DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

AIR CONDITIONER:
COMPACT VERTICAL
208V, 3 PHASE, 60,000 BTUH COOLING;
49,000 BTUH HEATING
(TRANE MODELS)
50/60 CYCLE-MODEL MAC6V60-360-2
FSN 4120-935-5416
400 CYCLE-MODEL MAC4V60-360-3
FSN 4120-935-5417

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 1969

Changes in force: C1, C2, and C3

CHANGE

NO 3

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

Operator, Organizational, Direct Support, General Support
and Depot Maintenance Manual

AIR CONDITIONER: COMPACT VERTICAL,
208 V, 3 PHASE,, 60,000 BTUH COOLING, 49,000 BTUH HEATING
(TRANE MODELS) 50/60 HERTZ-MODEL MAC6V60-360-2,
NSN 4120-00-935-5416,
400 HERTZ-MODEL MAC4V60-360-3,
NSN 4120-00-935-5417

Approved for public release; distribution is unlimited

TM 5-4120-270-15, 1 April 1969, is changed as follows:

Title Is changed as shown above.

Page 1, paragraph 1-1c Is superseded as follows:

c You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

Page 6-16 is changed as follows:

- Paragraph 6-28, Discharging the Refrigerant System, is superseded as follows:

NOTE

In accordance with Environmental Protection Agency regulations, refrigerants cannot be discharged into the atmosphere. A recovery/recycling unit must be used whenever discharging the unit.

Operation of the recovery/recycling unit must be by AUTHORIZED PERSONNEL ONLY.

CONNECT AND OPERATE RECOVERY/RECYCLE UNIT IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

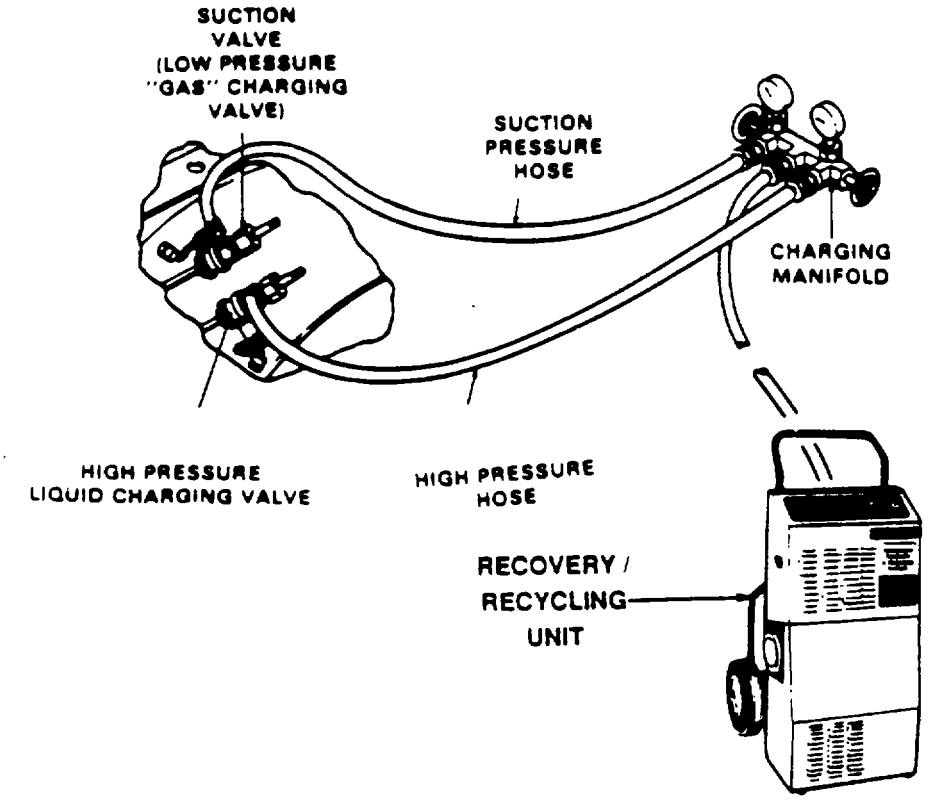
- Paragraph 6-30. Charging the Refrigerant, insert the following note:

NOTE

Whenever available, use recycled refrigerant for charging the refrigeration system.

Page 6-19 is changed as follows:

- Figure 6-14, (2) Charging refrigerant system is replaced as shown.



NOTE

Whenever available, use recycled refrigerant for charging the refrigeration system.

Figure 6-14(2). Charging refrigerant system - Continued

Page C-2 is changed as follows:

- Following Section II, add SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS as shown:

SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
	F-H	Recovery and Recycling Unit, Refrigerant	4130-01-338-2707	17500B (07295)

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
01638

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25E, qty rqr block no. 0157.

*U.S. GOVERNMENT PRINTING OFFICE: 1992 - 654-028/60214

Change in force:C1 andC2

CHANGE

No. 2

HEADQUARTERS
DEPARTMENTOFTHEARMY
WASHINGTON, DC, 15 March 1975

**Operator, Organizational, Direct Support
General Support and Depot Maintenance Manual
AIR CONDITIONER: COMPACT VERTICAL, 208 V,
3 PHASE, 60,000 BTUH COOLING; 49,000 BTUH HEATING
(TRANE MODELS) 50/60 CYCLE-MODEL MAC6V60-360-2,
NSN 4120-00-935-5416, 400 CYCLE-MODEL MAC4V60-360-3
NSN 4120-00-935-5417**

TM 5-4120-270-15, 1 April 1969, is changed as follows:

Title is changed as shown above.
Page2 of cover. Add the following warning to the list of safety precautions:

WARNING

The burning of polyurethane foams is dangerous. Due to the chemical composition of 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 paint spray booth should be used. Air supplied respirators, approved by the National Institute for Occupational Safety and Health or the US Bureau of Mines, should be used for all welding in confined spaces and when ventilation is inadequate. Individuals who have chronic or recurrent respiratory conditions, including allergies and asthma, should not be employed in this type of environment.

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25C (qty rqr block no. 574), organizational maintenance requirements for Environmental Equipment, Air Conditioners, 60,000 BTU.

Change No.1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 19 April 1973

Operator, Organizational, DS, GS, and Depot Maintenance Manual
AIR CONDITIONER: COMPACT VERTICAL, 208 V, 3 PHASE, 60,000 BTUH COOLING: 49,000 BTUH HEATING
(TRANE MODELS)
50/60 HERTZ - MODEL MAC6V60-360-2
FSN 4120-935-5416
400 HERTZ - MODEL MAC4V60-360-3
FSN 4120-935-5417

TM 54120-270-15, 1 April 1969, is changed as follows: The title is changed to read as shown above. Throughout the manual, change the word “cycle” to read “hertz”.

Page B-1. Appendix B is superseded as follows.

APPENDIX B
BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the air conditioner and are required by the crew/operator for operation, installation, or operator's maintenance.

B-2 General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List-Section II. Not applicable.

b. Items Troop Installed or Authorized List- Section III.A list in alphabetical sequence of items which at the discretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a Source, Maintenance, and Recoverability Code(s)(SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g. ft, ea., pr, etc.

e. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Table 1

(1) SMR CODE	(2) Federal stock number	(2) Ref. No. & Mfr. code	(3) Description	Usable on Code	(4) Unit of meas	(5) Qty Auth
	7520-559-9618		CASE, MAINTENANCE AND OPERATIONAL MANUAL		EA	1
	5935-839-9681		CONNECTOR, PLUG		EA	1
	4130-402-5417		PLATE, BLOCKOFF		EA	1

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed In accordance with DA Form 12-25C (qty rqr block No. 574), Organizational maintenance requirements for Air Conditioners: 60.000 BTU.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY

No. 5-4120-270-15 *WASHINGTON, D.C., 1 April 1969*

OPERATOR, ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL
AIR CONDITIONER: COMPACT VERTICAL 208V, 3 PHASE
60,000 BTUH COOLING: 49,000 BTUH HEATING
(TRANE MODELS)
50/60 CYCLE-MODEL MAC6V60-360-2
FSN 4120-935-5416
400 CYCLE-MODEL MAC4V60-360-3
FSN 4120-935-5417

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual is published for use of personnel to whom Military Models hIAC4V60-360-3 and MAC6V60-360-2 air conditioners are issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapters 4 through 6 provide instructions for direct and general support and depot maintenance. Also included are description of main units and their relationship to other components.

b. Numbers in parentheses on illustrations indicate quantity. Numbers preceding nomenclature callouts on illustrations indicate the preferred maintenance sequence.

c. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to the Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

d. Report all equipment improvement recommendations as prescribed by TM 38-750.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to the operator and organizational maintenance, refer to TMI 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by the operator, will be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND TABULATED DATA

1-3. Description

a. General. The air conditioner (fig. 1-1 through 13) is used primarily in van type enclosures for providing filtered, conditioned, or heated air as required to maintain service conditions necessary for the efficient operation of electronic equipment and for the comfort of operating personnel housed within the specified vans. It is a completely self-contained, air cooled, electric motor driven unit designed for continuous operation with varying loads. It is equipped with internal ducting to the low side of the evaporator fans so that ventilation air from the Chemical, Biological, and Radiological (CBR) filter unit may be supplied by the evaporator fans.

b. Condensing Section. The condensing section located at the bottom of the unit, contains the hermetically sealed compressor, condensing coil, receiver, condenser air intake opening, condense air discharge opening, control panel, junction box, condenser fan, fan motor, dehydrator, system access valves, solenoid valve, expansion valve, check valve and pressure release safety valve.

c. Evaporator Section. The evaporator section, located in the top of the unit, contains an evaporator coil, evaporator fans, air conditioning filters, intake and discharge grilles, evaporator coil drain pan, expansion valve, solenoid valve, back pressure 1igulating valve, electrical heaters, sight glass, accumulators and a damper to regulate the amount of outdoor air entering the air conditioner.

1-4. Identification and Tabulated Data

a. Identification. The air conditioner has 14 major identification plates. The information contained on the plates is listed below. See figure 1-4 for location

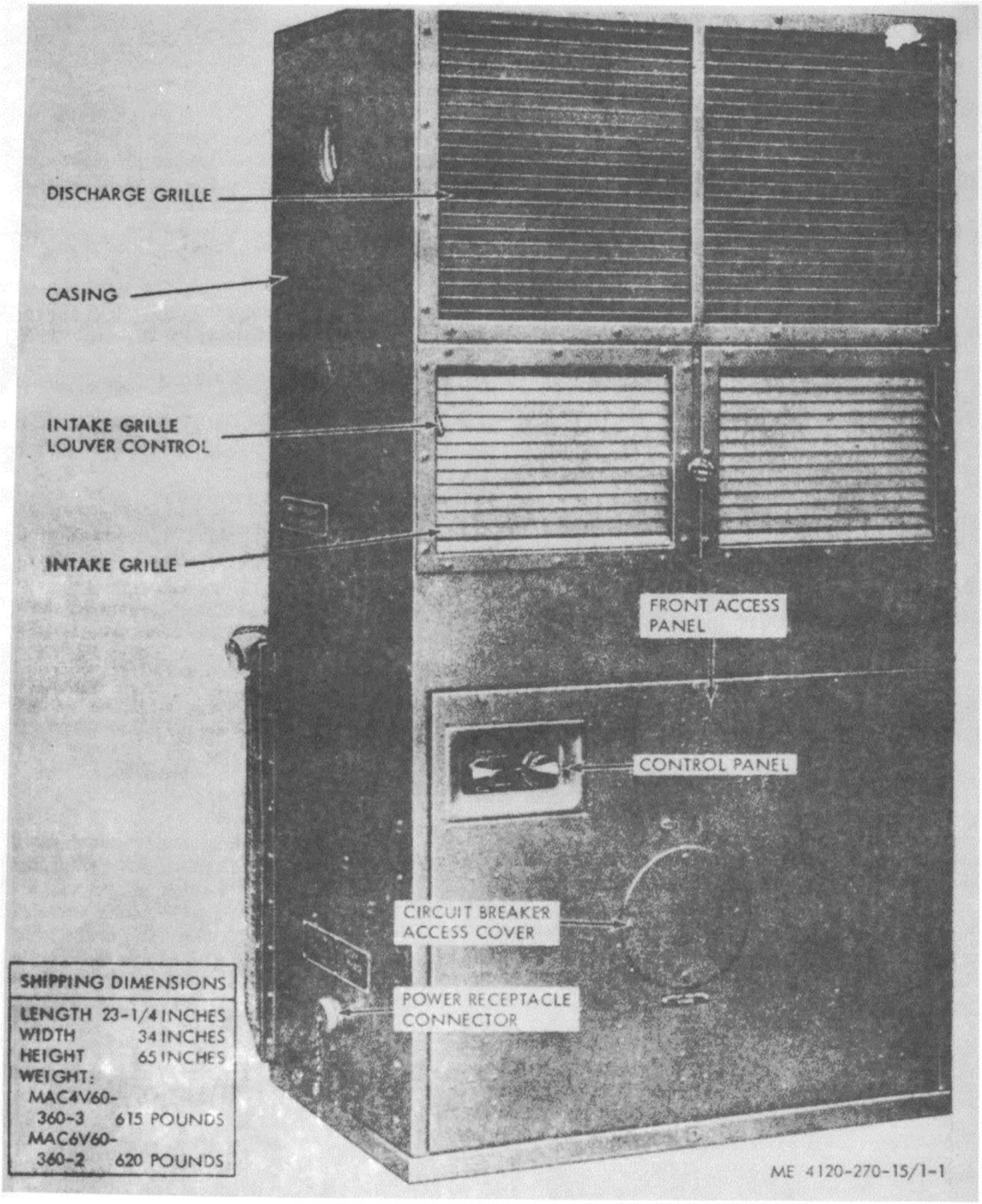


Figure 1-1. Air Conditioner, left front 3/4 view with shipping dimensions.

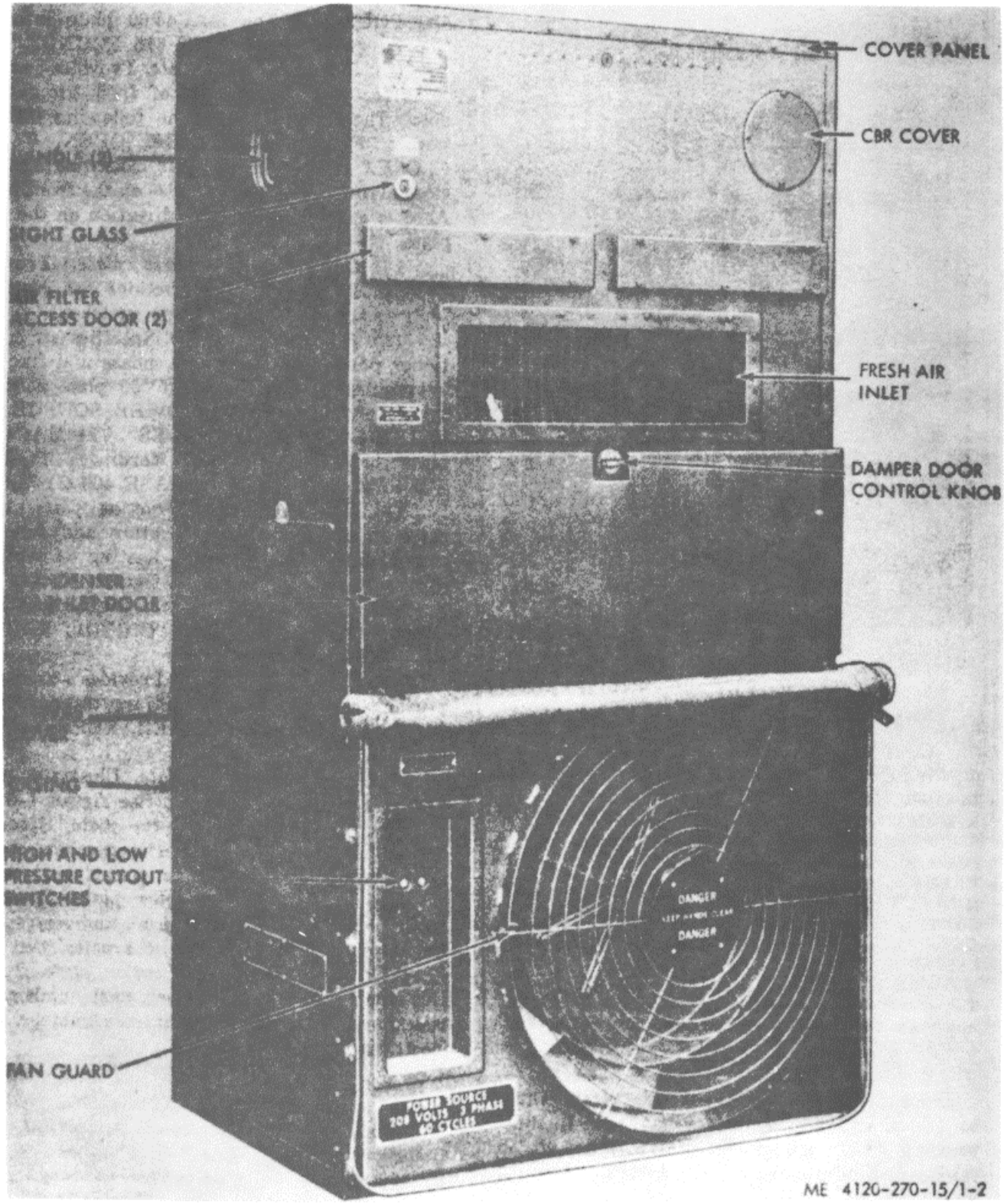


Figure 1-2. Air Conditioner, right rear 3/4 view.

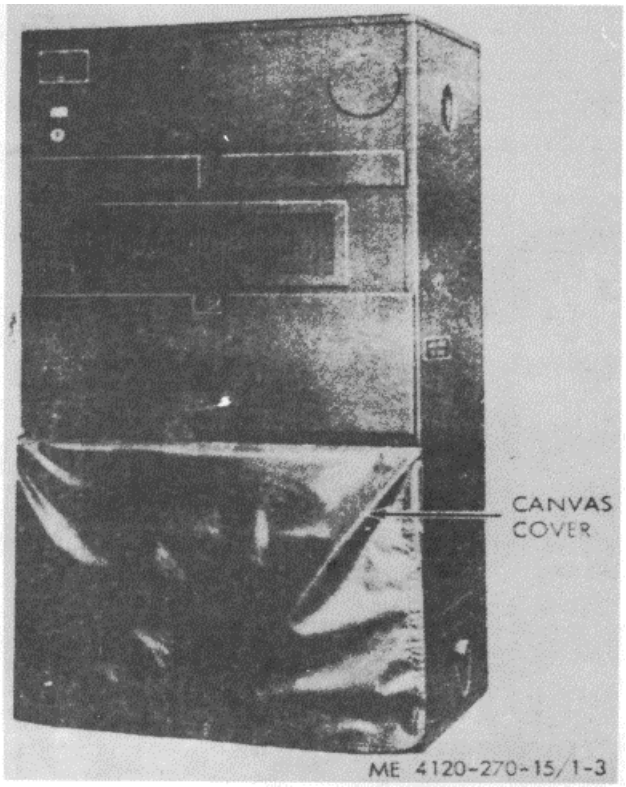


Figure 1-3. Air Conditioner, cover installed

.

(1) Military identification plate. The plate on the MAC6V60360-2 air conditioner contains the following information.

AIR CONDITIONER, VERTICAL COMPACT 60,000
BTU/HR, 208 VOLT, 3 PHASE, 60 CYCLE
FSN 41209356416
PART NO. (97403) 13214E4300
MFD BY THE TRANE CO.
CONTRACT NO. DA-23-195-AMC01159(T)
DATE
SERIAL NO.
WT - 620 lb.

The MAC4V60360-3 plate contains the same information but with the following changes: 400 CYCLE, FSN 4120-935-5417, PART NO. (97403) 13124E4200, WT - 615 LB.

(2) Sight glass color change plate. Three color bands are provided: green (Dry), chartreuse (Caution) and yellow (Wet), for use in conjunction with the sight glass to determine moisture content of refrigerant.

(3) Refrigerant type and change plate. Specifies type and amount of refrigerant used to charge unit as follows: This unit charged with 26.9 lbs. Refrigerant-22.

(4) Weight plate. Specifies air conditioner weight in pounds. The MAC6V60 plate contains the following information: "GROSS WEIGHT 620 POUNDS." The MAC4V60 plate information is: "GROSS WEIGHT 615 POUNDS."

(5) Damper control plate. Provides instructions for correct operation of fresh air damper door. The plates contain the following instructions: "FRESH AIR DOOR, OPEN, TURN, CLOSE." The open arrow is clockwise and the close arrow is counterclockwise on the front plate. Arrows are in the opposite direction on the rear plate.

(6) Cutout switch reset plate. Provides "PUSH TO RESET" instructions for resetting high and low pressure cutout switches.

(7) Power supply plate. Specifies air conditioner power supply voltage, phase and frequency requirements. The MAC6V60 plate contains the following wording: "POWER SOURCE 208 VOLTS 3 PHASE 60 CYCLES". The MAC4V60 plate has. the following wording: "POWER SOURCE 208 VOLTS 3 PHASE 400 CYCLES".

(8) Control panel instruction plate. Indicates air conditioner temperature and function-control settings for cooling, heating or ventilating modes of operation. See figure 21.

(9) Circuit breaker access plate. Located on lower front cover, identifies "CIRCUIT BREAKER ACCESS" opening.

(10) Fan warning plate. Provides warning to prevent possible personnel injury through carelessness as follows: "DANGER, KEEP HANDS CLEAR, DANGER".

(11) Wiring diagram plate. Illustrates complete air conditioner wiring. See figure 1-6.

(12) Evaporator fan motor plate. Specifies motor horsepower, type, serial number, speed, frame number, and electrical characteristics.

(13) Condenser fan motor plate. Specifies motor horsepower, type, serial number, speed, frame number, and electrical characteristics.

(14) Compressor identification plate. Specifies compressor model number, part number, serial number, refrigerant, contract number, and electrical characteristics.

b. Tabulated Data.

(1) Air conditioner, compact, vertical, self-contained.

Manufacturer	The Trane Company
Models.....	MAC4V6360-3 and MAC6V60-360-2
Capacity:	
Cooling	60,000 BTU/HR
MAC6V60-360-2 operating on 50 cycles	50,000 BTU/HR
Heating	
60 Cycles	49,000 BTU/HR

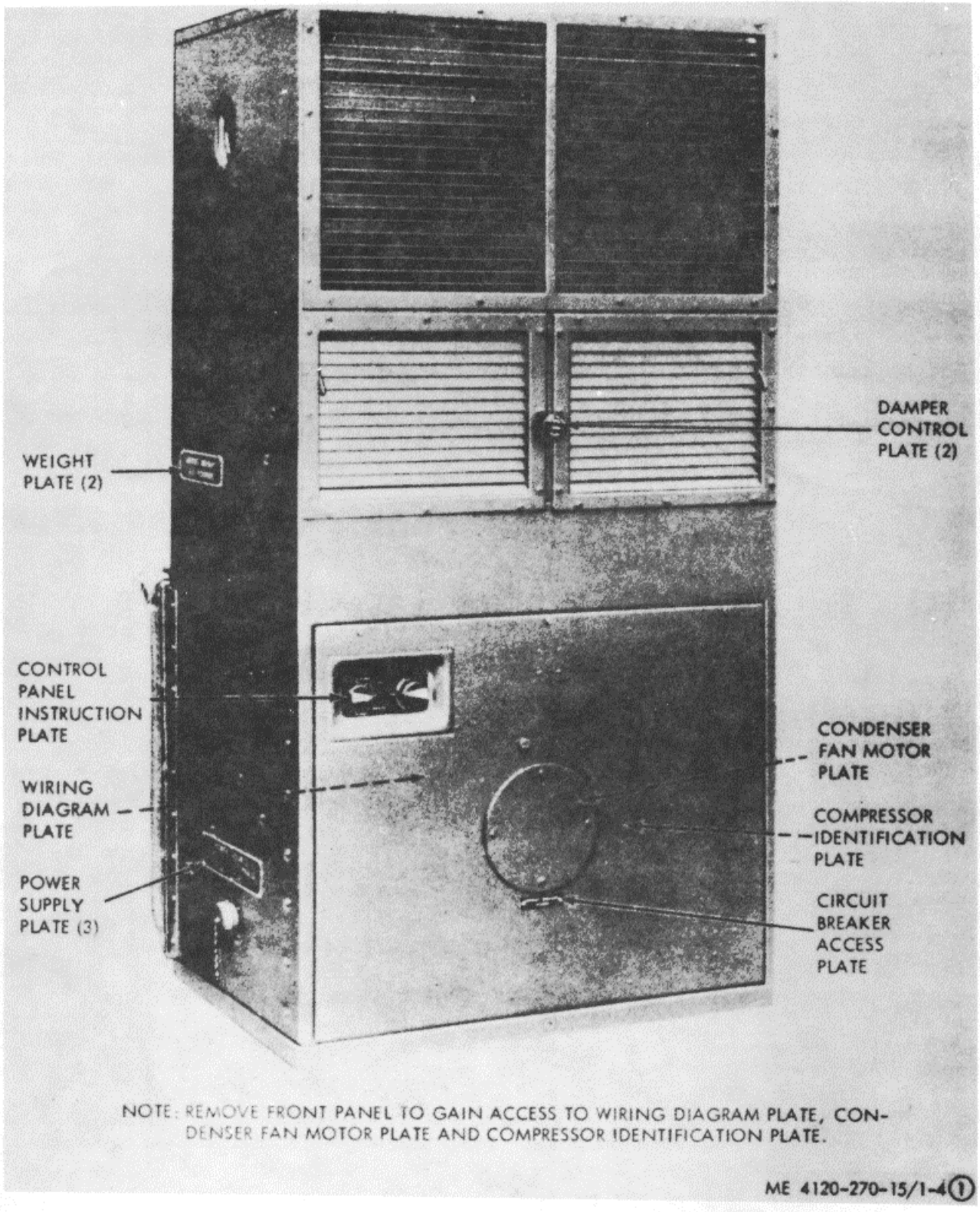


Figure 1-4 (1). Identification plates.

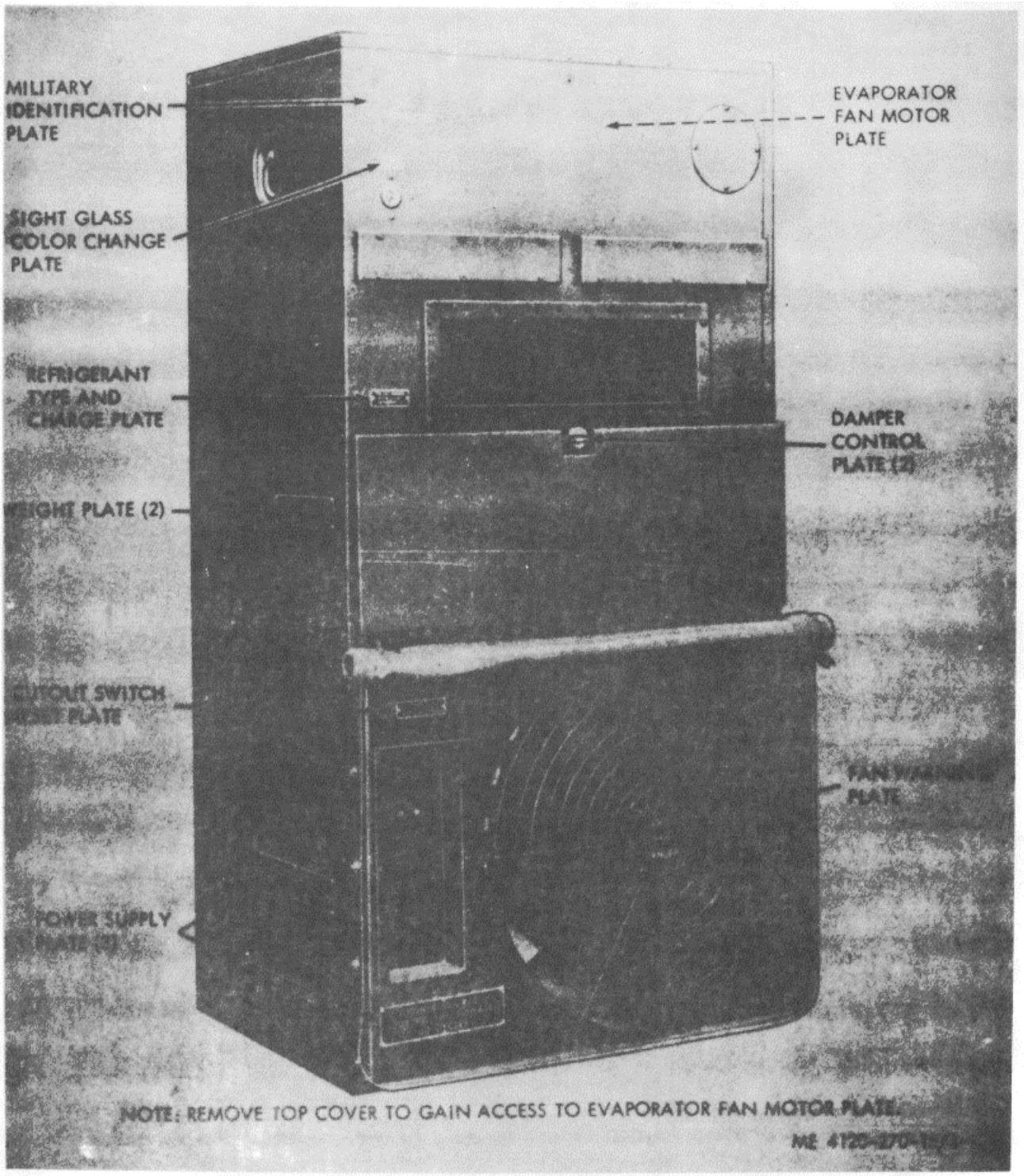


Figure 1-4 (2). — Continued.

400 Cycles ---------- 52,000 BTU/HR
50 Cycles ---------- 46.750 BTU/HR
Ventilating ---------- 2,000 CFM
(2) Condensing section.
(a) Compressor.
Manufacturer ---------- The Trane Company
Model ---------- MJ-6
Type ---------- Hermetically sealed,
---------- reciprocating
Part number:
MAC4V60-360-3---------- A4525-760-4
MAC6V60-360-2---------- A4525-760-3
(b) Condensing coil.
Manufacturer ---------- The Trane Company
Type ---------- Finned tube
Part number ---------- A4525-702
(c) Condenser fan.
Manufacturer ---------- The Trane Company
Type Axial, vane
Part number ---------- B604-1008
(d) Condenser fan motor.
Manufacturer ---------- Welco Industries, Inc.
Type ---------- Induction, direct drive
Part number:
MAC4V660-36 ---------- 7045-3
MAC6V60-360-2---------- 7030-6
(e) Dehydrator.
Manufacturer ---------- Sporlan Valve Co.
Type ---------- Dessicant drier
Part number ---------- C164
(f) Pressure relief valve.
Manufacturer ---------- Superior Valve &
---------- Fitting Co.
Type ---------- Preset, non-adjustable
Part number ---------- 3001-X4
(g) Solenoid valves.
Manufacturer ---------- Jacques-Evans Mfg. Co.
Type ---------- Pilot operated, normally
---------- open
Part number ---------- OB241
Number per unit ---------- 2
(h) High pressure cutout switch.
Manufacturer ---------- Penn Controls, Inc.
Type ---------- Pressure operated,
---------- normally open
Part number ---------- 210AP40AN
(i) Low pressure cutout switch.
Manufacturer ---------- Penn Controls, Inc.
Type ---------- Pressure operated,
---------- normally closed
Part number ---------- 210AP10OAN
(j) System access valves.
Manufacturer ---------- Superior Valve & Fitting
---------- Co.
Type ---------- Packless charging valves
Part number ---------- 5939X4
Number per unit ---------- 2
(3) Evaporator section.
(a) Evaporator coil.
Manufacturer ---------- The Trane Company
Type ---------- Finned tube
Part number ---------- E4525835
(b) Evaporator fans.
Manufacturer ---------- The Trane Company
Type ---------- Centrifugal flow, air foil
Part number ---------- FAN 319 (ICH) and
FAN 320 (RH)
Number per unit ---------- 2
(c) Evaporator fan motor.
Manufacturer ---------- Welco Industries, Inc.
Type ---------- Induction, direct drive,
double extended shaft
Part number:
MAC4V60-360-3---------- 4720-24
M A C6V60360-2---------- 472518
(d) Air filters.
Manufacturer ---------- Air-Maze Corp.
Type ---------- Permanent
Part number ---------- 124935-065
Number per unit ---------- 2
(e) Expansion valves.
Manufacturer ---------- Alco Control Corp.
Type ---------- Thermal expansion
Cooling load ------ ------- 4 1/2 ton------- 2.1 ton
Part number ------ --- TCLAOOHW100 DT12104
Number per unit ---------- 1
(f) Back pressure regulating valve.
Manufacturer ---------- Controls Co. of America
Type ---------- Pressure operated,
normally closed
Part number ---------- 237AVIL-70327-142
(g) Electric heaters.
Manufacturer ---------- McGraw Edison
Type ---------- Tubular
Part number ---------- 4496-011-01
Number per unit ---------- 6
(h) Sight glass.
Manufacturer ---------- Sporlan Valve Co.
Type ---------- Bulls-eye
Part number ---------- SA-K16 SEE ALL
(4) Electrical Controls.
(a) Temperature control thermostat.
Manufacturer ---------- Penn Controls, Inc.
Type ---------- Bimetallic element,
normally closed
Part number ---------- A 9AGF-16
(b) Selector switch.
Manufacturer ---------- Cutler-Haummer, Inc.
Type ---------- Rotary, five-position
Part number ---------- 912K216
(c) Heater high temperature cutout
Manufacturer ---------- Metals and Controls, Inc.
Type ---------- Automatic reset, normally
closed
Part number ---------- CWA1249
(d) Magnetic contactors.
Manufacture ---------- Cutler-Hammer, Inc.
Type ---------- Three-pole, single throw
Load capacity ---------- 50 amperes····· 25 amperes
Part number ---------- 9565H94 ····· 9565H2B
Number per unit ---------- 2 ····· 3
(e) Time delay. relay.
Manufacturer ---------- Dialtron Corp.
Type ---------- Thermal delay, normally
open
Part number ---------- FR-30S-NO-24

(f) Circuit breaker, MAC4V60-60o-.

Manufacturer	Heinemann Electric Co.
Type	Manual reset
Part number	71-212-7MG6

Circuit breaker, MAC8V60-360--.

Manufacturer	Heinemann Electric Co.
Type	Manual reset
Part number	71-212-6MG6

(g) Five.

Manufacturer	Bussman Mfg. Co.
Type	Cartridge
Load capacity	5amperes----.1.6 amperes
Part number	KAW56 ·····FNM1-6/10
Number per unit	1----------2

(h) Transformer.

Manufacturer	Reid Hill Electronics
Type	Stepdown, single phase
Part number	
MAC4V60-360-3	35666
MAC6V60-360-2	566

(i) Terminal boar.

Manufacturer	Kulka Electric Corp.
Part number	
10-terminl	X2010
6terminal	605-JJ-2502-6

(j) Rectifier.

Manufacturer	Syntron Co.
Type	Silicon semiconductor bridge
Part number	SS-0257

(k) RFI Filters.

Manufacturer	Sprague Electric Co.
Part number	SJX100
Number per unit	4

(5) Dimensionand weight (fig. 1-1).

