fan is loose or defective.	Tighten setscrew or replace impeller fan. (Refer to paragraph 4.32.)
3. EVAPORATOR OR CONDENSER FAN MOTOR FAILS TO OPERATE	
Step 1. Make sure that power cable is properly connected.	Connect cable.
Step 2. Check for bad fan motor. (Refer to paragraphs 4.33 and 4.36.) Check for bad start capacitor by using an ohmmeter. (Refer to paragraph 4.29.)	Replace motor. (Refer to paragraphs 4.33 and 4.36.)
Step 3. Check evaporator or condenser fan motor for binding.	Relieve binding or replace fan motor. (Refer to paragraphs 4.33 and 4.36.)
Step 4. Check continuity of receptacle or plus terminals. (Refer to paragraphs 4.33 and 4.36.)	Replace terminals or receptacles. (Refer to paragraph 4.36.)
Step 5. Disconnect condenser fan motor relay. Actuate primary contacts with 24 volt DC source, then check continuity of contacts that should be closed. (Refer to paragraph 4.25.)	Replace bad relay. (Refer to paragraph 4.25.)

Table 4-2. Unit Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action	
3.	EVAPORATOR OR CONDENSER FAN MOTOR FAILS TO OPERATE - Continued
Step 6.	Inspect for bad Evaporator Fan Speed Control switch by checking continuity with ohmmeter. (Refer to paragraph 4.24.) Replace bad switch. (Refer to paragraph 4.24.)
Step 7.	Inspect Mode Selector Rotary switch for improper adjustment or damage. (Refer to paragraph 4.24.) Replace bad switch. (Refer to paragraph 4.24.)

WARNING

Disconnect the power source before performing any troubleshooting function.

4.	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.	Check for open contacts of high-or-low-pressure cut-out switches. (Refer to paragraph 5.21.) a. Reset pressure switches. b. Report fault to Direct Support Maintenance personnel if condition continues.
Step 3.	Check for loose electrical connections or faulty wiring. a. Tighten loose connections. b. Replace wiring if necessary. (Refer to paragraph 5.27.)
Step 4.	Make continuity check of control circuit to determine whether open circuit exists. (Refer to paragraph 4.24.) Repair open circuit or replace wire. (Refer to paragraph 4.24.)

Table 4-2. Unit Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action	
4.	COMPRESSOR WILL NOT START - Continued
Step 5.	Check continuity across primary winding and across secondary winding of control transformer to see whether windings are good. (Refer to paragraph 4.31.)
	Replace bad transformer. (Refer to paragraph 4.31.)
Step 6.	Apply 30 volts AC across side input terminals; check for 24-28 volts DC across output terminals (marked + and -) of rectifier. (Refer to paragraph 4.30.)
	Replace bad rectifier. (Refer to paragraph 4.30.)
Step 7.	Observe operation of time delay relay and check continuity. (Refer to paragraph 4.25.)
	Replace bad relay. (Refer to paragraph 4.25.)
5.	INSUFFICIENT HEATING
Step 1.	Check that Mode Selector switch is in HIGH HEAT position.
	a. Switch to HIGH HEAT position.
	b, Replace bad Mode Selector switch. (Refer to paragraph 4.24.)
Step 2.	Check that Evaporator Fan Toggle switch is in HIGH SPEED position.
	a, Switch to HIGH SPEED position.
	b. Replace bad Evaporator Fan Speed switch. (Refer to paragraph 4.24.)
Step 3.	Check that Temperature Selector switch is in WARMER position.
	a. Switch to WARMER position.
	b. Replace bad Temperature Selector switch, (Refer to paragraph 4.24.)
Step 4.	Check that the COMPRESSOR CIRCUIT BREAKER is in the ON position.
	a. Switch to ON position.
	b. Replace bad COMPRESSOR CIRCUIT BREAKER. (Refer to paragraph 4.24.)

Section V. UNIT MAINTENANCE

4.14 MAINTENANCE OF MECHANICAL PARTS.

4.14.1 Louvers, guards, and controls covered in this section include:

a. Evaporator Louvers,

b. Panels,

c. Guards,

d. Condenser Air Discharge Louver and Linkage,

e. Fabric Cover,

f. Evaporator Inlet Air Filter,

g. Mist Eliminator,

h. Condensate Drain Tube,

i. Fresh Air Damper and Actuator, and

j. Condenser Louver Control.

4.14.2 Mechanical assemblies and groups of associated components are covered in separate paragraphs.

Disconnect air conditioner power supply before doing maintenance work on the mechanical assemblies.

4.15 MAINTENANCE OF ELECTRICAL SYSTEM.

4.15.1 The electrical system is made Up of:

a. Heater Thermostatic Switch,

b. Heater Elements,

c. Control Module and Components,

d. Junction Box and Components,

e. Transformer,

f. High/Low Pressure Cutout Switches,

g. Evaporator and Condenser Fan Motors Run Capacitors,

h. Compressor Start and Run Capacitors,

i. Compressor Start Relay,

j. Wiring Harness, and

k. Compressor Wiring.

4.15.2 Electric assemblies and groups of associated components are covered in separate paragraphs.

WARNING

Disconnect air conditioner power supply before doing maintenance work on the electrical system.

4.15.3 Testing and Inspecting the Electrical System,

a. Troubleshooting procedures for testing the electrical system to isolate causes of trouble are discussed in Table 4-1. More detailed test information is contained in specific paragraphs about the electrical components.

b. Use a continuity tester or a multimeter set on low-resistance range to test for continuity.

c. Use an insulation tester or a multimeter set on a high-resistance range to test for short circuits between the circuit in a component and the outside casing of the component.

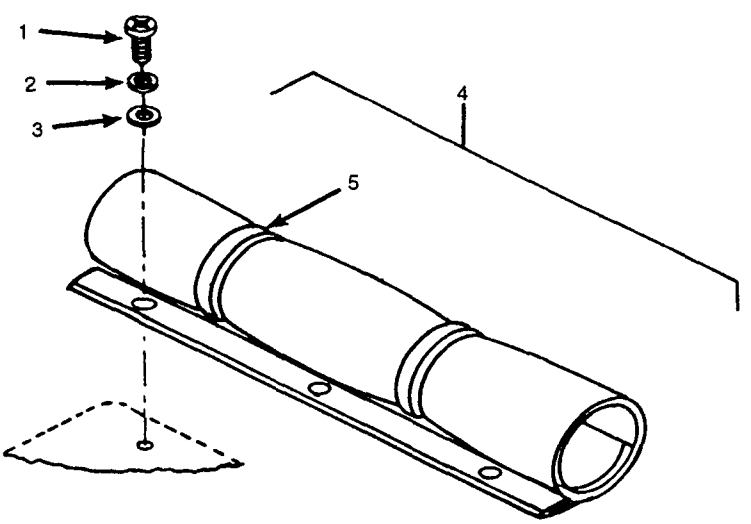
d. When testing an electrical component, check for visible damage and inspect all wiring in the area for damage or loose connections.

4.16 CANVAS COVER-SERVICE. This task covers removal, inspection, cleaning and installation.

INITIAL SETUP

Materials/Parts:
Cloth, lint-free (Item 9, Appendix E)
Dry cleaning solvent (Item 16, Appendix E)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Top Rear of Housing Removal	a. Remove three screws (1), three lockwashers (2), and three flat washers (3) securing canvas cover (4) to rear top cover.	
	b. Roll up canvas cover (4) at rear top cover and tie (5).	Do not leave rolled up when wet. Spread canvas cover out flat until it is dry.
	c. Remove canvas cover (4) from top rear cover.	
Inspection and Cleaning	a. Inspect for cuts, rips, tears and fraying.	



4.16 CANVAS COVER- continued

Location/Item	Action	Remarks
inspection and Cleaning -Continued	**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, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. 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. Inspect for stains, clean with dry cleaning solvent (Item 18, Appendix E) and lint free cloth.	Do not roll up immediately af-:er cleaning with solvent. Spread canvas cover out flat Until it is dry.
Installation	Secure with three screws (1), three Iockwashers (2), and three flat washers (3) to rear of top rear cover, roll up and tie.	

4.17 PANELS-SERVICE. This task covers removal, inspection, cleaning and installation.

INITIAL SETUP

Materials/Parts:
Flexible polyurethane foam (Item 20, Appendix E)
Warm, soapy water
Filter-kote or oil (Item 17, Appendix E)
Cellular rubber strips (Item 19, Appendix E)
Adhesive (Item 18, Appendix E)
Toluolene (Item 27, Appendix E)

Equipment Condition:
Canvas cover removed (paragraph 4.16)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Front Top Panel		
Removal	a. Remove eight screws (1) securing front top cover (2).	
	b. Remove front top cover (2).	
Rear Top Panel		
Removal	a. Remove seven screws (3) securing rear top cover (4).	
	WARNING Always ground every capacitor likely to hold a dangerous potential charge.	
	b. Slide rubber boots (5) away from capacitors (6).	
	c. Discharge capacitors (6) using instrument with insulated handle.	
	d. Tag and disconnect leads from capacitors (6).	
	e. Remove rear top cover (4).	

4.17 PANELS. - Continued

Location/Item	Action	Remarks
Center Top Panel		
Removal	a. Remove two screws (7) securing center top cover (8).	
	b. Remove two screws (9) holding the thermostatic heater switch bracket (1 O) to the cover. Leave the switch in place.	
	c. Remove center top cover (8).	
Cleaning	Clean dirty panels with warm soapy water.	
Center Top Panel		
Installation	a, Secure thermostatic heater switch bracket (1 O) to underside of cover (8) with two screws (9),	See paragraph 4.16.
	b, Aline cover (8) and secure with two screws (7),	
Rear Top Panel		
Installation	a, Connect leads to capacitors (6) and remove tags,	
	b. Slide rubber boots (5) over capacitor leads.	
	c. Aline cover (4) and secure with seven screws (3).	
	d. Attach canvas cover.	See paragraph 4.16.
Front Top Panel		
Installation	Aline cover (2) and secure with eight screws(1).	

4.17 PANELS. - Continued

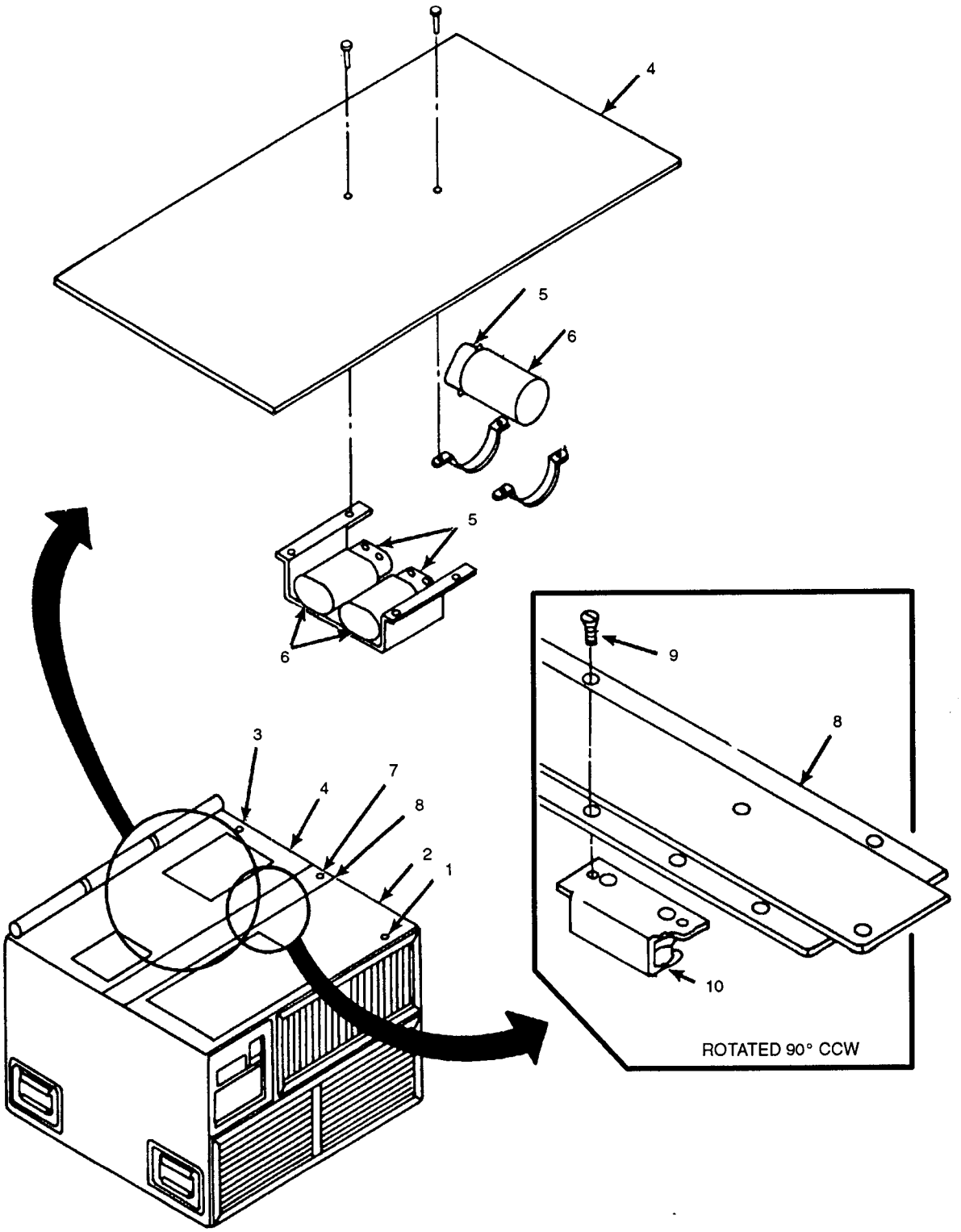


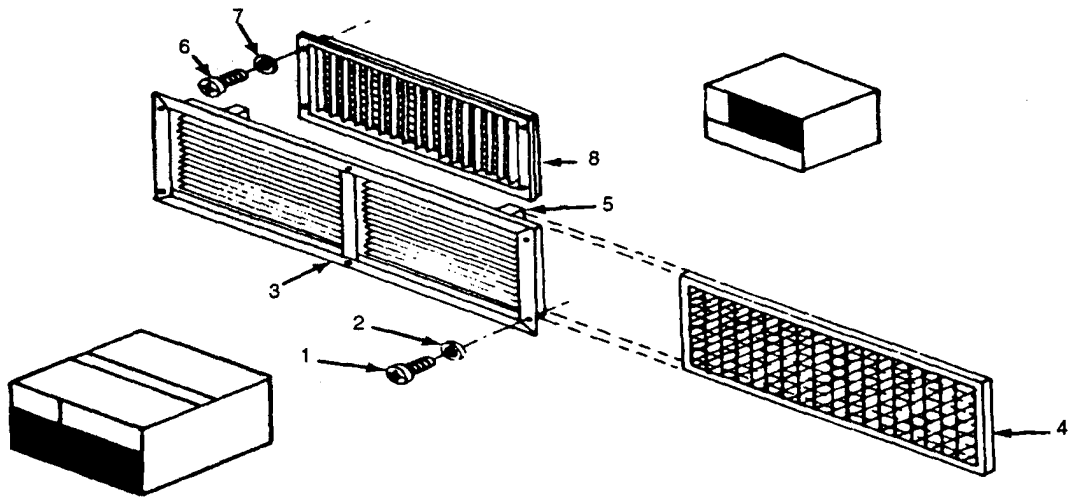
Illustration for paragraph 4.17.

4.18 EVAPORATOR LOUVERS-SERVICE. This task covers removal, cleaning and installation.

INITIAL SETUP

Material/Part:
Dry cleaning solvent (Item 16, Appendix E)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Evaporator Inlet Louver		
Removal	a. Remove eight screws (1) and eight lockwashers (2) securing louver (3) to housing. b. Remove louver (3). c. Remove evaporator air inlet filter (4) from filter clips (5).	
Evaporator Outlet Louver		
Removal	a. Remove six screws (6) and six lockwashers (7) securing louver (8) to housing. b. Remove louver (8)	



4.18 EVAPORATOR LOUVERS. -Continued

Location/Item	Action	Remarks
Evaporator Inlet and Outlet Louvers		
Clean	a. Inspect louver blades for bends or damage and straighten.	
	b. Inspect for missing or damaged tabs and filter clips (5).	Evaporator inlet louvers only.
	c. Clear obstructions from louver blades using dry cleaning solvent.	
	d. Clean louver blades of obstructions.	
Evaporator Outlet Louver		
Installation	Aline and secure louver (8) to housing using six screws (6) and six lockwashers (7), respectively.	Evaporator outlet louver only.
Evaporator Inlet Louver		
Installation	a. Install evaporator inlet air filter (4) into filter clips (5).	Evaporator inlet louver only.
	b. Aline and secure louver (3) to housing using eight screws (1) and eight lockwashers (2), respectively.	

4.19 EVAPORATOR INLET AIR FILTER-SERVICE/REPLACE. This task covers removal, cleaning and installation.

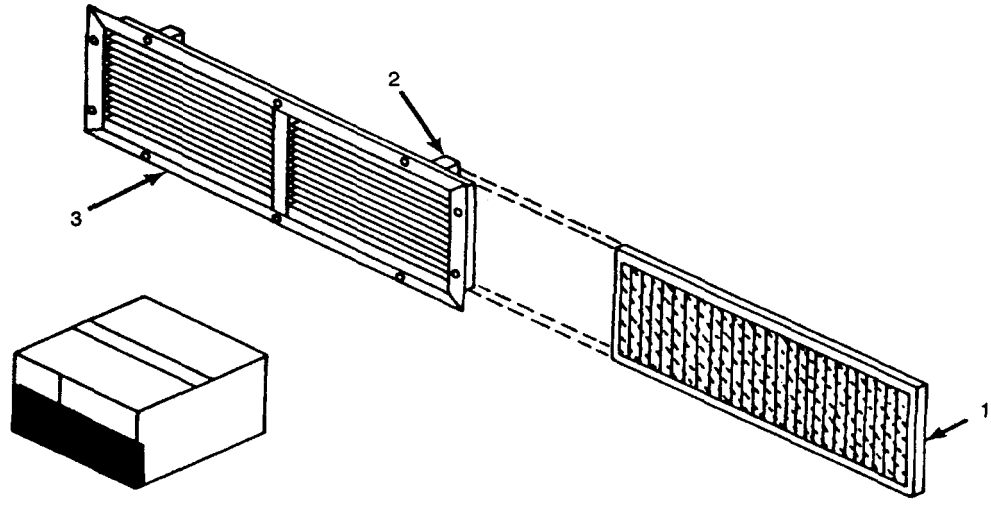
INITIAL SETUP

Materials/Parts:
Hose, with running water
Filter-kote or oil (Item 17, Appendix E)
Dry cleaning solvent (Item 16, Appendix E)

Equipment Condition:
Evaporator inlet louver removed (paragraph 4.18)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Removal	Slide air filter (1) out of retaining clips (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, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100” F to 138° F (38° C to 58°C).	

4.19 EVAPORATE INLET AIR FILTER. - Continued

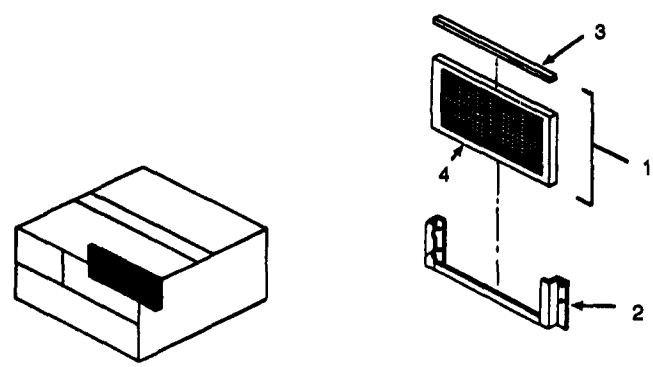
Location/Item	Action	Remarks
Removal Continued		
		
Cleaning	a. Inspect filter(1). Replace damaged filter. Clean with dry cleaning solvent (Item 16, Appendix E), b. Replace filters having breaks, tears, excess accumulations of dirt or grease, or other major damage. c. Lubricate air filter with filter-kote (Item 17, Appendix E).	
Installation	a. Slide air filter(1) into retaining clips (2) on rear of evaporator inlet louver. b. Install evaporator inlet louver.	Heed airflow directional arrow on air filter frame. See paragraph 4.18.

4.20 MIST ELIMINATOR-SERVICE/REPLACE/REPAIR. This task covers removal, cleaning, repair and installation.

INITIAL SETUP

Material/Pam
Hose, with running water

Equipment Condition:
Front top cover removed (paragraph 4.17)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Removal	Slide mist eliminator (1) up and out of mist eliminator holder (2),	
		
Cleaning	a. Inspect mist eliminator for dift, bends or warped frame, b. Inspect for damage or missing insulation (3) on top of mist eliminator. c. Clean mist eliminator(1) by hosing water through in opposite direction of airflow.	
Repair	a. Replace bent or damaged mist eliminator. b. Replace insulation (3) if it has been damaged or is missing.	
Installation	a. Insert mist eliminator (1) into mist eliminator holder (2). b. Install top cover.	Heed airflow direction arrow on mist eliminator frame. See paragraph 4.17.

4.21 CONDENSER AIR DISCHARGE LOUVER AND LINKAGE-SERVICE/RE PLACE/ADJUST. This task covers removal, disassembly, repair and clean, assembly, installation and adjustment.

INITIAL SETUP

Material/Part
Dry cleaning solvent (Item 16, Appendix E)

Equipment Conditions:
Fabric cover detached (paragraph 4.16)
Rear top cover removed (paragraph 4.17)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Condenser Guard		
Removal	Remove condenser guard (14) by removing eight screws(16) and eight lockwashers (15),	
Condenser Louver		
Removal	a. Loosen post screw (1). b. Remove outer sheath retaining nut (2) from control cable sheath (3). c. Pull end of wire (4) from mechanical post (5), d. Remove seven screws (6) and seven lockwashers (7) securing condenser louver assembly (8) to housing. e. Remove condenser louver assembly (8) from housing.	
Condenser Louver		
disassembly	a. Remove five push nuts (9). b. Remove two screws (1 0).	

4.21 CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - Continued

Location/Item	Action	Remarks
disassembly Continued	c. Remove bearing plate (11). d Remove louver blades (12) and bearings (13) from louver assembly frame (8).	
Condenser Louver		
Repair and Clean	a. Replace damaged louver blades, bearing, lever, or insulation. b. Straighten or replace bent frame. c. Clean with dry cleaning solvent. **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, P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 OF to 138°F (38°C to 58°C).	
Condenser Louver		
Assembly	a. Install bearings (13) and louver blades (12) into louver assembly frame (8). b. Install bearing plate (11) to louver assembly frame (8) by securing two screws (1 O). c. Install five push nuts (9).	
Condenser Louver		
Installation	a. Place condenser louver assembly (8) in housing. b. Install top and bottom screws (6) and washers [7) finger tight.	

4.21 CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. - Continued

Location/Item	Action	Remarks
Installation . Continued	c. Reconnect control (push-pull) cable (4).	
	d. Install remaining screws (6) and washers (7).	
	e. Attach rear top cover.	See paragraph 4.17.
	f. Attach fabric cover.	See paragraph 4.16.
Adjustment	a. Turn off air conditioner and wait 4 hours, or until air conditioner is at ambient temperature.	
	b. Loosen post screw (1) on mechanical post (5).	
	c. Close condenser louvers (12) and draw wire (4) tight.	
	d. Tighten post screw (l).	
	e. Check to see that louvers(13) are tightly closed when air conditioner is off.	
	f. Assure that all external screws (6) are tight.	
Condenser Guard		
Installation	a. Install condenser guard (14) using eight lock-washers (15) and eight screws (16).	
	b. Attach rear top cover.	See paragraph 4.17.
	c. Attach fabric cover.	See paragraph 4.16.

4.21 CONDENSER AIR DISCHARGE LOUVER AND LINKAGE. -Continued

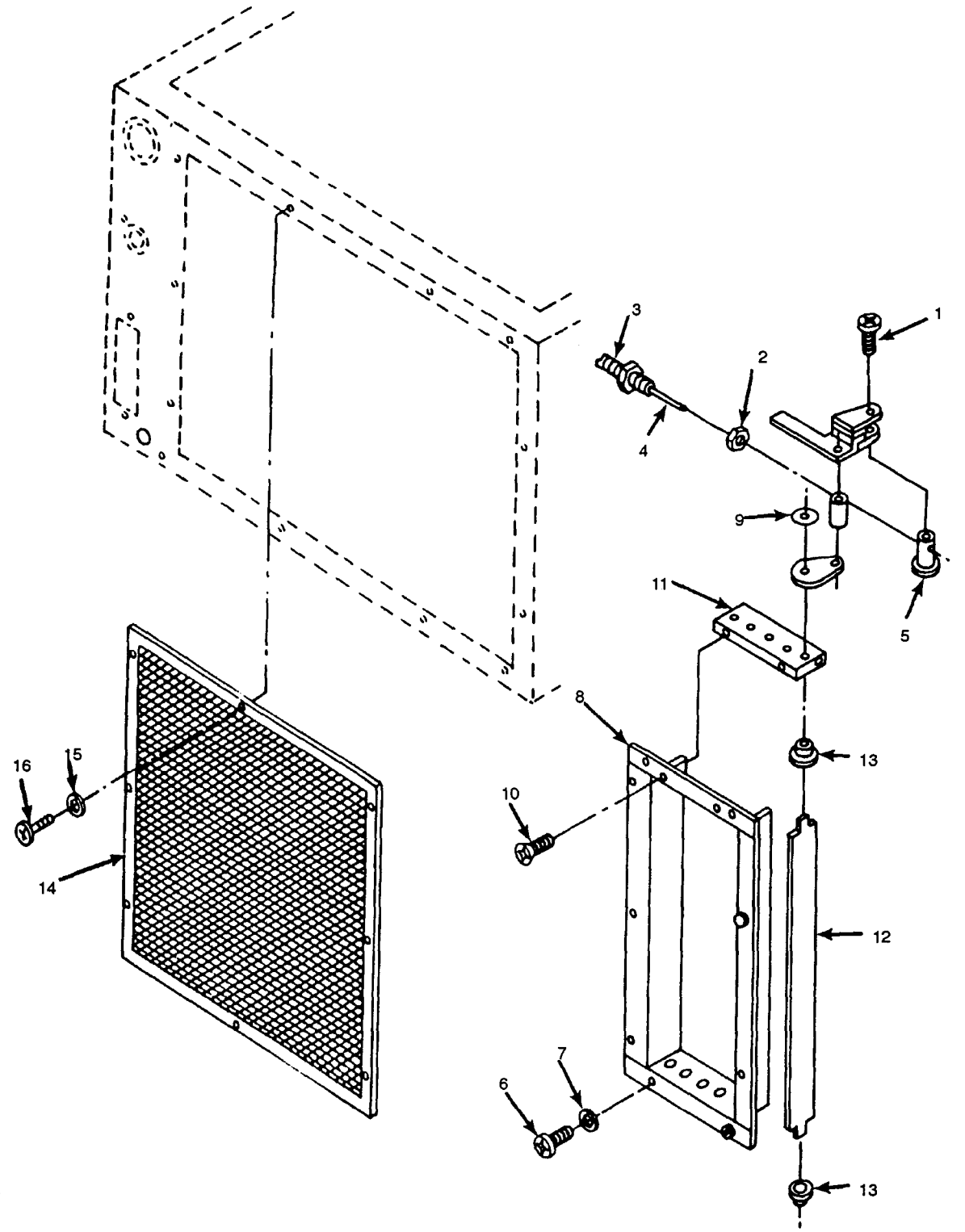


Illustration for paragraph 4.21.

4.22 FRESH AIR DAMPER AND ACTUATOR-INSPECT/SERVICE/RE PLACE/ADJUST. This task covers removal, inspect, cleaning, installation and adjustment.

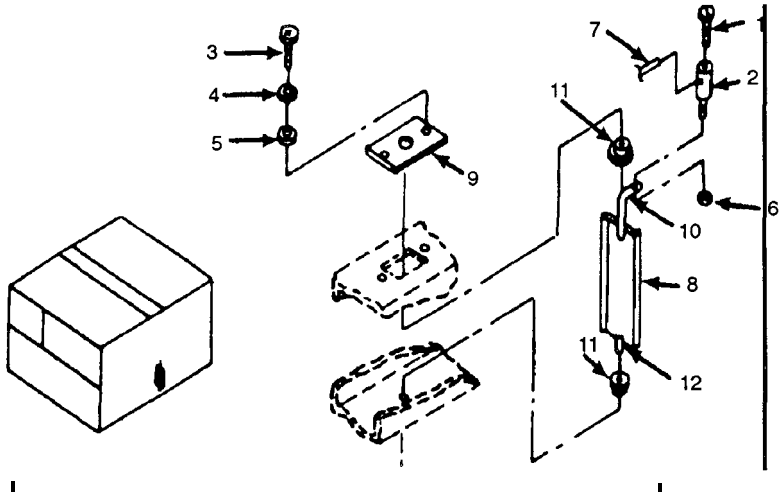
INITIAL SETUP

Materials/Parts:
Dry cleaning solvent (Item 16, Appendix E)
Cloth, lint free (Item 9, Appendix E)

Special Tool:
Off-set phillips screwdriver

Equipment Conditions:
Top covers removed (paragraph 4.17)
Evaporator inlet and outlet louvers removed (paragraph 4.18)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Fresh Air Ventilation Damper Removal	a. Loosen post screw (1) on mechanical post (2). b. Remove two screws (3), two lockwashers (4), and two flat washers (5).	

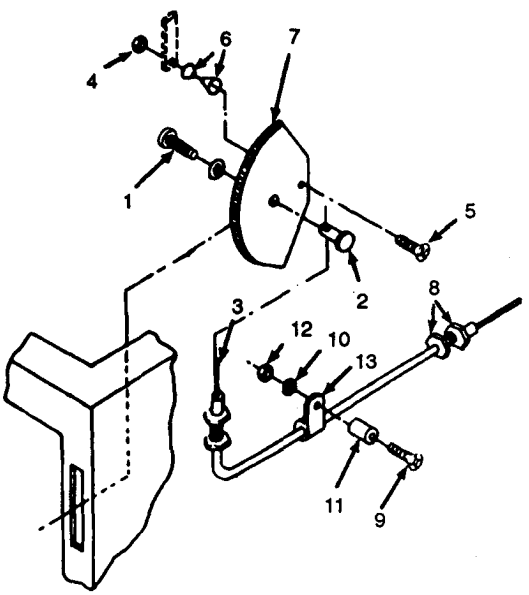


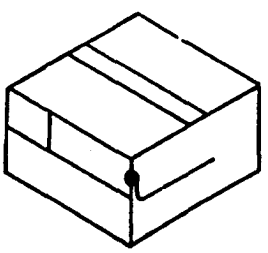
c. Remove hex nut (6).

d. Disconnect push-pull control cable wire (7) from mechanical post (2).

4.22 FRESH AIR DAMPER AND ACTUATOR. - Continued

Location/Item	Action	Remarks
Removal - Continued	e. Lift fresh air ventilation damper assembly (8) from fresh air duct. f. Remove the damper cover (9) from the upper damper arm (10). g. Remove the top and bottom damper bearings (11) from the upper damper arm (10) and the lower damper arm (12).	
ventilation Control Actuator		
Rernoval	a. Loosen post screw (1) on mechanical post (2). b. Disconnect push-pull control cable wire (3) from mechanical post (2). c. Remove nut (4), screw (5), and two spring washers (6) from center hole of actuator (7) and housing.	





	d. Remove ventilation control actuator (7).	

4.22 FRESH AIR DAMPER ACTUATOR. - continued

Location/Item	Action	Remarks
Push-Pull Control Cable		
Removal	a. Remove two outer sheath retaining nuts (B) on push-pull control cable (3).	
	b. Remove screw (9), lockwasher (10), spacer (11), nut (12), and clamp (13).	
	c. Remove push-pull control cable (3) from unit.	
Fresh Air Ventilation Damper		
Inspection	a. Inspect ventilation damper for bends and breaks.	
	b. Inspect rubber seal for damage.	
	c. Inspect damper plate for bending or warping.	
	d. Inspect bearing for cracks and excessive wear.	
Ventilation Control Actuator		
Inspection	Inspect for cracks, chips or warps.	
Push-Pull Control Cable		
Inspection	a. Pull control wire from sheath.	
	b. Inspect wire and sheath for fraying, kinking, or breaks.	
Fresh Air Ventilation Damper		
Clean	a. Wipe off dirt with clean dirt free cloth (Item 9. Appendix E). For stubborn dirt, wash with warm soapy water and lint free cloth.	

4.22 FRESH AIR DAMPER AND ACTUATOR. - Continued

Location/Item	Action	Remarks
Clean - Continued	**WARNING** Dry cleaning solvent (P-D-680) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near flame or excessive heat. b. Carefully scrape away all adhesive from damper cover and opening, and clean with dry cleaning solvent (Item 16, Appendix E).	
Push-Pull Control Cable		
Clean	a. Clean control cable wire and sheath using dry cleaning solvent (Item 16, Appendix E) and lint free cloth (Item 9, Appendix E). b. Slide control wire into sheath.	
Ventilation Control Actuator		
Clean	Wipe off loose dirt using lint free cloth (Item 9, Appendix E). For stubborn dirt, wash with warm soapy water using lint free cloth (Item 9, Appendix E) and rinse.	
Fresh Air Ventilation Damper		
Repair	a. Straighten damper and cover if possible. Replace if necessary. b. Remove and replace cellular rubber seals on damper, if necessary, using cellular rubber strips (Item 19, Appendix E), acid swab brush, and adhesive (Item 18, Appendix E). c. Replace vent damper bearings as necessary.	
Push-Pull Control Cable		
Repair	Straighten out minor kinks and bends in control wire and sheath, or replace as necessary.	

4.22 FRESH AIR DAMPER AND ACTUATOR. - continued

Location/Item	Action	Remarks
Ventilation Control Actuator		
Repair	Straighten if possible. Replace as necessary.	
Fresh Air /ventilation Damper		
Installation	a. Install the top and bottom damper bearings (11) onto lower damper arm (12) and the upper damper arm. b. Slide damper cover (9) over the upper damper arm (10). c. Install mechanical post (2) and screw (1) to damper arm using locknut (6). d. Apply thin bead of adhesive (Item 18, Appendix E) around damper cover opening. e. Install damper (8). f. Slide damper cover (9) into position and firmly press down to ensure good seal. g. Slide push-pull control cable wire (7) into mechanical post (2). h. Install two screws (3), two lockwashers (4), and two flat washers (5) into damper cover and tighten. i. Tighten screw (1) of mechanical post (2) atop upper damper arm (1 0).	
Push-Pull Control Cable		
Installation	a. Slide control cable (3) through housing bulkhead. b. Slide two retaining nuts (8) over control cable wire ends (3). c. Install clamp (13) with screw (9), spacer (11), lockwasher (10), and nut (12) to bulkhead.	

4.22 FRESH AIR DAMPER AND ACTUATOR.- continued

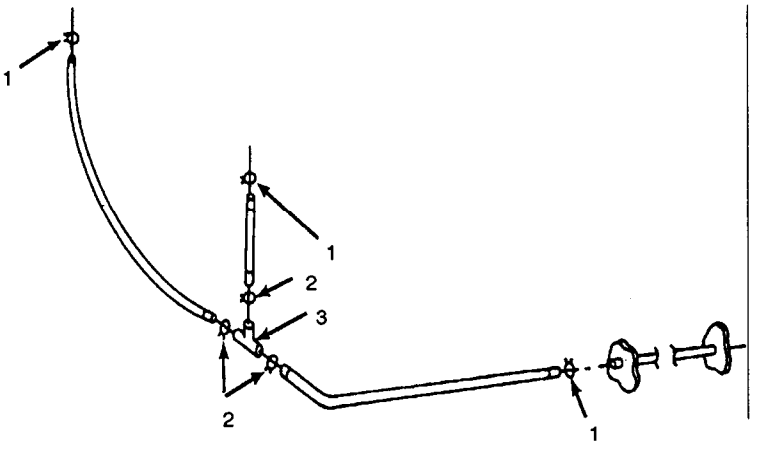
Location/Item	Action	Remarks
Installation Continued	d. Slide control cable wire ends into mechanical posts (2).	
	e. Tighten control cable retaining nuts (8).	
	f. Tighten screws (1) to mechanical posts (2).	
Ventilation Control Actuator		
Installation	a. Slide control actuator (7) into position on unit.	
	b. Install screw (5), two spring washers (6) and nut (4) that hold control actuator (7) in position.	
	c. Slide push-pull control cable wire (3) into mechanical post (2).	
	d. Tighten screw (1) to mechanical post (2).	
Adjustment	a. Position control actuator (7) to fully closed position.	
	b. Loosen screw (1) from mechanical post (2) of fresh air damper.	
	c. Position fresh air damper to fully closed position by hand while looking down vent housing from evaporator fan motor compartment with flashlight.	
	d. Tighten screw (1) on mechanical post (2).	
	e. Shine flashlight into fresh air damper screen side of unit (read side) while looking into vent housing from evaporator fan motor compartment. Ensure no light can be seen around edges of damper seal. If fails, repeat adjustment procedure. If fails again, service or replace fresh air damper as necessary.	
	f. Install evaporator inlet and outlet louvers.	See paragraph 4.18.
	g. Install top covers.	See paragraph 4.17.

4.23 CONDENSER DRAIN TUBE-INSPECT/SERVICE/REPLACE. This task covers removal, disassembly, cleaning, assembly and installation.

INITIAL SETUP

Materials/Parts:
Water, warm soapy
Wire, soft 10-12 gage

Equipment Conditions:
Front top cover removed (paragraph 4.17)
Evaporator inlet louver removed (paragraph 4.18)
Mist eliminator removed (paragraph 4.20)

Location/item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Removal	a. Loosen three tube clamps (1) attaching the tubing to the housing.	
		
	b. Remove drain tube assembly from inside evaporator inlet compartment.	
disassembly	Remove three clamps (2) at tee fitting (3).	
Cleaning	a. Clean tubing using warm soapy water or replace.	
	b. Clear obstructions from drains at bottom of evaporator compartment using soft wire.	Under mist eliminator.

4.23 CONDENSER DRAIN TUBE. - continued

Location/Item	Action	Remarks
cleaning . Continued	c. Clear obstructions from drain outlet using soft wire.	Insert from evaporator drain opening.
	d. Replace damaged tubing, tee, pipe plug, mist eliminator, or hose clamps as necessary.	
Installation	a. Reassemble tubing and tee (3) using three clamps (2).	
	b. Install drain tube assembly on evaporator drains using three hose clamps (1).	
	c. Install mist eliminator.	See paragraph 4.20.
	d. Aline and install front top cover.	See paragraph 4.17.
	e. Install evaporator inlet louver,	See paragraph 4.18.

4.24 CONTROL MODULE-REPAIR/REPLACE. This task covers removal, disassembly, repair, inspection, test, replacement, reassembly and installation.

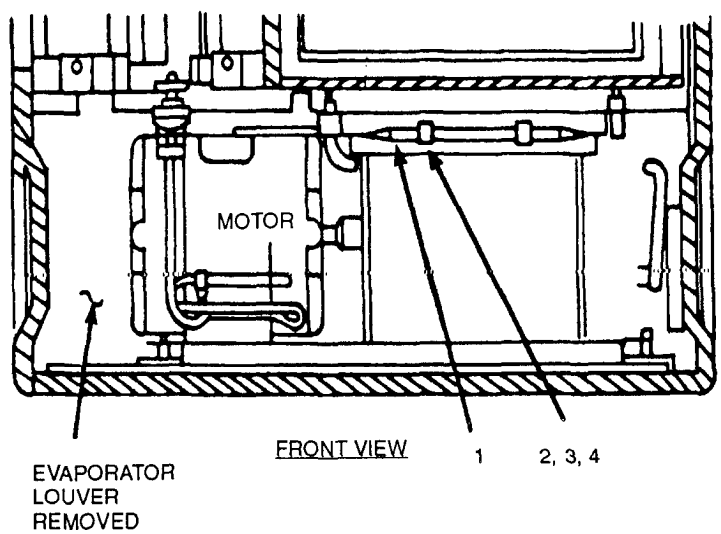
INITIAL SETUP

Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment:
Multimeter

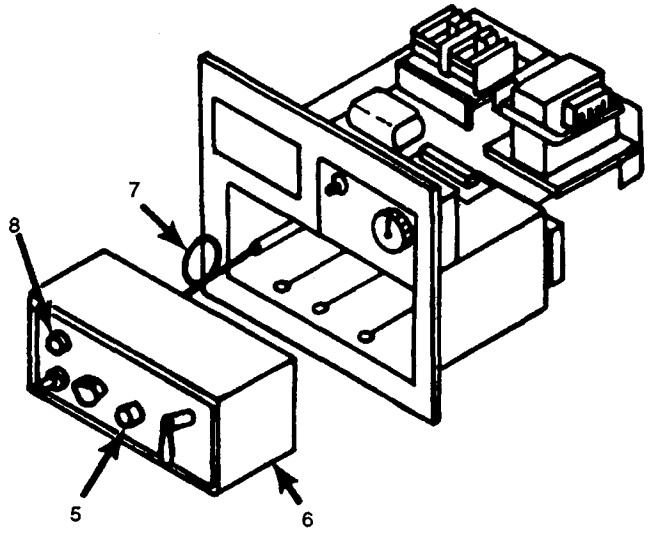
Equipment Condition:
Evaporator inlet louver removed (paragraph 4.18)

Location/Item	Action	Remarks
Control Module	**WARNING** Disconnect power from air conditioner before removing control module.	
Removal	a. Remove Temperature Selector switch sense bulb (1) from top of evaporator fan housing by removing two clamps (2) attached with two screws (3) and two lockwashers (4).	Take care not to break or kink sensing line (7) while removing from mounting place.



	b. Turn connector post (5) counterclockwise until post is disengaged.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Removal Continued		
	c. Pull control module (6) straight out of junction box.	
	d. Carefully pull temperature sensing line (7) and bulb through slot in bottom of junction box.	
Control Module		
disassembly	a. Remove Temperature Control switch knob (6) by loosening hex setscrew (7) and nut (8).	
	b. Remove four screws (9) attaching cover (10) to frame and slide cover (10) from module.	
	c. Remove three screws (11) attaching frame posts (12) that hold front (13) and back (14) plates together.	
	d. Pull front (13) and back (14) plates apart until connector posts (12) clear front (13) plate.	
	e. Remove wire ties (15) from wires as required,	
Control Module Cover		
Repair	a. Remove nicks, dents or deformation, if minor.	
	b. Prime and paint as necessary.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
designation Plate		
Repair	a. Remove dents or deformation, if minor. Replace if major.	
	b. Replace if illegible.	
Frent and Back Plate		
Repair	a. Remove dents or deformation, if minor. Replace if major.	
	b. Replace if cracked.	
Frame Posts		
Repair	a. Straighten posts if bend is minor.	
	b. Replace if bend is major.	
Temperature Selector Switch		
Inspect ion	a. Turn temperature control knob from stop-to-stop to ensure smooth operation. Replace if binding occurs.	
	b. Inspect temperature control knob for chips, cracks, or if indicator line cannot be readily seen. Replace if found.	
	c. Inspect sensor bulb and line for kinks, excessive bends, nicks, breaks, or cuts. Replace if found.	
	d. Inspect sensor line grommet for tears, cracks, and general deterioration. Replace if found or missing.	
Evaporator Fan Speed Switch		
Inspection	a. Inspect contacts. Replace switch if damaged.	
	b. Inspect contact leads for damage or corrosion. Clean if minor or replace if major.	
	c. Inspect wiring for breaks or damage. Replace if found.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Inspection . Continued	d. Inspect switch for distinct click when changing positions. Replace switch if not found.	
Mode Selector Switch		
Inspection	a. Inspect selector knob for chips, stripping out, cracks, or damage. Replace if found.	
	b. Inspect contacts. Replace switch if damaged.	
	c. Inspect wiring for breaks or damage. Replace if found.	
	d. Inspect for distinct click when changing positions. Replace switch if not found.	
Compressor Circuit Breaker		
Inspection	a. Inspect toggle for chips, cracks, or damage. Replace switch if found.	
	b. Inspect contacts. Replace switch if damaged.	
	c. Inspect wiring for breaks or damage. Replace if found.	
	d. Inspect for distinct click and engagement of switch when placed in ON position, Replace if found.	
	e. Inspect for smooth motion to OFF position. Replace if not found.	
Connector With Leads (Wiring)		
Inspection	a. Inspect contacts. Replace connector if damaged.	
	b. Inspect wiring for breaks, fraying, discoloration, or damage. Replace if found.	
	c. Inspect soldered connections for breaks or damage. Repair or replace if found.	
	d. Inspect pins for bending or corrosion. Straighten bent pins if possible. Clean minor corrosion Replace if necessary.	

