TM 5-4120-239-14

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT **AND GENERAL SUPPORT MAINTENANCE MANUAL** AIR CONDITIONER, **HORIZONTAL COMPACT, 9,000 BTU (TRANE MODELS) 208V, 3 PHASE, 50/60** HERTZ, **MODEL MAC6H9-208-11O1-O3 (FSN4120-411-5444)**

208V, 3 PHASE, 400 HERTZ,
MODEL MAC4H9-208-1101-04
(FSN 4120-411-5445)

115V, 1 PHASE, 50/60 HERTZ,
MODEL MAC6H9-115-1101-01
(FSN 4120-411-5442)

230V, 1 PHASE, 50/60 HERTZ,
MODEL MAC6H9-230-1101-02
(FSN 4120-411-5443)

This copy is a reprint which includes current pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
9 SEPTEMBER 1971

WARNING

HIGH VOLTAGE

is used in the operation of this equipment,

DEATH ON CONTACT

or severe injury may result if personnel fail to observe safety precautions.
Always disconnect the air conditioner from power source before performing maintenance on this equipment.
Do not operate the air conditioner without louvers, top covers, and guards in place and tightly secured.

WARNING

REFRIGERANT U'NDER PRESSURE

is used in the operation of this equipment,

DEATH

or severe injury may result if personnel fail to obscrve safety precautions.
Never use' a heating torch on any part that contains refrigerant-22.
Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

CHANGE

NO. 3

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

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

AIR CONDITIONER, HORIZONTAL, COMPACT, 9,000 BTU,
TRANE MODELS, 208 VOLT, 3 PHASE, 50/60 HERTZ
MODEL MAC6H9-208-1 101-03, NSN 4120-00411-5444
208 VOLT, 3 PHASE, 400 HERTZ
MODEL MAC4H9-208-11 01-04, NSN 4120-00-41 1–5445
115 VOLT, 1 PHASE, 50/60 HERTZ
MODEL MAC6H9-115-1101-01, NSN 4120-00-41 1–5442,
230 VOLT, 1 PHASE, 50/60 HERTZ
MODEL MAC6H9-230-11 01-02, NSN 4120-00-41 1–5443

Approved for public release; distribution is unlimited

TM 5-4120-239-14, 9 September 1971, is changed as follows:

Page 1-1, paragraph 1-3 is superseded as follows:

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 6-1 is changed as follows:

. Paragraph 6-3b, ***Discharging and Purging System,*** add the following note:

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.

Page 6-2 is changed as follows:

. Figure 6-1, ***Discharging and Purging System,*** the discharging portion of this illustration is superseded as follows:

Connect and operate recovery/recycle unit in accordance with the manufacturer's instructions.

Page 6-3 is changed as follows:

. Paragraph 6-3c, *Charging the System,* insert the following note:

NOTE

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

Page 6-4 is changed as follows:

. Figure 6-2, Charging the System, (sheet 1 of 2), insert the following note:

NOTE

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

Page B–5 is changed as follows:

- Add following text to SECTION Ill. TOOLS AND TEST EQUIPMENT REQUIREMENTS is as shown:

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

01657

DISTRIBUTION:
To be distributed in accordance with DA Form 12–25E, qty rqr block no. 5800.

TM 5-4120-239-14
C 2

CHANGE NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
W.ASHINGTON, DC, 14 March 1975

Operator's, Organizational, Direct Support, and General Support Maintenance Manual AIR CONDITIONER, HORIZONTAL COMPACT, 9,000 BTU, TRANE MODELS, 208 VOLT, 3 PHASE, 50/60 HERTZ MODEL MAC6H9-208-1 101-03, NSN 4120-00-411-5444,208 VOLT, 3 PHASE 400 HERTZ MODEL MAC4H9-208-1101-O4, NSN 4120-00-411-5445, 115 VOLT, 1 PHASE, 50/60 HERTZ MODEL MAC6H9-115-1101-O1 , NSN 4120-00-411-5442,230 VOLT, 1 PHASE, 50/60 HERTZ MODEL MAC6H9-230-1101-02 NSN 4120-00-411-5443

TM 54120-239-14,9 September 1971, is changed as follows:

The title is changed as shown above.
Page 2 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 a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation in its proximity, precautions should be taken to adequately ventilate the area. An exhaust system equivalent to that of a 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*
Chiet 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. 533) Operator maintenance requirements for Environmental Equipment, Air Conditioners, 9,000 BTU.

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. *4 April 1973*

Operator, Organizational, Direct Support and General Support Maintenance

AIR CONDITIONER, HORIZONTAL, COMPACT; 9,000 BTU (TRANE MODELS)
208V, 3-PHASE, 50/60 HERTZ (MODEL MAC649-208-1101-03)
FSN 4120-411-5444
208V, 3-PHASE, 400 HERTZ (MODEL MAC4H9-208-1101-04)
FSN 4120-411-5445
115V, 1-PHASE, 50/60 HERTZ (MODEL MAC6H9-115-1101-01)
FSN 4120-411-5442
230V, 1-PHASE, 50/60 HERTZ (MODEL MAC6H9-230-1101-02)
FSN 4120-411-5443

TM 5-4120-239-14, 9 September 1971, is changed as follows:

Page C-1. Appendix C is superseded.

APPENDIX C

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

C-1. Scope

This appendix lists items required by the operator for operation of the air conditioner.

C-2. General

This 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 of items in alphabetical sequence, which at the discretion of the unit commander may accompany the air conditioner. These items are NOT SUBJECT TO TURN-IN with the air conditioner when evacuated.

C-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 Recoverablilty Code (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 two 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 Furnished with Equipment (BILL). Not applicable.

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

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description Ref No. & Mfr code Usable on code	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE: Maintenance and Operation Manuals	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. 533) operator's maintenance requirements for Air Conditioners: 9000 BTU.

TECHNICAL MANUAL
No. 5-4120-239-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D. C., 9 September 1971

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, HORIZONTAL COMPACT, 9,000 BTU

(TRANE MODELS)

208V, 3 PHASE, 50/ 60 HERTZ, MODEL MAC6H9-208-1101-03

(FSN 4120-411-5444)

208V, 3 PHASE, 400 HERTZ, MODEL MAC4H9-208-1101-04

(FSN 4120-411-5445)

115V, 1 PHASE, 50/60 HERTZ, MODEL MAC6H9-115-1101-01

(FSN 4120-411-5442)

230V, 1 PHASE, 50/60 HERTZ MODEL MAC6H9-230-1101-02

(FSN 4120-411-5443)

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. These instructions are published for the use of the personnel to whom the Trane Company Models MAC6H9-115-1101-01, MAC6H9-230-1101-02, MAC6H9-208-1101-03, and MAC4H9-208-1101-04 Air Conditioners are issued. Chapters 1 through 4 provide information on the operation, preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapters 5 and 6 provide information for direct and general support maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. The Organizational, Direct, and General Support Maintenance Repair Parts are listed and illustrated in TM 5-4120-239-34P (when printed).

c. Preparation, care and removal of equipment in administrative storage will be in accordance with the applicable requirements of TM 740-90-1 (Administrative Storage of Equipment).

d. Instructions for destruction of material to prevent enemy use will be in accordance with TM 750-244-3 (Procedures for Destruction of Equipment to Prevent Enemy Use).

1-2. Forms and Records

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

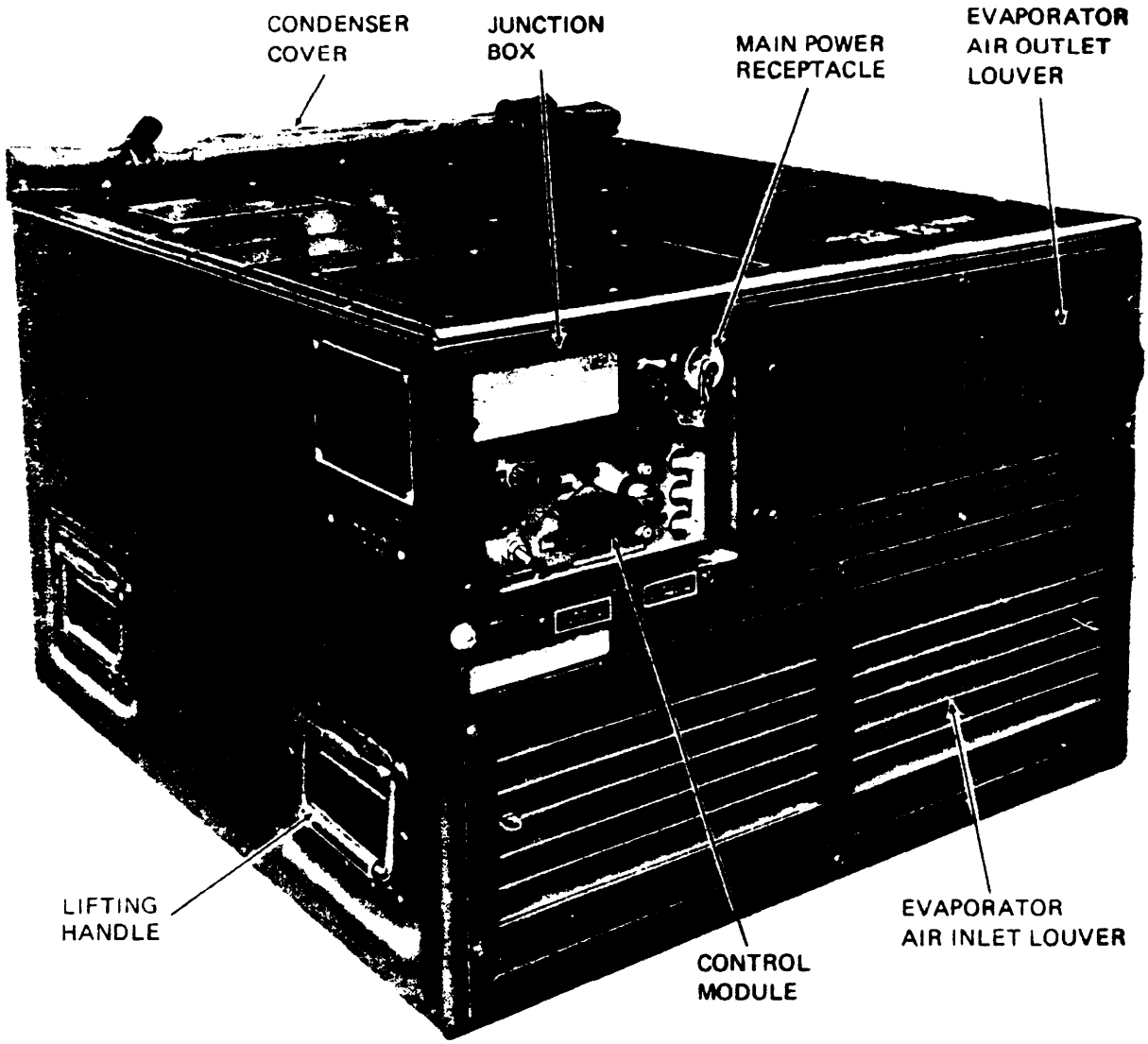
1-3. Reporting of Errors

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 Publications) and forwarded direct to the Commanding General, U. S. Army Mobility Equipment Command, ATTN: AM SME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo, 63120.

Section II. DESCRIPTION AND DATA

1-4. Description

a. General. Air conditioners, Models MAC6H9-115-1101-01, MAC6H9-230-11 01-02, MAC6H9-208-1101-03, and MAC4H9-208-1101-04 (fig. 1-1 thru 1-3) are lightweight, compact, horizontal units designed for cooling and heating air to a desired pre-determined range and circulating the conditioned air to provide heating or cooling of equipment or personnel within the air conditioned area.



SHIPPING DIMENSIONS	
LENGTH	26.0 inches
HEIGHT	16.0 inches
WIDTH	23.8 inches
VOLUME	5.7 cubic feet
WEIGHT	200 pounds

ME-4120-239-14/1-I

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

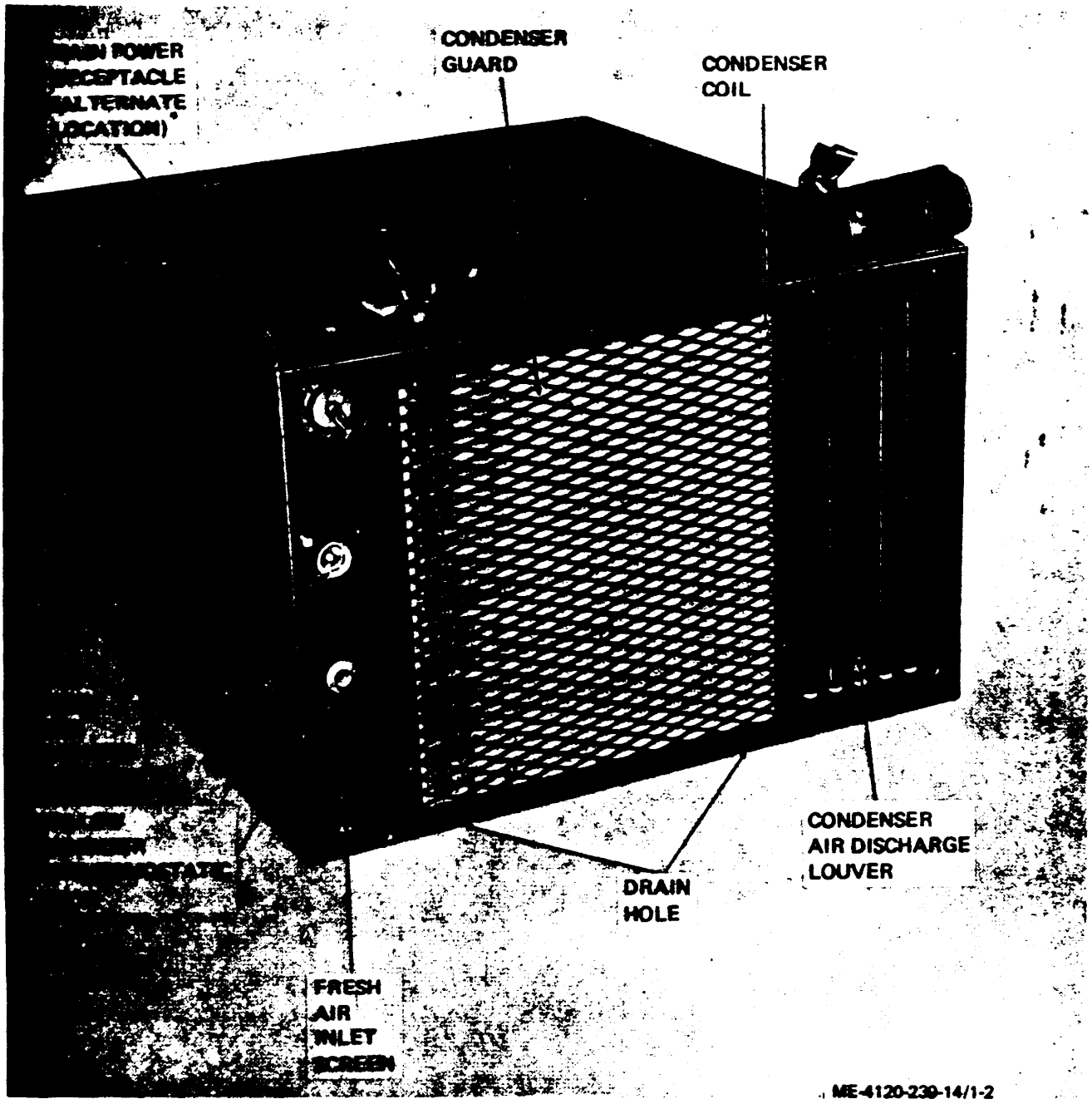


Figure 1-2. Air conditioner, right rear 3/4 view.

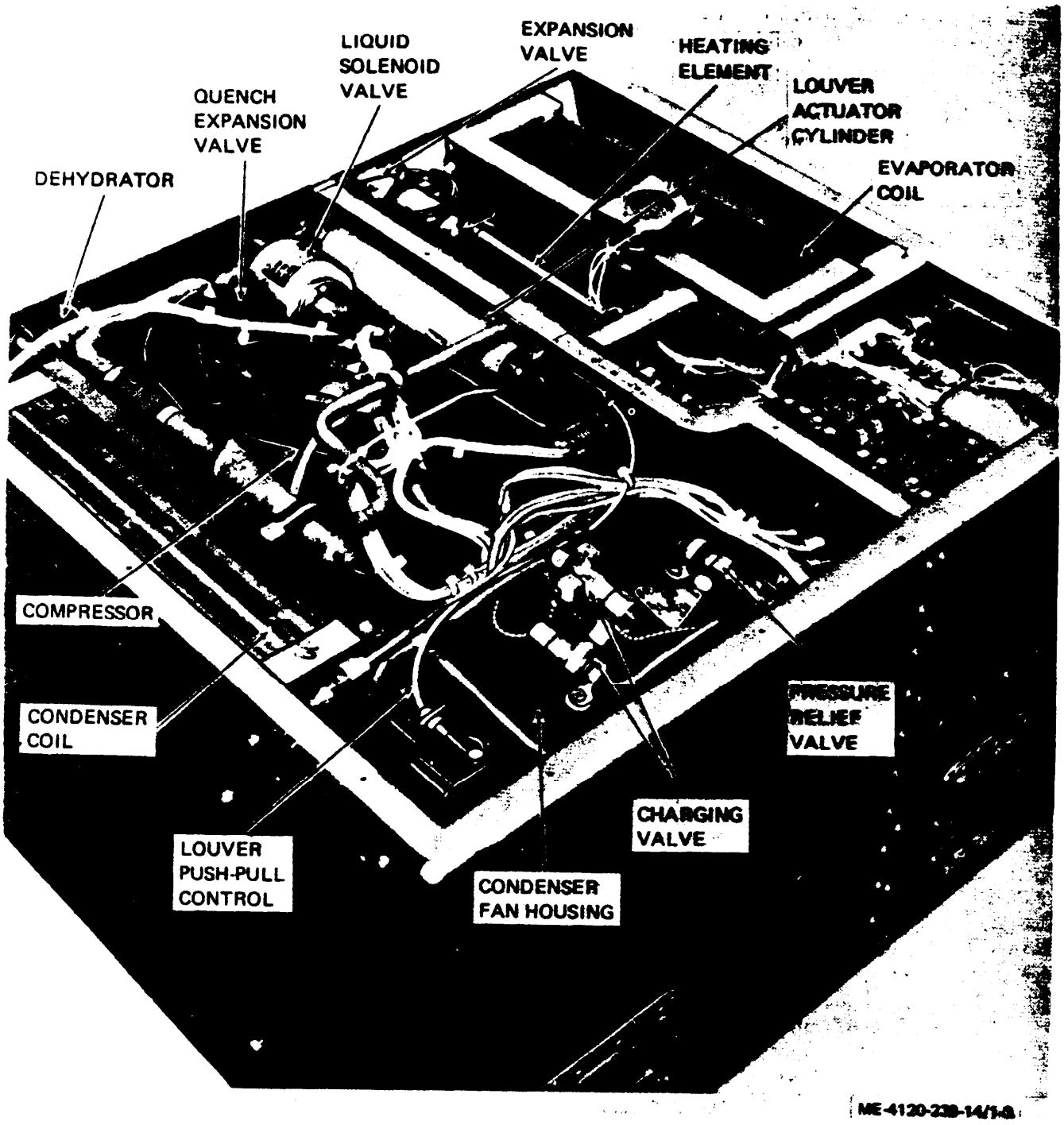


Figure 1-3. Air *conditioner, top view, top covers removed.*

b. Evaporator Section. **The evaporator section contains the evaporator coil, fan motor and fan, control module and junction box, air filter, heating elements and thermal expansion valve. When cooling, air in the evaporator section is forced over the evaporator coil by the evaporator fan which lowers the temperature of the air before it is distributed into the space to be conditioned. When heating, air is circulated over the heating elements and distributed by the evaporator fan. Evaporator fan speed is controlled by a selector switch located on control module.**

c. *Condenser Section.* **The condenser section contains the hermetically sealed motor compressor, condenser coil, condenser fan and motor, service valves, filter dryer, equalizer solenoid valve, liquid quench valve, pressure regulator valve, electrical power connectors, and the necessary refrigerant. The compressor mechanically compresses refrigerant vapor to a condensing condition and discharges it into the condenser coil through the hot gas line. Out-side air, drawn over the condenser coil surface by the condenser fan, condenses the refrigerant vapor to a liquid. The liquid then leaves the condensing coil and returns to the thermal expansion valve through the liquid line. Condenser fan speed is controlled with a thermostatic switch located on rear of unit. At ambient temperature of 100°F (±5° F) or above the condenser fan speed will turn at high speed but at ambient temperature below 100°F (±5° F) the condenser fan will turn at low speed. Due to residual mass heat there will be a delayed reaction time for this to happen when ambient temperature drops below the 100°F change-over point.**

1-5. Differences Between Models

a. This manual covers Trane Models MAC6H9-115-1101-01, MAC6H9-230-1101-02, MAC6H9-208-1101-03, and MAC4H-208-1101-04 air conditioners. Each model is designed to operate on a different set of incoming power current characteristics. The electrical characteristics for each model are as follows:

(1) MAC6H9-115-1101-01. Single phase, 50/60 hertz, 115 volts.

(2) MAC6H9-230-1101-02. Single phase, 50/60 hertz, 230 volts.

(3) MAC6H9-208-1101-03. Three phase, 50/60 hertz, 208 volts.

(4) MAC4H9-208-1101-04. Three phase, 400 hertz, 208 volts.

b. **W here instructions and descriptions apply only to specific models, the model numbers to which the descriptions or instructions apply will be specified. If no model number is specified, the instructions or descriptions apply to all four models.**

1-6. Identification and Tabulated Data

a. Identification. **Each air conditioner has one major identification plate mounted on the side of the unit. The plate specifies nomenclature, manufacturer, military part number BTU / HR, phase, hertz, volts, serial number, contract number, and shipping weight. A manufacturers identification plate mounted just below the military plate contains the manufacturer's name and address and the model and serial numbers.**

b. *Tabulated Data.*

(1) Air conditioner (Model MAC6H9-115-1101-01).

Nomenclature	**Air conditioner, horizontal, compact**
Manufacturer	**The Trane Company**
Capacity:	
Cooling	**9,000 BTU / HR (British Thermal Units per hour)**
Heating	**7,000 BTU / HR**
Phase	**1**
Hertz	**50 / 60**
volts	**115**

*(2) Air conditioner (Model MA C6H9-230-**1101-02).***

Nomenclature	**Air conditioner. horizontal, compact**
Manufacturer	**The Trane Company**
Capacity:	
Cooling.	**9,000 BTU/HR**
Heating	**.7,000 BTU /HR**
Phase	**1**
Hertz	**50/60**
volts	**230**

(3) *Air conditioner (Model MAC6H9-208-**1101-03).***

Nomenclature	**Air conditioner, horizontal, compact**
Manufacturer	**The Trane Company**
Capacity:	
Cooling	**9,()()() BTU / HR**
Heating	**7,000 BTU / HR**
Phase	**3**
Hertz	**50/60**
volts	**208**

(4) *Air conditioner (Model MAC4H9-208-1101-04).*

Nomenclature	**Air conditioner. horizontal, compact**
Manufacturer	**The Trane Company**
Capacity:	
Cooling.	**9,000 BTU / HR**
Heating	**7.000 BTU / HR**
Phase.	**3**
Hertz	**400**
volts.	**208**

{5) Condenser fan motor (B2) and/or evaporator fan motor (B3) (Model MAC6H9-115-1101-01).

Manufacturer	**IMC Magenetics Corp.**
Model	**BC4520-1 (modified by marking "97403 13216E6140-1"**
Volts	**115**
Hertz	**50 / 60**

Phase ..... Single
RPM ..... 3450 / 1725
Horsepower:
High 0.4
Low 0.2
Amperes:
High 0.4
Low 0.3
Duty ..... Continuous
Motor drive ..... Direct
Thermal Protector ..... Automatic reset type opens at 145° C±5° C
Rotation (facing shaft end) ..... Counterclockwise

(6) *Condenser fan motor (B2) and / or evaporator fan motor (B3) (Model MAC6H9)-230-1101-02).*

Manufacturer ..... IMC Magnetics Corp.
Model ..... FBC4620 (modified by marking "97403 13216E6140-2")
Volts 230
Hertz ..... 50 / 60
Phase ..... Single
RPM ..... 3450 / 1725
Horsepower:
High 0.73
Low 0.12
Amperes:
High 3.5
Low 1.2
Duty ..... Continuous
Motor drive ..... Direct
Thermal protector ..... Automatic reset type opens at 145° C±5° C
Rotation (facing shaft end) ..... Counterclockwise

(7) *Condenser fan motor (B2) and / or evaporator fan motor (B3) (Model MAC6H9-208-1101-03).*

Manufacturer ..... IMC Magnetics Corp.
Model ..... FBT4625-3 (modified by marking "97403 13216E6140-3")
Volts 208
Hertz ..... 50 / 60
Phase 3
RPM ..... 3450 / 1725
Horsepower:
High 0.73
Low 0.16
Amperes:
High 2.3
Low 0.9
Duty ..... Continuous
Motor drive ..... Direct
Thermal protector ..... Automatic reset type
High ..... opens at 120° C±5° C
Low ..... opens at 150° C±7° C
Rotation (Facing shaft end) ..... Counterclockwise

(8) *Condenser fan motor and / or evaporator fan motor (Model MAC4H9-208-1101-04).*

Manufacturer ..... IMC Magnetics Corp.
Model ..... BT4520-2 (modified by marking "97403 13216E6140-4")
Volts 208
Hertz 400
Phase 3
RPM ..... 3750 / 1800
Horsepower:
High 1.1
Low 0.27
Amperes:
High 6.0
Low 3.0
Duty ..... Continuous
Motor drive ..... Direct
Thermal Protector ..... Automatic reset type
High ..... Opens at 150° C±5° C
Low ..... Opens at 150° C±5° C
Rotation (facing shaft end) ..... Counterclockwise

(9) *R. F. I. capacitor (C1).*

Type designation CK14AX103K
Specification ..... MIL-C-11015 / 20A
Type ..... Fixed
Dielectric ..... Ceramic
Capacitance ..... 10,000 pf±10 pf

(10) *R. F. I. capacitor (C2 or C6).*

Manufacturer ..... Paktron
Part number ..... Paktron WA .056
Type ..... Fixed
Dielectric ..... Mylar
Capacitance ..... 0.056 mfd±10%
Working voltage ..... 400 VDC

(11) *Condenser fan motor capacitor (C2) (MAC6H9-115-1101-01).*

Manufacturer ..... General Electric
Part number ..... 28F1559G2 (modified by marking "97403 13216E6236-1") (with protective boot 614A625P21)
Type ..... Fixed
Dielectric ..... Paper
Capacitance ..... 15 mf
Volts AC 330

(12) *Condenser fan motor capacitor (C2) (MAC6H9-230-1101-02).*

Manufacturer ..... General Electric
Part number ..... 28F1557G2 (Modified by marking "97403 13216E6236-4") (with protective boot 614A625P21)
Type ..... Fixed
Dielectric ..... Paper
Capacitance ..... 12.5 mf
Volts AC 440

(13) *Evaporator fan motor capacitor (C3) (MAC6H9-115-1101-01).*

Manufacturer ..... General Electric
Part number ..... 28F1559G2 (modified by marking "97403 13216E6236-1") (with protective boot 614A625P21)
Type ..... Fixed
Dielectric ..... Paper
Capacitance ..... 15 mf
Volts AC 330

(14) *Evaporator fan motor capacitor (C3) (MAC6H9-230-1101-02).*

Manufacturer ..... General Electric

Part number ..... 28F1557G2 (modified by marking "97403 13216E6236-4") (with protective boot 614A625P21)
Type ..... Fixed
Dielectric ..... Paper
Capacitance ..... 12.5 mf
Volts AC 440

(15) *Compressor motor starting capacitor (C4) (MAC6H9-115-1101-01 and MAC6H9-230-1101-02).*
Manufacturer ..... General Electric
Part number ..... 35F1109BA3 (modified by marking "97403 13216E6239")
Type ..... Fixed, aluminum electrolytic
Capacitance ..... 80 mf±10%
Bleed resistor ..... 15,000 ohms±20%, 1 watt

(16) *Compressor motor run capacitor (C5) (MAC6H9-115-1101-01 and MAC6H9-230-1101-02).*
Manufacturer ..... General Electric
Part number ..... 28F1559G2 (modified by marking "97403 13216E6236-1") (with protective boot 614A625P21)
Type ..... Fixed
Dielectric ..... Paper
Capacitance ..... 15 mf
Volts AC 330

(17) *Compressor circuit breaker (CB1) (MAC6H9-115-1101-01).*
Manufacturer ..... Heinemann Electric
Part number ..... JA2Z21-2 (modified by marking "97403 13216E6206-1")
Type ..... DPST, series trip with mechanically actuated auxiliary switch

(18) *Compressor circuit breaker (CB1) (MAC6H9-230-1101-02).*
Manufacturer ..... Heinemann Electric
Part number ..... JA2Z21-1 (modified by marking "97403 13216E6206-2")
Type ..... DPST, series trip with mechanically actuated auxiliary switch

(19) *Compressor circuit breaker (CB1) (MAC6H9-208-1101-03).*
Manufacturer ..... Heinemann Electric
Part number ..... JA3Z18-1 (Modified by marking "97403 13216E6205-1")
Type ..... 3 PST, series trip with mechanically actuated auxiliary switch

(20) *Compressor circuit breaker (CB1) (MAC4H9-208-1101-04).*
Manufacturer ..... Heinemann Electric
Part number ..... JA3Z18-2 (modified by marking "97403 13216E6205-2")
Type ..... 3 PST, series trip with mechanically actuated auxiliary switch