Height	3 1/4 inches
Length	34 inches
Width	65 inches
Weight	
MAC4V60-608	615 pounds
MAC6V6O-6880-9	620 pounds

(6) Base plan. Refer to figure 1-5 for base plan.

(7) Wiring diagram. Refer to figure 1-6 for wiring diagrams.

1-5. Difference in Models

This manual covers the Trane MAC4V6O-86-8 and MAC6V60-360-2 air conditioners. The differences between the two air conditioners are in the electrical system. Model MAC4V-60-3 is designed to operate from a 400 cycle, 208 volt, 3 phase supply. Model MAC6V60-360-2 is designed to operate from a 50/60 cycle, 208 volt, 3 phase supply. Where differences exist, each model is covered separately in applicable maintenance section of this manual.

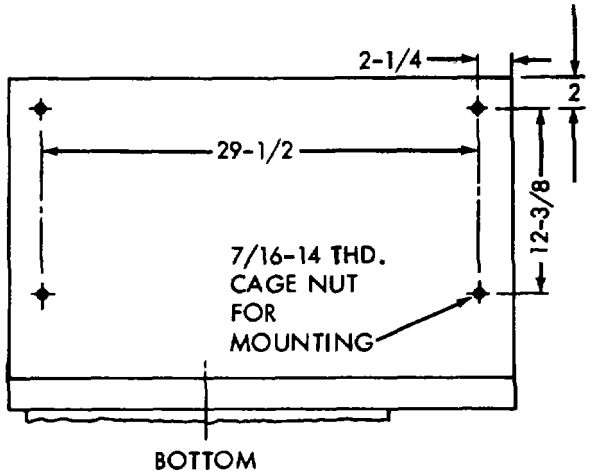
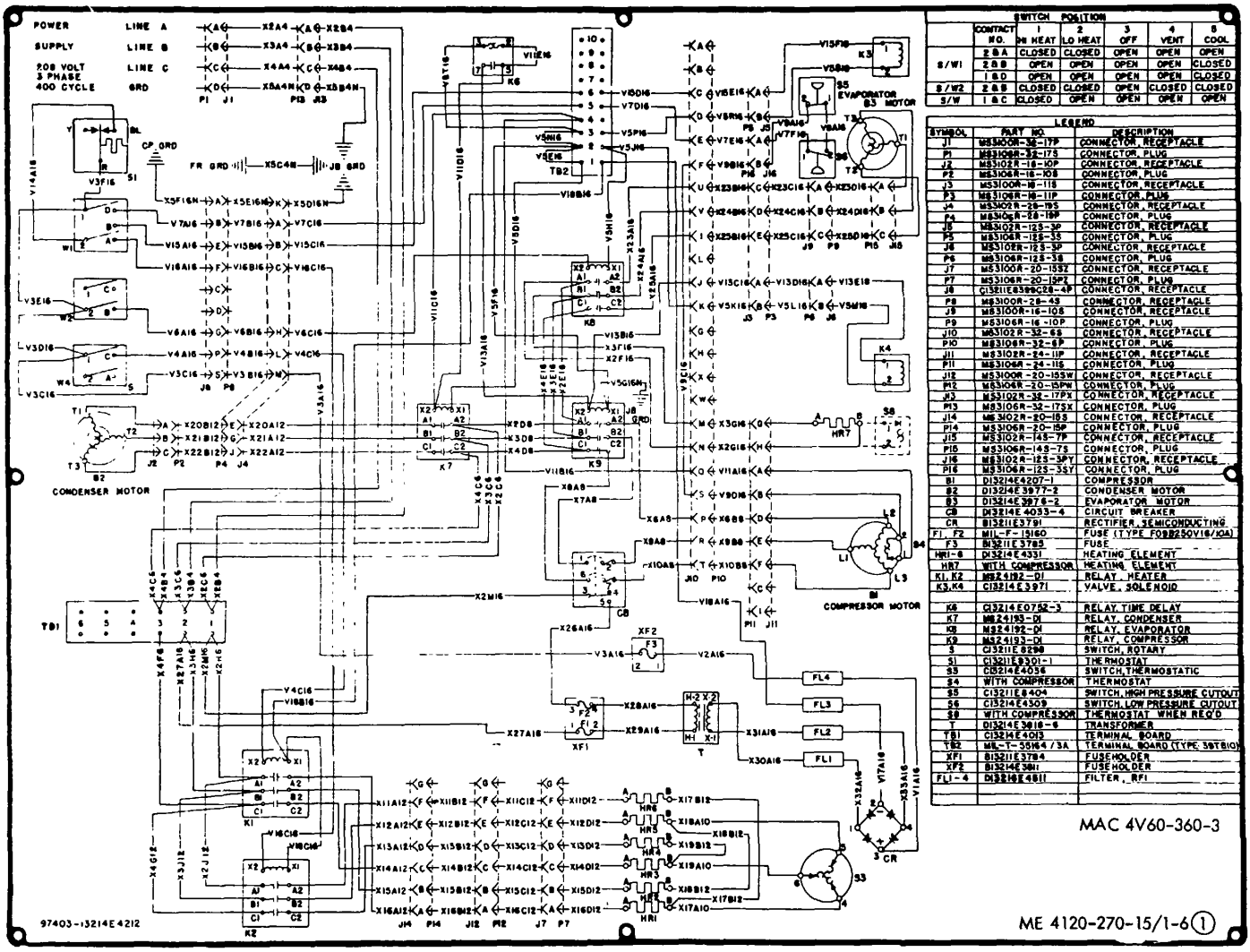


Figure 1-5. Base plan.



SWITCH POSITION						
	CONTACT NO.	1 HI HEAT	2 LO HEAT	3 OFF	4 VENT	5 COOL
S/W1	2 & A	CLOSED	CLOSED	OPEN	OPEN	OPEN
	2 & B	OPEN	OPEN	OPEN	OPEN	CLOSED
	1 & D	OPEN	OPEN	OPEN	OPEN	CLOSED
S/W2	2 & B	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
S/W	1 & C	CLOSED	OPEN	OPEN	OPEN	OPEN

LEGEND		
SYMBOL	PART NO.	DESCRIPTION
J1	MS3100R-32-17P	CONNECTOR, RECEPTACLE
P1	MS3106B-32-17S	CONNECTOR, PLUG
J2	MS3102R-16-10P	CONNECTOR, RECEPTACLE
P2	MS3106R-16-10S	CONNECTOR, PLUG
J3	MS3100R-16-11S	CONNECTOR, RECEPTACLE
P3	MS3106R-16-11P	CONNECTOR, PLUG
J4	MS3102R-28-19S	CONNECTOR, RECEPTACLE
P4	MS3106R-28-19P	CONNECTOR, PLUG
J5	MS3102R-12S-3P	CONNECTOR, RECEPTACLE
P5	MS3106R-12S-3S	CONNECTOR, PLUG
J6	MS3102R-12S-3P	CONNECTOR, RECEPTACLE
P6	MS3106R-12S-3S	CONNECTOR, PLUG
J7	MS3100R-20-15SZ	CONNECTOR, RECEPTACLE
P7	MS3106R-20-15PZ	CONNECTOR, PLUG
J8	C15211E8398C28-4P	CONNECTOR, RECEPTACLE
P8	MS3100R-28-4S	CONNECTOR, RECEPTACLE
J9	MS3100R-16-10S	CONNECTOR, RECEPTACLE
P9	MS3106R-16-10P	CONNECTOR, PLUG
J10	MS3102R-32-6S	CONNECTOR, RECEPTACLE
P10	MS3106R-32-6P	CONNECTOR, PLUG
J11	MS3102R-24-11P	CONNECTOR, RECEPTACLE
P11	MS3106R-24-11S	CONNECTOR, PLUG
J12	MS3100R-20-15SW	CONNECTOR, RECEPTACLE
P12	MS3106R-20-15PW	CONNECTOR, PLUG
J13	MS3102R-32-17PX	CONNECTOR, RECEPTACLE
P13	MS3106R-32-17SX	CONNECTOR, PLUG
J14	MS3102R-20-15S	CONNECTOR, RECEPTACLE
P14	MS3106R-20-15P	CONNECTOR, PLUG
J15	MS3102R-14S-7P	CONNECTOR, RECEPTACLE
P15	MS3106R-14S-7S	CONNECTOR, PLUG
J16	MS3102R-12S-3PY	CONNECTOR, RECEPTACLE
P16	MS3106R-12S-3SY	CONNECTOR, PLUG
B1	D13214E4207-1	COMPRESSOR
B2	D13214E3977-2	CONDENSER MOTOR
B3	D13214E3976-2	EVAPORATOR MOTOR
CB	D13214E4033-4	CIRCUIT BREAKER
CR	D13211E3791	RECTIFIER, SEMICONDUCTING
F1, F2	MIL-F-15160	FUSE (TYPE FOB8250V16/10A)
F3	D13211E3785	FUSE
HR1-6	D13214E4331	HEATING ELEMENT
HR7	WITH COMPRESSOR	HEATING ELEMENT
K1, K2	MS24192-D1	RELAY, HEATER
K3, K4	C13214E3971	VALVE, SOLENOID
K6	C13214E0752-3	RELAY, TIME DELAY
K7	MS24193-D1	RELAY, CONDENSER
K8	MS24192-D1	RELAY, EVAPORATOR
K9	MS24193-D1	RELAY, COMPRESSOR
S	C13211E8298	SWITCH, ROTARY
S1	C13211E8301-1	THERMOSTAT
S3	C13214E4036	SWITCH, THERMOSTATIC
S4	WITH COMPRESSOR	THERMOSTAT
S5	C13211E8404	SWITCH, HIGH PRESSURE CUTOUT
S6	C13214E4509	SWITCH, LOW PRESSURE CUTOUT
S8	WITH COMPRESSOR	THERMOSTAT WHEN REQ'D
T	D13214E3816-6	TRANSFORMER
TB1	C13214E4013	TERMINAL BOARD
TB2	MS-T-3514 4/3A	TERMINAL BOARD (TYPE 3STB10)
XF1	D13211E3784	FUSEHOLDER
XF2	D13214E3811	FUSEHOLDER
FL1-4	D13219E4811	FILTER, RFI

Figure 1-6 (1). Wiring diagram

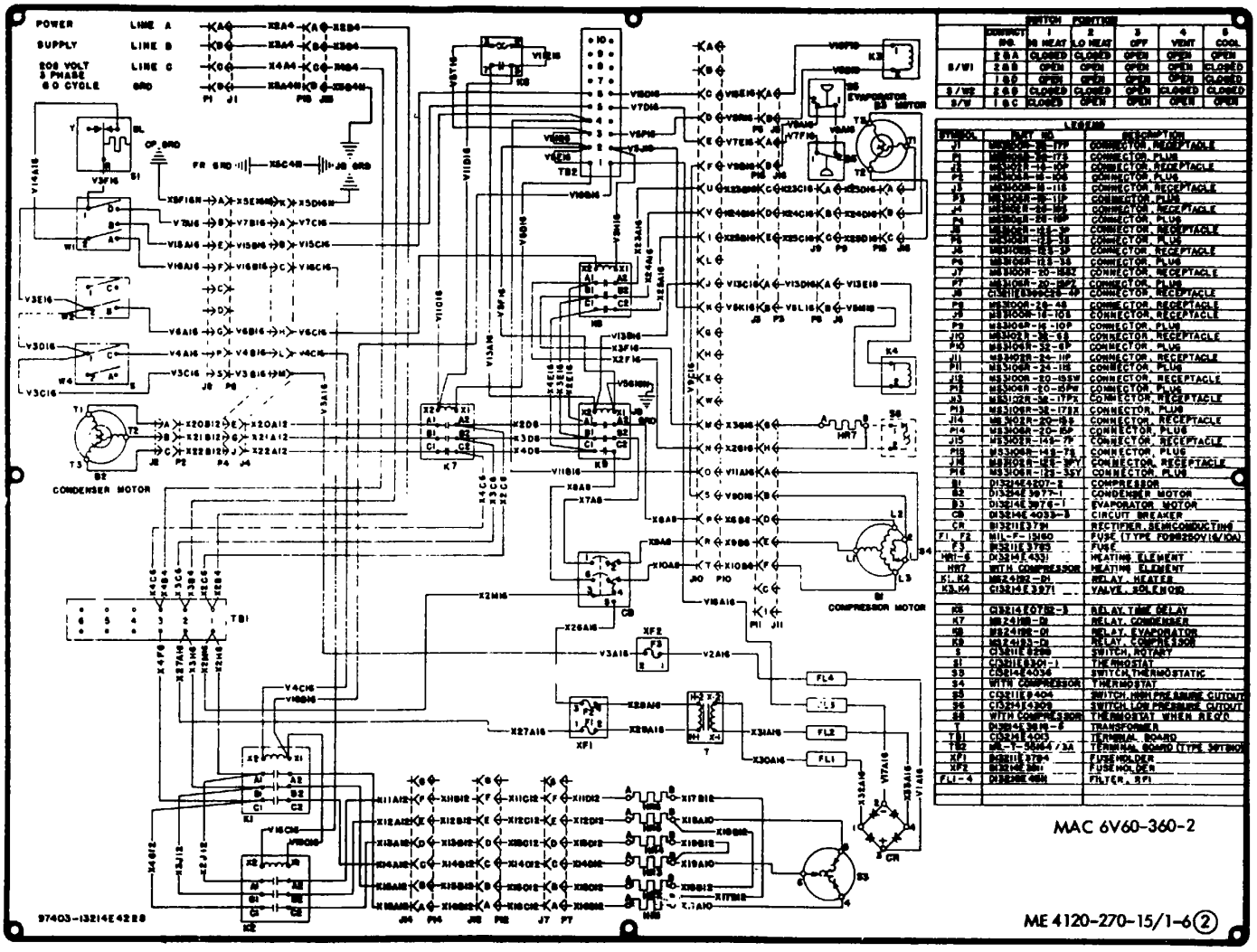


Figure 1-6 (2).— Continued.
Figure 1-6 (3)— Continued.
(Located in back of manual)

CHAPTER 2
INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading the Equipment

a. Remove any blocking or tiedowns that may have been used to secure the item to carrier. The air conditioner is shipped in a wooden carton, the base of which is raised to provide for insertion of tongs of a fork.

b. Use a forklift or other suitable lifting de- vice to remove unit from carrier. Caution: Use care in handling to avoid damaging the air conditioner.

2-2. Unpacking the Equipment

a. General. 'love air conditioner to installa-tion site before removing shipping container. Cut the metal bands and remove top, end, and sides of carton, and the Kimpak covering. Remove bolts securing base of unit to crate. Using a suitable hoist or crane and a spreader bar attached to the lifting handles, lift unit from crate.

b. Depreservation. Prior to placing unit in op- eration, accomplish depreservation in accordance with instructions outlined in T)A Form 2258 (Depreservation Guide of Engineer Equipment). DA Form 2258 is attached on or near the operational controls.

2-3. Inspecting and Servicing Equipment

a. Perform daily preventive maintenance services (para 3-C,).

b. Perform quarterly preventive maintenance services (para 3--7).

c. Inspect entire r conditioner for signs of damage, paying particular attention to evaporator and condenser coils.

d. The air conditioner contains a full operating charge of refrigerant and compressor oil. No further service is required.

2-4. Installation of Separately packed Components

a. General. The air conditioner is basically a self-contained unit, however, in certain installations it may become desirable to place the control panel in a remote location and utilize the remote control blockoff plate.

b. Blockoff Plate. The blockoff plate is pro- vided for installation when the controls are removed for remote control operation. The block-off plate provided must be used so that no air. will enter the lower compartment. Refer to figure 2-1, and install the blockoff plate.

2-5. Installation or Setting-up Instructions

a. General. Set the air conditioner in a level position to allow proper condensate draining (operation will be satisfactory with unit setting at a slight angle, and using one of the alternate drain connections).

b. Locating the Unit. The removable lower front panel and evaporator fan discharge and intake grilles must be accessible for normal service and maintenance. The condenser air intake and discharge openings must always be unobstructed to allow sufficient air for condensing purposes. Clearance must be allowed for the condenser air inlet door which must be open during operation. The evaporator fan discharge and intake openings at front of unit should be relatively free from obstruction to permit maximum unit capacity. Sufficient headroom must be allowed for removal of the mist eliminator.

Note. Remove discharge and intake grilles and filter, if unit is to be used with ducts carrying air to and from the conditioned space. Install grilles and filter in the duct.

Note. Remove CBR cover (fig. 1-2) if a CBR filter unit is to he attached to ,he air conditioner.

c. Installing Unit). Bolt unit to floor or other flat surface. Refer to base plan (fig. 1-5) for dimensions. Connect drain hose to drain nipple at base of unit to lead condensate away from unit. Alternate 1/2 inch NPT condensate drain connections are provided at both sides and front and rear of unit. If one of these is used, remove the desired drain plug prior to installing the drain hose.

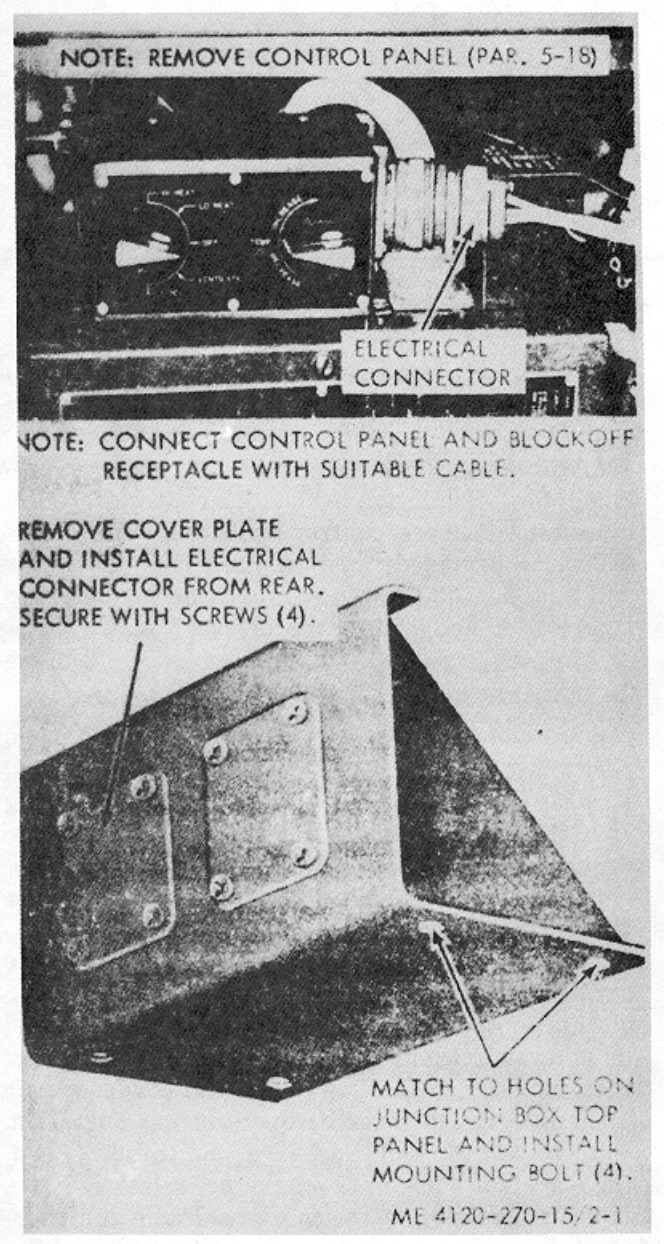


Figure 2-1. Remote control connection installation

d. Power Source.

(1) Model MAC4V60-360-3. Operates on 208 volts, 400 cycle, 3 phase power.

(2) Model MAC6V60-60-2. Operates on 208 volt, 50/60 cycle, 3 phase power.

(3) Power receptacle connector. An MS31-00R3217P receptacle is located on the left hand side of unit, above the base drain plug. Connect the proper electrical power supply source to this receptacle using a MS3106R32-17S plug or acceptable alternate. Alternate electrical power connections are provided at both sides and rear of the unit; any location may be used by interchanging the power receptacle at rear of unit and one of the cover plates at side of unit. Be sure to attach cover plate over unused location at rear of unit to prevent air from being drawn through the opening.

e. Remote Control.

(1) General. The control panel may be removed from the unit and used as a remote control for operation of the air conditioner. The remote control connection and blockoff plate provided must be used when the control panel is used as

a remote control.

(2) Remote control connection.

(a) Disconnect power source from unit.

(b) Refer to figure 21, and install the remote control connection.

Section II. MOVEMENT TO NEW WORKSITE

2-6. Dismantling for Movement

a. General.

(1) Shit off electrical power supply to air conditioner and disconnect power cable from unit.

(2) Disconnect drain hose from unit.

Note. Disconnect all duct work and remote control cable if used with unit.

(3) Unbolt unit from mounting surface.

b. Short Distance Movement. Use a forklift and lift unit at base, or place unit on a truck using suitable lifting equipment attached to the recessed handles at sides of unit.

Note. Use a spreader bar whenever unit is hoisted with a crane.

c. Long Distance Movement. Crate the air conditioner, providing adequate protection to grilles and control panel. Provide suitable blocking and tiedowns to prevent unit from shifting during transfer.

2-7. Reinstallation After Movement

Reinstall the air conditioners as instructed in paragraph 2-5.

Section III. CONTROLS AND INSTRUMENTS

2-8. General

This section describes, locates, illustrates, and furnishes the operator, crew or organizational maintenance personnel sufficient information about the various controls and instruments for proper operation of the air conditioner.

2-9. Controls and Instruments

a. General. The controls and instruments on the air conditioner are illustrated on figure 2-2.

b. High Pressure Cutout Control. The high pressure cutout located at the rear of the unit (fig. 2-2) is designed to sense discharge line pressure at the compressor and will cutout at 445 poig (pounds per square inch gage). When discharge line pressure has reduced to 400 psig, the high pressure cutout control can be reset by pushing the reset button.

c. Low Pressure Cutout Control. The low pressure cutout located at the rear of the unit (fig. 2-2) is designed to sense suction line pressure at the compressor and will cutout at 7 peig. When suction line pressure has increased above this limit, the low pressure cutout control can be reset by pushing the reset button.

d. Liquid Line Sight Glass. The sight glass (fig. 22) indicates dryness of the system. Moisture in the refrigerant is shown by the indicator turning from green to yellow. A shortage of refrigerant is indicated by bubbles in the sight glass.

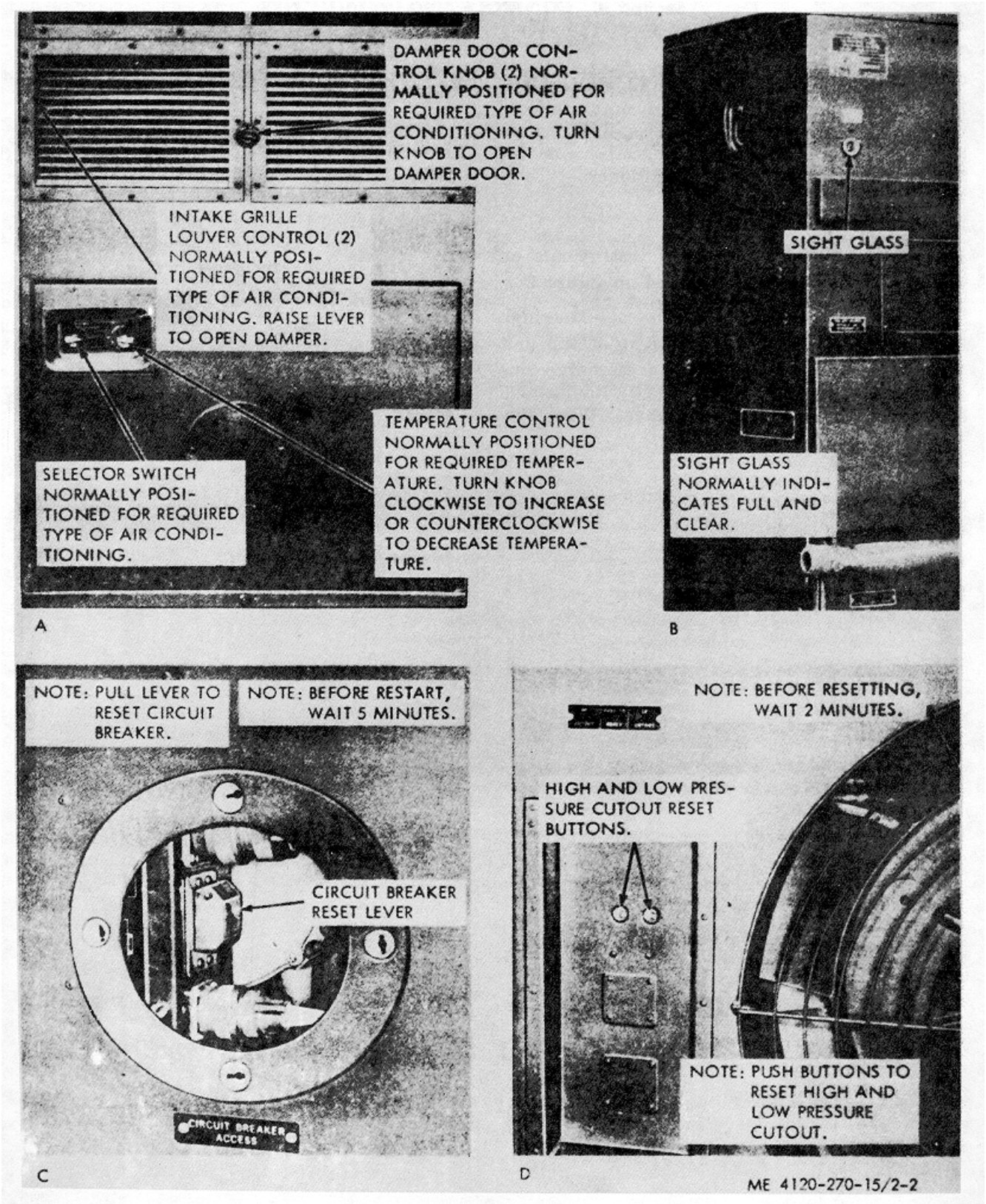


Figure 2-2. Controls and instruments.

Section IV. OPERATION OF EQUIPMENT

2-10. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting, stopping, and operating details of the air conditioner. Since nearly every application presents a different problem, the operator may have to vary given procedure to fit the individual job. Operating control settings are listed in table 2-1.

Table 2-1. Operating Control Settings

Type of air conditioning required	Thermostat setting	Indoor return air damper	Outdoor air damper	Selector switch position
Cooling — 100% Recirculated Air	Desired Temperature	Open	Closed	COOL
Cooling — With Fresh Makeup Air	Desired Temperature	Partially* Closed	Open	COOL
Cooling — With Fresh Makeup Air Drawn Through CBR Filter (Outdoor Air Contaminated)	Desired Temperature	Open	Closed	COOL
Heating — 100% Recirculated Air	Desired Temperature	Open	Closed	LO–HEAT or HI-HEAT
Heating — With Fresh Makeup Air	Desired Temperature	Partially* Closed	Open	LO-HEAT or HI-HEAT
Heating — With Fresh Makeup Air Drawn Through CBR Filter (Outdoor Air Contaminated)	Desired Temperature	Open	Closed	LO-HEAT or HI-HEAT
Ventilation — Maximum Outdoor Air	Any	Closed	Open	VENTILATE

2-11. Starting

a. Perform daily preventive maintenance services (pars 3-6).

b. Refer to figure 2-, and start the air conditioner.

c. If the air conditioner fails to start, remove cover on lower front panel and reset the circuit breaker.

Caution: Wait 5 minutes before restarting the unit after operation.

d. Refer to table 21, and adjust air conditioner for desired mode of operation.

2-12. Stopping

Refer to figure 2-4, and stop the air conditioner.

2-13. Air Conditioner Operation

Refer to figure 25, for instructions on operation of the air conditioner.

2-14. Operation In Extreme Cold

a. General. The air conditioner is designed to operate at a maximum low temperature of -650F, (Fahrenheit). Be sure that all thermostatic controls and dampers are in working order.

b. Electrical System. Make sure the electrical system is free of ice and moisture.

Caution: Do not disturb the wiring during cold weather unless absolutely necessary. Cold temperatures make wiring and insulation brittle and easily broken.

2-15. Operation In Extreme Heat

a. General. The air conditioner is designed to operate satisfactorily at temperatures up to 1256F.

b. Ventilation. Allow sufficient room around the air conditioner for adequate air circulation. Note. Do not restrict the flow of air at the intake and discharge openings of the unit.

2-16. Operation in Dusty or Sandy Areas

Clean the condenser coil and evaporator coil weekly or more often if necessary. Clean the mist eliminator, air conditioning filter, fresh air inlet screen and condenser screen daily.

2-17. Operation Under Rainy or Humid Conditions

If the unit is outside and not operating, close dampers and air inlet door; cover condenser air discharge with tarpaulin provided. Protect air conditioner with the canvas cover provided. Remove covers during dry periods. Open access panels and covers to allow unit to dry before operating. Use caution when operating electrical equipment in damp or wet areas to avoid shock hazard.

2-18. Operation in Salt Water Areas

Wash the exterior of the unit with clean, fresh water at frequent intervals. Do not damage the electrical equipment during the cleaning operation. Coat exposed metal surfaces with rust proofing material. Remove corrosion and paint the exposed metal surface.

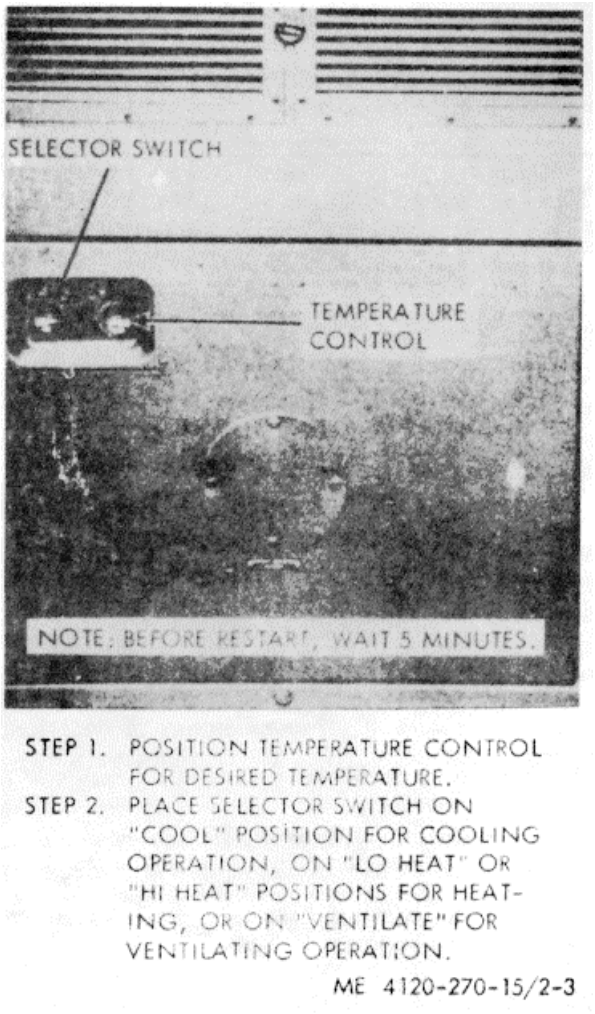
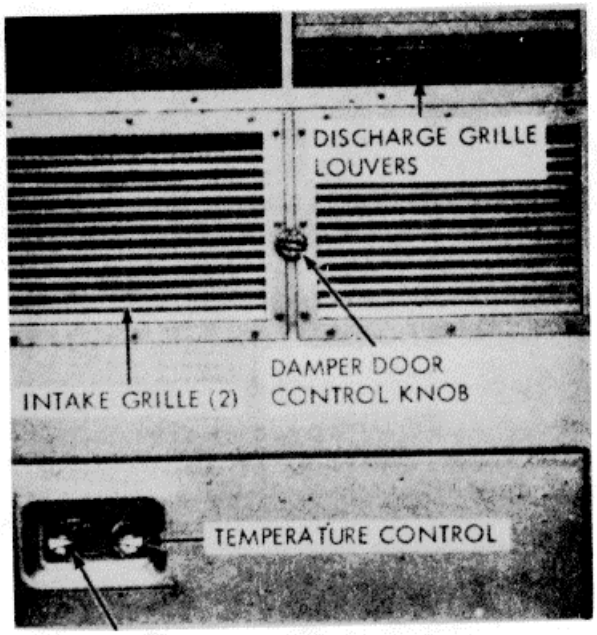


Figure 2-3. Starting instructions.

Figure 2-4. Stopping instructions



NOTE: BEFORE RESTART, WAIT 5 MINUTES.

A. COOLING OPERATION.

STEP 1. POSITION TEMPERATURE CONTROL FOR DESIRED TEMPERATURE.

STEP 2. ADJUST DISCHARGE GRILLE LOUVERS FOR DESIRED CONDITIONED AIR DELIVERY PATTERN.

STEP 3. ADJUST INTAKE GRILLES AND DAMPER DOOR AS INSTRUCTED IN TABLE 2-1.

STEP 4. PLACE SELECTOR SWITCH ON "COOL" POSITION.

B. HEATING OPERATION.

STEP 1. POSITION TEMPERATURE CONTROL FOR DESIRED TEMPERATURE.

STEP 2. ADJUST DISCHARGE GRILLE LOUVERS FOR DESIRED CONDITIONED AIR DELIVERY PATTERN.

STEP 3. ADJUST INTAKE GRILLES AND DAMPER DOOR AS INSTRUCTED IN TABLE 2-1.

STEP 4. PLACE SELECTOR SWITCH ON "LO HEAT" OR "HI HEAT" AS REQUIRED.

C. VENTILATING OPERATION:

STEP 1. ADJUST DISCHARGE GRILLE LOUVERS FOR DESIRED CONDITIONED AIR DELIVERY PATTERN.

STEP 2. ADJUST INTAKE GRILLES AND DAMPER DOOR AS INSTRUCTED IN TABLE 2-1.

STEP 3. PLACE SELECTOR SWITCH IN "VENTILATE" POSITION.

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Figure 2-5. Operating instructions.

CHAPTER 3
OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment
No special tools or equipment are required by the operator or organizational maintenance personnel for maintenance of the air conditioner.

3-2. Basic Issue Tools and Equipment
Tools and repair parts issued with or authorized for the air conditioner are listed in the Basic Issue Items List, Appendix B of this manual.

Section II. LUBRICATION

3-3. General Lubrication Information
The air conditioner fan motors and compressor are lubricated and sealed by the manufacturer. No additional lubrication is required.

3-4. Detailed Lubrication Information
Although the air conditioner requires no lubrication maintenance, operation of grilles and dampera will be assisted by periodically adding a few drops of light oil to all pivot points, bring surfaces and linkages. During cold weather operation clean off all accumulated oil and dirt and use graphite for lubrication of the points outlined above.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-5. General
To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-6 and 3-7. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation, which would damage the equipment if operation were continued. An deficiencies and shortcomings will be recorded together with corrective action taken, on DA Form 2404 (Equipment Inspection Maintenance Worksheet) at the earliest possible opportunity.

3-6. Daily Preventive Maintenance Services
This paragraph contains an illustrated tabulated listing of the preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-1 for daily preventive maintenance services.

3-7. Quarterly Preventive Maintenance Services
a. This paragraph contains an illustrated tabulated listing of the preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation whichever occurs first b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-2 for quarterly preventive maintenance services.