4.24 CONTROL MODULE. - continued

Location/Item	Action	Remarks
Inspection - Continued	e. Inspect electrical contacts for corrosion. Replace or clean as necessary.	
Temperature Selector Switch		
Test	a. Tag and disconnect leads.	
	b. Check for continuity using a multimeter on the lowest ohm setting. Place probes on the red and blue terminals.	See fig. FO-2.
	c. Turn switch to COOLER (fully counterclockwise). No continuity should exist.	Switch operates in temperature range of 94°F to 56° F 34°C to 13 °C). If out of range, immerse bulb in water.
	d. Turn switch to WARMER (fully clockwise). Meter should show continuity as setting becomes higher than bulb temperature.	
	e. Place multimeter probes on red and yellow terminals.	
	f. Turn switch to WARMER (fully clockwise). No continuity should exist.	
	g. Turn switch to COOLER (counterclockwise). Meter should show continuity as setting becomes lower than bulb temperature.	
	h. Replace if fails above indications.	
Evaporator Fan Speed Switch		
Test	a. Tag and disconnect leads.	
	b. Check for continuity in LOW and HIGH SPEED position using a multimeter on the lowest ohm setting.	See fig. FO-2.
	c. In LOW SPEED position, there should be continuity between contacts A2 to A3, and between B2 to B3. No continuity should exist between A1 to A2 and B1 to B2.	
	d. In HIGH SPEED position, there should be continuity between B1 to B2 and A1 to A2. No continuity should exist between B2 to B3 and A2 to A3.	

4.24 CONTROL MODULE. -Continued

Location/Item	Action	Remarks
Test Continued	e. Replace if fails test.	
Mode Selector Switch		
Test	a. Tag and disconnect leads.	
	b. Check for continuity using a multimeter and switch position chart shown below. With switch position closed, continuity should be indicated. With switch position open, no continuity should be indicated. Check between each set of contacts and at each switch position.	See fig. FO-2.
	c. Replace if fails test.	

Position	Function	Switch Sections and Terminals Connected			
		SIA	SIB	SIC	SID
1	HEAT (HIGH)	12 and 1A	21 and 2C 22 and 2B	31 and 3C 32 and 3A	41 and 4C
2	HEAT (LOW)	12 and 1A	21 and 2C 22 and 2B	———	———
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	31 and 3C	Not Used

Compressor Circuit Breaker		
Test	a. Tag and disconnect leads,	
	b. Check for continuity in ON position between contacts A1 to A2, 61 to B2, and C to NO. Continuity should exist. No continuity should exist between these contacts in the OFF position.	See fig. FO-2.
	c. Replace if fails test.	
Control Module Wiring Harness		
Test	a. Tag and disconnect leads.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Test Continued	b. Check for continuity by touching the test probes of a continuity tester or multimeter set on low-resistance range, to the ends of wire and/or the corresponding pin of connector.	See fig. FO-1. and fig. FO-2.
	c. Replace pins and wire if not found.	
Temperature Selector Switch		
Replacement	a. Remove screw (16), nut (17), flat washer (18), and spacer (19) from capillary clamp (20).	NOTE Switches are not repairable and may only be replaced.
	b. Remove clamp (20).	
	c. Remove four screws (21), four flat washers (22), and four nuts (23) attaching switch to back plate (14).	
	d. Remove switch (24) from control module.	
	e. Clean contacts. Replace switch if contacts are damaged.	
	f. Replace if failed test.	
	g. Replace grommet (25) if damaged.	
	h. Reassemble into control module if passed test.	
Evaporator Fan Speed Switch		
Replacement	a. Remove two mounting nuts (26), lockwasher (27), and lockring (28).	
	b. Slide switch (29) out backside of front panel (1 3).	
	c. Clean contacts. Replace switch if contacts are damaged.	
	d. Replace if failed test.	
	e. Reassemble into control module if passed test.	
Mode Selector Switch		
Replacement	a. Remove selector knob (30) by loosening set screw (31).	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Replacement Continued	b. Remove mounting nut (32) and lockwasher (33).	
	c. Slide switch (34) through back of front plate (13).	
	d. Clean contacts. Replace switch if contacts are damaged.	
	e. Replace if failed test.	
	f. Reassemble into control module if passed test.	
Compressor Circuit Breaker		
Replacement	a. Remove pin and middle section of throw switch,	
	b. Remove four screws (35) and four flat washers (36) securing switch to front plate (13).	
	c. Slide switch (37) through back of front plate (13).	
	d. Clean contacts. Replace switch if contacts are damaged.	
	e. Replace if failed test,	
	f. Reassemble in control module if passed test.	
Control Module Wiring Harness		
replacement	a. Remove screw (16), flat washer (18), post spacer (19), locknut (17), and clamp (20) securing Temperature Selector switch sensing line to back plate (14).	
	b. Remove seven screws (38), seven flat washers (39), and seven locknuts (40) securing connector plug (41) to back plate (14).	
	c. Remove connector with leads (41) from back plate (14).	
	d. Replace wires if damaged or failed test.	
	e. Desolder wire from connector pin.	
	f. Measure old wire and cut new wire to that length.	
	g. Strip insulation from wire ends.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Replacement - Continued	h. Crimp required contacts on appropriate wire ends.	
	i. Print wire identification number on shrink sleeving and shrink on appropriate wire end.	
	j. Solder wire to appropriate connector pin.	
	k. Straighten and clean any bent or dirty pins on connector plug.	
	l. Replace connector plug with leads.	
Control Module Wiring Harness		
Installation	a. Install connector with leads (41) into back plate (14).	
	b. Connect leads and disconnect tags.	
	c. Install seven screws (38), seven flat washers (39) and seven locknuts (40) and secure connector to back plate.	
	d. Install screw (16), flat washer (18), post spacer (19), locknut (17), and clamp (20) and secure Temperature Selector switch sensing line to back plate (14).	
Compressor Circuit Breaker		
Installation	a. Slide switch (37) into front plate (13) through backside.	
	b. Attach switch using four screws (35) and four flat washers (36).	
	c. Aline middle section of throw switch and insert pin.	
	d. Connect leads and remove tags.	
Mode Selector Switch		
Installation	a. Slide switch (34) into front plate (13) through backside.	
	b. Attach switch (34) using lockwasher (33) and mounting nut (32).	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Installation Continued	c. Install selector knob (30) and tighten set screw (31).	
	d. Connect leads and remove tags.	
Evaporator Fan Speed Switch		
Installation	a. Slide switch (29) into front panel through back-side.	
	b. Attach switch (29) using Iockring (28), lockwash-er (27), and two mounting nuts (26).	
	c. Connect leads and remove tags.	
Temperature Selector Switch		
Installation	a. Attach switch (24) to back plate (14) using four screws (21), four flat washers (22), and four nuts (23).	
	b. Install capillary tube clamp on capillary tube.	
	c. Attach capillary tube clamp (20) to back plate using screw (16), flat washer (18), locknut (17), and spacer (19).	
Control Module		
Installation	a. Add wire ties (15).	
	b. Push connector post through front plate pressing on front and back plates.	
	c. Attach three frame posts (12) with three screws (11).	
	d. Attach Temperature Control switch knob (6) by tightening hex setscrew (7).	
	e. Slide cover (10) over module and attach frame to cover with four screws (9).	
Control Module		
Installation	a. Carefully push sensing bulb and line (7, previous figure) through slot in bottom of junction box.	
	b. Push control module (5) straight into junction box.	

4.24 CONTROL MODULE. - Continued

Location/Item	Action	Remarks
Installation - Continued	c. Turn connector post screw (5) clockwise until post is fully engaged. d. Attach Temperature Selector switch bulb (1) atop evaporator fan housing with two clamps (2), two lockwashers (4), and two screws (3). e. Install evaporator inlet louver. f. Connect power.	 See paragraph 4.18.

4.24 CONTROL MODULE. - continued

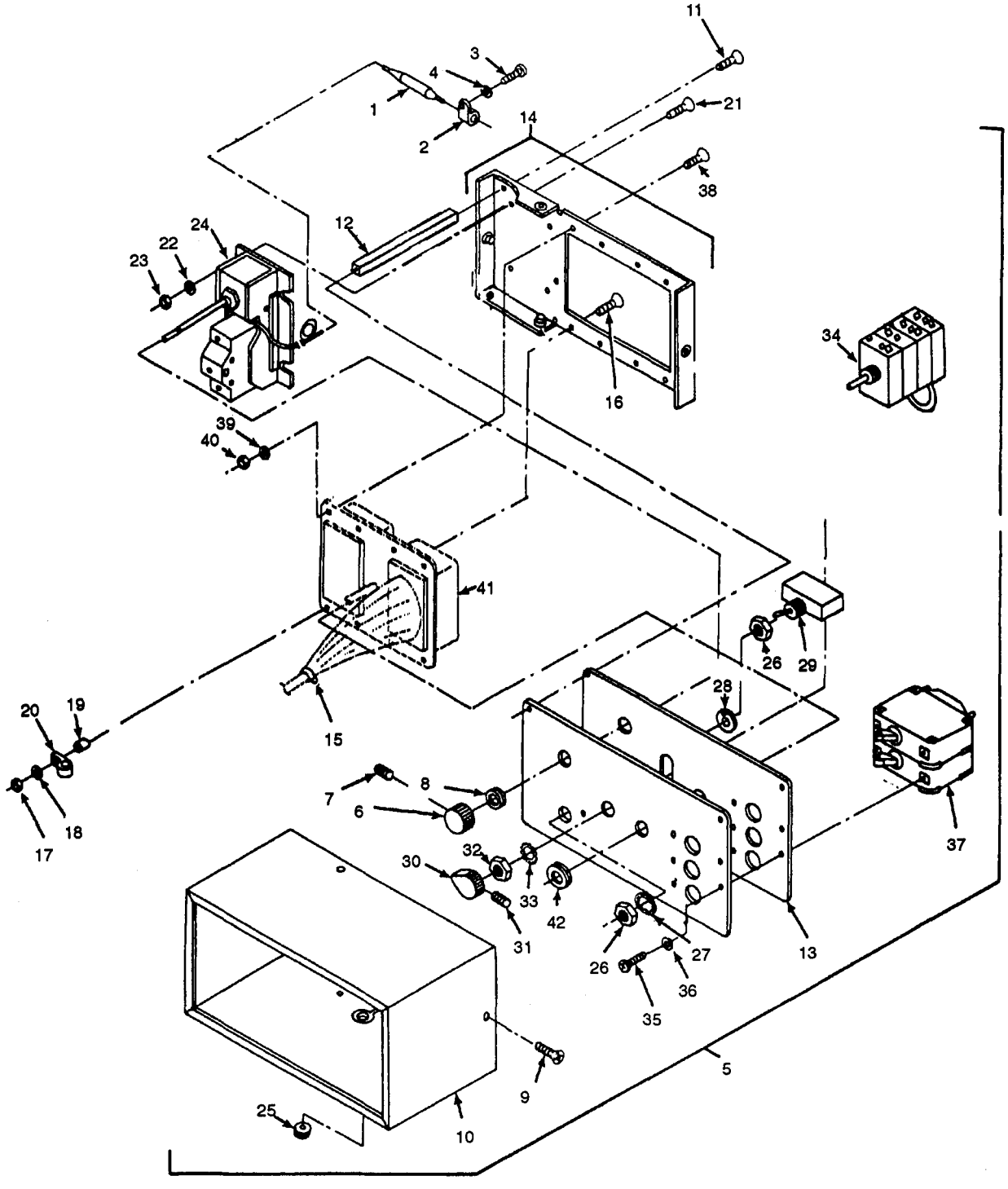


Illustration for paragraph 4.24.

4.25 JUNCTION BOX - INSPECT/REPAIR/REPLACE. This task covers removal, inspection, repair and installation.

INITIAL SETUP

Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment:
Mutimeter or continuity tester
Variable voltage power source (AC/DC)

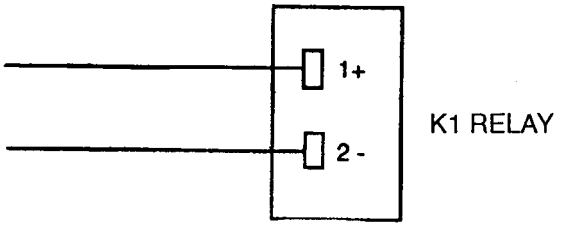
Equipment Conditions:
Top front cover removed (paragraph 4.17)
Evaporator inlet louver removed (paragraph 4.18)
Control module removed (paragraph 4.24)

Location/Item	Action	Remarks
Junction Box	**WARNING** Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Removal	a Remove seven screws (1) and seven lockwashers (2) that secure the junction box to the housing,	
	b. Partially remove the junction box by pulling it forward and out of the air conditioner.	Support the junction box to relieve the strain on wiring.
	c. It is not necessary to remove junction box completely from unit.	Most repairs and replacements can be made without removing junction box completely.
Junction Box		
Inspection	a. Inspect junction box for damage.	
	b. Inspect all designation part markings for illegibility.	
	c. Inspect all designation plates and instruction plates for damage and illegibility.	
	d. Replace damaged designation markings, instruction plates and designation plates.	
	e. Replace junction box if damaged enough to prevent normal operation of air conditioner.	

4.25 JUNCTION BOX. - Continued

Location/Item	Action	Remarks
Time Delay Relay (K1), Heater Relay (K2), Compressor Motor Relay (K3), Condenser Fan Motor Relay (K4)		
Inspection	a. Inspect relays for any external damage to housing or contacts. b. If damaged enough to prevent normal operation of relay, replace relay.	
Control Circuit Breaker (CB2)		
Inspection	a. Inspect control circuit breaker for external damage. b. Inspect toggle for distinct click and engagement of switch when placed in ON or OFF positions. c. Inspect contacts for damage. d. Replace circuit breaker if damaged enough to prevent normal operation.	
Terminal Board (TB1) and Marker Strip		
Inspection	a. Inspect terminal board (TB1) for dents, breaks, nicks or damaged terminals. b. If unrepairable, replace terminal board. c. Inspect marker strip for illegibility or damage. d. Replace marker strip if damaged.	
Time Delay Relay (K1) Model A9KH-115P		
Inspection	a. Tag and disconnect wire leads except for jumper wire between terminals 1 and 2. b. Use a continuity tester or a multimeter set on the lowest ohms scale on relay contacts 1 (+) to 5(-) and 2 to 4. Continuity should exist.	See fig. FO-1. and fig. FO-2.

4.25 JUNCTION BOX. - continued

Location/Item	Action	Remarks
Inspection . Continued	c. Continuity should not exist between relay contacts 2 to 3.	
	d. Set multimeter at appropriate DC voltage scale. Apply 24 ± 5 volts DC power across terminals 1 and 5. Voltage indicated should be 24 ± 5 volts DC. After approximately a 30-second time delay, voltages at terminals 1 and 3 should be 24 volts ± 5 volts DC. If not, replace.	
	e. Replace if fails test.	
Time Delay Relay (K1) Model F9000H–1S	a. Tag and disconnect wire leads to terminals 1 and 2.	See Fig FO-3 and Fig FO-4.
	b. Use a continuity tester or a multimeter set to the lowest ohms scale to check continuity between terminals 1 (+) and 2(–). Continuity should not be indicated.	
	c. Set multimeter at appropriate dc voltage scale. Apply 24 ± 5 volts dc power across terminals 1 and 2. Voltage indicated should be 24 ± 5 volts dc. After approximately a 30 second time delay, voltages at terminals 1 & 2 should be 24 ± 5 volts dc. If-not, replace.	
	d. Replace if fails test.	
		

4.25 JUNCTION BOX. - Continued

Location/Item	Action	Remarks
Heater Relay (K2) (both models), Compressor Motor Relay (K3) bothmodels), Condenser Fan Motor Relay (K4) (model A9KH-115P)		
Inspection	a. Tag and disconnect wire leads.	
	b. Use a continuity tester or multimeter. Set on the lowest ohm to check continuity between terminals Al1to A2, B1 to B2, and C1 to C2. All contacts should be open. If there is continuity, replace the relay.	See fig. FO-1. through fig. FO-4.
	c. Check continuity between terminals X1 and X2. If there is no continuity, the coil is open. Replace the relay.	
	d. Apply 24 volts DC across terminals X1 and X2 and repeat continuity checks between terminals Al and A2, B1 and B2, and C1 and C2. All three contacts should be closed. If there is no continuity, replace the relay.	
Condenser Fan Motor Relay (K4) (Model F9000H-1S)	a. Tag and disconnect wire leads.	See FO-3 and Fig FO-4
	b. Use a continuity tester or multimeter, set on lowest ohm scale, check continuity between teminals 1 to 3, terminals 5 to 11, and terminals 8 to 10. All contacts should be open. If there is continuity, replace relay.	
	c. Check continuity between terminals 2 and 9. If there is no continuity, the coil is open. Replace the relay.	
	d. Apply 24 volts dc across terminals 2 and 9. Repeat step b., above. All three contacts should be closed. If there is no continuity, replace relay.	
Control Circuit Breaker		
Inspection	a. Using a continuity tester or a multimeter set on the lowest ohms scale, check continuity between terminal contacts 1 and 2.	See fig. FO-1. through fig. FO-4.
	b. In the OFF position, no continuity should exist.	

4.25 JUNCTION BOX. - Continued

Location/Item	Action	Remarks
Inspection Continued	c. In the ON position, continuity should exist.	
	d. Replace if fails test.	
Junction Box		
Repair	a. Repair or straighten sheet metal parts.	disassembly is limited to replacement of individual components.
	b. Tag and disconnect the leads from components to be replaced.	
Time Delay Relay (K1) (model 49 KH-115P)		
Repair	a. Remove the time delay relay (K1) (4) from the junction box by removing four screws (5), four flat washers (6), and four nuts (7).	
	b. Install replacement time delay relay (K1) on the junction box (45).	
	c. Secure relay (4) to junction box (3) with four screws (5), four flat washers (6), and four nuts (7).	
Time Delay Relay (K1) {Model F9000H-1S)	a. Remove time delay relay K1 (48) from junction box by removing screws (45) flat washers (46) and nuts (46A).	
	b. Install replacement time delay relay K1 on junction box (69).	
	c. Secure time delay relay to junction box with screws, flat washers, and nuts removed in step a. above.	

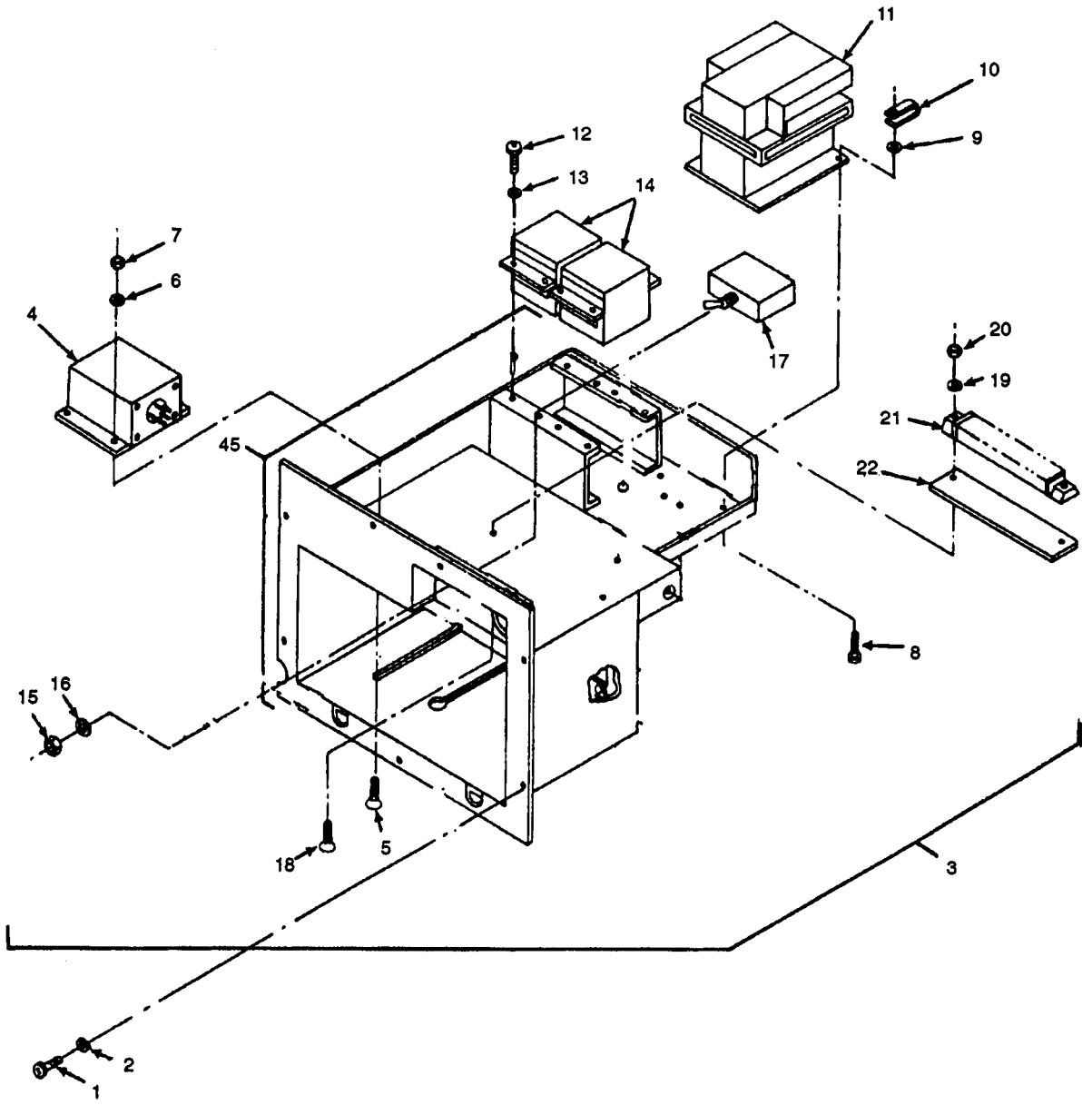
4.25 JUNCTION BOX. - continued

Location/Item	Action	Remarks
Heater Relay (K2)		Call out numbers indicate A9KH-115P/F9000H-1S)
Repair	a. Remove four screws (8/49), four flat washers (9/50) and four nuts (10/51). b. Remove the heater relay (K2) (11/52) from the junction box (45/69). c. Install replacement heater relay (K2) and secure relay (11 /52) with four screws (8/49), flat washers (9/50) and four nuts (10/51).	
Compressor Motor Relay (K3) and Condenser Fan Relay (K4) (Model A9KH-115P)		
Repair	a. Remove four screws (12) and four lockwashers (13). b. Remove compressor motor relay (K3) (14) or condenser fan motor relay (K4) (14) as required. c. Install replacement relay (K3 or K4) injunction box (45). d. Secure relay with four screws (12) and four lockwashers (13).	

4.25 JUNCTION BOX. - continued

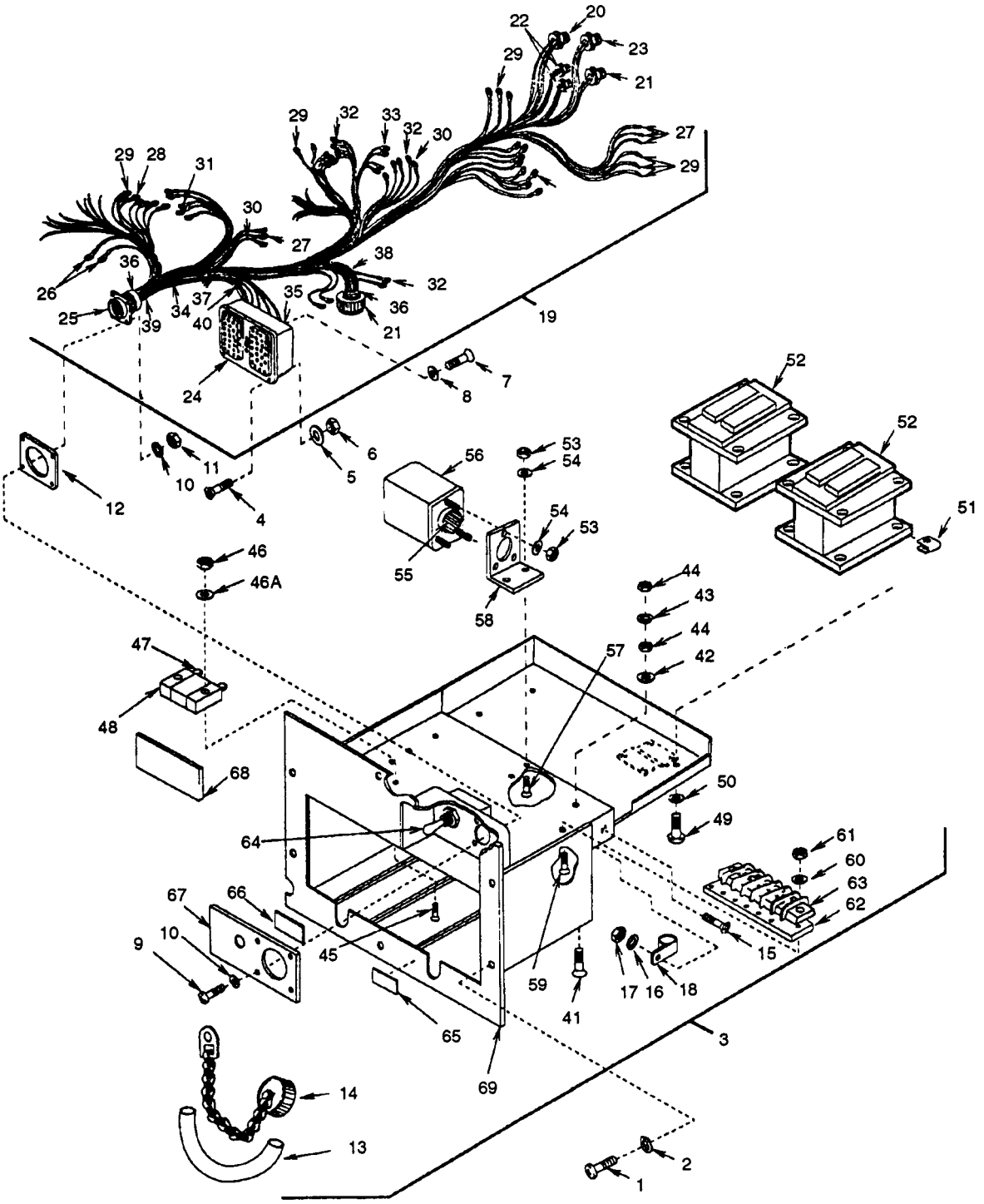
Location/Item	Action	Remarks
Condenser Fan Motor Relay K4 (Model F9000H-1S	a. Remove three lock nuts (53) and three flat washers (54).	
	b. Remove condenser fan motor relay K4 (55).	
	c. Install replacement relay in junction box (69).	
	d. Secure relay with three lock nuts and three flat washers removed in step a., above.	
Control Circuit Breaker (CB2)		Sail out numbers indicate (A9KH-115P/F9000H-1S)
Repair	a. Remove the circuit breaker mounting nut (15) and lockwasher (16) from front of the junction box and pull the circuit breaker (17/64) to the rear of the junction box (45/69).	
	b. Install replacement control circuit breaker (17/64) (CB2) through opening in junction box (45/69).	
	c. Install the circuit breaker mounting nut (15) and lockwasher (16) to secure circuit breaker (17/64).	
Terminal Board (TB1) and Marker Strip		Call out numbers indicate (A9KH-115P/F9000H-1S)
Repair	a. Remove two screws (18/59), two flat washers (19/60) and two nuts (20/61).	
	b. Remove terminal board (TB1) (21/62) and marker strip (22/62) from junction box (45/69).	
	c. Install replacement terminal board (TB1) (21/63) and marker strip (22/62) on junction box (45/69).	
	d. Secure to junction box using two screws (18/59), two flat washers (19/60) and two nuts (20/61).	
Junction Box		
Installation	a. Carefully install junction box in housing and secure with seven screws (1) and seven lockwashers (2).	
	b. Install the control module,	See paragraph 4.24.
	c. Install evaporator inlet louver.	See paragraph 4.18.
	d. Install top f rent cover.	See paragraph 4.17.

4.25 JUNCTION BOX. - Continued



Model A9KH-115P
Illustration for paragraph 4.25.

4.25 JUNCTION BOX. - continued



Model F9000H-1S
Illustration for paragraph 4.25.

4.26 JUNCTION BOX WIRING HARNESS-INSPECT/TEST/REPAIR/REPLACE. This task covers inspection, removal, test, repair and installation.

INITIAL SETUP

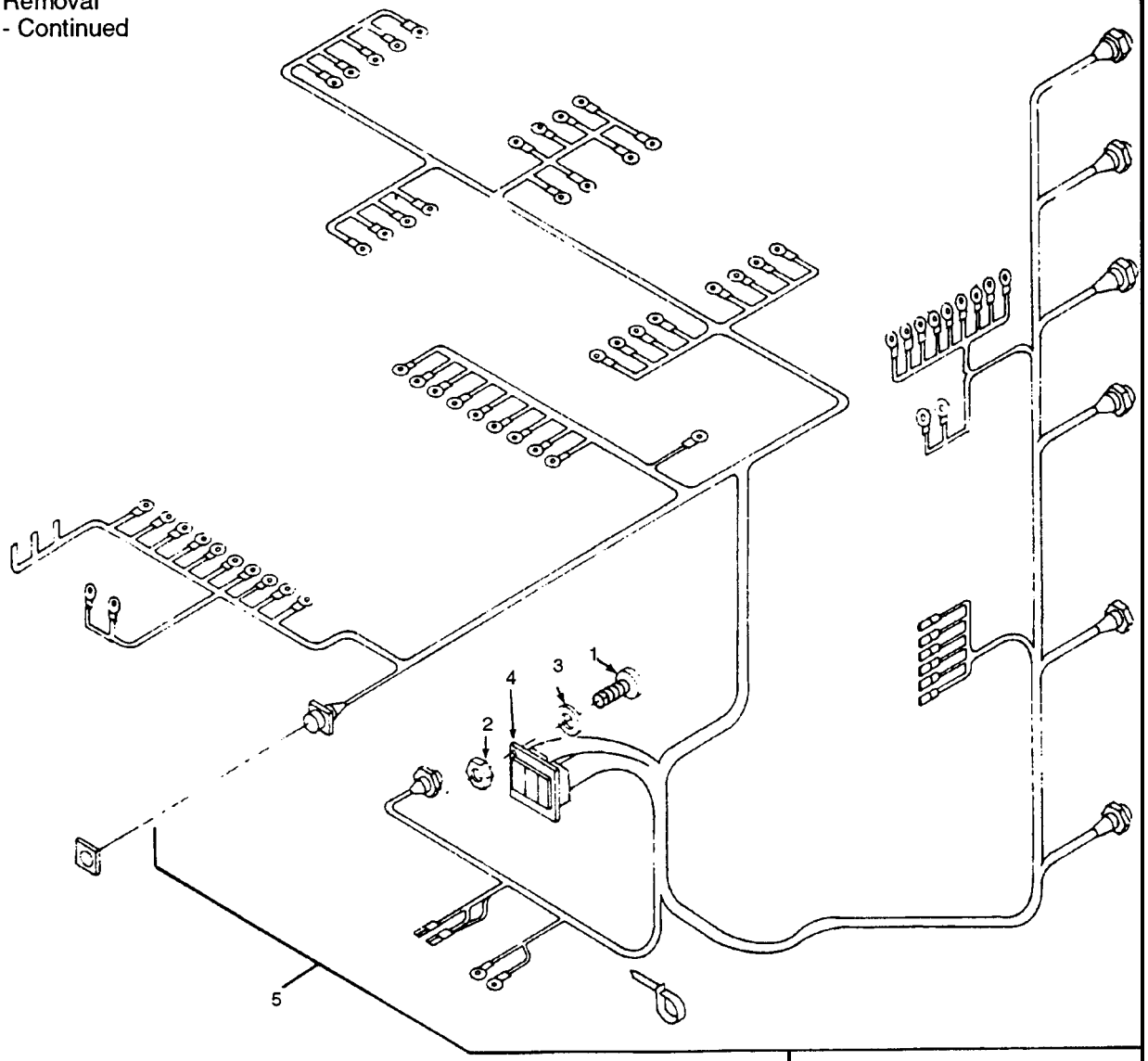
Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment
Multimeter
Continuity tester

Equipment Conditions:
Top covers removed (paragraph 4.17)
Evaporator inlet louver removed (paragraph 4.18)
Control module removed (paragraph 4.24)
Junction box partially removed (paragraph 4.25)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Inspection	a. Inspect all installed wiring for cracked or frayed insulation. Pay particular attention to wires passing through holes in the frame or routed around sharp edges.	
	b. Repair or replace bad wiring.	
	c. Inspect electrical connectors and fittings for damage.	
	d. Replace damaged connectors or fittings.	
Removal	a. Tag all wire leads prior to removal.	Use Wiring Diagram (Appendix F).
	b. Remove eight screws (1), eight nuts (2), and eight flat washers (3) to release connector (4) from housing.	
	c. Disconnect all connector plugs and terminals.	
	d. Carefully remove harness from unit.	

4.26 JUNCTION BOX WIRING HARNESS. - continued

Location/Item	Action	Remarks
Removal - Continued		
Test	a. Test for continuity on wiring harness. b. Touch the test probes of a continuity tester or multimeter set on low-resistance range to ends of wire and/or corresponding pin of connector. c. If continuity is not indicated, repair or replace wire or damaged connector.	

4.26 JUNCTION BOX WIRING HARNESS. - Continued

Location/Item	Action	Remarks
Repair	a. Remove the insulation to expose 1/2 inch/1.27 centimeters of bare wire on each side of break or damaged insulation.	
	b. Insert the ends into a splice-connector; splice and crimp the connector to make firm electrical contact.	
	c. Alternatively, heat-shrink tubing may be slipped over one end of the wire before splicing, then heated after the splice is made and soldered, so as to cover the spliced area.	
	d. Be sure that no bare wire is exposed after the splice is complete.	
	e. Replace broken terminal lugs with exact duplicates.	
	f. To replace electrical plugs or connectors, tag and unsolder wires from the solder-wells of the inserts.	
	g. Insert bare ends of the wires in corresponding holes of new insert, and solder in place.	
	h. Check continuity terminal-to-terminal.	
Installation	a. Transfer tags to new harness.	
	b. Install connector (4) using eight screws (1), eight nuts (2) and eight flat washers (3).	
	c. Connect all connector plugs and terminals and remove tags.	Use Wiring Diagram (Appendix F).
	d. Install junction box.	See paragraph 4.25.
	e. Install control module.	See paragraph 4.24.
	f. Install evaporator inlet louver.	See paragraph 4.18.
	g. Install top covers.	See paragraph 4.17.

4.27 COMPRESSOR START RELAY-INSPECT/TEST/REPLACE. This task covers removal, test and installation.

INITIAL SETUP

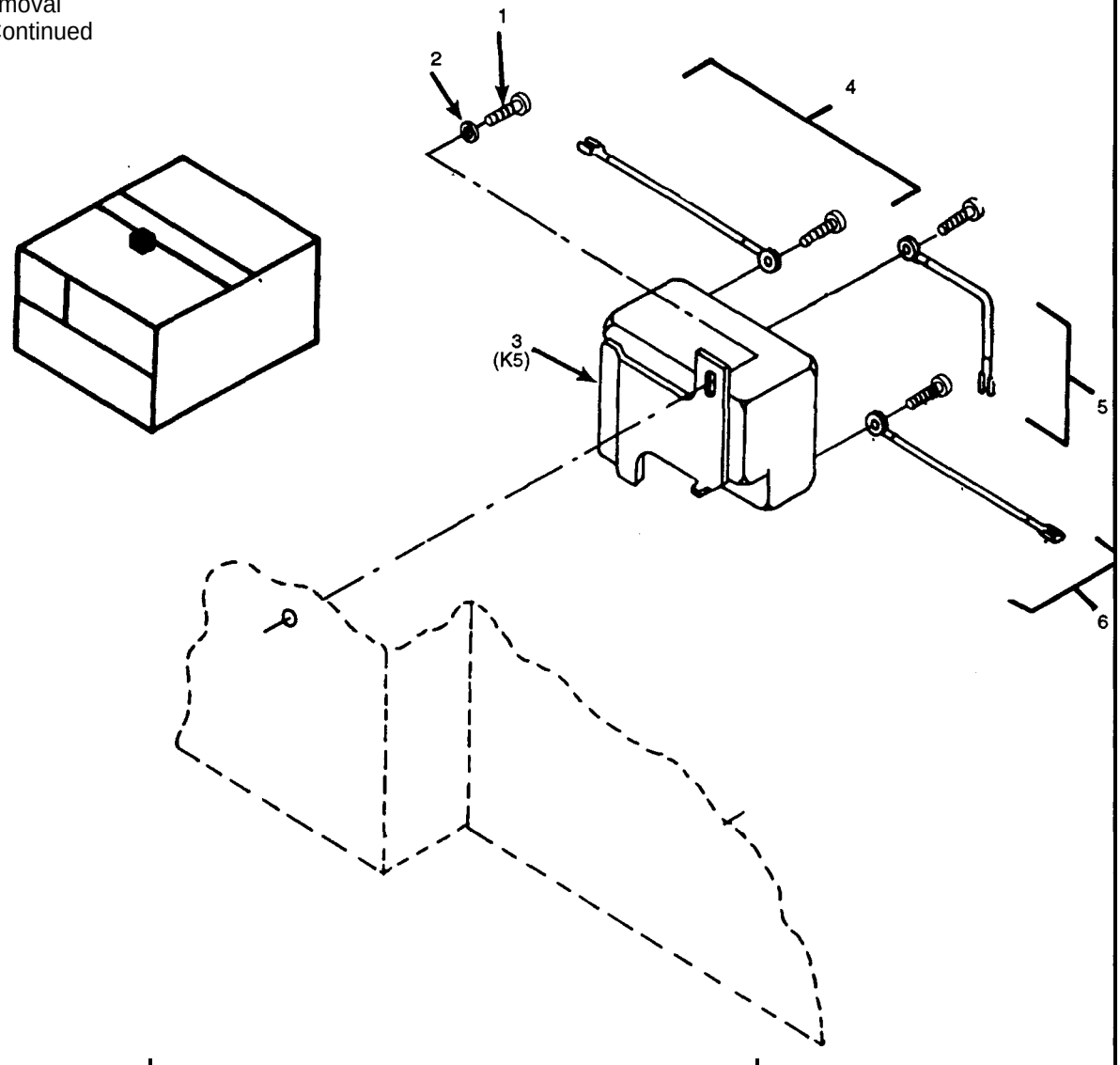
Materials/Parts:
Methyl-ethyl ketone (MEK) (Item 23, Appendix E)
Clean rags (Item 9, Appendix E)
Silicone adhesive sealant RTV (Item 1, Appendix E)

Test Equipment:
Multimeter

Equipment Condition:
Rear and center top cover removed (paragraph 4.17)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing maintenance work on the electrical system.	
Top Rear Removal	a. Remove screw (1) and lockwasher (2) from mounting tab and remove compressor start relay (K5) (3).	
	WARNING Methyl-Ethyl Ketone (MEK) is flammable and its vapors are explosive. Prolonged or repeated inhalation of fumes or contact with the skin can be toxic. Use in a well-ventilated area, wear gloves and keep away from sparks or flame.	
	b. Using methyl-ethyl ketone (MEK) (Item 23, Appendix E) and rag (Item 9, Appendix E), remove silicone adhesive sealant (RTV) from relay.	
	c. Tag and disconnect leads (4), (5), and (6) from the compressor start relay (K5) (3).	

4.27 COMPRESSOR START RELAY - Continued

Location/Item	Action	Remarks
Removal - Continued		
Test	a. Inspect for cracks, bent or missing mounting tab, bent or missing terminals, dents or other obvious defects. Replace if damaged/defective.	
	b. Check terminals 1-5,2-5, and 1-2 for continuity. If continuity does exist, relay is good and may be installed. If continuity does not exist, or if there is a short circuit, replace compressor start relay.	See fig. FO-1. and fig. FO-2.

4.27 COMPRESSOR START RELAY - Continued

Location/Item	Action	Remarks
Installation	a. Using tags as a guide, connect electrical leads (4), (5), and (6) to the compressor start relay (K5) (3) and remove tags. **WARNING** Silicone Adhesive Sealant RTV, Type 1, MI L-A-46106, releases acetic acid during application and curing. Use in well-ventilated area to stay below 10 ppm acetic acid. Avoid prolonged skin contact, prolonged inhalation of vapors, and eye contact. b. Coat the terminals and electric leads (1) with 1/8 inch of silicone adhesive sealant RTV (Item 1, Appendix E). c. Install the compressor start relay (K5) (3) using screw (1) and lockwasher (2) through mounting tab. d. Install rear and center top covers.	See paragraph 4.17.

4.28 UNIT WIRING HARNESS-INSPECT/TEST/REPAIR/REPLACE. This task covers inspection, removal, test repair and installation.