(21) *Control circuit breaker (CB2) (MAC6H9-115-1101-01, MAC6H9-230-1101-02 and MAC6H9-208-1101-03).*
Manufacturer ..... Texas Instruments, Inc.
Part number ..... 2MO1-102-1 (modified by marking "97403 13216E6178-1")
Type ..... SPST, series trip

(22) *Control circuit breaker (CB2) (MAC4H9-208-1101-04).*
Manufacturer ..... Texas Instruments, Inc.
Part number ..... 2MO1-202-1 (modified by marking "97403 13216E6178-2")
Type ..... SPST, series trip

(23) *Rectifier (CR1).*
Manufacturer ..... Motorola Semiconductor Products, Inc.
Part number ..... MDA952-3 (modified by marking "97403 13216E6223")

(24) *Heater element (HR1 through HR4) (MAC6H9-115-1101-01 and MAC6H9-230-1101-02).*
Manufacturer ..... Hotwatt, Inc.
Part number ..... 13E6077-1 (modified by marking "97403 13216E6124-1")
Sheath ..... Nickel-iron-chromium alloy tubular type
Element ..... Nickel-chromium
Volts 115
Watts 472.5

(25) *Heater element (HR1 through HR6) (MAC6H9-208-1101-03 and MAC4H9-208-1101-04).*
Manufacturer ..... Hotwatt, Inc.
Part number ..... 13E6077-2 (modified by marking "97403 13216E6124-2")
Sheath ..... Nickel-iron-chromium alloy, tubular type
Element ..... Nickel-chromium
Volts 120
Watts 315

(26) *Time delay relay (K1).*
Manufacturer ..... E.V. Naybor Laboratories, Inc.
Part number ..... TQ1D25 (modified by marking "97403 13216E6182")
Alternate ..... HI-G Inc, Part No. 1600-3590 (modified by marking)
Type ..... SPDT
Time delay ..... 25±6 seconds

(27) *Heater relay (K2).*
Part number MS24192D1
Type ..... 3 PST, normally open
Volts ..... 28 VDC

(28) *Compressor motor relay (K3).*
Part number MS24192D1
Type ..... 3 PST, normally open
Volts ..... 28 VDC

(29) *Condenser fan relay (K4).*
Manufacturer ..... Potter and Brumfield
Part number ..... KA4619 (modified by marking "97403 13216E6184")

Type ..... 3 PDT, armature type
Coil voltage ..... 24 VDC

(30) *Compressor start relay (K5) (MAC6H9-115-1101-01 and MAC6H9-230-1101-02).*
Manufacturer ..... Essex Wire Corp.
Part number ..... 128116-1343S (modified by marking "97403 13216E6240")
Type ..... SPST, armature type, normally closed

(31) *Phase sequence relay (K5) (MAC6H9-208-1101-03).*
Manufacturer ..... HI-G Inc.
Part number ..... 1400-S421 (modified by marking "97403 13216E6183-1")
Type ..... SPDT
Hertz 50/60
Phase 3
Voltage ..... 208 VAC

(32) *Phase sequence relay (K5) (MAC4H9-208-1101-04).*
Manufacturer ..... HI-G Inc.
Part number ..... 1400-S428 (modified by marking "97403 13216E6183-2")
Type ..... SPDT
Hertz 400
Phase 3
Voltage ..... 208 VAC

(33) *Solenoid valves (L1 and L2).*
Manufacturer ..... Jackes-Evans Mfg. Co.
Part number ..... OB2S3 (modified by marking "97403 13216E6158")
Type ..... Pilot operated diaphragm type, normally open (when not energized)
Volts ..... 24 DC

(34) *Rotary selector switch (S1).*
Manufacturer ..... Cutler-Hammer
Part number ..... 8912K261 (modified by marking "97403 13216E6201")
Type ..... 8 PDT, 4 switch wafers
Number of switch positions 5

(35) *Toggle switch (S2).*
Manufacturer ..... Cutler-Hammer
Part number ..... 8906K1462 (modified by marking "97403 13216E6200")
Type ..... 3 PDT, slow make, slow break contacts

(36) *Temperature selector switch (S3).*
Manufacturer ..... Penn Controls, Inc.
Part number ..... A19AGF23 (modified by marking "97403 13216E6203-1")
Type ..... SPDT
Temperature range .... 60° F to 90° F

(37) *High pressure switch (S4).*
Manufacturer ..... Penn Controls, Inc.
Part number ..... 210AP40AN2301 (modified by marking "97403 13216E6215-3")
Type ..... SPST, normally closed, with trip free manual reset
Pressure setting ..... 445±10 psig

(38) *Low pressure switch (S5).*
Manufacturer ..... Penn Controls, Inc.
Part number ..... 210AP10AN2308 (modified by marking "97403 13216E6215-1")
Type ..... SPST, normally closed, with trip free manual reset
Pressure setting ..... 15±5 psig

(39) *Heater thermostatic switch (S6).*
Manufacturer ..... Thermo-O-Disc, Inc.
Part number ..... HLAS4947 (Modified by marking "97403 13216E6224")
Type ..... DPST, normally closed, bimetallic
Reset ..... Automatic
Contacts open (temp. rise) ..... 150° F±5° F
Contacts close (temp. drop) ..... 110° F±10° F

(40) *Condenser fan relay thermostatic switch (S7).*
Manufacturer ..... Thermo-O-Disc, Inc.
Part number ..... 14T22 (modified by marking "97403 13216E6217" and changing mounting holes to slots)
Type ..... SPST, normally open, non-adjustable bimetallic disc
Contacts close (temp. rise) ..... 100° F±5° F

(41) *Transformer (T1).*
Manufacturer ..... Signal Transformer Co., Inc.
Part number ..... 5249 (Modified by marking "97403 13216E6214" and changing mounting slots to holes)
Rating:
Input ..... 115 VAC, 120 watts, 50 to 500 hertz
Output ..... 30 VAC, 4 amps

(42) *Compressor (MAC6H9-115-1101-01).*
Manufacturer ..... Whirlpool Corp.
Part number ..... WHP622H9-115-1 (modified by marking "97403 13208E4182-1")
Oil charge ..... 17 ounces
Volts 115
Hertz 50/60
Phase 1
Weight (with oil) ..... 44 pounds

(43) *Compressor (MAC6H9-230-1101-02).*
Manufacturer ..... Whirlpool Corp.
Part number ..... WHP622H9-230-1 (modified by marking "97403 13208E4182-4")
Oil charge ..... 17 ounces
Volts 230
Hertz 50/60

Phase 1
Weight (with oil) ..... 44 pounds

(44) *Compressor (MAC6H9-208-1101-03).*
Manufacturer ..... Whirlpool Corp.
Model ..... WHP622H9-208-3 (modified by marking "97403 13208E4182-3")
Oil charge ..... 17 ounces
Volts 208
Hertz 50/60
Phase 3
Weight (with oil) ..... 41 pounds

(45) *Compressor (MAC4H9-208-1101-04).*
Manufacturer ..... Whirlpool Corp.
Model ..... WHP422H9-208-3 (modified by marking "97403 13208E4182-2")
Oil charge ..... 17 ounces
Volts 208
Hertz 400
Phase 3
Weight (with oil) ..... 37 pounds

(46) *Thermal expansion valve.*
Manufacturer ..... Alco Controls Corp.
Part number ..... HNE1HW100-6A (modified by marking "97403 13216E6160-1")
Inlet ..... ¼ ODF
Outlet ..... ⅜ ODF
Cap tube length ..... 30"
Nominal capacity ..... 1 ton
Superheat (factory set) 6° F ± ½° F at a 32° F bath temperature

(47) *Liquid quench valve.*
Manufacturer ..... Alco Controls Corp.
Part number ..... HN1/4CW16A (modified by marking "97403 13216E6174-1")
Inlet ..... ¼ ODF
Outlet ..... ⅜ ODF
Cap tube length ..... 30"
Nominal capacity ..... ¼ ton
Superheat (factory set) 16° F ± ½° F at a 32° F bath temperature

(48) *Refrigerant service valves.*
Manufacturer ..... Henry Valve Co.
Part number F503A
Valve stem ..... Hex socket for opening and closing

(49) *Pressure regulator valve.*
Manufacturer ..... Controls Co. of America
Model number 104A
Part number ..... 70034-187 (modified by marking "97403 13216E6171")
Adjustment range ..... 0 to 80 psig
Setting ..... 68 psig

(50) *Liquid sight indicator.*
Manufacturer ..... Sporlan Valve Co.
Part number ..... SA12S (modified by marking "97403 13216E6155")

(51) *Dehydrator.*
Manufacturer ..... Alco Valve Co.
Part number ..... ADK032 (modified by marking "97403 13216E5918-1")
Type ..... Sealed and non-refillable

(52) *Actuator cylinder assembly.*
Manufacturer ..... Robert Shaw Control Co.
Part number ..... P011-22 (modified by marking "97403 13216E6128" and changing cable attachment plate)
Stroke ..... .952 in.
Full stroke pressure (no load) ..... 240 ± 20 psig
Pressure to start stroke 165 ± 15 psig

(53) *Dimensions and weights.*
Length ..... 26 in.
Height ..... 16 in.
Width ..... 23¼ in.
Weight ..... 200 lbs.

1-7. Diagrams

a. Control System Schematic Diagrams. Refer to figures 1-4 through 1-6 for schematic wiring diagrams.

Figure 1-4. Control system schematic diagram, 1 phase, 50/60 hertz, 115 volts.

(Located in back of manual)

Figure 1-5. Control system schematic diagram, 1 phase, 50/60 hertz, 230 volts.

(Located in back of manual)

Figure 1-6. Control system schematic diagram, 3 phase, 50/ 60 hertz and 400 cycle, 208 volts.

(Located in back of manual)

b. Wiring Diagrams. Refer to figures 1-7 through 1-10 for wiring diagrams.

Figure 1-7. Wiring diagram, 1 phase, 50/ 60 hertz, 115 volts.

(Located in back of manual)

Figure 1-8. Wiring diagram, 1 phase. 50 / 60 hertz, 230 volts.

(Located in back *of* manual)

Figure 1-9. Wiring diagram, *3 phase,* 50 / 60 hertz, 208 volts

(Located in back of manual)

Figure 1-10. Wiring diagram, 3 phase, 400 hertz, 208 volts.

(Located in back of manual)

CHAPTER 2

OPERATING INSTRUCTIONS

Section 1. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unloading Equipment

The total weight of the air conditioner is 200 pounds. Use a hand truck or forklift of at least 300 pounds capacity to unload the unit. Keep unit upright during the unloading operation.

2-2. Unpacking Equipment

Move the unit as near to the site of installation as possible. Remove crating hardware and metal straps, being careful not to damage the unit with the tools used for uncrating.

2-3. Inspecting and Servicing Equipment

a. Inspection. Inspect the entire air conditioner for signs of damage, missing or loose hardware, and any defects that may have been incurred during shipment. Make a thorough check to see that all wiring, lines, and tubing are secure; and pay particular attention to the evaporator and condenser coils and main power receptacle connector. Be sure that visible wiring and insulation is not frayed or broken. Check the evaporator and condenser fan motors. Report all damage and defects to organizational maintenance.

b. Servicing. Perform the daily preventive maintenance services listed in paragraph 3-6. Be sure all hardware is securely in place.

2-4. Installantion

u. *General.* The air conditioner is shipped, assembled and ready for operation. It contains l full charge of refrigerant and compressor oil. Install the unit on a firm, level surface to allow proper condensate drainage. Place it so that the control panel and condenser and evaporator louvers l re accessible to the operator and to maintenance personnel. Be sure there are no obstructions in front of any air intake or discharge louvers or other openings that may cause insufficient flow of air into or out of the air conditioner. If the unit is van mounted, report any such obstructions to organizational maintenance.

b. Mounting. Base mounting hole dimensions are shown on figure 2-1. The resilient mount parts shown in figure 2-2 are shipped with the air conditioner.

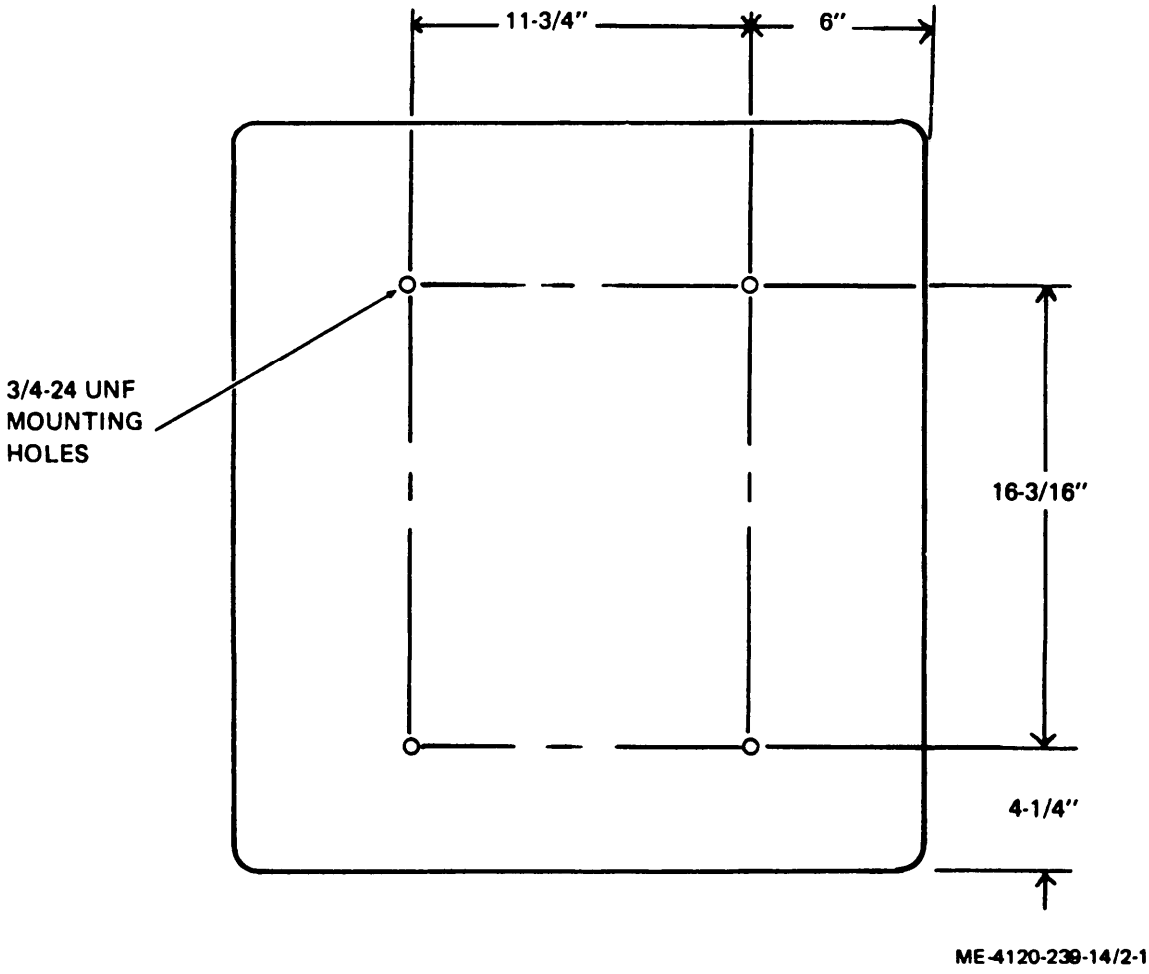


Figure 2-1. Base mounting holes.

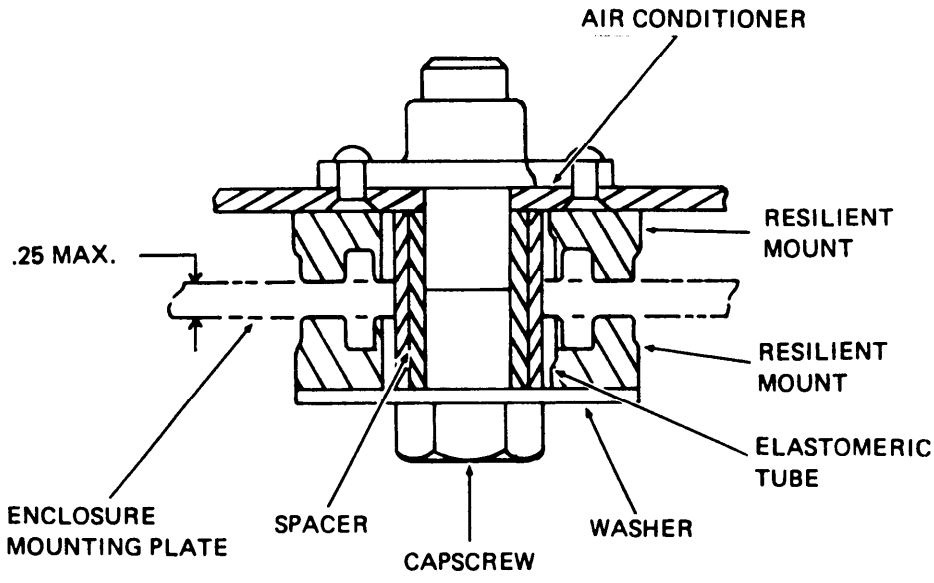


Figure 2-2. Typical installation of air conditioner to enclosure.

Caution: For safe operation, connect a No. 10 AWG (min.) ground wire to ground connection.

c. ***Connections.*** Connect the main power cable.

d. ***Air Ducts.*** Connect air ducts contingent to site of installation. Mount air filter in duct work if an evaporator return air duct is required.

Note. Operation without filtration will clog coils

Section I 1. MOVEMENT TO A NEW WORKSITE

2-5. Dismantling for Movement

a. Disconnect main power cable.

b. Disconnect drain lines from the outlets.

c. Disconnect any air ducts and install the evaporator air discharge grille and air return grille.

d. Remove the unit from the mounting surface.

e. If the air conditioner is to be moved over a long distance, recrate it by reversing the unpacking procedures. See paragraph 2-2.

2-6. Reinstallation After Movement

After movement, follow the Procedures in paragraph 2-4 to reinstall the air conditioner.

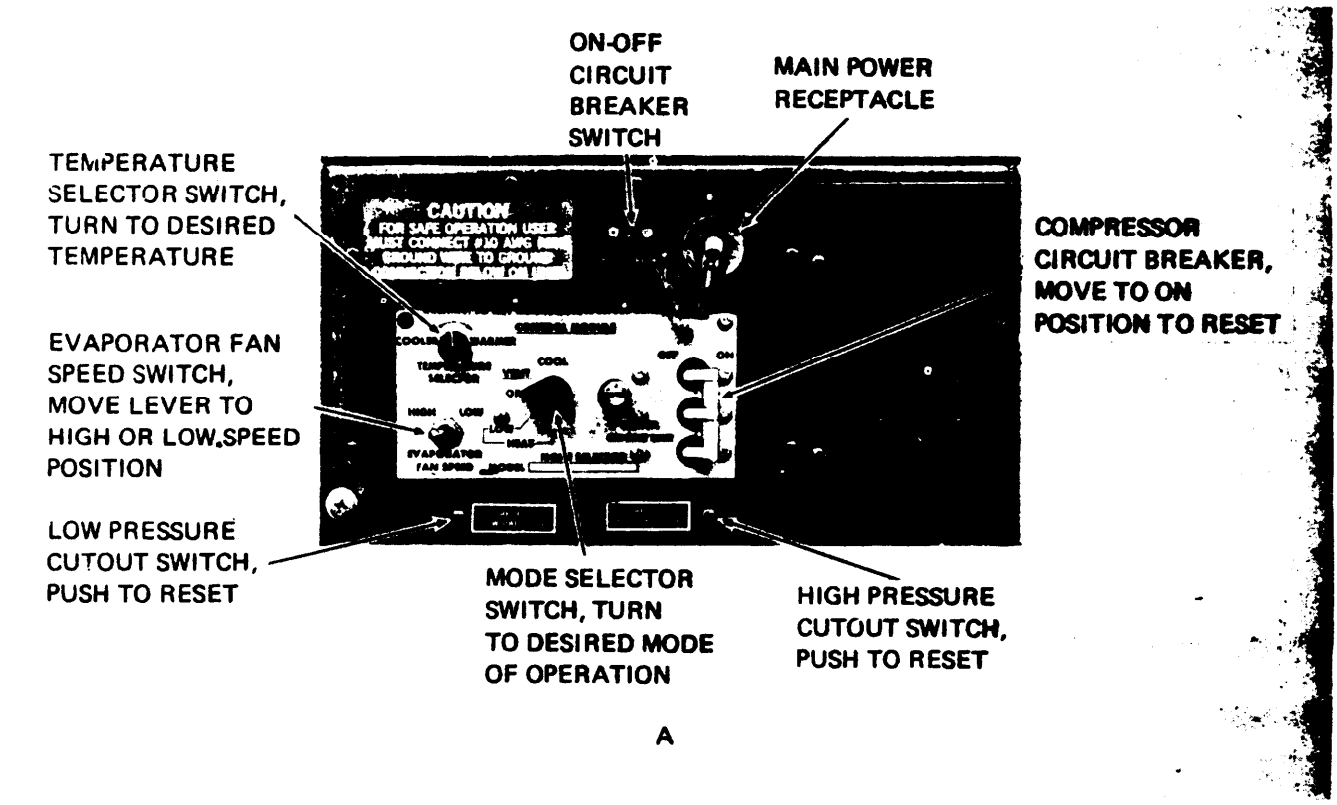
Section III. CONTROLS AND INSTRUMENTS

2-7. General

This section describes, locates and illustrates the various controls and provides the operator / crew sufficient information to insure proper operation of the air conditioner.

2-8. Controls and Instruments

The location and the function of the controls and installments are illustrated in figure 2-3.



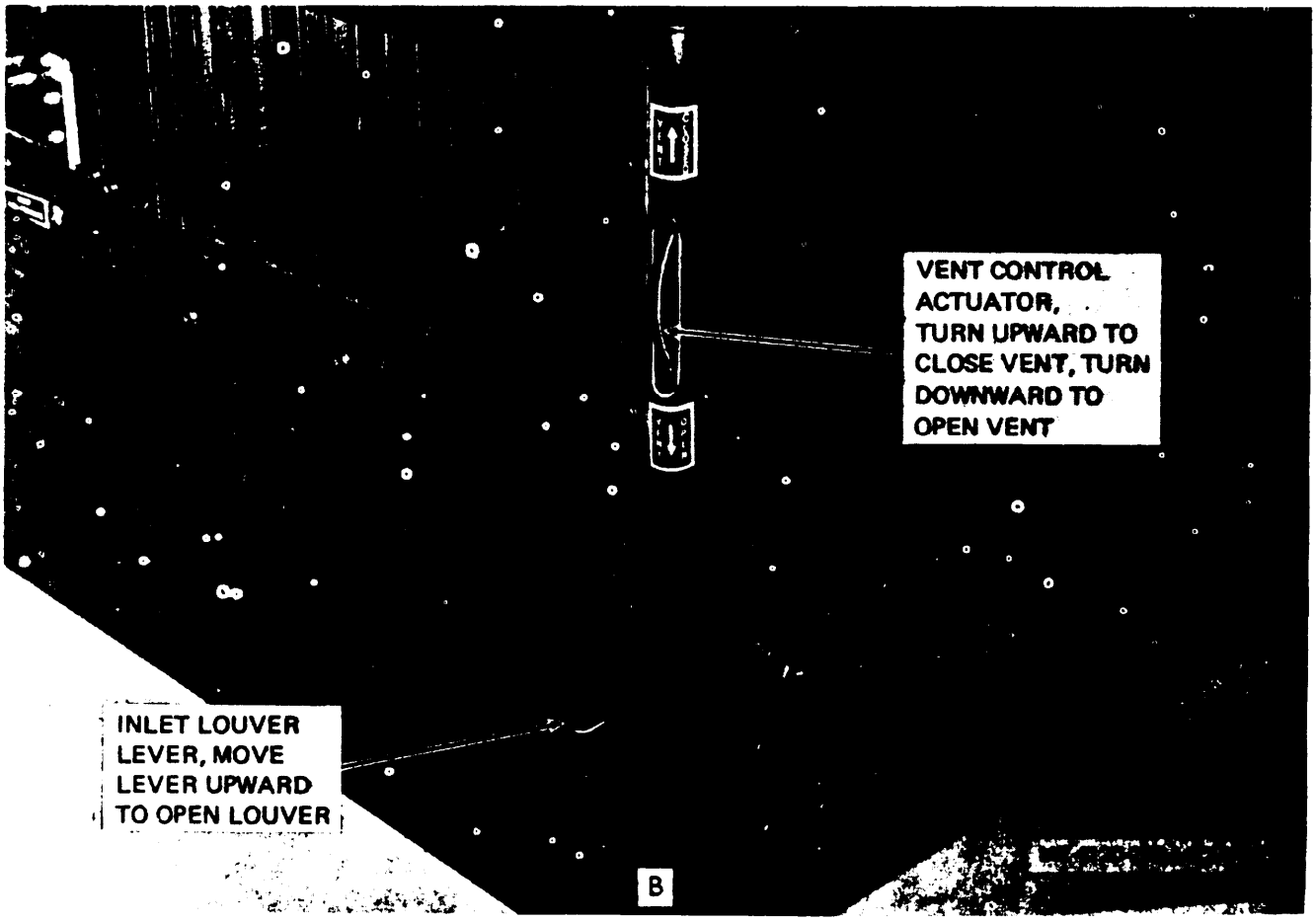


Figure 2-3 *Controls and instruments (Sheet 1 fo 2).*

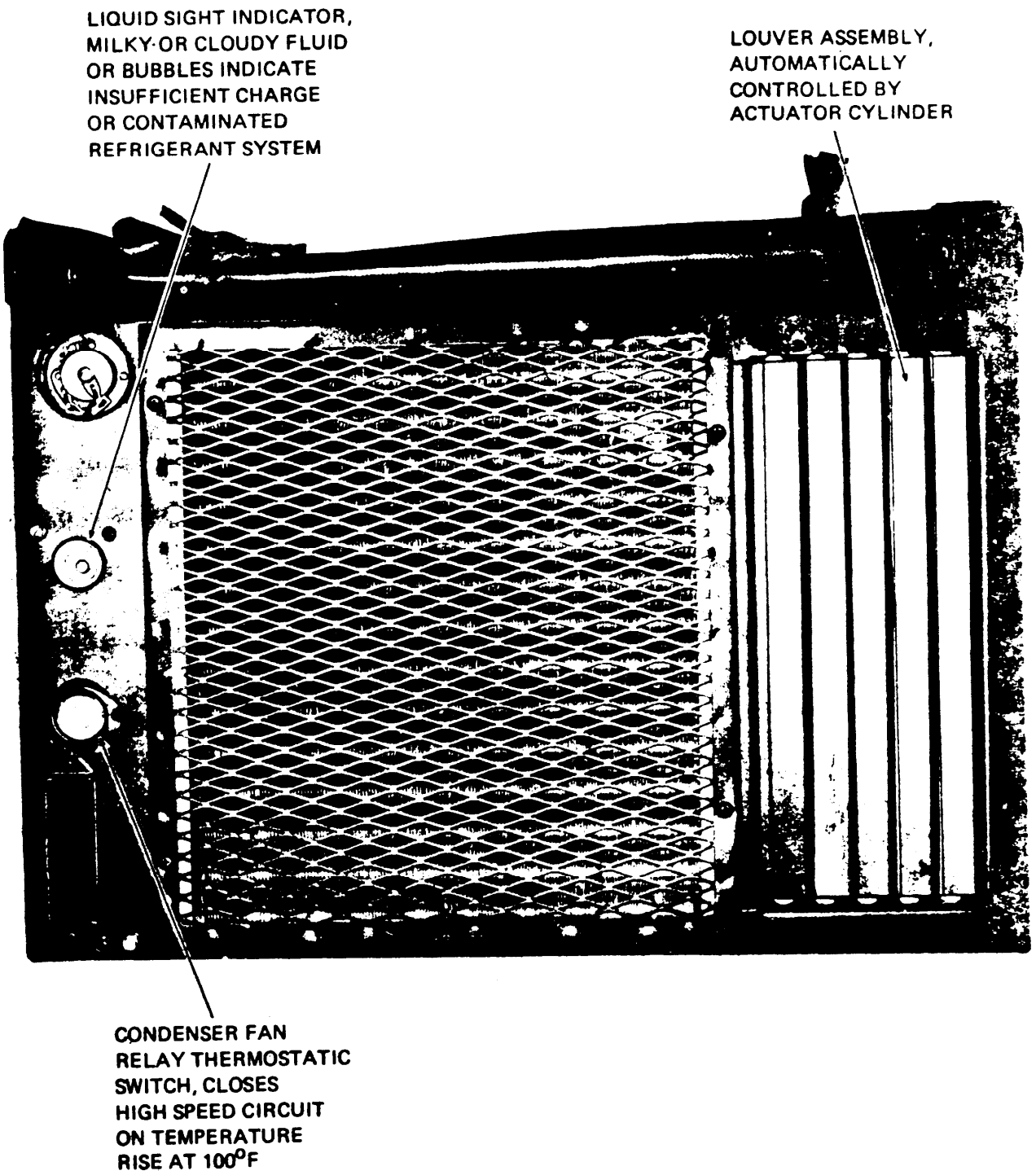


Figure 2-3. Controls and instruments (Sheet 2 of 2)

Section IV. OPERATION UNDER USUAL CONDITIONS

2-9. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the 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 and stopping the air conditioner, and detailed operating instructions. Since nearly every condition presents a different problem, the operator may have to vary the givenprocedure to fit the condition.

2-10. Starting and operating Instructions

a. Preparation for Starting.

(1) Perform the daily preventive maintenance service (para 3-6).

(2) Connect the main power cable.

(3) Check drain holes to insure that they are open.

(4) Be sure the unit “is firmly secured.