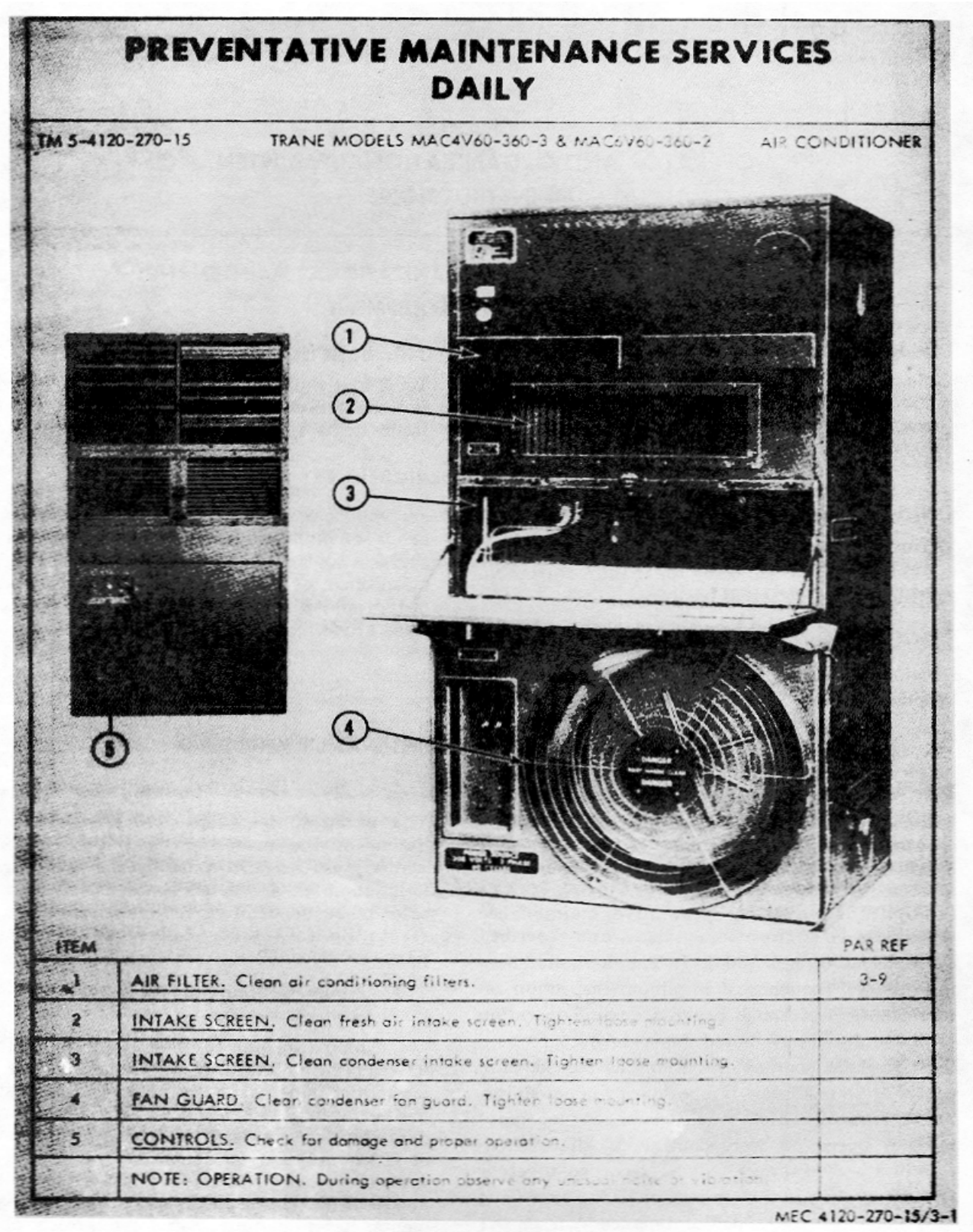
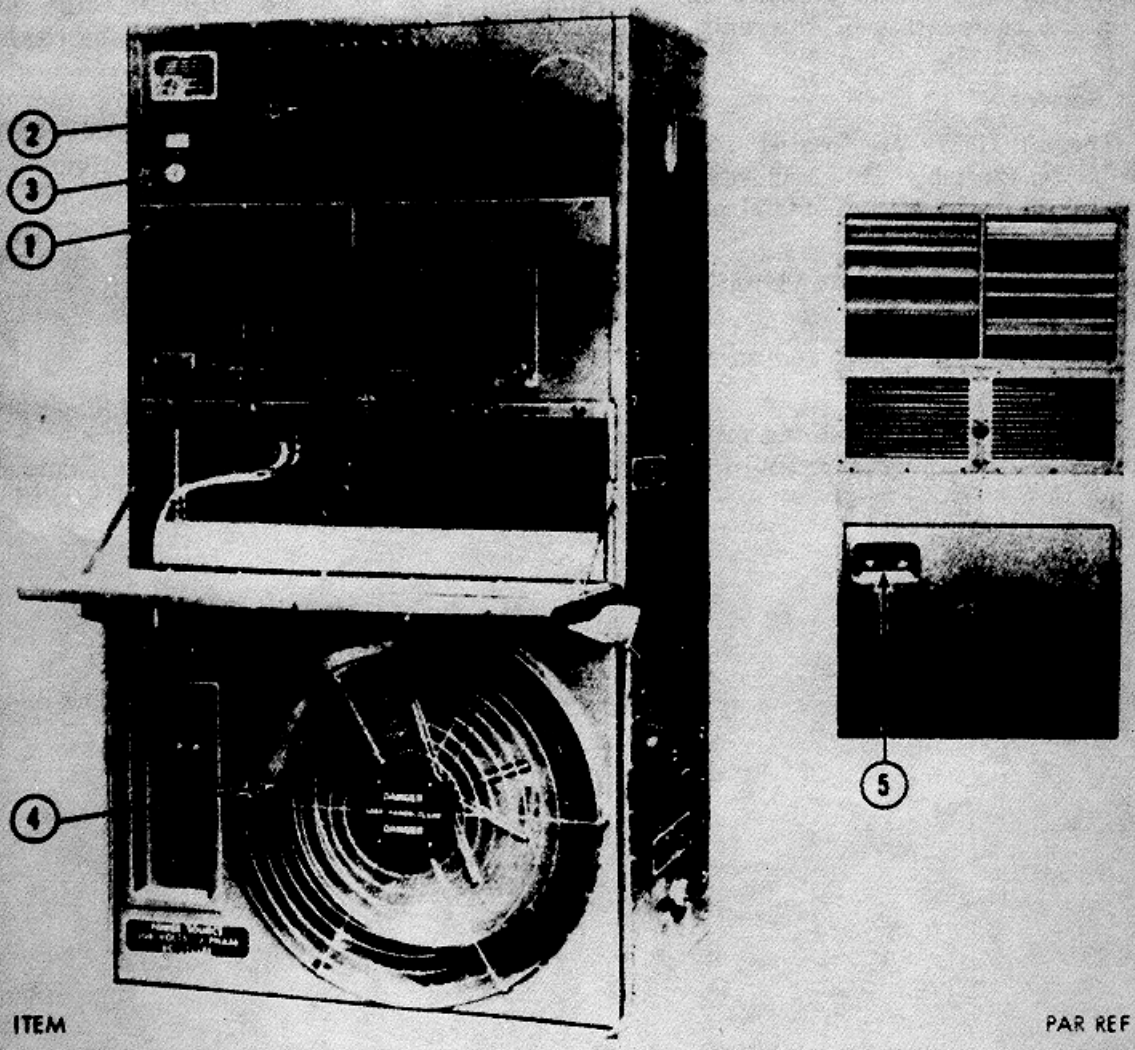


Figure 3-1. Daily preventive maintenance services

PREVENTATIVE MAINTENANCE SERVICES
QUARTERLY

TM 5-4120-270-15 TRANE MODELS MAC4V60-360-3 & MAC6V60-360-2 AIR CONDITIONER



ITEM		PAR REF
1	AIR FILTER. Clean air conditioning filters.	3-9
2	BLOWERS. Clean blowers. Tighten loose mounting. Replace damaged blowers.	3-28
3	SIGHT GLASS. Check for damage or broken glass. Check for full condition of unit and absence of moisture in system.	5-22
4	FAN. Clean fan. Tighten mounting. Replace damaged fan.	3-29
5	CONTROLS. Check for damage and proper operation.	
	NOTE: OPERATION. During operation observe any unusual noise or vibration.	

MEC 4120-270-15/3-2

Figure 3-2. Quarterly preventive maintenance 8ervsice.

Section IV. OPERATOR'S

3-8. General

The instructions in this section are published for the information and guidance of the operator to maintain the air conditioner. learning: Disconnect the air conditioner from the power source before performing any maintenance on the components of this unit.

3-9. Air Filter Service

a. General. The air filters are located under the evaporator blower assembly. They remove airborne particles of dust and other contaminants from the conditioned area.

b. Removal. Refer to figure 34 and remove filter access doors and filters.

c. Servicing. Refer to figure 34 and service both air filters.

d. Installation. Refer to figure 3-3 and install filters and access doors in reverse order of removal.

3-10. Mist Eliminator and Evaporator Coil Service

a. General. The mist eliminator, located between the air discharge grille and the evaporator coil, removes moisture from the air after the air has passed over the evaporator coil. The evaporator coil is to be cleaned each time the mist eliminator is serviced. The coil may be cleaned without removal from air conditioner.

b. Maintenance Procedure. Refer to paragraph 8-25 and remove the evaporator air discharge grille and top cover panel. Refer to figure 8-4 and perform prescribed maintenance service.

c. Installation. Refer to figure 34 and install the mist eliminator. Install evaporator discharge grille and top cover panel (para S25).

3-11. Condenser Coil

a. General. The condenser coil may be cleaned without removal from the air conditioner.

b. Maintenance Procedure. Refer to figure 3-5 and perform prescribed maintenance service.

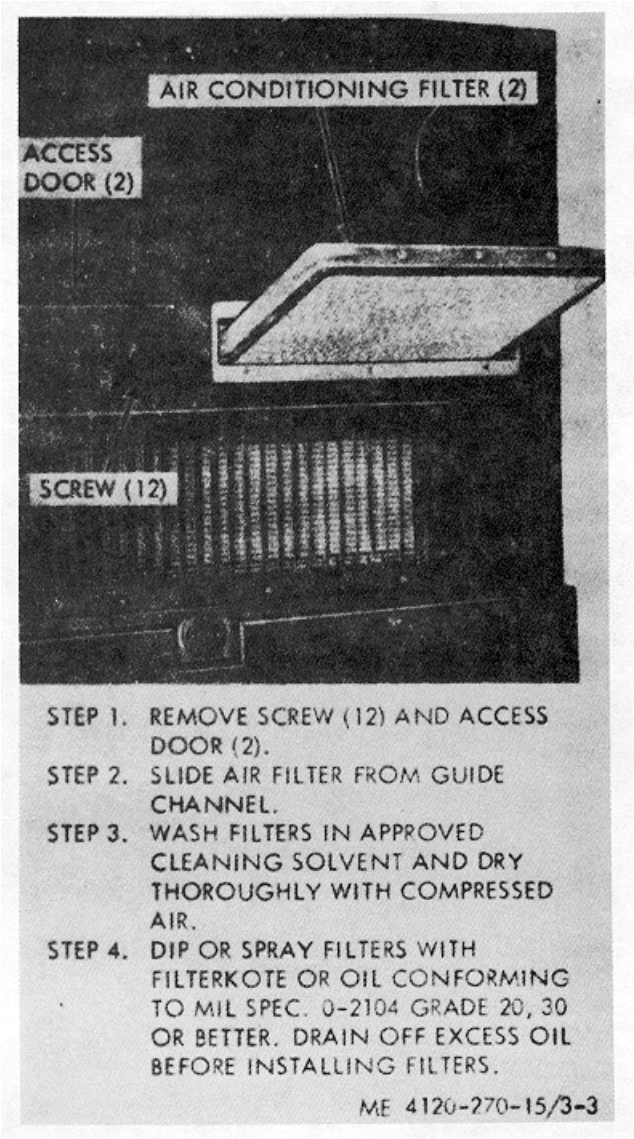


Figure 3-3. Servicing air conditioning filter.

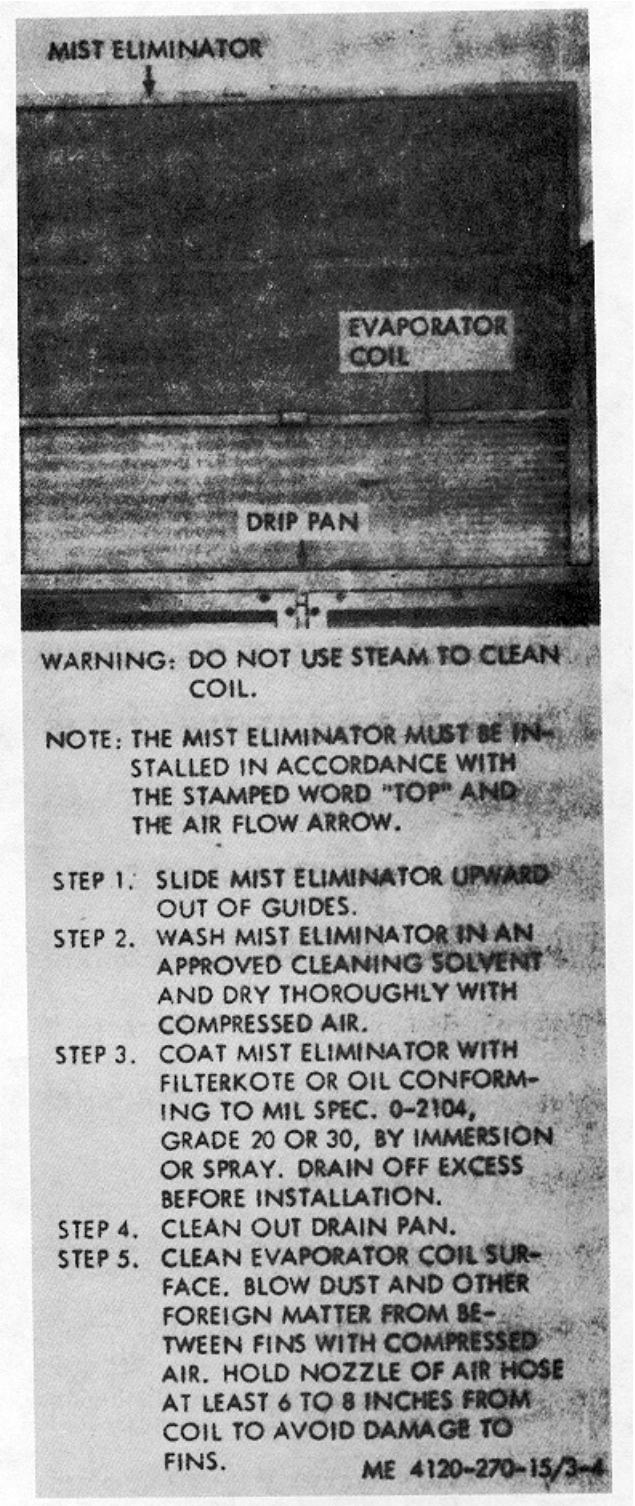


Figure 3-4. Servicing mist eliminator and evaporator coil

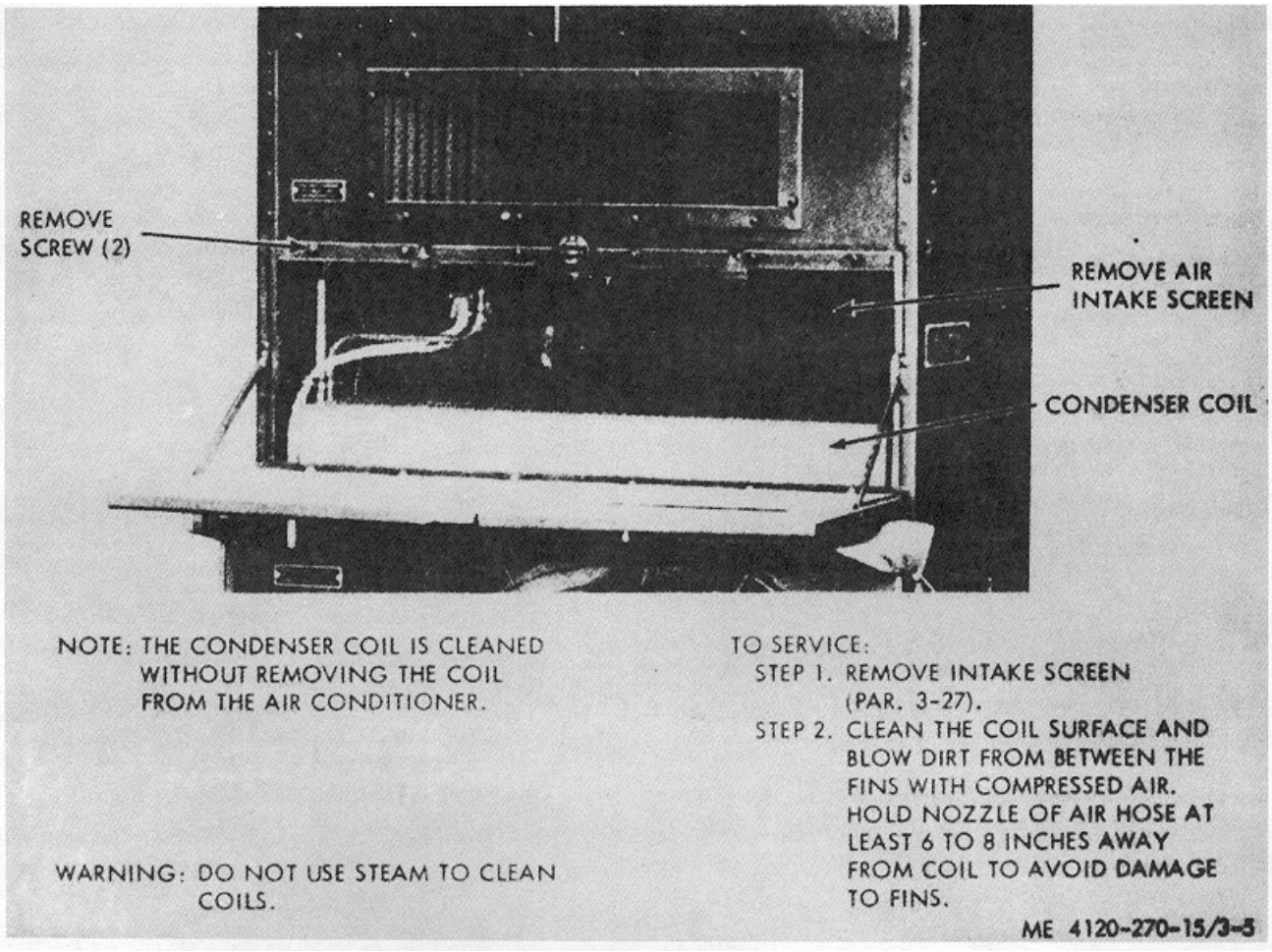


Figure 3-5. Servicing condenser coil.

Section V. TROUBLESHOOTING

3-12. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-13. Compressor Fails to Start

Probable cause	Possible remedy
Power line failure	Restore power.
Selector switch improperly set	Set selector switch to "COOL"
Circuit breaker tripped	Reset circuit breaker.
High or low pressure cutout switches tripped	Push reset button to close switch.
Open or defective fuses	Replace fuses (para 3-34).
Loose, broken or defective electrical leads	Tighten loose connection Repair leads as necessary.

3-14. Compressor Starts Normally, but Stops on Overload

Probable cause	Possible
Obstructed intake or exhaust air grilles	Clean out grilles and r move obstacles to air circulation
High head pressure	Clean condenser coil (para 3-11). Check condenser fan for damage or looseness. Replace if defective (para 3-29).
Defective condenser fan motor	Replace condenser fan motor (para 3-36).

3-15. Reduced Cooling Capacity

Probable cause	Possible remedy
Dirty or clogged air filters	Clean or replace air filters (para 3-9).

Probable cause	*Possible remedy*
.improperly adjusted (closed) evaporator return and discharge air grilles or fresh air and CBR air intakes	Adjust louvers and correctly (table 2-1).
Dirty or clogged condenser coil	Clean condenser coil (para 3-11).
Improperly set thermostat - (too high)	Set thermostat to desired ambient temperature.
Damaged or loose evaporator - fans	Check evaporator fans damage or looseness. Replace if defective. (para 3-28).
Defective fan motor	Replace evaporator fan motor (para 346).

3-16. No Heat in "Heat" Position

Probable cause	*Possible remedy*
Power line failure	Restore power.
Loose connections or defective wiring in heater or fan circuits	Tighten loose connections. Repair damaged wiring.
Inoperative evaporator fan motor	Replace evaporator fan motor (para 3-36).

3-17. Reduced Heating Capacity

Probable cause dampers	*Possible remedy*
Improperly adjusted dampers (closed) evaporator return and discharge air grilles or fresh air and CBR air intakes	Adjust louvers and correctly (table 21).
Dirty or clogged air filters	Clean or replace air filters (para 3-9).
Loose connections or defective leads in the heater - circuit	Tighten loose connection Repair leads necessary.

3-18. Inoperative Compressor Crankcase Heater

Probable cause	*Possible- remedy*
Air conditioning disconnected from power line	Stop unit by turning selector switch to "OFF", leave connected to power line.

Section VI. RADIO INTERFERENCE SUPPRESSION

3-19. Definitions

a. *Interference.* The term interference as used herein applies to electrical disturbances in the radio frequency range which are generated by the air conditioner and which may interfere with the proper operation of radio receivers or other electronic equipment, or enable the enemy to locate the equipment.

b. *Interference suppression*. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the air container.

3-20. General Methods Used to Attain Proper Suppression

a. Essentially, suppression is attained by providing a low resistance path to ground for stray currents. Methods used include shielding the ignition and high frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

b. In the air conditioner, filters are used to ground RFI-producing stray currents in the electrical system. All magnetic contractors and switches are effectively shielded in metal boxes which are bonded to each other and to the frame with grounding straps. The air conditioner frame is grounded through the junction box to the power line ground wire.

3-21. Interference Suppression Components

a. *Primary Suppression Components*. The primary suppression components are those whose primary function is to suppress radio frequency interference. These components are described and located in figure 3-6.

b. *Secondary Suppression Components*. These components have radio frequency interference suppression functions which are incidental and/ or secondary to their primary function and am located in figure 3-6.

3-22. Replacement of Suppression Components

Refer to figure 3-7 and replace radio frequency interference suppression components.

3-23. Testing of Radio Interference Suppression Components

Test the filters using a continuity tester; replace defective filters. If the test equipment is not available and interference is indicated, isolate cause by the trial-and-error method of replacing each filter in turn until the cause of interference is located and eliminated.

Figure 3-6. Interference . suppression components

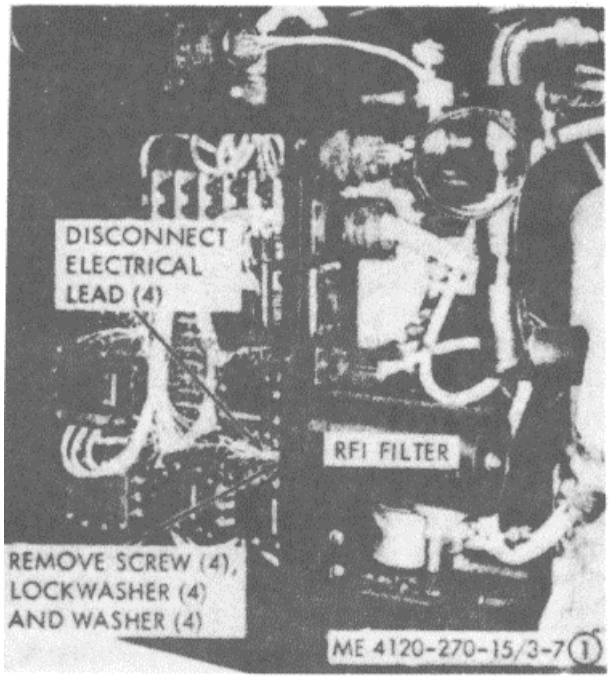
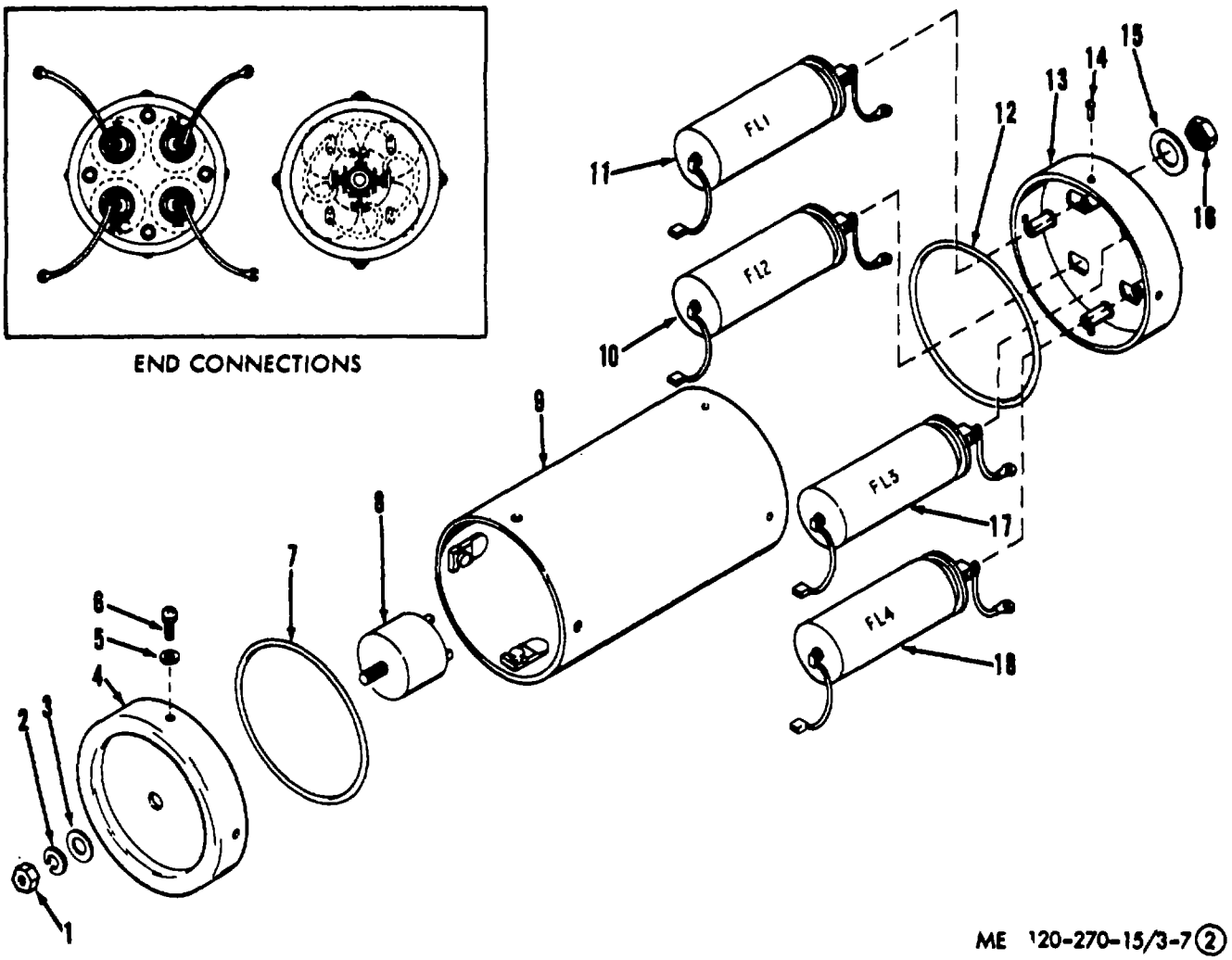


Figure 3-7 (1). Interference suppression components removal and replacement.



Key to fig. 3-7 (2):
1 Nut, hex, 1/4-20
2 Washer, lock, 1/4 in.
3 Washer, flat, 1/4 in.
4 End cap, top
5 Washer, flat, 3/8 in.
6 Screw, slotted head, No. 6-32 x 3/8
7 Gasket, RFI
8 Rectifier
9 Tube
10 FRI filter assy.
11 RFI filter assy.
12 Gasket, RFI
13 End cap, bottom
14 Rivet, blind
15 Washer, flat, 7/16 in.
16 Nut, hex, 7/16 20NF-2A
17 RFI filter assy.
18 RFI filter assy.

Figure 3-7 (2). Interference suppression components, exploded view.

Section VII. GRILLS, COVERS, SCRTEES, INLET O001, FAN GUARD, LOWER FRONT PANEL, FRESH AIR AMPER OOR CONTROL, IDENTICAION PLATES AND BASE DRAIN

3-24. General

The air conditioner is constructed with removable aluminum panels. The front access panel provides access to the control panel, junction box, compressor and associated components. A discharge grille protects the evaporator coil and controls the discharge of conditioned air. The intake grille protect the air filters and regulates the amount of air returned to the unit. The condenser coil inlet door, grille and screen protect the condenser coil. A fan guard protects the condenser fan. A fresh air inlet screen permits the entry of outside air; amount is regulated by a damper operated by a knob and linkage. An intake cover provides for attachment of a CBR filter unit.

Warning: Disconnect air conditioner from power source before performing any maintenance on the components of the unit.

3-25. Cover Panel, Discharge Grille, Intake Grilles, and Front Access Panel

a. Removal. Refer to figure 3-8, and remove the cover panel, discharge grille, intake grilles and front access panel.

b. Installation. Install the cover panel, discharge grille, intake grilles and front access panel in reverse order of removal as illustrated in figure 88.

3-26. Air Conditioning Filters

a. Removal. Refer to figure 3-9 and remove the air conditioning filters.

b. Installation. Clean or replace air filters. Refer to figure 3-9 and install the air conditioning filters in reverse order of removal.

3-27. Fresh Air Inlet Screen, CBR Cover, Fan Guard, and Condenser Coil Inlet Door and Screen

a. Removal. Refer to figure 3-10, and remove the fresh air inlet screen, CBR cover, fan guard, and condenser coil inlet door and screen.

b. Installation. Install the fresh air inlet screen, CBR cover, fan guard, and condenser coil inlet door and screen in reverse order of removal as illustrated in figure 3-10.

3-28. Evaporator Fans and Inlet Rings

a. General. The MAC4V60-360-3 and MAC6V60-86--2 air conditioners are provided with centrifugal air foil evaporation fans to reduce excessive vibration and noise.

b. Removal. Refer to figure 3-11 and remove the inlet rings and evaporator fans.

c. Installation. Install the inlet rings and evaporator fans in reverse order of removal as illustrated on figure 3-11.

3-29. Condenser Fan

a. General. The axial flow condenser fan and baffle, figure 3-12, reduce excessive vibration and noise.

b. Removal. Refer to figure 3-12, and remove the condenser fan.

c. Installation. Install the condenser fan in reverse order of removal as illustrated on figure 3-12.

3-30. Fresh Air Damper Door Control

a. The damper door control consists of a worm gear and linkage arrangement by which the damper door can be placed in any. between full open and closed.

b. Removal.

(1) Loosen setscrews and remove screw from center of adjusting knobs. Remove knobs (fig.3-13).

(2) Remove evaporator air intake grilles (para 3-25).

(3) Remove short linkage rod and gear lever assembly from housing. Remove long linkage rod and worm assembly.

(4) Remove worm and gear if -required for replacement.

c. Installation. Install replacement parts by reversing order of disassembly (fig.3-13). Check damper control OPEN and CLOSED positions. Adjust length of short linkage rod (15, fig.3- 13) between ball joints as required for proper operation.

3-31. Identification Plates

a. General. Identification plates provide information for operation of the air conditioner.(fig.1-4).

b. Removal. Carefully file rivets attaching identification plates to casing and remove plates.

c. Installation. Set new rivets to attach new plate securely. Use care to avoid damaging external panels.

3-32. Base Drain

a. General. Moisture condensate from the evaporator is collected in the drain pan and conveyed to a sump in the air conditioner base by means of tubing. The sump drains through attached drain hose.

b. Removal. Remove lower front access panel (para 3-25). Flush out base sump with clear water and inspect and clean drain hose as required.

c. Installation. Install lower front access panel and assemble drain hose by reversing order of removal.

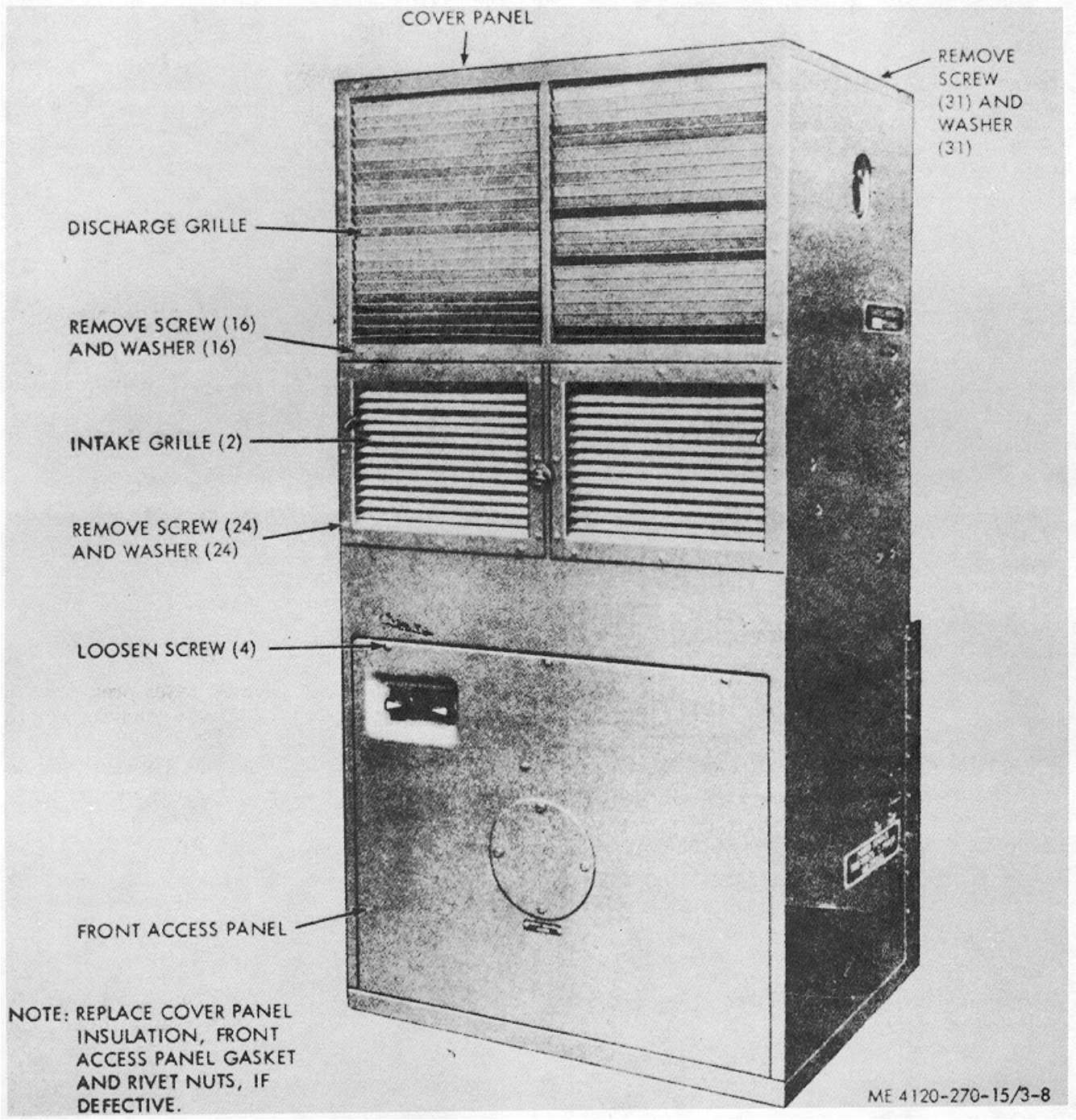


Figure 3-8. Cover panel, discharge grille, intake grille and front access panel, removal and installation

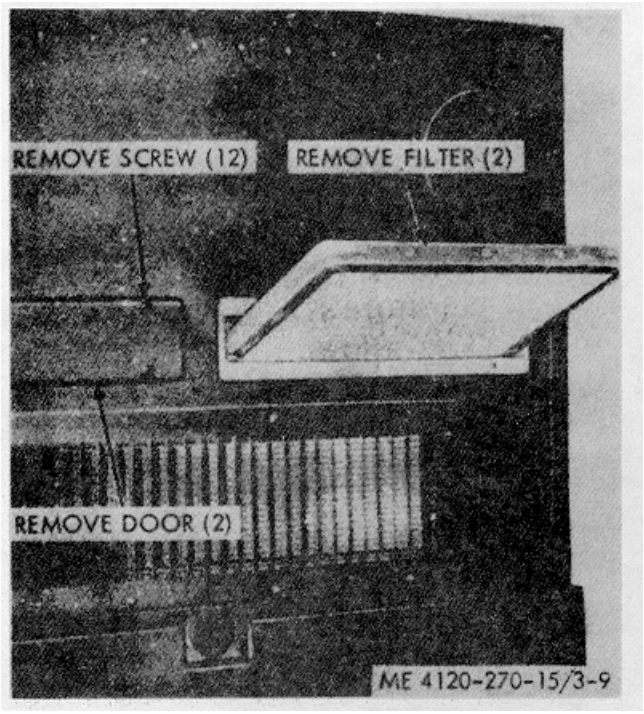


Figure 3-9. Air conditioning filter, removal and installation.