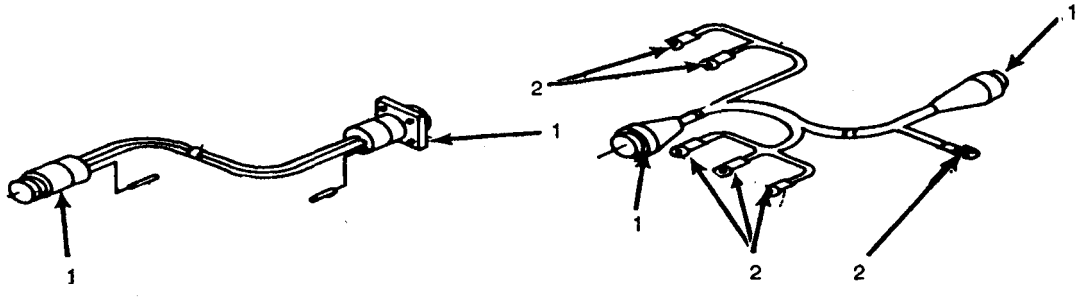
INITIAL SETUP

Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Equipment Condition:
Rear top cover removed (paragraph 4.17)

Test Equipment
Multimeter
Continuity Tester

Looation/item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Inspection	a. Inspect all installed wiring for cracked or frayed insulation. Pay particular attention to wires passing through holes in the frame or routed around sharp edges.	
	b. Repair or replace bad wiring.	
	c. Inspect electrical connectors (1) and terminal lugs (2) for damage.	
	d. Replace damaged connectors (1) or terminal lugs (2).	
Removal	a. Tag all wire leads prior to removal.	Use Wiring Diagram (Appendix F).
	b. Disconnect all connector plugs (1) and terminal lugs (2).	
	c. Carefully remove harness from unit.	



4.28 UNIT WIRING HARNESS. - Continued

Location/Item	Action	Remarks
Test	a. Test for continuity on wiring harnesses.	
	b. Touch the test probes of a continuity tester or multimeter set on low-resistance range to ends of wire and/or corresponding pin of connector.	
	c. If continuity is not indicated, repair or replace wire or damaged connector.	
Repair	a. Remove the insulation to expose 1/2 inch/1.27 centimeters of bare wire on each side of break or damaged insulation.	
	b. Insert the ends into a splice-connector; splice and crimp the connector to make firm electrical contact.	
	c. Alternatively, heat-shrink tubing may be slipped over one end of the wire before splicing, then heated after the splice is made and soldered, so as to cover the spliced area.	
	d. Be sure that no bare wire is exposed after the splice is complete.	
	e. Replace broken terminal lugs with exact duplicates.	
	f. To replace electrical plugs or connectors, tag and unsolder wires from the solder-wells of the inserts.	
	g. Insert bare ends of the wires in corresponding holes of new insert and solder in place.	
	h. Check continuity terminal-to-terminal.	
Installat ion	a. Transfer tags from old cable to new cable.	
	b. Connect all connectors (1) and terminal lugs (2) and remove tags.	Use Wiring Diagram (Appendix F).
	c. Install rear top cover.	See paragraph 4.17.

4.29 CAPACITORS-INSPECT/TEST/REPLACE . This task covers removal, test and installation.

INITIAL SETUP

Equipment Condition:
Rear top cover removed (paragraph 4.17)

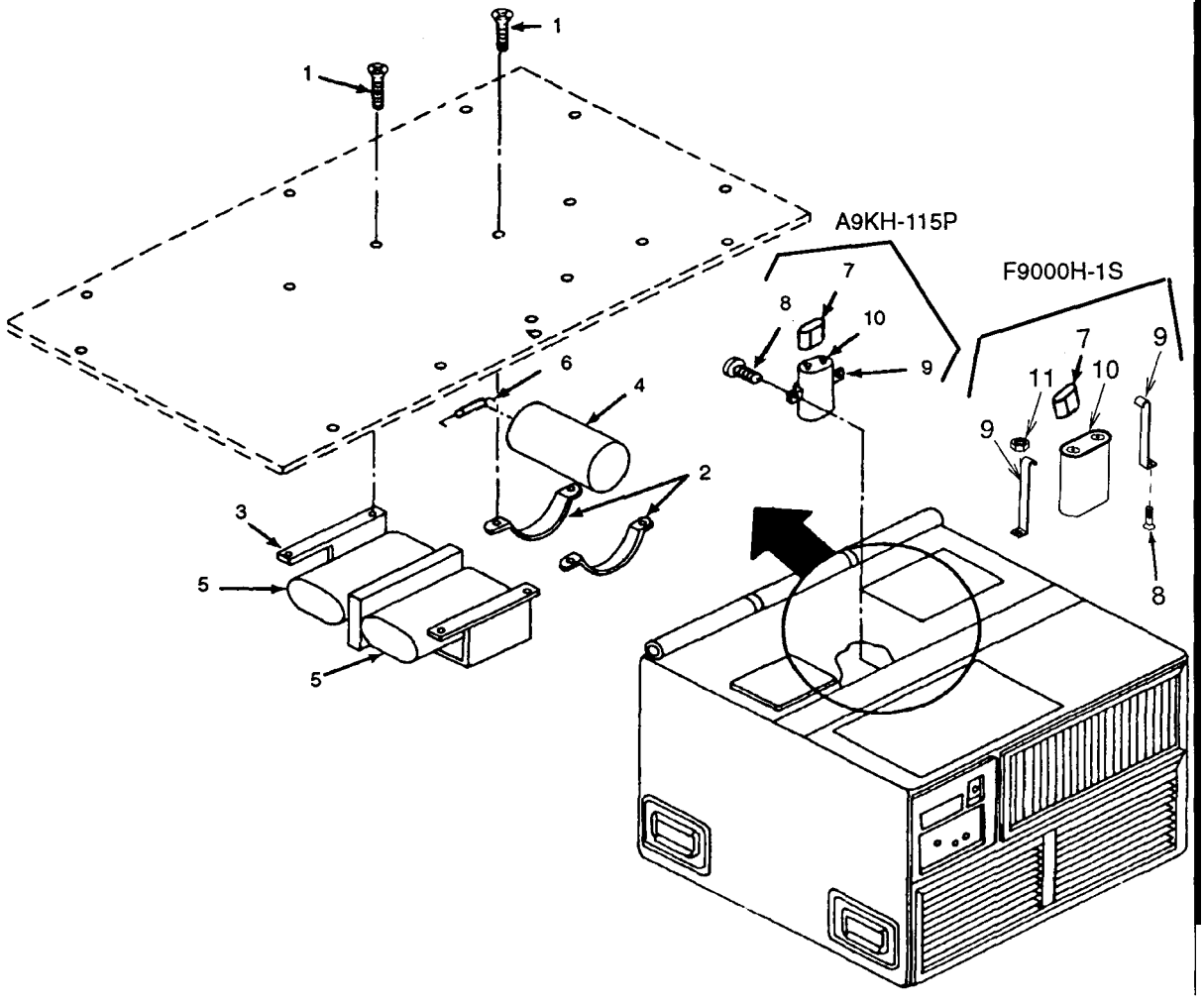
Test Equipment:
Multimeter or ohmmeter

Special Tool:
Offset screwdriver

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing maintenance work on electrical system. **WARNING** Ground all capacitors before touching.	
Fan Motor and Compressor Start Capacitors		
Removal	a, Loosen eight screws (1) securing straps (2 and 3) holding capacitors to underside of rear top cover. Do not remove straps. b. Remove capacitors (4 and 5) by sliding out from under straps (2 and 3). c. Desolder resistor (6) from compressor start capacitor (4) terminals.	Removal is only necessary when capacitors are to be redated.
Compressor Run Capacitor		
Removal	a. Slide rubber boot (7) away from leads. b. Using an instrument with an insulated handle, discharge capacitor, c. Tag and disconnect leads. (Model A9KH-115P) Loosen strap screw (8) using offset screwdriver. (Model F9000H-1S) remove screws (8) and nuts (11) using screwdriver and wrench. d. Remove compressor run capacitor (10) from straps (9).	

4.29 CAPACITORS. -continued

Location/Item	Action	Remarks
Removal - Continued		



Fan Motor Capacitors (6) and Compressor Start Capacitor [3]		
Test	a. Check for internal condition by placing the test leads of an ohmmeter on the terminals of the capacitor.	

4.29 CAPACITORS. - continued

Location/Item	Action	Remarks
Test - Continued	b. Ohmmeter needle should move rapidly toward top of the scale; then, slowly return toward zero if the capacitor is good. c. If needle moves to top of scale and remains there, the capacitor is internally short-circuited; if the needle does not move, the capacitor contains an open circuit. d. Replace capacitors with short/open circuits. e. If the capacitors have a metal case, check also for shorts to case. f. There will be no deflection of the ohmmeter needle if the capacitor is good. If the needle does deflect, replace the capacitor. g. Check compressor start capacitor resistor with ohmmeter. Nominal value 15 kiloohms plus/minus 20% (Range 12,000-18,000 ohms). If defective, discard and replace. Resolder serviceable start capacitor terminals, **NOTE** Compressor start capacitor (C5) is installed on all units. When compressor (97403) 13208E4120-10 is used this capacitor is not connected. Wires from capacitor (C5) are connected to dummy terminal board TB4 on units with 13208E4120-10 compressors. See wiring diagram fig. FO-3.	
Compressor Run Capacitor (10)		
Test	a. Test capacitor (10) for internal leakage and short or open circuits by using an ohmmeter set at maximum resistance. b. Check for internal condition by placing the test leads of an ohmmeter on the terminal of the capacitor. Place positive (+) lead to positive terminal and negative (-) lead to negative terminal. The ohmmeter needle should move rapidly toward top of scale; then slowly return toward zero if capacitor is good. If needle moves to top of scale and remains there, the capacitor is internally short-circuited; if the needle does not move, the capacitor contains an open circuit. Replace capacitor indicating short or open circuits.	

4.29 CAPACITORS. - Continued

Location/Item	Action	Remarks
Test Continued	c. If the capacitor has a metal case, check for short circuits to case by placing the positive (+) lead of the ohmmeter on the positive terminals of the capacitor and the negative (-) lead on the case. There will be no deflection of the ohmmeter needle if the capacitor is good. If the needle does deflect, replace the capacitor.	
Compressor Run Capacitor (10)		
Installation	a. Install good compressor run capacitor (10) into strap (9).	See Wiring Diagram (Appendix F).
	b. (Model A9KH-115P) Tighten screws (8) using offset screwdriver. (Model F9000H-1S) Install screws (8) and nuts (11) using screwdriver and wrench.	
	c. Connect the leads and remove tags.	
	d. Slide rubber boot (7) over leads.	
	e. Install the top rear cover.	
Fan Motor Capacitors (6) and Compressor Start Capacitor 3)		
Installation	a. Solder resistor (6) to compressor start capacitor (4) terminals.	
	b. Install capacitors (4 and 5) in securing straps (2 and 3).	Perform Steps b. and c. only if capacitors were replaced.
	c. Tighten eight screws (1) attaching capacitors (4 and 5) and securing straps (2 and 3) to underside of rear top cover.	
	d. Reconnect wiring.	
	e. Install rear top cover.	See paragraph 4.17.

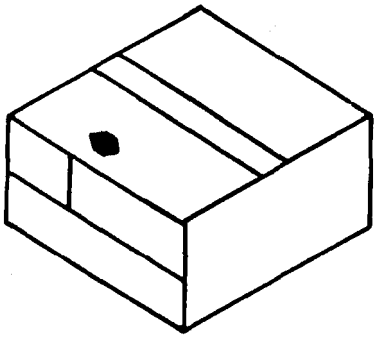
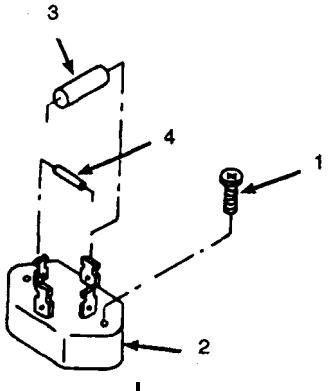
4.30 RECTIFIER-INSPECT/TEST/REPLACE. This task covers removal, inspection, test and installation.

INITIAL SETUP

Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment:
Multimeter
Variable voltage power source (AC/DC)

Equipment Conditions:
Front top cover removed (paragraph 4.17)
Evaporator inlet louver removed (paragraph 4.18)
Control module removed (paragraph 4.24)
Junction box partially removed (paragraph 4.25)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing work on electrical system.	
Removal	a. Tag and disconnect leads.	See fig. FO-1.
	b. Remove two screws (1).	
	c. Remove rectifier (2) from unit.	
	d Remove shrink sleeving from capacitor C6 (3).	
	e. Desolder capacitors (3 and 4).	
	 	
Inspection	a. Inspect rectifier (4) for external damage.	
	b. Inspect capacitors (2 and 3) for external damage.	

4.30 RECTIFIER. - Continued

Location/Item	Action	Remarks
Inspection Continued	c. Replace if damaged.	
Rectifier		
Test	a. Apply 24-28 Vac to input terminals 1 and 3.	See fig. FO-1.
	b. Check for 24-28 Vdc across output terminals (marked pos. and neg.) 2 and 4.	
	c. Replace if fails test.	
Capacitor		
Test	a. Check for internal condition by placing the test leads of an ohmmeter on the terminals of the capacitor.	
	b. Ohmmeter needle should move rapidly toward top of the scale; then, slowly return toward zero if the capacitor is good.	
	c. If needle moves to top of scale and remains there, the capacitor is internally short-circuited; if the needle does not move, the capacitor contains an open circuit.	
	d. Replace capacitors with short/open circuits.	
Installation	a. Install shrink sleeving on capacitor C6 (3).	
	b. Solder capacitors (3 and 4) to rectifier (2).	See fig. FO-1. and fig. FO-2.
	c. Install rectifier (2) using two screws (1).	
	d. Connect leads and remove tags on wires.	
	e. Install junction box.	See paragraph 4.25.
	f. Install control module.	See paragraph 4.24.
	g. Install evaporator inlet louver.	See paragraph 4.18.
	h. Install front top cover.	See paragraph 4.17.
	i. Reconnect power.	

4.31 TRANSFORMER-INSPECT/TEST/REPLACE. This task covers removal, test replacement and installation.

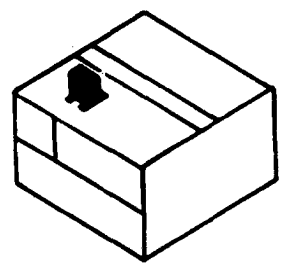
INITIAL SETUP

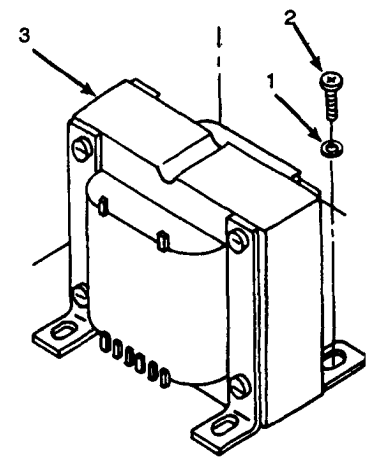
Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment
Multimeter
Variable voltage power source (AC/DC)

Equipment Conditions:
Evaporator inlet louver removed (paragraph 4.18)
Front top cover removed (paragraph 4.17)
Control module removed (paragraph 4.24)
Junction box partially removed (paragraph 4.25)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing work on electrical system.	
Removal	a. Remove screws (2) and lockwashers (1).	
	b. Remove shrink sleeving from two input and six output terminals.	
	c. Tag and desolder all wires connected to input and output terminals, except for wires between terminals 3 and 6 and 4 and 2.	See fig. FO-2. for all test steps.
	d. Lift transformer (3) out of unit.	





4.31 TRANSFORMER. - Continued

Location/Item	Action	Remarks
Test	a. Check for continuity across primary terminals 1 and 6.	See fig. FO-2 for all test steps.
	b. Check for continuity across secondary terminals 7 and 8.	
	c. Check for discontinuity between primary and secondary coils.	
	d. If transformer fails continuity/discontinuity test, replace.	
	e. Connect 115 Vac power source to primary terminals.	
	f. Connect multimeter to secondary terminals.	
	g. Check for reading of 27 to 33 Vat.	
	h. If transformer fails test, replace.	
Installation	a. Slide new shrink sleeving onto and up wire.	
	b. Solder leads on terminals and remove tags.	
	c. Slide shrink sleeving down wire and over solder connection.	
	d. Heat-shrink sleeving onto solder connection.	
	e. Secure transformer (3) to housing using screws (2) and lockwasher (1).	
	f. Install junction box.	See paragraph 4.25.
	g. Install control module.	See paragraph 4.24.
	h. Install evaporator inlet louver.	See paragraph 4.18.
	i. Install front top cover.	See paragraph 4.17.

4.32 EVAPORATOR FAN AND HOUSING-REPLACE. This task covers removal, disassembly, assembly and installation.

INITIAL SETUP

Equipment Conditions:
Evaporator inlet louver removed (paragraph 4.18)
Evaporator drain tubing removed (paragraph 4.23)
Control module removed (paragraph 4.24)

Test Equipment
Ohmmeter
Continuity tester or multimeter

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing maintenance work on the electrical system.	
Front of Housing Evaporator Fan Assembly		
Removal	a. Unplug the electrical connector from the motor. b. Remove the bracket (1) by removing two screws (2) and two lockwashers (3). c. Loosen clamps holding Temperature Selector switch sensing bulb; move bulb to clear housing. d. Remove four screws (4) and four lockwashers (5) securing the fan and motor base to the resilient mounts (6 and 7). e. Lift out fan and motor assembly (8).	
Fan and Housing		
Disassembly	a. Remove two screws (9) and flat washer (10) on strap (11). Remove strap (11). b. Loosen the setscrew (12) on motor shalt extension (13).	

4.32 EVAPORATOR FAN AND HOUSING. - continued

Location/Item	Action	Remarks
disassembly Continued	c. Remove four nuts (14) and four flat washers (15) securing inlet ring (16) to flange (17). d. Remove inlet ring (16). e. Withdraw impeller (18) and shaft extension (13) through opening of flange (17). f. Loosen setscrew (19) of impeller (18) that secures impeller to shaft extension (13). g. Remove shaft extension (13) from impeller (18). h. Remove four screws (20) and four nuts (21) securing flanges (17 and 22) to base (23). i. Remove two screws (24) and flat washer (25) on strap (26). Remove strap (26). j. Remove flange (17). k. Remove housing (27). l. Remove flange (22) with inlet ring (28). m. Remove four nuts (29) and four flat washers (30) securing inlet ring (28) to flange (22) and remove inlet ring (28).	
Inspection	a. Inspect shaft extension (13), fan inlet rings (16 and 28), impeller (18), flanges (17 and 22), straps (11 and 26) and housing (27) for visible out-of-round conditions, dents, burrs and nicks. b. Replace defective items. c. Check impeller (18) for damaged or bent vanes. Straighten or replace impeller (18).	

4.32 EVAPORATOR FAN AND HOUSING. - continued

Location/Item	Action	Remarks
Evaporator Fan Assembly Assembly	**WARNING** Acetone and Methyl-Ethyl Ketone are flammable and their vapors are explosive. Prolonged or repeated inhalation of fumes or contact with the skin can be toxic. Use in a well-ventilated area, wear gloves and keep away from sparks or flame. a. Clean off old sealant from inlet rings (16 and 28) and flanges (17 and 22) using methyl-ethyl ketone and clean rag. b. Clean off old sealant from sides of housing (27) using methyl-ethyl ketone (MEK) (Item 23, Appendix E). c. Install inlet rings (16 and 28) to flanges (17 and 22), respectively, using eight nuts (14 and 29) and eight flat washers (15 and 30). **WARNING** industrial sealant (Item 28, Appendix E) is extremely flammable. The vapors given off from this product can easily be ignited. Contains Methyl-Ethyl Ketone (MEK), Methyl Isobutyl Ketone (MIBK) and asbestos (bound). Keep product and its vapors away from heat, sparks and open flames. Use only in a well-ventilated area with enough air movement to remove vapor and prevent vapor build-up. Avoid prolonged breathing of vapor. Avoid eye contact. Avoid prolonged or repeated skin contact. d. Seal the outer edge of the inlet rings(16 and 28) to flanges (17 and 22) using industrial sealant ‘ (Item 28, Appendix E) and acid swab brush (Item 29, Appendix E).	

4.32 EVAPORATOR FAN AND HOUSING - Continued

Location/Item	Action	Remarks
Assembly - Continued	e. Install inlet ring (28) and flange (22) to base (23) using two screws (20) and two nuts (21). f. Insert motor shaft extension (13) into impeller (18). g. Tighten impeller setscrew (19) on motor shaft extension (13). h. Install motor shaft extension (13) and impeller (18) onto motor shaft. i. Install housing (27) to connect with flange (22) and inlet ring (28). j. Install inlet ring (16) and flange (17) onto housing (27) and base (23) using two screws (20) and two nuts (21). k. Install strap (11) to inlet rings (16 and 28) with two screws (9) and flat washer (10). Position strap (11) parallel to base (23) before final tightening of two screws (9) and flat washer (10). l. Install strap (26) to flanges (17 and 22) using two screws (24) and flat washer (25). m. Position impeller (18) inside housing with equal space from each inlet ring (16 and 28). n. Tighten setscrew (12) in motor shaft extension (13). **WARNING** Industrial sealant (Item 28, Appendix E) is extremely flammable. Keep away from sparks, heat, and open flames. Use in well-ventilated area. Avoid prolonged breathing of vapor, prolonged skin contact and eye contact. o. Seal outer edge of flanges (17 and 22) to sides of housing (27) using industrial sealant (Item 28, Appendix E) and acid swab brush (Item 29, Appendix E).	

4.32 EVAPORATOR FAN AND HOUSING. - continued

Location/Item	Action	Remarks
Installation	a. Place the fan and motor assembly on resilient mounts (6 and 7) and install four screws (4) and four lockwashers (5).	
	b. Install bracket (1) using two screws (2) and two lockwashers (3).	
	c. Place the Temperature Selector switch sensing, bulb in clamps and tighten screws.	
	d. Install evaporator drain tubing.	See paragraph 4.21.
	e. Plug in the motor electrical connector.	See paragraph 4.23.
	f. Install the evaporator inlet louver.	See paragraph 4.14.
	g. Install control module.	See paragraph 4.24.

4.32 EVAPORATOR FAN AND HOUSING - Continued

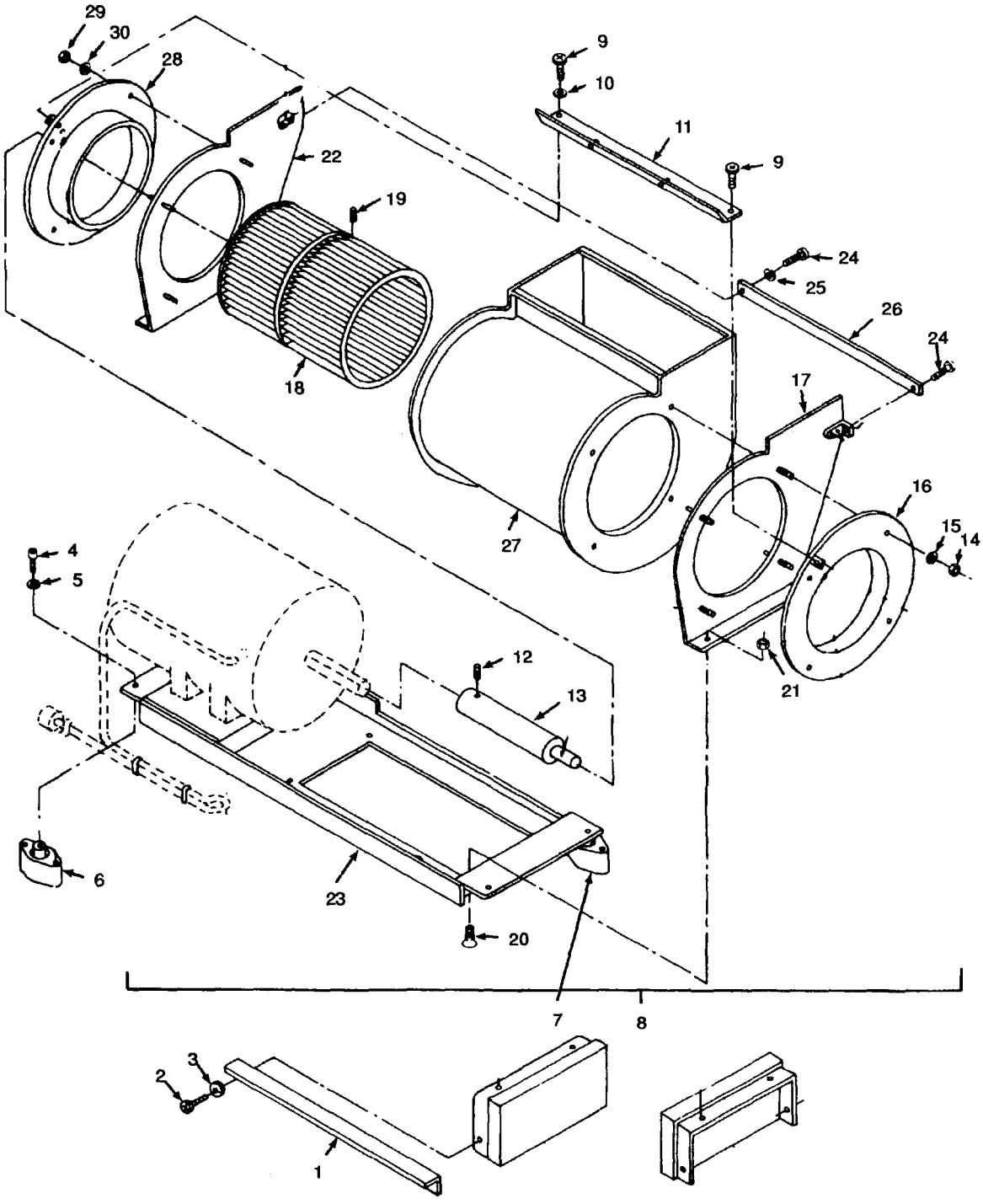


Illustration for paragraph 4.32.

4.33 EVAPORATOR MOTOR-INSPECT/TEST/REPLACE. This task covers inspect, test, removal and installation.

INITIAL SETUP

Equipment Conditions:
Evaporator fan assembly removed (paragraph 4.32)
Inlet louver removed (paragraph 4.18)
Evaporator drain tubing removed (paragraph 4.23)

Test Equipment
Ohmmeter or continuity tester

Location/item	Action	Remarks
	WARNING Disconnect air conditioner power source before doing maintenance work on the electrical system.	
Inspect	Inspect plug for bent pin, loose wires, etc.	
Testing	a. Turn the motor shaft by hand and listen for clicking sounds that indicate bad bearings.	
	b. If the shaft cannot be rotated, the bearings may have seized.	
	c. Test the thrust bearings by attempting to push and pull the motor shaft axially.	
	d. If end play is excessive (i.e., can be felt manually in push-pull), the thrust bearings or shims are worn beyond limits and should be replaced.	
	e. If fails test, notify Direct Support Maintenance personnel.	
	f. Use an ohmmeter or continuity tester to check continuity between pins of the electrical connector (P3).	See Appendix F, Wiring Diagram.
	g. The motor is capable of operating at two speeds; therefore, there are two sets of field roils.	
	h. Check to be sure continuity exists between pins A and B and E and F.	

4.33 EVAPORATOR MOTOR. - Continued

Location/Item	Action	Remarks
Testing Continued	i. Then check from pin G to pins A, B, E, and F.	
Removal	a. Remove four cap screws (1) and four lockwashers (2) from underside of base (3).	
	b. Loosen the setscrew (4) on shaft extension (5) and remove motor (6).	
Installation	a. Set the motor (6) on base (3) with the motor shaft in the shaft extension (5).	
	b. Install four cap screws (1) and four Iockwashers (2) through the underside of the base (3) to secure the motor.	
	c. Tighten setscrew (4) of shaft extension (5).	
	d. Install evaporator fan assembly.	See paragraph 4.32.
	e. Install evaporator drain tubing.	See paragraph 4.23.
	f. Connect the motor electrical connector.	
	g. Install the evaporator inlet louver.	See paragraph 4.18.

4-33 EVAPORATOR MOTOR. Continued

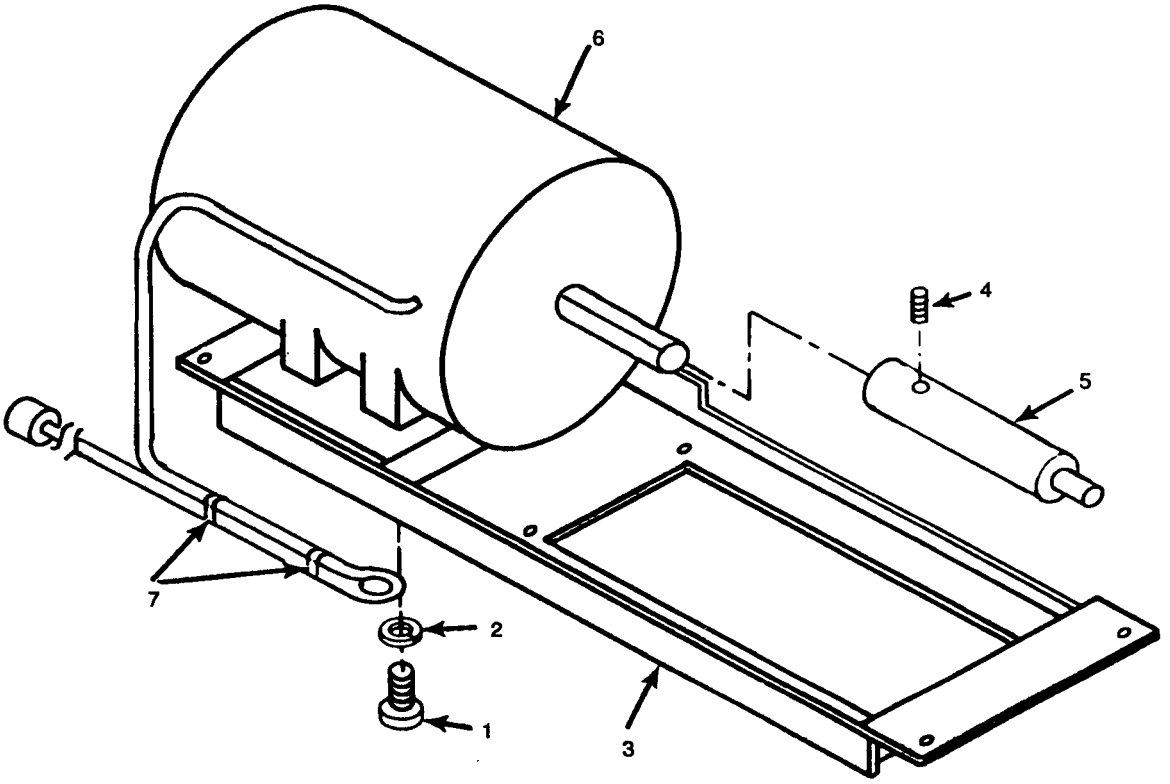


Illustration for paragraph 4.33.

*U.S. GOVERNMENT PRINTING OFFICE:1995-655-121/20221

4.34 HEATER THERMOSTAT-INSPECT/TEST/REPLACE. This task covers inspect, removal, test and install.

INITIAL SETUP

Materials/Parts:
150-watt lamp bulb or heat gun

Equipment Condition:
Front and center covers removed (paragraph 4.17)

Test Equipment
Multimeter
Thermometer (32 °F to 212 °F)
(0°C to 100°C)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Inspect	Inspect for wiring damage.	
Rernoval	a. Take out two crews (1) and remove bracket (2) and thermostat (3) from center cover.	
	b. Take out two screws (4) and two Iockwashers (5) and remove thermostat from bracket (2).	
	c. Tag leads and remove four screws (6) to disconnect leads (7, 8, 9, and 10).	
Test	a. Using a multimeter on the lowest possible setting, test for continuity between contacts 1 and 2 and between contacts 3 and 4. Contacts should open on temperature rise at 145-155 degrees F (63-68 degrees C) and should close on temperature drop at 100-120 degrees F (38-49 degrees C). Use 150-watt lamp bulb or heat gun as heat source for testing.	See Wiring Diagram, fig. FO-2., in Appendix F. Use thermometer to determine temperature of sensor surface.
	b. Replace if defective.	
Installation	a. Connect leads (7,8,9, and 10) to thermostat (3) with four screws (6) and remove tags.	
	b. Attach the thermostat (3) to bracket (2) with two screws (4) and two Iockwashers (5).	
	c. Secure the bracket (2) to the center cover with two screws (1).	
	d. Install front and center covers.	See paragraph 4.17.

4.34 HEATER THERMOSTAT. - continued

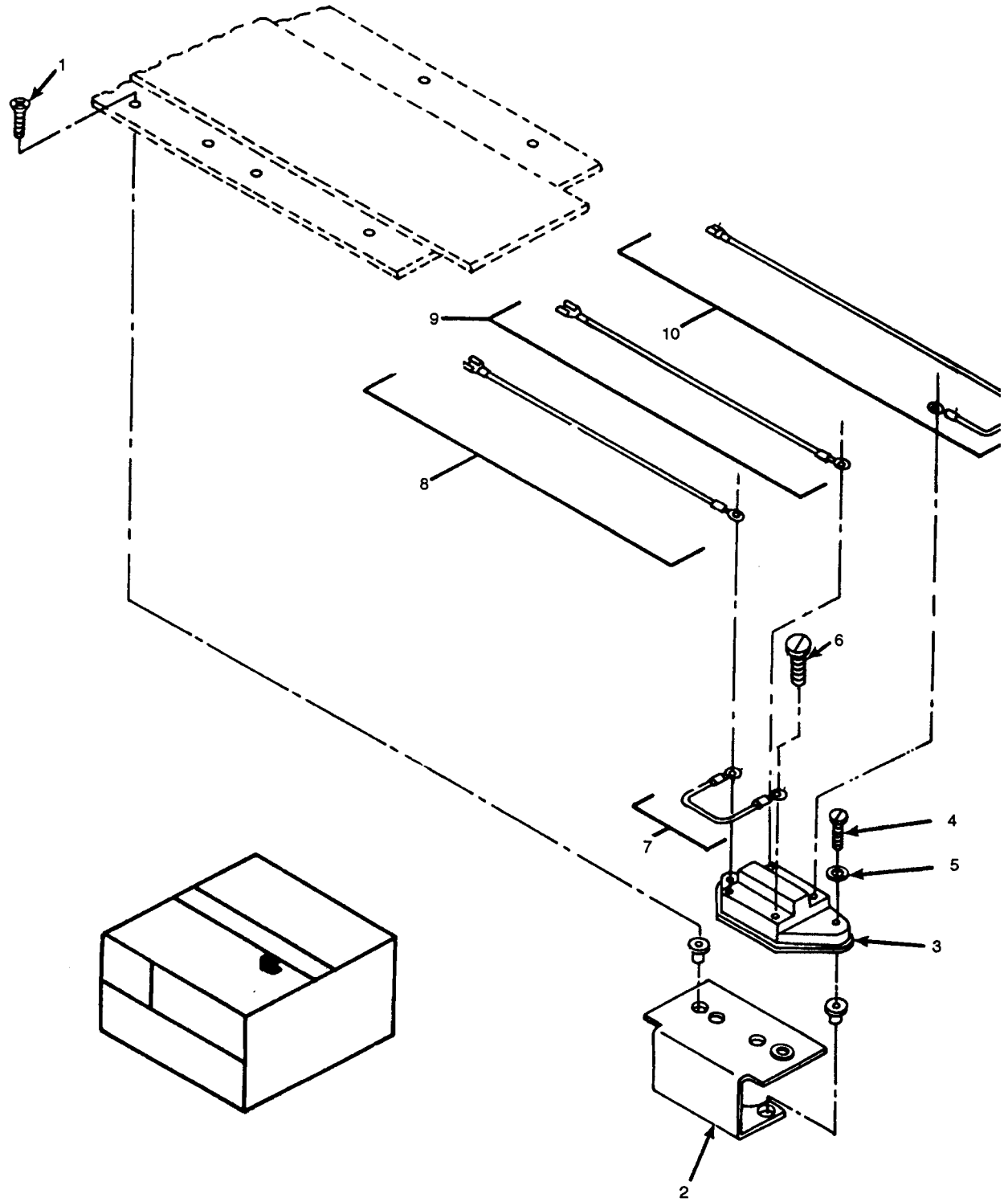


Illustration for paragraph 4.34.

4.35 HEATER ELEMENTS -INSPECT/TEST/REPLACE. This task covers inspect, test, remove and install.

INITIAL SETUP

Materials/Parts:
Toluolene (Item 27, Appendix E)
Adhesive (Item 18, Appendix E)
Insulation (Item 25, Appendix E)

Test Equipment:
Multimeter

Equipment Conditions:
Top covers removed (paragraph 4.17)
Junction box pulled half way out of unit (paragraph 4.25)
Control module removed (paragraph 4.24)

Location/Item	Action	Remarks
	WARNING Allow heating elements to cool for 15 minutes before touching. **WARNING** Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Heater Elements and Electrical Wiring		
Inspection	a. Inspect for damage to elements or leads. b. Check heater element for continuity. c. Replace damaged leads and bad elements.	
Heater Support Bracket		
Inspection	a. Inspect for warping or cracking. b. Replace as necessary.	

4.35 HEATER ELEMENTS. - continued

Location/Item	Action	Remarks
Heater Mounting Bracket Insulation		
Inspection	a. Inspect for damaged or missing insulation,	
	b. Replace as necessary.	
Terminal Board (TB2)		
Inspection	a. Inspect TB2 for corrosion or damage.	
	b. Replace as necessary.	
Test	Test elements by checking for continuity between the two electrical leads (1 and 2) of each heater element (3.) If continuity does not exist, replace the element.	
Removal	a. Tag and disconnect leads (1 and 2) from terminal board TB2 (4).	
	b. Remove two screws (5), two lockwashers (6), and two flat washers (7) securing heater support bracket (8) to housing.	
	c. Remove heater support bracket (8) from ends of heating elements (3).	
	d. Remove three screws (9) and three lockwashers (10) securing heater mounting bracket (11) to housing.	
	e. For each heater element (3), remove nut (12), lockwasher (13), flat washer (14), and insulator (15) securing heater element (3) to heater mounting bracket (11).	
	f. Slide each heating element (3) from heater mounting bracket (11).	Do not remove tags from heater element wire.
	g. Remove heater mounting bracket (11) with terminal board (TB2) (4) and marker strip (16) from unit.	
	h Remove two screws (17), two lockwashers (18) and two nuts (19) securing TB2 to bracket (11).	
	i. Remove terminal board TB2 from bracket (11).	

4.35 HEATER ELEMENTS. - continued

Location/Item	Action	Remarks
Removal Continued	j. Remove insulation (20) from bracket (11) using a scraper. **WARNING** Toluolene is flammable and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapor can be toxic. Use in well-ventilated area and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate.	
Installation	a. Clean heater mounting bracket (11) with toluolene (Item 27, Appendix E) and lint free cloth (Item 9, Appendix E). b. Measure and cut piece of unicellular plastic foam insulation (Item 25, Appendix E). c. Apply adhesive (Item 18, Appendix E) to foam insulation heater mounting bracket (11) using acid swab brush (Item 29, Appendix E) and allow to become tacky. d. Press foam insulation (20) firmly into place. e. Replace terminal board TB2 if terminals are missing or unserviceable. f. Replace marker strip (16) if cannot be easily read, if cracked, or missing. g. Insert heater elements (3) and insulator (15) into heater mounting bracket (11). h. Secure each heater element (3) to heater mounting bracket (11) using flat washer (14), lockwasher (13) and nut (12). i. Install heater mounting bracket (11) in unit using three screws (9) and three lockwashers (10). j. Slide heater support bracket (8) over ends of heating elements (3). k. Secure heater support bracket (8) to housing using two lockwashers (6), two flat washers (7), and two screws (5).	

4.35 HEATER ELEMENTS. - Continued

Location/Item	Action	Remarks
Installation - Continued	l. Connect leads (1 and 2) to terminal board TB2 (4) and remove tags.	
	m. Install junction box.	See paragraph 4.25.
	n. Install top covers,	See paragraph 4.24.
	o, Control module installed,	

4.35 HEATER ELEMENTS. -continued

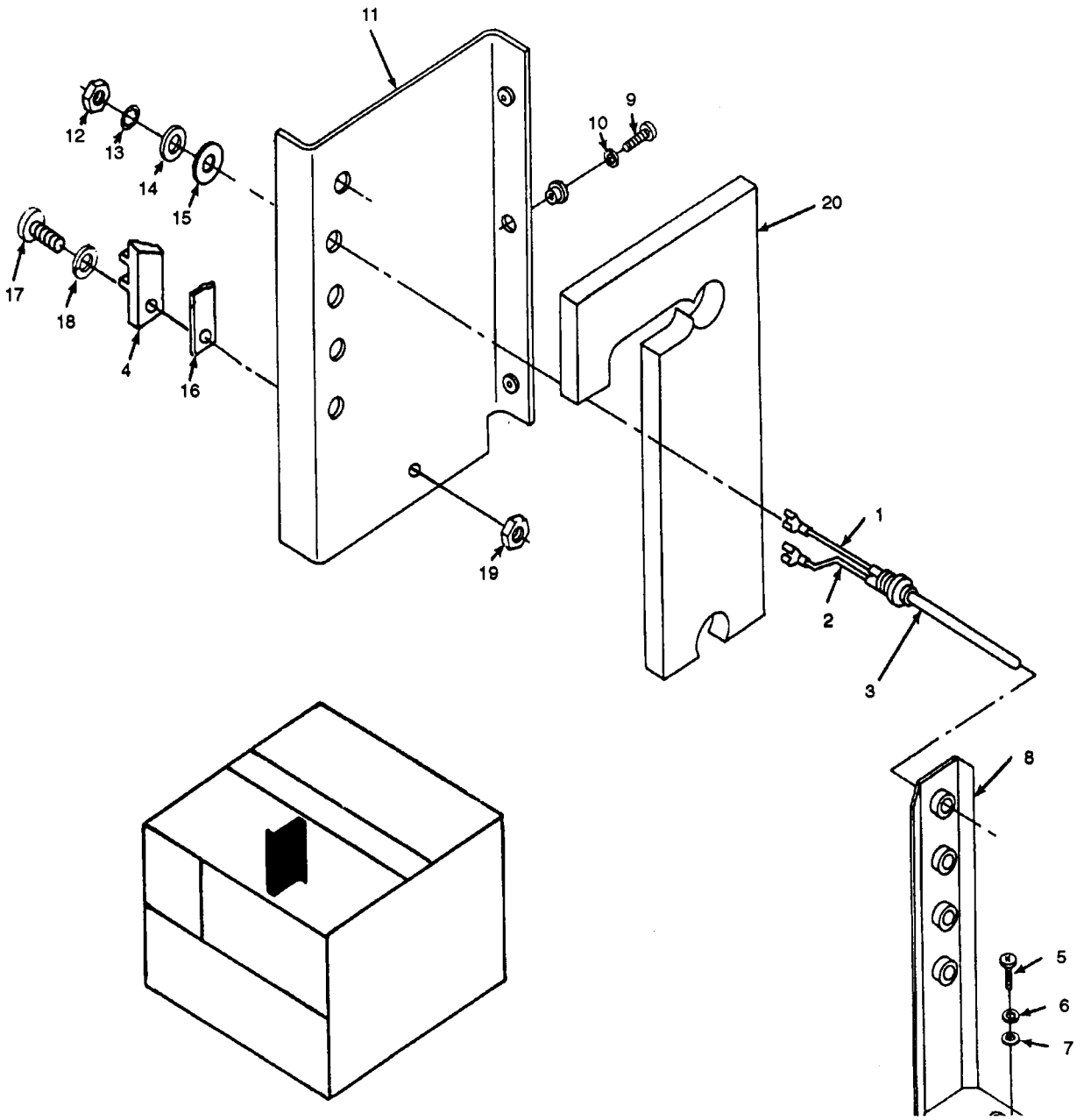


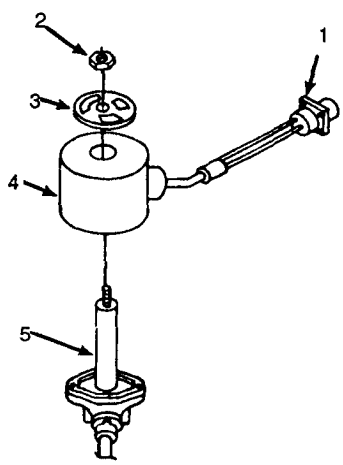
Illustration for paragraph 4.35.