(5) Roll up condenser cover and tie at top of air conditioner to clear condenser opening.

Note. When vent damper door is open to admit fresh air, partially close evaporator inlet louver to balance incoming air. Keep vent damper door closed during heavy rain.

b. Starting Instructions for Cooling. Start the air conditioner for cooling as shown in figure 2-4.

c. Operating Instructions for Cooling. Operate the air conditioner for cooling as shown by figure 2-5.

d. Starting Instructions for Heating. Starting the air conditioner for heating is shown in figure 2-6.

e. Operating Instructions for Heating. Operate the air conditioner for heating as shown in figure 2-7.

f. Operating Instructions for Ventilation. Operate the air conditioner for ventilation as shown by figure 2-8.

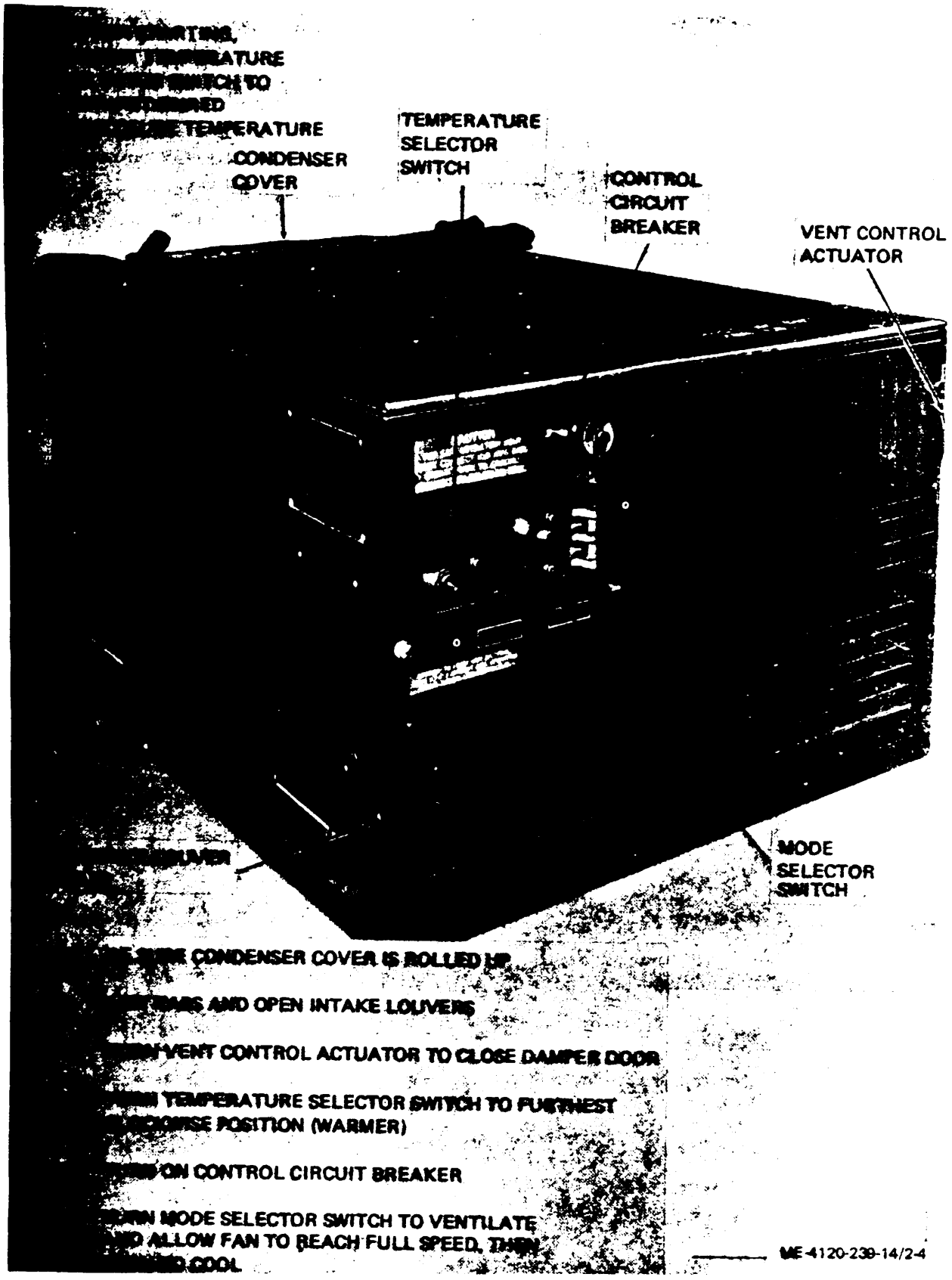
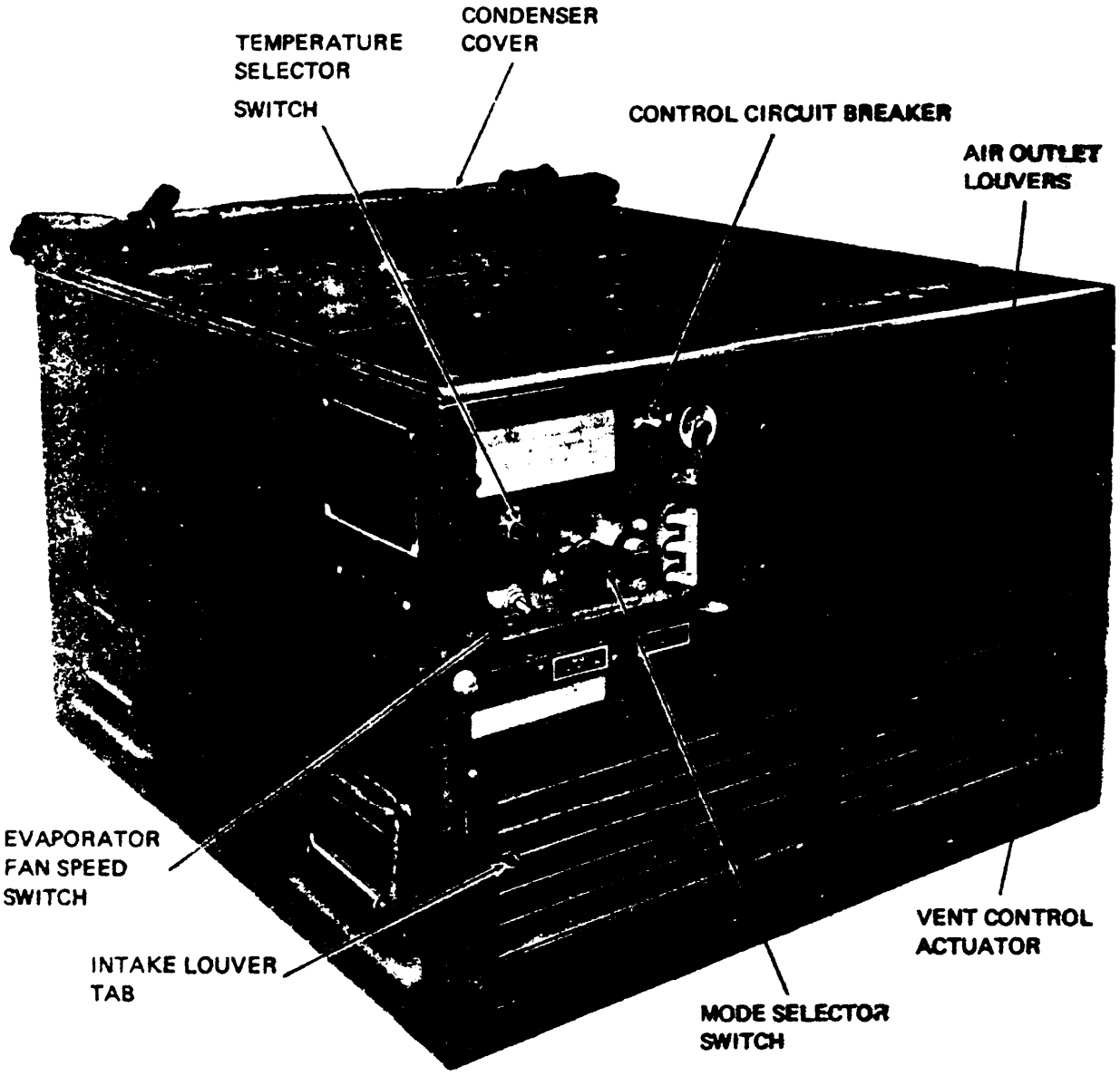


Figure 2-4. Starting instructions for cooling.



STEP 1 LEAVE MODE SELECTOR SWITCH COOL

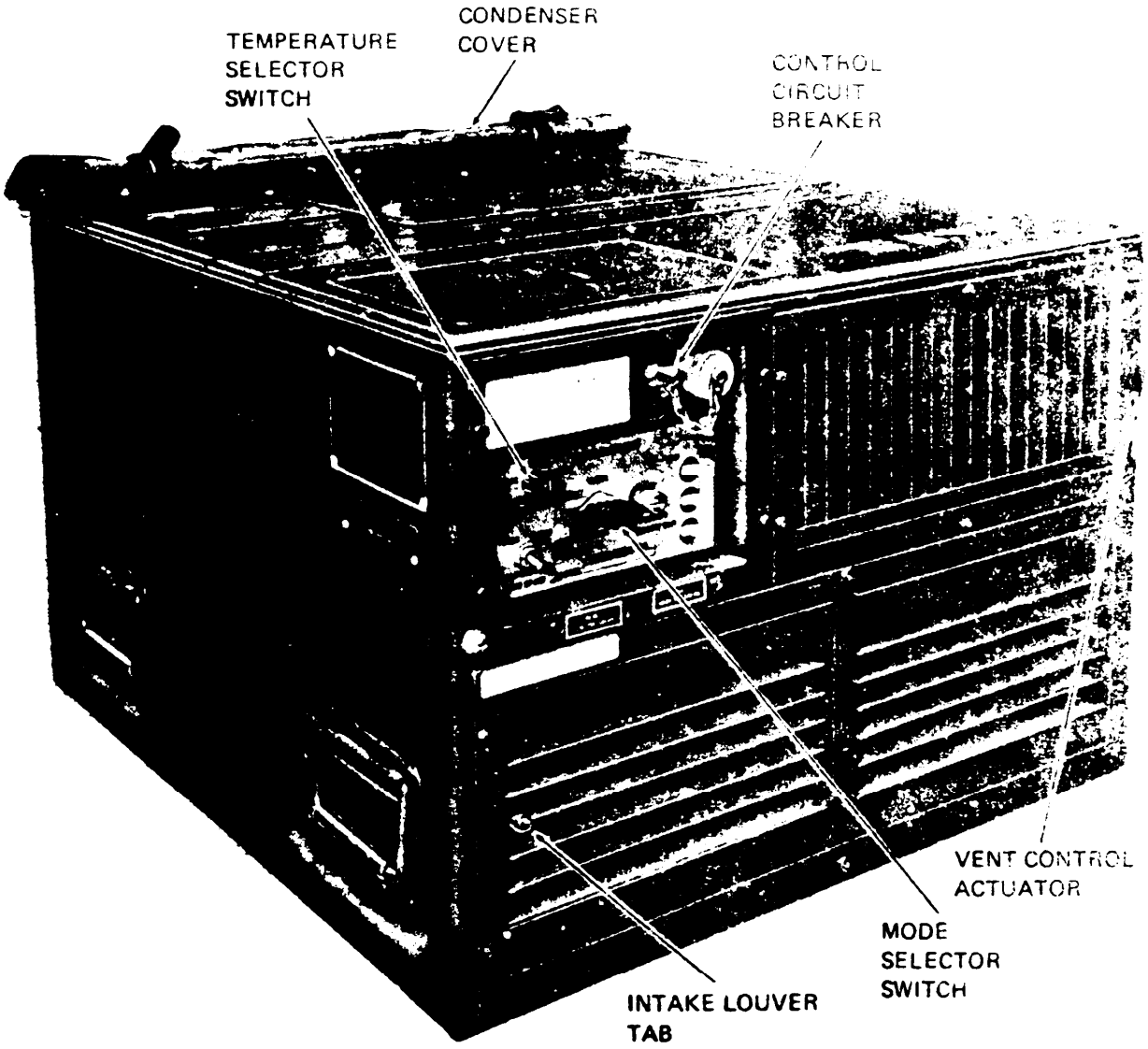
STEP 2 ADJUST TEMPERATURE SELECTOR SWITCH TO DEGREE OF COOLING DESIRED

STEP 3 SET EVAPORATOR FAN SPEED SWITCH TO DESIRED POSITION

STEP 4 ADJUST AIR OUTLET LOUVERS TO DIRECT AIR FLOW AS DESIRED

ME 4120-239-14/2-8

Figure 2-5. Operating instructions for cooling.



STEP 1 **BE SURE CONDENSER COVER IS ROLLED UP**

STEP 2 **LIFT TABS AND OPEN INTAKE LOUVERS**

STEP 3 **TURN VENT CONTROL ACTUATOR TO CLOSE DAMPER DOOR**

STEP 4 **TURN TEMPERATURE SELECTOR SWITCH TO FURTHEST COUNTERCLOCKWISE POSITION (COOLER)**

STEP 5 **TURN ON CONTROL CIRCUIT BREAKER**

STEP 6 **TURN MODE SELECTOR SWITCH TO LOW HEAT. TURN TO HIGH IF MORE HEAT IS DESIRED**

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Figure 2-6. Starting instructions for heating.

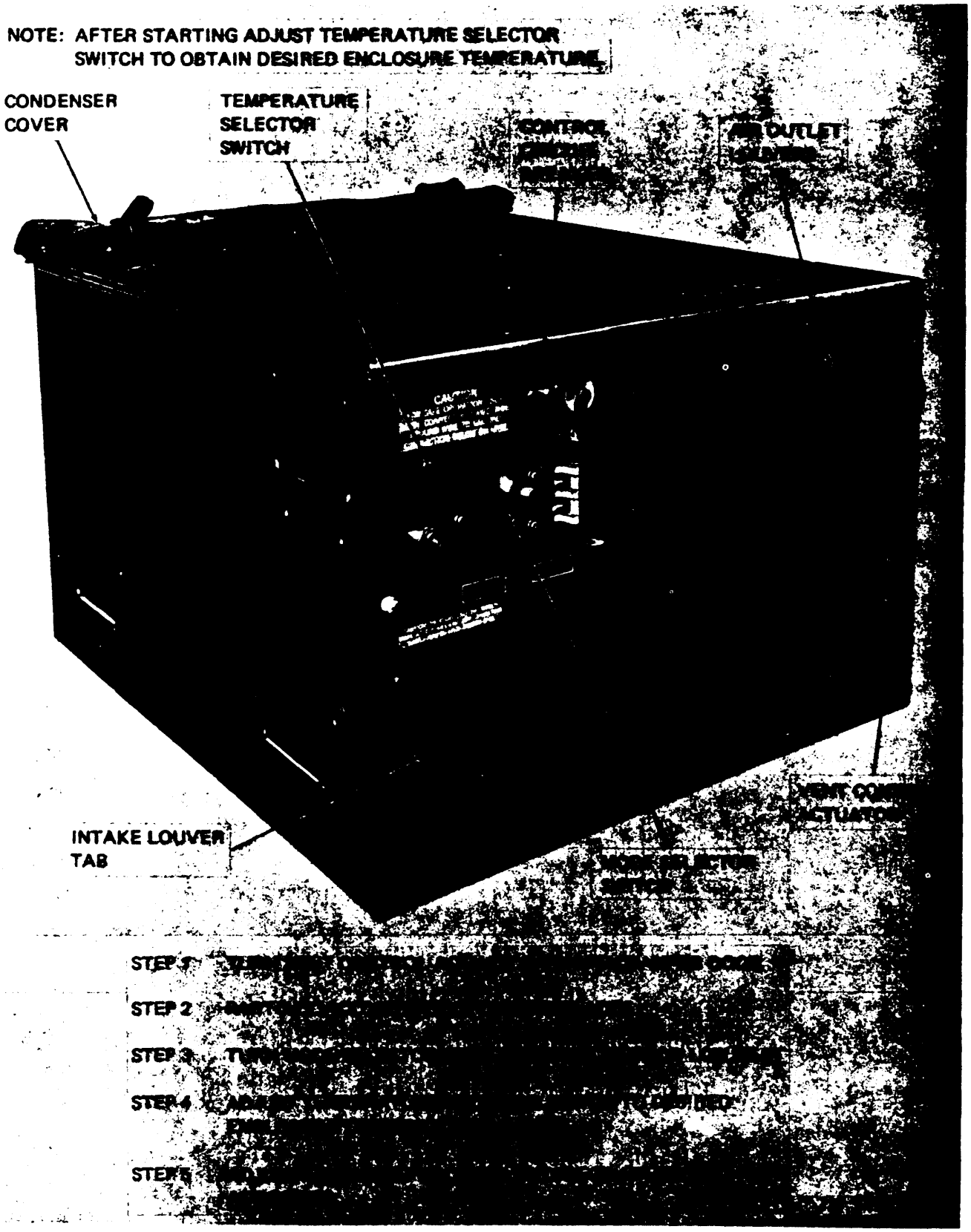


Figure 2-7. Operating instructions for heating.

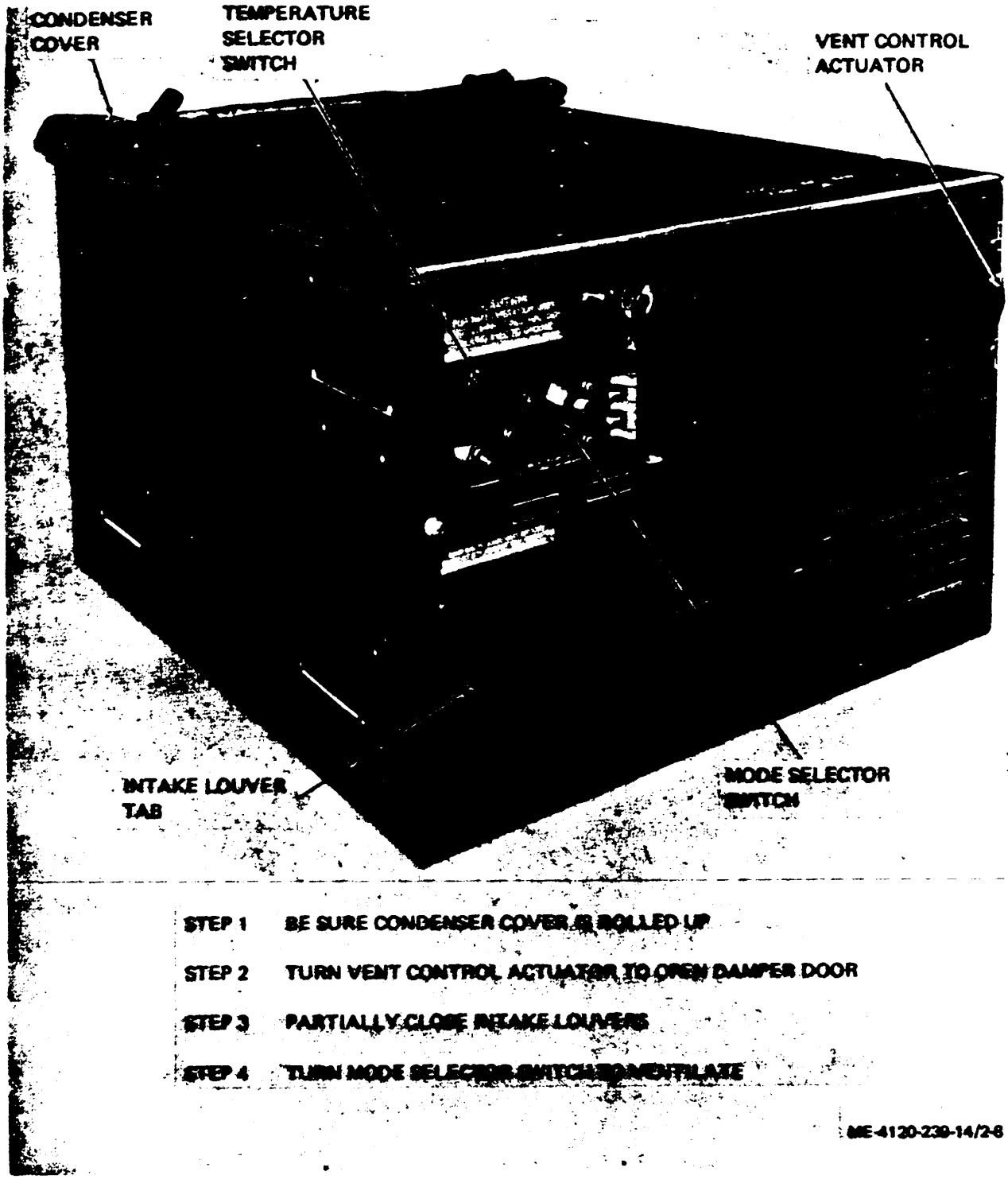
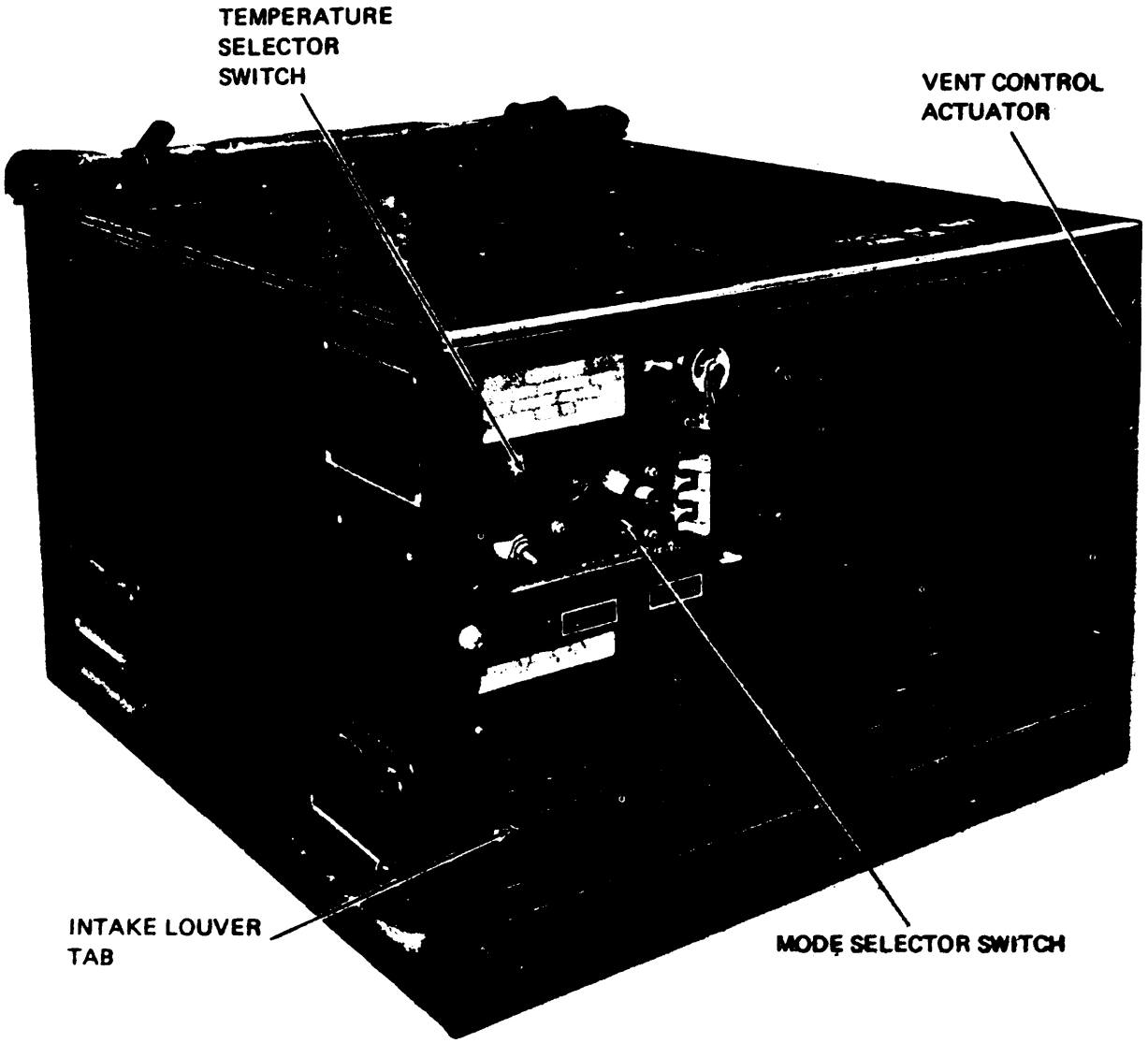


Figure 2-8. operating instructions for ventilation.

2-11. Stopping Instructions

a. Stop the air conditioner as shown by figure 2-9.

b. Perform the daily preventive maintenance service (para 3-6).



STEP 1 TURN MODE SELECTOR SWITCH TO OFF

STEP 2 CLOSE INTAKE LOUVERS

STEP 3 TURN ACTUATOR TO CLOSE FRESH AIR VENT DAMPER

NOTE: IF SHUTDOWN IS FOR AN EXTENDED PERIOD COVER EVAPORATOR AND CONDENSER GRILLES AND DISCONNECT POWER CABLE

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Figure 2-9. Air conditioner stopping instructions.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-12. Operation in Extreme Cold

Caution: To start unit on "cool" mode at O°F ambient (min. operating temp), jumper LPCO switch (S-5).

a. *General.* The air conditioner is designed to operate on the heating cycle in ambient temperatures as low as minus 50° F (Fahrenheit) and on cooling cycle with O°F air entering the condenser and 70° F air entering the evaporator.

b. *Before Operation.* Before starting on cooling cycle be sure cover is removed from condenser air intake and discharge. Clear all ice and snow from openings. Be sure all dampers are in operating condition.

c. *After Operation.* Install cover over condenser air intake and discharge openings.

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

2-13. Operation in Extreme Heat

a. General The air conditioner is designed to operate satisfactorily at temperatures up to plus 120°F. If unit is operated at condenser inlet temperatures higher than 120°F, the cooling capacity will be lowered and long periods of operation at extended temperatures may cause condenser or condenser fan motor to overheat and trip their internal overload switches or the high pressure cut out switch will shut the unit off.

b. Filters. To maintain the highest capacity of the unit, the return air filter and fresh air screen should be cleaned weekly or more often if necessary. Dirty filters reduce the flow of air across the evaporator coil, thereby reducing the capacity of the air conditioner.

c. *Guards and Louvers.* Keep all guards and louvers clean and free of any obstructions to maintain full air flow through the air conditioner.

d. *Coils.* Clean evaporator and condenser coils as frequently as necessary to prevent dirt or other matter from obstructing the air flow.

2-14. Operation in Dusty or Sandy Areas

a. Protection. Shield the air conditioner from dust as much as possible. Take advantage of any natural barriers which offer protection.

b. Cleaning. Keep the air conditioner as clean as possible. Pay particular attention to the louvers, filters, coils, electrical components and grilles. Use compressed air, if available, to aid in cleaning.

c. *Air Filters and Coils.*

(1) Under extremely dusty or sandy conditions, the louvers, filters, coils, electrical components and grilles must be serviced more often.

Note. Never operate the unit without having the air filters in place.

(2) The condenser coil is subjected to ambient air. Therefore, it requires cleaning more often than the evaporator coil.

2-15. Operation Under Rainy or Humid Conditions

Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture.

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

2-16. Operation in Salt Water Areas

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

Warning: Disconnect power source prior to washing the air conditioner.

b. Painting. Paint all exposed areas where paint has cracked, peeled, or blistered or report condition to organizational maintenance. Coat all exposed areas of polished metal with a light coat *of* grease.

CHAPTER 3

OPERATOR/ CREW MAINTENANCE INSTRUCTIONS

Section 1. BASIC ISSUE ITEMS

3-1. Basic Issue Tools and Equipment

Tools, equipment, and repair parts issued with or authorized for the air conditioner are listed in the basic issue items list, appendix C.

3-2. Special Tools and Equipment

No special tools or equipment are required by the operator / crew for maintenance of the air conditioner.

Section II. LUBRICATION

3-3. Fan Motors

The evaporator fan and condenser fan motors are permanently lubricated by the manufacturers and require no additional lubrication.

3-4. Compressor

The compressor and compressor motor are fully lubricated by the manufacturers and require no additional lubrication.

Section III. PREVENTIVE MAINTENANCE CHECKS AND 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 paragraph 3-6. 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 of the unit has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

3-6. Daily Preventive Maintenance Services

This paragraph contains a tabulated listing of 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 table 3-1 for the daily preventive maintenance services.

Table 3-1. Preventive Maintenance Checks and Services

Operator's Maintenance Category — **Daily Schedule (or weekly)**

Interval and sequence number			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
1	..	12	**Evaporator outlet louver.**	Remove obstructions. Clean louvers. Tighten mounting screws.	Para 3-10
2	.	13	**Evaporator inlet louver.**	Remove obstructions. Clean louvers. Check for ease of operation. Tighten mounting screws,	Para 3-10
3	..		**Condenser cover.**	With cover rolled up for operation, check securing ties for damage.	
4	..	14	**Fresh air inlet screen.**	Inspect for obstructions and insecure mounting. Remove obstructions clean and tighten loose mounting screws,	Para 3-10
5	..	15	**Drains.**	Inspect drains for obstructions. Remove obstructions.	Para 3-11
6	.	16	**Condenser louver.**	Check for insecure mounting and damaged louvers.	Para 3-10
7	..	17	**Condenser guard.**	Remove obstructions and clean guard.	Para 3-10
8	..		**Controls.**	Check for visual damage. Check operation of damper control.	Para 2-8
9	..		**Main power receptacle connector.**	Check for secure power connection. Tighten if necessary.	
..	10		**Liquid sight indicator.**	Check for moisture and low refrigerant charge. Yellow indicates moisture, bubbles or milky appearance indicates low charge.	Para 3-12
	11		**Air conditioner operation.**	Check for abnormal operation, vibration, unusual noise. failure to respond to controls.	
		18	**Condenser cover.**	Check for damaged fasteners.	