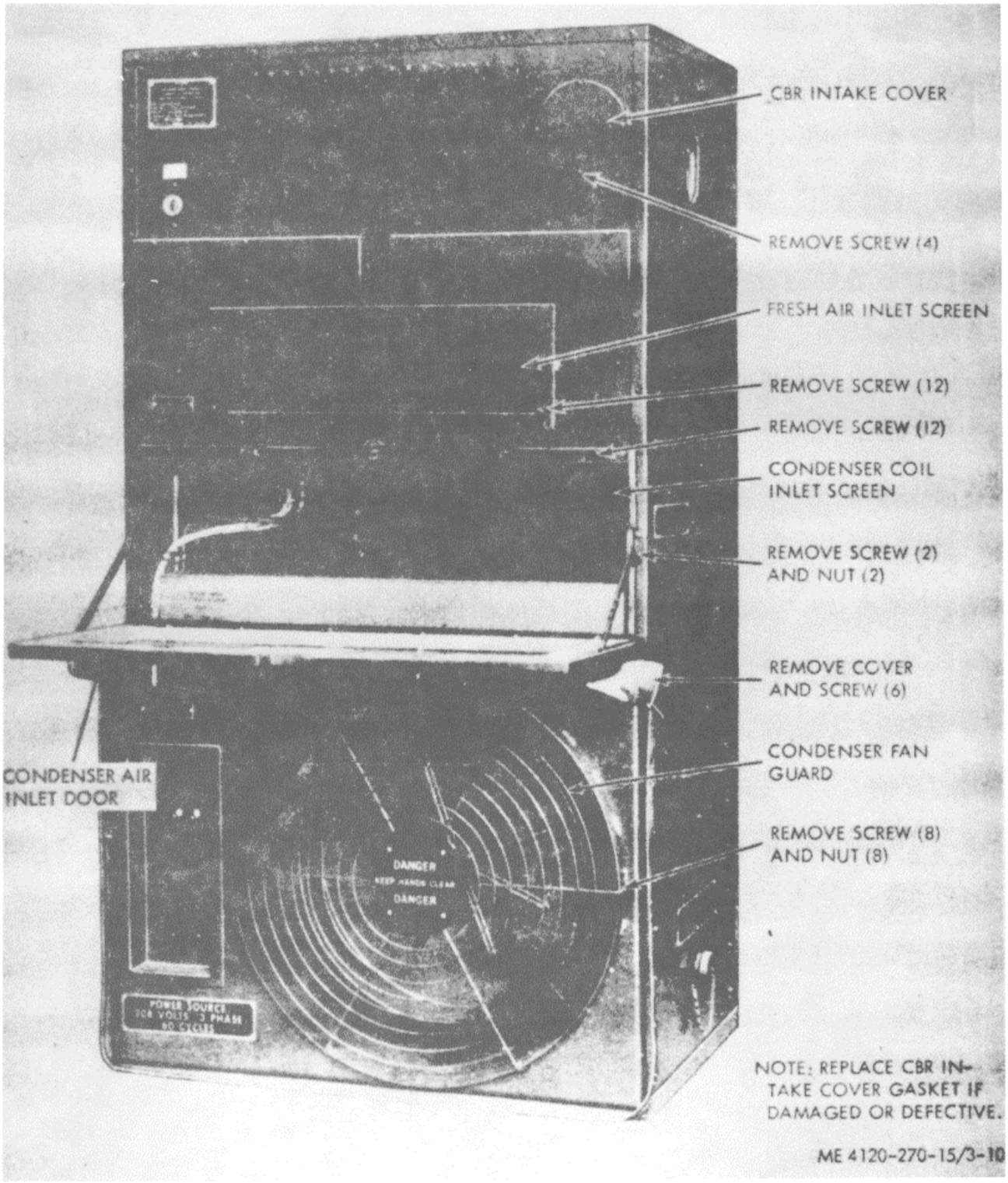


Figure 3-10. Fresh air inlet screen, CBR cover, fan guard, and condenser coil inlet door and screen, removal and installation.

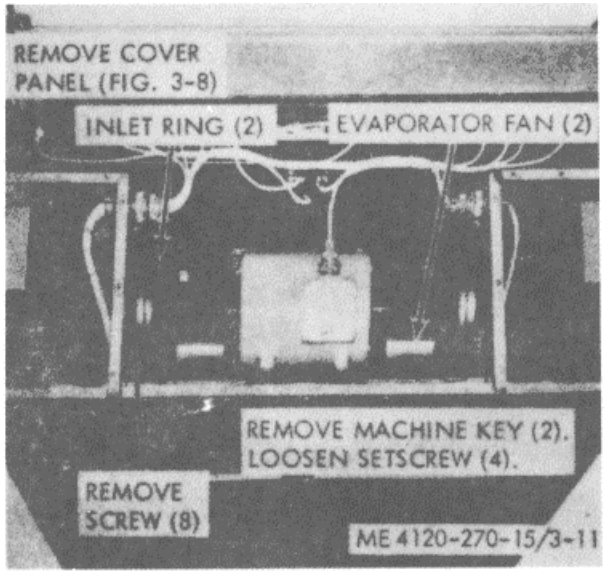


Figure 3-11. Evaporator fans and inlet ring, removal and installation.

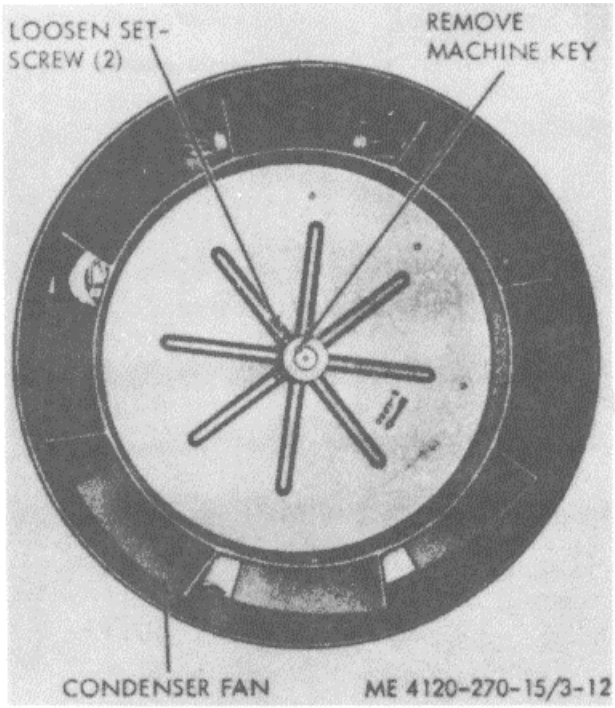
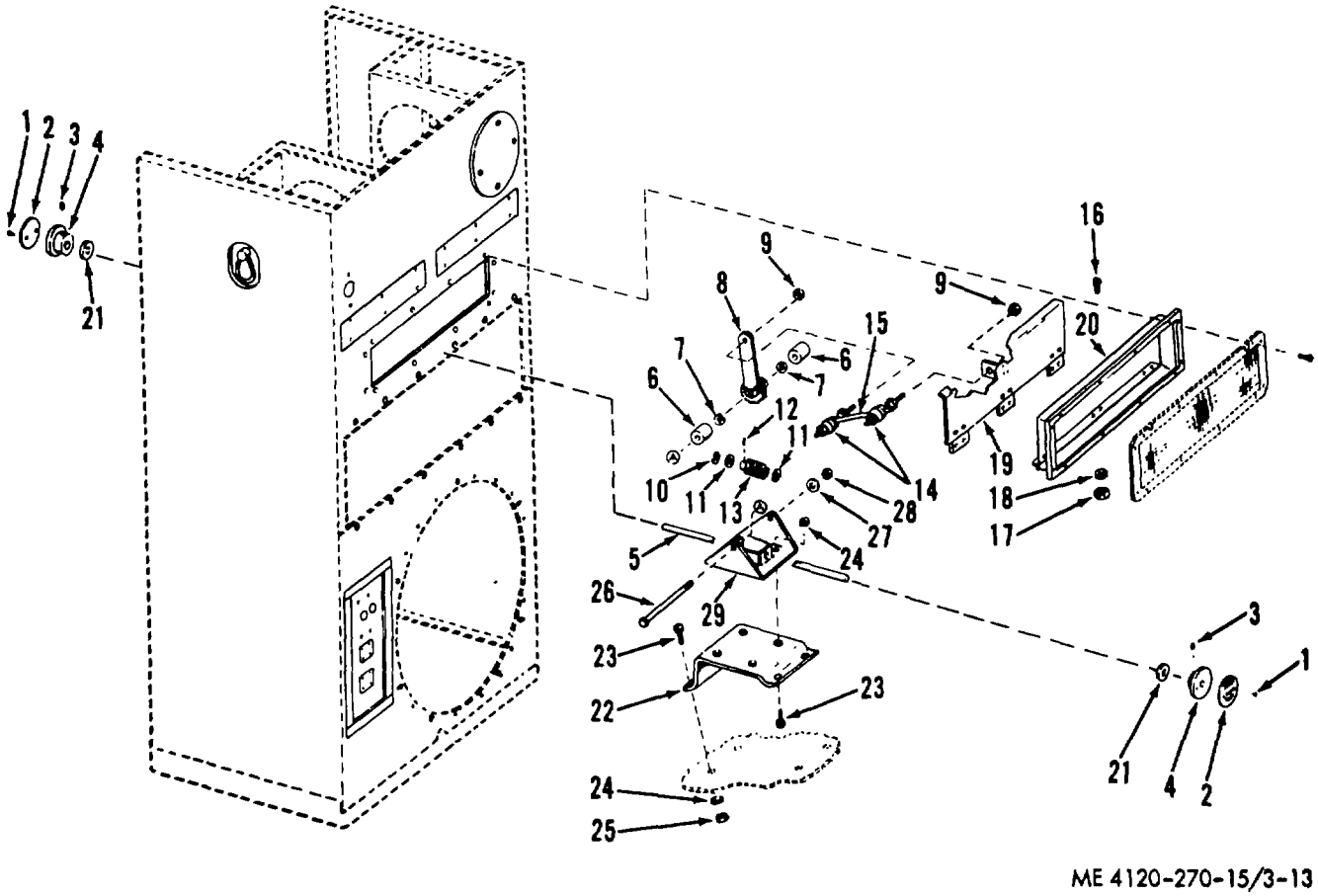


Figure 3-12. Condenser fan, removal and installation



Key to fig. 3-18:

1	Screw, drive	9	Nut, self-locking, #1032	17	Nut, self-locking, #8-32	26	Screw, hex hd, 1/428 x 8 in.
2	Plate, instruction	10	Washer, spring, 5/8 in.	18	Washer, flat	27	Washer, flat, 1/4 in
8	Screw, set, hex skt, #10-32 x 3/8 in.	11	Washer, flat	19	Damper assembly	28	Nut, self-locking, 1/4-28
4	Knob	12	Pin, locking	20	Box assembly	29	Bracket, support
5	Rod, linkage, long	13	Worm gear	21	Grommet		
6	Spacer, 6/8 in.	14	Joint, ball	22	Bracket, support		
7	Washer, spring, 5/8 in.	15	Rod, linkage, short	23	Screw, machine, #10432 x 8/4 in.		
8	Worm gear assembly	16	Screw, rd hd, # 8-32 x 5/8	24	Washer, flat, #10		
				25	Nut, self-locking, #10-32		

Figure 3-13. Damper door control, exploded view.

Section VIII. ELECTRICAL SYSTEM AND FAN BLOWER MOTORS

3-33. General

The electrical system (fig. 1-6) consists of the compressor, fan motors, contactors, solenoid valves, selector switch, temperature control thermostat fuses, circuit breaker, heaters, heater high temperature cutout, high and low pressure cutouts, transformer, RFI filters, time delay re- lay and all internal wiring. An internal compressor overload protector and a manual reset circuit breaker prevent the compressor from being damaged by electrical overload. The compressor heater thermostat cuts off the power of the compressor heater when the compressor reaches safe operating temperature and also activates the heater when required. Both evaporator fans are driven by the blower motor which has integral overload protection. The evaporator heater cutout prevents overheating when the unit is operating on the heating cycle.

3-34. Fuse Replacement

a. General. The air conditioner is provided with three cartridge-type fuses located in the upper corner of the junction box.

b. Maintenance Procedure. Refer to figure 3-14 and perform fuse replacement as required.

3-35. Electrical leads

When removing or replacing components of the air conditioner, always inspect condition of all wires and cables. Repair or replace any defective wiring (wiring diagram, fig. 1-6)

3-36. Evaporator Blower and Condenser Fan Motors

a. On-Equipment Testing. Test the motors for resistance with a multimeter set on the low ohm scale. Touch the leads of the multimeter to the pins in the receptacle connector on the motor. On Model MAC4V60-8604, the multimeter should indicate an approximate value of 2.25 ohms. On Model MAC6V60860-2, the reading should be approximately 4.7 ohms. Set multimeter on the highest ohm scale. Connect one lead of the multimeter to the motor frame and touch the other lead to any of the three pins. Continuity should not exist.

b. Removal. Refer to figures 8-15 and S-16,

a. Installation. Install the motors in reverse order of removal as illustrated on figure 3-15 and 3-16.

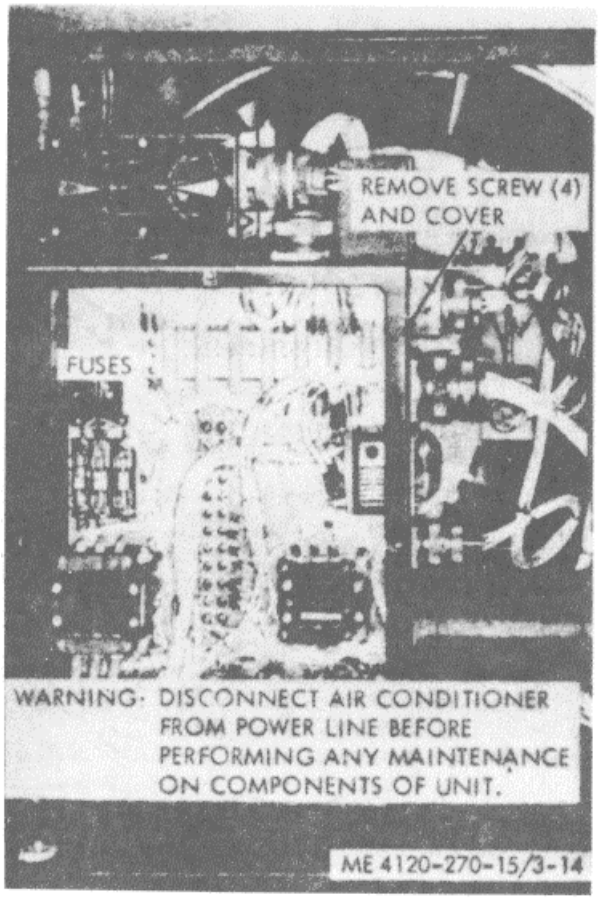


Figure 3-14. Fuse replacement.

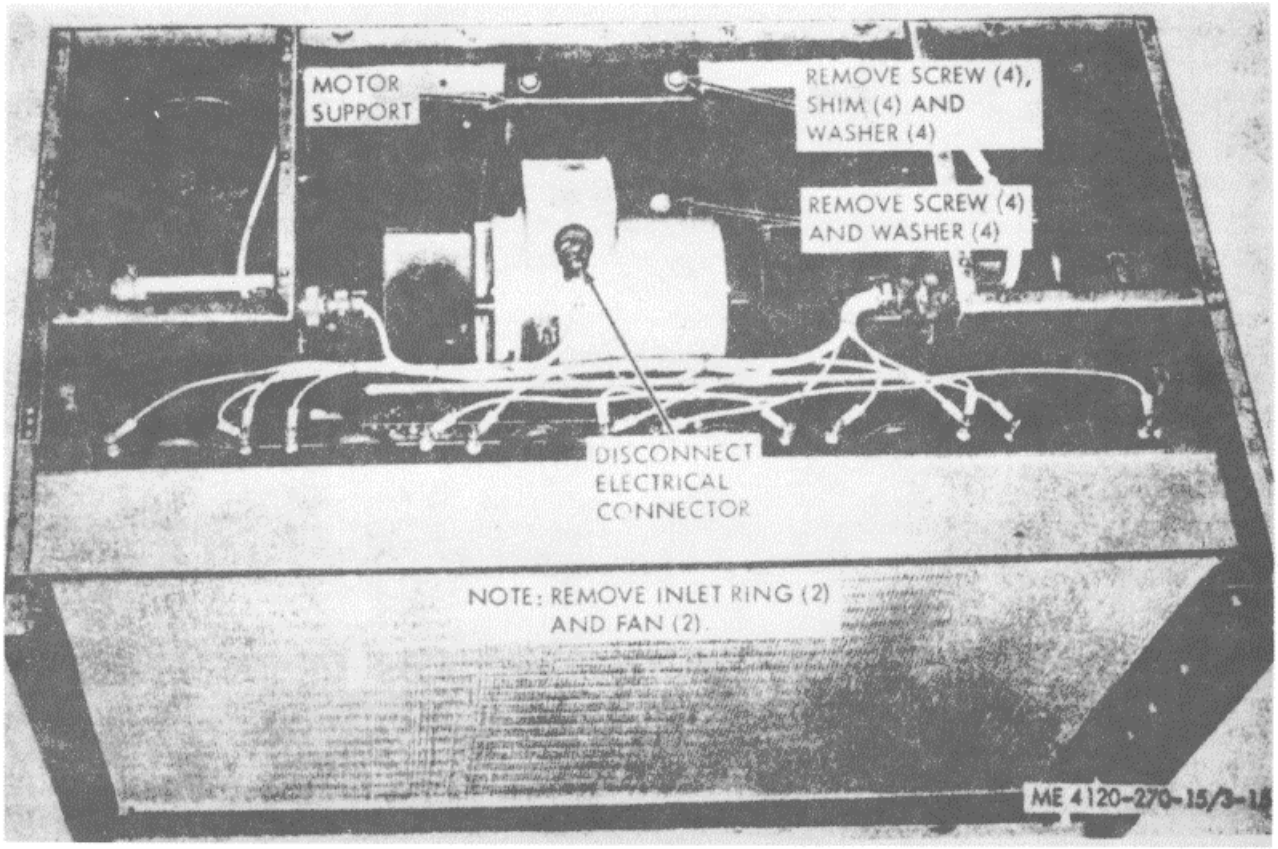


Figure 3-15. Evaporator fan motor, removal and installation

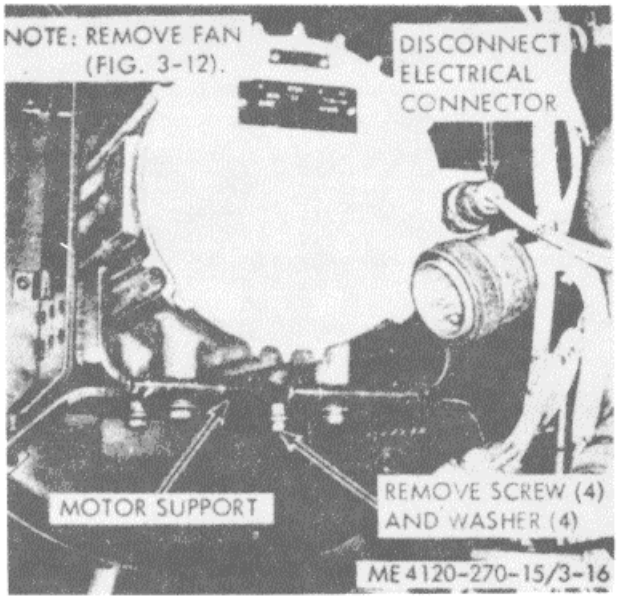


Figure 3-16. Condenser fan motor, removal and installation.

CHAPTER 4
DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope
These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Trane Model MAC4V60-360-3 and MAC6V60-360-2 Air Conditioners. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

4-2. Record and Report Forms
For record and report forms applicable to direct and general support and depot maintenance, refer to TM 8-750.

Section II. DESCRIPTION AND TABULATED DATA

4-3. Description
A general description of the air conditioner, the location and description of the identification and instruction plates, and information on the differences in models are contained in Chapter 1, Section II, of this manual. Direct and general sup- port and depot maintenance and repair instructions are described in subsequent sections of this manual.

4-4. Tabulated Data
a. General. This paragraph contains all the overhaul data pertinent to direct and general support and depot maintenance personnel. Refer to figure 1-6 for wiring diagrams.

b. Air Conditioner Classification and Rating.

Model MAC4V60-360 MAC6V60-60-2
Cooling capacity ..... 60,000 BTU/H .. 60,000 BTU/H
Heating capacity:
Hi-heat_------__62,000 BTU/H-__.9,000 BTU/H
Lo-heat_____96,000 BTU/H___.24,500 BTU/H
Ventilating
capacity-------2,0000 CFM
Model --------_MAC4V60-360_ MAC6V60-360-2
Operating
Voltage---.--208V AC_ .208V AC
Phase ----- _ .------ _3
Frequency--___-400 cycle -------60 cycles
Current input,

FL:		
Cooling	72 amperes	55 amperes
Hi-heat	61 ampere	68 ampere
Lo-heat	34 amperes	31 amperes
Ventilating....	6.5 amperes----	4.1 amperes

Power input:

Cooling ...	19.4 KW.	.....15.5 KW
Hi-heat....	16.7 KW	.....1.0 KW
Ventilating	2.9 KW	.....1.2 KW

Note Locked rotor (LR) current input is approximately 3 times full load (FL) current input

c Compressor Classification and Rating.

Type ..... Reciprocating piston,
..... hermetically sealed.
Number of cylinders 3
Borge..... 2 inches
Stroke..... 31/32 inches
Displacement ..... 9.00 cubic inches (Approx.)
Lubrication..... Forced feed
Crankcase capacity..... 6 pints
Crankcase heater..... 120 watts
Motor rating ..... 6 HP
Motor protection ..... External circuit breaker
..... and internal automatic
..... reset thermal overload
..... cutout.

d Condenser Fan Motor Classification and Rating.

Type ..... Induction, squirrel cage
..... rotor single shaft
Duty..... Continuous
Drive..... Direct
Protection..... Automatic reset internal
..... thermal overload and
..... over current.

MAC4V606MA C6V66SO-0

Rating.....	5.0 HP.....	4.0 HP
Voltage.....	208V AC	208V AC
Phase.....	3.....	3
Frequency	400 cycle.....	60 cycles
Speed.....	1900 rpm	1726 rpm

e. Evaporator Fan Motor Classification and Rating.

Type	Induction, squirrel cage rotor, double extended shaft
Duty	Continuous
Drive	Direct
Protection	Automatic reset internal thermal overload and overcurrent

	MAC4V6--604	*MAC6V6O-360-2*
Rating	1.60 HP	1.25 HP
Voltage	208V AC	208V AC
Phase	3	3
Frequency	400 cycles	60 cycles
Speed	3600 rpm	3450 rpm

f. Electric Heaters Classification and Rating.

Type	Folded, stainless steel-sheathed tubular elements.
Rating (at 120 volts)	2100 watts each
Duty	Continuos
Protection	Automatic reset external overload and overcurrent.

g. Temperature Control Thermostat Classification and Rating.

Type	Single pole, double-throw, normally closed bimetallic element.
Range	+40*F to +90°F
Closing differential	2°±1°F

h. *Selector Switch Classification and Rating.*

Type	Rotary, five positive dent positions.
Rating	15 amperes at 208V AC

i. Heater High Temperature Cutout Classification and Rating.

Type	-Automatic reset thermal overload and overcurrent, normally closed.
Range	Closed 140° t 9°F; open 1900 * 9°F
Rating	180 amperes at 208V AC

j. Magnetic Contactor Classification and Rating.

Type	Three-pole, single-throw, normally open, class AS.
Duty	Continuous
Control coil	28V DC
Rating:	
(1)	0 amperes at 208V AC (2 per unit)
(2)	26 amperes at 208V AC (3 per unit)

k. Time Delay Relay Classification and Rating.

Type	Single-pole, single-throw, normally open, thermal delay, hermetically sealed.
Delay	30 seconds
Rating	8 amperes at 28V DC

l. Circuit Breaker Classification and Rating.

Type	Manual reset double-pole, double-throw with single-pole, single-throw auxiliary.
Trip time, main breaker:	
Locked rotor	1.5 6.0 second
Rated overload	30 minutes maximum
Rating, main breaker	MA Cs V60460 MAC6V-460. 4
Must hold	49.0 ampere 44.2 amperes
Must trip	61.2 amperes .....50.8 ampere
Rating, auxiliary	2.5 amperes at 250V_AC

m. Transformer Classification and Rating.

Type	Stepdown, single phase
Input voltage	208V AC
Output voltage	30V AC
Output current	2.2 amperes continuos; 7.7 amperes surge.

n. Rectifier Classification and Rating.

Type	Silicon rectifier full-wave bridge, stud mount am
Input voltage	SOV AC
Output voltage	24V AC
Output current	3.0 ampere maximum

o. RFI Filter Classification and Rating.

Type	Feed through
Rating	.5 amperes at 2SOV AC

p. Expansion Valve Classification and Rating

Type	Compensated thermal expansion remote bulb
Superheat	----------_--_.100 + 1/2"F
Rating	4 1/2 ton (1 par unit) and 2.1 ton (1 per unit)

q. High Pressure Cutout Classification and Rating.

Type	Manual reset normally closed pressure operated single-pole, single-throw.
Trip pressure	445 °F 10 pig (pounds per square inch gag.).
Reset pressure	400 psig

r. Low Pressure Classification and Rating.

Type	Manual reset, normally closed pressure operated single-pole, single-throw.
Trip pressure	7 ± 5 psig
Reset pressure	12 ± 5 psig

s. Solenoid Valve Classification and Rating.

Type	Normally open, pilot oper ated with integral at and resilient disc
Coil voltage:	
Pull-in	20.4V DC
Release	18.0V DC
Coil current	0.51 amperes (holding).

t. Back Pressure Regulating Valve Classification and Rating.

Type	Pressure operated, normally closed
Operating range	-__ --------90 psig
Opening pressure	psig preset, adjustable

u. Pressure Relief Valve Clarification and Rating.

Type	Spring loaded, normally closed, non-adjustable
Release pressure	40 pig.

CHAPTER 5
GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5-1. Special Tools and Equipment
No special tools or equipment are required to perform direct and general support and depot maintenance on the air conditioner.

5-2. Specially Designed Tools and Equipment
No specially designed tools and equipment are required to perform direct and general support and depot maintenance on the air conditioner.

Section II. TROUBLESHOOTING

5-3. General
This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

5-4. Compressor Fails to Start

Probable cause	Probable remedy
Defective selector switch	Test selector switch (para 6-2). Replace if defective.
Defective circuit breaker	Test circuit breaker (para 6-4). Replace if defective.
Defective compressor motor contactor	Test contactor (para 6-6). Replace if defective.
Defective time delay relay	Test time delay relay (pars 6-6). Replace if defective.
Defective compressor motor protective relay	Test relay (para 6-6). Replace compressor if relay is defective (para 5-24).
Open or shorted control circuits	Perform continuity tests (para 612). Repair or replace defective component
Defective compressor motor	Test compressor or motor (para 626). Replace compressor if motor is defective (para 5-24).
Compressor damaged	Replace compressor (para internally 5-24).
Defective control circuit transformer	Test transformer (pars 6 7).Replace if defective
Defective control circuit Rectifier	Test rectifier (para 6-8). Replace if defective.
Defective RFI filters	Test filters (para 68). Replace if defective.
Shorted control coil in hot gas bypass solenoid valve	Test control coil (para 6 18). Repair or replace if defective.

5-5. Compressor Starts Normally, but Stops on Overload

Probable cause	Probable remedy
Incorrectly set or defective thermal expansion valves	Set thermal expansion valves to correct superheat (para 6-17). Replace thermal expansion valves if correct adjustment cannot be obtained or if valves fail to modulate refrigerant flow correctly.
Defective liquid line or hot gas line solenoid valves	Test control coils (para 6 18). Check valves for positive opening and closing. Replace solenoid valves if defective.
Bent or kinked refrigerant tubing	Visually inspect all tubing for damage. Replace damaged sections (para 6-16).
Overcharge of refrigerant_	Carefully open pressure line access valve with air conditioner operating and bleed excess refrigerant (para 6-28).

5-6. Reduced Cooling Capacity

Probable cause	Probable remedy
Dirty, clogged or damaged evaporator coil	Clean evaporator coil (pars 623). Repair or replace if damaged.
Evaporator coil frosting	Adjust back pressure regulating valve to specification (pars 6-20). Replace valve if correct adjustment cannot be obtained.
Insufficient refrigerant in system	Test, evacuate and recharge system (para 6-28, 29, 30).
Defective temperature control thermostat	Test thermostat (para 6-3). Replace if defective

Incorrectly set or defective thermal expansion valves	Set valves to correct superheat (para 6-17). Replace valves if correct adjustment cannot be obtained or if valves fail to modulate refrigerant flow correctly.
Defective solenoid valves	Test control coils (par* 6-18). Check valves for positive opening and closing. Replace defective valve
Defective evaporator fan motor	Test motor (para 69). Repair or replace if defective

5-7. System Malfunction or Combination of Malfunctions

Abnormal system operating pressures	Perform operating pressure teat (para 6-14).
LOW SUCTION PRESSURE	
Conditioned area temperature excessively low	Raise thermostat temperature sting.
Restricted air flow over evaporator	Clean mist eliminator and evaporator coil (para 8-10), air filters (para 8-26) and grilles and screens
Incorrectly set or defective expansion valve	Set valves to correct superheat (para --17). Replace if defective
Insufficient refrigerant	Test, evacuate and recharge system (pan 6-28, 29, 80).
Restricted suction line	Replace damaged sections (par 6B-16).
Incorrectly set or defetive suction pressure regulating valve	Set valve to correct super (pan 6-20). Replace if defective
Defective compressor	Replace compressor (para -24).
HIGH SUCTION PRESSURE	
Conditioned area temperature excessively high	Normal operation; self correcting as temperature drops
Incorrectly set or defective expansion valves	Set valves to correct superheat (par 6-17). Replace if defective
Defective hot gas bypass solenoid valve	Test valve (para 6-18). Re place if defective.
Defective compressor	Replace compressor (par 5-24).
LOW DISCHARGE PRESSURE	
Insufficient refrigerant	Test, evacuate and recharge system (para 6-28, 29, 30).
Defective compressor	Replace compressor (para 5-24).

Probable cause	**Possible remedy**
HIGH DISCHARGE PRESSURE	
Restricted air flow over condenser	Clean condenser coil (para 8-11) grille and screens
Incorrectly set or defective expansion valve	Set valves to correct super heat (para 6-17). Replace if defective.
Defective solenoid valve	Test valves (para 6-18). Replace if defective
Restricted discharge line	Replace damaged (para 6-16).
Excessive refrigerant	Bleed excess refrigerant (par 6-28).

5-8. Blower Motor Fails to Start or Stops on Overload

Probable cause	Probable remedy
Defective selector switch	Test selector switch (pan 6-2). Replace if defective
Defective fan motor contactor	Test contactor (pan 64). Replace if defective
Defective fan motor p	Test relay (r 6-9). Re-
Defective relay	place if defective
Open or shorted control circuits	Perform Continuity t (par 6-12). Repair or re
place defective component.	
Defective fan motor	Test motor (para 6-). Re
pair or replace if defective.	
Defective control circuit rectifier	Test transformer (par 6-7). Replace if defective
Defective control circuit transformer	Test rectifier (para 68). Replace if defective.
Defective RFI filters	Test RFI filter .(para 68). Replace if defective.

5-9. No Heat in "HEAT" Position

Probable cause	**Possible remedy**
Defective selector switch	Teat selector switch (para 6-2). Replace if defective.
Defective temperature control thermostat	Test thermostat (para .6-3) Replace if defective
Defective heater high temperature cutout	Test high temperature cutout (para 6-11). Replace if defective
Defective or damaged heater elements	Test heater (p 6-10). Replace if damaged or defective
Defective heater contactors	Test contactors (para 6-5).
Replace if defective.	
Open or shorted control cir cuits	Perform continuity tests (para 6-12). Repair or re place defective component.
Defective control circuit transformer	Test transformer (pen 6-7). Replace if defective
Defective control circuit rectifier	Test rectifier (para -8). Replace if defective
Defective RFI filters capacitors	Test RFI filters (part 8-8). Replace if defective

5-10. Reduced Heating Capacity

Probable cause	Possible remedy
Restricted air flow over evaporator	Clean mist eliminator and evaporator coil (para (3-1-, air filters (para 3-9) and grilles and screens.
Defective selector switch (para ("LO HEAT" only)	Test selector switch 6-2). Replace if defective.
Defective temperature con trol thermostat	Test thermostat (para 6-3). Replace if defective
Defective or damaged heat er elements	Test heaters (para 6-10). Replace if damaged or defective

5-11. Inoperative Compressor Crankcase Heater

Probable cause	Possible remedy
Defective or damaged heat- ing element	Replace if damaged or defective

Section III. RADIO INTERFERENCE SUPPRESSION

5-12. General

Refer to TM 11-483 for definitions, purposes, source and methods used to obtain proper radio frequency interference suppression.

5-13. Interference Suppression Components The four air conditioner RFI filters (fig. 3-6) mounted on the junction box, are 5 amp, 250- volt, feed-through units.