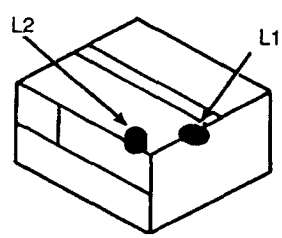
4.36 CONDENSER FAN, HOUSING AND MOTOR-INSPECT/TEST/REPLACE. This task covers removal, disassembly, inspection, test assembly and installation.

INITIAL SETUP

Equipment Conditions:
Rear and center top covers removed (paragraph 4.17)
Condenser louver removed (paragraph 4.21)
Compressor start relay removed (paragraph 4.27)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Top of Housing Removal	a. Disconnect electrical connector (1) for solenoid coil L2 from bulkhead. b. Remove plunger nut (2) and nameplate (3), and remove solenoid coil (4) from plunger (5).	





	c. Tag and disconnect the motor connectors. d. Remove four screws (6) and four flat washers (7) securing motor mounting plate (8) to housing. e. Remove wire ties as required.	

4.36 CONDENSER FAN, HOUSING AND MOTOR.- Continued

Location/Item	Action	Remarks
Removal . Continued	f. Loosen two setscrews (9) on the shaft extension (10) and the setscrew (11) on the impeller (12). g Separate the shaft extension (10) from the impeller (12) by sliding the shaft extension (10) snug onto the motor shaft (13). h. Remove the shaft extension (12) from the motor shaft (13) and set aside. i. Lift out the motor (14) and mounting plate (8) and set aside. **CAUTION** Take care to avoid damaging the condenser coil while removing motor and mounting plate from unit. j. Remove five screws (15) to loosen scroll housing (16). k. Remove two screws (17), two lockwashers (18) and two flat washers (19) from clamps (20) securing service valves (21) to scroll housing. l. Remove screw (22), lockwasher (23) and flat washer (24) from clamp (25) securing high pressure relief valve (26) to scroll housing (16). m. Remove nut (27) from louver control cable (28) and disconnect from bracket (29). n. Remove screw (30), flat washer (31) and lockwasher (32) from clamp (33) securing louver control cable (28) to scroll housing (16). **CAUTION** Handle tubing at service valves and pressure relief valve with special care to avoid kinking or creating leaks at brazed joints. 0. Bend tubing back at service valves (21) and at pressure relief valve (26) with extreme care to permit scroll to be rotated.	

4.36 CONDENSER FAN, HOUSING AND MOTOR. - continued

Lccation/Item	Action	Remarks
Removal - Continued	p. Rotate scroll housing (16) so that louver opening is at top.	
	q. Ease base flange of scroll housing (16) up until it extends slightly above the cabinet housing.	
	r. Rotate scroll housing (16) towards the condenser louver opening and lift carefully from housing.	
Disassembly	a. Remove three screws (34) and three flat washers (35) from inlet ring (36) and remove inlet ring (36) from scroll (16).	
	b. Remove impeller (12) gently from scroll (16). (Do not force.)	
	c. Separate motor (14) from mounting plate (8) by removing four screws (37), four lockwashers (38), eight flat washers (39) and four bushings (40).	
Inspection	a. Visually inspect impeller (22), inlet ring (21), shaft extension (4) and scroll (8) for nicks, dents and out of round conditions.	
	b. Straighten bent vanes on impeller (12).	
	c. Replace unserviceable impeller (12).	
	d. Straighten bent inlet ring (36) and scroll (8). Replace if unserviceable.	
	e. Replace damaged shaft extension (10).	
Test	a. Inspect exterior case of motor for cracks, dents, oil, evidence of overheating or any other abnormalities.	Replace defective motor.
	b. Turn motor shaft by hand and listen for clicking sounds that indicate bad bearings, Report condition to Direct Support Maintenance personnel.	
	c. If the shaft cannot be rotated, the bearings may have seized.	
	d. Test the thrust bearings by attempting to push and pull the motor shaf axially. Report condition to Direct Support Maintenance personnel.	

4.36 CONDENSER FAN, HOUSING AND MOTOR. -continmd

Location/Item	Action	Remarks
Test Continued	e. If end play is excessive (i.e., can be felt on manual push-pull), the thrust bearings and shims are worn beyond limits and should be replaced.	See paragraph 5.8.
	f. Use an ohmmeter or continuity tester to check continuity between pins of the electrical connector (P5).	See Wiring Diagram (Appendix F).
	g. Check to be sure that continuity exists between connector pins A and B and between E and D. This means that open circuits do not exist.	Replace motor if either open or short circuits exist.
	h. Then check from pin G to pins A, B, E, and D. No continuity should exist, which indicates that there is not an internal short circuit.	Replace motor if either open or short circuits exist.
Assembly	a. Secure motor (14) to mounting plate (8) using four screws (37), four lockwashers (38), eight flat washers (39) and four bushings (40).	
	b. Insert impeller (12) into scroll housing (16).	
	c. Install inlet ring (36) onto scroll housing (16) using three screws (34) and three flat washers (35).	
Installation	a. Insert scroll housing (16) back into position in unit. **CAUTION** Handle tubing at service valves and pressure relief valve with special care to avoid kinking or creating leaks at brazed joints.	
	b. Bend tubing back into position at service valves (21) and at pressure relief valve (26) with extreme care.	
	c. Secure louver control cable (28) to scroll housing (16) using screw (30), flat washer (31), lockwasher (32), and clamp (33).	
	d. Insert louver control cable (28) through bracket (29) and secure with nut (27).	
	e. Secure high Pressure relief valve (26) to scroll housing (16) using screw (22), lockwasher (23), flat washer (24) and clamp (25).	

4.36 CONDENSER FAN, HOUSING AND MOTOR. - Continued

Location/Item	Action	Remarks
Installation Continued	f. Secure service valves (21) to scroll housing (16) using two screws (17), two lockwashers (18), two flat washers (19) and two clamps (20).	
	g. Install five screws (15) to secure scroll housing.	
	CAUTION Take care to avoid damaging the condenser coil when installing the motor and mounting plate in unit.	
	h. Place motor (14) and mounting plate (8) into position in the housing.	
	i. Insert shaft extension (10) onto motor shaft (13).	
	j. Align the shaft extension (10) with the impeller (12) and join together.	
	k. Tighten the setscrew (11) on the impeller (12).	
	l. Secure the motor mounting plate (8) to the housing using four screws (6) and four flat washers (7).	
	m. Center impeller (12) in scroll housing (16) while looking through the louver opening.	
	n. Tighten two setscrews (9) on the shaft extension (10).	
	o. Connect the motor connections and remove tags.	
	p. Install the solenoid coil (4) onto the plunger (5) with nameplate (3) and plunger nut (2).	
	q. Connect the electrical connector (1) for solenoid coil L2 to the bulkhead.	
	r. Install condenser louver.	See paragraph 4.21.
	s. Install compressor start relay.	See paragraph 4.27.
	t. Install rear and center top covers.	See paragraph 4.17.

4.36 CONDENSER FAN, HOUSING AND MOTOR. - continued

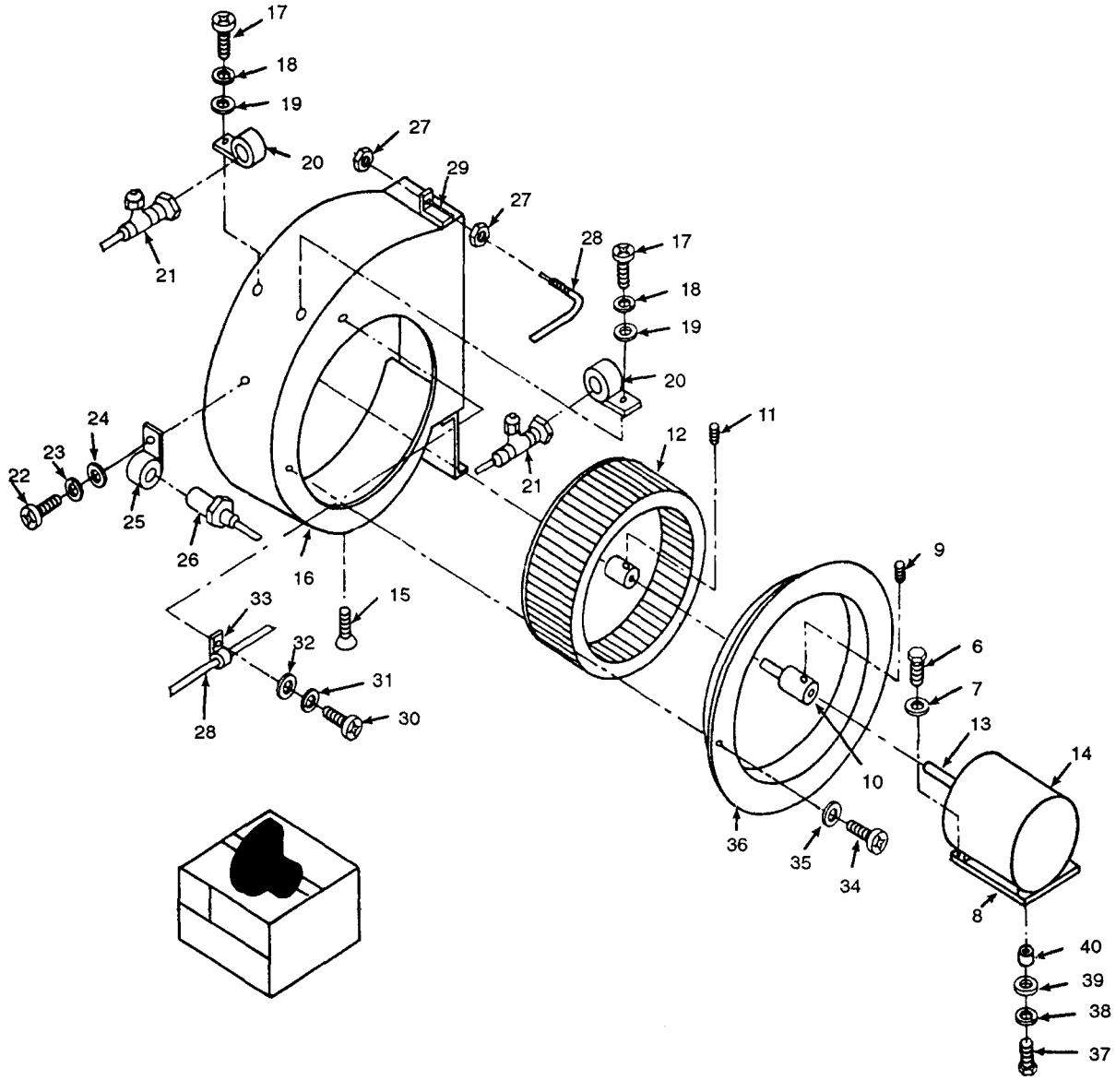
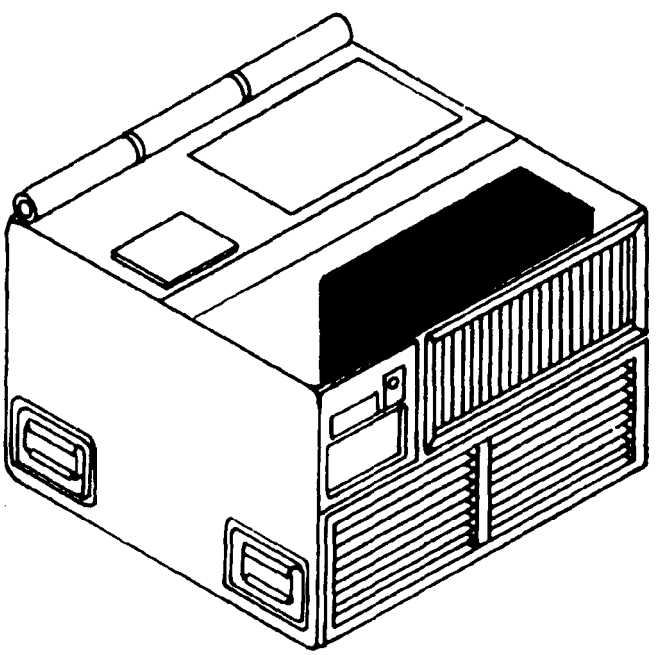


Illustration for paragraph 4.36.

4.37 EVAPORATOR COIL ASSEMBLY-SRVICE. This task covers inspection and cleaning.

INITIAL SETUP

Equipment Conditions:
Front top cover removed (paragraph 4.17)
Mist eliminator removed (paragraph 4.20)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
		
Inspection	a. Check to be sure power is disconnected. b. Check for accumulated dirt. Clean if an accumulation of dirt is evident. c. Check fins for dents, bent edges, or any condition that would block or distort airflow. Straighten all damaged fins with a plastic fin comb.	

4.37 EVAPORATOR COIL ASSEMBLY - Continued

Location/Item	Action	Remarks
Inspection . Continued	**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.	
Cleaning	Clean coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes.	

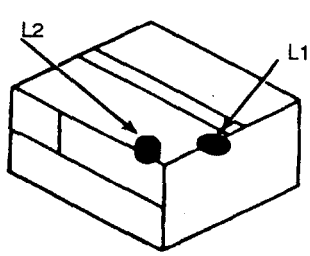
4.38 SOLENOID VALVES-TEST/RFPAIR. This task covers test remove, repair and install.

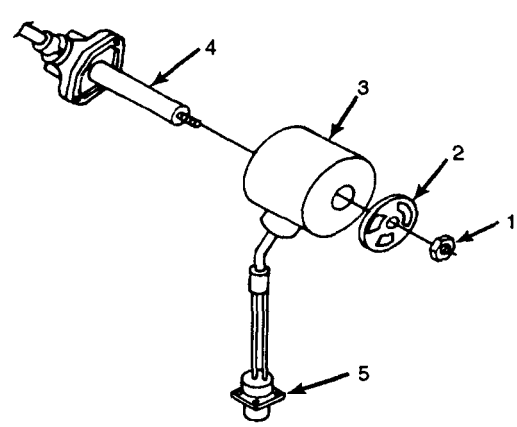
INITIAL SETUP

Equipment Condition:
Rear and center top covers removed (paragraph 4.17)

Test Equipment:
Multimeter
24V power supply

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
	NOTE The following instructions apply to both the equalizing solenoid L2 and the liquid line solenoid L1.	
Test	a. Disconnect wiring harness connector from connector on solenoid valve.	
	b. Use a multimeter set on lowest OHMS scale to check for continuity between contacts A and B in solenoid valve connector. If continuity is not found, coil is open and must be replaced,	
	c. Use multimeter to check for continuity between each contact in solenoid valve connector and coil casing. If continuity is found between either contact and case, the coil is grounded and should be replaced.	

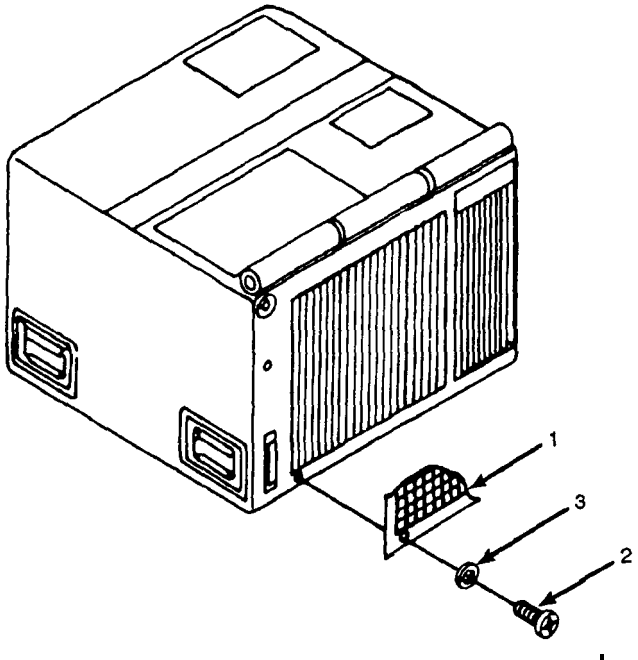




4.38 SOLENOID VALVES. - Continued

Location/Item	Action	Remarks
Test Continued	d. If continuity checks are satisfactory, apply 24 volts DC from an external power supply across contacts A and B in solenoid valve connector, and listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and entire valve should be replaced (see paragraph 5.19).	
Remove	**WARNING** Do not attempt any disassembly of solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if screws that attach tube and plunger assembly to valve body are loosened. Remove nut (1) that secures plate (2) and coil (3) to valve body (4), and remove coil and connector assembly.	
Repair	a. Unsolder coil leads from pins in the connector, and remove connector (5). b. Solder the coil leads to the pins in the connector (5).	
Install	a. Install coil (3), connector (5), plate (2), and the attaching nut (1) on valve body (4). b. Connect harness connector to connector on solenoid valve. c. Replace top covers.	See paragraph 4.17.

4.39 CONDENSER COIL ASSEMBLY-INSPECT/SERVICE. This task covers inspection and cleaning.

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Inspection	a. Remove eight screws (2) and eight lockwashers (3) securing guard (1). Remove guard.	
		
	b. Check for accumulated dirt. Clean if an accumulation of dirt is evident.	
	c. Check fins for dents, bent edges, or any condition that would block or distort airflow. Straighten all damaged fins with a plastic fin comb.	

4.39 CONDENSER COIL ASSEMBLY - continued

Location/Item	Action	Remarks
Inspection - Continued	**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.	
Cleaning	a. Clean coil with a soft bristle brush, vacuum cleaner and brush attachment, or use compressed air at 30 psi or less from the inside of the unit to blow the dirt out. Take care to avoid fin damage. When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes. b. Attach guard (1) and secure with eight screws (2) and eight lockwashers (3).	

4.40 HOUSING-INSPECT/SERVICE. This task covers inspection and service,

INITIAL SETUP

Material/Part:
Dry cleaning solvent (Item 16, Appendix E)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system. **WARNING** Clean parts in well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent, P-D-680, used to clean parts, which is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).	
Inspection	Visually inspect the housing for cleanliness, nicks, gouges, dents, bare spots in paint or other defects.	
Service	a. If cleaning is required. Wipe off dirt or arime with a cloth moistened with dry cleaning solvent (Item 16, Appendix E). b. Report any necessary repairs to general maintenance personnel.	

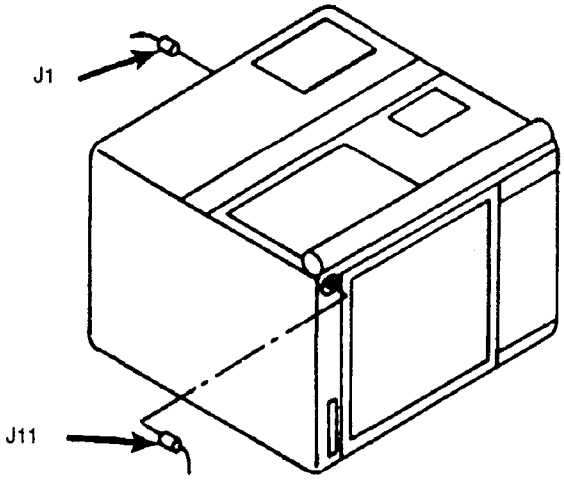
4.41 MAIN POWER INPUT CONNECTOR (J1) AND AUXILIARY POWER INPUT CONNECTOR (J11)-INSPECT/RE PLACE. This task covers inspection, removal, test, repair and installation.

INITIAL SETUP

Materials/Parts:
Solder (Item 2, Appendix E)
Flux (Item 15, Appendix E)

Test Equipment:
Multimeter
Continuity tester

Equipment Conditions:
Top covers removed (paragraph 4.17)
Evaporator inlet louver removed (paragraph 4.18)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Inspection	a. Inspect all installed wiring for cracked or frayed insulation. b. Repair or replace bad wiring. c. Inspect electrical connectors for damage. d. Replace damaged connectors.	
		
Removal	a. Tag all wire leads prior to removal.	Use Wiring Diagram (Appendix F).

4.41 MAIN POWER INPUT CONNECTOR (J1) AND AUXILIARY POWER INPUT CONNECTOR (J11).-Continued

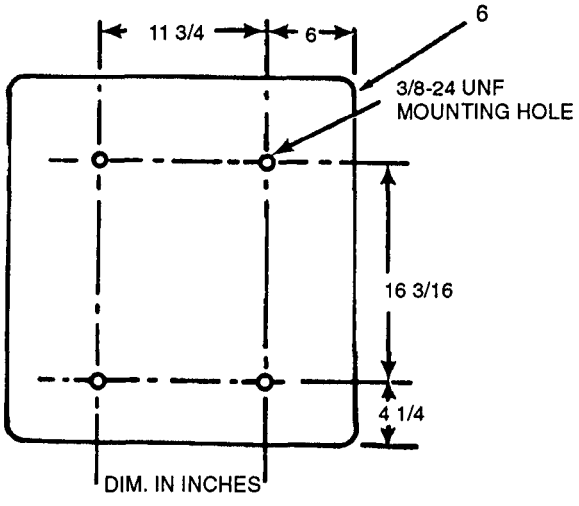
Location/Item	Action	Remarks
Removal Continued	b. Remove eight screws, eight nuts, and eight flat washers to release connector from housing.	
	c. Disconnect all connector plugs and terminals.	
	d. Carefully remove harness from unit.	
Test	a. Test for continuity on wiring harness.	
	b. Touch the test probes of a continuity tester or multimeter, set on low-resistance range, to ends of wire and/or corresponding pin of connector.	
	c. If continuity is not indicated, repair or replace wire or damaged connector.	
Repair	a. Remove the insulation to expose 1/2 inch/1.27 centimeters of bare wire on each side of break or damaged insulation.	
	b. Insert the ends into a splice-connector; splice and crimp the connector to make firm electrical contact.	
	c. Alternatively, heat-shrink tubing may be slipped over one end of the wire before splicing, then heated after the splice is made and soldered, so as to cover the spliced area.	
	d. Be sure that no bare wire is exposed after the splice is complete.	
	e. Replace broken terminal lugs with exact duplicates.	
	f. To replace electrical plugs or connectors, tag and unsolder wires from the solder-wells of the inserts.	
	g. Insert bare ends of the wires in corresponding holes of new insert, and solder in place.	
	h. Check continuity terminal-to-terminal.	
Installation	a. Transfer tags to new harness.	
	b. Install connector into junction box with nuts and washers.	

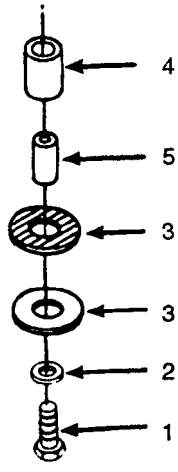
4.41 MAIN POWER INPUT CONNECTOR (J1) AND AUXILIARY POWER INPUT CONNECTOR (J11) - Continued

Location/Item	Action	Remarks
Installation - Continued	c. Connect all connector plugs and terminals and remove tags.	Use Wiring Diagram, Appendix F
	d. Install junction box.	See paragraph 4.25.
	e. Install control module.	See paragraph 4.24.
	f. Install evaporator inlet louver.	See paragraph 4.18.
	g. Install top covers.	See paragraph 4.17.

4.42 INSTALLATION HARDWARE-INSPECT/REPLACE. This task covers removal, inspection and installation.

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Removal	a, Remove four screws (1) and flat washers (2) from bottom of air conditioner and enclosure mounting plate (6). b. Remove four resilient mounts (3), four elastomeric tubes (4) and four spacers (5) from bottom of enclosure mounting plate (6). c. Remove air conditioner from atop of four remaining resilient mounts (3) and the enclosure mounting plate (6). d. Remove the remaining four resilient mounts (3) from atop of enclosure mounting plate (6).	
Inspection	a. Inspect four screws (1) and flat washers (2) for damage. b. Inspect eight resilient mounts (3), four elastomeric tubes (4) and four spacers (5) for damaged or worn out conditions.	





4.42 INSTALLATION HARDWARE.- Continued

Location/Item	Action	Remarks
Inspection . Continued	c. Replace damaged hardware.	
Installation	a. Assemble onto each of four screws (1), a flat washer (2), a spacer (5), an elastomeric tube (4) and a resilient mount (3). b. Install the above screws, flat washers, spacers, elastomeric tubes and resilient mounts through the bottom of enclosure plate and then install one additional resilient mount (3) on each of the four screws (1), on top of the enclosure mounting plate (6). c. Aline the air conditioner on top of the resilient mounts (3) and screws (1), which attach the air conditioner to the enclosure mounting plate (6). d. Tighten the screws (1) into the bottom of air conditioner.	

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4.43 STORAGE AND SHIPMENT.

4.43.1 Short-Term STORAGE.

a. Disconnect power supply and remove from shelter.

b. Make sure unit is clean and dry.

c. Close all louvers and grilles.

d. Unroll canvas cover and snap into place.

e. Store in the operating (upright) position.

4.43.2 Long-Term STORAGE.

a. Disconnect power supply and remove from shelter.

b. Make sure unit is clean and dry.

c. Close all louvers and grilles.

d. Unroll canvas cover and snap into place.

e. Package all hardware, cable connectors, technical manuals, etc., in a cushioned protective sack. Staple shut and secure to unit.

NOTE

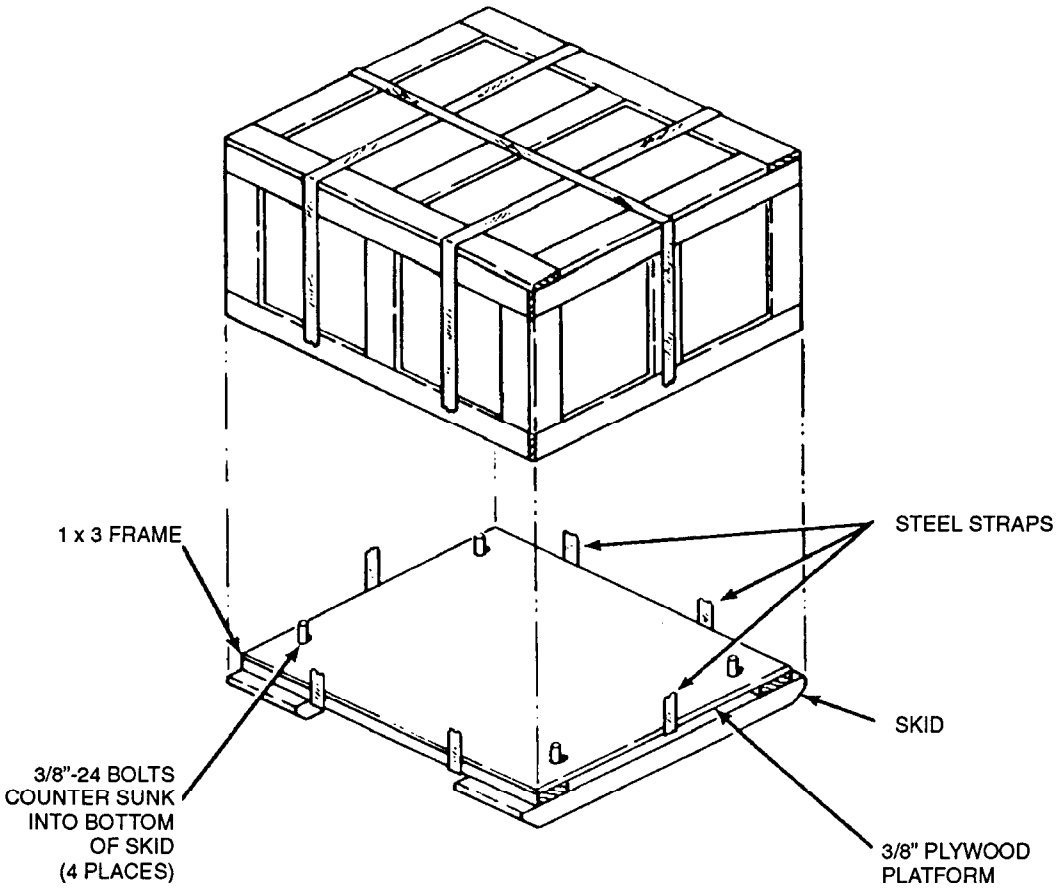
Wrap cable connectors in cushioning material before packaging.

f. Seal all openings with polyethylene film and l/2-inch pressure sensitive tape.

g. Cover the entire unit with a polyethylene film shroud and secure with /2-inch pressure sensitive tape.

h. Store air conditioner in a dry, dust-free space and in the operating (upright) position.

i. Storage of the air conditioner will be in accordance with TM 740-90-1, Administrative Storage of Equipment.



4.43.3 Preparartion. Prepare as prescribed for long-term storage.

4.43.4 Shipping Container.

a. Fabricate a wood shipping container conforming to PPP-B-601, Domestic Type. A minimum of 1- inch clearance will exist between the air conditioner and walls of the box. The box will be modified with skids located so that the bolts securing the air conditioner pass through the skids. Bolt heads will be countersunk into the bottom of the skids. The bolts with washers should protrude at least 3/8 inch above the skid and not more than 1/2 inch.

b. The air conditioner will be packed in the shipping container and secured to the skids with four bolts (3/8-24) and washers.

c. Wood spacers will be padded with water resistant cushioning material to prevent abrasion. Comer pads constructed of fiberboard will be used on all top and bottom edges of the air conditioner.

d. The shipping container will be closed and secured with nails and steel strapping material.

e. The air conditioner will be stored and shipped in the operating (upright) position. The words “THIS END UP” with arrows will be placed on each side of the shipping container. The letters will be black, at least 3 inches high, and located within the upper third of each side.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. DIRECT SUPPORT TROUBLESHOOTING

5.1 GENERAL

5.1.1 This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner. Each malfunction is followed by a list of probable causes and actions to take to remedy the malfunction. You should perform the test/inspections and corrective actions in the order listed.

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

5.2 DIRECT SUPPORT TROUBLESHOOTING. See table 5-1.

Table 5-1. Direct Support Troubleshooting

Malfunction Test or Inspection Corrective Action	
1.	COMPRESSOR WILL NOT START
Step 1.	Make continuity check of control circuit. See Appendix F for control circuit schematic and wiring diagram. (Refer to paragraph 4.24.) a. Repair loose or broken connections. b. Replace bad components. (Refer to paragraphs 4.24, 4.25 and 4.26.)
Step 2.	Make continuity check of circuit breaker. (Refer to paragraph 4.24.) Replace bad circuit breaker. (Refer to paragraph 4.24.)
Step 3.	Test starting relay or start capacitor. (Refer to paragraphs 4.27 and 4.29.)
Step 4.	Check continuity or compressor motor leads, and leads to casing using ohmmeter. (Refer to paragraph 5.27.) Replace bad compressor. (Refer to paragraph 5.27.)
Step 5.	Check continuity of HIGH and LOW pressure switches at room temperature. Continuity should exist. (Refer to paragraph 5.21.) a. If continuity does not exist. press reset button and recheck. b. Replace faulty HIGH or LOW pressure switch. (Refer to paragraph 5.21.)
Step 6.	Check polarity of power input plug (P1) using voltmeter. With positive (+) lead in pin A and negative (-) lead in pin B, voltage should be115 Vac. With positive (+) lead pin A and negative (-) lead in pin D, voltage should be 115 Vat. With positive (+) lead in pin B and negative (-) lead in pin D, voltage should be zero volts. Replace power input plug (P1) which does not pass above test.
2.	COMPRESSOR STARTS, BUT STOPS AT ONCE - “SHORT CYCLES"
Step 1.	Test compressor run capacitor. (Refer to paragraph 4.29.) Replace bad compressor run capacitor. (Refer to paragraph 4.29.)
Step 2.	Inspect evaporator coil for dirt or icing, and check for obstructions at outlet louver. (Refer to paragraphs 4.18 and 4.37.) a. Clean dirty evaporator coil. b. Defrost in HEAT mode, or remove obstructions from outlet louver.

Table 5-1. Direct Support Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action	
2.	COMPRESSOR STARTS, BUT STOPS AT ONCE - “SHORT CYCLES” - Continued
Step 3.	Check for proper operation of condenser fan and motor. a. Repair faulty condenser fan/motor. (Refer to paragraph 5.15.) b. Replace bad motor. (Refer to paragraph 4.36.)
Step 4.	Turn off power; short-circuit ("jumper”) the HIGH pressure switch. Turn on power. For maximum of 12 seconds, cycle compressor to see whether compressor operates normally. **CAUTION** Do not exceed 12-second operating time for compressor, or vacuum may be formed in suction side or refrigeration system and damage it. Replace faulty HIGH pressure switch, (Refer to paragraph 5.21.)
Step 5.	Check dehydrator to see that it is not sweating, frosting or cold to the touch. If so, replace obstructed dehydrator. (Refer to paragraph 5.25.)
Step 6.	Check refrigerant system for leaks using a halogen or electronic leak detector. Refrigerant charge may be low, as indicated by bubbles in liquid sight indicator, or non-condensable gas may have entered system, If refrigerant charge is low, but no leaks are found, discharge and purge system, repair or replace leaking component, and recharge. (Refer to paragraphs 5.9 through 5.15.)
Step 7.	Install pressure gages in system (paragraph 5.4) and check system pressures to see whether an overcharge of refrigerant is indicated. If overcharge is indicated, partially discharge the system and retest. (Refer to paragraph 5.10.)
3.	INSUFFICIENT COOLING
Step 1.	Feel dehydrator to see whether it is cold to the touch, or is frosted or sweating. If so, replace dehydrator. (Refer to paragraph 5.25.)
Step 2.	Check input and discharge sides of solenoid valves for temperature difference. Abnormally cold discharge indicates leakage or obstruction. Replace faulty solenoid valves. (Refer to paragraph 5.18.)

Table 5-1. Direct Support Troubleshooting - Continued

Malfunction / Test or Inspection / Corrective Action	
3.	INSUFFICIENT COOLING - Continued
Step 3.	Check evaporator coil for overall temperature. If part of coil is relatively warm and evaporator inlet is sweaty or frosty, expansion valve may be obstructed or damaged. (Refer to paragraph 5.17.)
Step 4.	Check liquid sight indicator for bubbles or cloudiness, which indicates insufficient refrigerant. Recharge system after checking for and repairing leaks. (Refer to paragraphs 5.3 through 5.10.)
Step 5.	Check for low discharge pressure to see whether compressor is pumping. (Refer to table 5-2 for normal pressures.) Replace faulty compressor. (Refer to paragraph 5.27.)
4.	COMPRESSOR RUNS BUT DOES NOT COOL
Step 1.	Check for excessively high temperature in conditioned area. a. Close doors, windows or other openings. b. Insulate areas of high heat gain.
Step 2.	Check compressor for noisy operation, high suction pressure or excessively low discharge pressure indicating leaky internal valves. (Refer to paragraph 5.10 and table 5-2.) Replace compressor. (Refer to paragraph 5.27.)
Step 3.	Check liquid sight indicator for bubbles indicating low charge of refrigerant. a. Repair leaks or replace leaking component. b. Purge and recharge system. (Refer to paragraphs 5.3 and 5.10.)
Step 4.	Check for high discharge pressure. (Refer to table 5-2.) a. Purge or bleed off excess refrigerant. b. Check HIGH pressure switch or pressure regulator valve.

Table 5-1. Direct Support Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action
5. COMPRESSOR EXCESSIVELY NOISY
Step 1. Listen for knocking. Check for high pressure indicating that liquid refrigerant is returning to compressor. (Refer to paragraph 5.10 and table 5-2.)
Step 2. Check for high discharge pressure indicating overcharge of refrigerant. (Refer to paragraph 5.10 and table 5-2.) a. Purge or bleed off excess refrigerant. b. Check HIGH pressure switch or pressure regulator valve.
6. SUCTION PRESSURE TOO LOW OR TOO HIGH
Step 1. Stop compressor and check expansion valve as follows: a. Remove remote bulb from well in suction line. b. Place bulb in ice water for 1-2 minutes. c. Start compressor. d. Remove bulb from ice water and hold it in one hand to warm it. At the same time, check the suction line for rapid change of temperature, which indicates flood-through of liquid refrigerant. If liquid floods through valve, it is operating satisfactorily. If not, valve or remote bulb is faulty. CAUTION Do not let liquid flood back into compressor or compressor will be seriously damaged. e. Replace faulty expansion valve. (Refer to paragraph 5.17.)
Step 2. Feel dehydrator for temperature difference. Discharge end will feel cooler than input end if clogged, or discharged end may be frosty or sweaty. Replace dehydrator. (Refer to paragraph 5.25.)

Table 5-1. Direct Support Troubleshooting - Continued

Malfunction Test or Inspection Corrective Action	
7. LOW HEAT OR NO HEAT	
Step 1.	Check heater wiring and control circuit for loose connections or broken wires.
	a. Tighten loose connections.
	b. Replace or repair broken wires. (Refer to paragraphs 4.35, 4.24 and 4.26.)
Step 2.	Check continuity of Mode Selector switch and Temperature Selector switch. (Refer to paragraph 4.24.)
Step 3.	Disconnect and remove heater elements, and apply 115-volt AC power to check for open circuit in element. Element should heat.
	Replace faulty heating elements. (Refer to paragraph 4.35.)
Step 4.	Check continuity of HIGH pressure cutout switch at room temperature. Continuity should exist. (Refer to paragraph 5.21.)
	a. If continuity does not exist, press reset button and recheck. (Refer to paragraph 5.21.)
	b. Replace faulty switch.
Step 5.	Disconnect heater relay. Apply 24-28 volts DC to actuate relay and check continuity at secondary terminals. Continuity should exist. (Refer to paragraph 4.25.)
	Replace faulty relay. (Refer to paragraph 4.25.)
Step 6.	Check operation of evaporator fan and motor. (Refer to paragraphs 4.32 and 4.33.)
	Repair or replace faulty fan or motor. (Refer to paragraphs 4.32 and 4.33.)

Section II. DIRECT SUPPORT MAINTENANCE PROCEDURES

5.3 REFRIGERATION SYSTEM.

5.3.1 Description.

WARNING

Whenever it is necessary to open the refrigeration system for any reason, discharge the refrigerant carefully. Avoid contact with liquid refrigerant. Severe freezing of body tissues can take place with extreme rapidity. Avoid excessive inhalation of refrigerant gas, and ventilate the area in which it is released. Refrigerant gas in contact with flame or hot surfaces is converted to phosgene, a highly toxic gas having an odor similar to newly mown grass or hay.

a. The refrigeration system, illustrated by the refrigerant flow diagram, is a mechanical, vapor-cycle circuit consisting of the evaporator, thermal expansion valve, compressor, condenser, and the necessary valves and cutout devices for automatic control during operation.

b. The thermal expansion valve releases high-pressure liquid refrigerant into the evaporator at reduced pressure.

c. The liquid refrigerant begins to vaporize by absorbing heat from the air passing over the outside surface of the evaporator coil.

d. The heated vapor is sucked out of the evaporator section by the compressor and is forced into the condenser section under high pressure where it is cooled and condensed back into a liquid.

e. The heat released during condensation is carried off by the condensing airstream.

f. The liquid refrigerant flows from the condenser to a receiver to a subcooler and then to the thermal expansion valve to repeat the cycle.

g. If the temperature control switch (evaporator return-air thermostat) becomes satisfied or the evaporator return-air temperature is lower than the point at which you have set the control, the refrigeration system will switch to a bypass condition.

h. The temperature control switch will activate the normally open liquid bypass solenoid valve and shut off the evaporator section of the unit. You will notice that the compressor will continue to pump as usual, and the suction pressure will begin to drop.

i. When the suction pressure reaches about 65 psig (4.6 kg/cm^2), the valve starts to open in an effort to maintain the suction pressure above about 55 psig (3.86 kg/cm^2).

j. As the suction temperature goes up, due to the opening of the pressure regulating valve, the quench expansion valve will start to meter liquid refrigerant into the suction line to maintain the suction temperature below 75 °F (24 °C).