Section IV. TROUBLESHOOTING

3-7. General

This section contains information that is useful in diagnosing and correcting troubles which cause unsatisfactory operation of failure of the air conditioner.

3-8. Operator's Troubleshooting Chart

Troubleshooting procedures for operator / crew are listed in table 3-2. The first column shows the apparent trouble or symptom, the second column contains the probable cause, and the corrective action is listed in the third column. Remedies that are beyond the scope of the operator must be reported to organizational maintenance.

Table 3–2. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Air conditioner fails to operate.	a. Main power cable disconnected.	*a.* Connect power cable to receptacle (fig. 2-3, sheet 1).
	b. Control or compressor circuit breaker in "OFF" position.	*b.* Reset circuit breaker (fig. 2-3, sheet 1).
	c. Mode selector switch in "OFF" posit ion.	*c.* Turn selector knob to desired operation (fig. 2-3, sheet 1).
2. Insufficient cooling.	a. Mode selector switch improperly positioned.	*a.* Set switch to "COOL" (fig. 2-5).
	b. Temperature selector switch set incorrectly.	*b.* Adjust setting to "COOLER" (fig. 2-5).
	c. Insufficient air passing over evaporator coil.	*c.* Open evaporator inlet louvers (fig. 2-4). Remove any obstructions from evaporator inlet and outlet louvers (para 3-10).
	d. Too much outside air entering unit.	*d.* Close or adjust damper door (fig. 2-3, sheet 1).
	e. Insufficient refrigerant in system.	*e.* Check liquid sight indicator (para 3-12).
	f. Evaporator fan speed switch set at low speed.	*f.* Reset switch to high speed (fig. 2-3, sheet 1).
	g'. Insufficient air passing through condenser coil.	*g.* Remove any obstructions from condenser fan inlet and outlet (para 3-10). Make sure louvers are open (fig. 2-3, sheet 2).
3. No heat or low capacity heat.	a. Mode selector switch improperly set.	*a.* Set switch to LOW HEAT or HIGH HEAT (fig. 2-3, sheet 1).
	b. Temperature selector switch set incorrectly.	*b.* Reset switch (fig. 2-3, sheet 1).
	c. Insufficient air movement over heaters.	*c.* Remove any obstructions from evaporator air intake and discharge louvers (para 3-10). Make sure intake louvers are open (fig. 2-3, sheet 2).

Section V. OPERATOR'S MAINTENANCE OF AIR CONDITIONER

3-9. General

This section contains maintenance procedures for the operator of the air conditioner.

3-10. Louvers, Condenser Guard and Fresh Air Screen

Remove any obstructions. Brush off loose dirt and wipe clean.

3-11. Drains

Clean out drain openings and remove any obstructions.

3-12. Liquid Sight Indicator

Wipe refrigerant liquid sight indicator glass with a soft clean cloth. Set controls at cool-cooler and operate unit for 15 minutes before observation. Yellow appearance indicates moisture in system and bubbles or milky flow indicate low refrigerant charge. Report presence of these conditions to direct support maintenance.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIAL

4-1. General

Instructions for unloading. unpacking and installing the air conditioner are covered in paragraphs 2-1, 2-2. and 2-4.

4-2. Inspecting and Servicing Equipment

a. Inspection. General inspection of the equipment is covered in paragraph 2-3. If possible damage has occured, requiring removal of covers or other components not authorized for removal by the operator, further inspection of internal components is to be performed by organizational maintenance personnel. If other than new equipment has been received, a thorough inspection is to be performed.

b. Servicing.Remove and inspect return air filter and fresh air screen and service filter and screen if necessary.

4-3. Installation

Check air conditioner for proper installation. If auxilliary power connection is to be used, change leads as shown on wiring diagram.

Section II. MOVEMENT TO A NEW WORKSITE

4-4. Dismantling for Movement

Refer to paragraph 2-5.

4-5. Reinstallation After Movement

Refer to paragraphs 2-6 and 4-3.

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-6. Tools and Equipment

Refer to appendix C for tools equipment and repair parts issued with the air conditioner.

4-7. Special Tools and Equipment

No special tools or equipment are required for maintenance of the air conditioner.

4-8. Maintenance Repair Parts

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering organizational maintenance for this equipment. (TM 5-4120-239-20P) (when printed).

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

4-9. General

Periodic maintenance checks are required by organizational maintenance personnel to check the performance of daily preventive maintenance services. Additional periodic maintenance services are required that are beyond the scope of the operator's maintenance.

4-10. Quarterly Preventive Maintenance Services

a. This paragraph contains a tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to three calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of inspection and minimum requirements. Refer to table 4-1 for quarterly preventive maintenance services.

c. Some services are required at a shorter interval and are so noted. Service intervals should be shortened under extreme or unusual conditions.

'Table 4-1. Preventive Maintenance Checks and Sercices
Organizational Maintenance Category Monthly Scledule (or quarterly)

Sequence number	Item to be inspected	Procedures	Paragraph reference
1	Evaporator inlet and discharge louvers	Clean, inspect for damage. Replace if necessary.	Para 4-18
* 2	Air filter	Inspect and service or replace as necessary.	Para 4-17
3	Condenser guard	Inspect and clean. Replace if damaged.	Para 4-20
* 4	Fresh air screen	Inspect and clean or replace as necessary.	Para 4-19
5	Evaporator coil	Clean and inspect.	Para 4-24
6	Condenser coil	Clean and inspect.	Para 4-23
7	Condenser cover	Inspect, clean and repair or replace if damaged.	Para 4-21
8	Housing covers	Repair or replace damaged covers.	Para 4-21
9	Fans	Check fans for damage. Check motors for evidence of over heating. Replace damaged fans and motors.	Para 4-38,4-39, and 4-40
10	Heaters	Check for breaks in wiring and insulation. Tighten loose connections.	Para 4-35
11	Controls and instruments	Check for damage to any controls in control module. Replace defective parts or control module.	Para 4-49 thru 4-48
12	Junction box components	Check for defective relays and circuit breaker.	Para 4-49 thru 4-54
13	Wiring and electrical components.	Check for damaged or frayed wiring. Check for defective electrical components. Repair or replace defective wiring. Replace defective electrical components.	Para 4-33
14	Liquid sight indicator	Check for damage.	
15	Refrigeration system	Check compressor, valves, and piping for damage. Report damage to direct support maintenance.	Para 4-63

* To be accomplished weekly instead of monthly

Section V. TROUBLESHOOTING

4-11. General

This section contains troubleshooting instructions for the isolation of causes of common troubles that may occur during operation and also contains the possible remedies to correct the trouble.

4-12. Organizational Troubleshooting Chart

a. General. Troubleshooting procedures for organizational maintenance personnel are listed in table 4-2. The first column shows the apparent trouble or malfunction. The second column contains the probable cause. The third column lists the corrective action to be taken. Remedies that are beyond the scope of organizational maintenance must be reported to direct support maintenance personnel. Additional procedures are listed in paragraphs b and c below.

6. Control Circuit. The cause for a system's failure to operate can be greatly narrowed if the control which caused the failure can be isolated. It is the function of safety devices to open the circuit under certain conditions; therefore. additional checking may be required to determine whether the safety device is open because it is defective or is performing its designed function. The following steps contain instructions for checking the control circuit,

(1) Disconnect power from air conditioner.

(2) Test the continuity across each control in the affected circuit with a test lamp or ohmmeter if available, using schematic diagram as a guide. Check wiring diagrams for connections.

(3) Replace defective parts.

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

Table 4-2. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. Air conditioner fails to operate.	*a.* Main power cable disconnected.	*a.* Connect cable.
	b. Main power receptacle connector defective.	*b.* Replace connector (para 4-33).
	c. Loose electrical connections.	*c.* Tighten connections.
	d. Rotary selector switch improperly adjusted or defective.	*d.* Turn selector switch to "cool" or "ventilate". Replace a defective switch (para 4-44 through 4-48).
	e. Control or compressor circuit breaker in OFF position or defective.	*e.* Reset circuit breaker(s) or replace (para 4-44 thru 4-48 or para 4-50 thru 4-54).
	f. Defective phase sensing relay.	*f.* Replace defective phase sensing relay (para 4-50 thru 4-54).
	g. Defective control circuit transformer.	*g.* Replace defective transformer (para 4-56).
	h. Defective control circuit rectifier.	*h.* Replace defective rectifier (para 4-57).
2. Insufficient cooling.	*a.* Mode selector switch improperly positioned.	*a.* Set switch to "Cool".
	b. Insufficient refrigerant charge.	*b.* Report condition to direct support maintenance.
	c. Condenser coil dirty.	*c.* Clean coil (para 4-23).
	d. Evaporator return air filter dirty.	*d.* Clean filter (para 4-17).
	e. Temperature selector switch set incorrectly or defective.	*e.* Adjust setting or replace switch (para 4-44 thru 4-48).
	f. Fresh air damper control set incorrectly or incorrectly adjusted.	*f.* Check setting of control. Adjust fresh air damper control (para 4-27).
	g. Defective compressor.	*g.* Report condition to general support maintenance.
	h. Evaporator outlet louver bent or stuck in closed position.	*h.* Repair or replace louver (para 4-18).
	i. Evaporator fan motor worn or defective.	*i.* Report deficiency to direct support maintenance or replace motor (para 4-38 and 4-40).
	j. Evaporator fan loose or defective.	*j.* Tighten or replace fan.
	k. Evaporator fan motor thermal protector defective.	*k.* Replace thermal protector (para 4-39).

Table 4-2. Troubleshooting--Continued

Malfunction	Probable Cause	Corrective Action
3. Evaporator or condenser fan fails to operate.	*a.* Main power cable disconnected.	*a.* Connect cable.
	b. Defective fan motor.	*b.* Replace motor (para 4-38 and 4-40).
	c. Evaporator or condenser fan defective or binding.	*c.* Relieve binding or replace fan (para 4-38 and 4-40).
	d. Defective condenser motor thermal protector.	*d.* Replace thermal protector (para 4-39).
	e. Defective evaporator fan motor thermal protector.	*e.* Replace thermal protector (para 4-39).
	f. Defective receptacle or plug connectors.	*f.* Replace connectors or receptacles (para 4-33).
	g. Defective high-low condenser fan thermostatic switch.	*g.* Replace thermostatic switch (para 4-41).
	h. Defective condenser fan relay.	*h.* Replace defective relay (para 4-50 thru 4-54).
	i. Defective evaporator fan speed control switch.	*i.* Replace defective switch (para 4-44 thru 4-48).
	j. Mode selector switch improperly adjusted or defective.	*j.* Replace a defective switch (para 4-44 thru 4-48).
4. Compressor will not start.	*a.* Compressor or control circuit breakers or selector switch improperly set.	*a.* Reset controls properly.
	b. Contacts of high or low pressure cutout switch open.	*b.* Reset pressure switches. Report deficiency to direct support maintenance if condition continues..
	c. Loose electrical connections or faulty wiring.	*c.* Tighten loose connections. Repair wiring if necessary.
	d. Open control circuit.	*d.* Make continuity check of circuit (para 4-12).
	e. Defective circuit breaker.	*e.* Replace defective control or compressor circuit breaker (para 4-44 thru 4-48 or para 4-50 thru 4-54).
	f. Defective control transformer.	*f.* Replace defective transformer (para 4-66).
	g. Defective rectifier.	*g.* Replace defective rectifier (para 4-.57).
	h. Defective time delay relay.	*h.* Replace defective relay (para 4-50 thru 4-.54).
	i. Defective compressor relay.	*i.* Replace defective relay (para 4-50 thru 4-.541.
	j. Defective starting relay or capacitor (singel phase compressor).	*j.* Replace defective capacitor or relay (para 4-61).
	k. Defective phase sequence relay (three phase compressor).	*k.* Replace defective relay (para 4-50 thru 4-.541.
	l. Defective or tripped compressor internal temperature overload switch.	*l.* Allow unit to cool. Report deficiency to direct support maintenance if condition continues.
	m. Defective compressor motor.	tm. Check and report deficiency to general support maintenance if motor is defective.
5. Compressor starts but goes out on overload.	*a.* Condenser fan motor failure.	a.. Replace defective motor (para 4-38 and 4-40).
	b. High head pressure.	b. Clean condenser coil and louvers. Check fan for proper operation.
	c. Defective or "tripped" compressor internal temperature overload switch.	f". Allow unit to cool. Report (Deficiency to direct support maintenance if condition continues.
	d. Improperly adjusted or defective refrigerant control valves.	d. Report condition to direct support maintenance.
	e. Evaporator fan speed switch set at low speed.	e. Reset switch to high speed.

Table 4-2. Troubleshooting-Continued

Malfunction	Probable Cause	Corrective Action
6. Evaporator air output volume low.	*a.* Dirty or damaged filter or louvers.	a. Clean or replace filter (para 4-7). Clean or replace louvers as required (para 4-18).
	b. Iced or dirty evaporator coil.	b. De-ice and clean coil (para 4-24).
	c. Defective evaporator fan.	c. Replace fan.
	d. Defective fan motor.	d. Replace motor (para 4-38 and 4-40).
	e. Evaporator fan speed switch set at low speed.	c. Reset switch to HIGH speed.
7. Condenser air output volume low.	*a.* Dirty condenser coil or guard.	a. Clean coil and guard (para 4-23).
	b. Defective HIGH-LOW condenser fan thermostatic switch.	b. Replace switch (para 4-41).
	c. Defective condenser fan.	c. Replace fan.
	d. Defective fan motor.	d. Replace motor (para 4-38 and 4-40).
	e. Air outlet louvers stuck in closed position.	f. Free louvers and control cable. Adjust control or refer to direct support maintenance if actuating cylinder is not functioning properly.
8. Air conditioner fails to heat.	*a.* Selector switch improperly adjusted.	*a.* Reset selector switch to LO-Heat or HI-Heat (para 2-10).
	b. Temperature control switch set incorrectly.	b. Reset switch (para. 2-10).
	c. Dirty evaporator return air filter.	*c.* Clean fitter (para 4-17).
	d. Defective evaporator fan motor.	*d.* Replace rnotor (para. 4-38 and 4-40).
	e. Defective temperature selector switch or mode selector switch.	*e.* Replace defective switch (para 4-44 through 4-48).
	f. Defective heaters or wiring.	*f.* Tighten connections and repair damaged wiring. Replace defective heaters (para 4-35).
	g. Defective heater relay.	g. Replace defect relay (para 4-50 thru 4-54).
	h. Defective heater high temperature cutout thermostatic switch.	h. Replace defective thermostatic switch (para 4-34).
9. Excessive noise.	*a.* Evaporator or condenser fan vibrating.	a. Tighten fans on shafts. Tighten all mounting screws.
	b. Evaporator or condenser fan motor worn or defective.	b. Replace worn *or* defective motor (para 4-38 and 4-40).
	c. Compressor knocks or chatters.	c. Stop air conditioner and report condition to direct support maintenance.

Section VI. RADIO INTERFERENCE SUPPRESSION

4-13. General Methods Used to Attain Proper Suppression

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

4-14. Interference Suppression Components

The control module, junction box and electrical system components are grounded to the housing. The housing is connected to a ground wire in the power supply. Capacitors (fig. 4-1) are located across the rectifier terminals. Grommets are inserted in the heater support bracket to isolate heating elements from bracket to prevent metal to metal contact and scraping during expansion and contraction of heating elements. Power inlet cover chains are encased in shrink type tubing to prevent rattling of chain links.

4-15. Replacement of Capacitor

a. Removal.

(1) Remove front top cover of air conditioner.

(2) Disconnect capacitor (fig. 4-1) from terminals 1 and 3 or 2 and 4 of rectifier.

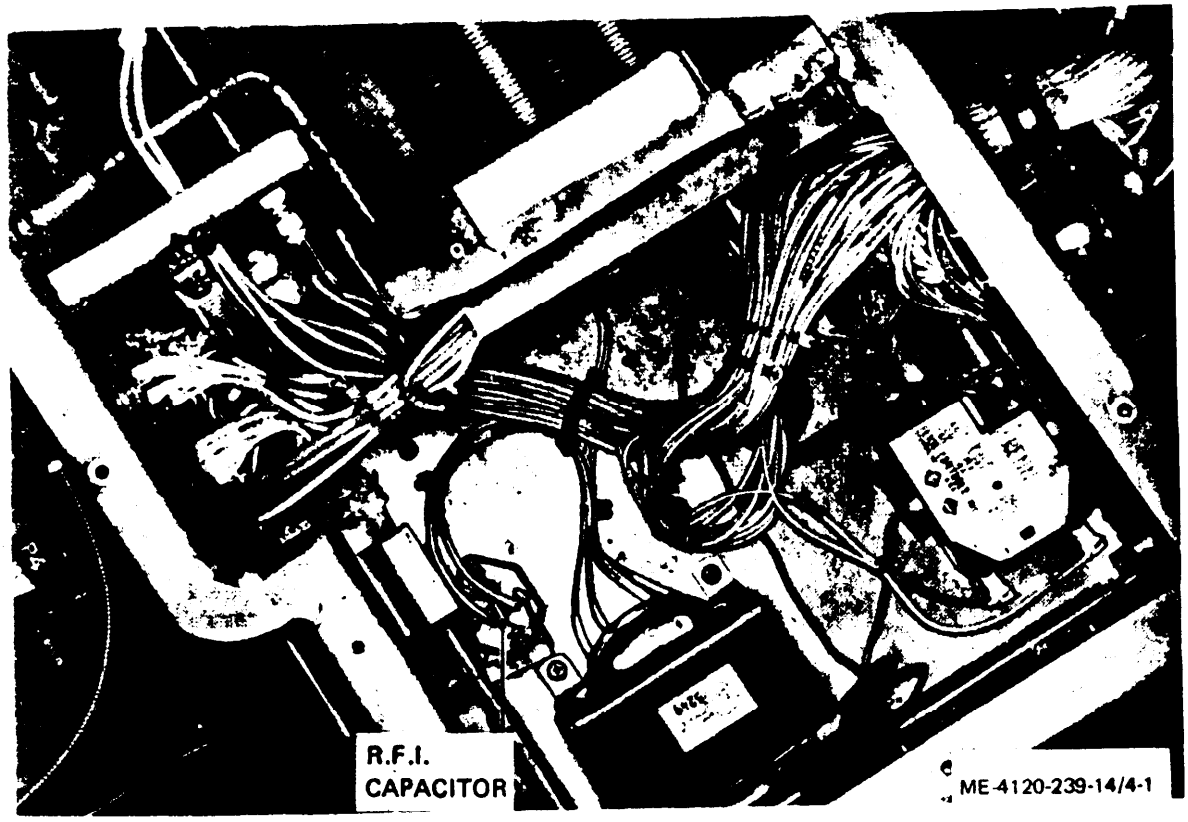


Figure 4-1. R.F.I.. capacitors.

b. Installation. **Connect new capacitor across terminals 1 and 3 or 2 and 4 of rectifier as required and install front top cover.**

Section VII. MAINTENANCE OF COVERS, LOUVERS, AND FILTERS

4-16. General

This section covers the evaporator louvers, return air filter, condenser guard, condenser louvers, fresh air screen, and the top covers of the housing. These parts must be serviced regularly or removed frequently to gain access to parts of the air conditioner. For ease of reference these parts are covered in separate paragraphs in this section. This unti was designed for use with CBR.

4-17. Servicing Return Air Filter

a. General. ***The*** return air filter (fig. 4-2) mounted in clips on the inner side of the inlet louver, filters the air returning to the air conditioner from the conditioned area.

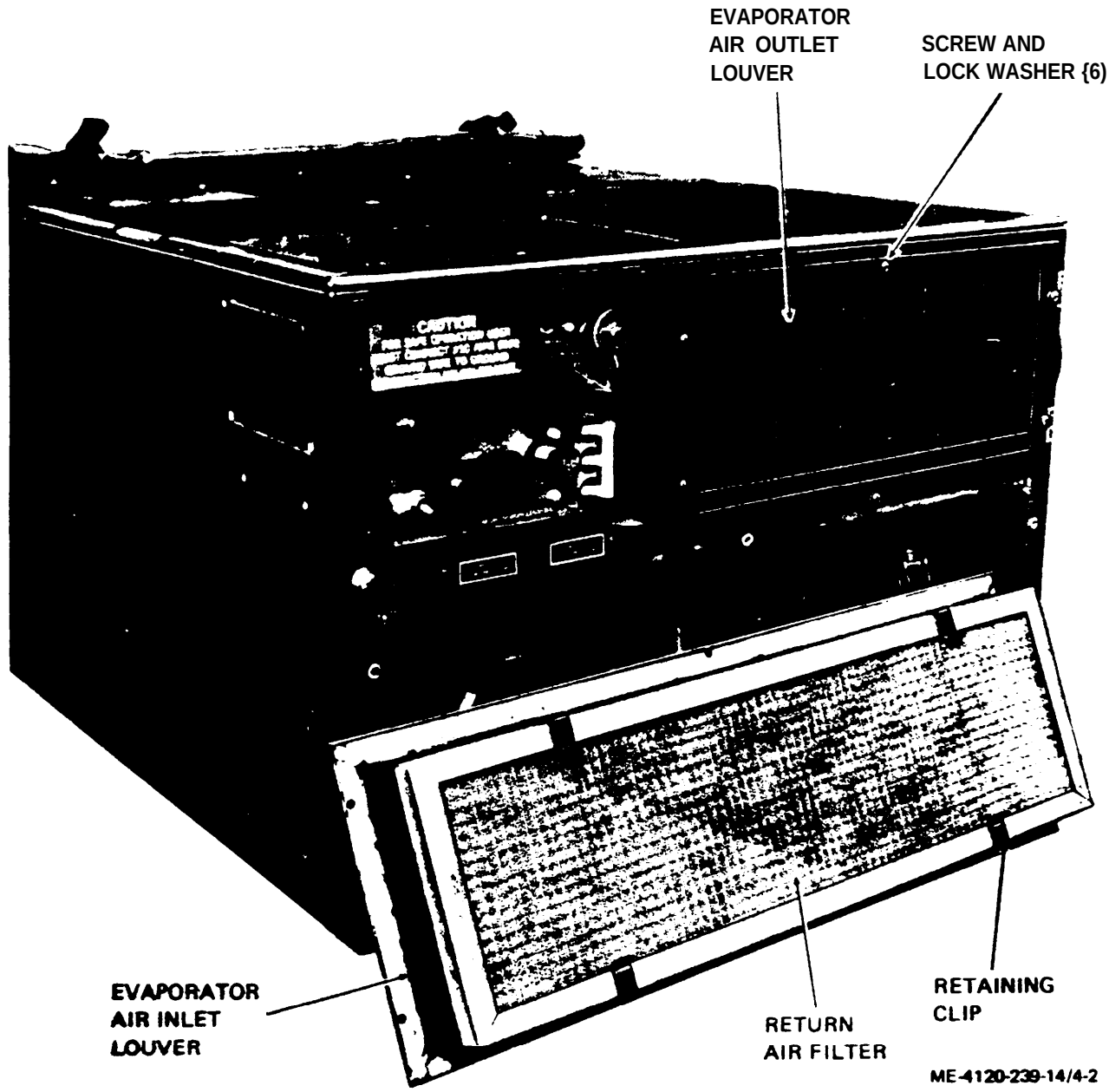


Figure 4-2. Evaporator air louvers and air filter.

b. Removal. Remove ten screws and lock washers and remove evaporator air inlet louver (fig. 4-2). Slide return air filter from retaining clips on louver.

c. *Cleaning and Inspection.Clean* and inspect air filter as follows:

(1) Wash filter in detergent or cleaning solvent (Fed. Spec. P-D-680). Dry thoroughly.

(2) Inspect filter for damage or clogged condition. Replace filter if damaged or clogged.

(3 Reoil filter with SAE 30 oil. Drain eight hours and wipe off excess oil.

d. *Installation.* Slide filter into air inlet louver and secure louver to housing with ten screws and lock washers.

4-18. Evaporator Air Inlet and Outlet Louvers

a. General. The evaporator air inlet louver is adjustable to control the amount of return air that will pass through the air conditioner when the fresh air ventilation damper is open. The evaporator air outlet louver, mounted in front of the evaporator coil, has individual) adjustable blades to direct the evaporator air outlet flow.

b. Removal. Refer to paragraph 4-17 and remove the evaporator air inlet louver. Refer to figure 4-2

and remove the evaporator air outlet filter by removing six screws and lock washers.

c. *Cleaning, Inspection and Repair.* Clean, inspect and repair louvers as follows:

(1) Clean louvers with cleaning solvent (Fed. Spec. P-D-680).

(2) Inspect for bent or broken louver blades. Straighten bent blades. Replace louver if damaged.

d. Installafion. Refer to paragraph *4-17* and install the air inlet louver. Install outlet louver over discharge opening and install six screws and lock washers.

4-19. Fresh Air Screen

a. General. The fresh air screen (fig. 4-3) mounted on the rear wall *of* the housing, covers the fresh air inlet opening, to prevent bugs and other air borne matter from entering the air conditioner This unit was designed for use with CBR.

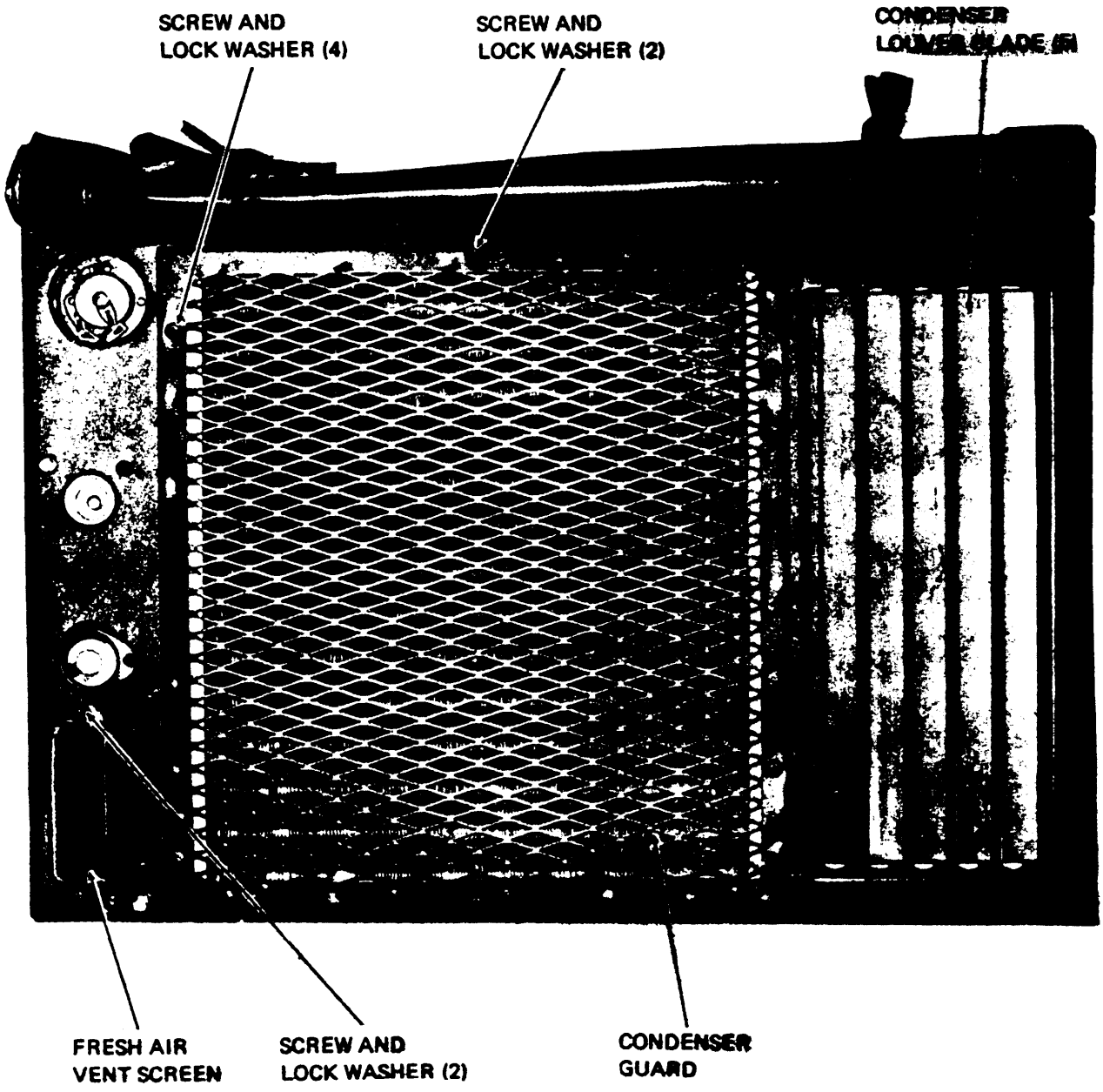


Figure 4-3, Fresh air vent screen, condenser guard and condenser louver blades.

b. Removal. Refer to figure 4-3. Remove two screw and lock washers and fresh air screen.

c. Cleaning and Inspection. Clean the screen in cleaning solvent (Fed. Spec. P-D-680). Replace the screen if damaged or broken.

d. Installation. Refer to figure 4-3 and install the screen and two screws and lock washers.

4-20. Condenser Guard and Louver

a. General. The condenser guard (fig. 1-2), located at the rear of the air conditioner, is an expanded metal guard that protects the condenser coil from damage. The condenser air discharge louver is opened and closed automatically by an actuator cylinder in the refrigeration system. A push-pull control assembly connects the louver and cylinder.

b. Cleaning and Inspection. The guard can be cleaned with a bristle brush without removing the guard from the air conditioner or the guard can be removed and washed thoroughly. Clean the louvers with a dry cloth. Inspect louver blades for bent condition or damaged rubber strips. Inspect guard for bent or broken condition.

c. Condenser Guard Removal and Installation. Refer to figure 4-3 and remove and install condenser guard as follows:

(1) Remove two screws and lock washers from top and bottom of guard.