5-14. Replacement of Suppression Components

a. Removal. Refer to figure 3-7 and remove radio interference suppression components.

b. Testing. Test filters on a continuity tester; replace defective RFI filters.

c. Installation. Refer to figure 3-7 and install radio interference suppression components by reversing removal procedure.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS OR AUXILIARIES

5-15. General

The air conditioner, after it is started, is automatic in operation. The relationship of the automatic components, controls, and instruments, is explained in the operating cycle description for maintenance of the air conditioner (para 5-16). A refrigerant flow diagram (fig. 5-1) and practical wiring diagram (fig. 1-6) are included to assist in the maintenance of the electrical components, wiring harness, wire leads, and refrigerant components.

Warning: Disconnect the air conditioner from the power source before performing any maintenance on the components of the unit.

5-16. Description of Operating Cycle

a. General. The type and degree of air conditioning provided by the unit is controlled by a five-position selector switch and a temperature control (temperature control thermostat).

(1) On units with reciprocating piston compressors the crankcase heater is in constant operation.

(2) Placing the selector switch in the HI-HEAT position actuates the blower motor with both banks of evaporator heaters being under the control of the temperature control. If the air temperature falling below the set point of the temperature control the control contacts close, energizing the contactors which supply power to the heaters through the normally closed contacts of the heater high temperature cutout.

(3) Moving the selector switch to the LO HEAT position presents the same control sequence but reduces the heating capacity of the unit by supplying power to a single bank of heaters only.

(4) The blower motor starts when the selector switch is placed in the VENTILATE position.

(5) In the "COOL" position, the blower motor is in operation and the compressor motor contactor is energized through the normally closed contacts of the circuit breaker and the compressor overload protector. After the blower motor and compressor have started, the flow with- in the refrigerant system is controlled by the temperature control thermostat. Sensing a rise in the air temperature above the set point, the temperature control thermostat closes, positioning the valves for cooling service. Sensing a fail in the air temperature below the set point, the contacts of the temperature control thermostat open, positioning the valves for bypass service.

b. *Compressor Operation*. The compressor delivers refrigerant gas to the condenser at the correct pressure and temperature required for con

densation. A system of solenoid and expansion valves directs the liquid refrigerant to the evaporator coil for conditioned area cooling. When the desired temperature is attained, the same valves bypass the evaporator coil to prevent further cooling of the conditioned area. The compressor operates continuously whenever the selector switch is on "COOL" to prevent voltage fluctuations in the power line. A time delay relay keeps the hot gas bypass valve open and prevents operation of the compressor for 30 seconds after initial startup.

Note. Hot gas bypass solenoid valve V, remains at all time during cooling cycle and bypass cycle operation. It opens when selector switch is moved from "COOL" position ad remains open for 30 seconds after selector switch is returned to "COOL" position.

c. Cooling Cycle of Operation. When the conditioned area temperature rises above the temperature control thermostat setting, a set of contacts opens, permitting liquid line solenoid valve V, to return to its normally open position. Liquid refrigerant is metered to the evaporator coil by thermal expansion valve W1. Thermal expansion valve W, bypasses a small amount of liquid refrigerant to the suction line to maintain a constant load on the compressor. The back pressure ,regulating valve (BPR) prevents evaporator coil icing and loss of efficiency. The condenser receiver and accumulators further stabilize the system.

d. Bypass Cycle of Operation. When the conditioned area temperature falls below the temperature control thermostat setting, a set of contacts closes, energizing the pull-in coil of liquid line solenoid valve V, and blocking the flow of liquid refrigerant to the evaporator coil. Suction pressure increases and the back pressure regulating valve (BPR) opens to bypass hot refrigerant gas to the suction line. At the same time, thermal expansion valve W, meters increased amounts of liquid refrigerant into the suction line to maintain a constant load on the compressor. The condenser receiver and accumulators further stabilize the system.

e. Heating Operation. Placing the selector switch in the "LO HEAT" position actuates half of the evaporator heaters mounted in the conditioned air stream, directly behind the evaporator coil. When the selector switch is placed in the "HI HEAT" position, the remaining heaters are energized, providing maximum heating capacity.

5-17. Cover Panel

a. Removal. Refer ’to figure 3-8 and remove cover panel.

b. Installation. Refer to figure M8 and install cover panel.

5-18. Control Panel

a. Removal. Refer to figure 5-2 and remove control panel.

Note. Use care in removing temperature control thermostat remote bulb and capillary tubing.

b. Installation. Refer to figure 5-2 and install’ control panel.

5-19. Junction Box

a. Removal. Refer to figure 5-2 and remove junction box.

b. Installation. Refer to figure 5-2 and install junction box.

5-20. Electrical Heaters and High
Temperature Cutout

a. Removal. Refer to figure 5-8 and remove electrical heaters and high temperature cutout.

b. Installation. Refer to figure 58 and install electric heaters and high temperature cutout.

5-21. Evaporator Fan Motor

a. Removal. Refer to figure 3-15 and remove evaporator fan motor.

b. Installation,. Refer to figure 315 and install evaporator fan motor.

5-22. Sight Glass

a. Removal. Refer to figure 54 and remove sight glass.
b. Installation. Refer to figure 5-4 and install sight glass.

5-23. Evaporator Coil

a. Removal. Refer to figure 55 and remove evaporator coil.

b. Installation. Refer to figure 55 and install evaporator coil.

5-24. Compressor

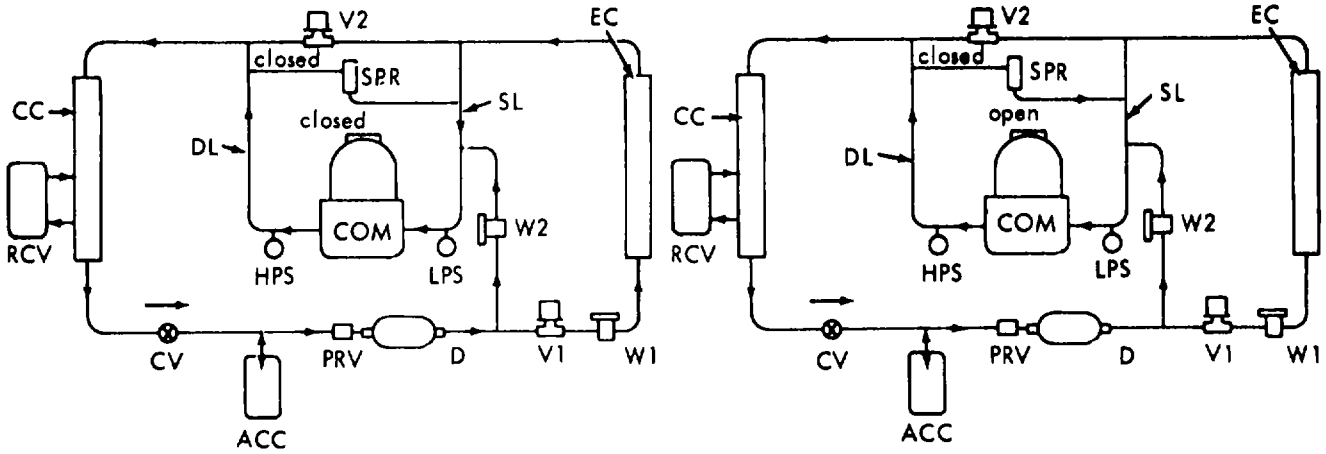
a. Removal. Refer to figure 56 and remove compressor.

b. Installation. Refer to figure -6 and install compressor.

5-25. Expansion Valves

a. Removal. Refer to figure 5-7 and remove expansion valves.

Note. Use care in removing remote sensing bulb and capillary tubing.



A. COOLING CYCLE OF OPERATION

DEVICE LEGEND

ACC ACCUMULATOR (2)
CC CONDENSER COIL
COM COMPRESSOR
CV CHECK VALVE
D DEHYDRATOR
DL DISCHARGE LINE
EC EVAPORATOR COIL
HPS HIGH PRESSURE CUTOUT SWITCH
LPS LOW PRESSURE CUTOUT SWITCH
B. BYPASS CYCLE OF OPERATION
PRV PRESSURE RELIEF VALVE
RCV RECEIVER
SL SUCTION LINE
SPR SUCTION PRESSURE REGULATOR VALVE
V1 LIQUID LINE SOLENOID VALVE
V2 HOT GAS BYPASS SOLENOID VALVE
W1 EVAPORATOR FEED THERMAL EXPANSION VALVE
W2 BYPASS THERMAL EXPANSION VALVE

Figure 5-1. Refrigerant flow diagram

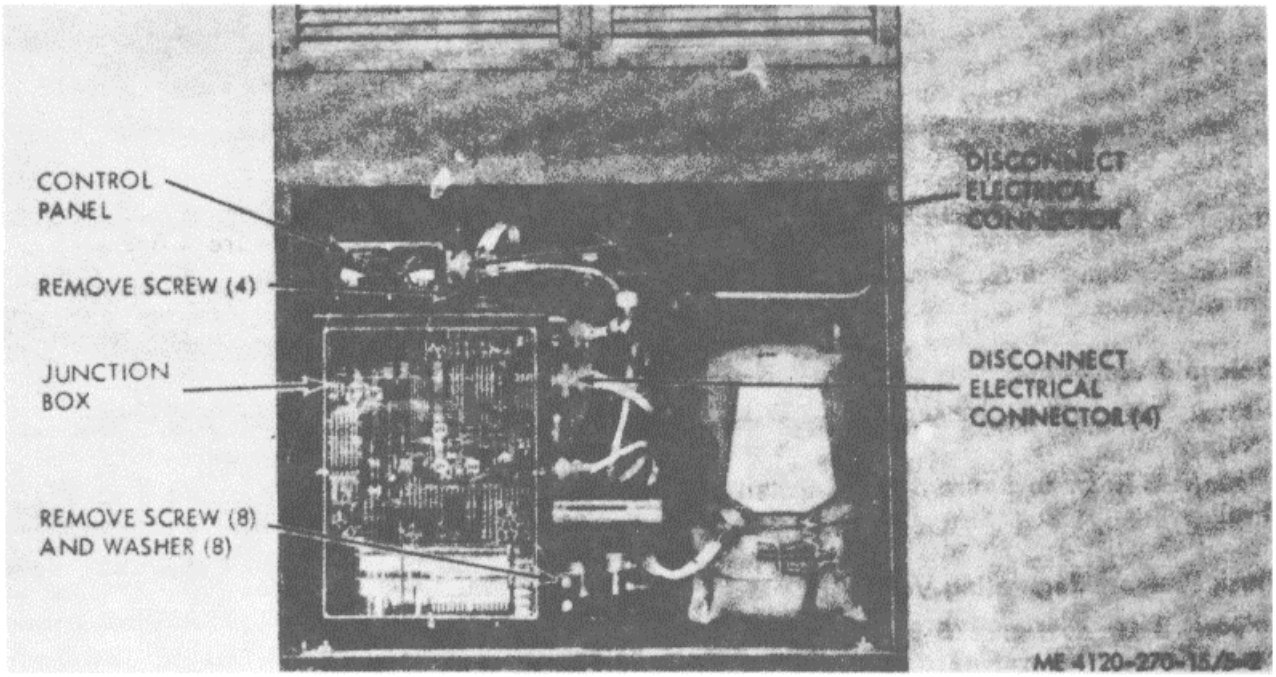


Figure 5-2. Control panel and junction box, removal and installation

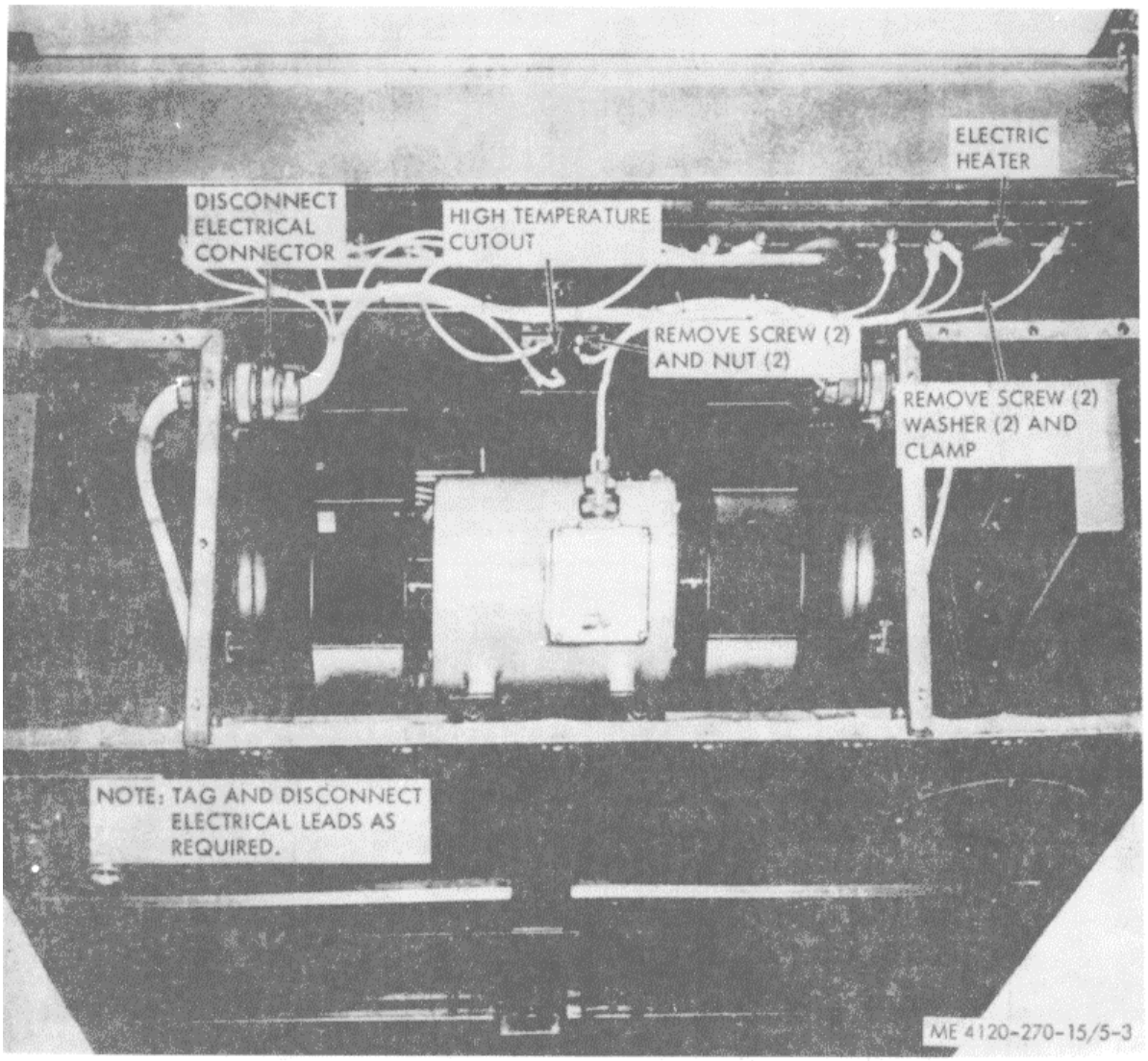


Figure 5-3. Electric heaters and high temperature cutout, removal and installation

b. Installation. Refer to figure 5-7 and install expansion valves.

5-26. Solenoid Valves

a. Removal. Refer to figure 5-8 and remove solenoid valves.

b. Installation. Refer to figure 5-8 and install solenoid valves.

5-27. Back Pressure Regulating Valve

a. Removal. Refer to figure 5-9 and remove back pressure regulating valve.

b. Installation. Refer to figure 5-9 and install back pressure regulating valve.

5-28. High and Low Pressure Cutout Switches

a. Removal. Refer to figure 5-10 and remove high and low pressure cutout switches.

b. Installation. Refer to figure 5-10 and install high and low pressure cutout switches.

5-29. System Access Valve

a. Removal. Refer to figure 5-11 and remove system access valves.

b. Installation. Refer to figure 5-11 and install system access valves.

5-30. Pressure Relief Valve

a. Removal. Refer to figure 5-12 and remove pressure relief valve.

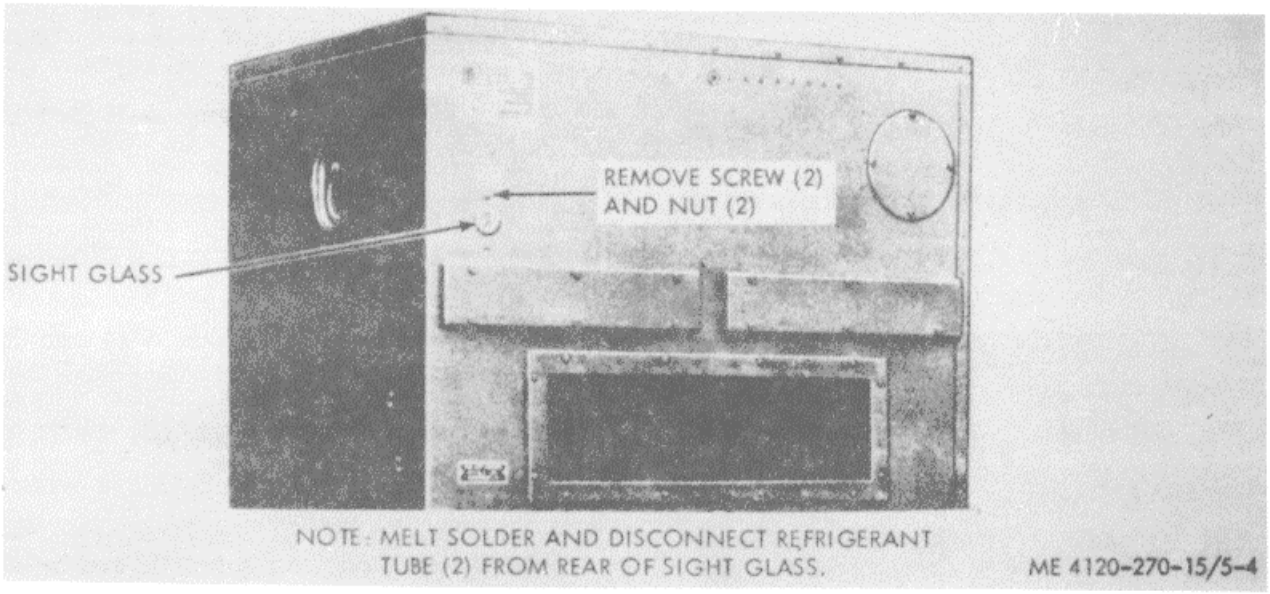


Figure 5-4. Sight glass, removal and installation

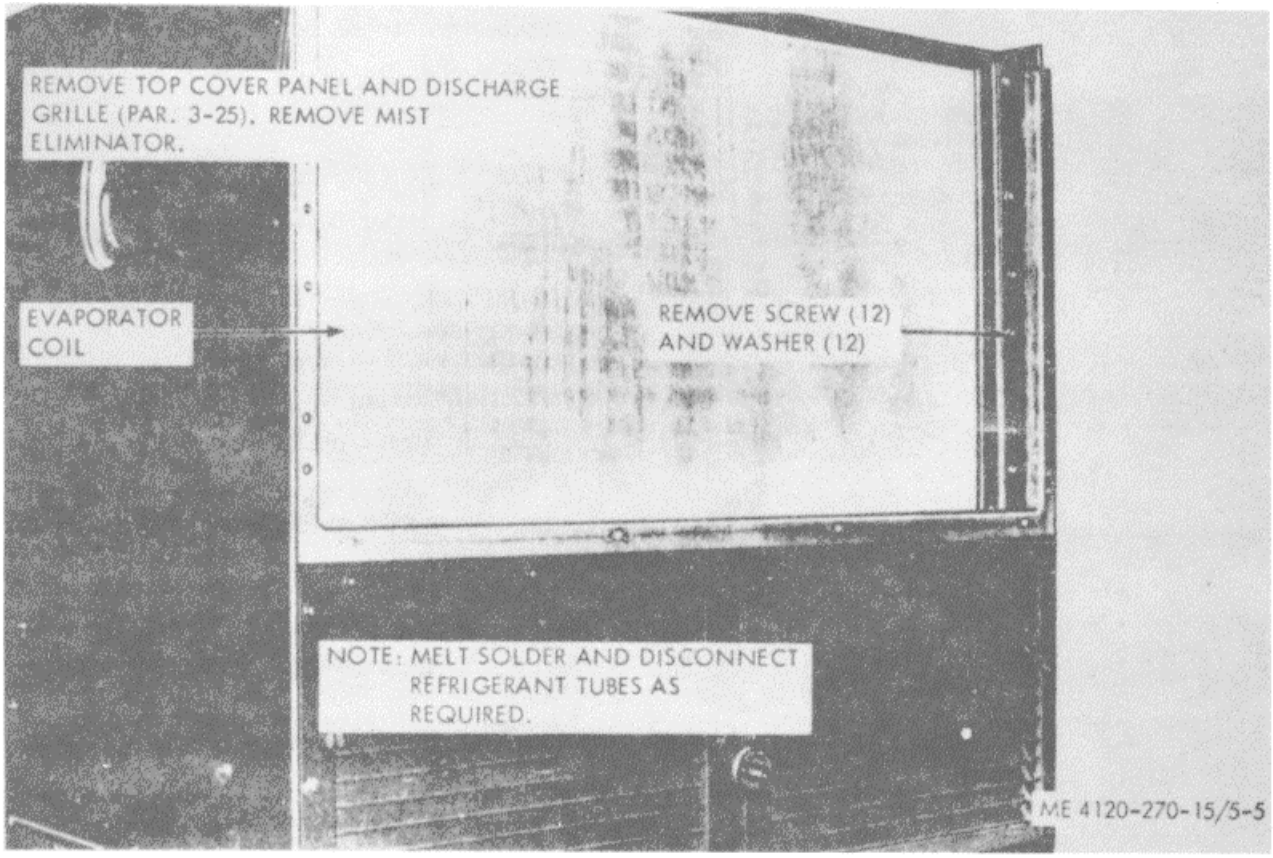


Figure 5-5. Evaporator coil, removal and installation

b. Installation. Refer to figure 5-12 and install pressure relief valve.

5-31. Dehydrator

a. Removal. Refer to figure 5-12 and remove dehydrator.

b. Installation. Refer to figure 5-12 and install dehydrator.

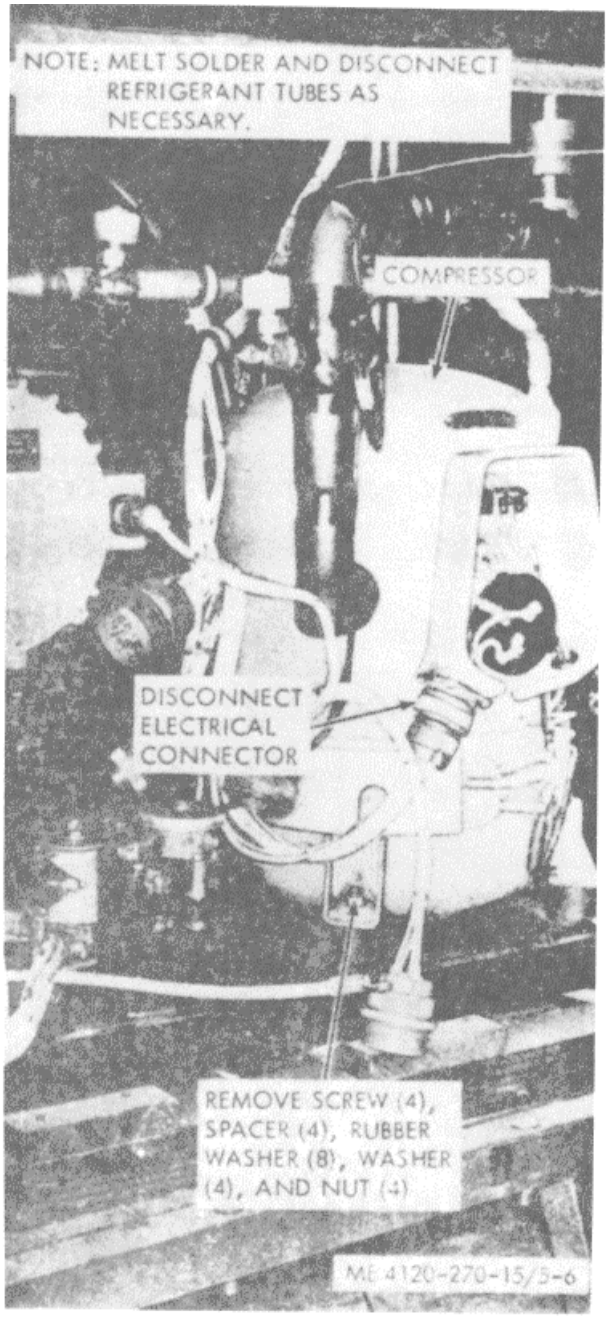


Figure 5-6. Compressor, removal and installation.

5-32. Condenser Coil

a. Removal. Refer to figure 5-18 and remove condenser coil.

b. Installation. Refer to figure 5-18 and install condenser coil.

5-33. Condenser Fan Motor

a. Removal. Refer to figure 3-16 and remove condenser fan motor.

b. Installation. Refer to figure 3-16 and install condenser fan motor.

5-34. Fresh Air Damper Assembly

a. Removal. Refer to figure 3-13 and remove fresh air damper assembly.

b. Installation. Refer to figure 3-13 and install fresh air damper assembly.

5-35. Condensate Drain Tube

a. Removal. Refer to figure 5-14 and remove condensate drain tube.

b. Installation. Refer to figure 5-14 and install condensate drain tube.

5-36. Thermal Insulation

a. Removal. Refer to figure 5-15 and remove thermal insulation.

b. Installation. Refer to figure 5-15 and install thermal insulation.

5-37. Casing Assembly

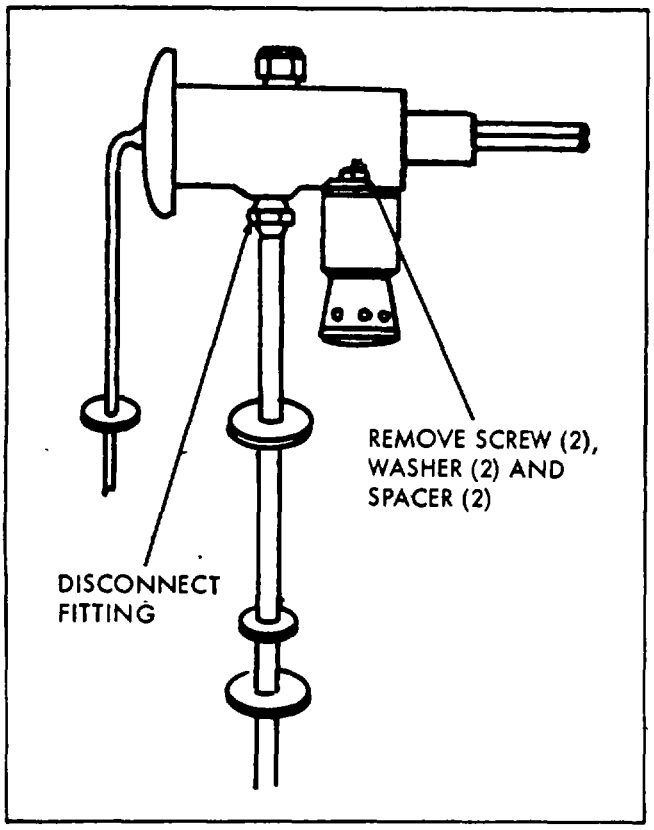
a. Removal. Refer to figure 5-15 and remove casing assembly.

b. Installation. Refer to figure 5-15 and install casing assembly.

5-38. Base Assembly

a. Removal. Refer to figure 5-15 and remove base assembly.

b. Installation. Refer to figure 5-15 and install base assembly.



NOTE: MELT SOLDER AND DISCONNECT REFRIGERATION TUBES AS REQUIRED.

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Figure 5-7 (1). Expansion valve, removal and installation.

Figure 5-7 (2).-Continued.

Figure 5-8 (1). Solenoid valve, removal and installation

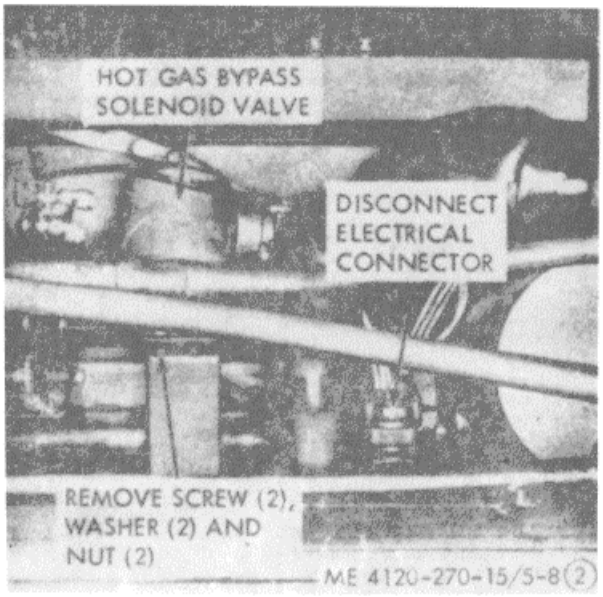


Figure 5-8 (2). -Continued.

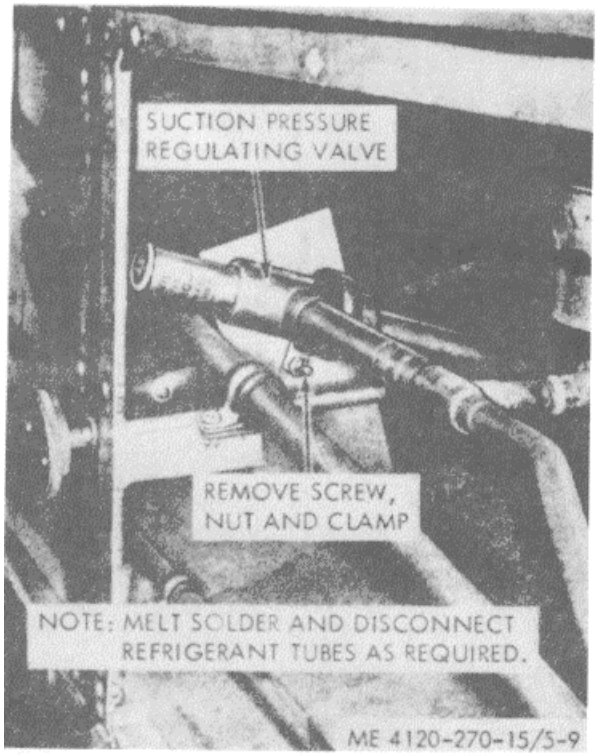


Figure 5-9. Back pressure regulating valve, removal and installation

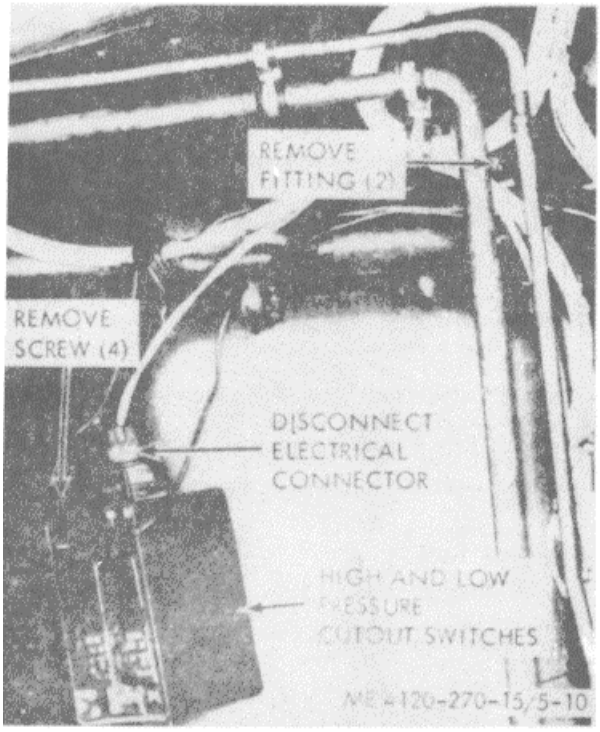


Figure 5-10. High and low pressure cutout switches, removal and installation.

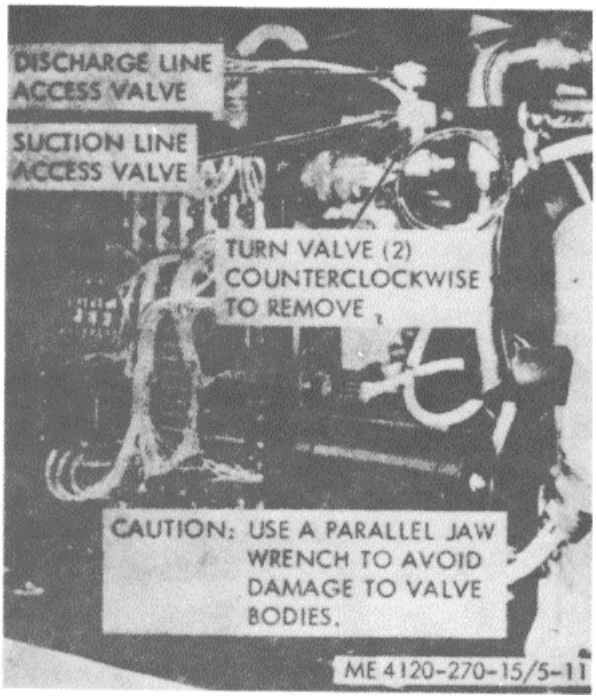


Figure 5-11. System access valves, removal and installation.

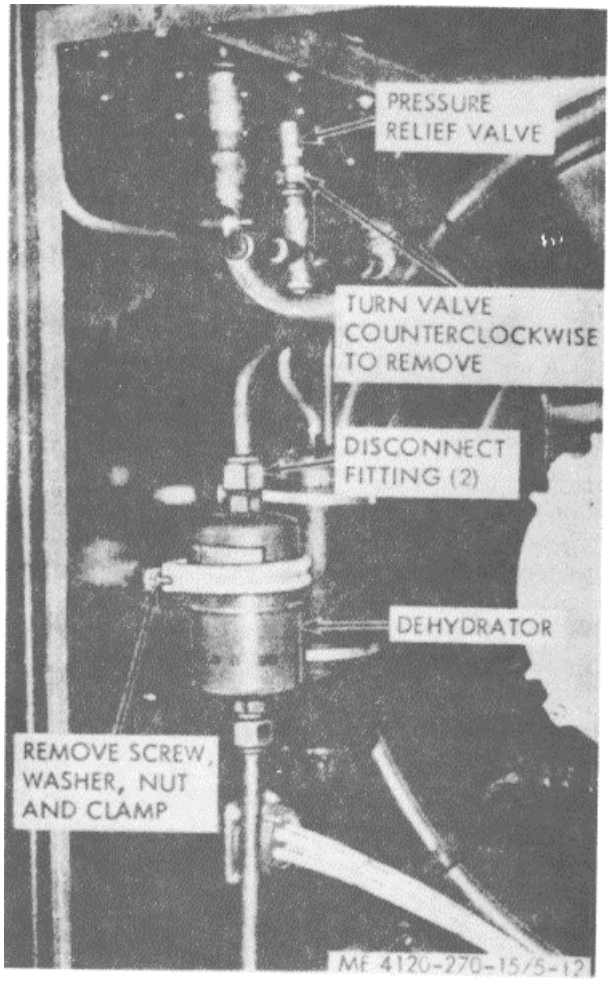


Figure 5-12. Pressure relief valve and dehydrator, removal and installation.