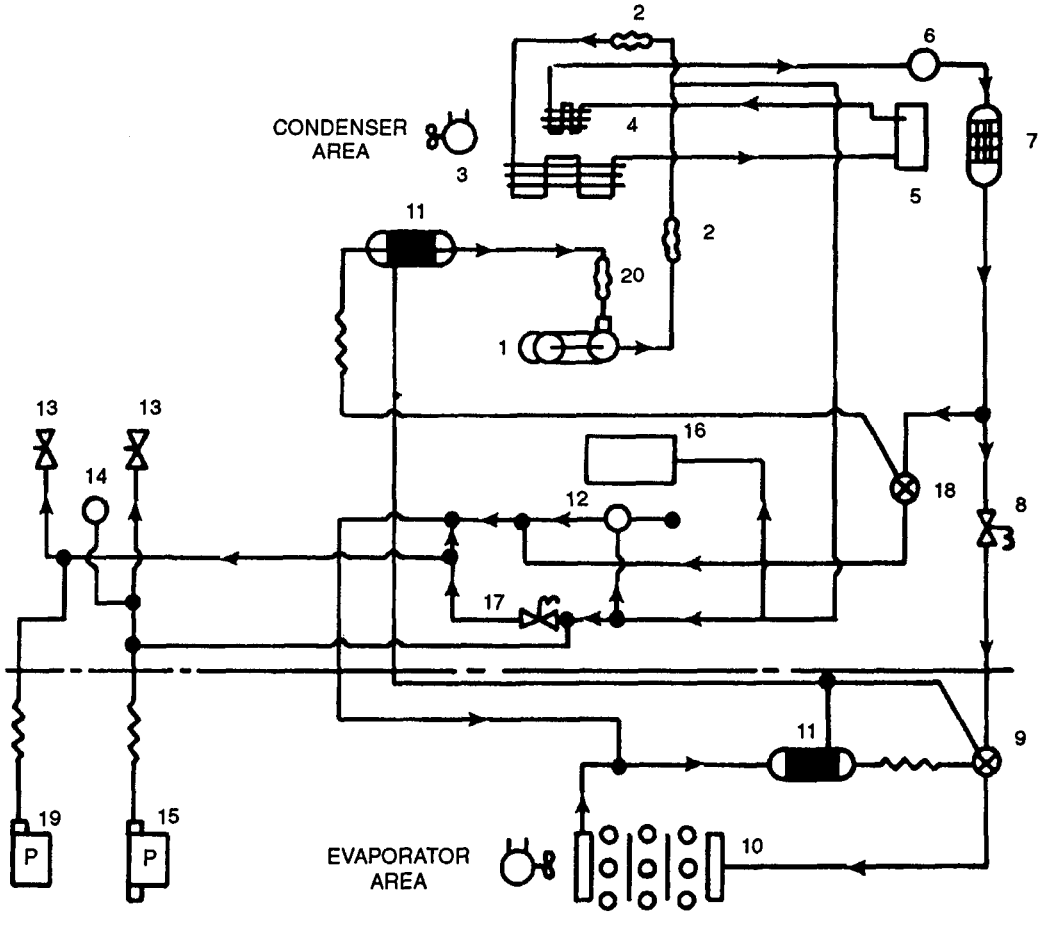
k. The action of the pressure regulating valve and quench valve is automatic. This action may also occur at extreme conditions in an attempt to maintain the suction pressure (even during the COOLING mode) at a point above 55 psig (3.86 kg/cm^2) and the suction temperature (measured at the quench bulb well) below 75 °F (24 °C).

l. The condenser louvers are operated by a refrigerant-powered actuator located in the high-pressure part of the system. This actuator should be fully extended (louvers open) at approximately 80 °F (27 °C) at 260-220 psig

(18.3-15.5 kg/cm^2) discharge pressure, and fully closed at 180-150 psig (12.67-10.56 kg/cm^2). Failure to perform this function could result in cutout on the high pressure cutout switch.

5.3.2 Refrigeration System Repair. The following paragraphs contain repairs covering commonly used hardware, the tubing and valves of the refrigeration system. Re-use or repair of seals and gaskets should not be attempted new parts should be used at assembly. When heating refrigeration piping to debraze or unsolder connections (see paragraph 5.6) as well as to solder or braze them, the piping should be protected with a continuous flow of dry nitrogen to prevent scaling or oxidation of the inside surface.

Item No.	Nomenclature	Item No.	Nomenclature
1.	Compressor, reciprocating	11.	Bulb well
2.	Hose assembly, metal	12.	Regulator, fluid pressure
3.	Coil, condenser w/angle	13.	Valve, service
4.	Subcooler	14.	Valve, pressure relief
5.	Receiver, liquid refrigerant	15.	Switch, pressure (high)
6.	Indicator, sight, liquid	16.	Cylinder assembly, actuating linear
7.	Dehydrator, desiccant, refrigerant	17.	Solenoid valve w/leads
8.	Solenoid, valve w/leads	18.	Valve, expansion (quench)
9.	Valve, expansion (primary)	19.	Switch, pressure (low)
10.	Coil, evaporator	20.	Hose assembly, metal



5.4 REFRIGERATION SYSTEM SERVICIN G - (DISCHARGING). This task covers service.

INITIAL SETUP

Equipment Conditions:
Mode Selector switch in OFF position
Main power source is disconnected
Panels removed (paragraph 4.17)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on or near electrical components or junction box compartment.	
Rear Top of Unit		
Service	a. Remove screws from service valve access cover. b, Remove service valve access cover. c. Unscrew hose connection protective caps from service valves. **WARNING** Death or serious injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and 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.	

5.4 REFRIGERATION SYSTEM SERVICING - (DISCHARGING). - Continued

Location/Item	Action	Remarks
Service Continued	**NOTE** In accordance with Environmental Protection Agency regulations, refrigerants cannot be discharged into the atmosphere. A refrigerant recovery and recycling unit must be used whenever discharging the refrigerant system. Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY. **WARNING** Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes therefrigerant to breakdown and form carbonyl chloride (phosgene), a highly poisonous and corrosive gas. d. Connect the charging manifold hoses to the manifold and air conditioner service valves. e. Connect and operate a recovery/recycling unit in accordance with manufacturer's instructions.	

5.4 REFFRIGFRATION SYSTEM SERVICING-(DISCHARGING). - Continued

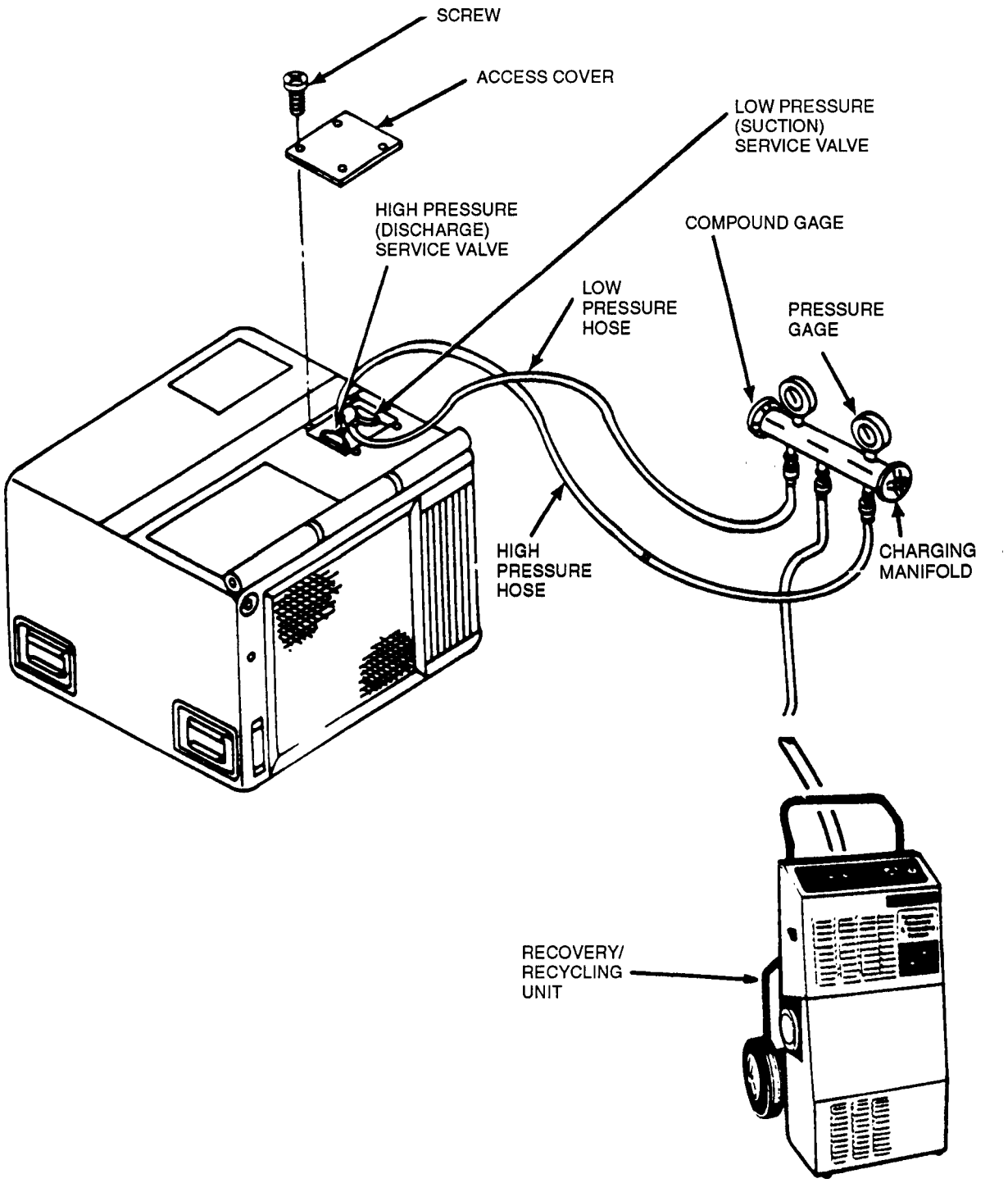


Illustration for paragraph 5.4.

5.5 REFRIGERATION SYSTEM SERVICING- (PURGING). This task covers service.

INITIAL SETUP

Equipment Conditions:
Refrigerant system discharged (paragraph 5.4)
Main power source disconnected

Material/Part:
Nitrogen (Appendix E, Item 4)

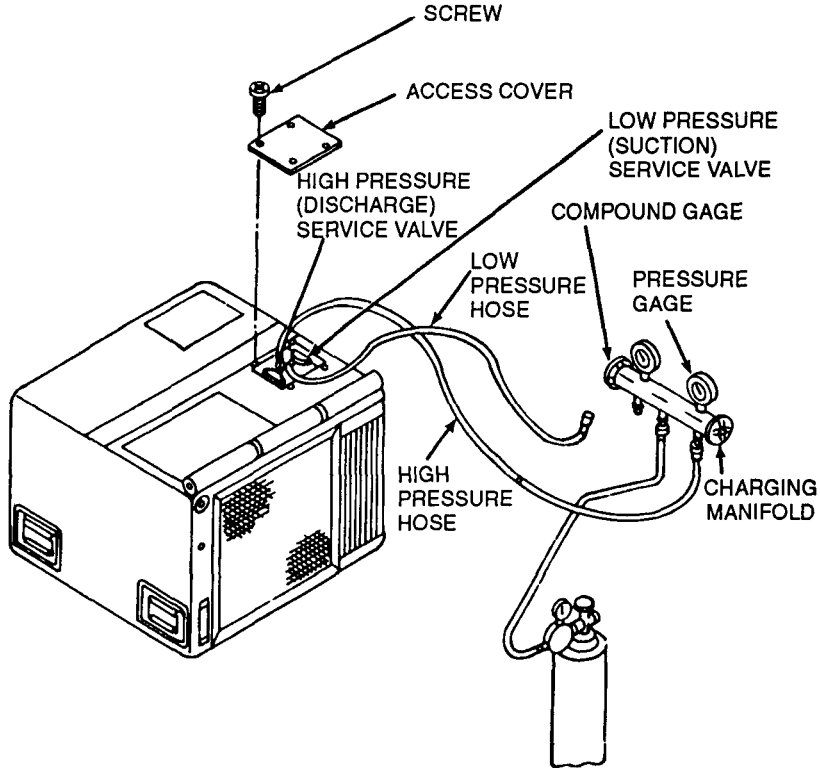
Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on or near electrical system. **WARNING** The refrigeration system must be purged with dry nitrogen, Appendix E, Item 4, during any brazing operation performed on any component. A flow of dry nitrogen at the rate of less than 1 - 2 cfm (0.028-0.057 m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling. **CAUTION** Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations.	

5.5 REFRIGERATION SYSTEM SERVICING-(PURGING) .- Continued

Location/Item	Action	Remarks
	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 5-4, proceed as follows: a. See specific component removal/repair instructions. b. Be sure that refrigerant has been discharged (see paragraph 5.4). c. Connect the center hose from the charging manifold to a nitrogen regulator and dry nitrogen tank. d. The hose from the high pressure service valve to the charging manifold must be connected. e. The hose from the low pressure service valve must be disconnected from the charging manifold. f. Open both service valves on the unit. g Close the unused valve on the charging manifold and open the one with the nitrogen tank hooked up. h. Open the nitrogen cylinder valve and adjust the regulator so that less than 1 -2 cfm (0.028-0.057 m^3/minute) of nitrogen flows through system. i. Check discharge from hose attached to the low pressure service valve to be sure that no oil is being forced out of the system. j. Allow nitrogen to sweep through the system at the rate of less than 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. (See paragraph 5.6 for brazing/debrazing procedures.) k. After installation brazirng operations are completed, allow nitrogen to flow for a minimum of 5 minutes.	

5.5 REFRIGERATION SYSTEM SERVICING - (PURGING).- Continued

Location/Item	Action	Remarks
	L Close nitrogen cylinder valve, nitrogen regulator, charging manifold valve, and both low and high pressure service valves on the unit. m. Disconnect the hose from the nitrogen tank. n. Assuming that all repairs are completed, go to paragraph 5.7.	



5.6 REFRIGERATION SYSTEM SERVICING- (BRAZING/DEBRAZING). This task covers service.

INITIAL SETUP

Equipment Conditions:
Refrigeration system discharged (paragraph 5.4)
Refrigeration system purged (paragraph 5.5)
Main power source disconnected

Materials/Parts:
Brazing alloy (silver) (Appendix E, Items 5 and 6)
Nitrogen cylinder (Appendix E, Item 4)
Brazing flux (Appendix E, Item 7)
Abrasive cloth (Appendix E, Item 8)
Rags (Appendix E, Item 9)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on or near electrical system. a. General. All tubing in the refrigeration system is copper with a finish that permits thorough cleaning. All inter-connecting fittings, such as elbows, tees, etc., are also copper. The bodies of all valves and all connections on other components are brass. All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required. b. Filler 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 III brazing alloy may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints. c. Debrazing. Debraze joints for removal of refrigeration system components as follows: **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.	

5.6 REFIGERATION SYSTEM SERVICING - (BRAZING/DEBRAZING). - Continued

Location/Item	Action	Remarks
	(1) Determine which joints are to be debrazed. Due to the limited work space inside the air conditioner, it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing the joints on the component itself. (2) Before debrazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet rag to act as a heat sink. **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 at brazing temperature. (3) Protect insulation, wiring harnesses, cabinet, and other surrounding components with appropriate shields. (4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1-2 cfm (0.028-0.057 m^3/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 dry cloth. Be sure no filler alloy or other debris are left inside any tubing, fitting or component. e. Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new component before reinstallation.	

5.6 REFRIGERATION SYSTEM SERVICING - (BRAZING/DEBRAZING).- Continued

Location/Item	Action	Remarks
	f. Brazing. Braze joints within the air conditioner as follows: (1) Position the component to be installed. (2) To prepare a joint on a valve for brazing, disassemble the valve to the extent possible. Then wrap all but the joint with a wet rag to act as a heat sink. (3) Protect insulation, wiring harnesses, and surrounding components with appropriate shields. (4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of less than 1-2 cfm (0.028-0.057m^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.	

5.7 REFRIGERATION SYSTEM SERVICING - (LEAK TEST). This task covers test.

INITIAL SETUP

Equipment Condition:
Main power source disconnected

Test Equipment
Electronic refrigerant gas leak detector

Materials/Parts:
Nitrogen (Appendix E, Item 4)
Refrigerant R-22 (Appendix E, Item 10)

Looation/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system. a. The entire repaired area should be thoroughly leak tested after repair or replacement of any component, before it is recharged with refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause. b. Testing Method. There are two acceptable methods for leak testing the refrigeration system. (1) Refrigerant Gas Leak Detector. If an electronic refrigerant gas leak detector is available, it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas." **NOTE** The electronic refrigerant gas leak detector is highly sensitive to the presence of a minute quantity of gas in the air, and due to this factor is quite effective in the detection of a small leak. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty maybe encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area. (2) Soap Solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of possible leakage while closely watching for the formulation of bubbles.	

5.7 REFRIGERATION SYSTEM SERVICING - (LEAK TEST). - Continued

Location/Item	Action	Remarks
	CAUTION If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation. c. Testing 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 method, the system may be pressurized with dry nitrogen alone. (1) To pressurize a system that has some refrigerant charge, for either leak testing method: (a) Remove the hose connection protective caps from the high and low pressure service valves. (b) Connect the hoses from a charging manifold to the service valves. **NOTE** If it is possible that the problem may not be a leak and that you may not have to replace a refrigeration system component, refrigerant-22 may be substituted for the nitrogen 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) Open the unit service valves and the charging manifold valves. (e) Open the nitrogen tank valve and pressurize the system to 300 psig (21.2 kg/cm^2). (f) Perform leak tests.	

5.7 REFRIGERATION SYSTEM SERVICING- (LEAK TEST). -Continued

Location/Item	Action	Remarks
	(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 (see paragraph 5.9). (2) To pressurize a system that has been dis charged and purged for leak testing with an electronic detector (a) Remove the hose connection protective caps from the high and low pressure service valves. (b) Connect the hoses from a charging manifold to the service valves. (c) Connect a cylinder of refrigerant-22 tc the center hose connection of the charging manifold. CAUTION Connect the refrigerant-22 cylinder so that only gas will be used for pressurization. (d) Open both unit service valves and the charging manifold valves. (e) Open the refrigerant cylinder valve slightly and adjust as necessary to prevent formation of frost, and allow system pressure to buildup until the gages read 40-50 psi (2.8-3.5 kg/cm^2). (f) Close the charging manifold valves and the refrigerant cylinder valve. (g) Remove the refrigerant-22 cylinder from the center hose connection. (h) Connect a nitrogen regulator of dry nitrogen to the center hose connection.	

5.7 REFRIGERATION SYSTEM SERVICING - (LEAK TEST).- Continued

Location/Item	Action	Remarks
	(i) Open the charging manifold valves and the nitrogen cylinder and regulator valve. Allow system pressure to build up until gages read 300 psig (21.2 kg/cm^2). (j) Perform leak tests, then discharge and purge the system, in accordance with paragraphs 5.4 and 5.5 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.	

5.8 REFRIGERATION SYSTEM SERVICING- (EVACUATION). This task covers evacuation.

INITIAL SETUP

Equipment Conditions:
Refrigerant system leak tested (paragraph 5.7)
Refrigerant system discharged (paragraph 5.4)

Material/Part:
Nitrogen (Appendix E, Item 4)

Test Equipment:
Vacuum pump

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing any maintenance work on the electrical system. **NOTE** Replace dehydrator whenever refrigerant system is opened. **WARNING** Do not evacuate a leaking system. The vacuum created can cause air, moisture, and dirt to enter system. **NOTE** In the event the compressor was replaced as a result of burnout, check that compressor burnout procedures were followed.	See paragraph 5.27.
	a. Connect the hose from the low pressure service valve to the compound gage side of the charging manifold. The hose from the high pressure service valve shall be connected to the high pressure gage side of the charging manifold.	
	b. Open both service valves.	
	c. Attach center hose assembly charging manifold to vacuum pump.	
	d. Start vacuum pump.	

5.8 REFRIGATION SYSTEM SERVICING - (EVACUATION) - Continued

Location/Item	Action	Remarks
	e. Open charging manifold valves.	
	f. Run the vacuum pump until approximately a 300 micron vacuum is reached.	
	NOTE Inability to reach 300 microns may indicate either a leak or a problem with the pump.	
	g. Close manifold valves and check compound gage. Record reading. Let unit sit for 1 hour. Observe compound gage reading.	
	h. if the system holds the vacuum without change of pressure, proceed to Step j.	
	i. If the vacuum cannot be held for 1 hour, one of the following reasons may account for the problem:	
	(1) Presence of water vapor in the system. Continued pumping will correct this condition.	
	(2) Leak in the refrigeration system. Break the vacuum with dry nitrogen and retest for leaks.	See paragraph 5.7.
	(3) Internal leakage of vacuum pump. Test the pump by connecting a vacuum gage directly to the vacuum pump intake and continue to pump. If pump still fails to reach approximately 300 microns, the pump is faulty.	
	j. Close both unit service valves.	
	k. Close charging manifold valves.	
	l. Stop vacuum pump.	
	m. Disconnect pump from center hose connection.	
	n. Charge system with refrigerant-22.	See paragraph 5.9.

5.8 REFRIGERATION SYSTEM SERVICING- (EVACUATION).- Continued

Location/Item	Action	Remarks

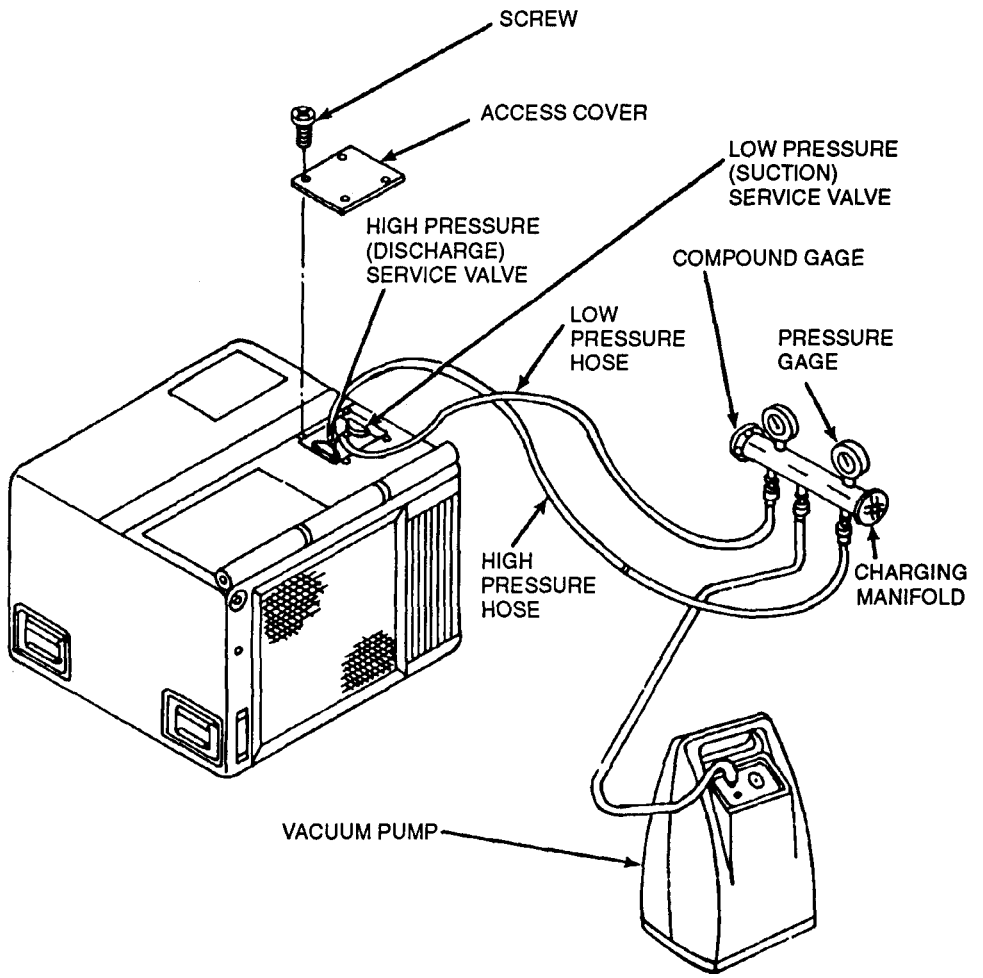


Illustration for paragraph 5.8.

5.9 REFRIGERATION SYSTEM SERVICING - (CHARGING). This task covers charging refrigeration system.

INITIAL SETUP

Equipment Condition:
Refrigeration system evacuated (paragraph 5.8)

Material/Part:
Refrigerant-22, (Appendix E, Item 10)

Test Equipment:
Charging cylinder or scale

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing any maintenance work on the electrical system. **CAUTION** Never introduce liquid refrigerant into the low pressure (suction) service valve. **NOTE** Install top covers before charging unit. The system must be evacuated before charging. Use only refrigerant-22 to charge the unit. Whenever available, use recycled refrigerant for charging the refrigeration system. a. Connect the hose from the low pressure service valve to the compound gage side of the charging manifold. The hose from the high pressure service valve should be connected to the high pressure gage side of the manifold. b. Connect the center hose from the charging manifold to a well-charged cylinder of refrigerant-22, or a charging cylinder. c. Loosen the hose connections to the two service valves slightly.	

5.9 REFRIGERATION SYSTEM SERVICING - (CHARGING). -Continued

Location/Item	Action	Remarks
	d. Open the two charging manifold valves. e. Open the refrigerant-22 or charging cylinder valve slightly to allow a small amount of refrigerant to purge air from the hoses. Tighten the hose connections at the air conditioner service valve. f. Close the low pressure (suction) charging manifold valve. g. Position the refrigerant-22 cylinder so that liquid will be used for charging. (Some cylinders must be inverted and some are equipped with a selection valve.) h. Using accurate scales, measure and record the weight of the charged refrigerant-22 cylinder. i. Fully open the refrigerant-22 cylinder valve. j. Open the high pressure service valve on the air conditioner. Allow liquid refrigerant to enter the system until the charged refrigerant cylinder weight has decreased by 2.875 Ibs (1.15 kg) or until system pressure has equalized. k. Close the refrigerant cylinder valve and the high pressure (discharge) manifold valve. l. Connect power to air conditioner. m. Press and release both pressure switch reset buttons. n. Turn air conditioner on and operate in the COOL mode with the temperature control thermostat set at a maximum COOLER position. o. If the 2.875 Ibs (1.15 kg) full charge was obtained, skip Steps o through r. If the system pressure equalized prior to obtaining a full charge of 2.875 Ibs (1.15 kg) proceed with Step p. p. Switch the refrigerant cylinder valve, the low (suction) pressure charging manifold valve, and the low (suction) pressure service valve on the air conditioner.	

5.9 REFRIGERATION SYSTEM SERVICING - (CHARGING). - Continued

Location/Item	Action	Remarks
	q. Open the refrigerant cylinder valve, the low (suction) pressure charging manifold valve, and the low (suction) pressure service valve on the air conditioner. r. Monitor the weight of the refrigerant cylinder as the air conditioner compressor pulls additional refrigerant gas into the system until the full 2.875 lbs (1 .15 kg) charge is obtained. When the system is fully charged, immediately close the refrigerant cylinder valve. s. Run the air conditioner in COOL mode with temperature control thermostat in full COOLER position for 15 minutes. **NOTE** Do not skip the next step. t. After 15 minutes, observe the liquid sight indicator (sight glass) on left rear of unit. Green center means the refrigerant moisture content is acceptable. Yellow center means there is too much moisture in the system. It must be discharged, evacuated and charged again. Milky white or bubbly liquid means the system has a low charge. Clear bubble-free liquid around the center means the system is fully charged. u. If charge is low, add gas refrigerant. Switch refrigerant cylinder to vapor position. Open cylinder valve and the manifold low pressure valve. v. Check air conditioner for proper cooling. There should beat least a 5 °F temperature difference between evaporator discharge air and inlet air. Turn Mode Selector switch to OFF. w. Close the high and low pressure service valves and remove charging manifold hoses.	

5.9 REFRIGERATION SYSTEM SERVICING - (CHARGING).- Continued

Location/Item	Action	Remarks
	x. Install service valve protective caps. y. Secure service valve access cover using four screws.	

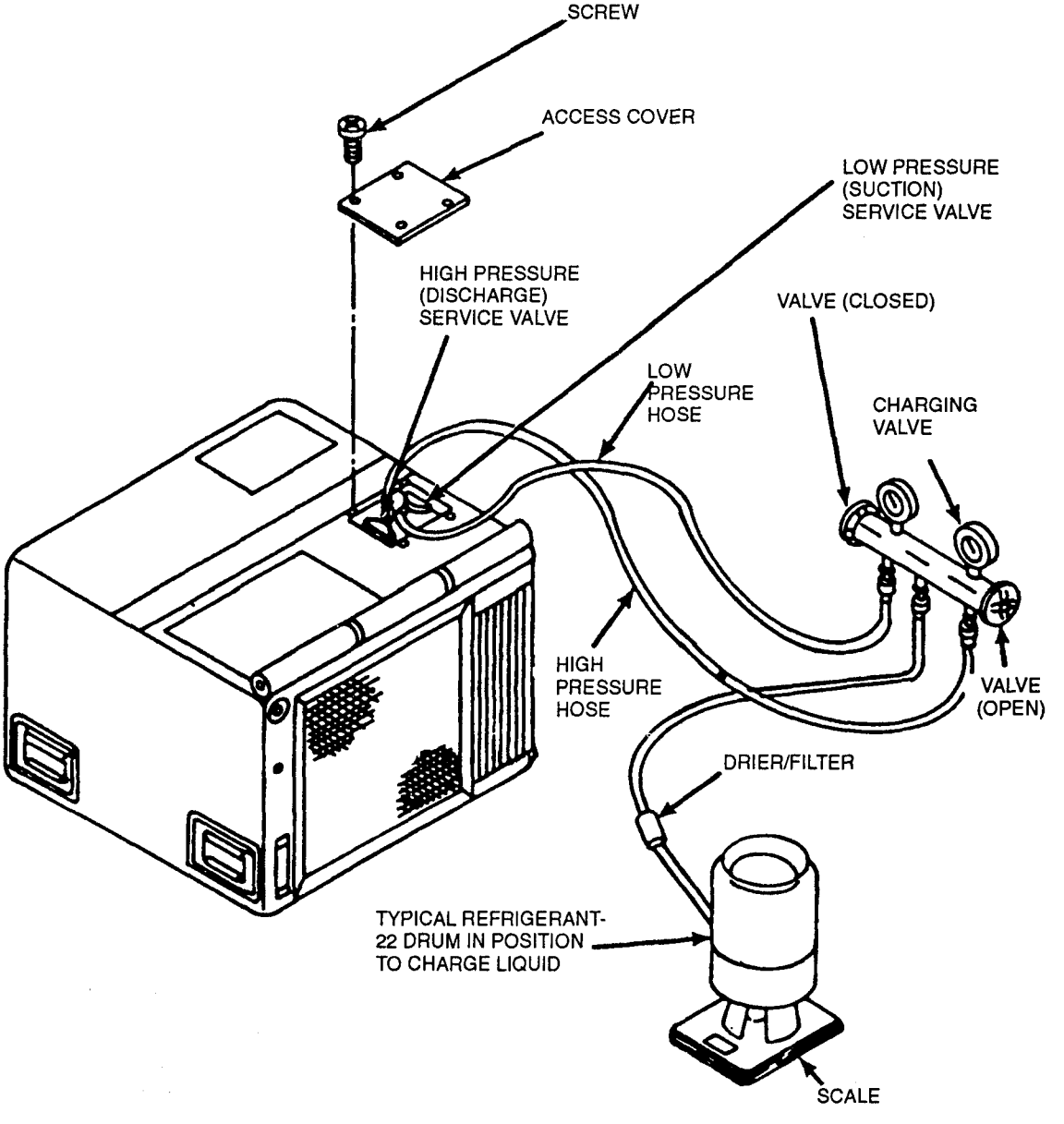


Illustration for paragraph 5.9.

5.10 REFRIGERATION SYSTEM SERVICING - (PRESSURE TESTING). This task covers test.

Location/Item	Action	Remarks
	WARNING Check to see that power is disconnected.	
Service Valve Access Cover	a. Remove screws from service valve access cover. b. Remove service valve access cover.	
Charging Valve Caps	Remove caps from high and low pressure service valves.	
Refrigeration System Pressure	a. Connect low pressure gage hose of marnifold valve to suction service valve. b. Connect high pressure hose of manifold valves to discharge service valve. c. Purge hoses - open discharge and suction service valves. d. Check that manifold valves are closed. e. Start air conditioner. f. Compare gage readings with the normal range of system pressure as shown on the following table. g. Close discharge and suction service valves. h. Disconnect gages. i. Install service valve access cover with screws.	

Table 5-2. Normal Temperature - Pressure Relationships

Temperatures	Pressure Range (psig)			
Outdoor Ambient	50 °F (10 °C)	75 °F (24 °C)	100 °F (38 °C)	125 °F (52 °C)
90 °F (32 °C) Return air to unit (dry bulb)	55-65 suction 125-160 discharge	59-70 suction 175-210 discharge	60-75 suction 255-295 discharge	75-90 suction 370-425 discharge
80 °F (27 °C) Return air to unit (dry bulb)	58-65 suction 120-155 discharge	58-70 suction 170-205 discharge	60-75 suction 250-290 discharge	65-75 suction 370-425 discharge

5.10 REFRIGERATION SYSTEM SERVICING - (PRESSURE TESTING).- Continued

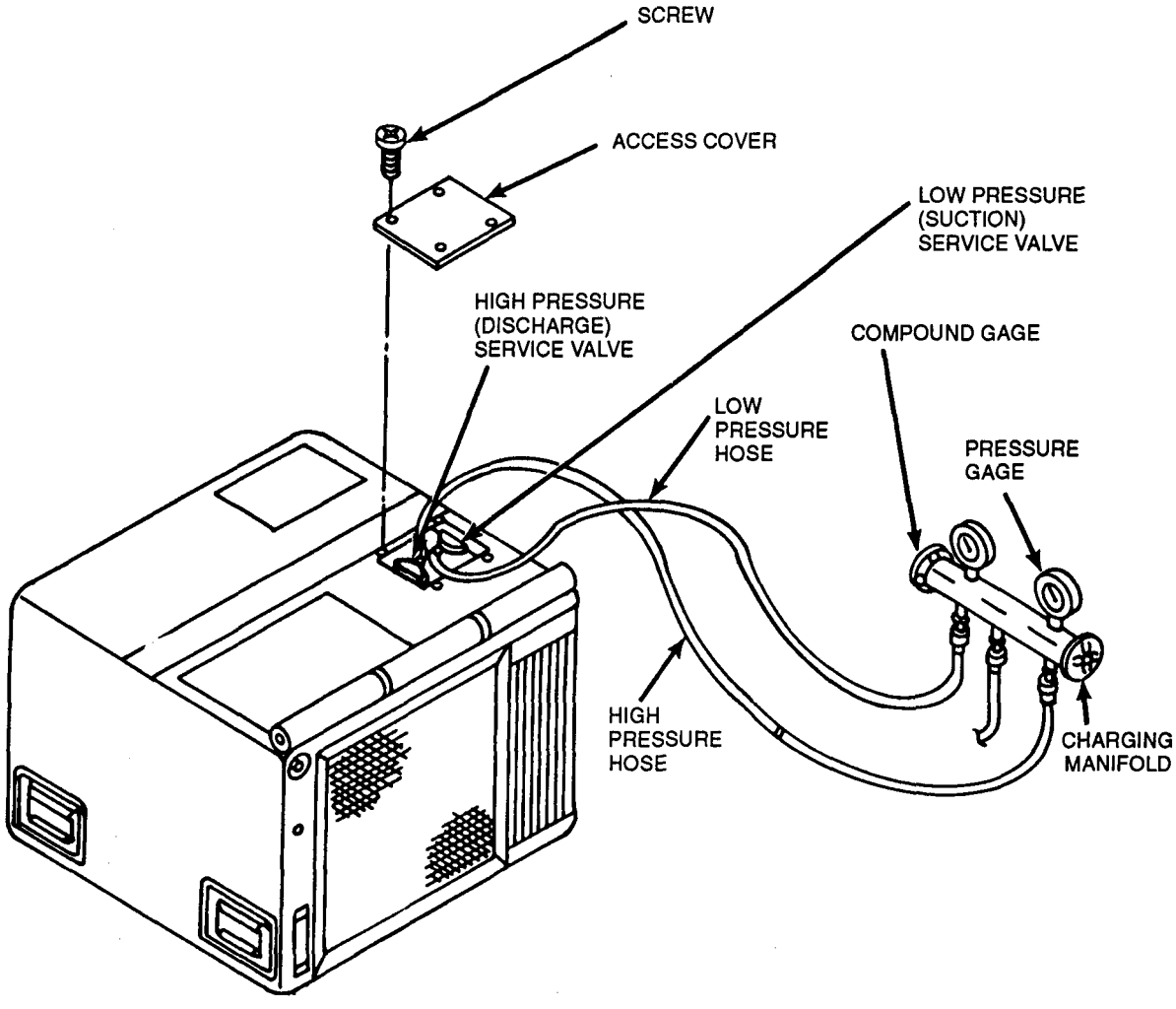


Illustration for paragraph 5.10.

5.11 CANVAS COVER AND PANELS-REPAIR/REPLACE. This task covers removal, repair and installation.

INITIAL SETUP

Materials/Parts:
Flexible polyurethane foam (Item 20, Appendix E)
Warm, soapy water
Filter-kote or oil (Item 17, Appendix E)
Cellular rubber strips (Item 19, Appendix E)
Adhesive (Item 18, Appendix E)
Toluolene (Item 27, Appendix E)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Top of Housing Fabric Cover		
Removal	a. Loosen ties on canvas cover (1).	
	b. Roll down.	
	c. Remove screws, flat washers, and lockwashers securing canvas cover (1).	
	d. Roll up canvas cover (1).	
	e. Refasten ties around rolled canvas cover (1).	
	f. Set aside.	
Front Top Cover		
Removal	a. Remove eight screws (2) securing front top cover (3).	
	b. Remove front top cover (3).	
Rear Top Cover		
Removal	a. Remove seven screws (4) securing rear top cover (5).	
	WARNING Always ground every capacitor likely to hold a dangerous potential charge.	

5.11 CANVAS COVER AND PANELS. - Continued

Location/Item	Action	Remarks
Removal Continued	b. Slide rubber boots (6) away from capacitors (7).	
	c. Discharge capacitors (7) using instrument with insulated handle.	
	d. Tag and disconnect leads from capacitors (7).	
	e. Remove rear top cover (5).	
Center Top Cover		
Removal	a. Remove two screws (8) securing center top cover (9).	
	b. Remove two screws (10) holding the thermostatic heater switch bracket (11) to the cover. Leave the switch in place.	
	c. Remove center top cover (9).	
Top Covers		
Repair	a. Inspect for bent covers, loose or missing gaskets or foam insulation.	
	b. Clean dirty covers with warm, soapy water.	
	c. Straighten or replace damaged covers.	
	WARNING MMM-A-121 Adhesive is flammable and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate.	
	d. Secure loose rubber gaskets or insulating foam with adhesive (Item 18, Appendix E).	
	e. Remove damaged gaskets.	

5.11 CANVAS COVER AND PANELS. - Continued

Location/Item	Action	Remarks
Repair Continued	**WARNING** Toluolene is flammable and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate. f. Clean area using toluolene (Item 27, Appendix E). **WARNING** MMM-A-121 Adhesive is flammable and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate. g. Replace damaged gaskets using cellular rubber strips (Item 19, Appendix E). **WARNING** MMM-A-121 Adhesive is flammable and its vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well-ventilated area and keep away from sparks or flame. Use goggles, gloves, and apron when appropriate. h. Replace damaged foam insulation with flexible polyurethane foam (Item 20, Appendix E) and adhesive (Item 18, Appendix E).	
Canvas Cover Repair	a. Repair any rips in canvas or seams.	

5.11 CANVAS COVER AND PANELS. - Continued

Location/Item	Action	Remarks
Repair - Continued	b. Replace any damaged grommets or snaps.	
	c. Replace cover if heavily damaged.	
Center Top Cover		
Installation	a. Secure thermostatic heater switch bracket (11) to underside of cover (9) with two screws (10).	
	b. Aline cover (9) and secure with two screws (8).	
Rear Top Cover		
Installation	a. Connect leads to capacitors (7) and remove tags.	
	b. Slide rubber boots (6) over capacitor leads.	
	c. Aline cover (5) and secure with seven screws (4).	
Fabric Cover		
Installation	Aline canvas cover (1) and secure with screws, flat washers, and lockwashers.	
Front Top Cover		
Installation	Aline cover (3) and secure with eight screws (2).	