(2) Remove four screws and lock washers that secure guard to condenser coil. Remove guard.

(3) Install guard and six screws and lock washers previously removed.

d. Replacement of Louver Blades. Individual condenser louver blades (fig. 4-3) are flexible enough for removal. Remove damaged blades as follows:

(1) Remove rear cover as described in paragraph 4-21.

(2) Remove push-on type nut (fig. 4-4) from louver blade to be removed. Bend blade to remove ends from bearings and remove blade.

(3) Bend new blade in same manner as in removal and install ends in bearings.

(4) Install push-on nut.

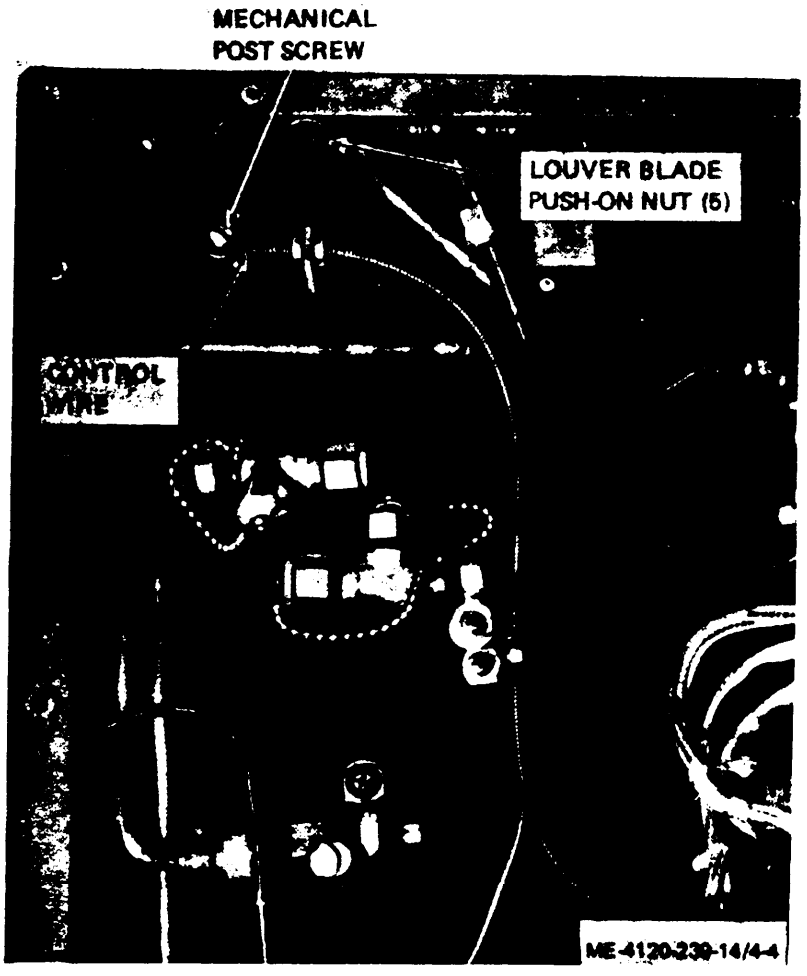


FigURE 4-4. Louver blade push-on nuts and louver control attachment.

e. Condenser Louver Control Adjustment. To adjust the louver control with refrigerant in the system proceed as follows:

(1) Turn off air conditioner and wait four hours or until air conditioner is uniformly at ambient temperature.

(3) Loosen mechanical post screw (fig. 4-4). Close condenser louvers, pull wire tight and tighten mechanical post screw. Louvers must be tightly closed when air conditioner is off.

4-21. Housing Covers

a. General. The top of the housing is enclosed by front, center and rear covers. The rear cover has an access opening over the charging valves. This opening is covered by an access cover during normal operation. A canvas cover, mounted on the rear cover, is used to cover the condenser and fresh air openings when the air conditioner is not in use.

b. Removal.

(1) To remove front cover, remove eight screws (fig. 4-5) and remove front cover.

(*2) To remove access* cover (fig. 4-5), remove four screws and cover.

(3) To remove rear cover (fig. 4-5) remove three screws and lock washers and remove condenser cover. Remove seven screws and rear cover.

(4) The front and rear covers must be removed before removing the center cover (fig. 4-5). Remove six screws. Remove two screws securing thermostatic switch bracket to cover.

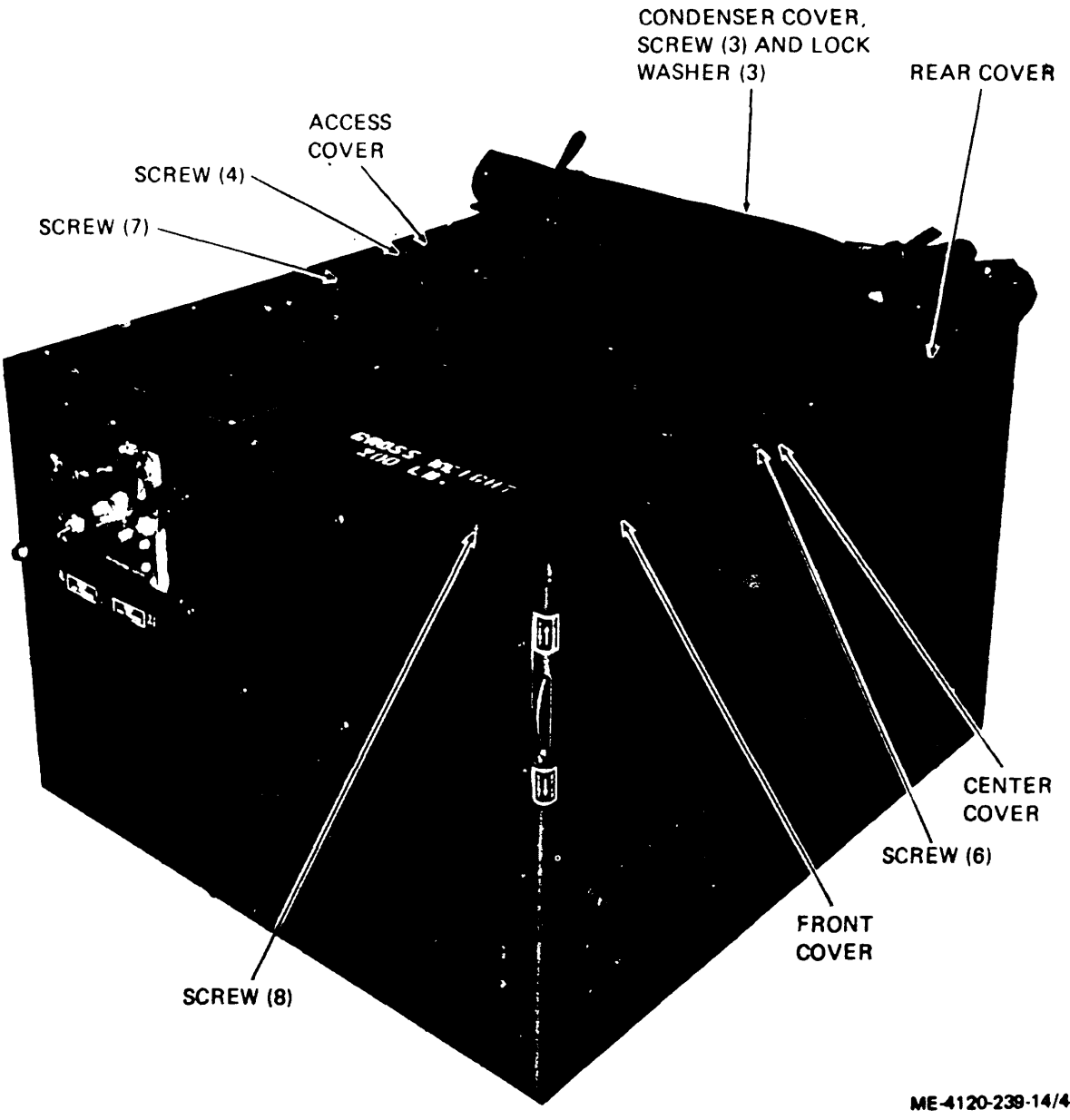


Figure 4-5. Housing covers.

c. Cleaning, Inspection and Repair. Clean, inspect and repair covers as follows:

(1) Brush off any loose dirt or foreign matter from gaskets and insulation. Wipe off tops of metal parts with a cloth dipped in cleaning solvent (Fed. Spec. *P-D-680).* Wash dirt from condenser cover.

(2) Inspect metal covers for distortion and damaged or loose gaskets and insulation. Inspect canvas cover for torn condition and for damaged fasteners.

(3) Straighten a bent metal cover, cement or replace loose or damaged gaskets and insulation Replace cover if it will not form a satisfactory sea after repair.

(4) Repair torn areas *of* condenser cover Replace cover if damage is extensive.

d. Installation. Refer to figure 4-5 and install covers as follows:

(1) Install thermostatic switch bracket on center cover and secure with two screws. Install center cover and six screws.

(2) Install rear cover and seven screws. Install condenser cover and three screws and lock washers.

(3) Install access cover and four screws.

(4) Install front cover and eight screws.

Section VIII. MAINTENANCE OF CONDENSER COIL, EVAPORATOR COIL, AND DRAINS

4-22, General

The condenser coil (fig. 1-3) and evaporator coil require periodic cleaning to insure full air flow through the coils and maximum heat transfer during operation. The evaporator drain tubes (fig. 4-6), located under the evaporator coil in the evaporator fan compartment, are connected to a drain tube in the housing. The housing drain tube terminates in the drain openings at the rear of the housing. Drain tubes must be open to prevent buildup of condensate under the evaporator coil.

4-23. Servicing Condenser Coil

a. Refer to paragraph 4-21 and remove rear cover and condenser cover.

b. Clean the surface of the condenser coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inches away from coil to avoid dam aging the fins.

Warning: **Do not use steam to clean coils.**

c. During cleaning inspect coil for leaks or damaged fins. If leaks or damage are evident, report condition to direct support maintenance.

d. Refer to paragraph 4-21 and install rear cover and condenser cover.

4-24. Servicing Evaporator Coil

u. Refer to paragraph 4-18 and remove evaporator outlet louver. Refer to paragraph 4-21 and remove front cover.

b. Clean the surface of the evaporator coil with a soft bristle brush. Blow dirt out from between the fins with compressed air. Hold nozzle of air hose at least 6 to 8 inches away from coil to avoid dam aging the fins.

Warning: **Do not use steam to clean coils.**

c. During cleaning, inspect coil for leaks or dam aged fins. If leaks or damage are evident, report condition to direct support maintenance..

d. Refer to paragraph 4-18 and install outlet louver. Refer to paragraph 4-21 and install front cover.

4-25. Evaporator Drain Tubing

a. Removal. Refer to figure 4-6 and remove six hose clamps, tee, and three pieces of flexible tubing.

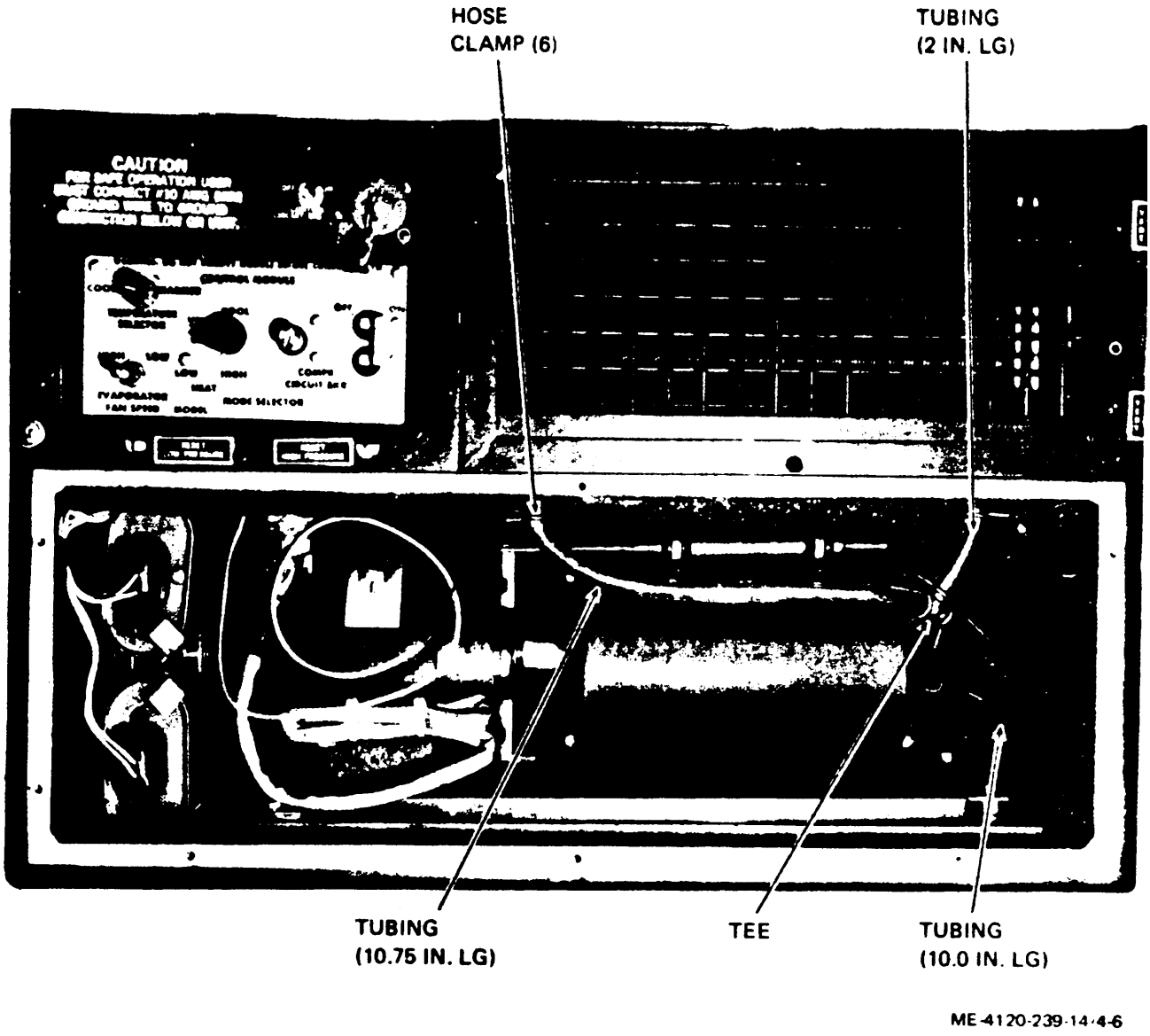


Figure 4-6. Evaporator drain tubing.

b. Cleaning and Inspection. Clean and inspect drain tubing as follows:

(1) Flush out tubing and clean out any accumulation *of* dirt or other foreign matter from tee. Use a small diameter brush or a piece of soft wire to clean drain tube in housing.

(2) Inspect tubing for split or deteriorated condition. Inspect tee for cracks. Replace defective parts.

C. *Installation.* Refer to figure 4-6 and install drain tubing as follows:

(1) Connect each piece of tubing to tee with hose clamps.

(2) Connect tubing to drain connections with hose clamps.

Section IX. MAINTENANCE OF FRESH AIR VENT DAMPER AND CONTROL

4-26. General

The vent damper opens and closes the fresh air inlet passage. It is opened and closed by a push-pull type control attached to the damper and to an actuator (fig. 2-3).

4-27. Adjustment

a. The wire core of the push-pull control is attachcd to the actuator (fig. 4-7) and to the rod on top of the vent damper (fig. 4-8) by a mechanical post. To change the adjustment at either end,

loosen the screw on the mechanical post, set the actuator or damper rod and tighten the screw.

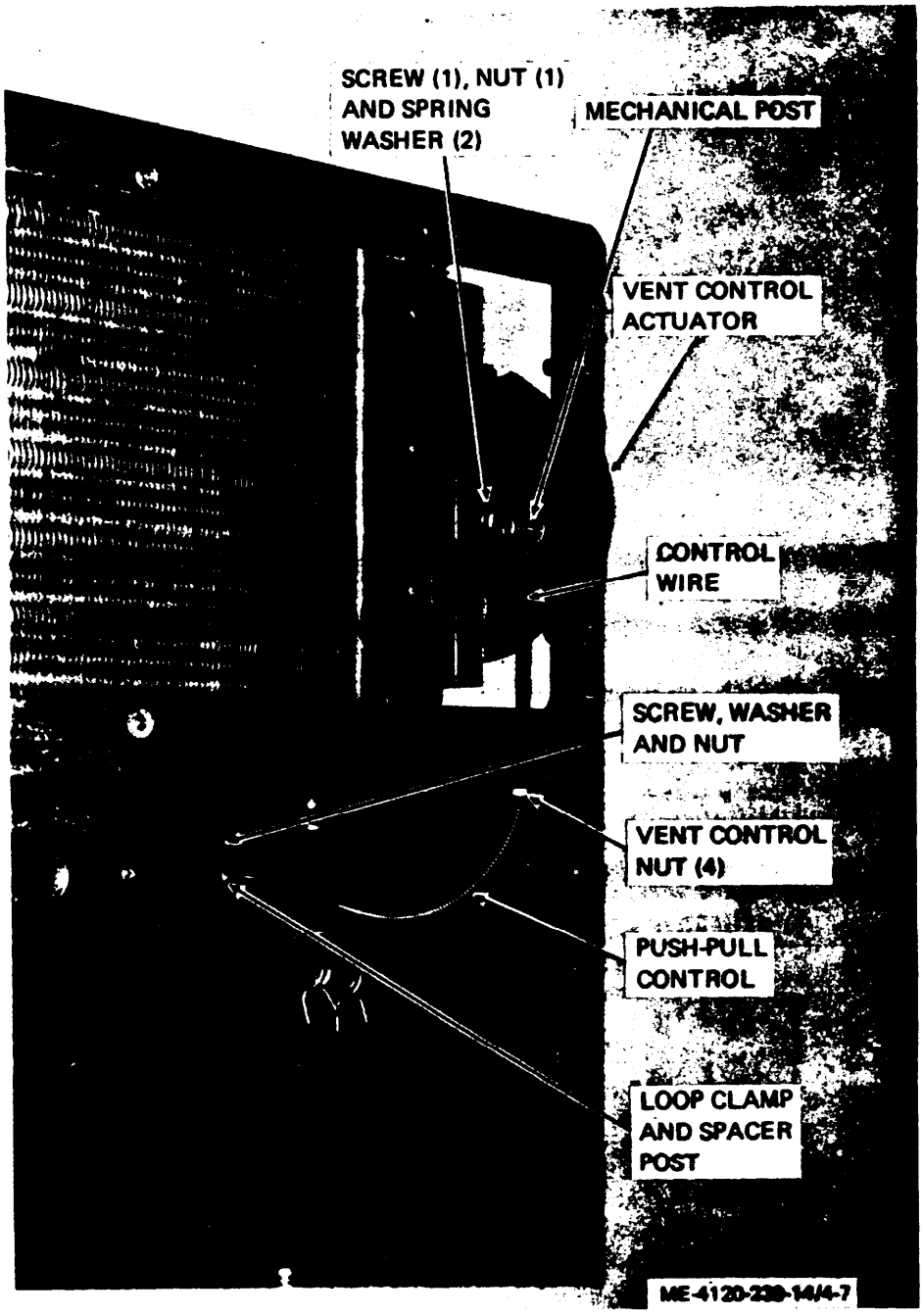


Figure 4-7. Vent damper control.

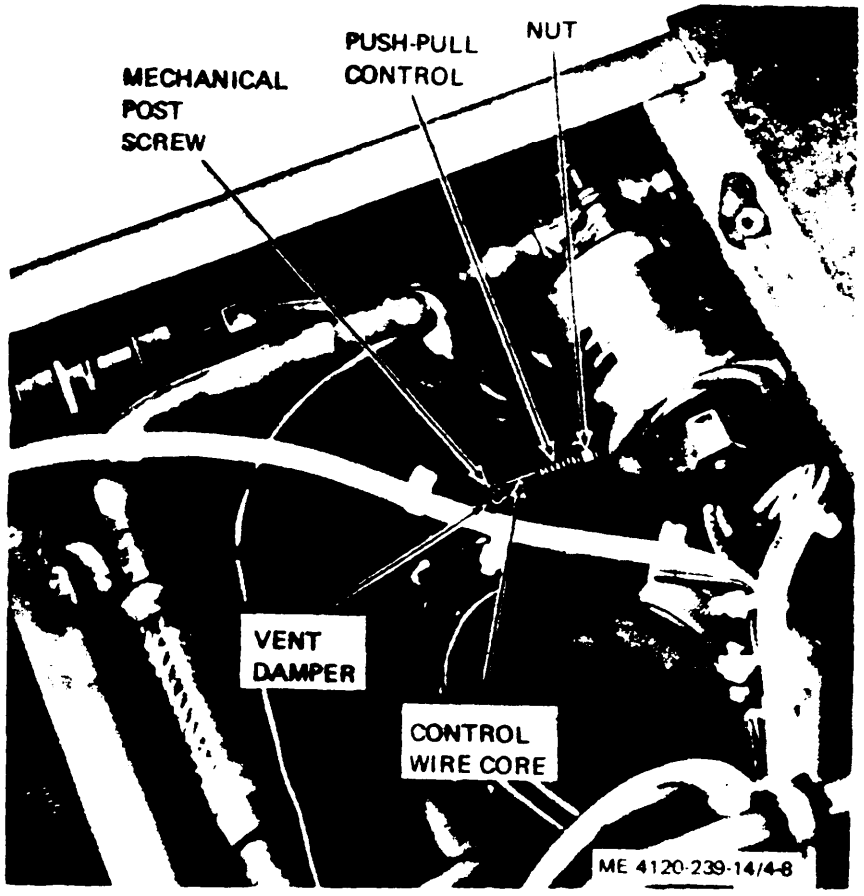


Figure **4-8.** ***Vent damper.***

b. The control should be adjusted for the center position between open and closed. The actuator should then be in the centered position and the rod on top of the damper should be parallel with front of the housing.

c. Check operation. The control should move smoothly between the open and closed position.

4-28. Removal

a. *Vent Damper*. Refer to paragraph 4-21 and remove the housing covers. Refer to figure 4-8 and remove vent damper as follows:

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

(2) Remove two screws and lock washers and lift vent darnper from air conditioner.

b. Push-Pull Control. Refer to paragraph 4-18 and remove evaporator louvers. Refer to figures 4-7 and 4-8 and remove push-pull control as follows:

(1) Remove screw, washer, nut, spacer, and loop clam p.

(2) Loosen screw on mechanical post to free end of control wire core.

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

c. *Vent Control Actuator.* Refer to figure 4-7 and remove screw. nut, two spring washers and actuator.

4-29. Cleaning, Inspection and Repair

Clean, inspect and repair vent damper and control as follows:

a. Wipe off all loose dirt with a dry cloth.

b. Inspect push-pull control for smooth operation of core in casing. Inspect vent damper for bent or broken condition, Replace defective parts. Inspect for loose or damage rubber seal on damper. Cement loose rubber or replace rubber if damaged. Inspect actuator for bent condition. Straighten actuator or replace as required.

4-30. Installation

a. Vent Control Actuator. Refer to figure 4-7 and install actuator, screw, two spring washers and nut.

b. Vent Damper. Refer to figure 4-8 and install vent damper in opening in housing. Secure vent damper cover to housing with two screws and lock washers.

c. Push-Pull Control. Refer to figures 4-7 and 4-8 and install control as follows:

(1) With one nut on each end of outer casing of push-pull control, install ends of control through

opening in housing. Install outer nuts and insert ends of wire core into mechanical posts of damper and actuator. Tighten outer nuts on casing.

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

(3) Refer to paragraph 4-27 and adjust the control.

(4) Refer to paragraph 4-21 and install housing covers.

(5) Refer to paragraph 4-18 and install evaporator inlet and outlet louvers.

Section X. MAINTENANCE OF ELECTRICAL SYSTEM

4-31. General

The electrical system consists of the evaporator and condenser fan motors, electric heaters and heater thermostatic switch, junction box, control module, transformer, rectifier, condenser fan motor, high-low speed thermostatic switch and connecting harnesses and wiring. Single phase air conditioners are equipped with motor capacitors and a compressor start relay. Three phase air conditioners are equipped with phase sequence relays. Electrical assemblies and groups of associated components are covered in separate sections.

Warning: Disconnect air conditioner power supply before performing maintenance work on electrical system.

4-32. Testing and Inspecting the Electrical System

Troubleshooting procedures for testing the electrical system to isolate cause of trouble are covered in paragraph 4-12. Additional detailed test information is contained in specific paragraphs covering the electrical components. Use a continuity tester or multimeter set on low ohms range to test for continuity. Use an insulation tester or multimeter set on higher ohm range to test for shorts between the circuit in a component and the outside case of the component. When testing air electrical component, check also for visual damage and inspect all wiring in the area for damage or loose connections.

4-33. Wiring Harnesses and Leads

a. *General.* The electrical circuits in the air conditioner are completed by individual wire leads or by wire leads laced or enclosed in a loom to form a wiring harness. All of the wiring carries code numbers. When testing, repairing or replacing the wiring harness or individual wires, refer to the wiring diagrams.

b. *Inspection.* Inspect all wiring installation 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. Inspect electrical connectors and fittings for damage or broken condition. Replace defective connectors and fittings.

c. *Testing.* Test for continuity in leads or wiring harnesses by disconnecting each end. Where wires terminate in an electrical connector, disconnect connector from corresponding receptacle connector or plug connector. Touch the test probes of a continuity tester or multimeter set on low ohms range to ends of wire or corresponding pin of connector. If continuity is not indicated, repair or replace wire.

d. *Repair.* Remove insulation to expose 1/2 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 making certain to cover all the repaired area. Replace broken terminal lugs with exact duplicates. To replace electrical connectors, unsolder wires from solder wells to inserts. Install new connector and insert ends of wires in solder wells. Solder wires in place. Check connections carefully. Refer to wiring diagram.

Section Xl. MAINTENANCE OF HEATERS AND THERMOSTATIC SWITCH

4-34. Heater Thermostatic Switch

a. General. The heater thermostatic switch mounted in a bracket under the housing center cover, protects the air conditioner from overheating if the heating element circuit is actuated and the air flow is restricted or stopped.

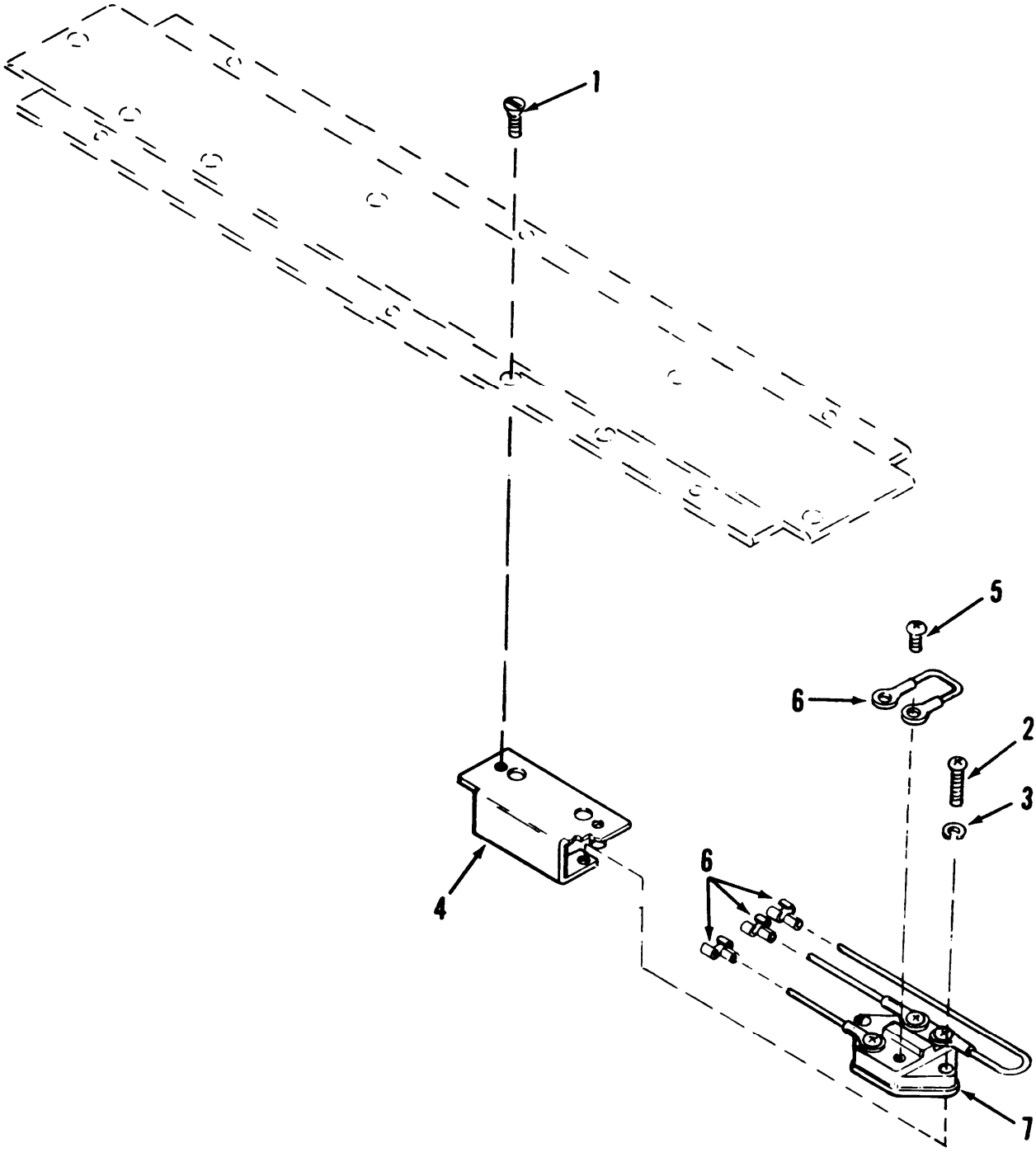
b. *Removal.* Remove the switch as follows:

(1) Refer to paragraph 4-21 and remove housing front cover.