Figure 5-13. Condenser coil, removal and installation.

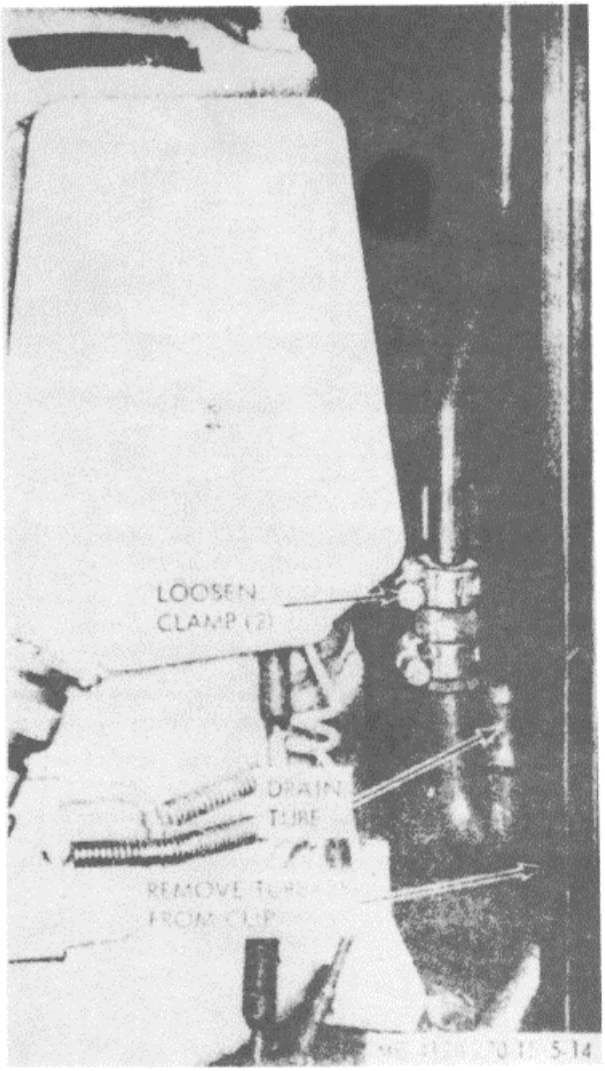


Figure 5-14. Condensate drain tube, removal and installation.

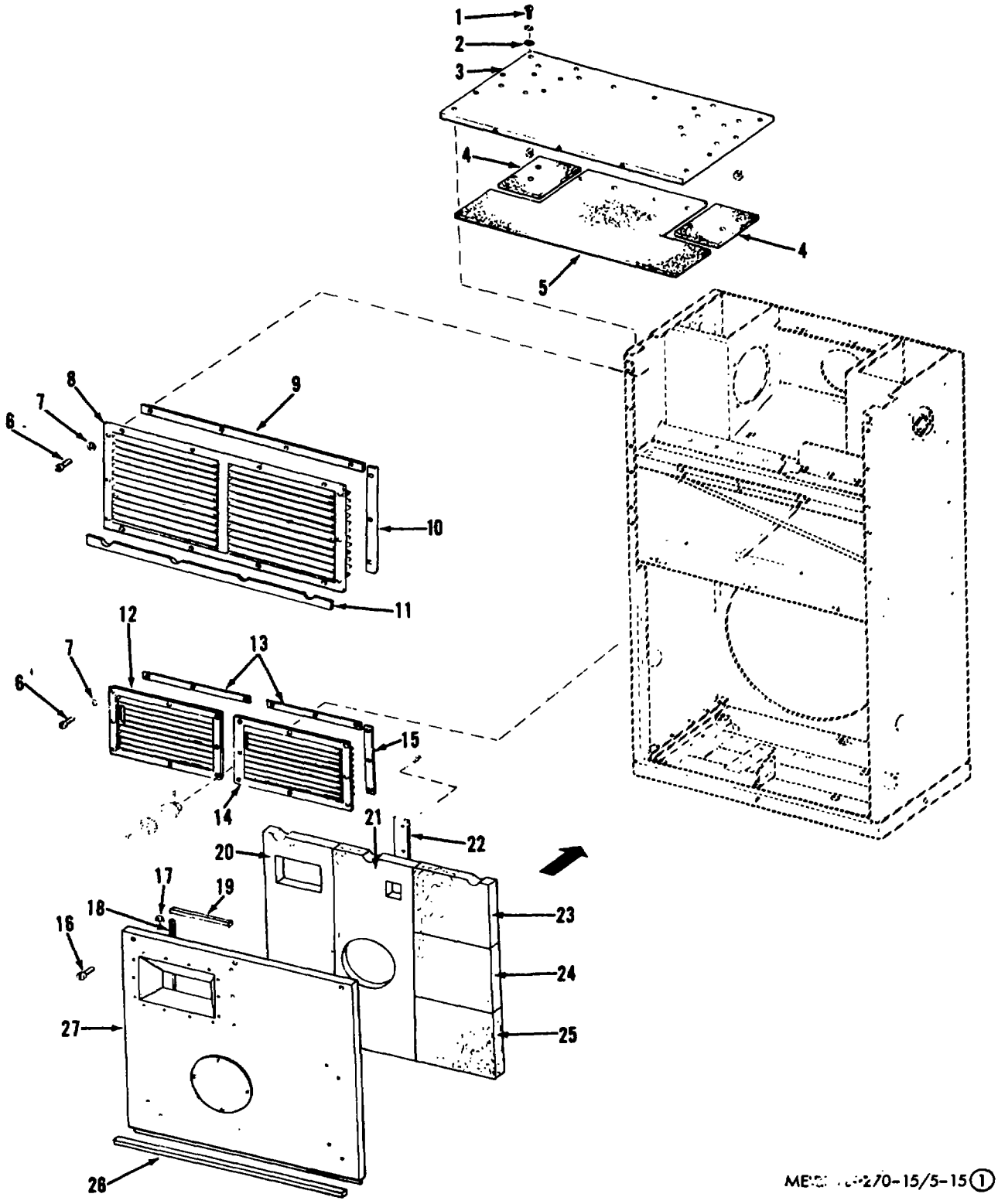
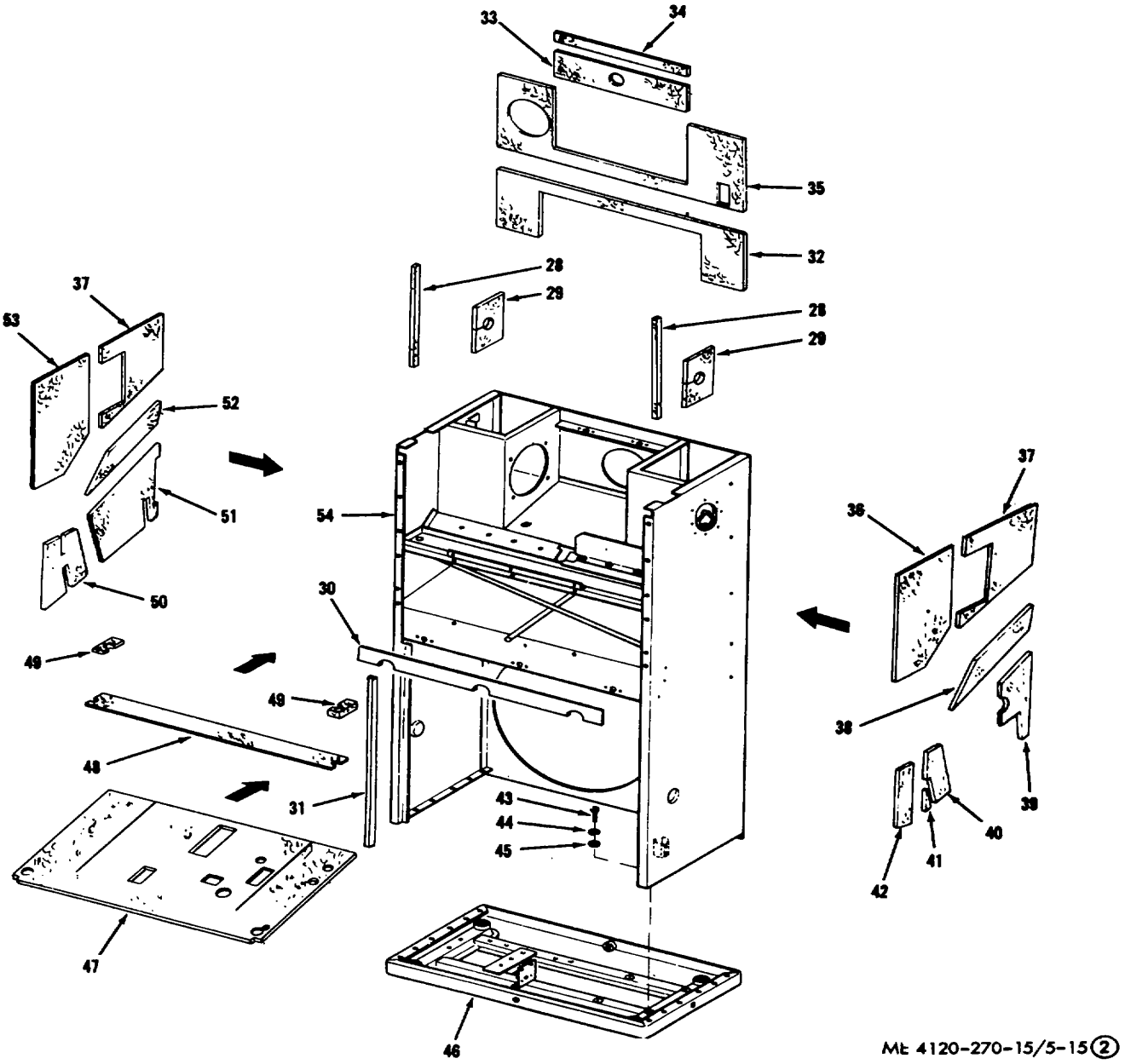


Figure 5-15 (1). Thermal insulation, casing and base assembly, exploded view..

Key to fig. -15 (1):
1 Screw, machine
2 Washer, flat, #8
3 Panel, top cover
4 Insulation, rubber
5 Insulation, rubber
6 Screw, machine, #10-32 x ¾ in.
7 Washer, flat #10
8 Grille, discharge
9 Gasket, rubber
10 Gasket, rubber
11 Gasket, rubber
12 Grille, intake, LH
13 Gasket, rubber
14 Grille, intake, RH
15 Gasket, rubber
16 Screw assembly
17 Washer, retaining
18 Gasket, rubber
19 Gasket, rubber
20 Insulation, rubber
21 Insulation, rubber
22 Strip, retaining
23 Insulation, rubber
24 Insulation, rubber
25 Insulation, rubber
26 Gasket, rubber
27 Panel, lower

Figure 5-15 (1).--Continued



Key to fig. 5-15 (2):

28 Gasket, rubber
29 Insulation, rubber
30 Gasket, rubber
31 Gasket, rubber
32 Insulation, rubber
33 Insulation, rubber
34 Insulation, rubber
35 Insulation, rubber
36 Insulation, rubber
37 Insulation, rubber
38 Insulation, rubber
39 Insulation, rubber
40 Insulation, rubber
41 Insulation, rubber

Fig 5-15 (1).--Continued

42 Insulation, rubber
43 Screw, machine, 1/4-28 x 8/4 in.
44 Washer, lock, 1/4 in.
45 Washer, flat, 1/4 in
46 Base assembly
47 Insulation, rubber
48 Insulation, rubber
49 Insulation, rubber
50 Insulation, rubber
51 Insulation, rubber
52 Insulation, rubber
53 Insulation, rubber
54 Casing assembly

Figure 5-15 (2).--Continued.

CHAPTER 6
SPECIFIC REPAIR INSTRUCTIONS

Section I. ELECTRICAL SYSTEM

6-1. General
This section contains those items which are considered part of major components or auxiliaries of the air conditioner electrical system. They consist of control circuit components, leads, heating elements, relays and electric motors.

6-2. Selector Switch
a. General. The selector switch is a manually operated, five-position rotary switch which is used to turn on the "COOL", "HEAT" and "VENTILATE" modes and to turn off the air conditioner.

b. Removal. Refer to figure 6-1 and remove the selector switch from the control panel.

c. Disassembly. Disconnect electrical leads from selector switch. Do not disassemble further.

d. Testing. Using a multimeter set on OHMS, refer to figure 62 and test for continuity or open circuit as indicated on the chart. Replace the selector switch if it fails to operate as specified.

e. Reassembly. Connect electrical leads to selector switch.

f. Installation. Refer to figure 6-1 and install the selector switch in the control panel.

6-3. Temperature Control Thermostat
a. General. The temperature control thermostat is a temperature sensing manually set single pole double-throw switch which automatically controls both heating and cooling cycles to maintain any selected conditioned area temperature between +40'F and +900F.

b. Removal. Refer to figure 6-1 and remove the temperature control thermostat from the control panel.

c. Disassembly. Disconnect electrical leads from temperature control thermostat. Do not disassemble further.

d. Testing.

(1) Rotate shaft so flat faces away from terminal. Using a multimeter set on OHMS, refer to figure 6-8 and test for continuity between each of the control terminals and the common terminal. It will be necessary to rotate the shaft clockwise ("warmer" direction) or counterclockwise ("cooler" direction) to open and close each set of contacts. Replace temperature control thermostat if contacts do not operate as indicated.

(2) The temperature control thermostat should maintain conditioned area temperature within 2° F 1°F of the temperature selected. Replace temperature control thermostat if operating differential is larger than specified.

e. Reassembly. Connect electrical leads to temperature control thermostat.

f. Installation. Refer to figure 6-1 and install temperature control thermostat in the control panel.

6-4. Circuit Breaker
a. General. The circuit breaker is a manually reset, double-pole double-throw switch which automatically protects the compressor motor from continuous overcurrent and short circuits. An electrically isolated single-pole double-throw switch protects the control circuits.

b. Removal. Refer to figure 6-4 and remove the circuit breaker from the junction box.

c. Testing.

(1) Refer to figure 6-5. With circuit breaker closed, there should be continuity between terminals 1 and 2, 8 and 5, 6 and 7.

(2) With circuit breaker open there should be no continuity between terminals 1 and 2, 8 and 5, 6 and 7. Replace circuit breaker if operation is not as indicated.

d. Installation. Refer to figure 64 and install circuit breaker in the junction box.

6-5. Magnetic Contactors
a. General. The magnetic contactors are remote controlled three-pole, single-throw switches which are used to connect the air conditioner electric motors and heaters across the line. The control coils operate on

24V DC provided by a step-down transformer and rectifier circuit. The condenser fan motor and compressor motor contactors are rated at 50 amperes. The evaporator fan motor and heater contactors are rated at 25 amperes.

b. Removal. Refer to figure 6-4 and remove contactors from the junction box.

c. Disassembly. Do not disassemble unless contacts are dirty or pitted and require cleaning or dressing.

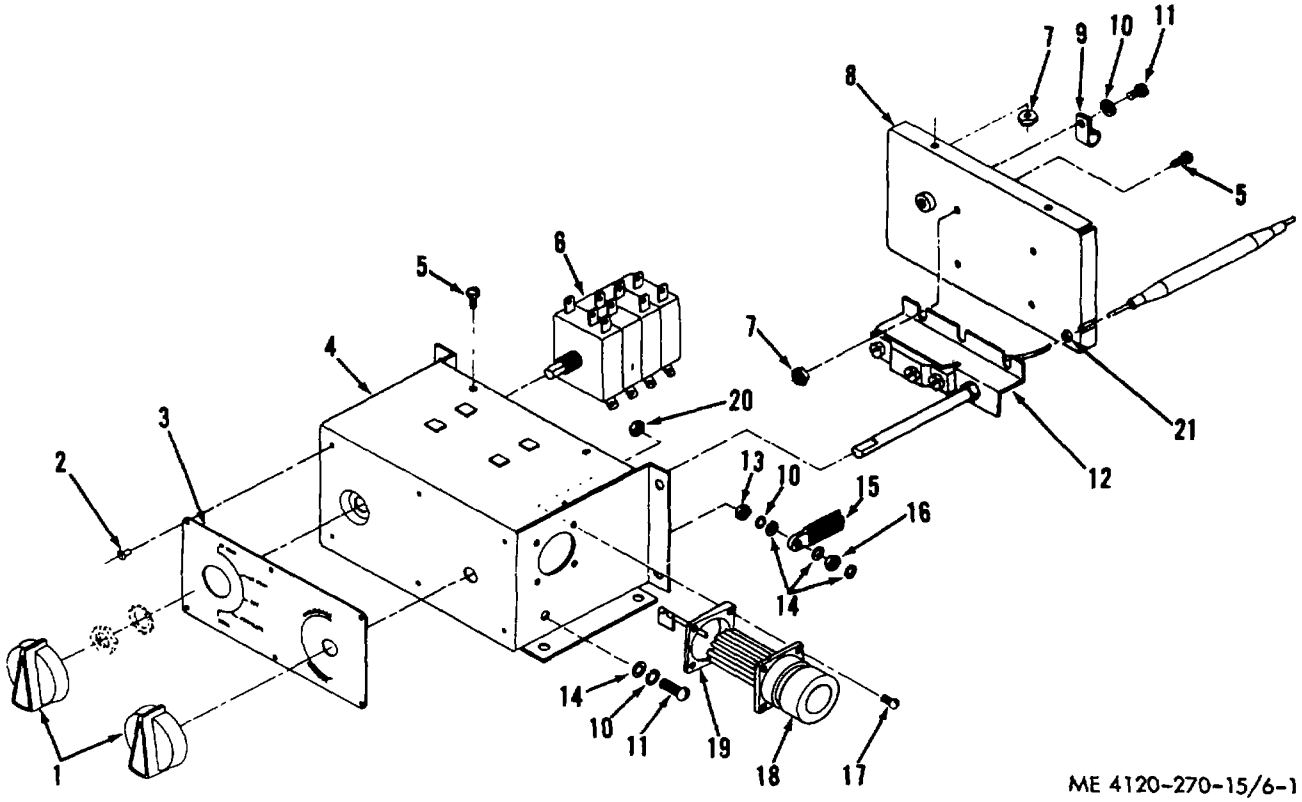
d. Testing (fig. 6-6).

(1) 50-ampere contactors.

(a) With contactor open, test for continuity across control coil terminals X, and X,. If coil is open, replace contactor.

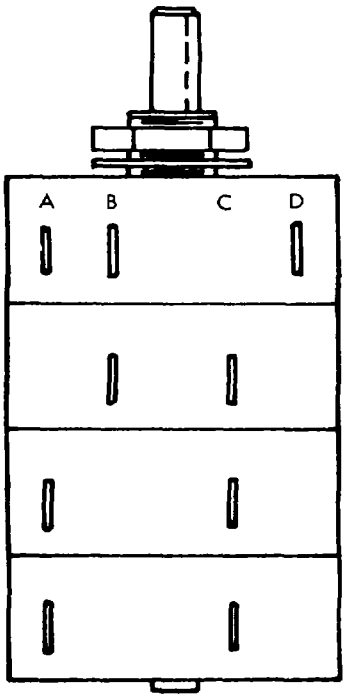
(b) With contactor open, test for continuity across each pair of line and load terminals L,-T,, L2-T2, and L,-T,. If continuity exists, contacts are welded or contact springs are broken. Replace contactor.

(c) Using a multimeter on high OHM' range, a megger or an insulation tester, test insulation resistance between contactor frame and each terminal in turn. If insulation resistance is less than 0.5 megohm, replace contactor.

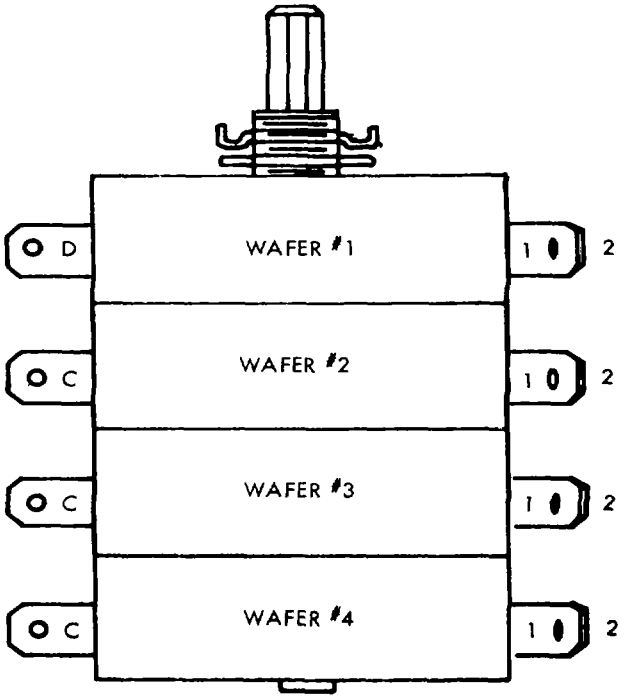


Key to fig. 6-1:
1 Knob
2 Rivet, blind
3 Plate, instruction
4 Panel assy.
5 Screw, machine, pan head, No. 8-32 x 1/2 in.
6 Switch, selector
7 Nut, hex, locking, No. 832
8 Plate, mounting
9 Clamp, loop
10 Washer, lock, No. 10
11 Screw, machine, pan head, No. 10-2 x 1/2 in
12 Switch, thermostat
13 Nut, hex, locking, No. 8-32
14 Washer, flat, No. 10
15 Lead, electrical, ground
16 Nut, hex, No. 10-32
17 Screw, machine, pan head, No. -62 x 1
18 Connector, receptacle, electrical
19 Spacer
20 Nut, hex, No. 642
21 Grommet

Figure 6-1. Control panel, exploded view.



TERMINAL LOCATION



RIGHT SIDE

SWITCH POSITION						
WAFER NO.	CONTACT NO.	1 HI HEAT	2 LO HEAT	3 OFF	4 VENT	5 COOL
1	2 & A	CLOSED	CLOSED	OPEN	OPEN	OPEN
	2 & B	OPEN	OPEN	OPEN	OPEN	CLOSED
	1 & D	OPEN	OPEN	OPEN	OPEN	CLOSED
2	2 & B	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
4	1 & C	CLOSED	OPEN	OPEN	OPEN	OPEN

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Figure 6-2. Selector switch test sequences

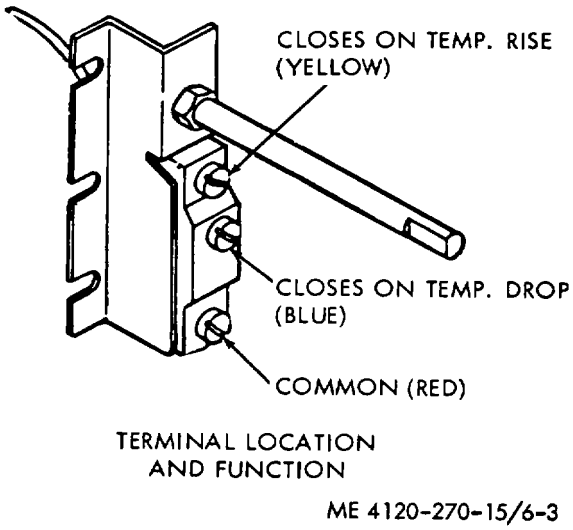

Figure 6-3. Temperature control thermostat test points.

Caution: **Do not apply test potentials in excess of 230 volts**

(d) Energize control coil using a 2428V DC source or two 12 volt batteries connected in series. Using a multimeter on lowest OHMS range, test contact resistance across each pair of line and load terminals L,-T,, L2-T, and L,-T,. Contact resistance in excess of 0.2 ohms indicates dirty or burnt contacts. Clean contacts if possible, or replace contactor.

(2) *25-ampere contactors*. Proceed as instructed above, noting that line and load terminals are now Al-A2, B1-B2 and C1-C2. Observe same cautions.

e. Reassembly. Reassemble any parts that were removed for cleaning or dressing contacts.

f. *Installation*. Refer to figure 6-4 and install contactors in junction box.

6-6. Time Delay Relay

a. General. The time delay relay is a hermetically enclosed, single-pole, single-throw normally open thermal delay relay which keeps the hot gas bypass valve open and prevents operation of the compressor for 30 seconds after the selector switch is placed on "COOL". The time delay relay closes at the end of the delay period and remains closed as long as the air conditioner is on "COOL" mode. Switching to other modes of operation opens the relay. It remains open until the air conditioner is again placed on "COOL" mode, at which time it delays valve and compressor operation as outlined above.

b. Removal. Refer to figure 6-4 and remove the time delay relay assembly from the junction box.

c. Disassembly. Do not disassemble for testing. If replacement is indicated, remove time delay relay from its mounting bracket and disconnect electrical leads.

d. Testing.

(1) Refer to figure 6-7 and place a continuity indicator or multimeter on low OHMS range across leads A and B.

(2) Apply 2-28V DC from a test source or two 12-volt batteries in series across leads A and C.

(3) Begin timing the relay from the instant DC power is applied until the continuity indicator or multimeter indicates the relay contacts have closed. Normal delay is 30 seconds :8 seconds. Replace time delay relay if delay time is not according to specifications.

e. Reassembly. Connect electrical leads to time delay relay and mount relay in its bracket.

f. Installation. Refer to figure 64 and install time delay relay in the-junction box.

6-7. Transformer

a. General. The control circuit transformer is a single-phase, shielded, potted stepdown transformer with a 208V AC primary and a 30V AC secondary. After rectification, the resulting 24V DC output is used to energize the magnetic contactor and solenoid valve control coils and the time delay relay. The transformer primary circuit is protected by the auxiliary circuit breaker contact and by a cartridge-type fuse in each line.

b. Removal. Refer to figure 64 and remove the transformer from the junction box.

c. Disassembly. Disconnect electrical leads from primary and secondary terminals. Do not disassemble further.

d. Testing.

(1) Connect a continuity tester or multimeter on low OHMS range across the transformer primary winding. If winding is open, replace transformer.

(3) Connect a continuity tester or multimeter on low OHMS range across the transformer secondary. If winding is open, replace transformer.

(3) Connect an insulation tester, megger or multimeter on high OHMS range between one primary terminal and transformer, case. If resistance is less than 0.5 megohm,-replace transformer.

(4) Connect an insulation tester, megger or multimeter on high OHMS range between one primary terminal and one secondary terminal. If resistance is

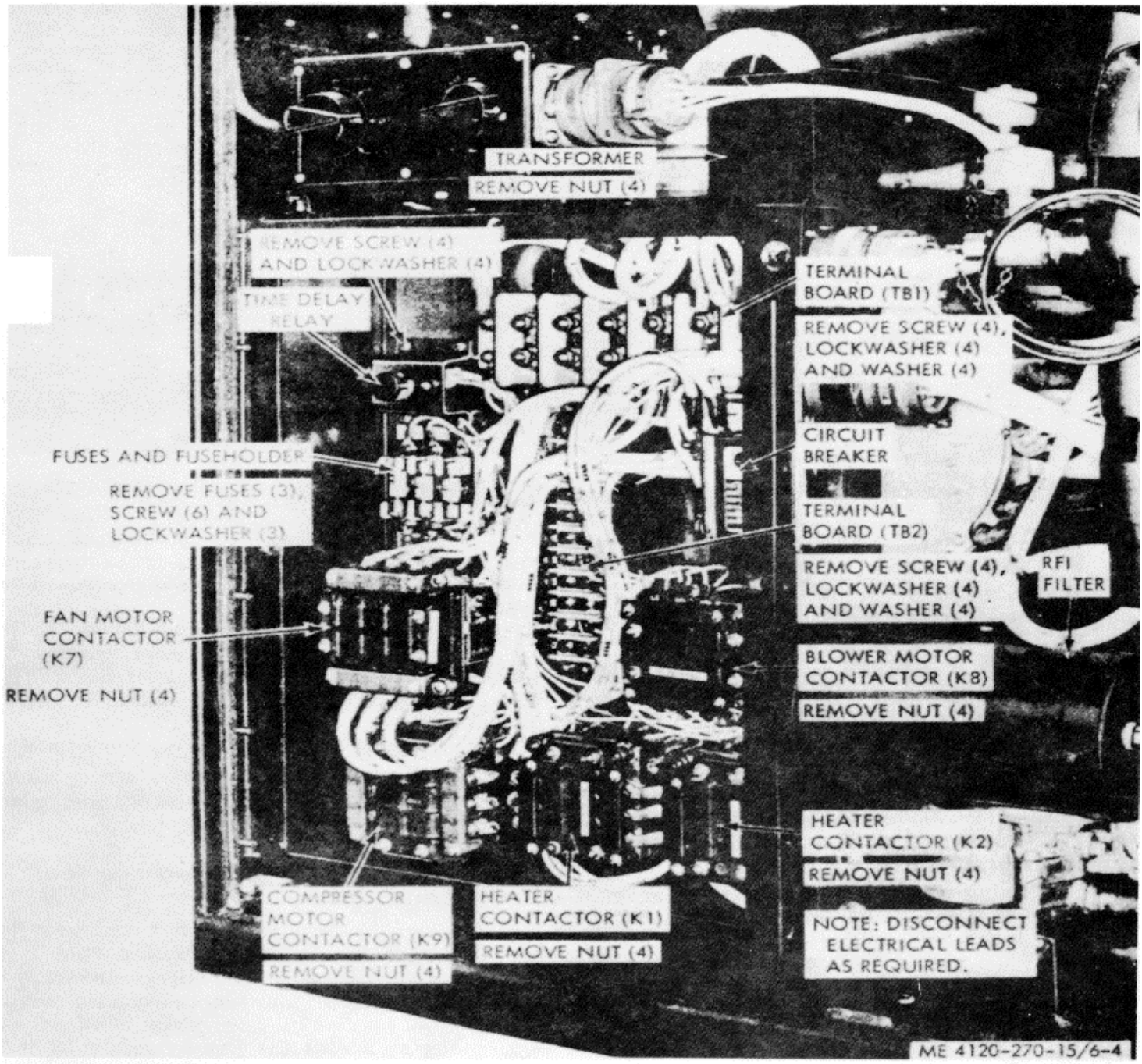

Figure 6-4. Junction box components, removal and installation

less than 0.5 megohm, replace transformer.

e. Reassembly. Connect electrical leads to transformer.

f. Installation. Refer to figure 6-4 and install transformer in the junction box.

6-8. RFI Filter Assembly

a. General. The RFI filter assembly contains a single-phase silicon rectifier bridge and four feed through filters mounted in a shielding canister provided with caps at both ends.

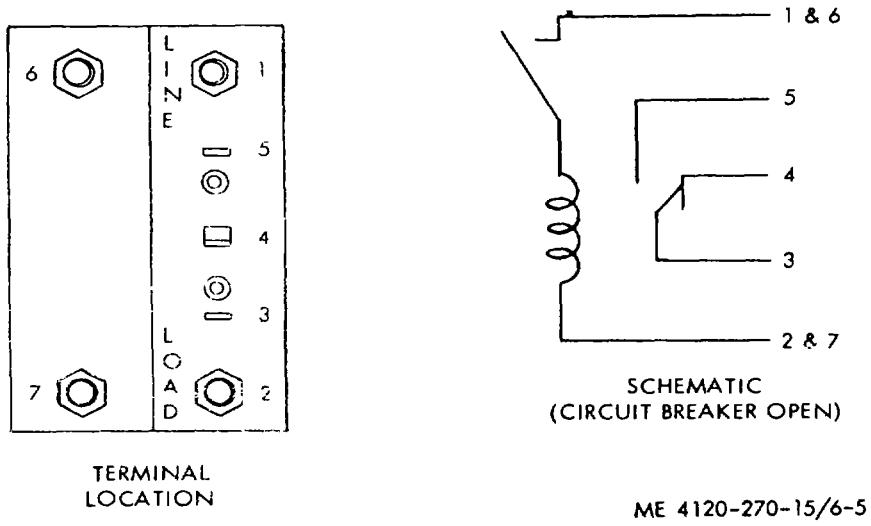

Figure 6-5. Circuit breaker test points.

b. Removal. Refer to figure 6-4 and remove the RFI filter assembly from the side of the junction box.

c. Disassembly. Refer to figure 3-7 and disassemble RFI filter assembly into components.

d. Testing.

(1) Rectifier.

(a) Using a multimeter on DC VOLTS range measure rectifier output voltage across positive and negative terminals when 28V AC is applied to the AC terminals through a stepdown transformer. Rectifier output should measure 24 ±5V DC. Replace rectifier if output voltage is less than specified.

(b) Using a multimeter on OHMS range measure rectifier resistance between terminals 1-2, 2-4, 4-3, and 3-1.

(c) Repeat above procedure, reversing leads to measure resistance between terminals 2-1, 4-2, 3- and 13.

(d) Compare reading against following chart. Replace rectifier.- f readings are substantially higher or lower than specified.

Terminal pair	Resistance reading
1-2	1000 ohms or higher
2-1	1 ohm or lower
2-4	1 ohm or lower
4-2	1000 ohms or higher
4-3	1 ohm or lower
3-4	1000 ohms or higher
3-1	1000 ohms or higher
1-3	1 ohm or lower

Note. A high ratio of reverse to forward resistance usually indicates a good rectifier. If possible, substitute a known good rectifier and check operation of air conditioner.

(2) RFI filters. Using a multimeter on low OHMS range or a continuity tester, check continuity between both the terminals of the RFI filters. If an open indication is obtained, replace RFI filters.

e. Reassembly. Refer to figure 3-7 and reassemble RFI components.

f. Installation. Refer to figure 6-4 and install RFI filter assembly in junction box.