5.11 CANVAS COVER AND PANELS. - Continued

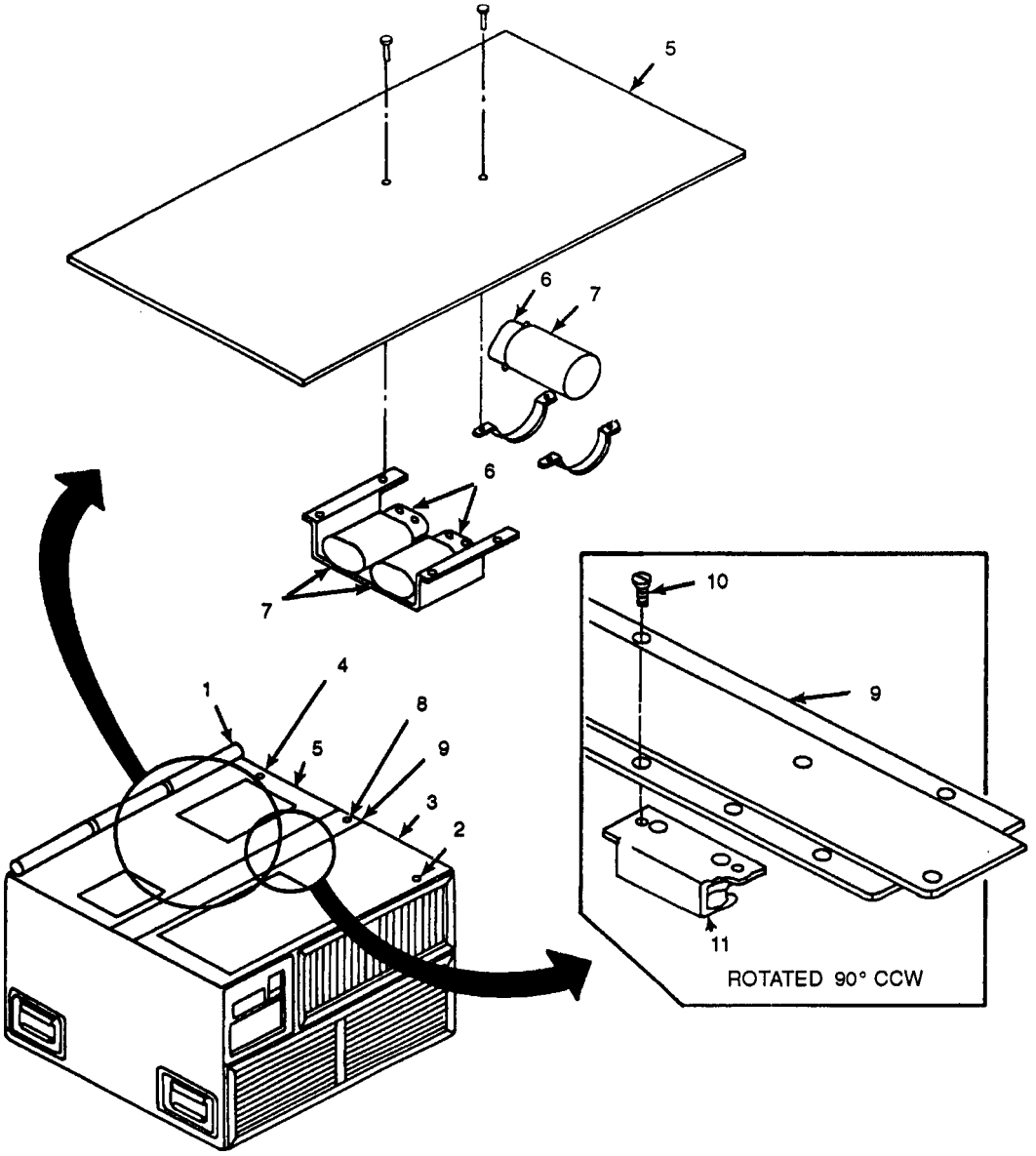
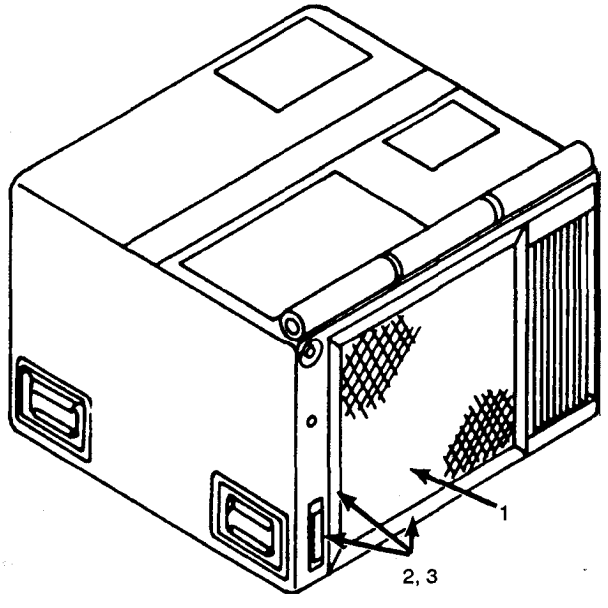


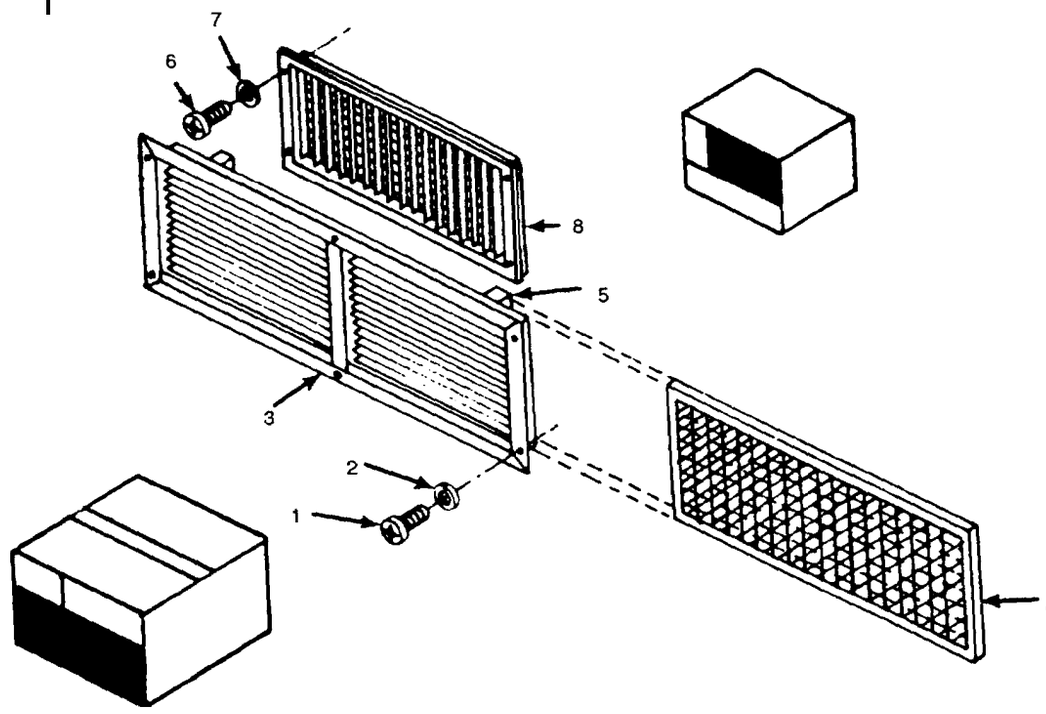
Illustration for paragraph 5.11.

5.12 SCREENS AND GUARDS-REPLACE/REPAIR. This task covers removal, repair and installation.

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Removal	Remove eight screws (2) and eight lockwashers (3) securing guard (1). Remove guard.	
	 REAR VIEW	
Repair	a. Inspect for bent guard.	
	b. Straighten bent guard or replace if damaged beyond repair.	
Installation	a. Install guard (1) with screws (2) and washers (3).	
	b. Tighten ail screws (2) securing guard (1).	

5.13 LOUVERS-REPLACE. This task covers removal and installation.

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Evaporator Inlet Louver		
Removal	a. Remove eight screws (1) and eight lockwashers (2) securing louver (3) to housing. b. Remove louver (3). c. Remove evaporator air inlet filter (4) from filter clip (5).	
Evaporator Outlet Louver		
Removal	a. Remove six screws (6) and six lockwashers (7) securing louver (8) to housing. b. Remove louver (8).	



5.13 LOUVERS. - Continued

Location/Item	Action	Remarks
Evaporator Outlet Louver		
Installation	Aline and secure louver (8) to housing using six screws (6) and six lockwashers (7).	
Evaporator Inlet Louver		
Installation	a. Install evaporator inlet air filter (4) into filter clips (5). b. Aline and secure louver (3) to housing using eight screws (1) and eight lockwashers (2).	

5.14 INFORMATION PLATES - REPLACE. This task covers removal and installation.

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power input connector before doing maintenance work on electrical system.	
Reset High Pressure Decal		
Removal	Using a flathead screwdriver, remove high pressure reset decal (14) from junction box (15).	
Reset Low Pressure Decal		
Removal	Using a flathead screwdriver, remove low pressure reset decal (16) from junction box (15).	
High Pressure Charging Valve Decal		
Removal	Using a flathead screwdriver, remove high pressure charging valve decal (4) from rear top cover (17).	
Low Pressure Charging Valve Decal		
Removal	Using a flathead screwdriver, remove low pressure charging valve decal (3) from rear top cover (17).	
Caution: LPCO Jumper Decal		
Removal	Using a flathead screwdriver, remove caution decal (11) from evaporator inlet louver (18).	
Caution: Grounding Decal		
Removal	Using a flathead screwdriver, remove caution decal (19) from front of junction box (15).	

5.14 INFORMATION PLATES. - Continued

Location/Item	Action	Remarks
Vent Open Decal		
Removal	Using a flathead screwdriver, remove the vent open decal (9) from right front of air conditioner (above vent damper actuator wheel).	
Vent Closed Decal		
Removal	Using a flathead screwdriver, remove the vent closed decal (9) from the right front of the air conditioner (beneath vent damper actuator wheel).	
Identification Plate	**WARNING** Disconnect air conditioner power supply before doing maintenance work on or near electrical components or junction box compartment.	
Removal	a. Remove front top cover (20). (See paragraph 4.17.) b. Remove junction box (15). (See paragraph 4.25.) **CAUTION** When removing or installing identification plate, be careful not to damage any components in the junction box compartment. c. Using a 1/8" diameter drill, remove four rivets (1) from identification plate (2) and housing. d. Remove identification plate (2) from housing.	
Danger Plate	**WARNING** Disconnect air conditioner power supply before doing maintenance work on or near electrical components or junction box compartment.	
Removal	a. Remove front top cover (20). (See paragraph 4.17.)	

5.14 INFORMATION PLATES. - continued

Location/Item	Action	Remarks
Removal - Continued	b. Remove junction box (15). (See paragraph 4.25.)	
	CAUTION When removing or installing danger plate, be careful not to damage any components in the junction box compartment.	
	c. Using a 1/8 diameter drill, remove four rivets (12) from danger plate (13) and housing.	
	d. Remove danger plate (13) from housing.	
Schematic Diagram		
Removal	a. Remove front top cover (20). (See paragraph 4.1 7.)	
	b. Using a 1/8" diameter drill, remove six rivets (5) from schematic diagram (6) and front top cover (20).	
	c. Remove schematic diagram (6) from front top cover (20).	
Refrigeration Diagram		
Removal	a. Remove rear top cover (17). (See paragraph 4.1 7.)	
	b. Using a 1/8" diameter drill, remove six rivets (7) from refrigeration diagram (8) and rear top cover (17).	
	c. Remove refrigeration diagram (8) from rear top cover (17).	
Reset High Pressure Decal		
Installation	a. Remove protective paper from back of new reset high pressure decal (14) to expose sticky surface	
	b. Aline reset high pressure decal (14) to proper position on junction box (15) and press in place.	

5.14 INFORMATION PLATES. - Continued

Location/Item	Action	Remarks
Reset Low Pressure Decal		
Installation	a. Remove protective paper from back of reset low pressure decal (16) and expose sticky surface. b. Aline reset low pressure decal (16) to proper position on junction box (15) and press in place.	
High Pressure Charging Valve Decal		
Installation	a. Remove paper from back of new high pressure charging valve decal (4) to expose sticky surface. b. Aline decal (4) to proper position on rear top cover (17) and press in place.	
Low Pressure Charging Valve Decal		
Installation	a. Remove paper from back of new low pressure charging valve decal (3) to expose sticky surface. b. Aline decal (3) to its proper position on rear top cover (17) and press in place.	
Caution: LPCO Jumper Decal		
Installation	a. Remove paper from back of Caution: LPCO Jumper Decal (11) and expose sticky surface. b. Aline decal (11) to its proper position on evaporator inlet louver (18) and press in place.	
Caution: Grounding Decal		
installation	a. Remove paper from back of Caution: Grounding Decal (19) and expose sticky surface. b. Aline decal (19) to its proper position on junction box (19) and press in place.	

5.14 INFORMATION PLATES. - continued

Location/Item	Action	Remarks
Vent Open Decal		
Installation	a. Remove paper from back of new vent open decal (10) and expose sticky surface. b. Aline decal (10) to proper position on housing (above vent damper actuator wheel) and press in place.	
Vent Closed Decal		
Installation	a. Remove paper from back of new vent closed decal (9) and expose sticky surface. b. Aline decal (9) to proper position on housing (beneath vent damper actuator wheel) and press in place.	
Identification Plate	**WARNING** Disconnect air conditioner power supply before doing maintenance work on or near electrical components or junction box compartment.	
Installation	a. Aline identification plate (2) onto housing in proper position. **CAUTION** Be careful not to damage internal components of junction box compartment when installing identification plate. b. Secure identification plate (2) to housing using four rivets (1). c. Install junction box (15). (See paragraph 4.25.) d. Install front top cover (20). (See paragraph 4.17.)	

5.14 INFORMATION PLATES. - Continued

Location/Item	Action	Remarks
Danger Plate	**WARNING** Disconnect air conditioner power supply before doing maintenance work on or near electrical components or junction box compartment. **CAUTION** Be careful not to damage internal components of junction box compartment when installing danger plate.	
Installation	a. Aline danger plate (13) onto housing in proper position. b. Secure danger plate (13) to housing using four rivets (12). c. Install junction box (15). (See paragraph 4.25.) d. Install front top cover (20). (See paragraph 4.17.)	
Schematic Diagram		
Installat ion	a. Aline schematic diagram (6) onto proper position. b. Secure schematic diagram (6) to front top cover (20) with six rivets (5). c. Install front top cover (20). (See paragraph 4.17.)	
Refrigeration Diagram		
Installation	a. Aline refrigeration diagram (8) onto rear top cover (17) in proper position. b. Secure refrigeration diagram (8) to rear top cover (17) with six rivets (7). c. Install rear top cover (17) onto air conditioner. (See paragraph 4.17.)	

5.14 INFORMATION PLATES. - Continued

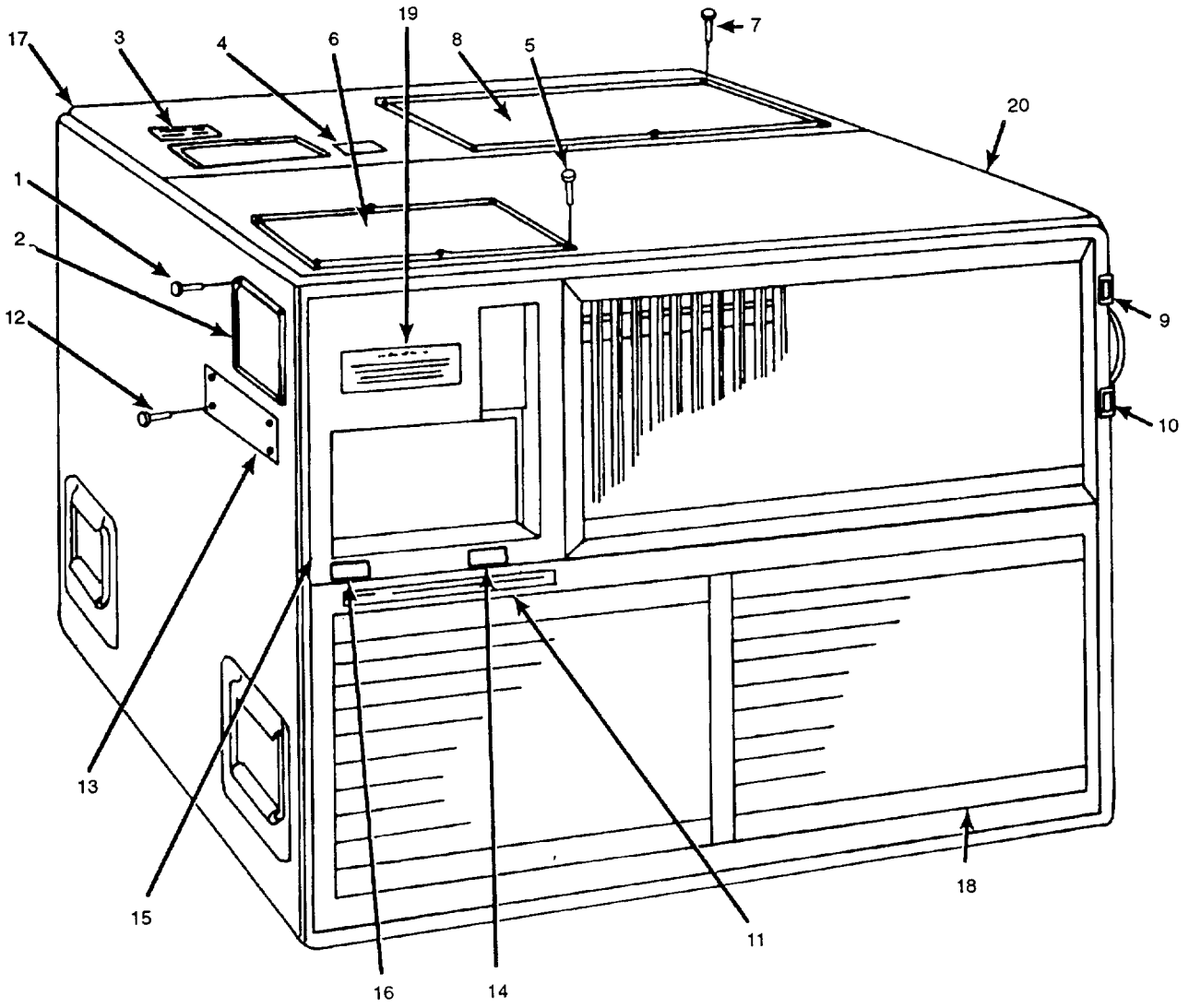


Illustration for paragraph 5.14.

5.15 CONDENSER FAN MOTOR-REPAIR. This task covers disassembly, cleaning, inspection and reassembly.

INITIAL SETUP

Equipment Conditions:
Rear top cover removed (paragraph 4.17)
Condenser fan motor removed (paragraph 4.36)

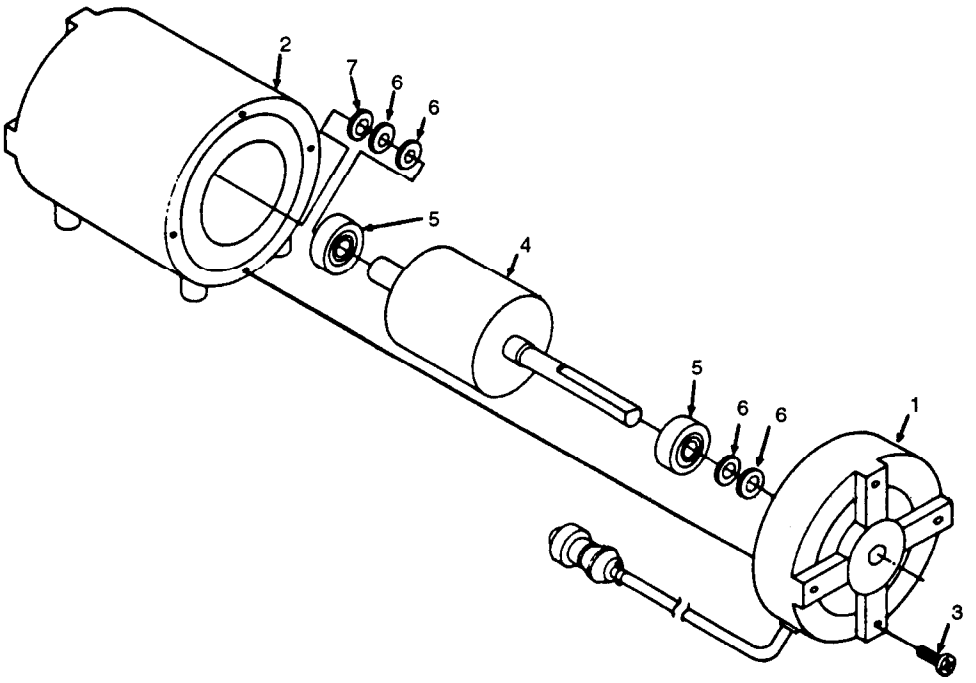
Special Tool:
Plastic bar or rawhide mallet

Materials/Parts:
Dry cleaning solvent (Appendix E, Item 16)
Cloth, lint-free (Appendix E, Item 9)
Oil (Appendix E, Item 14)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing any maintenance work on the electrical system.	
disassembly	a. Match-mark the end plate (1) and motor housing (2) to ease reassembly. b. Remove screws (3) from the end plate (1) on motor. c. Remove plastic nut from end plate (1) on wiring.	
	CAUTION Remove the rear end plate carefully to avoid damaging wires. Wires may be left in place if care is taken to avoid damaging them.	

5.15 CONDENSER FAN MOTOR. - Continued

Location/Item	Action	Remarks
disassembly Continued		



d. Using a rawhide mallet or plastic bar and hammer, tap the rear end plate (1) away from housing (2). Use caution not to damage wiring.

e. Pull out the rotor (4), with bearings (5) from end plate (1).

f. Remove bearings (5) from rotor (4). Retain the shims (6) and spring (7) for use at reassembly if they are in good condition.

WARNING

Dry cleaning solvent (Appendix E, Item 16) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 1000 F (38 °C - 59 °C).

5.15 CONDENSER FAN MOTOR. - Continued

Location/Item	Action	Remarks
Repair	a. Clean inside surfaces of end plate and housing with solvent; blow dry with compressed air or wipe dry with lint-free cloth. b. Blow dust out of coils in stator with compressed air (30-50 psi) (2.1 kg/cm^3 to 3.5 kg/cm^2). c. Inspect shaft surfaces of rotor for nicks, gouges and deformation. Dress out high metal with a fine file or stone. If damage exceeds reparable limits, replace motor. d. Inspect the thrust washer and shims for wear, tearing or other damage. Replace if worn or damaged. e. Inspect the wire connections to stator coils for cuts, abrasion or loose connections. Repair or replace as required.	
Reassembly	a. Coat the shaft surfaces of the rotor (4) with oil, then slide bearings (5) over end of shaft so they seat against shoulder at inner end of bearing diameter of shaft. Press or drive bearings (5) onto shoulders. b. Dip a spring (7) and shims (6) in oil and slide over each end of shaft with spring next to bearings. **NOTE** Bearings are lubricated at time of manufacture and require no further lubrication before they are installed. c. Coat the bearing cavity of the housing (2) and end plate (1) with oil. d. Insert rotor (4) into stator and housing (2). e. Install end plate (1). f. Install four screws to secure end plate (1) to stator and housing (2). g. Install and tighten plastic nut on wiring to end plate (1).	

5.16 EVAPORATORCOIL-REPLACE/REPAIR. This task covers removal and installation.

INITIAL SETUP

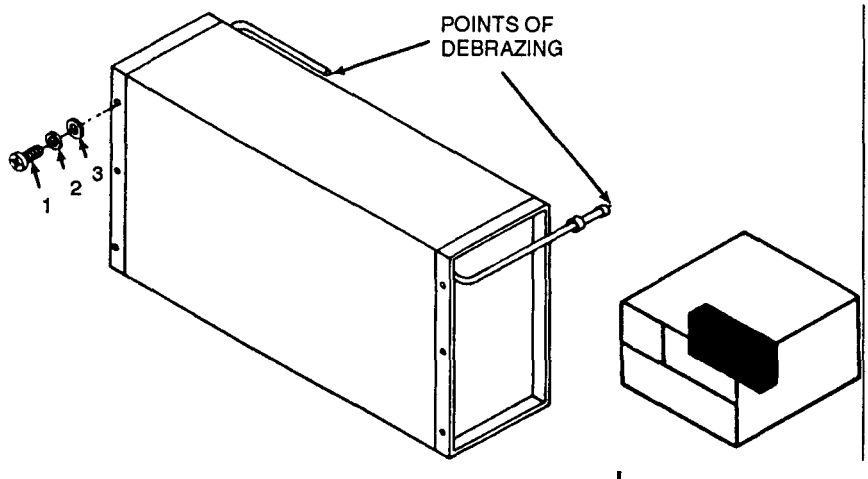
Equipment Conditions:
- Top covers removed (paragraph 4.17)
- Evaporator outlet louver removed (paragraph 4.18)
- System refrigerant discharged (paragraph 5.4)
- Mist eliminator removed (paragraph 4.20)

Test Equipment:
- Halogen leak detector

Materials/Parts:
- Dry cleaning solvent (P-D 680) (Appendix E, Item 16)
- Nitrogen (Appendix E, Item 5 or 6)
- Brazing alloy (Appendix E, Item 5 or 6)
- Brazing flux (Appendix E, Item 7)
- Warm, soapy water
- Brush, wire
- Cloth, lint-free (Appendix E, Item 9)

Location/Item	Action	Remarks
	WARNING Purge system with dry nitrogen prior to soldering; refrigerant heated by flame or hot surfaces creates phosgene gas, a highly toxic gas. **WARNING** Do not let refrigerant touch you or inhale refrigerant gas. Be especially careful to prevent refrigerant from coming in contact with your eyes. In ease of refrigerant leaks, ventilate area at once. **WARNING** Check that power source is disconnected.	

5.16 EVAPORATOR COIL. - Continued

Location/Item	Action	Remarks
	WARNING Follow general debrazing instructions given in paragraph 5.12. Provide a flow of dry nitrogen through the refrigeration system while debrazing connections. **WARNING** The polyurethane foam used as insulation in the air conditioner will break down to form toxic gasses if exposed to the flame of a torch at brazing temperature.	
Removal	a. Remove six screws (1), six lockwashers (2), and six flat washers (3) securing evaporator coil to housing. b. Debraze tubing from evaporator coil. c. Carefully lift the evaporator coil from the air conditioner. d. Remove dehydrator.	See paragraph 5.25.
		
Inspection	Inspect the evaporator coil for bent or torn fins and for damaged connections.	

5.16 EVAPORATOR COIL. - Continued

Location/Item	Action	Remarks
Cleaning	**WARNING** Dry cleaning solvent (Appendix E, Item 16) used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 °F (38 °C).	
	Clean coil using cleaning solvent (Appendix E, Item 16) and soft brush.	
Installation	a. Connect tubing to coil. Before brazing joints, provide a f low of dry nitrogen through refrigerant ion system to protect internal surfaces of the tubing and fittings.	
	b. Place coil in air conditioner, and secure coil to housing with six screws (1), six lockwashers (2) and six flat washers (3).	See paragraph 5.5.
	c. Install new dehydrator.	See paragraph 5.25.
	d. Leak test system.	See paragraph 5.7.
	e. Evacuate system.	See paragraph 5.8.
	f. Charge system.	See paragraph 5.9.
	g. Install evaporator outlet louver.	See paragraph 4.18.
	h. Install mist eliminator.	See paragraph 4.20.
	i. Install top covers.	See paragraph 4.17.

5.17 EXPANSION VALVES-REPLACE. This task covers removal and installation.

INITIAL SETUP

Equipment Conditions:
- Front and center top covers removed (paragraph 4.17)
- Solenoid valve coil (L1) removed (paragraph 4.38)
- Discharge refrigerant (paragraph 5.4)

Test Equipment:
- Halogen leak detector

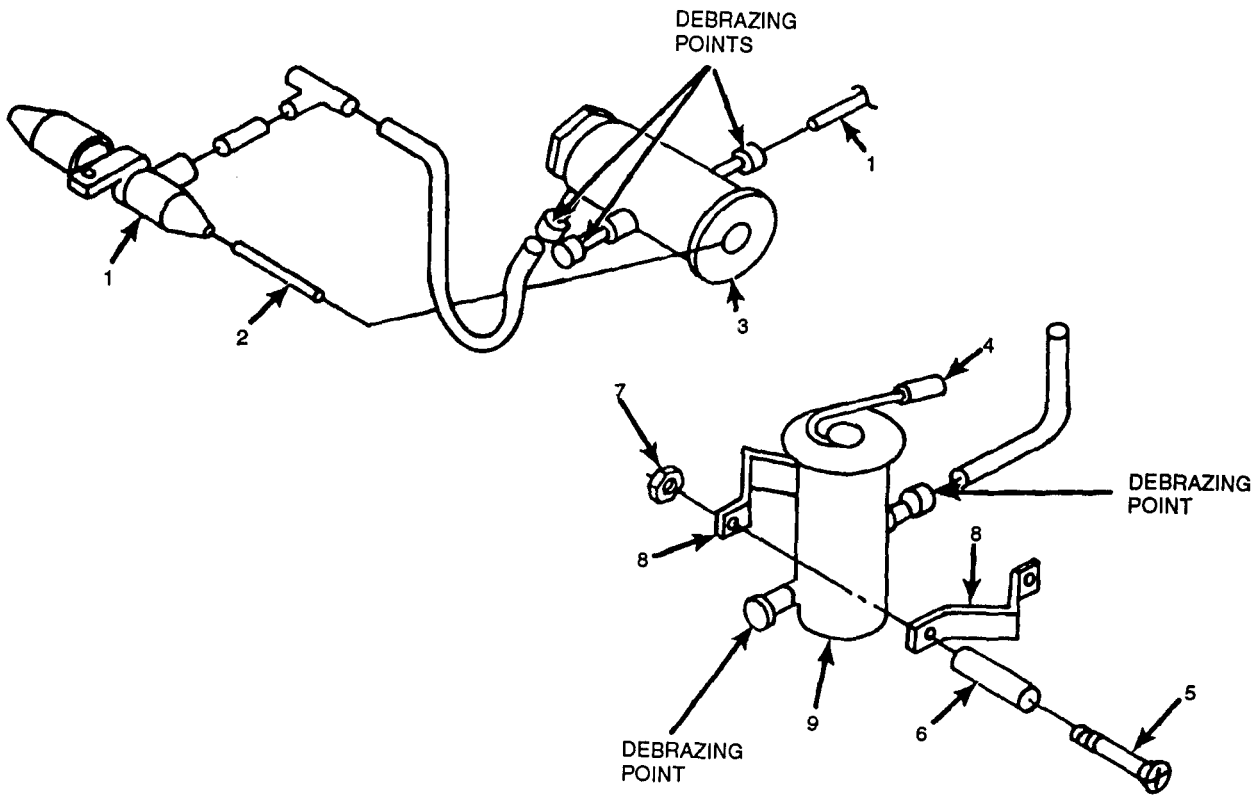
Materials/Parts:
- Nitrogen (Appendix E, Item 4)
- Brazing solder (Appendix E, Items 5 and 6)
- Brazing flux (Appendix E, Item 7)
- Hot water
- Cloth, lint-free (Appendix E, Item 9)

Location/Item	Action	Remarks
	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 in its proximity, precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a spray paint booth should be used. Air supply 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 when ventilation is inadequate. **WARNING** Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this environment.	

5.17 EXPANSION VALVES. - continued

Location/Item	Action	Remarks
	WARNING Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. Check that system is discharged of refrigerant. **WARNING** When performing brazing/debrazing operations, wrap valves with wet rags to act as a heat sink. **NOTE** Replace dehydrator whenever refrigerant system is opened.	
Primary Expansion Valve		
Removal	a. Soften mastic bulb in well (1) if necessary, by warming with a cloth soaked in hot water and wrung out, a heat lamp, or equivalent.	
	b. Withdraw bulb (2) from well taking care to prevent damage to capillary tube.	
	c. With dry nitrogen flowing through refrigerant system, debraze tubing to valve at debrazing point.	See paragraphs 5.5 and 5.6.
	d. Remove expansion valve (3) from unit.	

5.17 EXPANSION VALVELS. - continued



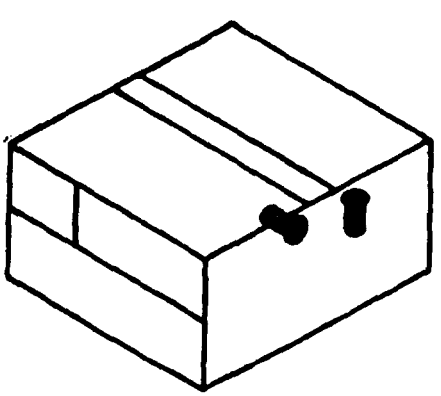


Illustration for paragraph 5.17.

5.17 EXPANSION VALVES. - continued

Location/Item	Action	Remarks
Quench Expansion Valve		
Rernoval	a. Soften mastic bulb in well if necessary, by warming with a cloth soaked in hot water.	
	b. Withdraw the bulb (4) from the well. Take care to prevent damage to the capillary tube.	
	c. Remove two screws (5), two spacers (6), two self locking nuts (7), and two valve mounting brackets (8).	
	d. Debraze tubing from valve (9) at debrazing points.	See paragraphs 5.5 and 5.6.
	e. Remove quench valve (9).	
Primary Expansion Valve		
Installation	a. With dry nitrogen flowing through refrigeration system, braze valve to tubing.	
	CAUTION Take care to avoid kinking capillary tube.	
	b. Coil excess tubing.	
	c. Insert approximately 1.0 ounce (28.349 gins) of thermal mastic bulb in well (1).	
	d. Press sensing bulb (2) into well (1) and work back and forth to distribute mastic thoroughly and until capillary end is approximately 1.0 inch (2.54 cm) beyond open end of well.	
	e. Replace dehydrator.	See paragraph 5.25.
	f. Leak test refrigeration system.	See paragraph 5.7.
	g. Evacuate refrigeration system.	See paragraph 5.8.
	h. Charge refrigeration system.	See paragraph 5.9.
	i. Install front and center top covers.	See paragraph 4.17.

5.17 EXPANSION VALVES. - continued

Location/Item	Action	Remarks
Quench Expansion Valve		
Installation	a. With dry nitrogen flowing through refrigerant system, braze valve to tubing.	See paragraphs 5.5 and 5.6.
	CAUTION Take care to avoid kinking capillary tube.	
	b. Coil excess tubing.	
	c. Insert approximately 1.0 ounces (28.349 gins) of thermal mastic bulb in well.	
	d. Press sensing bulb (4) into well and work back and forth to distribute mastic thoroughly and until capillary end is approximately 1.0 inch (2.54 cm) beyond open end of well.	
	e. Install two valve mounting brackets (8) to housing using two screws (5), two spacers (6) and two locknuts (7).	
	f. Replace dehydrator.	See paragraph 5.25.
	g. Leak test refrigeration system.	See paragraph 5.7.
	h. Evacuate refrigeration system.	See paragraph 5.8.
	i. Charge refrigeration system.	See paragraph 5.9.
	j. Install rear top cover.	See paragraph 4.17.

5.18 SOLENOID VALVES-REPLACE. This task covers removal and installation.

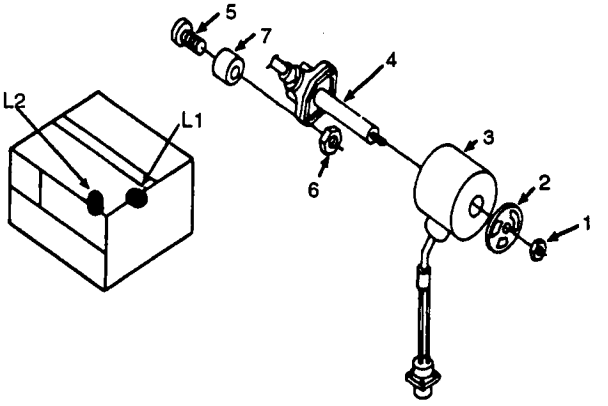
INITIAL SETUP

Equipment Conditions:
Rear top cover removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)

Materials/Parts:
Solder, brazing (Appendix E, Items 5 and 6)
Flux, soldering (Appendix E, Item 7)

Location/Item	Action	Remarks
Top of Housing	**WARNING** Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. **WARNING** Check that system is discharged of refrigerant. **CAUTION** When performing brazing/debrazing operations, wrap valves with wet rags to act as a heat sink.	
Solenoid L2		
Removal	a. Disconnect electrical connector from bulkhead.	
	b. Remove plunger nut (1) and nameplate (2) from plunger (4) and remove coil (3).	
	c. Purge system.	See paragraph 5.5.
	d. Debraze and remove valve	See paragraph 5.6.

5.18 SOLENOID VALVES. - continued

Location/Item	Action	Remarks
Solenoid L1		
Removal	a. Disconnect electrical connector of solenoid coil from bulkhead.	
	b. Remove plunger nut (1) and nameplate (2) from plunger (4) and remove coil (3).	
	c. Remove two screws (5), two nuts (6) and two spacers (7) securing the valve body to the housing.	
	d. Purge system.	See paragraph 5.5.
	e. Debraze and remove valve.	See paragraph 5.6.
		
Solenoid L2		
Installation	a. Purge system.	See paragraph 5.5.
	b. Braze valve body.	See paragraph 5.6.
	c. Install coil and secure to plunger with plunger nut (1).	
	d. Connect electrical leads.	See paragraph 5.25.
	e. Replace dehydrator.	See paragraph 5.7.
	f. Leak test refrigeration system.	See paragraph 5.8.
	g. Evacuate refrigeration system.	See paragraph 5.9.
	h. Charge refrigeration system.	See paragraph 4.17.
	i. Install rear top cover.	

5.18 SOLENOID VALVES. - continued

Location/Item	Action	Remarks
Solenoid L1		
Installation	a. Solder valve body on tubing.	
	b. Secure body to housing with two screws (5), two nuts (6), and two spacers (7) securing the valve body to the housing. Install from outside of housing into valve body.	
	c. Connect electrical connector of solenoid coil to bulkhead.	
	d. Replace dehydrator.	See paragraph 5.25.
	e. Leak test refrigeration system.	See paragraph 5.7.
	f. Evacuate refrigeration system.	See paragraph 5.8.
	g. Charge refrigeration system.	See paragraph 5.9.
	h. Install rear top cover.	See paragraph 4.17.

5.19 PRESSURE REGULATOR VALVE-REPLACE. This task covers removal and installation.

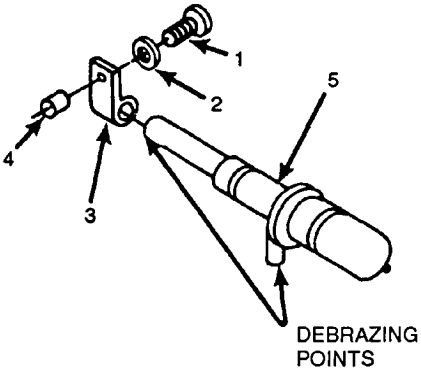
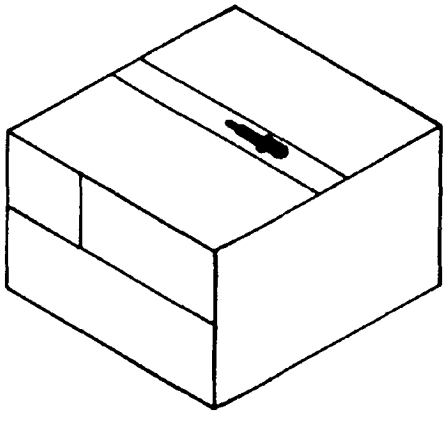
INITIAL SETUP

Equipment Conditions:
- Top rear and center covers removed (paragraph 4.17)
- Refrigerant system discharged (paragraph 5.4)
- Condenser louver actuating cylinder removed (paragraph 5.20)
- Solenoid valve coil (L1) removed (paragraph 5.18)

Materials/Parts:
- Nitrogen
- Brazing solder (Appendix E, Items 5 and 6)
- Brazing flux (Appendix E, Item 7)

Location/Item	Action	Remarks
Top of Housing	**WARNING** Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. Check that system is discharged of refrigerant.	
Removal	a. Purge system by initiating a flow of dry nitrogen through the refrigerant system.	See paragraph 5.5.
	b. Debraze the tubing connections as illustrated to the pressure regulator valve.	See paragraph 5.6.
	c. Remove screw (1), flat washer (2), clamp (3), and spacer (4) holding valve (5).	
	d. Remove valve (5).	

5.19 PRESSURE REGULATOR VALVE.- Continued

Location/Item	Action	Remarks
Removal Continued		
	 	
Installation	a. Replace dehydrator.	See paragraph 5.25.
	b. Connect tubing to valve and braze connections.	See paragraph 5.6.
	c. Fasten clamp (3) to housing wall and valve (5) using screw (1), lockwasher (2), and post spacer (4).	
	d. Install solenoid coil (L1).	See paragraph 5.18.
	e Leak test refrigerant system.	See paragraph 5.7.
	f. Evacuate refrigerant system.	See paragraph 5.8.
	g. Charge refrigerant system.	See paragraph 5.9.
	h. Install rear and center top covers.	See paragraph 4.17.

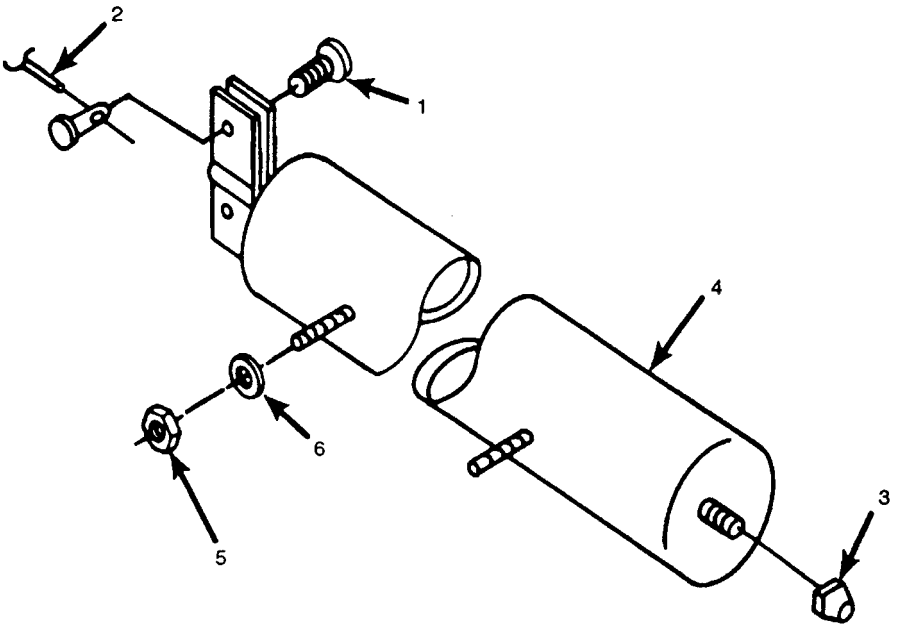
5.20 ACTUATING CYLINDER-INSPECT/ADJUST/REPLACE. This task covers inspect, removal, install and adjustment.

INITIAL SETUP

Equipment Conditions:
Rear and center top covers removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)
Solenoid coil (L1) removed (paragraph 5.18)

Location/Item	Action	Remarks
Top of Housing	**WARNING** Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. Check that system is discharged of refrigerant.	
Inspect	Check for visible damage to cylinder and actuating wire.	
Removal	a. Loosen mechanical post screw (1) to loosen control wire in flexible cable (2). Straighten control wire. b. Disconnect flare nut (3) from end of actuating cylinder (4). c. Remove two nuts (5) and two flat washers (6) from evaporator side of partition and remove actuating cylinder (4).	

5.20 ACTUATING VYLINDER. - Continued

Location/Item	Action	Remarks
Removal - Continued		
		
Installation	a. Install actuating cylinder (4) with studs through openings in partition. Install two flat washers (6) and two nuts (5) on studs.	
	b. Connect the flare nut (3).	
	c. Insert wire ends (2) into the openings in mechanical post of actuating cylinder.	
Adjustment	a. Extend actuator rod until there is a 1/4 inch (.635 cm) space between inner edge of mechanical post bracket and the face of the cylinder. Tighten the screw (1) on the mechanical post.	
	b. Replace dehydrator.	See paragraph 5.25.
	c. Leak test refrigeration system.	See paragraph 5.7.
	d. Evacuate refrigeration system.	See paragraph 5.8.
	e. Charge refrigeration system.	See paragraph 5.9.
	f. Install top rear and center covers.	See paragraph 4.17.