(2) Refer to figure 4-9 and remove two screws (1) to remove bracket and switch from center cover.

(3) Remove two screws (2) and lock washers (3) and remove bracket (4).

(4) Remove switch screws (5) and disconnect leads (6) from thermostatic switch (7).



1. Screw, flat csk-hd, 8-32 x ½
2. Screw, pan-hd, 6-32 x ¾
3. Washer, lock, spr, no. 6
4. Bracket
5. Switch terminal screw
6. Lead
7. Switch, thermostatic

Figure 4-9. Heater thermostatic switch, exploded view.

c. Cleaning and Inspection. Wipe off any accumulation of dust and test as described below.

(1) Test for continuity between contacts 1 and 2 and also between contacts 3 and 4. Contacts should open on temperature rise at 150°F ± 5 %F and close on temperature drop at 110°F ± 10 %F.

(2) Replace switch if it fails to meet test requirements.

d. Installation. Refer to figure 4-9 and install heater thermostatic switch.

(1) Refer to wiring diagram and connect leads (6) to switch (7) with screw (5).

(2) Attach switch to bracket (4) with screws (2) and lock washers (3).

(3) Secure bracket to center cover with two screws (1),

(4) Refer to paragraph 4-21 and install housing front cover.

4-35. Heater Elements

a. General. The single phase air conditioners are equipped with four heater elements and the three phase air conditioners are equipped with six heater elernents. The 115 volt single phase and 230 volt single phase heating elements are the same but pairs of the elements are connected in parallel circuits on the 115 volt units and in series in the 230 volt units.

b. Removal. Refer to figure 4-10 and remove heater elements as follows:

(1) Refer to paragraph 4-21 and remove housing cover.

(2) Disconnect leads from heaters.

(3) Remove two screws, washers, and lock washers that secure heater support to housing. Slide support from ends of heater elements.

(4) Remove heater element nut, lock washer and flat washer from each heater in turn and slide heater from bracket.

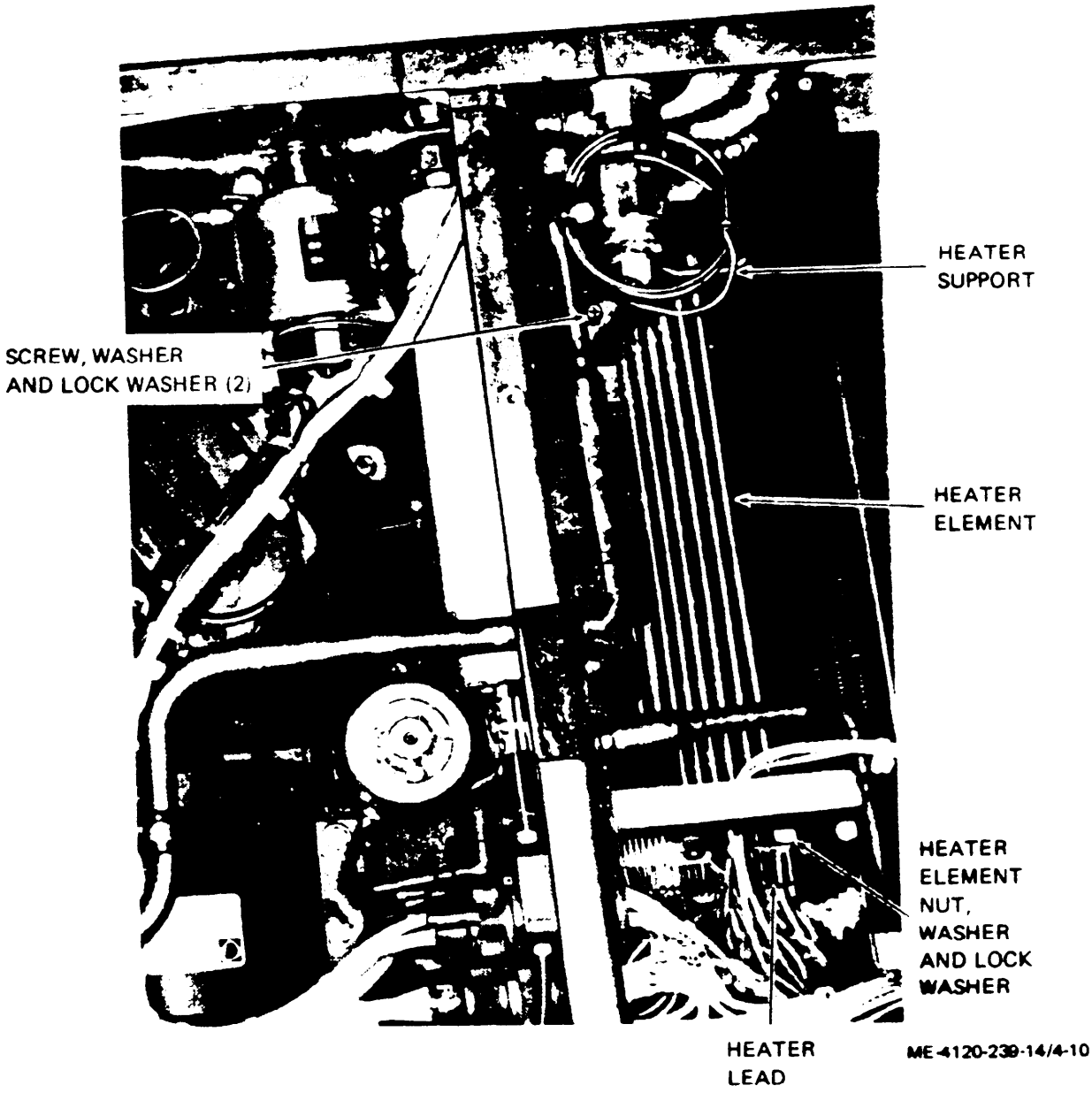


Figure 4-10. Heater elements and support.

c. Cleaning and Inspection. Wipe off all accumulated dirt from heater elements and inspect for visible damage to element or leads. Check each heater element for continuity. Replace defective heaters. Repair damaged leads.

d. ***Installation.*** Refer to figure 4-10 and install heater elements as follows:

(1) Insert heaters in bracket and support with an insulating washer between bracket and flange of each heater element.

(2) Install washer, lock washer and nut on each heater element. Secure support with two screws, washers, and lock washers.

(3) Refer to wiring diagram and make connections to heaters.

(4) Refer to paragraph 4-21 and install housing covers.

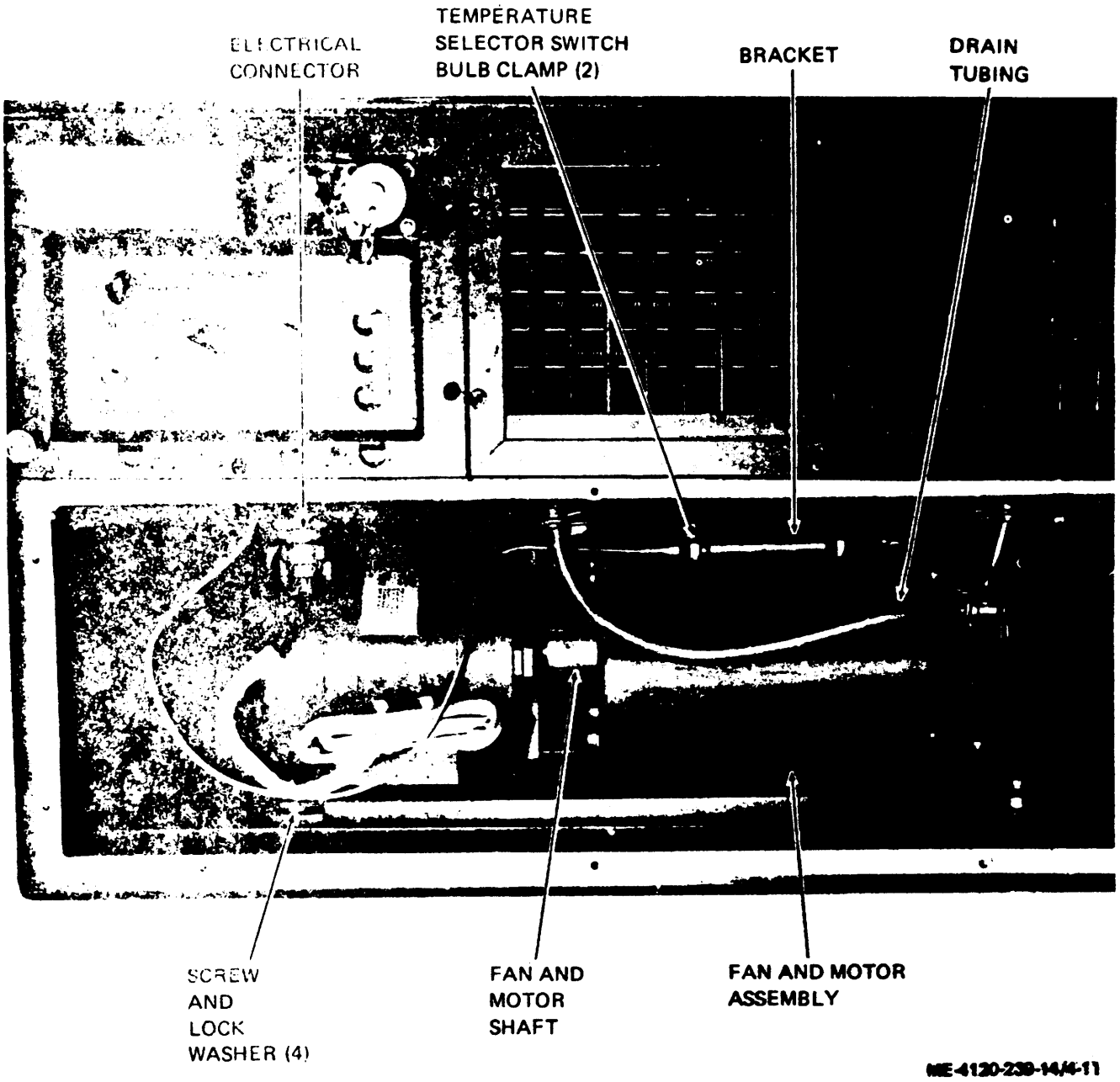


Figure 4-11. Evaporator fan and motor assembly.

(2) Disconnect motor electrical connector.

(3) Refer to paragraph 4-25 and disconnect evaporator drain tubing.

(4) Remove three brackets above fan to facilitate removal of fan and motor assembly. Remove two screws, lock washers, and clamps. Move temperature selector switch bulb clear of fan.

(5) Remove four screws and lock washers securing fan and motor base to resilient mounts and remove fan and motor assembly,

(6) To remove motor from the assembly, remove four cap screws and lock washers from underside of base. Loosen setscrew in fan and motor shaft and remove motor.

b. Condenser Fan Motor. Remove condenser fan motor as follows:

(1) Refer to paragraph 4-21 and remove housing covers.

(2) Refer to figure 4-12 and remove four screws and flat washers that secure motor mounting plate to housing,

(3) Disconnect motor lead electrical connector. Remote wire tires as required.

(4) Loosen setscrew in hub of fan impeller and remove impeller from shaft of motor.

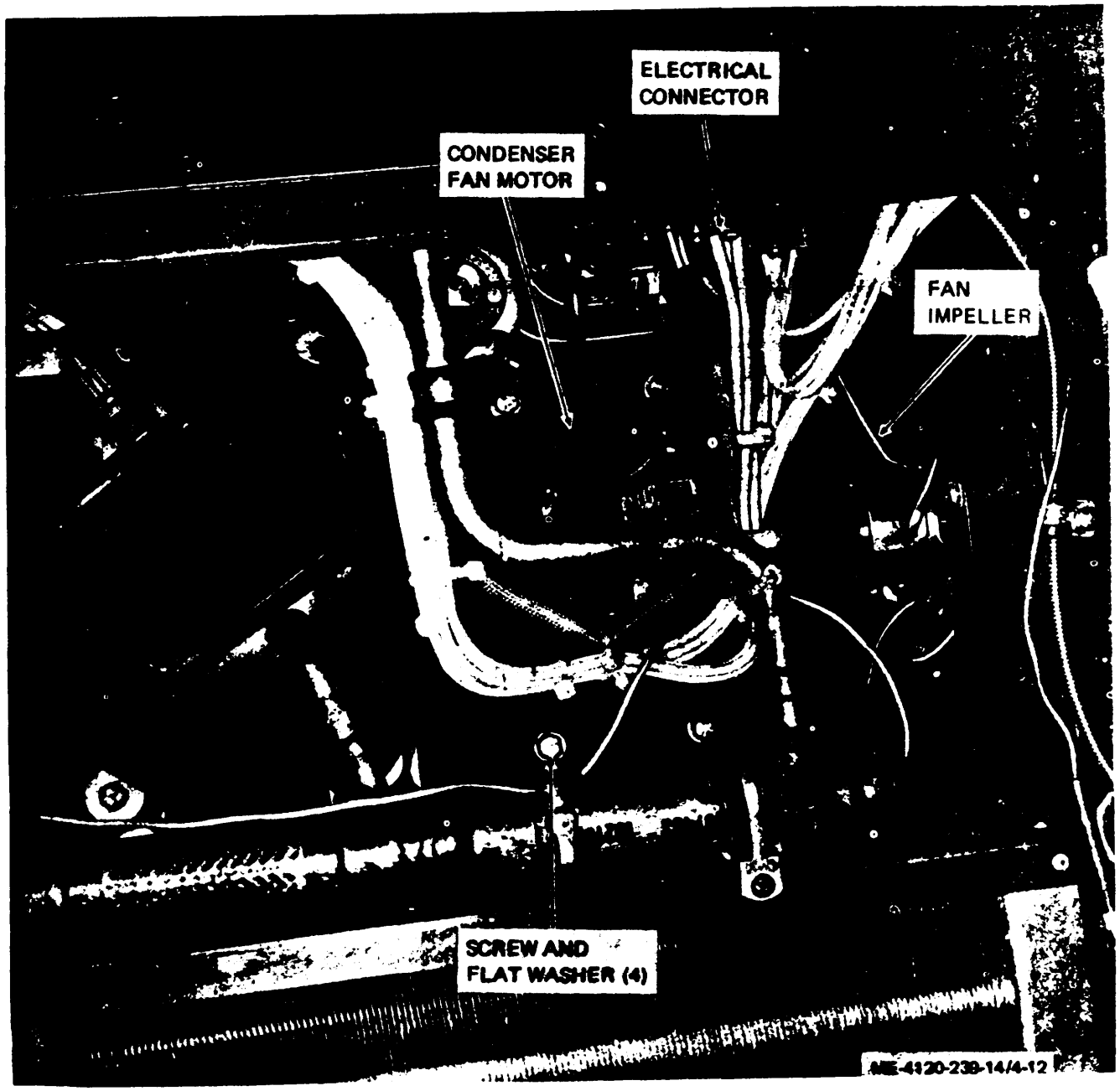
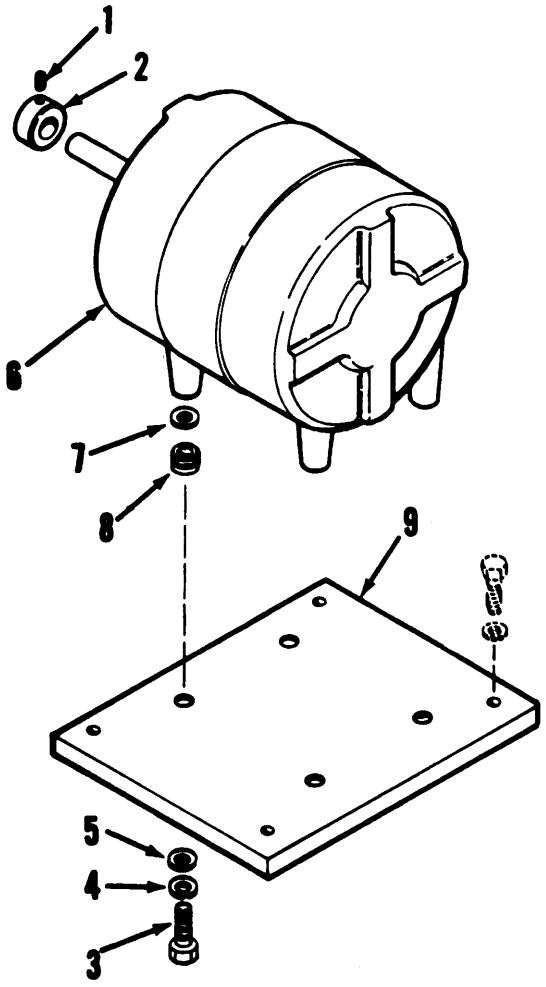


Figure 4-12. Condenser fan and motor.

(5) Remove motor and mounting plate from air conditioner.

(6) Refer to figure 4-13 and remove setscrew (1) and collar (2) from motor shaft. Remove four cap screws (3), lock washers (4) and flat washers (5). Remove motor (6) and four flat washers (7) from mounting plate (9). Remove bushing (8) from plate only if they require replacement.



1. Setscrew, ¼-28 x ¼
2. Collar
3. Screw, cap, hex-hd, ¼-28 x 1"
4. Washer, lock, spr, ¼ in.
5. Washer, flat, ⅝ OD
6. Motor
7. Washer, flat, ⅝ OD
8. Bushing
9. Mounting plate

Figure 4-13. Condenser fan motor and mounting plate, exploded view.

4-39. Fan Motor Thermal Protector Replacement

a. General. Organizational repair of motors is limited to testing and replacement of defective thermal protectors. Thermal protectors for single phase motors are imbedded in motor windings, and cannot be removed for "repairs. Instructions con. tained in this paragraph cover replacement of three phase motor thermal protectors.

b. Removal. Refer to figure 4-14 and partially remove thermal protector housing from motor by removing two screws and washers. Tag and disconnect electrical leads. Remove thermal protector. Remove other protector in the same manner.

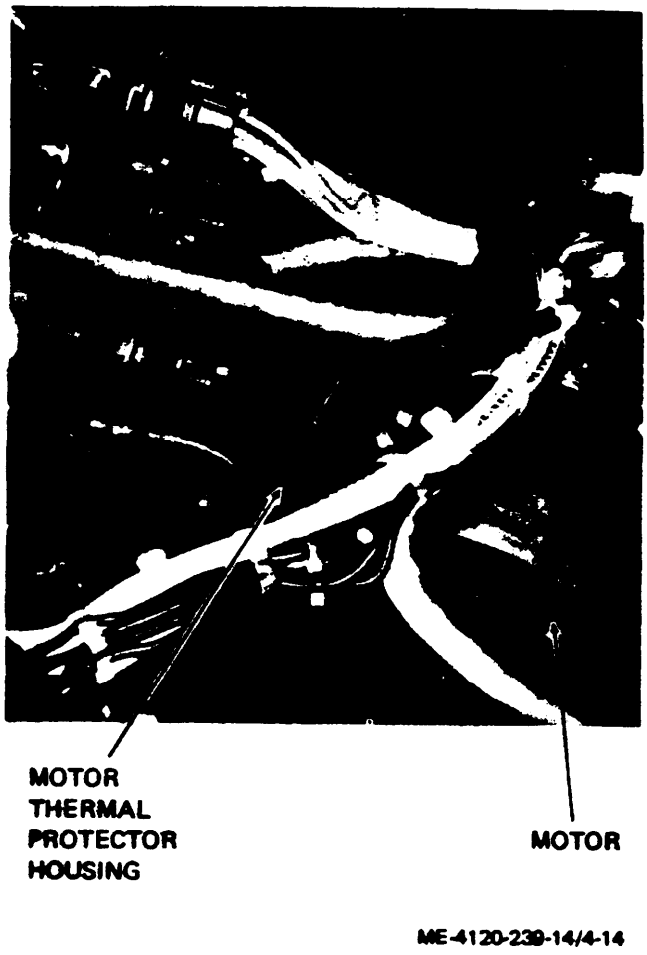


Figure 4-14. Motor thermal protector housing.

c. *Testing.* Check for continuity between terminals. Replace protector if open.

d. *Installation.* Install thermal protector in

housing and connect leads. Install thermal protector housing on motor and secure with screws and washers previously removed.

4-40. Installation

a. Evaporator Fan Motor. Install evaporator fan motor as follows:

(1) Set motor on fan and motor base with motor shaft in fan and motor shaft (fig. 4-11). Install four cap screws and lock washers through underside of base to secure motor. Tighten setscrew in fan and motor shaft.

(2) Install fan and motor assembly on resilient mounts and install four screws and lock washers (fig. 4-1 1).

(3) Install brackets above fan. Install temperature selector switch bulb in clamps and secure clamps with screws and lock washers.

(4) Refer to paragraph 4-25 and install evaporator drain piping.

(5) Connect motor electrical connector.

(6) Refer to paragraph 4-18 and install evaporator air inlet louver.

b. Condenser Fan Motor. Assemble motor on mounting plate and install motor and mounting plate as follows:

(1) Refer to figure 4-13 and install bushings (8) in mounting plate (9) if they were removed.

(2) Place a washer (7) over each bushing and set motor (6) on washers. Install four screws (3), washers (5), and lock washers (4). Install collar (2) on motor shaft and install setscrew (1).

(3) Install plate and motor in air conditioner and slide fan impeller (fig. 4-1 2) on motor shaft. Install four screws and flat washers.

(4) Connect motor electrical connector.

(5) Refer to paragraph 4-21 and install housing covers.

Section XIII. MAINTENANCE OF FAN MOTOR SWITCHES AND CAPACITORS

4-41. Fan Motor Speed Control Switches

a. General. The evaporator fan motor speed control switch is a toggle switch which is part of the control module. Replacement instructions for this switch are included with the control module. The condenser fan motor speed control thermostatic switch, located on the rear wall of the housing, automatically controls the fan motor speed. The switch is normally open and closes on temperature rise between 95° F and 105° F. When the switch contacts close the condenser fan relay coil is energized and the relay shifts the fan motor circuit from low-speed to high-speed.

b. Testing. Test the switch and connector assembly in the air conditioner as follows:

(1) Refer to paragraph 4-21 and remove rear top cover.

(2) Disconnect electrical connector located just below condenser motor electrical connector (fig. 4-12).

(3) Check for continuity between terminals of connector. There should be no continuity between terminals when temperature is below 95° F. If a source of heated air is available, check for closing of contacts and continuity between terminals at 95° F to 105°F.

(4) If switch and connector assembly do not meet requirements, check wiring and repair damaged wiring or replace switch.

c. Removal. With top cover removed and electrical connector disconnected, proceed as follows :

(1) Refer to figure 4-15 and remove two screws and lock washers. Remove switch and connector assembly.

(2) Disconnect switch Ieads from connector.

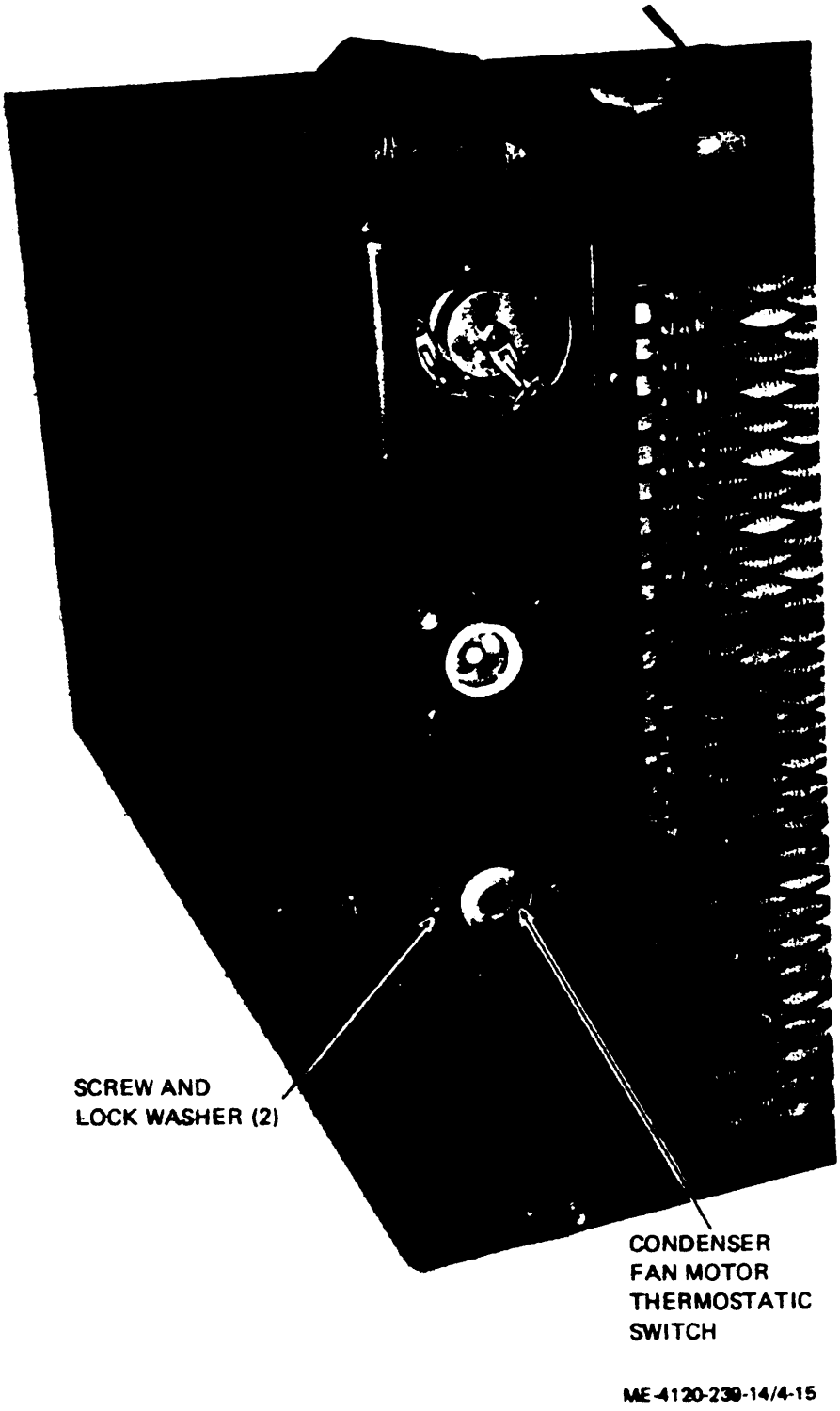


Figure 4-15. Condenser fan motor thermostatic switch.

d. Installation. Install the condenser fan thermostatic switch as follows:

(1) Connect switch leads to connector.

(2) Refer to figure 4-15 and install switch in opening. Secure switch with two screws and lock washers.

(3) Connect electrical connector.

(4) Refer to paragraph 4-21 and install rear top cover.

4-42. Fan Motor Capacitors

a. *General.* Single phase air conditioners are

equipped with fan motor run capacitors which are located in the evaporator air inlet compartment.

b. Rernoual. Remove fan motor capacitors as follows :

(1) Refer to paragraph 4-18 and remove the evaporator air inlet louver.

(2) Refer to figure 4-16 and disconnect capacitor leads.

(3) Remove screw and bracket l nd slide capacitors outward from air conditioner.

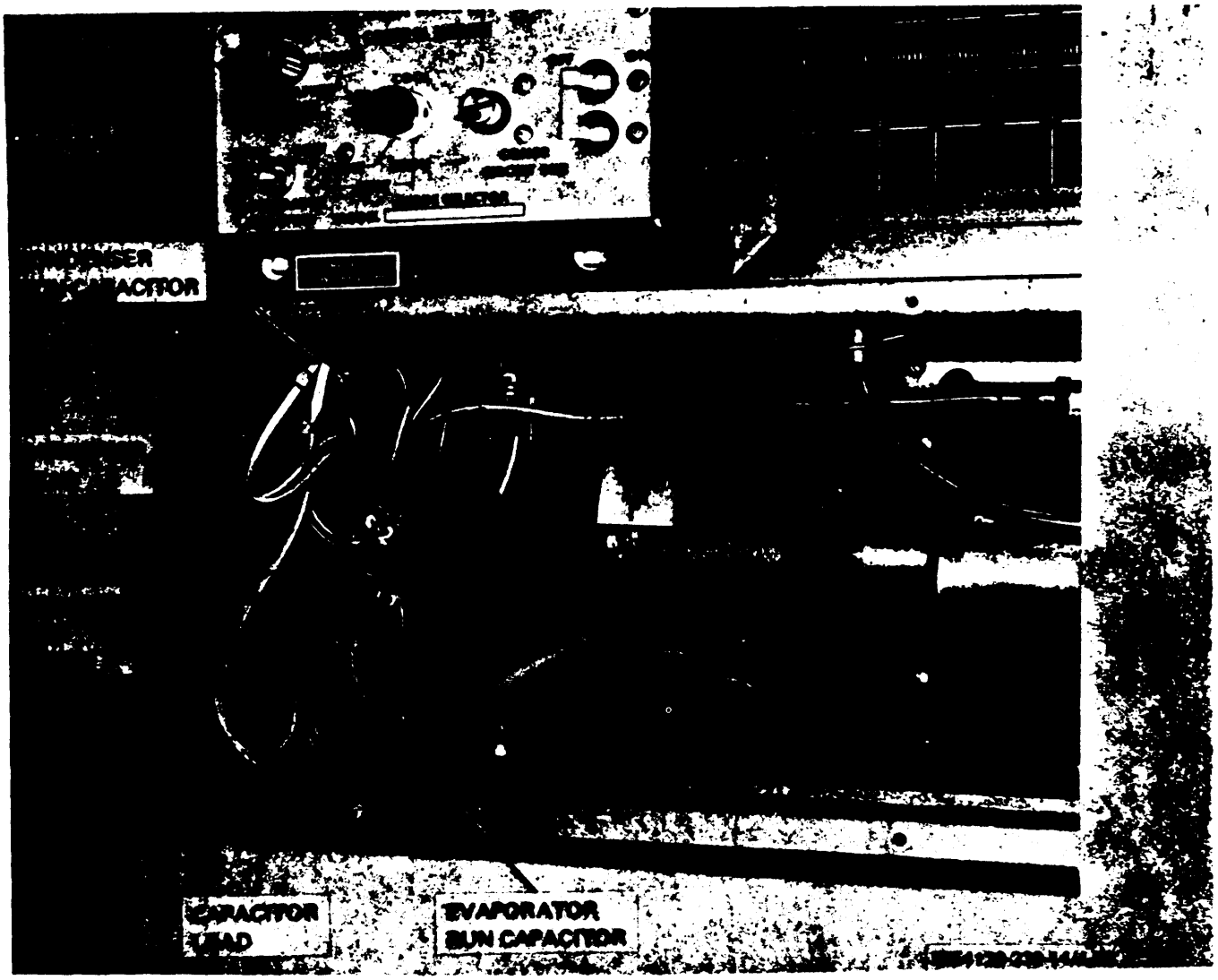


Figure 4-16. Fan motor capacitors.

c. Installation. Install capacitors as follows:

(1) Refer to figure 4-16 and install capacitors, bracket, and screw.