6-9. Evaporator Fans and Condenser Fan Electric Motors

a. General. The evaporator and condenser fan motors are of the squirrel cage, induction type They provide the mechanical energy necessary to turn the evaporator blowers and condenser fan. Both motors operate on three-phase 208V AC and are connected across the line by means of individual magnetic contactors energized by the control circuit. Motors on the MAC4V60-360- air conditioner are designed for 400 cycle service. The MAC6V60-360-2 motors operate on 50-0 cycles. Both models are similar in appearance and are protected by internal self-resetting thermal overload and overcurrent protectors

b. On-Equipment Testing. Before removing the motor for replacement, test the motor windings for opens and grounds:

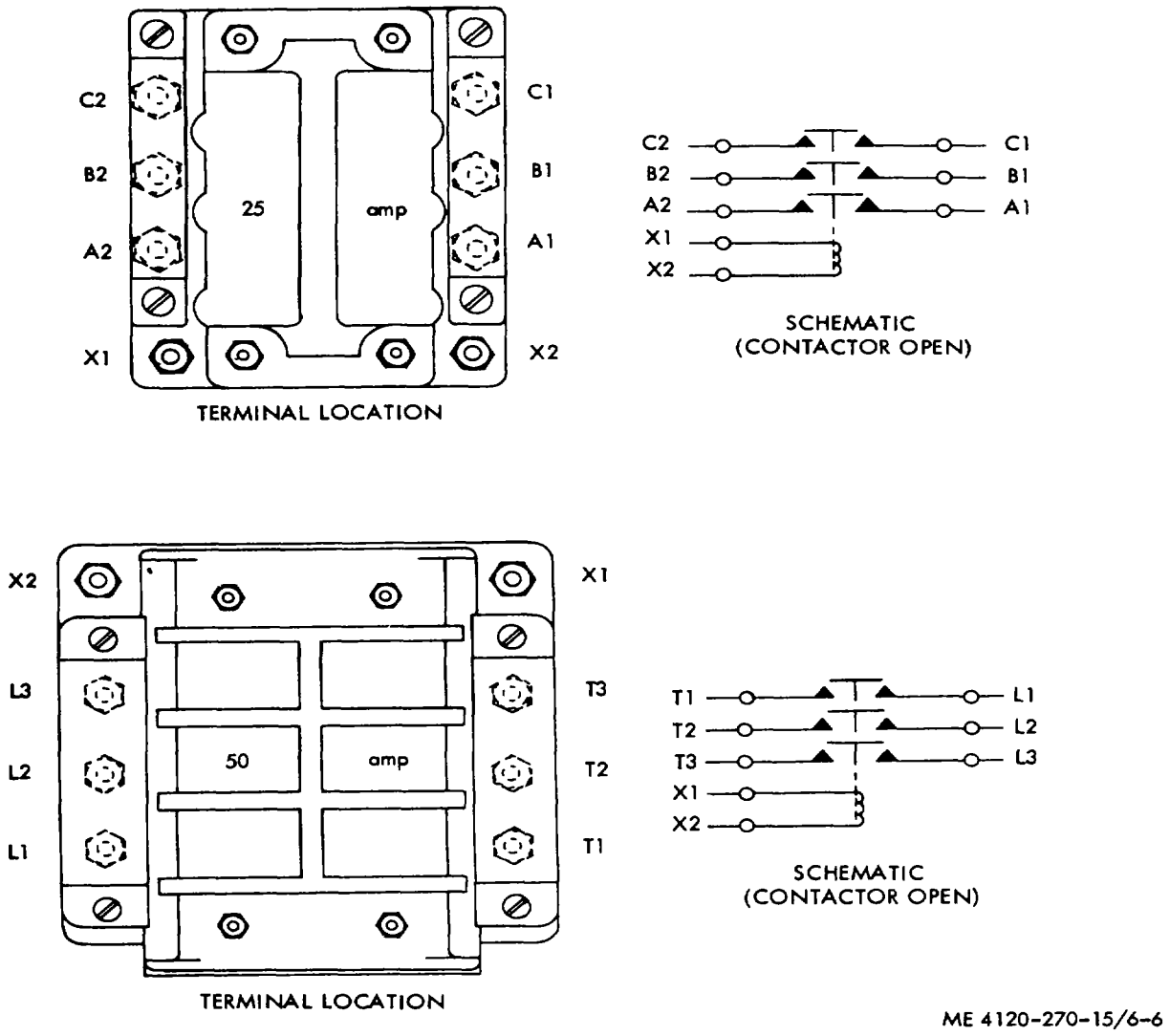

Figure 6-6. Magnetic contactor test points

(1) Disconnect receptacle connector from motor junction box.

(2) Test continuity across each combination of two motor terminals. Lack of continuity indicates an open winding.

(3) Place one contact of the tester against motor housing and the other against the motor terminals one at a time. If a circuit is indicated, the motor is grounded.

(4) Test the motor stator for insulation resistance as instructed in TM 5-764 (Electric Motor and Generator Repair). The insulation resistance should measure not less than 0.5 megohms for the motor on either model.

Note. The resistance measurement should be used only as a general guide, taking into consideration the accuracy of the instrument used, test lead resistance, and ambient temperature at time of test. If more precise measurement is required, an instrument such as a Kelvin or Wheatstone bridge should be used, or comparative measurement between the suspected component and a like item to be good should be utilized. In all cases where a megohmmeter is used for testing, make certain that the unit is thoroughly dry. Wet condemnation tolerances should be considered.

(5) Connect the air conditioner to a proper source of power. Use a hook-type ammeter and read the amperage flowing in each of the evaporator fan motor leads. On model MAC4V60-360- the ammeter should indicate between 5.75

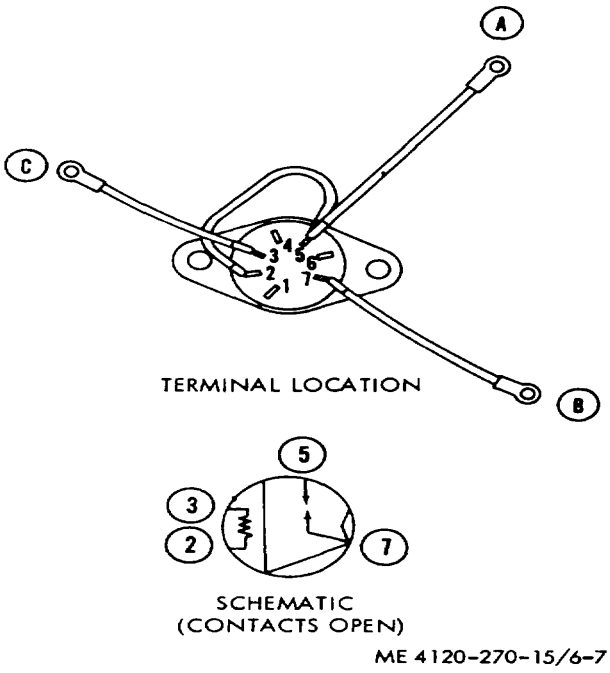

Figure 6-7. Time delay relay test points.

and 4.0 amperes. On model MAC6V60-360-2 the ammeter should indicate between 4.5 and 3.14 amperes at full load. When testing the condenser fan motor, the ammeter should indicate between 18 and 12.6 amperes at full load for model MAC4V60-360-. On model MAC6V60-36-2 the ammeter should indicate between 14.5 and 10.2 amperes at full load.

c. Removal. Refer to paragraphs 6-21 and 5-33 and remove fan motors.

d. Disassembly. Refer to figure 6-8 and 6-9 and disassemble the fan motors.

e. Testing of Overload Protector. Disconnect the electrical leads from the overload protector. Test the protector with a multimeter set on OHMS. If continuity does not exist, replace the overload protector.

f. Cleaning, Inspection and Repair.

(1) Clean all parts with a cloth dampened in cleaning solvent.

(2) Inspect the stator housing for cracks, breaks, or other defects. Replace a damaged or defective housing.

(3) Inspect bearings for pits, scoring, wear, and out-of-round. Replace worn or defective bearings.

(4) Inspect the rotor shaft for cracks, wear, and misalinement. Replace a damaged or defective rotor.

(5) Inspect the rotor for cracks, breaks, and damaged laminations. Replace the rotor and stator if they are damaged.

(6) Inspect all threaded parts for damage. Replace as necessary.

g. Reassembly. Refer to figure 6-8 and 6-9 and reassemble the fan motors.

h. Installation. Refer to paragraphs 5-21 and 5-33 and install the fan motors.

6-10. Electric Heater Elements

a. General. Two banks of three electrical heaters each are mounted directly behind the evaporator coil, in the conditioned air stream, and provide heat on command from the temperature control thermostat to maintain the selected ambient temperature. Placing the selector switch on "LO-HEAT" starts the evaporator blower and places one bank of heaters in operation on command from the temperature control thermostat. Placing the selector switch in "HI-HEAT" activates the second bank of heaters, which operates continuously in addition to the controlled bank.

b. Removal. Refer to figure 53 and remove the heating element assembly from air conditioner.

c. Disassembly. Refer to figure 53. Disconnect electrical leads from heating elements and remove elements from support channel assembly.

d. Testing. Using a multimeter set on low OHMS range, check resistance across each heating element in turn. Normal reading is 7 ± 4 ohms. Replace heating element if resistance is not as specified.

e. Reassembly. Refer to figure 5-3. Install elements in support channel assembly and connect
electrical leads.

f. Installation. Refer to figure 5-3 and install heating element assembly in air conditioner.

6-11. Heater High Temperature Cutout

a. General. The heater high temperature cutout is a three-pole, single-throw, automatic reset thermal overload and overcurrent protector which prevents the heaters from operating at discharge temperatures in excess of 190° ± 40°F regardless of selector switch and temperature control thermostat settings. Normal heater operation resumes automatically at 140° ± 40°F discharge air temperature.

Note. Normally, cutout temperature will be reached only if evaporator fan motor stops due to malfunction or if blowers are damaged or seized

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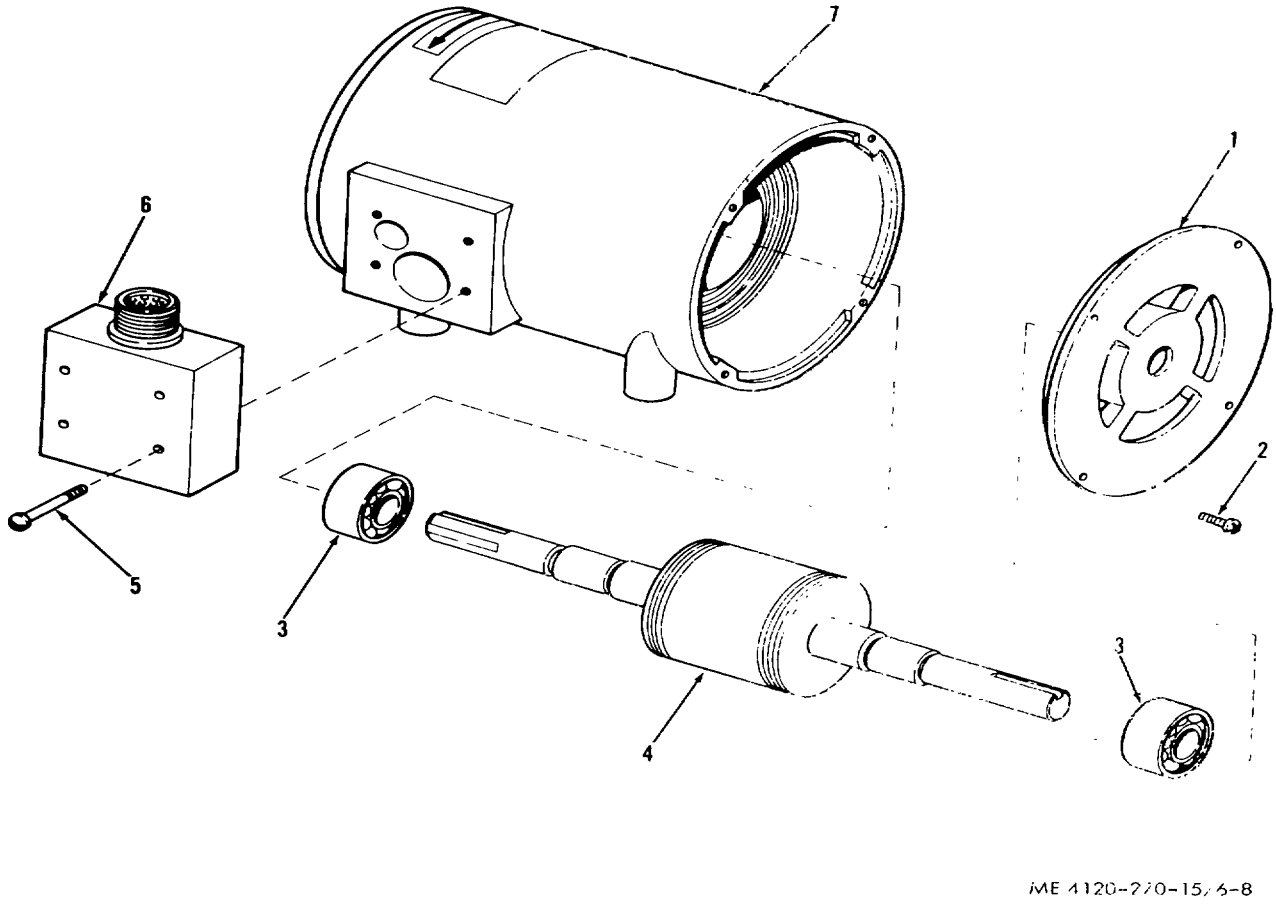


Key to fig. 6-8:
1 Cover, end
2 Screw, machine
3 Bearing, ball
4 Rotor and shafts
5 Screw, machine
6 Box, connector
7 Frame and windings

Figure 6-8. Evaporator fan motor, exploded ,view.

b. Removal. Refer to figure 5-3 and remove the heater high temperature cutout.

c. Disassembly. Disconnect electrical leads from heater high 'temperature control. Do not disassemble further.

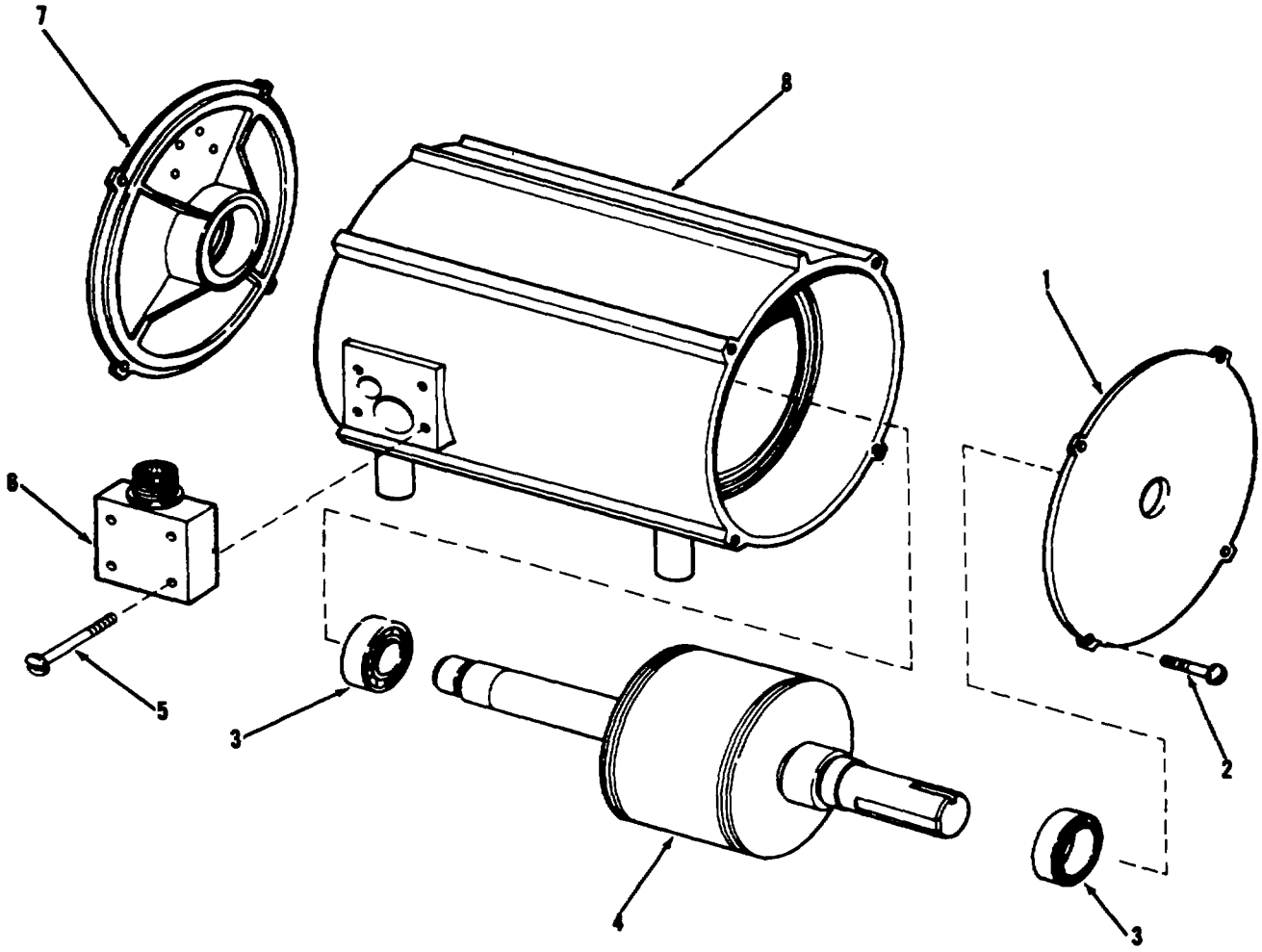
d. Testing. Using a continuity tester or a multimeter set on low OHMS range, test for continuity between each pair of terminals. Replace heater high temperature cutout if an open reading is obtained.

e. Reassembly. Connect electrical leads to heater high temperature cutout.

f. Installation. Refer to figure 5-3 and install heater high temperature cutout on beater support assembly.

6-12. Wiring Harness and Wire Leads

a. General. Tile electrical circuits in the air conditioner are completed by individual wire leads or by wire leads laced or enclosed in a in a loom to form a



Key to fig. 6-9:
1 Cover end
2 Screw, machine
3 Bearing, ball
4 Rotor and shaft
5 Screw, machine
6 Box connector
7 Cover, end
8 Frame and windings

Figure 6-9. Condenser fan motor, exploded view.

wiring harness. All of the wiring carries code numbers. When testing, repairing or replacing the wiring harness or -individual wires, refer to the practical wiring diagrams, figure 1-6. Inspect all wiring installations for cracked or frayed insulation material. Pay particular attention to wires passing through holes in the frame or around sharp edges. Repair or replace defective wiring.

b. Testing. Test for continuity by disconnecting each end. Touch the test probe of a continuity tester or multimeter set on low OHMS range to each end of wire. If continuity is not indicated, repair or replace wire.

c. Repair. Remove insulation to expose ½ inch of bare wire on each side of break. Twist the wire ends together and solder the splice. Cover the splice with rubber or PVC electrical tape and friction tape marking

certain to cover all the repaired area. Replace broken terminal lugs with exact duplicates.

d. Replacement. Replace single wire by using exact duplicates of terminal lugs from old wire. If the wire is part of a harness assembly, disconnect the wire at both ends and tape ends. Attach the replacement wire to the outside of the harness with PVC electrical tape. Refer to figure 1-6 for practical wiring diagrams

.

Section II. REFRIGERANT SYSTEM

6-13. General

This section contains those items which are considered part of major components or auxiliaries of the air conditioner refrigerant system. They consist of expansion valves, solenoid valves, pressure sensing valves and switches, compressor assembly, electric motors and refrigerant tubing.

6-14. Pressure Testing Under Normal Operating Conditions

If the air conditioner is losing cooling capacity, or is in some. way not functioning properly, a check of refrigerant system operating pressures will frequently lead to cause of malfunction. Install pressure gages on gage ports of suction and discharge line access valves (fig. 5-11) and turn valves two turns to open, exposing gages to system pressure. Start air conditioner and compare gage readings with normal ranges or system pressures listed in table 61.

Table 6-1. Normal Operating Pressures

AMBIENT-DEGREES F	50°	75°	100°	125°
90°F DRY-BULB RETURN AIR TO UNIT				
Suction line (psig)	58-65	58-70	60-75	75-90
Discharge line (psig)	125-160	175-120	255-295	370-410
80°F DRY-BULB RETURN AIR TO UNIT				
Suction line (psig)	58-65	58-70	60-75	65-75
Discharge line (psig)	120-155	170-205	250-290	370-410

Note. Dry-bulb temperatures are measured with an ordinary thermometer.

6-15. Leak-Testing Refrigerant System

a. Electric or Halide Torch Leak Detector. The preferred method of testing for leaks in the refrigerant system is by using a halide torch. A halide detector is used by passing the exploring tube over sweat-soldered fittings, all mechanical couplings, and valves. If refrigerant is leaking from the system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or, a large leak may extinguish the torch. Mark all spots where leaks are detected. Drain the refrigerant system and repair the leak, and pressure test (para 6-28, 29, 30).

Warning: Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that Refrigerant-22 does not come in contact with the eyes. In case of refrigerant leaks, ventilate the area immediately.

b. Soap Solution Method. Operate the air conditioner, brush all possible points or leakage with soap solution, and watch for bubbles. Follow a definite sequence so all points will be thoroughly tested. Wipe the soap solution from all joints and mark any spot where a leak occurs. Drain the refrigerant system and repair leaks and pressure test (para 6-28, 29, 30).

6-16. Refrigerant Tubing and Fittings

a. The refrigerant tubes used on the air conditioner consist of copper tubing and the necessary fittings. The joints of the refrigerant tubes are soldered. Inspect the tubing for cracks and breaks. Replace any defective tubing with tubes of the same length, size, shape, and material. Test the installation of tubes and fittings for leaks. Replace rubber insulation as necessary. Note. If the refrigerant system has been open to the atmosphere, replace the dehydrator (para a-31). Pressure test and evacuate the system before charging (para -28, 29, 30).

b. If the refrigerant system must be opened for repairs or replacement of parts, open the suction line access valve and relieve the system pressure. Connect a hose line to the suction line access valve and purge the refrigerant to an outside area.

Warning: Avoid bodily contact with liquid Refrigerant-22 and avoid inhaling refrigerant gas. Be especially careful that Refrigerant-22 does not contact the eyes. In case of refrigerant leaks, ventilate the area immediately.

c. After purging the system allow the tubing to warm to ambient temperature before opening the system; this delay will help prevent the for-

mation of condensation on the inside walls of the tubing. Plug or cap all openings as a part is removed to minimize the entry of dirt and moisture.

d. Use a silver solder on all soldered connections. Easy-Flo silver solder (or equivalent) with a 50 percent silver capacity and a melting point of approximately 1160°F is recommended. Continually pass dry nitrogen through the tubing or connections being soldered to prevent formation of harmful copper oxides.

e. After assembly of any flanged joint, apply one coat of Amer-coat No. 40 to the joint.

f. After assembly of piping, coat all copper to-aluminum joints with 3 coats Amer-coat No. 40 for a distance of one inch on each side of joint as well as the joint.

Note. Amer-coat may be force dried at a maximum temperature of 140°F.

g. When removing and installing the solenoid valves, direct flame away from the valve body to protect it from heat damage. Keep the flame on the outside of the distributor when disassembling or reassembling the expansion valve.

h. No metal to metal contact is allowable on capillary tubes; use tape to prevent such contact.

6-17. Thermal Expansion Valves

a. General. A 4 1/2-ton thermal expansion valve controls the rate of flow of liquid refrigerant into the evaporator coil during the cooling cycle of operation. The 2.1 ton thermal expansion valve functions when the unit is in the bypass cycle of operation. Each expansion valve is provided with a superheat setting or adjustment (10°F for each model) to assure efficiency in the refrigerant system.

Note. A gas is superheated whenever its temperature is higher than the temperature corresponding to its pressure at saturation. Example: Refrigerant-22 at 69 pounds pressure has a temperature of 40°F. If the suction pressure gage reads 69 pounds and the temperature of the suction tube reads 50°F, the gas is superheated 10OF.

b. Adjustment. Refer to figures 6-10 and 6-11 and check and adjust the superheat setting of the 4 1/2ton thermal expansion valve. The 2.1 ton thermal expansion valve adjusts in the same manner.

c. Testing.

(1) Stop the air conditioner and allow the suction line to warm up to ambient temperature. Remove the sensing bulb from its location against the suction line and place in an ice-water bath (820F).

(2) Start the air conditioner, remove the sensing bulb from the ice-water bath and warm by hand while feeling the suction line. If the suction line temperature drops, the valve is operating correctly. Stop air conditioner and reinstall the sensing bulb.

(3) If there is little or no change in suction line temperature, the valve is defective and must be replaced.

Caution: **Do not warm sensing bulb in hand longer than necessary to check operation of the valve. The valve is wide open or nearly so during this procedure and excessive flood-back of liquid refrigerant into the suction line will damage the compressor.**

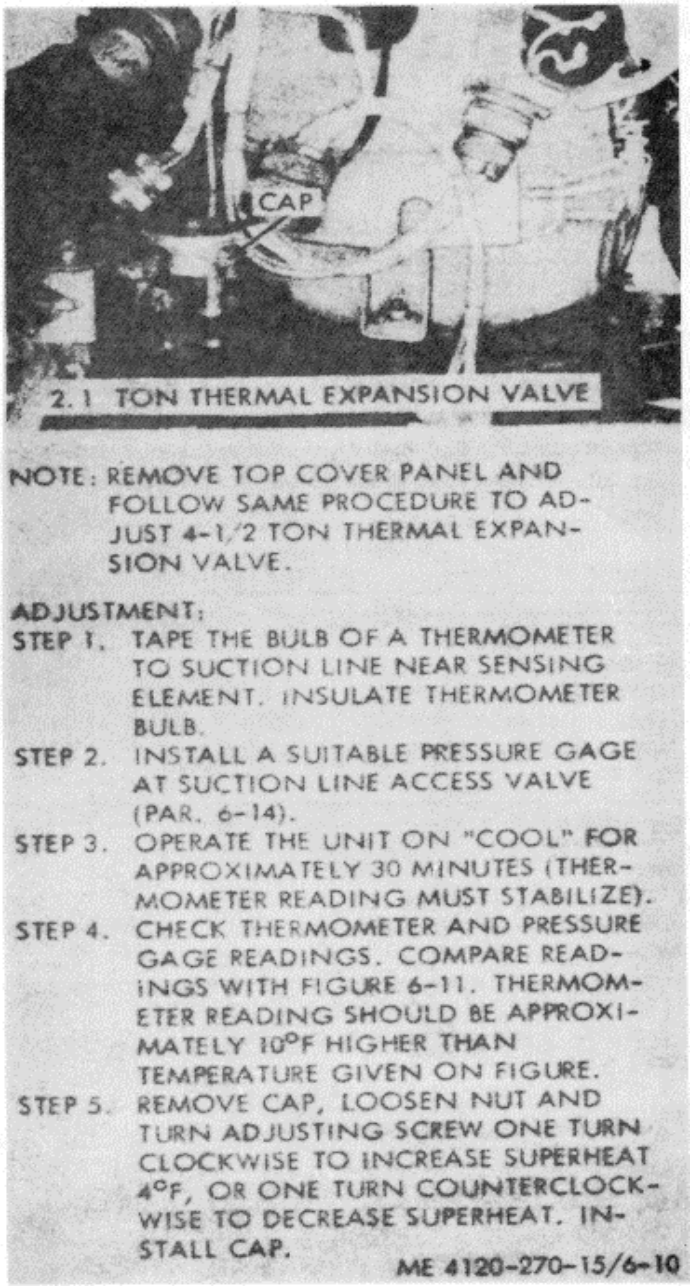


Figure 6-10. Thermal Expansion valve superheat adjustment

d. Removal. Discharge the refrigerant system (para 6-16) refer to figure 5-7, and remove the thermal expansion valves.

e. Installation. Replace defective expansion valves and install in reverse order of removal as illustrated in figure 5-7. Evacuate and recharge the unit refrigerating system (para 628, 29, 30).

6-18. Hot Gas Bypass Solenoid Valve

a. General. The hot gas bypass solenoid valve is a normally open, pilot operated valve which remains closed while the selector switch is on "COOL". The hot gas bypass valve opens whenever the selector switch is moved to another position, bypassing refrigerant gas under pressure in the discharge line to the compressor suction line. Moving the selector switch to "COOL" permits the hot gas bypass valve to close after the 30 second delay provided by the time delay relay.

b. On-Equipment Testing.

(1) Start the air conditioner. If the valve clicks closed, place hand on the downstream piping. If the piping begins to cool immediately, the valve is operating properly. Replace valve if it does not operate as specified.

(2) If the hot gas bypass solenoid valve fails to click closed after a 30-second delay, stop the unit and check the electrical connection and the solenoid coil.

(3) Refer to figure 5-8 and disconnect the electrical plug connector. Test the solenoid control coil at the electrical receptacle connector, placing a continuity tester or a multimeter set on low OHM range, across each pin. If continuity does not exist, remove valve and repair or replace control coil.

(4) Using a multimeter set on high OHMS range, measure resistance between one of the jack pins and the air conditioner frame. If resistance reading is less than 0.5 megohm, remove valve and repair or replace control coil.

c. Removal and Disassembly. Discharge refrigerant system (para 6-28), refer to figure 5-8 and remove and disassemble the hot gas bypass solenoid valve.

Caution: **Disassemble valve before attempting to remove tubing from valve to avoid heat distortion of internal parts.**

d. Reassembly and Installation. Replace any defective parts. Reassemble valve and install in reverse order of removal as illustrated on figure 5-8. Test, evacuate and recharge the refrigerant system (para 6-28, 29, 30).

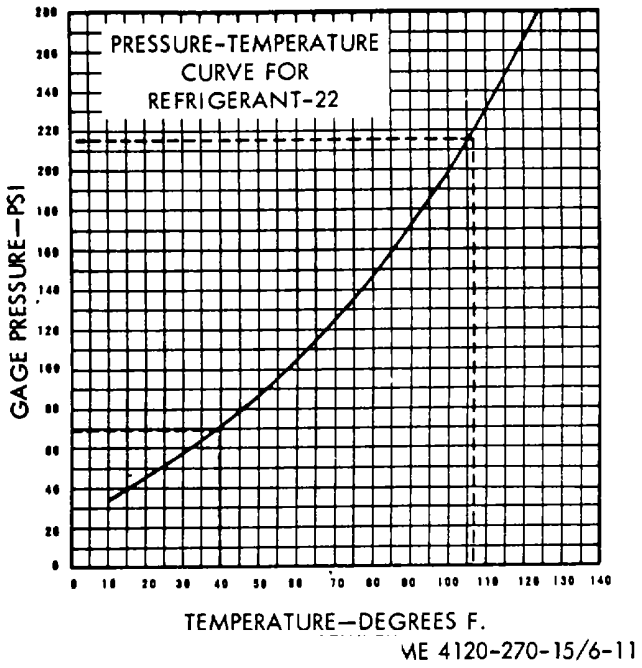


Figure 6-11. Pressure temperature curve for Refrigerant-22.

6-19. Liquid Line Solenoid Valve

a. General. The liquid line solenoid valve is a normally open pilot operated valve which automatically closes and opens on command from the air conditioner temperature control thermostat when the selector switch is on "COOL" position. In the open position, the liquid line solenoid valve allows flow of liquid refrigerant from the condenser to the evaporator coil. In the closed position, the liquid line solenoid valve blocks the flow of liquid refrigerant to the evaporator coil.

b. On-Equipment Testing.

(1) Turn the temperature selector thermostat 5°-10°F below ambient temperature to assure refrigerant system will operate on the cooling cycle. Start air conditioner and place hand on the dowstream piping. If the piping begins to warm immediately, the valve is operating properly. Replace valve if it does not operate as specified.

(2) Turn temperature control thermostat 5°-10°F above ambient temperature to place refrigerant system on bypass cycle. The liquid line solenoid valve should immediately click closed. Place hand on the downstream piping. If the piping begins to cool immediately the valve is operating properly. Replace valve if it does not operate as specified.

(3) If valve fails to click closed, stop air conditioner and test valve according to instructions in paragraph 618.

c. Removal and Disassembly. Discharge refrigerant system (para 6-28). Refer to figure 58 and remove and disassemble the liquid line solenoid valve.

Caution: **Do not remove tubing from valve to avoid heat distortion of integral parts.**

d. Reassembly and Installation. Replace any defective parts. Reassemble valve and install in reverse order of removal as illustrated on figure 5-8. Test, evacuate and recharge the refrigerant system (para 6-28, 29, 30).

6-20. Back Pressure Regulating Valve

a. General. The back pressure regulating valve (fig. 5-9), regulates refrigerant pressure in the evaporator to prevent coil freeze up. Valve is preset to establish a minimum pressure of 57.8 psig in the evaporator. The back pressure regulating valve also bypasses refrigerant gas from the discharge line to the suction line during bypass operation with the selector switch on "COOL".

b. Adjusting. Remove button plug from the back pressure regulating valve, (fig. 5-9), loosen the lock nut at the top of the valve and turn the adjusting screw. Tighten the lock nut after adjustment and check system operating pressures (para 6-14).

c. Removal. Refer to figure 5-9, and remove the back pressure regulator valve.

Note. Discharge the refrigerant before removing back pressure valve.

d. Installation. Replace a defective back pressure regulating valve and install in reversing order of removal as illustrated on figure 5-9. Test, evacuate and recharge refrigerant system (para 6-28, 29, 30).

6-21. High and Low Pressure Cutout Switches

a. General. The high pressure cutout switch prevents the compressor from operating if the head pressure exceeds 445 psig (pounds per square inch gage). The low pressure cutout switch prevents the compressor from operating if the suction line pressure drops below 7 psig.

b. Removal. Discharge the refrigerant system and remove high and low pressure cutout switches as illustrated in figure 5-10.

c. Testing. Test the pressure switches for continuity across the connector pins with a multimeter set on OHMS. If no continuity is indicated, press the reset button and recheck.

d. Installation. Replace defective pressure cutout switches in reverse order of removal as illustrated in figure 5-10. Test, evacuate and recharge the unit refrigerant system (para 6-28, 29, 30).

6-22. Pressure Relief Valve

a. General. The pressure relief valve (fig. 5-12) is located on a cross just above the dehydrator. The pressure relief valve protects the refrigerant system from excessive pressure. It is preset to open at a maximum pressure of 540 psig and is not adjustable.

b. Removal. Discharge the refrigerant system, refer to figure 5-12, and remove the pressure relief valve.

c. Installation. Replace a defective pressure relief valve by reversing order of removal as illustrated on figure 5-12. Pressure test, evacuate and recharge refrigerating system (para 6-28, 29, 30).

6-23. Evaporator Coil

a. General. The evaporator coil is mounted on the casing, directly behind the discharge grille. The coil must be removed from the air conditioner for repair or replacement. The coil is made of brazed aluminum and is of the finned plate configuration.

b. Removal. Refer to figure 5-5 and remove evaporator coil.

c. Cleaning, Inspection and Repair. Refer to paragraph 3-10 and clean and inspect the evaporator coil in a similar manner. Inspect coil for bent fins, damaged coil runs and internal leaks. Straighten bent fins with needle nose pliers. A damaged coil or an internally leaking coil cannot be repaired.

d. Installation. Replace a defective evaporator coil assembly and install in reverse order of removal as illustrated in figure 5-5. Test, evacuate and recharge refrigerating system (para 6-28, 29, 30).

6-24. Condenser Coil

a. General. The condenser coil is mounted horizontally on the bottom third of the casing, beneath the air filters. The coil must be removed from the air conditioner for repair or replacement. The coil is made from brazed aluminum and is of the finned plate configuration.

b. Removal. Refer to figure 5-s3, and remove condenser coil.

c. Cleaning, Inspection, and Repair. Refer to paragraph 3-11 and clean and inspect the condenser coil in a similar manner.

d. Installation. Replace a defective coil assembly and install in reverse order of removal as illustrated in figure 5-13. Test, evacuate and recharge refrigerating system (para 28, 29, 30).

6-25. Systems Access Valves

a. General. Two angle-type access valves (suction line and discharge line) provide access to the refrigerant system.

b. Removal. Discharge the refrigerant system and refer to figure 5-11 and remove the access valves.

c. Installation. Replace a defective valve and install valves in reverse order of removal as illustrated in figure 5-11. Test, evacuate and recharge the unit refrigeration system (para 628, 29, 80).

6-26. Compressor and Motor Assembly

a. General. The sole purpose of the compressor is to raise the pressure of refrigerant gas from evaporator pressure to condensing pressure. The function of the compressor i 'to deliver refrigerant to the condenser at a pressure and temperature at which the condensing process can readily be accomplished. The motor/compressor is a hermetically sealed unit and is not repairable in the field. An inoperative compressor is usually due to a mechanical failure causing the compressor to freeze, a control failure, or a motor burnout. If the motor/compressor is mechanically frozen or there has been a motor burnout, the compressor must be removed and replaced. When the motor of a hermetic compressor fails, high temperatures may develop within the compressor causing a breakdown of the oil and refrigerant, resulting in formation of acid, moisture, and sludge. All these are extremely. corrosive and must be flushed from the system. Repeated burnouts will occur if all of the contaminants are not removed.

b. Cleaning and Inspection. The immediate area around the compressor mounting should be thoroughly cleaned and dried. Examine all connections for foreign matter of any kind. Inspect area thoroughly.