5.21 PRESSURE SWITCHES-INSPECTS/TEST/REPLACE. This task covers inspect, removal, test and installation.

INITIAL SETUP

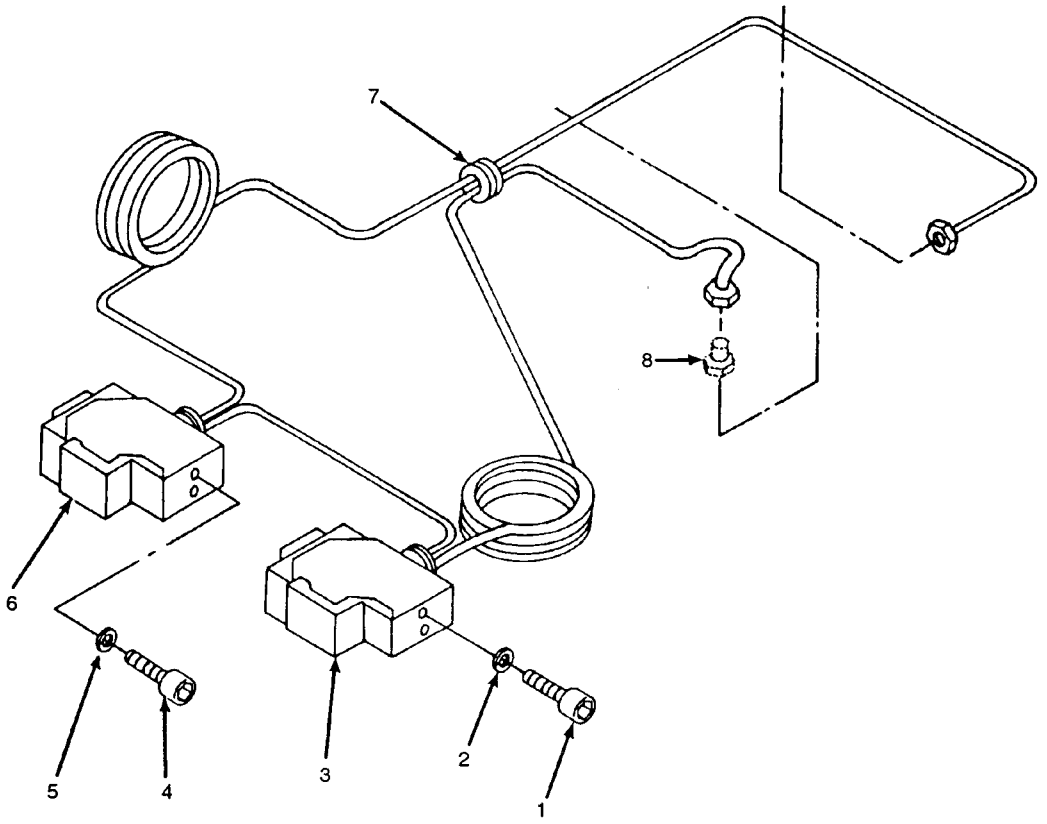
Equipment Conditions:
Front top cover removed (paragraph 4.17)
Mist eliminator and bracket removed (paragraph 4.20)
Junction box removed (paragraph 4.25)
Refrigerant system discharged (paragraph 5.4)

Test Equipment
Multimeter or continuity tester
Halogen leak detector

Material/Pare
Nitrogen (Appendix E, Item 4)

Location/Item	Action	Remarks
	WARNING Check that power source is disconnected before doing any maintenance on the air conditioner. Check that refrigerant system is discharged of refrigerant.	
Front of Housing		
Inspect	Check wiring and sensing tube for damage.	
Removal	a. Remove two mounting screws (1 and 4) and two lockwashers (2 and 5) from each switch 13 and 6). b. Unhook the electrical leads from the pressure switches. Tag leads for identification at assembly.	

5.21 PRESSURE SWITCHES. - Continued

Location/Item	Action	Remarks
Removal - Continued		
		
	c. Unscrew flare nuts from capillary tube connections (8). Remove grommet (7) from partition and carefully pull capillary tubes through partition.	
	d. Remove pressure switches (3 and 6).	
Test (Electrical)	a. Test for continuity across terminals of switch. If no continuity exists, press the reset button and retest.	
	b. If the switch exhibits continuity, switch may be good.	
	c. If the switch does not indicate continuity, replace.	
	d. Using nitrogen, pressurize low pressure cutout switches (10-20 psig range/.35-.69 kg/cm^2 range).	

5.21 PRESSURE SWITCHES.- continued

Location/Item	Action	Remarks
Test (Electrical) Continued	e. Check for discontinuity across terminals.	
	f. If continuity does not exist, replace defective switch.	
	g. Using nitrogen, pressurize high pressure cutout switch (470-490 psig range/16.3-17.0 kg/cm^2 range).	
	h. Check for discontinuity across terminals.	
	i. If continuity does not exist, replace defective pressure switch.	
Installation	a. Insert ends of capillary tubes through hole in partition, being careful to avoid kinking tubes.	
	b. Install grommet (7) in the partition by sliding it over both capillary tubes.	
	c. Connect capillary tube flare nuts (8) to fittings.	
	d. Install switches (3 and 6) and secure with two screws (1 and 4) and two lockwashers (2 and 5). Keep excess capillary tubing coiled neatly without kinks.	
	e. Connect electrical leads and remove tags.	
	f. Install mist eliminator bracket.	
	g. Replace dehydrator.	See paragraph 5.25.
	h. Leak test refrigerant system.	See paragraph 5.7.
	i. Evacuate refrigerant system.	See paragraph 5.8.
	j. Charge system.	See paragraph 5.9.
	k. Install junction box.	See paragraph 4.25.
	l. Install mist eliminator.	See paragraph 4.20.
	m. Install evaporator inlet louver.	See paragraph 4.18.
	n. Install top covers.	See paragraph 4.17.

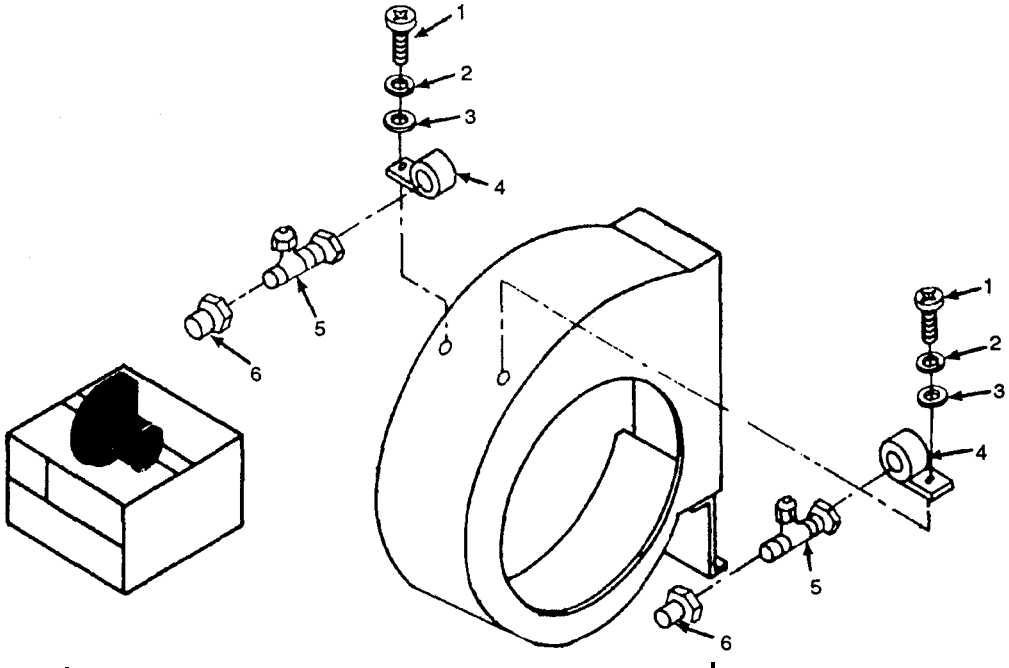
5.22 SERVICE VALVES-INSPECT/REPLACE. This task covers inspection, removal and installation.

INITIAL SETUP

Equipment Conditions:
Rear cover removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)

Location/Item	Action	Remarks
Interior of Housing	**WARNING** Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes, In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. Check that system is discharged of refrigerant.	
Inspection	a. Visually inspect all valves for signs of damage. b. Inspect valve fittings for leaks.	
Removal	a. Remove screw (1), Iockwasher (2), flat washer (3), and clamp (4) from each service valve (5). b. Unscrew and remove flare nuts (6) from suction and discharge service valves. c. Remove refrigeration lines from valves. d. Remove suction and discharge service valves.	

5.22 SERVICE VALVES. - Continued

Location/Item	Action	Remarks
		
	NOTE In almost every case, a defective service valve will require replacement.	
Installation	a. Connect suction and discharge service valves (5) to refrigerant piping.	
	b. Tighten flare nuts (6) at suction and discharge service valves.	
	c. Secure suction and discharge service valves to condenser scroll with screws (1), lockwashers (2), flat washers (3) and clamps (4).	
	d. Replace dehydrator.	See paragraph 5.25.
	e. Leak test refrigeration system.	See paragraph 5.7.
	f. Evacuate refrigeration system.	See paragraph 5.8.
	g. Charge refrigeration system.	See paragraph 5.9.
	h. Install rear top cover.	See paragraph 4.17.

5.23 PRESSURE RELIEF VALVE-INSPECT/REPLACE. This task covers inspect, removal and installation.

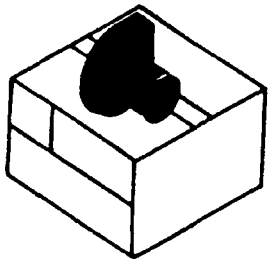
INITIAL SETUP

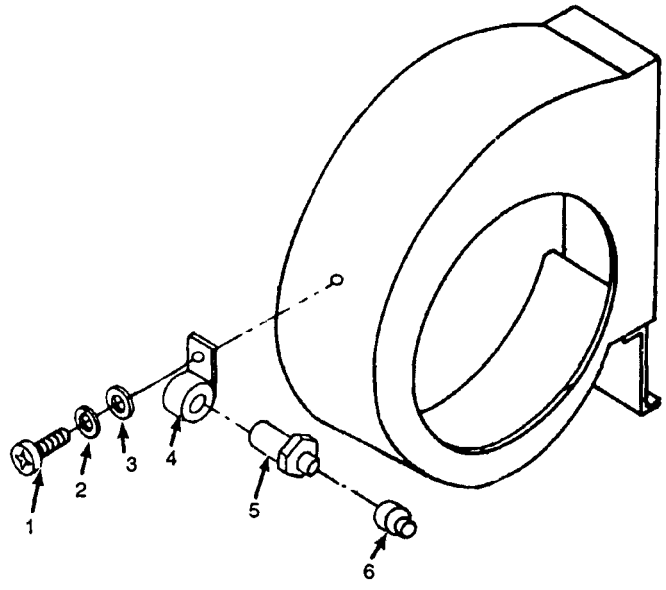
Equipment Conditions:
Rear top cover removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)

Location/Item	Action	Remarks
Top of Housing	**WARNING** Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately. **WARNING** Check that power source is disconnected. Check that system is discharged of refrigerant.	
Inspect	Check valve and attaching hardware for damage.	
Removal	a. Remove screw (l), lockwasher (2), flat washer (3) and clamp (4).	
	b. Unscrew valve (5) from adapter (6).	
Installation	a. Install pressure relief valve (5) in adapter (6). Install loop clamp (4) on valve (5) and secure clamp with screw (1), lockwasher (2), and flat washer (3).	
	b. Replace dehydrator.	See paragraph 5.25.
	c. Leak test refrigeration system.	See paragraph 5.7.
	d. Evacuate refrigeration system.	See paragraph 5.8.
	e. Charge refrigeration system.	See paragraph 5.9.

5.23 PRESSURE RELIEF VALVE. - continued

Location/Item	Action	Remarks
Installation Continued	f. Install rear top cover.	See paragraph 4.17.





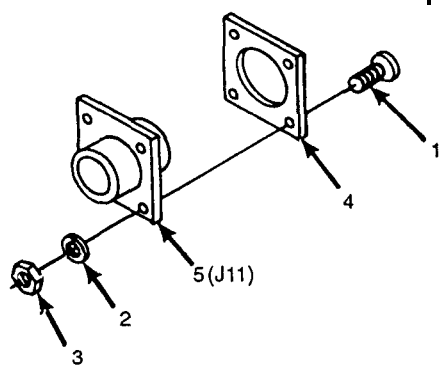
5.24 CONDENSER COIL-REPLACE. This task covers removal and installation.

INITIAL SETUP

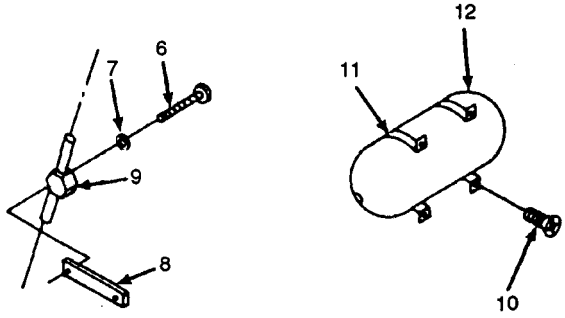
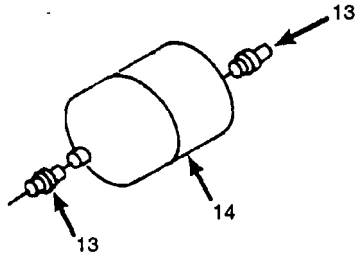
Equipment Conditions:
- Condenser guard removed (paragraph 5.4)
- Top rear cover removed (paragraph 4.17)
- Discharge refrigerant system (paragraph 5.4)

Materials/Parts:
- Dry cleaning solvent (Appendix E, Item 16)
- Cloth, lint-free (Appendix E, Item 9)
- Oil (Appendix E, Item 14)

Test Equipment:
- Halogen leak detector

Location/Item	Action	Remarks
Removal	**WARNING** Ensure power source is disconnected. Ensure refrigerant system is discharged. a. Remove four screws (1), four lockwashers (2), four nuts (3), and gasket (4) attaching auxilliary power input receptacle J11 (5) to housing.	
		
	Move auxiliary power receptacle J11 (5) and wiring to aid in condenser coil removal.	
	Remove two screws (6), two lockwashers (7), and mounting plate (8) attaching liquid sight indicator (9) to housing.	See paragraph 5.26.

5.24 CONDENSER COIL. - continued

Location/Item	Action	Remarks
Removal Continued	d. Remove four screws (10) and two mounting clamps (11) attaching receiver tank (12) to housing.	
		
	e. Purge system.	See paragraph 5.5.
	f. Reposition electrical wiring away from piping area to be debrazed.	See paragraph 5.6.
	g. Debraze condenser inlet tube tee.	
	h. Disconnect flare nut (13) on dehydrator.	
		
	CAUTION Use extreme care in removing condenser coil from housing to avoid damaging fins and coil piping.	
	i. Remove condenser coil from unit.	
	j. Debraze receiver tank (12) and liquid sight indicator (9) from condenser coil.	See paragraph 5.6.
Installation	a. Braze the receiver tank(12) and liquid sight indicator (9) onto the condenser coil.	See paragraph 5.6.

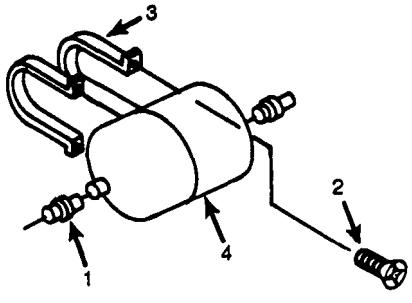
5.24 CONDENSER COIL. - continued

Location/Item	Action	Remarks
Installation - Continued	**CAUTION** Use extreme care in installing condenser coil assembly into housing to avoid damaging fins, coil, piping and refrigerant system tubing.	
	b. Install condenser coil assembly into air conditioner.	
	c. Purge system.	See paragraph 5.5.
	d. Braze condenser inlet tube into tee.	See paragraph 5.6.
	e. Replace dehydrator (14) and connect flare nuts (13).	See paragraph 5.25.
	f. Install condenser guard with screws and lockwashers.	See paragraph 5.12.
	g. Install dehydrator and liquid sight indicator. Install receiver using four screws (10) and two mounting clamps (11).	See paragraphs 5.25 and 5.26.
	h. Leak test refrigeration system.	See paragraph 5.7.
	i. Reposition electrical wiring to original position and tie as required.	
	j. Install auxiliary power receptacle J11 (5) and wiring and secure to housing using four screws (1), four lockwashers (2), and four nuts (3).	
	k. Install rear top cover.	See paragraph 4.17.
	l. Evacuate refrigeration system.	See paragraph 5.8.
	m. Charge refrigeration system.	See paragraph 5.9.

5.25 DEHYDRATOR-INSPECT/REPLACE . This task covers inspect, removal and installation.

INITIAL SETUP

Equipment Conditions:
Rear top cover removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)

Location/Item	Action	Remarks
Right Rear Top of Housing		
Inspect	Check dehydrator for leaks or damage.	
Removal	**WARNING** Check that power source is disconnected. Check that refrigerant system is discharged. a. Unscrew flare nuts (1) and remove refrigerant lines from dehydrator. b. Remove two screws (2) and straps (3) to remove dehydrator (4). c. Remove dehydrator (4).	
		
‘installation	a. Check the direction arrow marked on the dehydrator. b. Position dehydrator (4) between refrigerant lines. c. Tighten flare nuts (1). d. Install straps (3) with screws (2). e. Leak check refrigerant system.	See paragraph 5.7.

5.25 DEHYDRATOR. - Continued

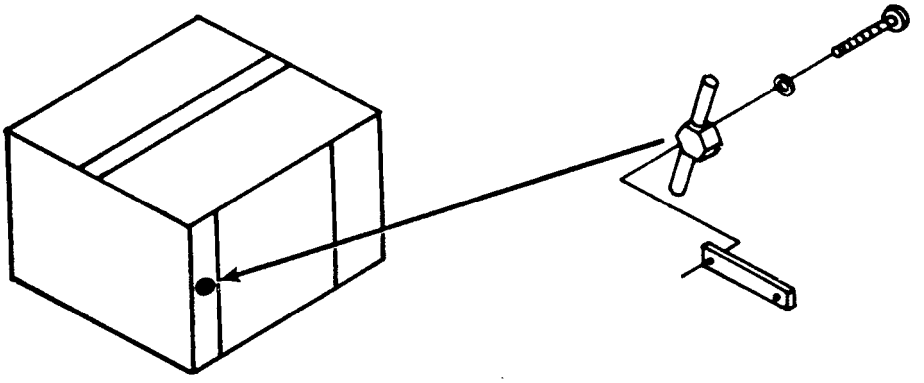
Location/Item	Action	Remarks
Installation - Continued	f. Evacuate refrigerant system.	See paragraph 5.8.
	g. Charge refrigerant system.	See paragraph 5.9.
	h. Install top covers.	See paragraph 4.17.

5.26 LIQUID INDICATOR-REPLACE. This task covers removal and installation.

INITIAL SETUP

Equipment Conditions:
- Rear top cover removed (paragraph 4.17)
- Refrigerant system discharged (paragraph 5.4)
- Condenser coil removed (paragraph 5.24)

Materials/Parts:
- Nitrogen (Appendix E, Item 4)
- Brazing solder (Appendix E, Items 5 and 6)
- Brazing flux (Appendix E, Item 7)

Location/Item	Action	Remarks
	WARNING Check that power source is disconnected. Check that refrigerant system is discharged.	
Removal	With a steady flow of dry nitrogen through refrigeration system, debraze liquid sight indicator from condenser coil and attached tubing.	See paragraphs 5.5 and 5.6.
		
Installation	a. With a steady flow of dry nitrogen through refrigeration system, braze liquid sight indicator onto condenser coil and tubing.	See paragraphs 5.5 and 5.6.
	b. Install condenser coil assembly.	See paragraph 5.24.
	c. Install dehydrator.	See paragraph 5.25.
	d. Leak check refrigeration system.	See paragraph 5.7.
	e. Evacuate refrigerant system.	See paragraph 5.8.

5.26 LIQUID INDICATOR. - continued

Location/Item	Action	Remarks
Installation - Continued	f. Charge refrigerant system.	See paragraph 5.9.
	g. Install rear top cover.	See paragraph 4.17.

5.27 COMPRESSOR-TEST/REPAIR/REPLACE. This task covers test, removal, repair and installation.

INITIAL SETUP

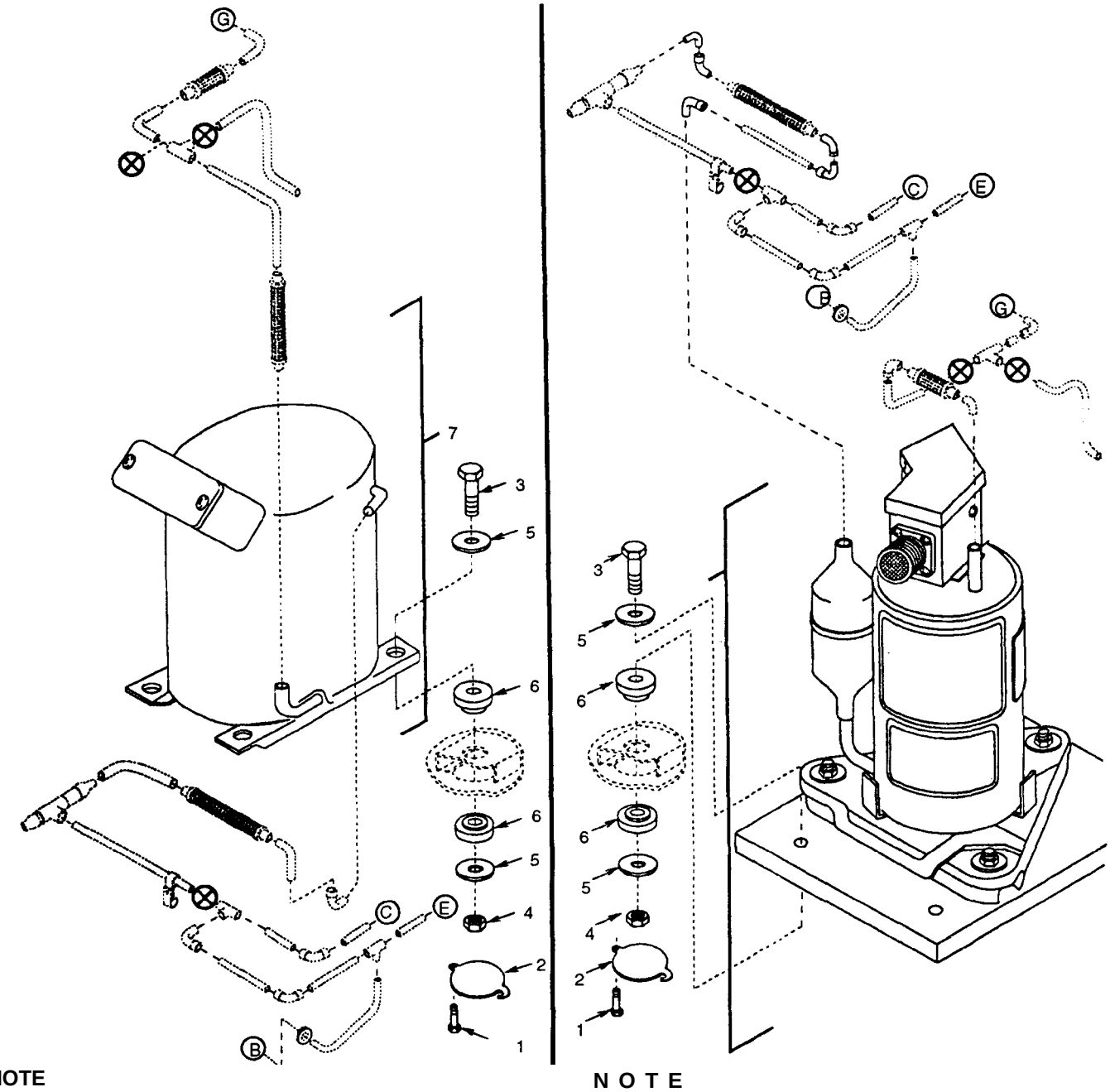
Equipment Conditions:
Rear and center top covers removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)
Condenser coil removed (paragraph 5.24)

Special Tool:
Multimeter or ohmmeter

Materials/Parts:
Nitrogen (Appendix E, Item 4)
Refrigerant R-22 (Appendix E, Item 10)
Refrigerant R-n (Appendix E, Item 12)
Brazing solder (Appendix E, Items 5 and 6)
Brazing flux (Appendix E, Item 7)
Clean glass container

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
Test	a. Disconnect the compressor electrical connector plug (P10) (15).	See wiring diagram, Appendix F.
	b. Using a multimeter, test for continuity between pins A and B, B and C, and C and A of the compressor electrical receptacle (15). Continuity should exist. If not, replace compressor.	
	c. Check for continuity between pins A, B and C and the compressor housing. No continuity should exist. if continuity exists, replace compressor.	
	d. Check for continuity between pins D and E. Continuity should exist. If the high temperature thermostat is open, let the compressor cool, then recheck for continuity. If continuity does not exist after allowing the compressor to cool, replace compressor.	
	e. If compressor windings are bad, check for compressor burn-out prior to installing new compressor.	
Removal	a. With dry nitrogen flowing through refrigerant system, debraze tubing from connections (X).	See paragraph 5.6.

5.27 COMPRESSOR-TEST/REPAIR/REPLACE .- Continued



NOTE

When installing a replacement 13208E4182–5 compressor in a unit with a 13208E4182–10 compressor order installation Kit (94833) 120K1242. Follow instructions provided with that kit for compressor change out.

N O T E

Whn installing a replacement 13208E4182–10 compressor in a unit with a 13208E4182–5 compressor order Installation Kit (94833) 120K1230. Follow instructions provided with that kit for compressor change out.

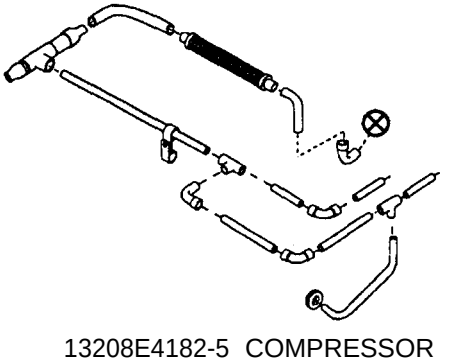
13208E4182-5 COMPRESSOR

13208E4182-10 COMPRESSOR

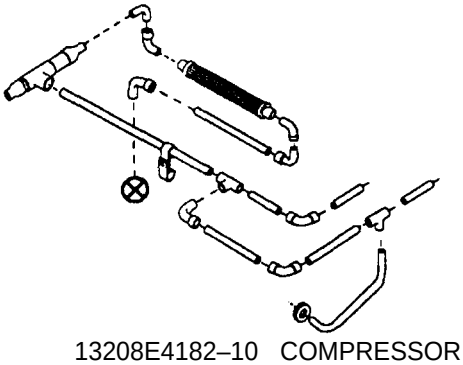
Illustration for paragraph 5.27.

5.27 COMPRESSOR. - Continued

Location/Item	Action	Remarks
Removal Continued	**NOTE** The compressor is mounted to the housing by bolts inserted from the inside of the unit, attaching to locknuts which are inserted from the underside of the unit. Thus, it is necessary that the entire air conditioner be raised and placed on blocks of sufficient height to allow for removal of the locknuts below the base. b. Loosen eight screws (1) and open four access covers (2) on bottom of unit. c. Remove four screws (3), eight flat washers (5) and four self-locking nuts (4) securing compressor (7) to housing. d. Remove compressor wiring harness. **WARNING** Compressor weighs as much as 55 lbs (25.0 kg) and could cause injury to personnel and damage to equipment if not handled properly while removing from unit. e. Remove compressor horizontally through condenser coil opening at rear of unit. f. Remove eight resilient mounts (6). g. Debraze tubing assemblies from compressor at connections (X).	See paragraph 5.6.



13208E4182-5 COMPRESSOR



13208E4182–10 COMPRESSOR

5.27 COMPRESSOR. - continued

Location/Item	Action	Remarks
Decontamination	a. After removal of a bad compressor from the refrigeration system, tip the compressor toward the discharge port to drain sample of oil into a clear glass container. **WARNING** Avoid inhaling fumes and burns from any acid formed by burn out of oil and refrigerant. b. If the oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burn out. If a burn out is not indicated, proceed to installing a replacement compressor. c. If the oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burn out. d. You must clean the entire refrigeration system after a burn out has occurred, since contaminants will have been carried to many corners and restrictions in the piping and fittings. These contaminants will soon mix with new refrigerant gas and compressor oil to cause repeated burn outs. e. Remove the dehydrator (filter-drier) and blow down each leg of the refrigeration system. To do this, connect a cylinder of dry nitrogen to each dehydrator connection, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm^2) pressure. f. Connect the two dehydrator fittings with a jumper locally manufactured from refrigerant tubing and fittings. g. Clean system by back-flushing with liquid R-11 from pressurized cylinder or circulating pump and reservoir with pressure of at least 100 psig. h. If pump is used, connect the discharge line of the refrigerant system to the discharge side of pump. i. Connect a line containing a filter to the suction line in the unit.	See paragraph 5.25.

5.27 COMPRESSOR. - continued

Location/Item	Action	Remarks
Decontamination Continued	**NOTE** An unused dehydrator or other suitable medium may be used as a filter. j. The other end of the temporary suction line should be connected to a small drum or suitable reservoir. k. Aline should be run from the bottom of the reservoir to the inlet of the pump. **WARNING** Avoid inhaling fumes and burns from any acid formed by burnout of oil and refrigerant. Wear a gas mask if area is not thoroughly ventilated. Wear protective goggles or glasses to protect eyes. Wear rubber gloves to protect hands. l. Fill reservoir with fluorocarbon refrigerant R-11 and start the pump. Continue filling the reservoir with refrigerant R-11 until it begins to pour out of the return line. Continue flushing for at least 15 minutes. m. Reverse the pump connections, replace the filter with a new filtering medium, and back-flush the system for an additional 15 minutes. n. Remove the pump, reservoir, filter, and dehydrator jumper. Place an empty container below the compressor connections, 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. o. Disconnect the dry nitrogen cylinder. Cap or plug open connections if compressor and filter-drier are not to be installed immediately.	
Repair/Wiring	a. Remove the insulation to expose 1/2 inch (1.27 cm) of bare wire on each side of break or damaged insulation. b. Insert the ends into a splice-connector: splice and crimp the connector to make firm electrical contact.	

5.27 COMPRESSOR. - continued

Location/Item	Action	Remarks
Repair Continued	c. Alternatively, heat-shrink tubing may be slipped over one end of the wire before splicing, then heated after the splice is made and soldered so as to cover the spliced area.	
	d. Be sure that no bare wire is exposed after the splice is complete.	
	e. Replace broken terminal lugs with exact duplicates.	
	f. To replace electrical connector, unsolder wires from the solder wells of the inserts.	
	g. Insert bare ends of the wires in corresponding holes of new insert, and solder in place.	
	h. Check continuity terminal-to-terminal.	
Installation	a. Install eight compressor resilient mounts (6).	
	b. Install new compressor having a full and proper charge of oil.	
	c. Secure compressor with four screws (3), eight flat washers (5), and four locknuts (4).	
	d. Connect piping. Provide a flow of dry nitrogen through the system to protect inside surfaces of refrigerant piping from scaling while brazing.	
	e. Replace dehydrator.	
	f. Leak test unit.	See paragraph 5.7.
	g. Evacuate the system.	See paragraph 5.8.
	h. Charge unit with refrigerant R-22.	See paragraph 5.9.
	i. Start the air conditioner and operate the unit for 24 hours.	
	j. Discharge system and purge with dry nitrogen.	See paragraphs 5.4 and 5.5.
	k. Evacuate the system and recharge it with refrigerant R-22.	See paragraphs 5.8 and 5.9.
	l. Install rear and center top covers.	See paragraph 4.17.

5.28 TUBING AND FITTINGS-TEST/REPLACE. This task covers test, removal and installation.

INITIAL SETUP

Equipment Conditions:
Top covers removed (paragraph 4.17)
Refrigerant system discharged (paragraph 5.4)

Test Equipment:
Halogen test detector and leak standard

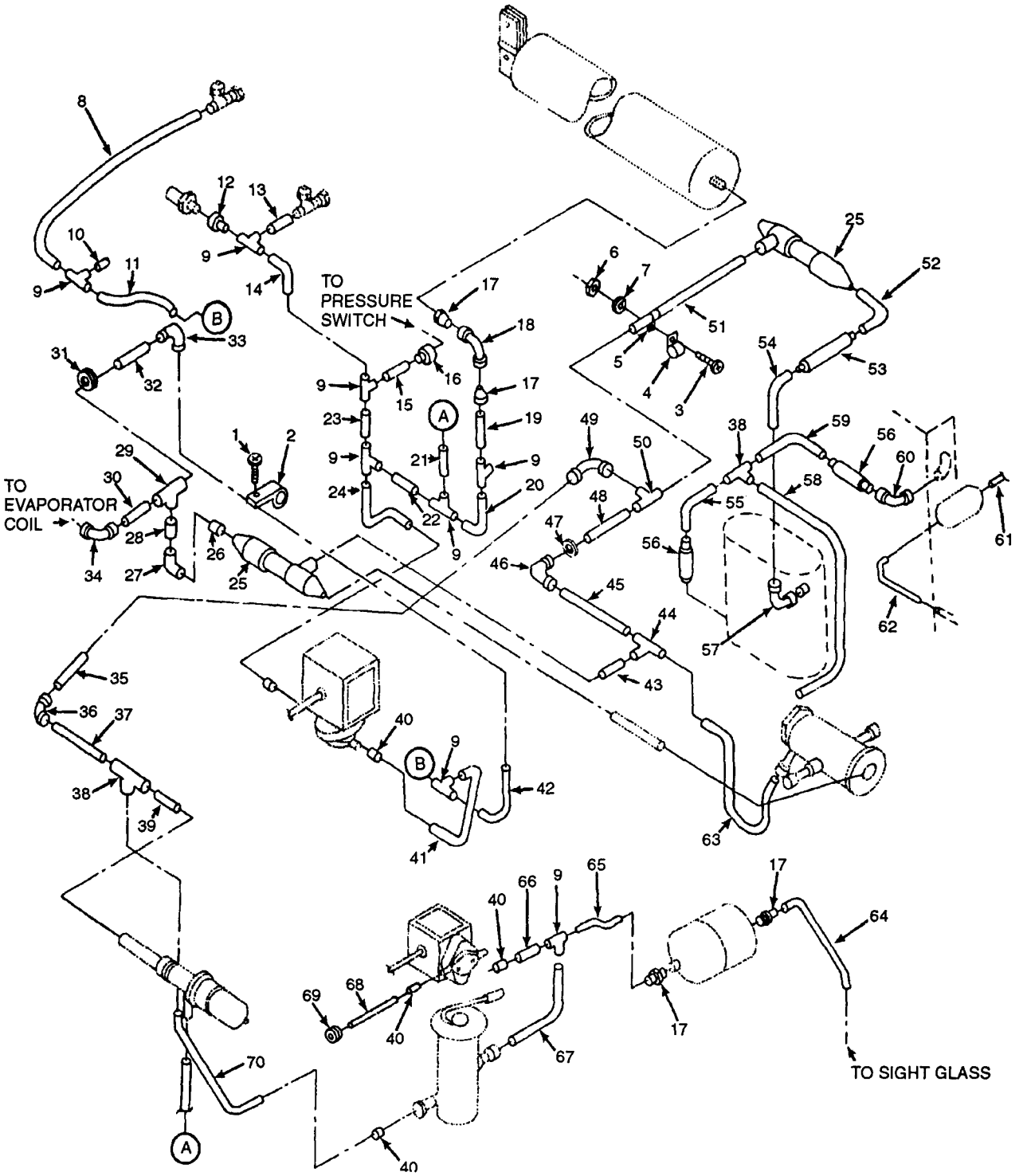
Materials/Parts:
Nitrogen (Appendix E, Item 4)
Brazing solder (Appendix E, Items 5 and 6)
Brazing flux (Appendix E, Item 7)
Refrigerant-22 (Appendix E, Item 10)

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system.	
	WARNING Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately.	
Test	a. Check all piping and connections with a General Electric Type H-2 halogen test detector (or approved equal).	
	b. Calibrate the detector with a General Electric LS-20 leak standard (or approved equal) for a pure refrigerant leak rate of 0.1 ounce (2.8349 gins) per year.	
	c. Replace any piping or connection that is leaking beyond the rate of 0.1 ounce (2.8349 gins) per year.	
Removal	a. Debraze and remove tubing only when necessary to remove a defective part.	
	b. When brazing, constantly purge the refrigerant system with dry nitrogen to prevent scale formation within the refrigerant system.	See paragraph 5.6.

5.28 TUBING AND FITTINGS. - continued

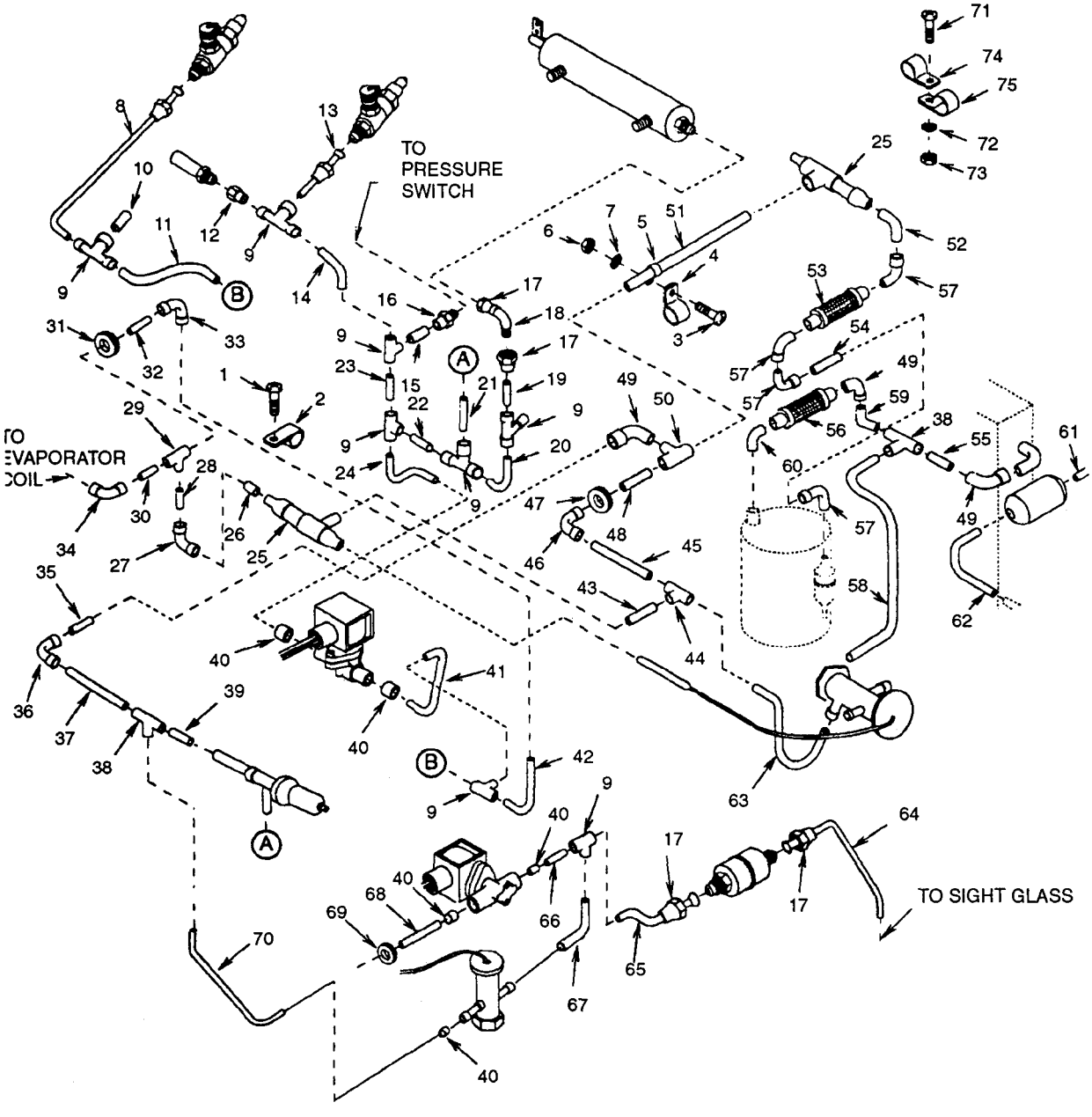
Location/Item	Action	Remarks
Installation	a. Braze all copper-to-copper joints with silver solder (Appendix E, Item 21).	
	b. Braze all copper-to-brass or copper-to-steel with silver solder.	
	c. Braze melting point is 1160°F (625 °C).	
	d. Make all braze joints with an atmosphere of inert gas to prevent internal oxidation.	See paragraph 5.6.
	e. Service refrigeration system after repairs.	See paragraphs 5.3 through 5.10.
	f. Secure top covers.	See paragraph 4.17.

5.28 TUBING AND FITTINGS. - Continued



NOTE: THIS PAGE APPLIES TO (97403) 13208E4182-5 COMPRESSOR ONLY.

5.28 TUBING AND FITTINGS. - Continued



NOTE: THIS PAGE APPLIES TO (97403) 13208E4182-10 COMPRESSOR ONLY.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

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

6.1 GENERAL INFORMATION. Repair parts are listed and illustrated in TM 9-4120-378-24P.No special tools are required for general support maintenance of the air conditioner. Test, Maintenance, and Diagnostic Equipment (TMDE) and support equipment include standard electrical test equipment, standard pressure and vacuum gages, and vacuum servicing manifolds found in any general support maintenance refrigeration facility.

Section II. MAINTENANCE PROCEDURES

6.2 HOUSING-REPAIR. This task covers removal, inspection and repair/replace.

INITIAL SETUP

Materials/Parts:
- Adhesive (Appendix E, Item 18)
- Cellular rubber strips (Appendix E, Item 19)
- Flexible polyurethane foam (Appendix E, Item 20)
- Cloth, lint-free (Appendix E, Item 9)
- Acetone (Appendix E, Item 22)
- Methyl-ethyl ketone (MEK) (Appendix E, Item 23)
- Paint, forest green (MIL-C-46168)
- Paint brush
- Sandpaper, 240 grit
- Primer (TT-P-1757)

6.2 HOUSING-REPAIR.- Continued

Location/Item	Action	Remarks
	WARNING Disconnect air conditioner power supply before doing maintenance work on the electrical system. **WARNING** Acetone and methyl-ethyl ketone are flammable and their vapors are explosive. Prolonged or repeated inhalation of fumes or contact with the skin can be toxic. Use in a well-ventilated area, wear gloves and keep away from sparks or flame.	
Inspection	a. Inspect for damage. Look for loose, frayed, cracked and missing insulation. b. Visually check for excessive drying of insulation or shrinkage.	
Removal	a. Scrape and pull off as much of the damaged insulation as possible. b. Soften the remaining insulation and adhesive with acetone or MEK (methyl-ethyl ketone). c. Repeat the softening and scraping process as required. d. Clean up metal surface with cloth moistened in acetone or MEK.	
Insulation		
Repair	a. Repair loose or torn insulation with adhesive. b. Replace frayed, drying, cracked or missing insulation. c. Cut a sheet of the proper insulating material to correct shape.	

6.2 HOUSING-REPAIR.- Continued

Location/Item	Action	Remarks
Repair . Continued	d. Coat the attaching side with adhesive, using a paint brush to ensure complete coverage. e. Coat the metal with adhesive to which the insulation is to be attached. f. Let both surfaces air-dry until the adhesive becomes tacky but will not stick to the fingers. g. Starting at one corner or at a narrow edge, carefully bring the insulation into full contact with the metal. h. Press into firm contact all over. i. Allow sufficient time to dry thoroughly before installation.	
Housing Repair	a. Visually inspect for nicks, gouges, dents, bare spots in paint and other defects which can be repaired. b. Repair/replace handles and associated hardware. c. Sand and paint any repaired area in housing, referencing TM 43-0139, Painting Instructions for Field Use. d. Remove minor dents, and paint. e. Remove any rust or other minor corrosive damage, and paint.	

APPENDIX A

REFERENCES

A.1 SCOPE. This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A.2 FORMS.

Recommended Changes to DA Publications . . . . . DA Form 28-2

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

Quality DeficiencyReport . . . . DA Form 368

A.3 FIELD MANUALS.