(2) Connect capacitor leads.

(3) Refer to paragraph 4-18 and install evaporator air inlet louvers.

Section XIV. MAINTENANCE OF CONTROL MODULE

4-43. General

The control module is located in a compartment in the junction box. All electrical connections to the control module are through plug-in type connectors permitting easy removal of the module as a unit. The control module contains the compressor circuit breaker, temperature selector switch, mode selector rotary switch, and the evaporator fan speed toggle switch.

Warning: Disconnect air conditioner power supply before removing control module.

4-44. Removal

a. Refer to paragraph 4-18 and remove evaporator air inlet louver.

b. **Refer to figure 4-17 and disengage temperature selector switch bulb from clamps by loosening clamp screws.**

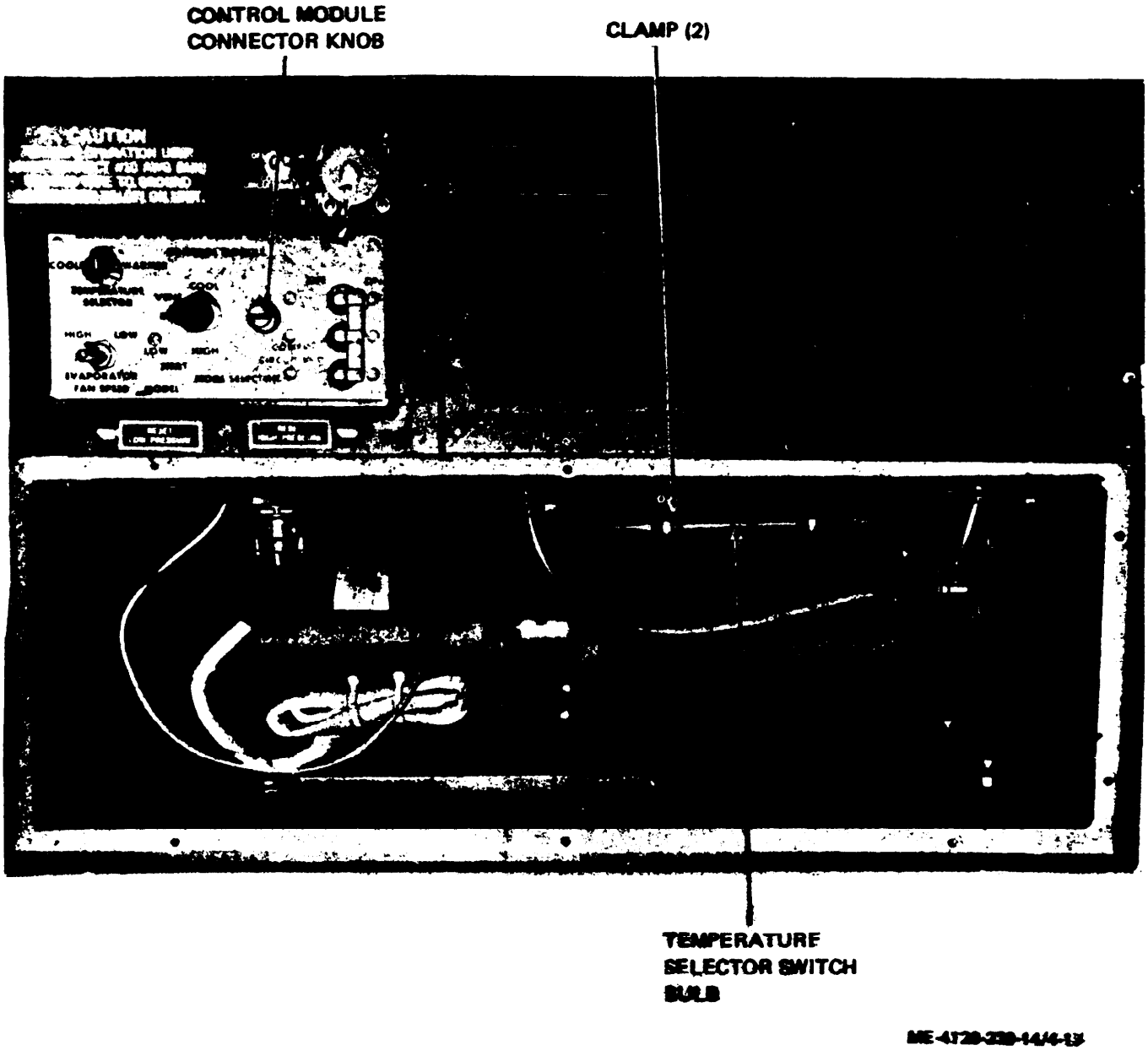


figure 4-17. Control module connector knob and bulb mounting.

c. **Turn connector knob (fig. 4-17) counter clockwise until screw is disengaged and pull control module from junction box. Carefully pull temperature selector switch bulb through slot in bottom of junction box.**

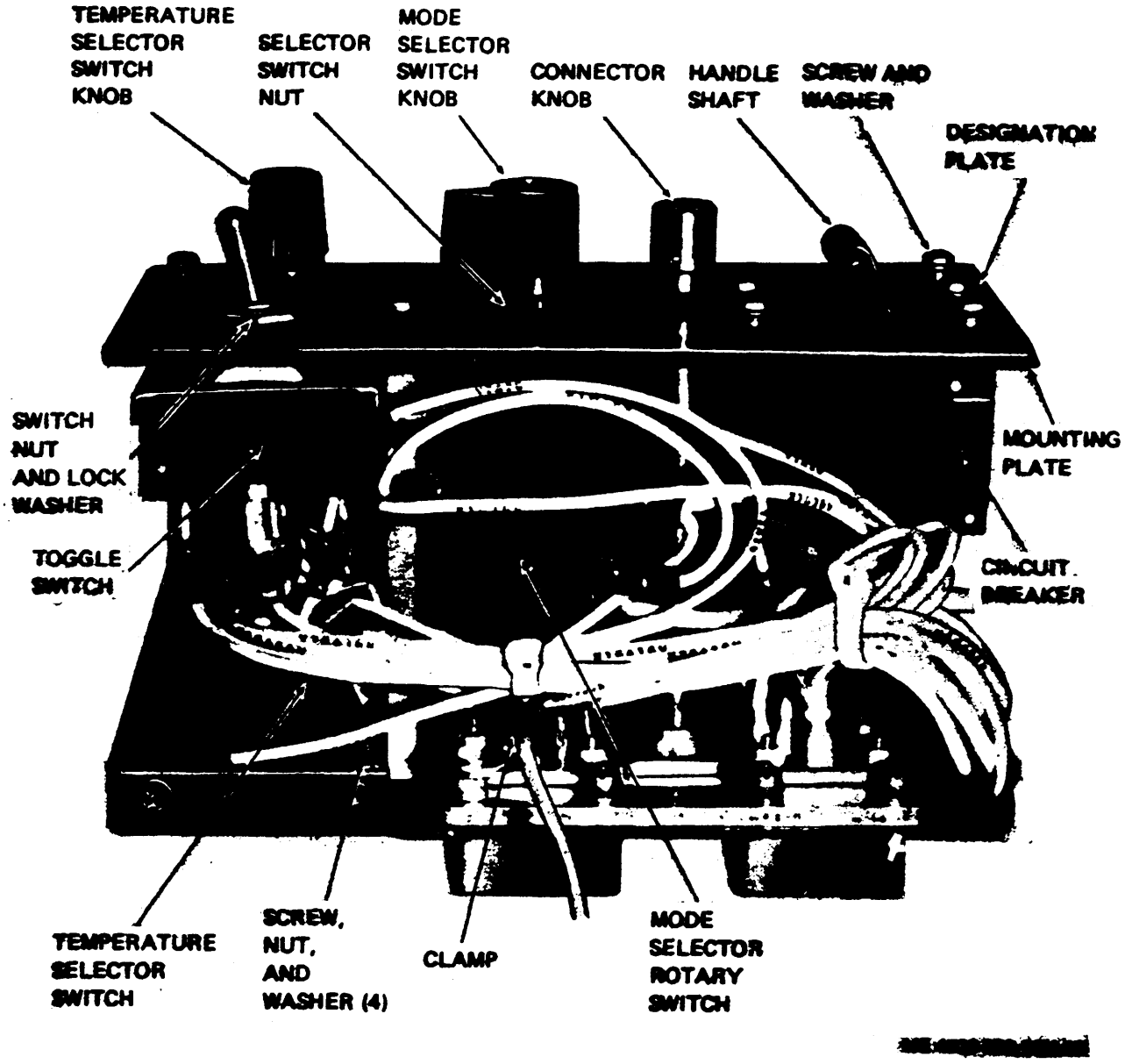


Figure 4-18. Control module less cover.

4-45. Testing

●. General. Remove four screws securing cover to frame. Remove capillary tube grommet and slide cover from module. Pull capillary tube bulb through hole in cover. To test individual components, mark and disconnect leads, and check for continuity. Refer to schematic diagram as a guide and refer to the following additional instructions.

b. Circuit Breaker. **Check for continuity between corresponding terminals in closed position. Check for proper functioning in open position. Replace defective circuit breaker.**

c. Evaporator Fan Toggle Switch. **Check for continuity in both positions. Replace defective switch.**

d. Temperature Selector **Switch. Check for continuity between common terminal 1 and blue terminal 2 (blue). Switch should close on temperature drops below setting. Turn switch knob to full '*COOLER" position. Switch should be open. Turn switch knob toward warmer. Switch should close as setting becomes higher than bulb tem - perature. Replace defective switch.**

e. *Mode Selector Rotary Switch.* **Refer to wiring diagram chart showing connections made by switch in various switch positions. Check for continuity. Replace defective switch.**

4-46. Disassembly

a. General. **Disassembly is limited to**

replacement *of* individual controls. Remove control module cover and mark and disconnect leads of control to be replaced.

b. Circuit Breaker. Refer to figure 4-18 and remove handle shaft and spacers. Remove screws and washers that secure circuit breaker to mounting plate and designation plate and remove circuit breaker. Single phase breakers are attached with four screws and washers and three phase breakers are attached with six screws and washers.

c. *Evaporator Fan Toggle Switch.* Refer to figure 4-18 and remove the switch nut and lock washer. Remove toggle switch.

d. Temperature Selector Switch. Refer to figure 4-18 and remove nut and capillary tube clamp. Remove four screws, nuts, and washers. Remove switch knob and temperature selector switch.

e. *Mode Selector Rotary Switch.* Refer to figure 4-18, loosen setscrew in knob and *remove* knob. Remove switch nut and switch.

4-47. Assembly.

a. *General.* Refer to figure 4-18 and install any component that were removed, Complete the assembly as described in *f* below.

b. Circuit Breaker. Install circuit breaker, screws and washers. Assemble handle spacers and shaft.

c. *Evaporator Fan Toggle Switch.* Install toggle switch and secure to mounting plate with switch nut and lock washer,

d. Temperature Selector Switch. Install switch and secure with four screws, washers, and nuts. Install switch knob. Install clamp on capillary tube and secure clamp with nut.

e. *Mode Selector Rotary Switch.* Install switch and secure with switch nut. Install knob and tighten setscrew.

f. *Control Module.* After components have been installed, make all necessary electrical connections. Insert capillary tube bulb through opening in cover. Install cover and mounting screws. Install capillary tube grommet,

4-48. Installation

a. Install temperature selector switch bulb and tube through slot in junction box. Install bulb in clamps (fig. 4-17) and tighten screws.

b. Install control module into junction box and turn connector knob clockwise until screw is tight.

c. Refer to paragraph 4-18 and install evaporator air inlet louver.

Section XV. MAINTENANCE OF JUNCTION BOX

4-49. General

The junction box (fig. 1-1) contains the time delay relay, control circuit breaker, condenser fan relay, heater relay, and compressor motor relay. Three phase junction boxes also contain the phase sequence relay.

4-50. Removal

a. Refer to paragraph 4-21 and remove front top cover. Refer to paragraph 4-44 and remove control module.

b. Remove seven screws and lock washers securing junction box to housing. Partially remove the junction box by pulling the box forward and out of the air conditioner. See figure 4-19. Support the junction box to relieve strain on wiring.

c. To completely remove the junction box it is necessary to disconnect all the electrical leads and connectors.

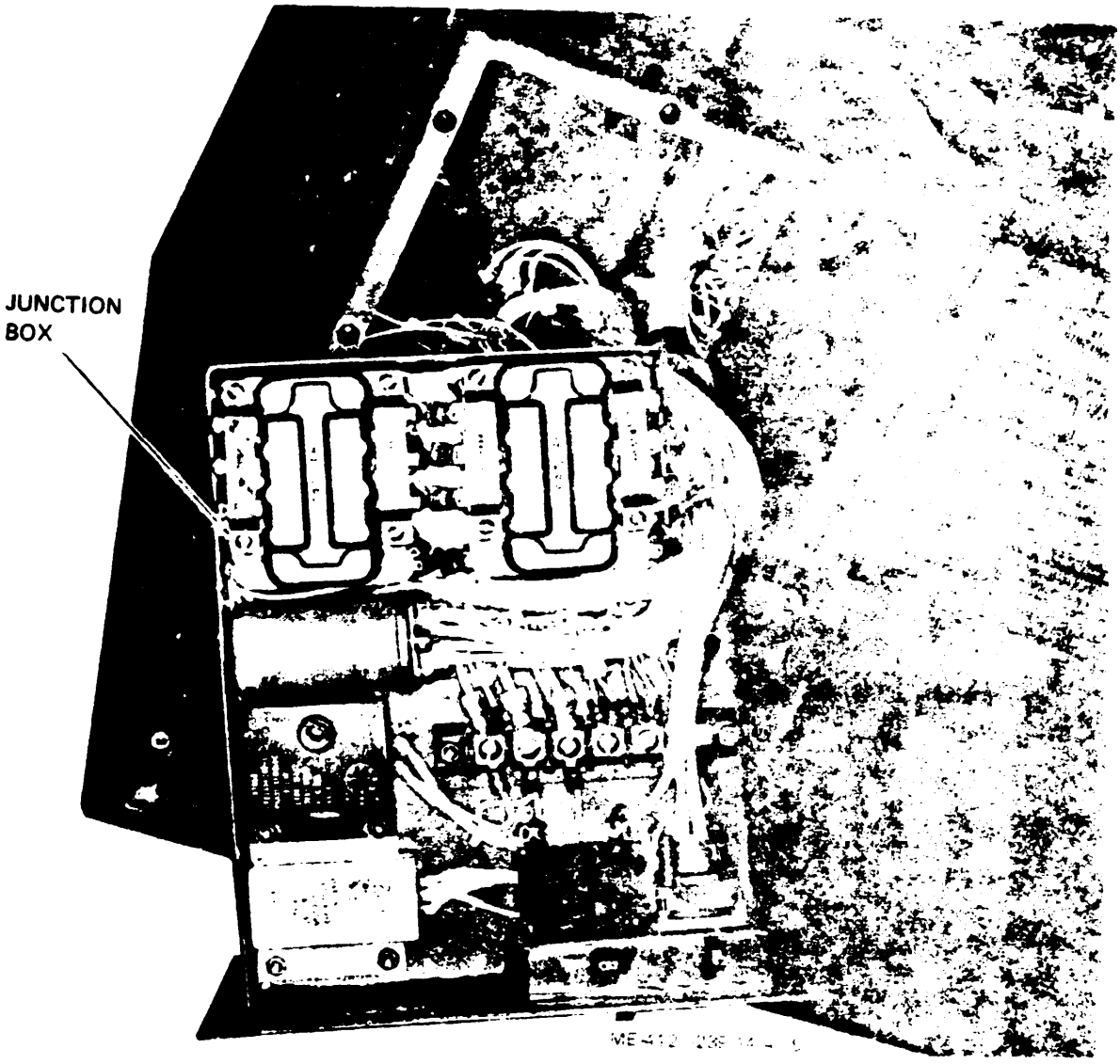


Figure 1-19. Junction box, partially removed.

4-51. Testing

Refer to schematic wiring diagram and test components for continuity after disconnecting leads. Check coils of armature relays for continuity then actuate the coil with a 24 volt dc source and check across contacts that should be closed according to the schematic wiring diagram. Check circuit breaker in open and closed position.

4-52. Disassembly

a. General. Disassembly is limited to replacement of individual components. Tag and disconnect leads from components to be removed.

b. Heater and Compressor Motor Relays. To remove the heater and compressor motor relays refer to figure 4-20 and remove relays as follows:

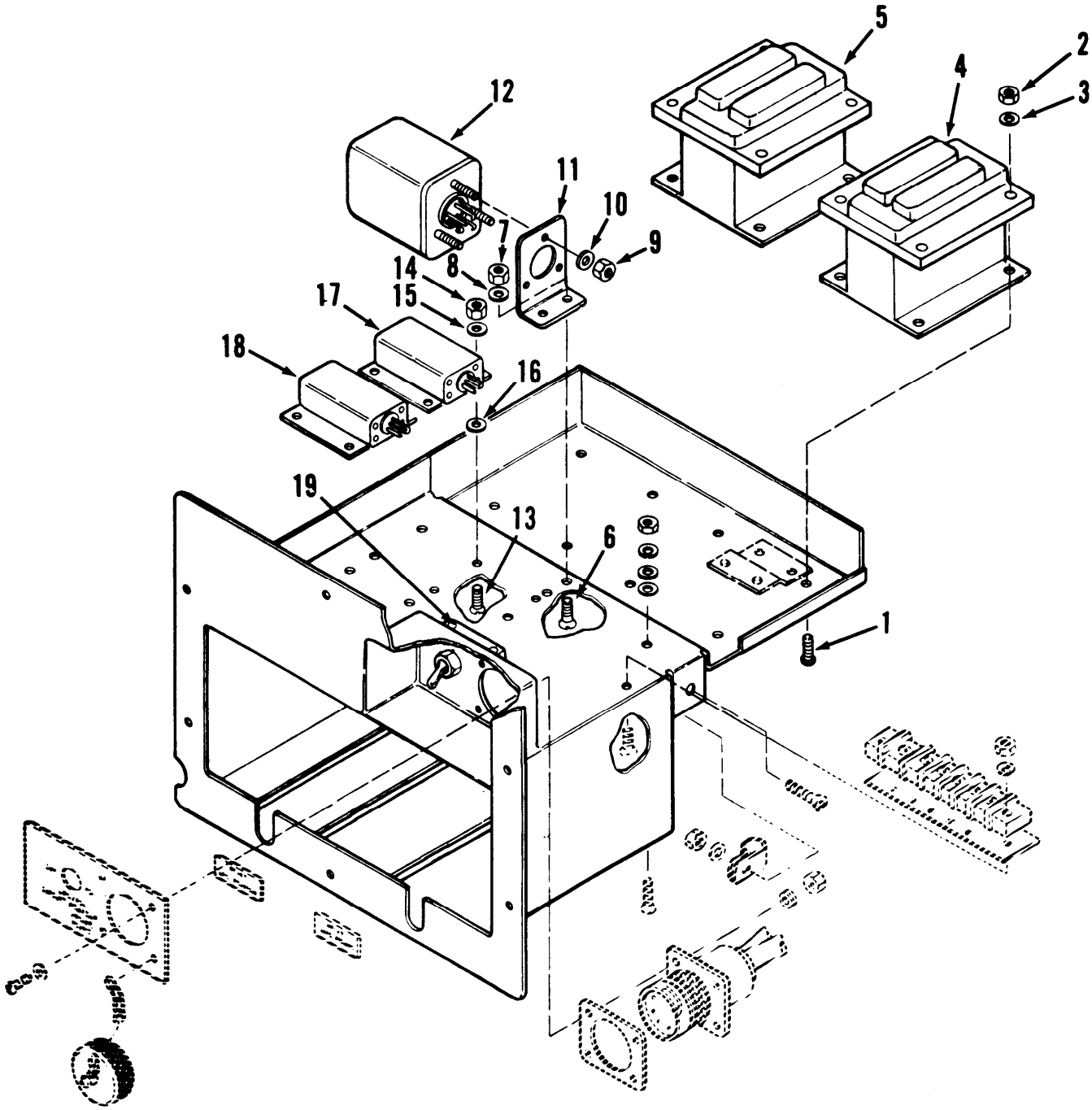
(1) Remove four screws (1), nuts (2), and washers (3). Remove compressor motor relay (4).

(2) Follow same procedure to remove heater relay (5).

c. Condenser Fan Relay. Refer to figure 1-20 and remove relay as follows:

(1) Remove two screws (6), nuts (7), and flat washers (8). Remove relay and bracket from junction box.

(2) Remove three nuts (9) and flat washers (10) to separate bracket (11) from condenser fan relay (12).



1. Screw, pan-hd, 10-32 x ⅝
2. Nut, hex, slflkg, 10-32
3. Washer, flat, no. 10
4. Compressor motor relay
5. Heater relay
6. Screw, fl-hd, 6-32 x ½
7. Nut, hex, slflkg, 6-32
8. Washer, flat, no. 6 (.156 ID)
9. Nut, hex, slflkg, 6-32
10. Washer, flat, no. 6 (.156 ID)
11. Bracket
12. Condenser fan relay
13. Screw, fl-hd, 6-32 x ½
14. Nut, hex, slflkg, 6-32
15. Washer, flat, no. 6 (.156 ID)
16. Washer, flat, no. 6 (.149 ID)
17. Phase sequence relay
18. Time delay relay
19. Circuit breaker

Figure 4-20. Junction box components. exploded view.

d. Phase Sequence Relay. To remove the phase sequence relay from three phase units, refer to figure 4-20 and remove relay as follows:

(1) Remove four screws (13), nuts (14), and washers (15).

(2) Remove relay (17) and two each of washers (15 and 16).

e. Time Delay Relay. To remove the time delay relay, refer to figure 4-20 and remove relay as follows:

(1) To remove time delay (18) from three phase units, remove the phase sequence relay then remove two remaining screws (13), nuts (14), and flat washers (15).

(2) To remove time delay relay (18) from single phase units, remove four screws (13), nuts (14), and flat washers (15).

f. Control Circuit Breaker. To remove the control circuit breaker (19, fig. 4-20), remove circuit breaker nut from front of junction box and pull breaker to the rear of the junction box.

4-53. Assembly

a. General. Refer to figure 4-20 and install any components that were removed. After installation of components, make all the necessary electrical connections.

b. Control Circuit Breaker. Install control circuit breaker (19) through opening in junction box with locating projection in opening provided. Install breaker nut.

c. Time Delay Relay. Install time delay relay (18) on junction box. Secure relay to single phase junction box with four screws (13), nuts (14), and washers (15). For three phase junction boxes, omit the two inner sets of hardware.

d. Phase Sequence Relay. To install the phase sequence relay on three phase junction box proceed as follows:

(1) Place a flat washer (15) and flat washer (16) over inner mounting holes of phase sequence relay.

(2) Install phase sequence relay (17) on washers and mounting flange of time delay relay. Install four screws (13), flat washers (15), and nuts (14).

e. Condenser Fan Relay. Install condenser fan relay (12) on bracket (11) a nd secure relay with three nuts (9) a nd flat washers (10). Install bracket on junction box and install two screws (6), nut. (7), a nd washers (8).

f. Heater and Compressor Motor Relays. Install heater relay (5) or compressor motor relay (4) and secure relay with four screws (1), nuts (2) and flat washers (3).

4-54. Installation

a. Make any electrical connections that were disconnected during removal.

b. Carefully install junction box into housing and install seven screws and lock washers.

c. Refer to paragraph 4-48 and install control module.

d. Refer to paragraph 4-21 and install top front cover.

Section XVI. MAINTENANCE OF TRANSFORMER, RECTIFIER, AND PRESSURE SWITCHES

4-55. General

The power transformer and rectifier reduces the power voltage and converts the alternating current to 24 volt direct current to operate the coils and switches in the control circuit. The transformer is rated at a secondary voltage of 30 vac with a primary voltage of 115 vac. The transformer and rectifier are located below the junction box. The high and low pressure cutout switches are also located below the junction box with the reset buttons extending through the front of the housing. The pressure cutout switches are connected in the refrigeration system and are electrically connected in the control system to the compressor motor relay coil. Extreme high or low pressure opens the circuit causing the compressor to stop.

4-56. Transformer

a. Testing. Test transformer as follows:

(1) Refer to paragraph 4-21 and remove top cover. Refer to paragraph 4-50 and partially remove junction box.

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

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

b. Removal. With junction box removed, refer to figure 4-21 and remove four screws and lock washers. Disconnect and remove transformer.

c. Installation. Refer to figure 4-21 and install transformer, four screws, and four lock washers. Connect leads. Refer to paragraph 4-54 and install junction box.

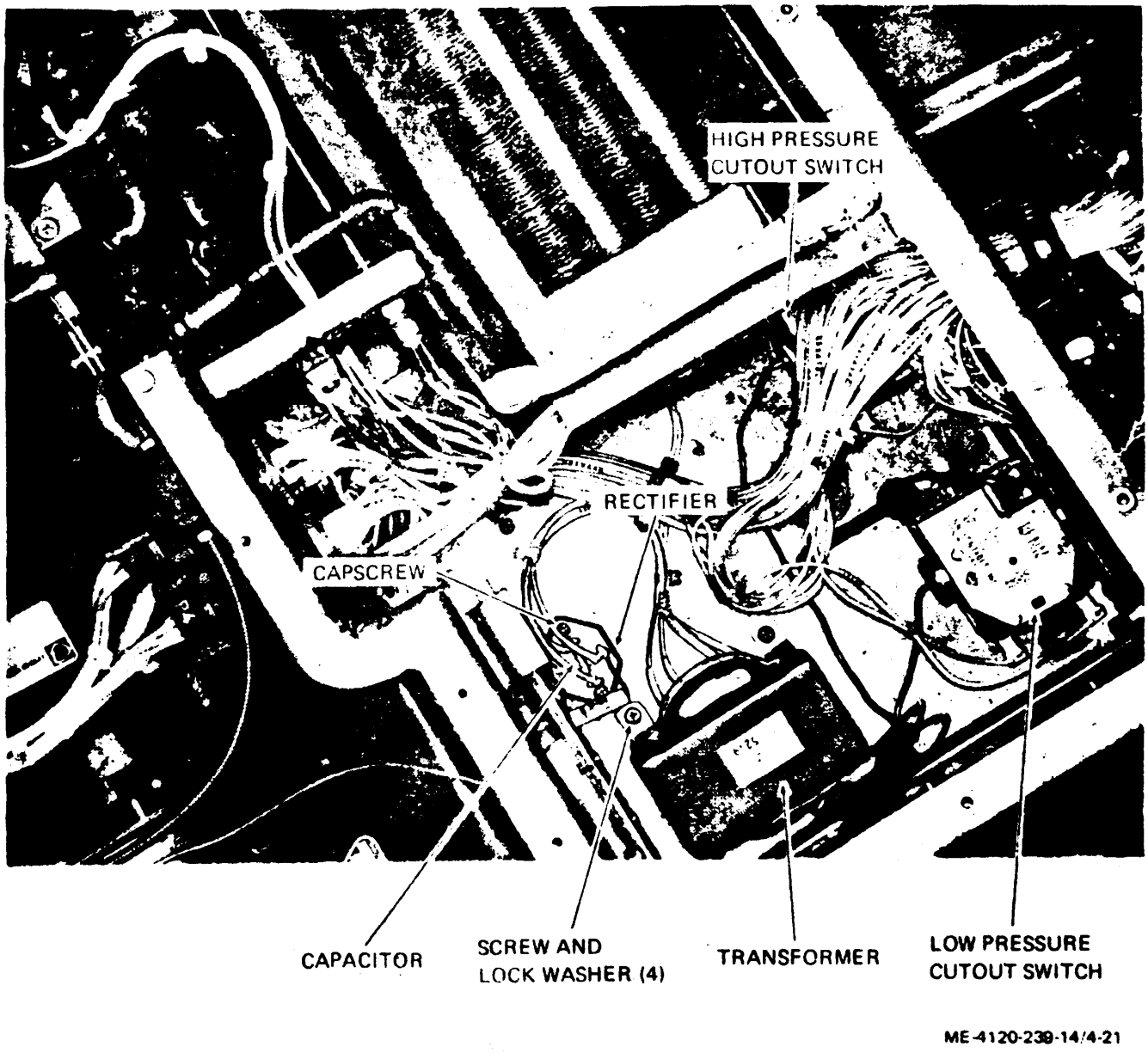


Figure 4-21. Transformer. rectifier. and pressure switches.