Warning: Avoid bodily contact with the refrigerant, especially eye contact. Avoid inhalation of refrigerant fumes.

c. Removal. Discharge the refrigerant system, refer to figure 5-6, and remove the compressor. If there has been a burnout, flush system as described in e below prior to installation of new compressor.

d. Installation. Install a replacement compressor in reverse order of removal, as illustrated in figure 5-6. Pressure test, evacuate and recharge refrigerating system (para 6-28, 29, 30).

e. Flushing The System. After compressor motor burnout, flush the system as described below:

(1) Refrigerant-11, along with a small amount of dry nitrogen to force the refrigerant through the tubing, is recommended for flushing the system.

(2) Remove the dehydrator as described in paragraph 5-31.

(3) Flush the refrigerant tubing to remove all contaminants.

(4) The liquid line bypass and the hot gas bypass valves are normally open when deenergized. These valves must be open to allow the flushing refrigerant to flow through the tubing.

6-27. Compressor Crankcase Heater

a. General. The compressor crankcase heater is designed to prevent refrigerant sludging. It ,provides heat to prevent sludging and oil pumping problems when the compressor is exposed to low ambient temperatures. It is a 208 volt, 120 watt resistance heater enclosed within tubing and protected by a thermally insulated cover.

b. Removal. Refer to paragraph 5-24, and remove the compressor. Refer to figure 6-12 and remove the crankcase heater.

c. Installation. Replace defective heater and install in reverse order of removal as illustrated in figure 6-12. Refer to paragraph 524, and install the compressor. Test, evacuate and recharge the refrigerant system (para 6-28, 29, 30).

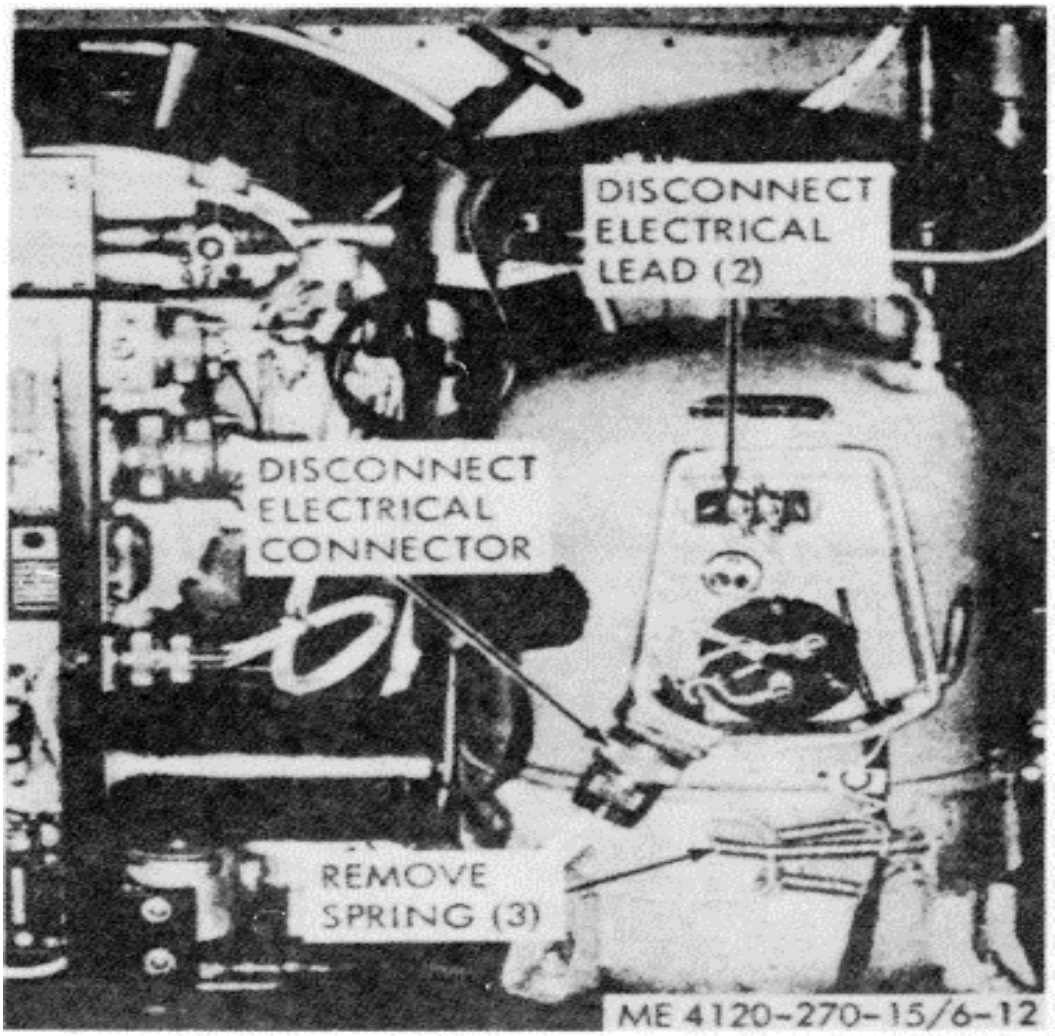


Figure 6-12. Compressor crankcase heater, removal and installation.

Section III. OSCHARGING, PRIESSURE TESTING, EVACUATING AND RECHARGING THE REFRIGERANT SYSTEM

6-28. Discharging the Refrigerant System

Attach a suitable hose to the suction line access valve (fig 5-11) and discharge the refrigerant into a safe area.

Warning: Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that Refrigerant-22 does not come in contact with the eyes In case of refrigerant leaks, ventilate the area immediately.

6-29. Pressure Testing and Evacuating the Refrigerant System

Discharge system (para 6-16). Refer to figure 6-13), end pressure test and evacuate the refrigerant system.

6-30. Charging the Refrigerant System

Refer to figures 6-14 and 6-15; charge the refrigerant system.

Note. Capacity of refrigerant sys is 286.9 lb Refigerant 22 FSN 6830174-9677.

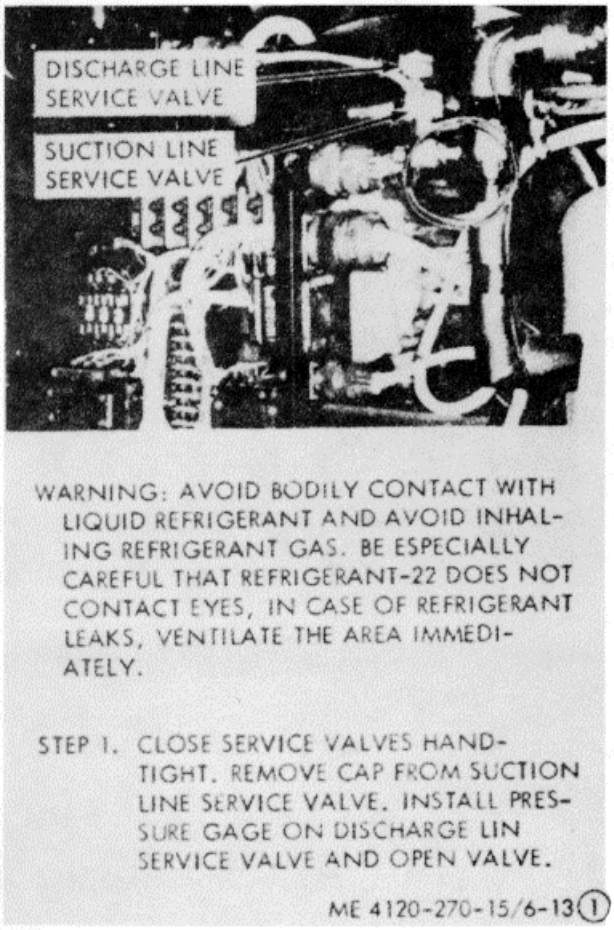
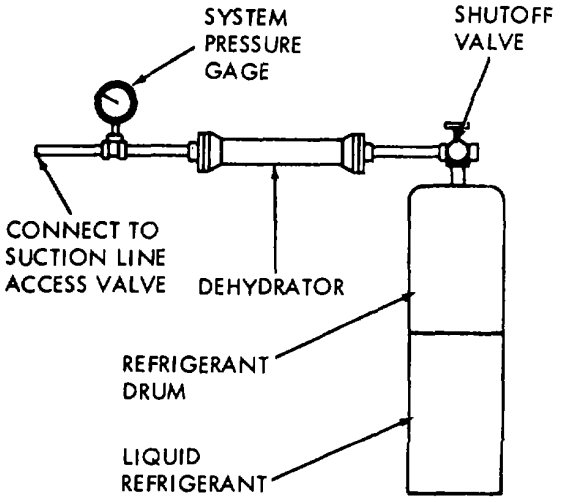


Figure 6-13 (1). Pressure testing and evacuating refrigerant system



STEP 2. CONNECT HOSE FROM REFRIGERANT CHARGING HOOKUP LOOSELY TO SUCTION LINE SERVICE VALVE. OPEN REFRIGERANT DRUM SHUTOFF VALVE SLIGHTLY TO PURGE HOSE. TIGHTEN CONNECTJON AT SERVICE VALVE. OPEN DRUM SHUTOFF VALVE AND OPEN SUCTION LINE SERVICE VALVE.

NOTE: REFRIGERANT DRUM MUST BE IN UPRIGHT POSITION TO ALLOW ONLY GASEOUS REFRIGERANT TO ENTER SYSTEM.

STEP 3. CLOSE THE DRUM SHUTOFF VALVE WHEN THE DISCHARGE LINE PRESSURE GAGE REACHES 10 PSIG. CLOSE SUCTION LINE SERVICE VALVE AND DISCONNECT CHARGING HOSE FROM VALVE.

STEP 4. CONNECT HOSE FROM PRESSURE TESTING HOOKUP LOOSELY TO SUCTION LINE SERVICE VALVE. OPEN NITROGEN DRUM SHUTOFF VALVE SLIGHTLY TO PURGE HOSE. TIGHTEN CONNECTION AT SUCTION LINE SERVICE VALVE. OPEN SHUTOFF VALVE AND SUCTION LINE SERVICE VALVE. BUILD UP SYSTEM PRESSURE UNTIL DISCHARGE LINE PRESSURE REACHES 150 PSIG. CLOSE SUCTION LINE SERVICE VALVE AND SHUTOFF VALVE. DISCONNECT CHARGING HOSE FROM SUCTION LINE SERVICE VALVE. CLOSE DISCHARGE LINE SERVICE VALVE AND REMOVE GAGE.

STEP 5. TEST FOR LEAKS (PAR. 6-15). DISCHARGE THE REFRIGERANT SYSTEM (PAR. 6-16).

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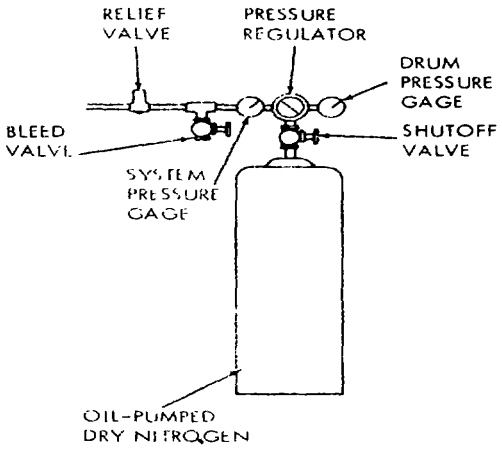
Figure 6-13 (2).—Continued..



STEP 6. REMOVE CAP FROM DISCHARGE SERVICE VALVE. ATTACH A SUITABLE VACUUM PUMP TO SUCTION LINE SERVICE VALVE. AND A MANOMETER TO THE DISCHARGE LINE SERVICE VALVE. OPEN THE SERVICE VALVES AND OPERATE THE VACUUM PUMP UNTIL THE MANOMETER INDICATES 2.6 MM HG.ABS. (MILLIMETERS OF MERCURY, ABSOLUTE),

STEP 7 CLOSE THE SUCTION LINE SERVICE VALVE AND STOP THE PUMP. ATTACH HOSE FROM REFRIGERANT DRUM, PURGE AIR FROM LINE WITH REFRIGERANT AND SLOWLY BREAK THE VACUUM BY OPENING THE SUCTION LINF SERVICE VALVE UNTIL MANOMETER INDICATES 760 MM HG. ABS. CLOSE SUCTION SERVICE VALVE. NOTE. RISE IN PRESSURE WILL BE INFLUENCED BY AMBIENT TEMPERATURE. MAKE SURE VACUUM IN SYSTEM IS COMPLETELY RELIEVED BEFORE REEVACUATING.

STEP 8. REMOVE REFRIGERANT DRUM AND CONNECT VACUUM PUMP TO SUCTION LINE SERVICE VALVE. PURGE AIR FROM HOSE, START PUMP AND OPEN SUCTION LINE SERVICE VALVE OPERA1E PLUMP UNTIL MANOMEIER AGAIN READS 2 5 MM HG.ABS.

STEP 9. CLOSE SUCTION LINE SERVICE VALVE AND ALLOW UNIT TO STAND UNDER VACUUM FOR APPROXIMATELY 12 HOURS. IF NO NOTICEABLE RISE IN PRESSURE OCCURS, THE SYSTEM IS READY FOR CHARGING. CLOSE SERVICE VALVES AND REMOVE VACUUM PUMP AND MANOMETER INSTALL SERVICE VALVE CAPS.

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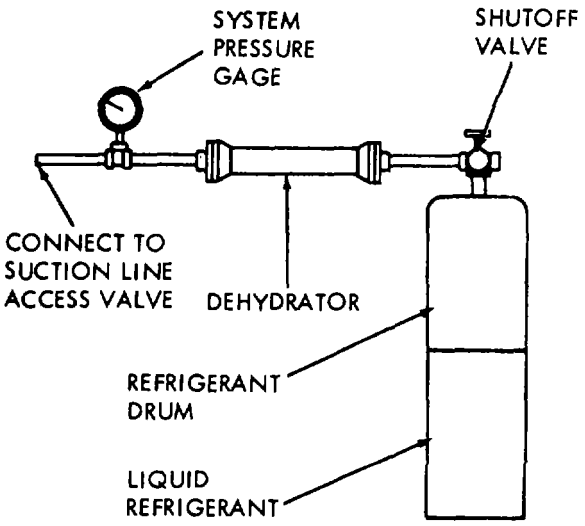
Figure 6-13 (3) -Continued.

Figure 6-14 (1). Charging refrigerant system.



STEP 2. CONNECT A SUITABLE REFRIGERANT CHARGING PRESSURE MANIFOLD TO THE REFRIGERANT CHARGING HOOKUP. CONNECT SERVICE HOSES FROM MANIFOLD LOOSELY TO SERVICE VALVES. OPEN REFRIGERANT DRUM SHUTOFF VALVE SLIGHTLY TO PURGE HOSES. TIGHTEN HOSE CONNECTIONS AT CHARGING VALVES. CONNECT A PRESSURE GAGE TO THE SUCTION LINE-SERVICE VALVE.

NOTE: SET REFRIGERANT DRUM IN AN UP- RIGHT POSITION SO THAT ONLY GASEOUS REFRIGERANT WILL ENTER SYSTEM. TO FACILITATE SPEED OF CHARGING, SET REFRIGERANT DRUM IN WARM WATER. NEVER USE A HEATING TORCH FOR THIS PURPOSE.

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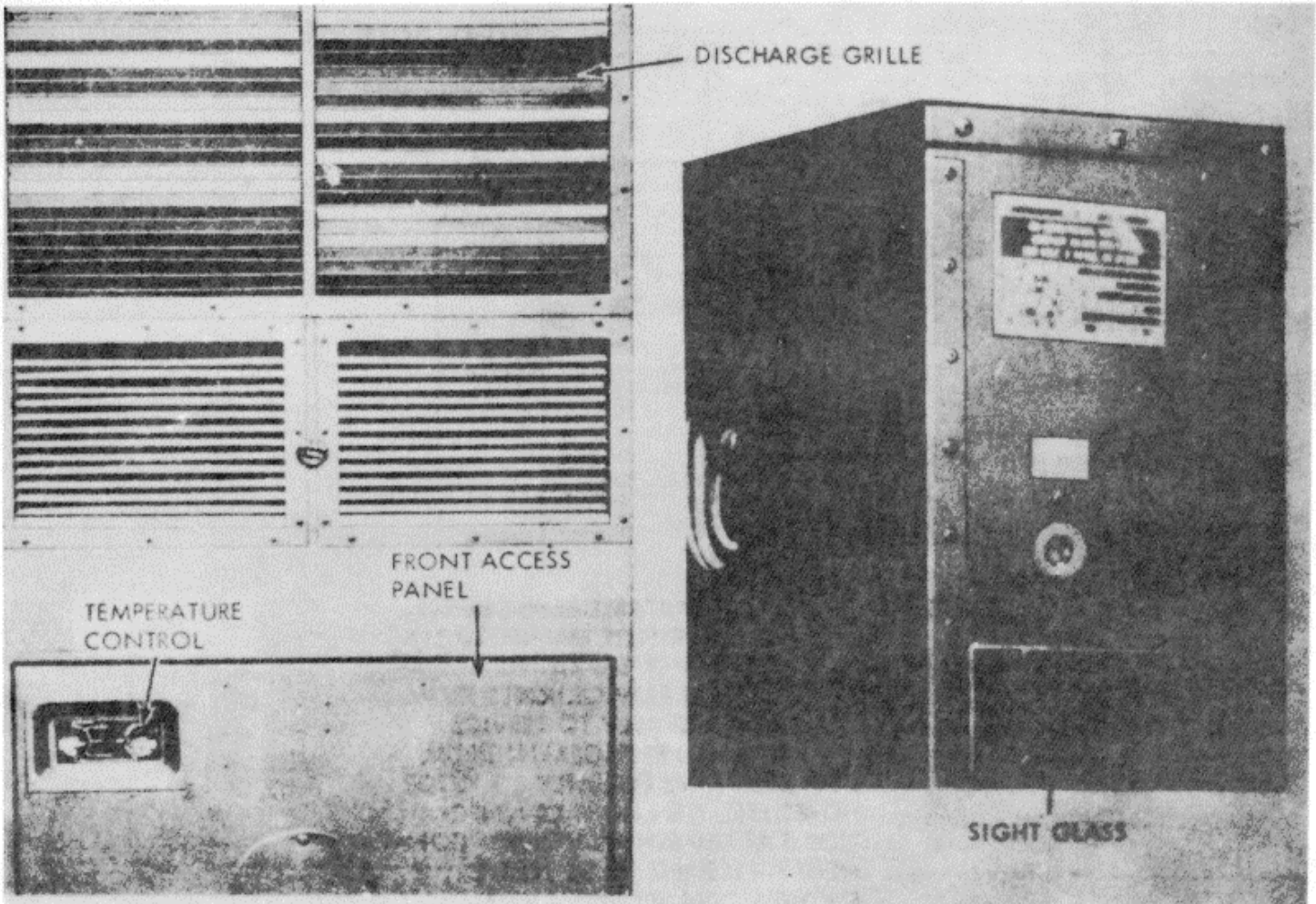
Figure 6-14 (2)--Continued



NOTE: SET TEMPERATURE CONTROL ABOVE AMBIENT TEMPERATURE TO INSURE UNIT OPERATES CONTINUOUSLY ON COOLING CYCLE.

STEP 3. OPEN REFRIGERANT DRUM SHUTOFF VALVE AND SERVICE VALVE. START UNIT (PAR. 2-11) AND WEIGHT IN 26.9 LB CHARGE OF REFRIGERANT-22. CONTINUE ADDING REFRIGERANT SLOWLY UNTIL SIGHT GLASS INDICATES FULL.

NOTE: OPERATE UNIT IN "COOL" POSITION ONLY DURING CHARGING OPERATION.

STEP 4. PARTIALLY BLOCK EVAPORATOR DISCHARGE GRILLE WITH A CARDBOARD BAFFLE. ADJUST BAFFLE UNTIL SUCTION LINE PRESSURE GAGE READS 55 PSIG. CONTINUE ADDING REFRIGERANT-22 SLOWLY, WHILE MAINTAINING 55 PSIG SUCTION PRESSURE BY ADJUSTING THE BAFFLE, UNTIL THE DISCHARGE PRESSURE GAGE READING OBTAINED CORRESPONDS TO THE AMBIENT TEMPERATURE (FIG. 6-15).

STEP 5. CLOSE SERVICE VALVES AND CLOSE REFRIGERANT DRUM SHUTOFF VALVE. STOP THE UNIT (PAR. 2-12). DISCONNECT CHARGING MANIFOLD HOSES FROM SERVICE VALVES. INSTALL VALVE CAPS (STEP 1).

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Figure 6-14 (3.)--Continued

DISCHARGE PRESSURE
AT CONSTANT 55" PSIG SUCTION
ANBIENT FROM 70° TO 125°F

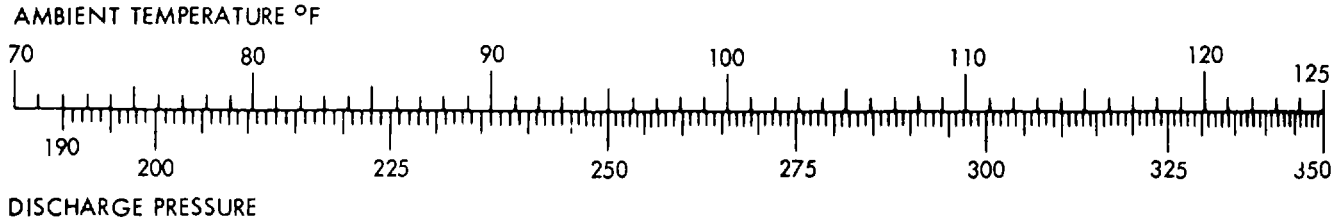

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*Figure 6-15. Discharge pressure at constant 55 psi suction, ambient temperatures 70°*F to 120°F.

CHAPTER 7
SHIPMENT, ADMINISTRATIVE STORAGE AND DEMOUTION TO PREVENT ENEMY USE

Section I. SHIPMENT AND ADMINISTRATIVE STORAGE

7-1. General
The placement of equipment in administrative storage can be for short periods of time' when a shortage of maintenance effort exists. Items placed in administrative storage should be ready for use within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

7-2. Preparation for Administrative Storage
Refer to TM 740-90-1, Administrative Storage of Equipment, for detailed instructions on preparation of the air conditioner for administrative storage and maintenance during storage.

7-3. Preparation of Equipment for Shipment
a. Preservation. Clean, paint, preserve, and weatherproof in accordance with applicable requirement of TM 740-90-1.

b. *Packing.* Pack the basic issue items, components, and publications in a suitable container and secure to air conditioner. Refer to T3I 38230 for guidance in selection, fabrication, and packing of the container.

c. Marking. Mark in accordance with MIL-STD-129.

d. Loading. Load, block, brace, and tiedown heater in accordance with carrier rules and regulations.

Section II. DEMOLITION OF MATERIAL TO PREVEN1

7-4. General
a. When capture or abandonment of the air conditioner is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of demolition. Whatever method of demolition is employed, it is essential to destroy the same vital parts of air conditioner and all corresponding repair parts. When the lack of time or personnel prevents complete destruction of the equipment, the following priorities will be used in the demolition of essential parts. Priorities for demolition:

Priorities	Part
I.....	Evaporator coil and condenser coils
2.....	All motors
3.....	Compressor
4.....	Tubing
5.....	Cables and wiring

b. The above priorities were established by International Standardization Agreement---STANAG 2113. Accordingly, no departure may be made from the agreement without permission of the Military Agency for Standardization, North Atlantic Treaty Organization.

7-5. Demolition to Render the Equipment Inoperative
a. Demolition by mechanical means. Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available.

b. Demolition by misuse. Perform the following steps to render the air conditioner inoperative.

(1) Loosen compressor discharge and suction valve attaching bolt and run compressor until it fails.

(2) Bend fan blades housing to prevent fan blades from turning.

7-6. Demolition by Explosive or Weapons Fire
a Explosive. Place as many of the charges as the situation permits, and detonate them simultaneously with a detonating cord and a suitable detonator.

b. Weapons fire. Fire on the air conditioner, using the heaviest practical weapon available.

7-7. Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible parts and wiring, and scatter them through dense foliage, bury them, or throw them in a body of water.

b. Burning. Pack rags, clothing, or paper under and around the air conditioner. Saturate this packing with gasoline, oil, or diesel fuel, and ignite.

c. Submersion. Completely submerge the air conditioner in a body of water to provide water damage and concealment. Salt water does greater damage to metal parts than fresh water.

7-8. Training

All operators should receive thorough training in the demolition of the air conditioner. Refer to FM 525. Simulated demolition using all of the methods listed above should be included in the operator-training program. It must be emphasized, in training, that demolition operations are usually necessitated by critical situations when time available for carrying out demolition is limited. For this reason, operators must be thoroughly familiar with all methods of demolition of equipment and must be able to carry out demolition instructions without reference to this or any other manual.

APPENDIX A
REFERENCES

A-1. Painting

TM 9-213	Painting Instructions for Field Use

A-2. Radio Suppression

TM 11-488	Radio Interference Suppression

A-3. Maintenance

TM 38-750	Army Equipment Record Procedures
TM 5-764	Electric Motor and Generator Repair

A-4. Shipment and Storage

TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TM 74090-1	Administrative Storage of Equipment
TM 38-230	Preservation, Packaging, and Packing of Military Supplies and Equipment

APPENDIX B
BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B1. Scope

This appendix lists items which accompany the air conditioner or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items-Section II. A list of items which accompany the air conditioner and are required by the operator/crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies--Section 111. (Not applicable)

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

A Source, Maintenance, and Recoverability Codes (SMR), Column (1):

(1) Source code, indicates the selection status and source for the listed item. Source code is:

Coder	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	-- Operator/crew

b. Federal Stock Number, Column (2). This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column (3). This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parenthesis.

d. Unit of Measure (u/m), Column (4). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit, Column (5). This column indicates the quantity of the item used in the functional group or the assembly group.

f. Quantity Furnished With Equipment, Column (6). This column indicates the quantity of an item furnished with the equipment.

g. Illustration, Column (7). This column is divided as follows:

(1) Figure Number, Column (7)(a). Indicates the figure number of the illustration in which the item is shown.

(2) Item Number, Column (7) (b). Indicates the callout number used to reference the item in the illustration.

8-4. Federal Supply Code for Manufacturers

98906 ---- Military Standards
97403 ---- Army Engineers Research and Development Laboratories, FL Belvoir, Va.

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal Stock Number	(3) Description	(4) Unit of Meas	(5) Qty inc in Unit	(6) Qty furn with equip	(7) Illustration (A) Fig no.	(7) Illustration (B) Item No.
PC	622069-9618	CASE: Maintenance and operational manual,, cotton duck, water repellent, mildew resistant, MILB-11748B	ea		1		
PC		Department of the Army Operator Organizational, Direct and General Support and Depot Maintenance Manual TM 64120-270-15	ea		1		
PC		Blockoff Plate, remote control operation 13214E8865-2 (9740S)	ea		1		
PC		Connector, Plug MS3106R2-17S (96906)	ea		1		

APPENDIX C
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III not applicable.

d. Section IV not applicable.

C-2. Explanation of Columns in Section II

a. Group Number, Column (1). The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TM 750-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group, Column (2). This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows: C-Operator or crew

O..... Organizational maintenance
F ..... Direct support maintenance
H..... General support maintenance
D..... Depot maintenance

The maintenance functions are defined as follows:

A--Inspect: To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B--Test: To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C-Service: To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D--Adjust: To rectify to the extent necessary to bring into proper operating range.

E--Aline: To adjust specified variable elements of an item to bring to optimum performance.

F--Calibrate: To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the 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 with the certified standard.

G--Install: To act up for use in an operational environment such as an emplacement, site, or vehicle.

H--Replace: To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I--Repair: To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J--Overhaul: To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K--Rebuild: To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original man

ufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment, Column (4). This column is provided for referencing by code the special tools and test equipment, (sec. III) required to perform the maintenance functions (sec. II).

e. Remarks, Column (5). This column is provided for referencing by code the remarks (se.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance function A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and equipment	(5) Remarks
40	ELECTRIC MOTORS													
4000	Motor assembly:													
	Motor assy, condenser	--	0	--	--	--	--	--	0	F				
	Motor assy, evaporator	--	0	--	--	--	--	--	0	F				
4002	Stator assemblies:													
	Stator, blower motor	--	F	--	--	--	--	--	F					
4006	Starting & protective devices:													
	Protector overload	--	F	--	--	--	--	--	F					
4009	Control panels, housing, cubicles:													
	Control panel assembly	--	--	--	--	--	--	--	F	F				
52	REFRIGERATION & AIR CONDITIONING COMPONENTS													
5200	Gas compressor assembly:													
	Compressor assembly	--	F	F	--	--	--	--	F					
5217	Refrigerant piping:													
	Tubing, copper	--	F	--	--	--	--	--	F					
	Valve, regulating	--	F	--	F	--	--	--	F					
	Valve, solenoid	--	F	--	--	--	--	--	F	F				
5230	Condenser:													
	Condenser assembly	--	F	O/C		--	--	--	F					
5241	Evaporator:													
	Eliminator, mist	--	--	O/C		--	--	--	0					
	Evaporator assembly	--	F	--	--	--	--	--	F					
	Valve, expansion	--	F	--	F	--	--	--	F					
5245	Air Filters:													
	Filters	--	--	O/C		--	--	--	O					

INDEX

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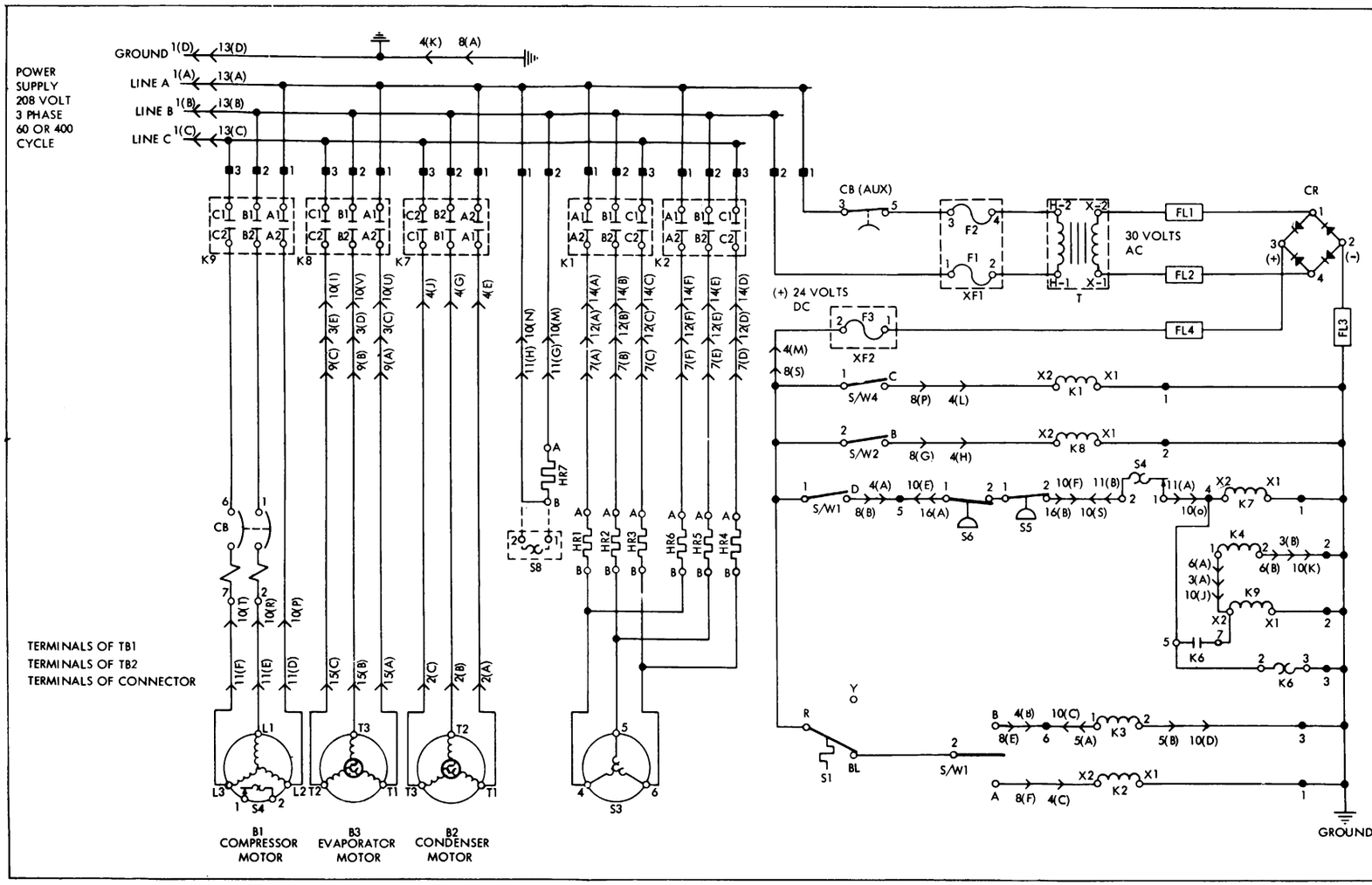

LEGEND	
SYMBOL	DESCRIPTION
B1	COMPRESSOR MOTOR
B2	CONDENSER MOTOR
B3	EVAPORATOR MOTOR
CB	CIRCUIT BREAKER
CR	RECTIFIER, SEMICONDUCTOR DEVICE
F1, F2, F3	FUSE
FL1–4	FILTER, RFI
HR1–6	HEATING ELEMENT
HR7	HEATING ELEMENT, CRANKCASE
K1, K2	RELAY, 25 AMP, HEATER
K3	VALVE, SOLENOID, LIQUID LINE
K4	VALVE, SOLENOID, HOT GAS
K6	RELAY, TIME DELAY
K7	RELAY, 50 AMP CONDENSER
K8	RELAY, 25 AMP EVAPORATOR
K9	RELAY, 50 AMP COMPRESSOR
S/W1 - S/W4	SWITCH, ROTARY
S1	THERMOSTAT
S3	THERMOSTAT - HEATING ELEMENT
S4	THERMOSTAT - COMPRESSOR MOTOR
S5	SWITCH, HIGH PRESSURE CUTOUT
S6	SWITCH, LOW PRESSURE CUTOUT
S8	THERMOSTAT, WHEN REQUIRED
T	TRANSFORMER
XF1, XF2	FUSEHOLDER

SWITCH POSITION						
	CONTACT NO.	1 HI HEAT	2 LO HEAT	3 OFF	4 VENT	5 COOL
S/W1	2 & A	CLOSED	CLOSED	OPEN	OPEN	OPEN
	2 & B	OPEN	OPEN	OPEN	OPEN	CLOSED
	1 & D	OPEN	OPEN	OPEN	OPEN	CLOSED
S/W2	2 & B	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
S/W4	1 & C	CLOSED	OPEN	OPEN	OPEN	OPEN

MEC 4120-270-15/1-6 (3)

Figure 1-6(3).—Continued.

SAFETY PRECAUTIONS

Before Operation

Disconnect air conditioner from power source before performing maintenance on components of unit.

During Operation

If air conditioner is stopped during operation, wait 5 minutes before restart.

After Operation

Disconnect air conditioner from power source before performing maintenance on components of unit.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be careful that Refrigerant-22 does not contact eyes. In case of leaks, ventilate area immediately.

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