Electric Motor andGeneratorRepair . . . . . FM 20-31

A.4 MANUALS.

Hand Portable Fire Extinguishers Approved forArmyUsers . . . . . TB 5-4200-200-10

The ArmyMaintenanceManagement System (TAMMS). . . . . .. DA PAM 738-750

Painting Instructions for FieldUse . . . .TM 43-0139

Unit, Direct Support and General Support
Maintenance Repair Parts and Special Tools List . . . . TM 9-4120-378-24P

Prevent Enemy Use . . . .TM 750-244-3

Leak Detector, Refrigerant Gas . . . . TM 9-4940-435-14

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B.1 THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be constant with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC in column (4) as:

Unit – includes two subcolumns, C (operator/crew) and O (unit) maintenance.
Direct Support – includes an F subcolumn.
General Support – includes an H subcolumn.
Depot – includes a D subcolumn.

c. Section III lists the tools and test equipment (both special tools and common tools sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B.2 MAINTENANCE FUNCTIONS. Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (i.e., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontamination, when required), to preserve, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. Replace is authorized by the MAC and is shown as the 3rd position code of the SMR code.

i. Repair. The application of maintenance services[1] including fault location/troubleshooting[2], removal/installation, and disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those service/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment and components.

B.3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1 – Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2–Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3 – Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B.2.)

---

[1]Service – Inspect, test, service, adjust, aline, calibrate, and/or replace.

[2]Fault location/troubleshooting – The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3]Disassembly/assembly – The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned as SMR code for the level of maintenance under consideration (i.e., identification as maintenance significant).

[4]Actions – Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

d. Column 4– Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C - Operator or Crew
O - Unit Maintenance
F - Direct Support Maintenance
H - General Support Maintenance
D - Depot Maintenance

e. Column 5 – Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6 – Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

B.4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION HI.

a. Column 1 – Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2 – Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3 – Nomenclature. Name or identification of the tool or test equipment.

d. Column 4 – National Stock Number. The National stock number of the tool or test equipment.

e. Column 5 – Tool Number. The manufacturer's part number.

B.5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1 – Reference Code. The code recorded in column 6, section II.

b. Column 2 – Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct support	General support	Depot	Tools &	
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Equip.	Remarks
01	HOUSING COVERS, PANELS, GRILLES, SCREENS AND INFOR-MATION PLATES								
	Cover, Canvas	Inspect							
		Service		0.5					
		Repair			2.0				
		Replace			1.0				
	Panels	Inspect							
		Service		0.5					
		Repair			2.0				
		Replace			1.0				
	Screens and Guards	Inspect							
		Service							
		Replace			0.5				
		Repair			1.0				
	Louvers	Inspect							
		Adjust							
		Service		0.1					
		Replace			1.0				
	Information Plates	Inspect							
		Replace			0.5				

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct support	General support	Depot	Tools &	
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Equip.	Remarks
02	AIR CIRCULATING AND CONDENSATE DRAIN SYSTEM								
	Air Filter	Inspect		0.2					
		Service		1.0					
		Replace		0.5					
	Mist Eliminator	Inspect		0.3					
		Service		1.0					
		Replace		0.5					
		Repair		1.0					
	Condenser Air Discharge Louver and 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	0.5					
		Replace		2.0					
	Condensate Drain Tubes	Inspect	0.1	0.5					
		Service		0.5					
		Replace		1.0					
03	ELECTRICAL SYSTEM								
	Control Module	Inspect	0.1						
		Adjust	0.1						
		Repair		2.0					
		Replace		0.5					
	Temperature Control (Thermostat)	Inspect		0.1					
		Adjust	0.1						
		Test		1.0					
		Replace		1.0					
	Evaporator Fan Speed Switch	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct support	General Support	Depot	Tools &	
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Equip.	Remarks
	Mode Selector Switch	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	Compressor Circuit Breaker	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Control Module Wiring Harness	Inspect		0.5					
		Test		1.0					
		Repair		1.0					
	Junction Box	Inspect		1.0					
		Repair		2.0					
		Replace		2.0					
	Control Circuit Breaker	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Junction Box Wiring Harness	Inspect		0.5					
		Test		1.0					
		Repair		1.0					
		Replace		12.0					
	Relays	Inspect		0.2					
		Test		1.0					
		Replace		1.5					
	Unit Wiring Harness	Inspect		1.0					
		Test		2.0					
		Repair		1.0					
		Replace		4.0					
	Capacitor	Inspect		0.1					
		Test		0.2					
		Replace		0.5					
	Rectifier	Inspect		0.1					
		Test		0.5					
		Replace		1.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct support	General support	Depot	Tools &	
Group Number	Component/ Assembly	Maintenance Function	c	o	F	H	D	Equip.	Remarks
	Transformer	Inspect Test Replace		0.1 0.5 1.0					
04	EVAPORA-TOR FAN MOTOR AND HEAT-ER								
	Fan and Housing	Inspect Replace		0.5 1.0					
	Motor	Inspect Test Replace		0.5 0.5 3.0					
	Heater Thermostat	Inspect Test Replace		0.1 1.0 0.5					
	Heater Elements	Inspect Test Replace		0.4 0.5 2.0					
05	CONDENS-ER FAN, AND MOTOR								
	Fan and Housing	Inspect Replace		0.5 1.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct support	General support	Depot	Tools &	
Group Number	Component/ Assembly	Maintenance Function	c	O	F	H	D	Equip.	Remarks
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				A
		Replace		3.0					
06	REFRIG-ERATION SYSTEM								
	Evaporator Coil	Inspect		0.5					
		Service		1.0					
		Replace			8.0				
	Expansion Valves	Replace			8.0				
	Solenoid Valves	Test		0.5					
		Repair		1.0					
		Replace			8.0				
	Pressure Regulator Valve	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		0.5					
		Service		1.0					
		Replace			8.0				
	Dehydrator	Inspect		0.1					
		Replace		8.0					

Section II. MAINTENANCE ALLOCATION CHART - Continued

Group Number	Component/ Assembly	Maintenance Function	Unit		Direct support	General Support	Depot	Tools & Equip.	Remarks
			c	O	F	H	D		
	Liquid Indicator	Inspect	0.5						
		Replace			8.0				
	Compressor	Test			0.5				
		Repair			1.0				
		Replace			12.0				
	Tubing and Fittings	Test			0.5				
		Replace			8.0				
07	HOUSING								
	Housing	Inspect		0.5					
		Service		0.5					
		Repair				1.0			
08	ACCESSO-RY/LOOSE ITEMS								
	Connectors	Inspect		0.5					
		Replace		2.0					
	Installation Hardware	Inspect		0.5					
		Replace		1.0					

Section III. TOOLS AND TEST EQUIPMENT REQUIRED

(1) Reference Code	(2) Maintenance Level	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
		No special tools and test equipment are required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II.		
1	O-F-H	Tool Kit, Service, Refrigeration (SC5180-90-CL-N18)	5180-00-596-1474	
2	F-H	Pump, Vacuum	4310-00-098-5272	
3	O-F-H	Soldering Gun Kit	3439-00-930-1638	
4	F-H	Recovery and Recycling Unit, Refrigerant	4310-01-338-2707	17500B (07295)

Section IV. REMARKS

Reference Code	Remarks
A	Limited Bearing Replacement Other than those items listed above, there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions is with the air conditioner in “OFF” position (power off).

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C.1 SCOPE. This appendix lists components of the end item and basic issue items for the air conditioner to help you inventory the items for safe and efficient operation of the equipment.

C.2 GENERAL. The Components of End Item and Basic Issue Items (BII) Lists are divided into the following sections:

a. Section II, Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the air conditioner, but they are to be removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to help you find and identify the items.

b. Section III, Basic Issue Items, These essential items are required to place the air conditioner in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the air conditioner during operation and when it is transferred between property accounts, Listing items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

C.3 EXPLANATION OF COLUMNS.

a. Column (l), Illustration Number, gives you the number of the item illustrated.

b. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

c. Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (Commercial and Government Entity Code) (in parentheses) and the part number.

If the item you need is not the same for different models of the equipment, a Usable On Code will appear on the right side of the description column on the same line as the part number. These codes are identified below as:

d. Column (4), U/I (Unit of Issue), indicates how the item is issued for the National Stock Number shown on column two.

e. Column (5), Qty. Rqd., indicates the quantity required.

Section II. COMPONENTS OF END ITEM

(1)	(2)	(3)		(4)	(5)
		Description			
Illustration Number	National Stock Number	CAGE and Part Number	Usable On Code	U/M	Qty. Reqd.
		None			

Section III. BASIC ISSUE ITEMS

(1)	(2)	(3)		(4)	(5)
		Description			
Illustration Number	National Stock Number	CAGE and Part Number	Usable On Code	U/M	Qty. Reqd.
		Department of the Army Technical Manual: Operator's, Unit, Direct Support and General Support Maintenance Manual, TM 9-4120-378-14. Department of the Army Technical Manual: Unit, Direct Support Maintenance Repair Parts and Special Tools List, TM 9-4120-378-24P.			

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 have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, OR JTA.

D.3 EXPLANATION OF LISTINGS. National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If item required differs for different models of this equipment the model is shown under the "Usable On" heading in the description column. These codes are identified as:

Section II. ADDITIONAL AUTHORIZATION LIST

(1)	(2)		(3)	(4)
	Description			
National Stock Number	CAGE and Part Number	Usable On Code	U/M	Qty. Auth.
	Cotton Duct Case		ea	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E.1 SCOPE. This appendix lists expendable/durable supplies that you will need cooperate and maintain the air conditioner. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

E.2 EXPLANATION OF COLUMNS.

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 item (e.g., "Use cleaning compound, Item 5, Appendix E'.)

b. Column 2. Level. This column identifies the lowest level of maintenance that requires the item.

C - Operator/crew
O - Unit maintenance
F - Direct support maintenance
H - General support maintenance

c. Column 3. National Stock Number. This is the national stock number assigned to the item which you can use to requisition it.

d. Column 4. Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number. This provides the other information you need to identify the item.

e. Column 5. Unit of Measure. This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O		Silicone Adhesive Sealant, RTV, General, MIL-A-46106, Type I	
2	O		Solder, Lead-Tin, QQ-S-571, Type SN60WRP2	
3	F	3040-00-664-0439	Adhesive, General Purpose, 1 pint container	ea
4	F	6830-00-292-0732	Nitrogen	CY
5	F		Brazing Alloy, Silver, QQ-B-654, Grade O, I or II	
6	F		Brazing Alloy, Silver, QQ-B-654, Grade lll	
7	F	3439-00-640-3713	Flux, Brazing, O-F-499, Type B	
8	F	5350-00-192-5047	Abrasive Cloth	P9
9	F	7920-00-205-1711	Rags	
10	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22Ibs. (Refrigerant-22), BB-F-1421, Type 22 (81 348)	CY
11	F		Tape PPP-T-60, Type IV, Class I	roll
12	F	6830-00-872-5120	Trichloromonofluoromethane, Technical: w/cylinder 50Ibs. (Refrigerant-11), BB-F-1421, Type II (81348)	
13	F	8030-00-889-3534	Tape, Antiseize, Polytetrafluorethylene, MIL-T-22730, Size I	roll
14	F		Lubricating Oil, VV-L-825, Type IV	qt
15	F	3439-01-045-7940	Flux, Soldering, Liquid Rosin Base, Ml L-F-l 4256	qt
16	O,F	6850-00-264-9037	Dry Cleaning Solvent, P-D-680 (81348)	qt

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST - Continued

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
17	O		Coater, Air Filter, MIL-L-2104 (81348)	
18	H		Adhesive, MMM-A-121	qt
19	H		Cellular Rubber Strips, MIL-R-6130, Type I, Grade A	ft
20	H		Flexible Polyurethane Foam (AMS3570)	shts
21	F		Solder, Silver, QQ-S-561, Type 3, 4 or 6A	
22	H		Acetone	pt
23	H		Methyl-Ethyl Ketone (MEK)	pt
24			Insulation, Sheet, Cellular, MIL-I-14511	
25			Plastic Foam, Unicellular, Sheet Form, MIL-P-15280	
26			Adhesive, MMM-A-132, Type I, Class I	
27			Toluolene	
28			Industrial Sealant 800	
29			Acid Swab Brush	

APPENDIX F

DIAGRAMS

F.1 WIRING DIAGRAM MODEL A9KH- 115P. The Wiring List for the air conditioner is shown as follows and wiring foldout (FO-1).

COMPONENT REFERENCE LIST MODEL A9KH-115P

Elec. Ref. Des.	Part Number	Description
B1	13208E4182-5	Compressor, reciprocating
B2	13221E9334-1	Motor, condenser fan
B3	13216E6140-1	Motor, evaporator fan
C1	M39014/05-2661	Capacitor, filter
C2	13222E9171-3	Capacitor, condenser run
C3	13222E9171-3	Capacitor, evaporator run
C4	13222E9171-2	Capacitor, compressor run
C5	13225E8430-2	Capacitor, compressor start
C6	13218E6961	Capacitor
CB1	13216E6206-1	Circuit breaker, compressor
CB2	13216E6178-1	Circuit breaker, control
CR1	13227E8321	Rectifier, semiconductor device
E1	MS24693-S50	Terminal stud (control module grid)
E2	MS24693-S50	Terminal stud (junction box grid)
E3 & E4	MS325206-246	Terminal stud (system grid)
HR1 through HR4	13216E6124-1	Heater element
J1 & J11	MS3100R-18-11P	Connector, receptacle, power input
J2	13216E6177	Connector, receptacle, junction box
J3	13216E6193-2	Connector, receptacle, evaporator fan
J4	13216E6193-3	Connector, receptacle, compressor
J5	13216E6193-2	Connector, receptacle, condenser fan
J6	13216E6193-5	Connector, receptacle, power input
J8	13216E6193-1	Connector, receptacle, solenoid valve bypass

COMPONENT REFERENCE LIST MODEL A9KH-115P - Continued

Elec. Ref. Des.	Part Number	Description
J9	13216E6193-1	Connector, receptacle, solenoid valve equalizer
J10	Part of B1	Connector, receptacle, compressor
J12	13216E6193-5	Connector, receptacle, evaporator & condenser run capacitor
K1	13216E6182	Relay,time delay
K2	MS24192-D1	Relay, heater
K3	MS27418-2B	Relay, compressor motor
K4	MS27418-2B	Relay, condenser fan
K5	13216E6240-2	Relay, compressor start
L1	13216E6158	Valve, solenoid, bypass
L2	13216E6158	Valve, solenoid, pressure equalizer
P1	MS3106R-18-11S	Connector, plug, power input
P2	13216E6209-2	Connector, plug, control module
P3	Part of B3	Connector plug, evaporator fan
P4	MS3106R-20-15P	Connector, plug, compressor
P5	Part of B2	Connector, plug, condenser fan
P6	MS3106R-18-11S	Connactor plug, power input switch
P8	13216E6173	Connector, plug, solenoid valve bypass
P9	13216E6173	Connector, plug, solenoid valve equalizer
P10	MS3106R-20-15S	Connector plug, compressor
P12	MS3106R-I8-11P	Connector, plug, evaporator & condenser run capacitors
S1	13216E6201-2	Switch, rotary selector
S2	13216E6200	Switch, toggle
S3	13216E6203	Switch, temperature control
S4	13216E6215-3	Switch, high pressure cutout
S5	13216E6215-1	Switch, low pressure cutout
S6	13216E6224	Switch, heater outlet
T1	13221E9117	Transformer

COMPONENT REFERENCE LIST MODEL A9KH-115P - Continued

Elec. Ref. Des.	Part Number	Description
TB1	13216E6232-6	Terminal board, junction box
TB2	13216E6220-1	Terminal board
TB3	13216E6232-6	Terminal board, power input

NOTE: To energize the unit from the auxiliary power input source (J 11). The leads originating and on TB3-1 and -2 must be changed to TB3-4 and -5, respectively.

F.2 SCHEMATIC DIAGRAM, MODEL A9KH-115P. The Schematic List for the air conditioner is shown as follows and schematic diagram foldout (FO-2).

COMPONENT REFERENCE LIST MODEL A9KH-115P

Elec. Ref. Des.	Part Number	Description
B1	13208E4182-5	Compressor, reciprocating
B2	13221E9334-1	Motor, condenser fan
B3	13216E6140-1	Motor, evaporator fan
C1	M39014/0512661	Capacitor, filter
C2	13222E9171-3	Capacitor, condenser run
C3	13222E9171-3	Capacitor, evaporator run
C4	13222E9171-2	Capacitor, compressor run
C5	13225E8430-2	Capacitor, compressor start
C6	13218E6961	Capacitor
CB1	13216E6206-1	Circuit breaker, compressor
CB2	13216E6178-1	Circuit breaker, control
CR1	13227E8321	Rectifier, semiconductor device
HR1 through HR4	13216E6124-1	Heater element
HR5	Part of B1	Crankcase heater
J1 & J11	MS3100R-18-11P	Connector, receptacle, power input
K1	13216E6182	Relay, time delay

COMPONENT REFERENCE LIST MODEL A9KH-115P - Continued

Elec. Ref. Des.	Part Number	Description
K2	MS24192-D1	Relay, heater
K3	MS27418-2B	Relay, compressor motor
K4	MS27418-2B	Relay, condenser fan
K5	13216E6240-2	Relay, compressor start
L1	13216E6158	Valve, solenoid, bypass
L2	13216E6158	Valve, solenoid, pressure equalizer
S1	13216E6201	Switch, rotary selector
S2	13216E6200	Switch, toggle
S3	13216E6203	Switch, temperature control
S4	13216E6215-3	Switch, high pressure cutout
S5	13216E6215-1	Switch, low pressure cutout
S6	13216E6224	Switch, heater cutout
S7	Part of B2	Thermal switch
S8	Part of B1	Thermal switch
T1	13221E9117	Transformer
TB3	13216E6232-6	Terminal board, power input

NOTE: To energize the unit from the auxiliary power input source (J11). The leads originating from TB3-1 and -2 must be changed to TB3-4 and -5, respectively.

F.3 WIRING DIAGRAM MODEL F9000H-1S. The Wiring List for the air conditioner is shown as follows and wiring foldout (FO–3).

COMPONENT REFERENCE LIST MODEL F9000H-1S

ELEC. REF. DES.	PART NUMBER	DESCRIPTION
B1	13208E4182–5	COMPRESSOR, RECIPROCATING
		OR
	13208E4182–10	COMPRESSOR, RECIPROCATING
B2	13221E9334-1	MOTOR, CONDENSER FAN
B3	13216E6140-1	MOTOR, EVAPORATOR FAN
C1	M39014/05-2661	CAPACITOR, FILTER
C2	13222E9171-3	CAPACITOR, CONDENSER RUN
C3	13222E9171-3	CAPACITOR, EVAPORATOR RUN
C4	13220E8229–3	CAPACITOR, COMPRESSOR RUN (13208E4182-5COMPRESSOR)
	13222E9171-4	CAPACITOR, COMPRESSOR RUN (13208 E4182-10 COMPRESSOR)
C5	13225E84302	CAPACITOR, COMPRESSOR START
C6	13218E6961	CAPACITOR
CB1	13216E6206-1	CIRCUIT BREAKER, COMPRESSOR
CB2	13216E6178-1	CIRCUIT BREAKER, CONTROL
CR1	13227E8321	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S50	TERMINAL STUD (CONTROL MODULE GND)
E2	MS24693-S50	TERMINAL STUD (JUNCTION BOX GND)
E3 & E4	MS325206-246	TERMINAL STUD (SYSTEM GND)
HR1 thru HR4	13216E6124-1	HEATER ELEMENT
J1 & J11	MS3100R–18-11 P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	13216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	13216E6193-2	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	13216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	13216E6193-2	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	13216E6193-5	CONNECTOR, RECEPTACLE, POWER INPUT
J8	13216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE BYPASS
J9	13216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE EQUALIZER
J1O	PART OF B1	CONNECTOR, RECEPTACLE, COMPRESSOR
J12	13216E6193-5	CONNECTOR, RECEPTACLE, EVAPORATOR AND CONDENSER RUN CAPACITOR
K1	13225E8024-2	RELAY, TIME DELAY
K2	MS24192–D1	RELAY, HEATER
K3	MS24192-D1	RELAY, COMPRESSOR MOTOR
K4	13216E6184	RELAY, CONDENSER FAN
K5	13216E6240-2	RELAY, COMPRESSOR START
L1	13216E6158	VALVE, SOLENOID, BYPASS
L2	13216E6158	VALVE. SOLENOID, PRESSURE EQUALIZER

COMPONENT REFERENCE LIST MODEL F9000H-1S - CONTINUED

ELEC. REF. DES.	PART NUMBER	DESCRIPTION
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	13216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF B3	CONNECTOR, PLUG, EVAPORATOR FAN
P4	MS3106-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF B2	CONNECTOR, PLUG, CONDENSER FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT SWITCH
P8	13216E6173	CONNECTOR, PLUG, SOLENOID VALVE BYPASS
P9	13216E6173	CONNECTOR, PLUG, SOLENOID VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
P12	MS3106R-18-11P	CONNECTOR, PLUG, EVAPORATOR AND CONDENSER RUN CAPACITORS
S1	13216E6201-2	SWITCH, ROTARY, SELECTOR
S2	13216E6200	SWITCH, TOGGLE
S3	13216E6203	SWITCH, TEMPERATURE CONTROL
S4	13216E625-3	SWITCH, HIGH PRESSURE CUTOUT
S5	13216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	13216E6224	SWITCH, HEATER OUTLET
T1	13221E9117	TRANSFORMER
TB1	13216E6232-6	TERMINAL BOARD, JUNCTION BOX
TB2	13216E6220-1	TERMINAL BOARD
TB3	13216E6232-6	TERMINAL BOARD, POWER INTUT
TB4	13216E6232-2	TERNTINAL BOARD (DUMNIY) (13208E4182-10 COMPRESSOR)

NOTE: TO EMERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS ORIGINATING AND 0N TB3-1 AND -2 MUST BE CHANGED TO TB3-4 AND -5, RESPECTIVELY.

F.4 SCHEMATIC DIAGRAM MODEL F9000H-lS. The Schematic Diagram for the air conditioner is shown as follows and schematic diagram foldout (FO-4).

COMPONENT REFERENCE LIST MODEL F9000H–1S

ELEC. REF. DES.	PART NUMBER	DESCRIPTION
B1	13208E4182–5	COMPRESSOR, RECIPROCATING
		OR
	13208E4182–10	COMPRESSOR, RECIPROCATING
B2	13221E9334–1	MOTOR, CONDENSER FAN
B3	13216E6140-1	MOTOR, EVAPORATOR FAN
C1	M39014/05–2661	CAPACITOR, FILTER
C2	13222E9171–3	CAPACITOR, CONDENSER RUN
C3	13222E9171–3	CAPACITOR, EVAPORATOR RUN
C4	13220E8229-3	CAPACITOR, CONIPRESSOR RUN (13208E4182-5 COMPRESSOR)
	1322E9171-4	CAPACITOR, COMPRESSOR RUN (13208E4182-10 COMPRESSOR)
C5	13225E6430-2	CAPACITOR, COMPRESSOR START
C6	13218E6961	CAPACITOR
CB1	13216E6206-1	CIRCUIT BREAKER, COMPRESSOR
CB2	13216E6178-1	CIRCUIT BREAKER, CONTROL
CR1	13227E8321	RECTIFIER, SEMICONDUCTOR DEVICE
HR1 thru HR4	13216E6124–1	HEATER ELEMENT
HR5	PART OF B1	CRANKCASE HEATER (13208E4182-5 COMPRESSOR ONLY)
J1 & J11	MS3100R-16-11P	CONNECTOR, RECEPTACLE, POWER INPUT
K1	13225E8024-2	RELAY, TIME DELAY
K2	MS24192-D1	RELAY, HEATER
K3	MS24192-D1	RELAY, COMPRESSOR MOTOR
K4	13216E6184	RELAY, CONDENSER FAN
K5	13216E6240-2	RELAY, COMPRESSOR START
L1	13216E6158	VALVE, SOLENOID, BYPASS
L2	13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
S1	13216E6201-2	SWITCH, ROTARY, SELECTOR
S2	13216E6200	SWITCH, TOGGLE
S3	13216E6203	SWITCH, TEMPERATURE CONTROL
S4	13216E6215–3	SWITCH, HIGH PRESSURE CUTOUT
S5	13216E6215–1	SWITCH, LOW PRESSURE CUTOUT
S6	13216E6224	SWITCH, HEATER OUTLET
S7	PART OF B2	SWITCH, THERMAL
S8	PART OF B1	SWITCH, THERMAL
T1	13221E9117	TRANSFORMER
TB3	13216E6232-6	TERMINAL BOARD, POWER INPUT
TB4	13216E6232-2	TERMINAL BOARD (DUMMY) (13208E4182-10 COMPRESSOR)

NOTE: TO EMERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS ORIGINATING AND ON TB3-1 AND -2 MUST BE CHANGED TO TB3-4 AND –5, RESPECTIVELY.

INDEX

Subject Page

A

B

C

Subject Page

C - Continued

Subject Page

D

E

Subject Page

E - Continued

F

G

Subject Page

H

I

Subject Page

I - Continued

J

L

M

Subject Page

M - Continued

O

P

Subject Page

P-Continued

R

Subject Page

R - Continued

Page

Subject

R - Continued

S

Subject Page

S - Continued

T

Subject Page

T - Continued

U

V

Subject

Page

W

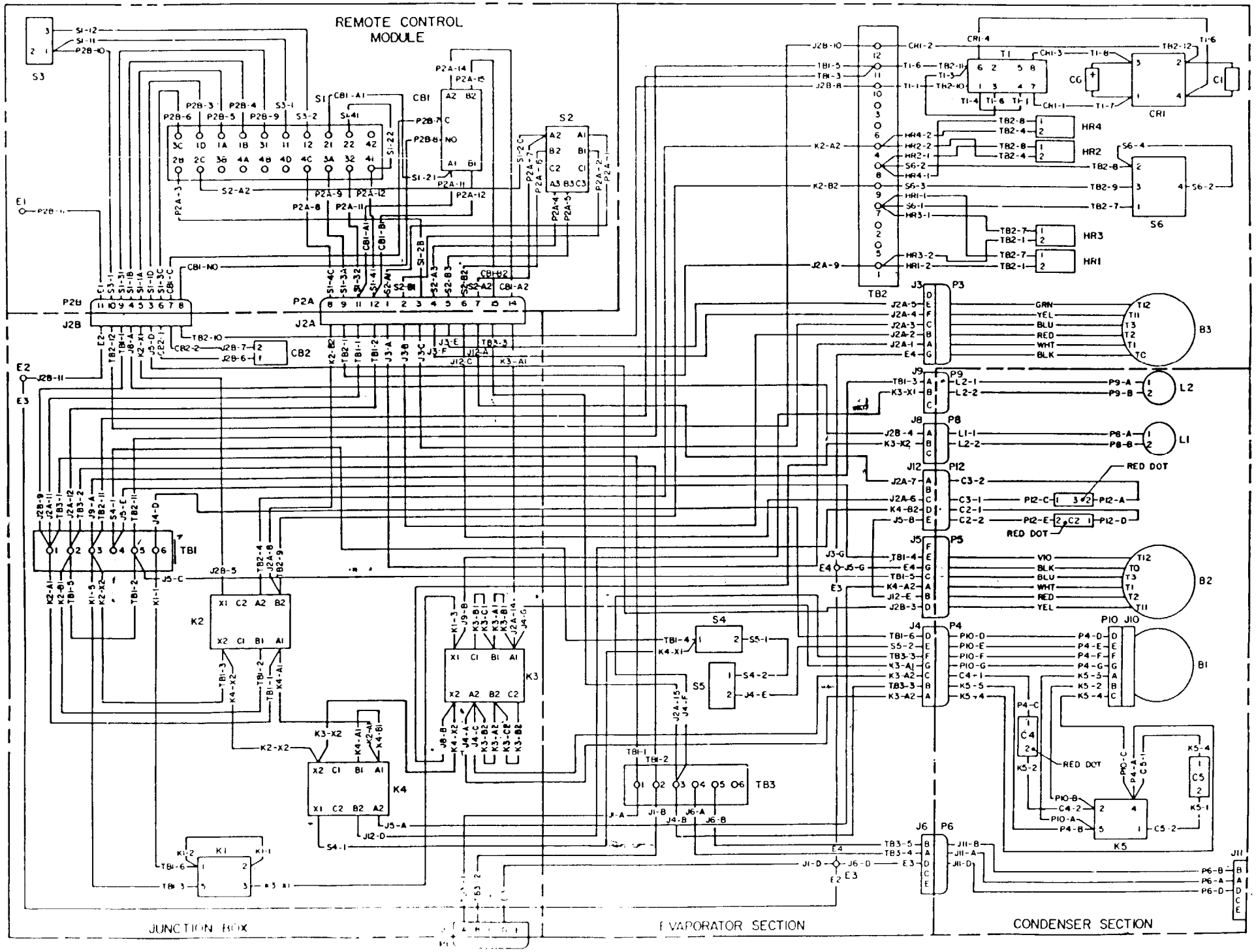
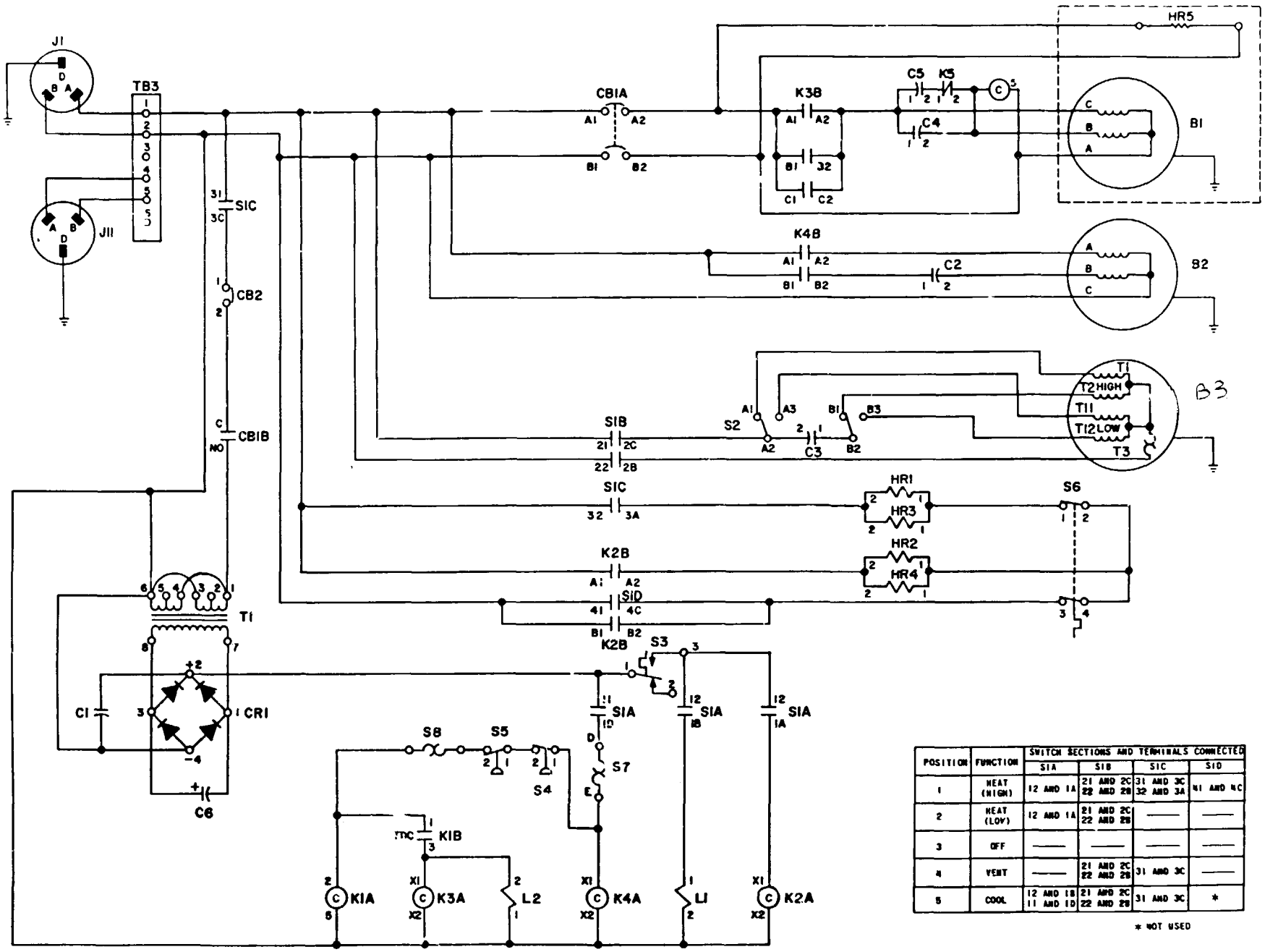


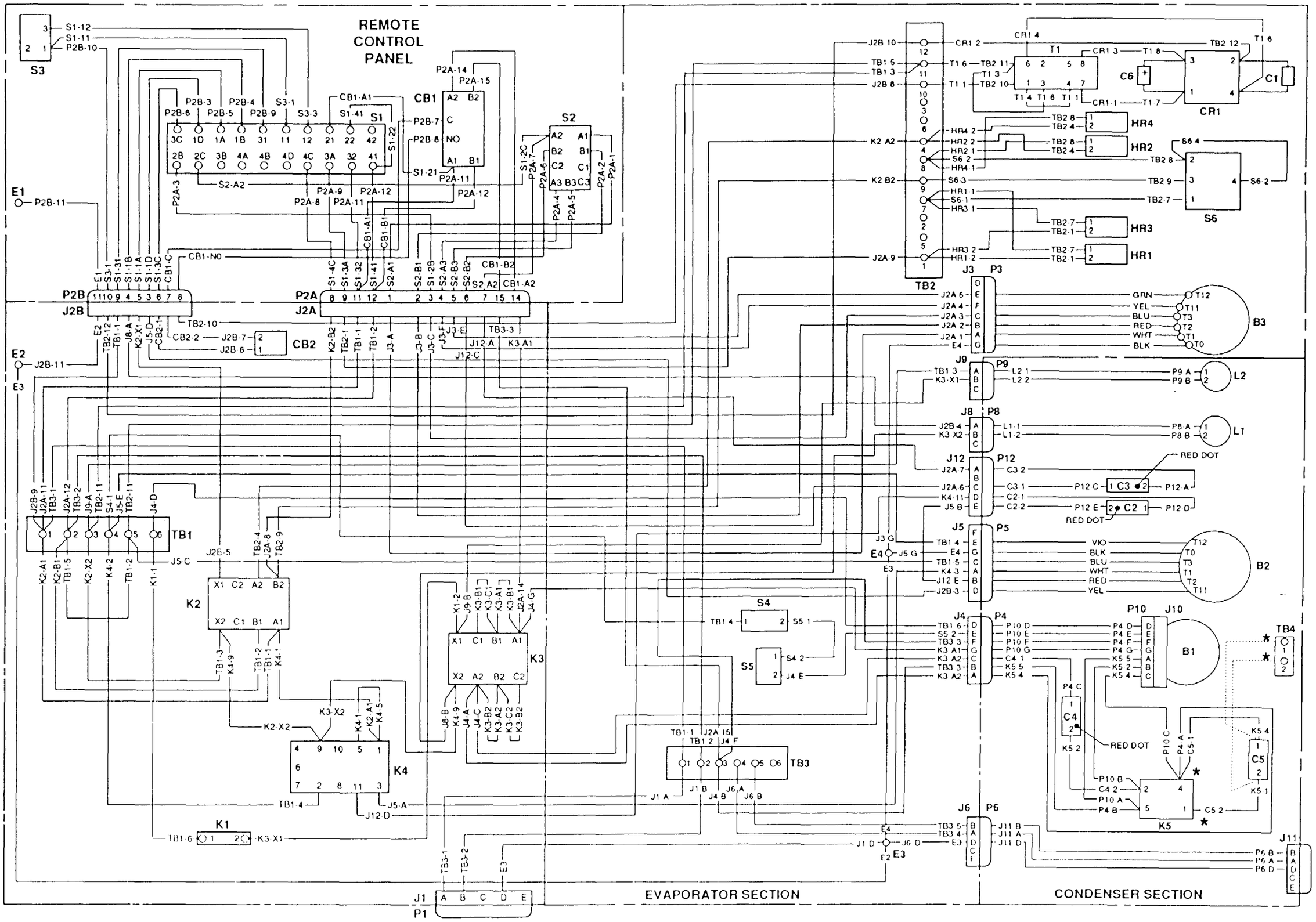
Figure FO-1. Wiring Diagram Model A9KH-115P



POSITION	FUNCTION	SWITCH SECTIONS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	N1 AND N2
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	——	——
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	31 AND 3C	*

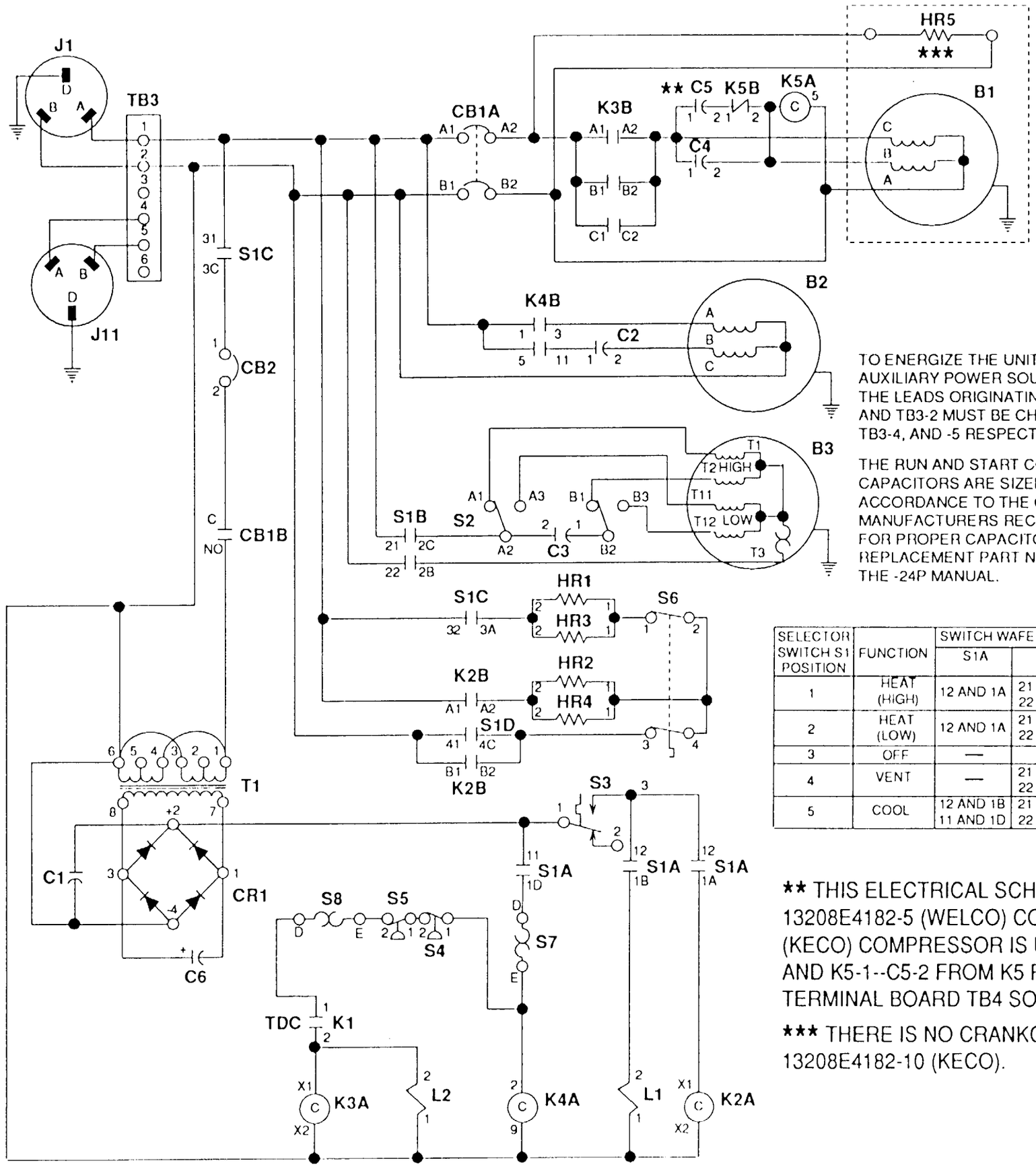
* NOT USED

Figure FO-2. Schematic Diagram Model A9KH-115P



★ THIS WIRING DIAGRAM REFLECTS UNITS WIRED FOR 13208E4182-5 (WELCO) COMPRESSOR. WHEN 13208E4182-10 (KECO) COMPRESSOR IS USED DISCONNECT WIRES K5-4--C5-1 AND K5-1--C5-2 FROM K5 RELAY AND REATTACH THEM TO DUMMY TERMINAL BOARD TB4 SO THAT C5 CAPACITOR IS NOT USED.

Figure FO-3. Wiring Diagram Model F9000H-1S



TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER SOURCE (J11), THE LEADS ORIGINATING FROM TB3-1, AND TB3-2 MUST BE CHANGED TO TB3-4, AND -5 RESPECTIVELY.

THE RUN AND START COMPRESSOR CAPACITORS ARE SIZED IN ACCORDANCE TO THE COMPRESSOR MANUFACTURERS RECOMMENDATIONS. FOR PROPER CAPACITOR REPLACEMENT PART NUMBER CHECK THE -24P MANUAL.

SELECTOR SWITCH S1 POSITION	FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		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
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	—
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	31 AND 3C	NOT USED

** THIS ELECTRICAL SCHEMATIC REFLECTS UNITS WIRED FOR 13208E4182-5 (WELCO) COMPRESSOR. WHEN 13208E4182-10 (KECO) COMPRESSOR IS USED DISCONNECT WIRES K5-4--C5-1 AND K5-1--C5-2 FROM K5 RELAY AND REATTACH THEM TO DUMMY TERMINAL BOARD TB4 SO THAT C5 CAPACITOR IS NOT USED.

*** THERE IS NO CRANKCASE HEATER (HR5) ON COMPRESSOR 13208E4182-10 (KECO).

Figure FO-4. Schematic Diagram Model F9000H-1S

By Order of the Secretary of the Army

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

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
04660

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6084, requirements for TM 9-4120-378-14.

★U.S. GOVERNMENT PRINTING OFFICE: 1993 - 755 - 120/60225

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 9-4120-378-14	15 July 1993	AIR CONDITIONER, HORIZONTAL, COMPACT 9,000 BTU/HR, 115 VOLT

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M Overprint 1, 1 Nov 80

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 9-4120-378-14	15 July 1993	AIR CONDITIONER, HORIZONTAL, COMPACT 9,000 BTU/HR, 115 VOLT

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNITS ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

_____

_____

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY AVIATION AND TROOP COMMAND
ATTN: AMSAT-I-MP
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 071482-002