4-57. Rectifier

a. Removal. Remove rectifier as follows:

(1) Refer to paragraph 4-50 and remote junction box.

(2) Refer to figure 4-21 and remote filter capacitor. Disconnect leads.

(3) Remove two cap screws and remove rectifier.

b. Testing, Apply a 30 volt ac source of power across the no. 1 and 3 terminals. Check for 24 to 28 Volt dc output across terminals 2 and 4. Replace rectifier if defective.

c. installation. Refer to figure 4-21 and install rectifier as follows:

(1) Install rectifier and two cap screws.

(2) Connect leads and install capacitor.

(3) Refer to paragraph 4-54 and install junction box.

4-58. High and Low Presure Cutout Switches

a. Gerteral. The high and low pressure cutout switches cannot be removed without opening the refrigeration system. Electrical tests should be made with the switches installed.

b. Testing. Test switches as follows:

(1) Refer to paragraph 4-50 and remote junction box.

(2) Disconnect leads and test for continuity

across terminals of switch. If no continuity is indicated, press reset button and recheck.

(3) If switch is defective, report condition to direct support maintenance.

(4) If switch is not defective, connect leads and install junction box.

Section XVII. MAINTENANCE OF COMPRESSOR

4-59. General

Organizational maintenance of the compressor is limited to the inspection, testing and repair of the electrical equipment.

4-60. Inspection, Testing, and Repair

a. Refer to paragraph 4-21 and remove housing rear top cover.

b. Refer to figure 4-22 and disconnect electrical connector.

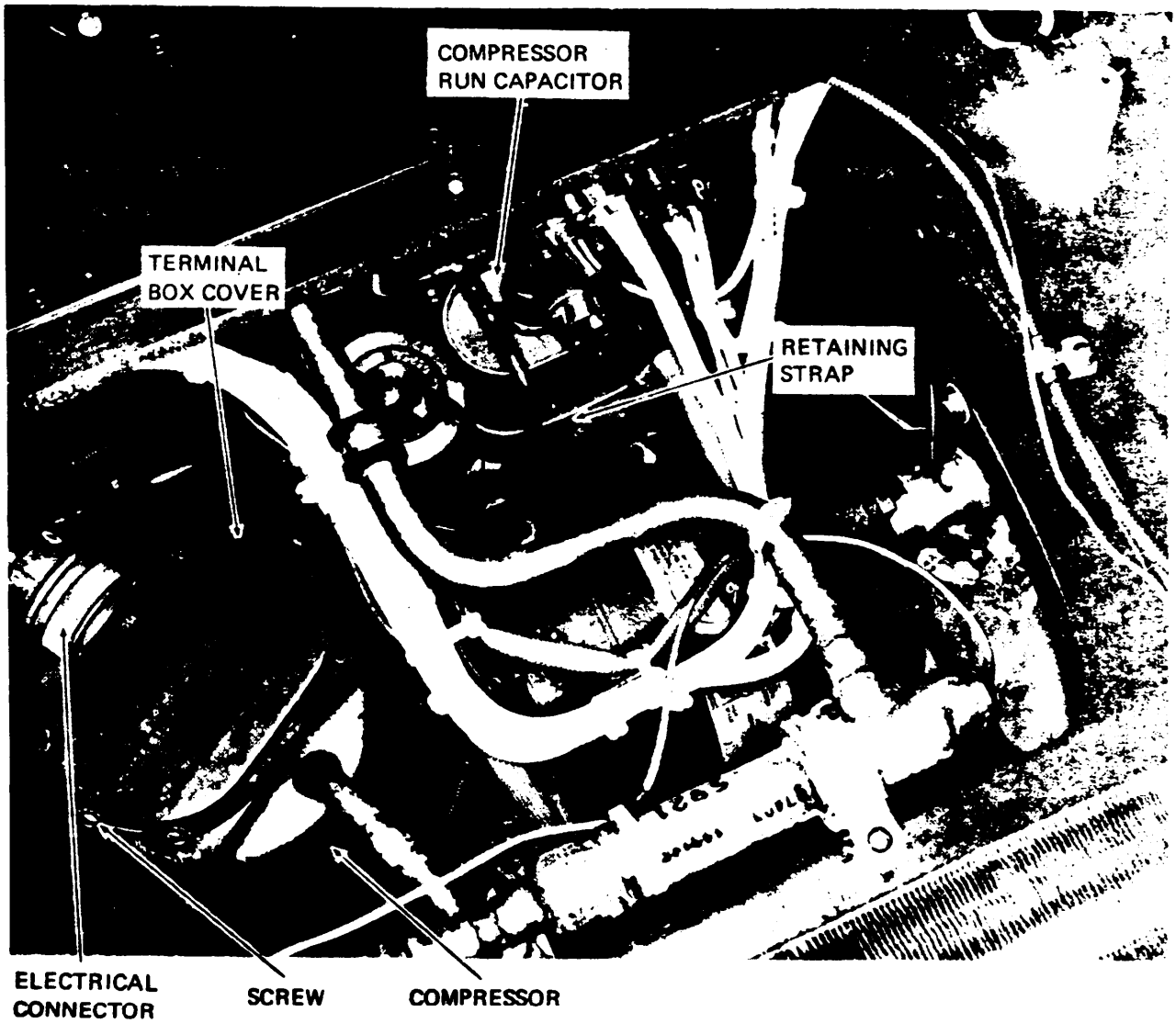


Figure 4-22. Compressor and compressor run capacitor.

c. Follow procedure outlined in paragraph 4-37 and test motor.

d. If tiny deficiency is indicated. remove screws and terminal box cover and check for damaged wiring or loose connections. Repair damaged wiring and tighten loose connections. If this does not correct the trouble. report the conditions to direct support maintenance.

e. Install terninal box cover and screws. Connect electrical connector. Refer to paragraph 4-21 and install housing rear top cover.

4-61. Compressor Capacitors and Relay

a. *General.* Single phase air Conditioners are equipped with a compressor start capacitor and relay and a compressor run capacitor. The compressor run capacitor (fig. 4-22), is located in the condenser compartment near the compressor. The compressor start capacitor and relay are located under the center top cover on the inner wall of the junction box compartment of the housing.

b. Removal. Remove the capacitors and relay as follows:

(1) Refer to paragraph 4-21 and remove housing covers.

(2) To remove run capacitor, disconnect leads and remove two screws and lock washers that secure capacitor retaining strap (fig. 4-22) to housing, Remove strap and capacitor.

(3) To remove start capacitor, refer to figure 4-23, disconnect leads and remove capacitor from retainer.

(4) To remove start relay, refer to figure 4-23 and disconnect relay leads. Remove screw and lock washer. Remove relay.

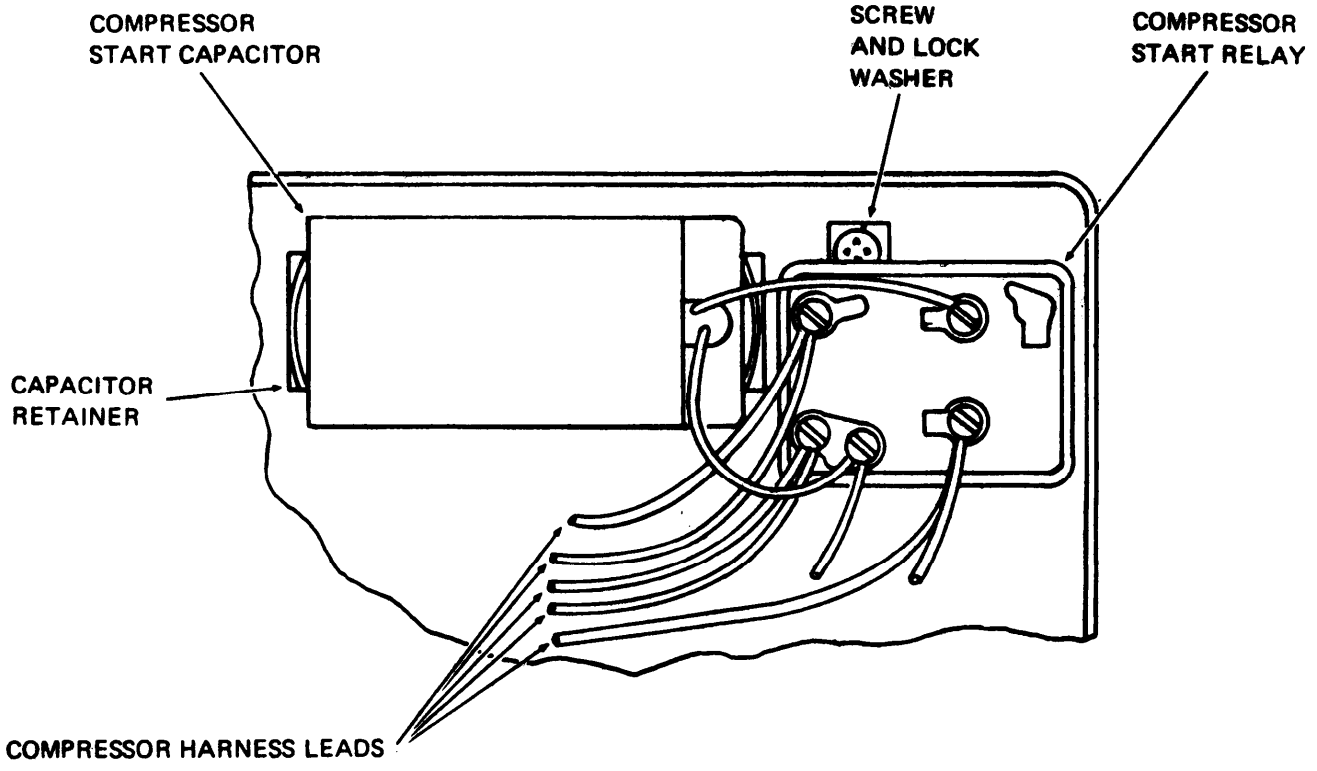


Figure 4-23. Compressor start capacitor and relay.

c. Installation. Install the compressor capacitors and relays as follows:

(1) Refer to figure 4-23 and install relay screw and lock washer. Connect leads.

(2) Refer to figure 4-23 and install capacitor in retainer. Connect leads.

(3) Refer to figure 4-22 and install capacitor and retaining strap. Secure strap with two screws and lock washers. Connect leads.

(4) Refer to paragraph 4-21 and install housing covers.

Section XVIII. MAINTENANCE OF REFRIGERATION SYSTEM

4-62. General.

Organizational maintenance *of* the refrigeration system is limited to inspection and testing of the system. Remove top covers, louvers and partially rem ov e junction box as required to gain access to all parts of the system. Report any deficiencies to direct support maintenance.

4-63. Inspection.

a. Values. Inspect charging valves, solenoid valves, expansion valves, pressure relief valves and pressure regulating valves for cracks or damaged condition. Inspect capillary tubes for kinks or breaks. Disconnect solenoid valve electrical connectors and check for coil continuity between terminals.

b. Vibration Eliminators. Check vibration eliminators for dam aged covering and connections.

c. Coils. Inspect condenser and evaporator coils for bent or broken fins and for damaged connections.

d. Louver Control Actuator. Inspect cylinder for cracks and damaged connections. Inspect control for bent or broken condition.

e. *Dehydrator and Receiver.* Inspect dehydrator and receiver for damage.

f. *Tubing and Fittings.* Inspect tubing for kinks, cracks or other damage. Inspect fittings for cracks.

4-64. Testing System for Leaks

Check all piping, components, and connections of the refrigerant system with a General Electric Type H-2 Halogen Leak Detector unit (or approved equal). The detector shall be calibrated with a General Electric LS-20 leak standard (or approved equal) for a pure refrigerant leak rate of 0.1 ounce per year. Any detected leaks exceeding this rate shall be reported immediately to direct support maintenance for correction and recharging.

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

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1. Tools and Equipment.

Refer to appendix C for tools, equipment and repair parts issued with the air conditioner.

5-2. Special Tools and Equipment.

No special tools or equipment are required for maintenance of the air conditioner.

5-3. Maintenance Repair Part.

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering direct and general support maintenance for this equipment. (TM 5-4120-239-34P) (when printed).

Section II. TROUBLESHOOTING

5-4. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air conditioner or any of its components. Electrical schematic and wiring diagrams shown in figure 1-4 through 1-10 will be helpful for checking electrical circuits. A refrigerant flow diagram is shown in figure 5-1. System pressure test instructions are in paragraph 6-2.

FIND NO.	PART NO.	QTY	NOMENCLATURE
1A	13214E4182-1	1	COMPRESSOR (1 PHASE, 50/60 HZ, 115V)
OR 1A	13214E4182-4	1	COMPRESSOR (1 PHASE, 50/60 HZ, 230V)
OR 1A	13214E4182-3	1	COMPRESSOR (3 PHASE, 50/60 HZ, 208V)
OR 1A	13214E4182-2	1	COMPRESSOR (3 PHASE, 400 HZ, 208V)
1B	PT OF FIND NO. 1A	1	SUCTION LINE FILTER
2	13216E6167-3	1	HOSE ASSY, METAL
3A	13216E5904	1	COIL, CONDENSER WITH ANGLE
3B	PT OF FIND NO. 3A	1	SUBCOOLER
4	13216E6163-1	1	RECEIVER, LIQUID REFRIGERANT
5	13216E6155	1	INDICATOR, SIGHT, LIQUID
6	13216E5918-1	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	13216E6172-1	1	SOLENOID VALVE WITH LEADS
8	13216E6160-1	1	VALVE, EXPANSION (PRIMARY)
9	13216E5898	1	COIL, EVAPORATOR WITH ANGLE
10	13216E5921	2	BULB WELL
11	13216E6167-4	2	HOSE ASSY, METAL
12	13216E6168	2	VALVE, CHARGING, WITH CAP
13	13211E8369	1	VALVE, PRESSURE RELIEF
14	13216E6215-3	1	SWITCH, PRESSURE (HIGH)
15	13216E6128	1	CYLINDER ASSY, ACTUATING, LINEAR
16	13216E6172-2	1	SOLENOID VALVE WITH LEADS
17	13216E6174-1	1	VALVE, EXPANSION (QUENCH)
18	13216E6171	1	REGULATOR, FLUID PRESSURE
19	13216E6215-1	1	SWITCH, PRESSURE (LOW)

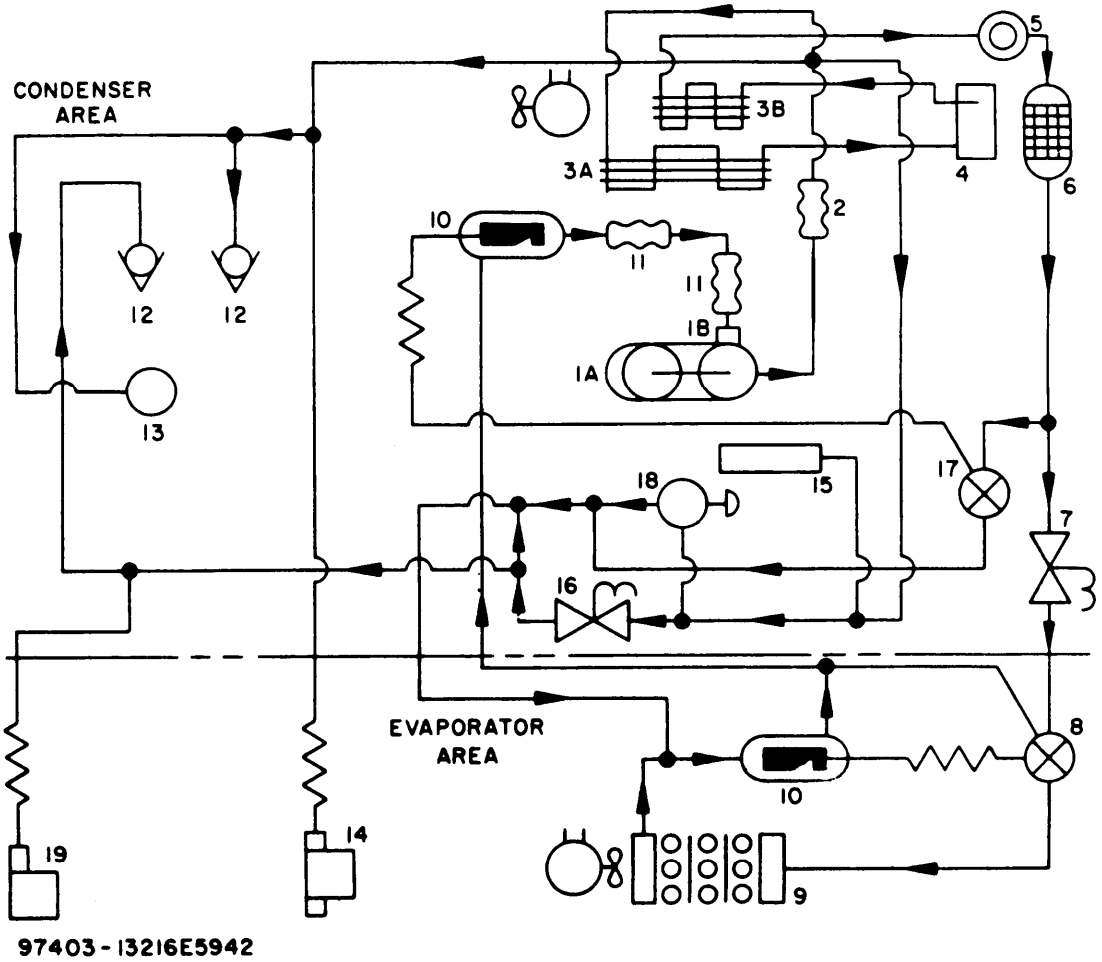


Figure 5-1. Refrigerant /low diagram.

5-5. Troubleshooting Chart

Troubleshooting procedures for direct and general support maintenance are listed in table 5-1. Each trouble symptom or malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 5-1. Troubleshooting

Malfunction	Probable Cause	Corrective Action
1. pressor will not start,	a. Open control circuit.	a. Make continuity check of control circuit (para 4-12).
	b. Defective circuit breaker.	b. Replace circuit breaker (para 4-50 thru 4-54).
	C. Defective starting relay or capacitor (single phase compressor).	c. Replace defective capacitor or relay (para 4-61).
	d. Defective phase sequence relay (three phase compressor).	d. Replace defective relay (para 4-50 thru 4-54).
	e. Defective high or low pressure cutout switch.	e. Replace defective switch (para 5-21).
	f. Defective compresser motor or thermal protector.	f. Replace compressor (para 5-17).
2. Compressor starts but goes out on overload.	a. Defective compressor run capacitor (single phase com - pressor).	a. Replace capacitor (para 4-61).
	b. Defective comprerssor.	b. Replace compressor (para 5-17).
3. Little or no heating capacity.	a. Loose electrical connections or faulty wiring.	a. Check wiring and repair if necessary (para 4-33).
	b. Defective temperature selector switch or mode selector switch.	b. Replace defective switch (para 4-44 thru 4-48).
	c. Defective heaters.	c. Replace defective heaters (para 4-35).
	d. Defective heater high temperature cut out switch.	d. Replace defective thermostatic switch (para 4-34).
	e. Defective heater relay.	e. Replace defective heater relay (para 4-50 thru 4-54).
	f. Defective evaporator fan motor.	f. Repair motor (para 6-8).
4. Insufficient cooling.	a. Low refrigerant charge.	a. Charge refrigerant system (para 6-3).
	b. Dehydrator clogged.	b. Replace clogged dehydrator (para 5-24).
	c. Pressure regulator valve defective.	c. Replace defective valve (para 5-31).
	d. Air in refrigerant system,	d. Purge and charge system (para 6-3).
	e. Thermal expansion valve defective.	e. Replace defective valve (para 5-28).
	f. Defective solenoid valve.	f. Replace defective solenoid valve (para 5-27).
	g. Defective quench thermal expansion valve.	g. Replace defective valve (para 5-29).
5. Low suction pressure.	a. Defective thermal expansion valve.	a. Replace defective valve (para 5-28).
	b. Dehydrator clogged or defective.	b. Remove restriction or replace dehydrator (para 5-24).
	c. Pressure regulating valve defective.	c. Replace defective valve (para 5-31).
6. Low discharge.	a. Compressor not pumping due to defective compressor.	a. Replace defective compressor (para 5-17).
	b. Defective high-low condenser fan thermostatic switch.	b. Replace defective switch (para 4-41).
7. Low suction and discharge pressure.	a. Lack of refrigerant.	a. Check sight glass for bubbles or milky appearance and check system for leaks (para 4-64). Repair leaks and add refrigerant as necessary.
	b. Defective thermal expansion valve.	b. Replace valve (para 5-28).

Table 5-1. *Troubleshooting-Continued*

Malfunction	Probable Cause	Corrective Action
	c. Defective quench thermal expansion valve.	*c.* Replace valve (para 5-29).
. High suction pressure.	*a.* Defective thermal expansion valve.	*a.* Replace valve (para 5-28).
	b. Defective pressure regulator valve.	*b.* Replace valve (para 5-31).
. High head pressure.	*a.* Overcharge of refrigerant.	*a.* Discharge refrigerant as necessary (para 6-3).
	b. Condenser coil dirty.	*b.* Clean coil.
	c. Defective condenser fan motor.	*c.* Repair motor (para 6-8).
	d. Inoperative or improper adjustment of condenser louvers or actuating mechanism.	*d.* Adjust and clean as necessary. Replace inoperative components (para 5-20).
	e. Compressor defective.	*e.* Replace defective compressor (para 5-17).
	f. Quench thermal expansion valve defective.	*f.* Replace defective valve (para 5-29).

Section III. GENERAL MAINTENANCE INSTRUCTIONS

5-6. General

This section contains general repair instructions which would otherwise have to be repeated several times.

5-7. Refrigeration System

a. Opening System. When the refrigeration system must undergo maintenance that requires the system to be opened for removal of parts, the system must first be discharged and purged (para 6-3). After the repair has been made and all soldering completed, the system must be charged (para *6-3)* and tested for leaks.

b. Removal of Parts. It may be necessary to remove some tubing and fittings with a part that is to be replaced. The tubing and fittings can then be removed from the defective part and installed in the new part. Care should be exercised in opening joints or resoldering to prevent damage to other parts of the air conditioner.

c. *Brazing.* Braze copper to copper joints with silver solder type 3, 4 or 6A specification QQ-S-561 and copper to brass or copper to steel with type 4 or 6A specification QQ-S-561 per MIL-B-7883. Solder melting point is 1160°F. All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

5-8. Insulation and Gaskets

Replace damaged insulation and gaskets. Cement loose insulation.

5-9. Hardware

Replace any damaged screws, washers, lock washers or nuts. Use screws of correct length to hold parts securely. In some applications screws that are too long may hit bottom before the head is tight against part it is to hold or may cause damage to the threads or other parts.

5-10. Shims

Be sure to remove all shims where used. Keep shims together and identify them as to location.

5-11. Repairing Damaged Threads

Damaged threads should be repaired by use of a thread restorer or by chasing in a lathe. Internal threads should be repaired with a used tap of the correct size. If threads cannot be satisfactorily repaired, replace the part.

5-12. Repair of Damaged Machined and Polished Surfaces

Smooth rough spots, scores, burs, galling, and gouges from damaged machined and polished surfaces so that part will efficiently perform its normal function. The finish of the repaired part is to approximate that of the original finish. In performing any of these operations, critical dimensions must not be altered.

5-13. Removal of Rust or Corrosion

Remove corrosion from all parts of material. To remove rust or corrosion, use wire brush, abrasive cloth, sand blast, vapor blast equipment, or rust remover except on highly polished surfaces. O n these surfaces. buffing or the use of crocus cloth is recommended.

5-14. Tubes and Fittings

Check tubes and fittings for cracked or split condition. Check tubing for kinks. Replace defective fittings. Replace damaged tubing with tubing of same size. Take care in making bends in tubing to prevent kinking of tubing. All tubing and

fittings must be completely clean on inside prior to installation.

5-15. Valves

Valves and other parts should be handled carefully to prevent damage. Capillary tubes must be handled very carefully to prevent kinking of the tubes.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

5-16. General

This section covers removal of all major assemblies of the air conditioner which are the responsibility of the direct support and general support maintenance. The refrigerant piping and valves cannot be removed as a unit and only those parts that require replacement should be removed. Removal and installation instructions for individual valves and other components of the refrigeration system are contained in this section. Refer to paragraph 5-7 before performing maintenance on the refrigeration system.

5-17. Compressor

a. General. The compressor is a self-contained hermetically sealed unit and cannot be repaired.

b. Removal. Remove compressor as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-21 and remove top covers.

(3) Refer to figure 5-2 and disconnect electrical connector.

(4) Disconnect tubing as required to permit removal of compressor.

(5) Remove four screws, washers, lock washers and compressor mount bushings.

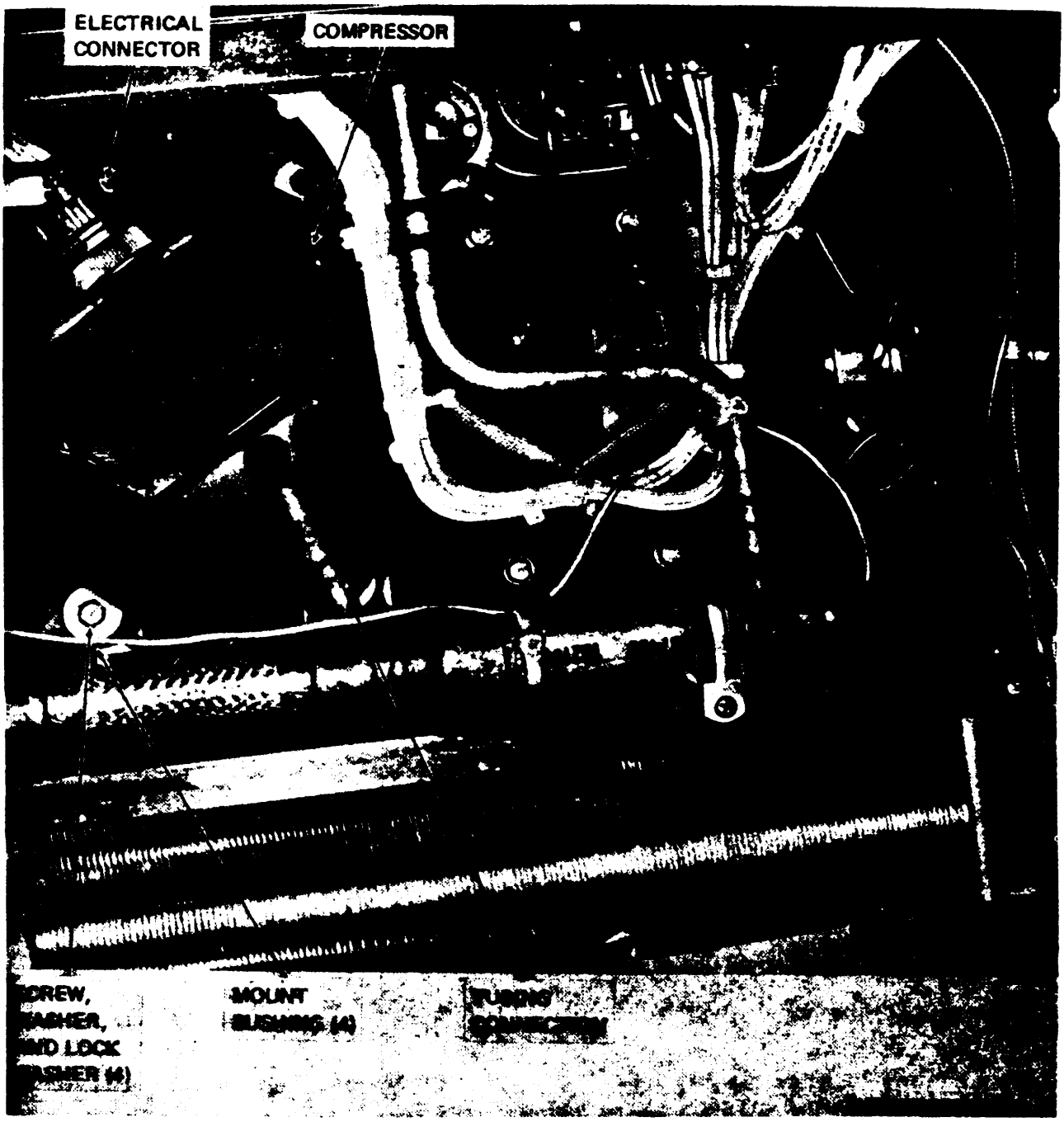


figure 5-2. Compressor. removal and installation.

(6) Lift compressor from air conditioner.

Caution: If compressor is being replaced because of a motor burnout, decontaminate system as instructed in paragraph 6-5. Failure of the replacement compressor will result if all the contaminates are not removed.

c. *Installation.* Refer to figure 5-2 and install compressor as follows:

(1) Place compressor on mounts and install four compressor mount bushings. Secure com pressor with four screws, washers and lock washer

(2) Connect tubing.

(3) Connect electrical connector.

(4) Refer to paragraph 4-21 and install housing top covers.

(5) Refer to paragraph 6-3 and discharge the refrigerant system.

5-18. Evaporator Coil

a. ***Removal.*** **Remove the evaporator coil as follows :**

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-21 and remove housing top covers.

(3) Refer to paragraph 4-18 and remove evaporator air outlet louvers.

(4) Refer to figure 5-3 and disconnect tubing from evaporator coil.

(5) Remove six screws and lock washers and lift evaporator coil and angle from air conditioner. Angle is connected to coil with four blind rivets.

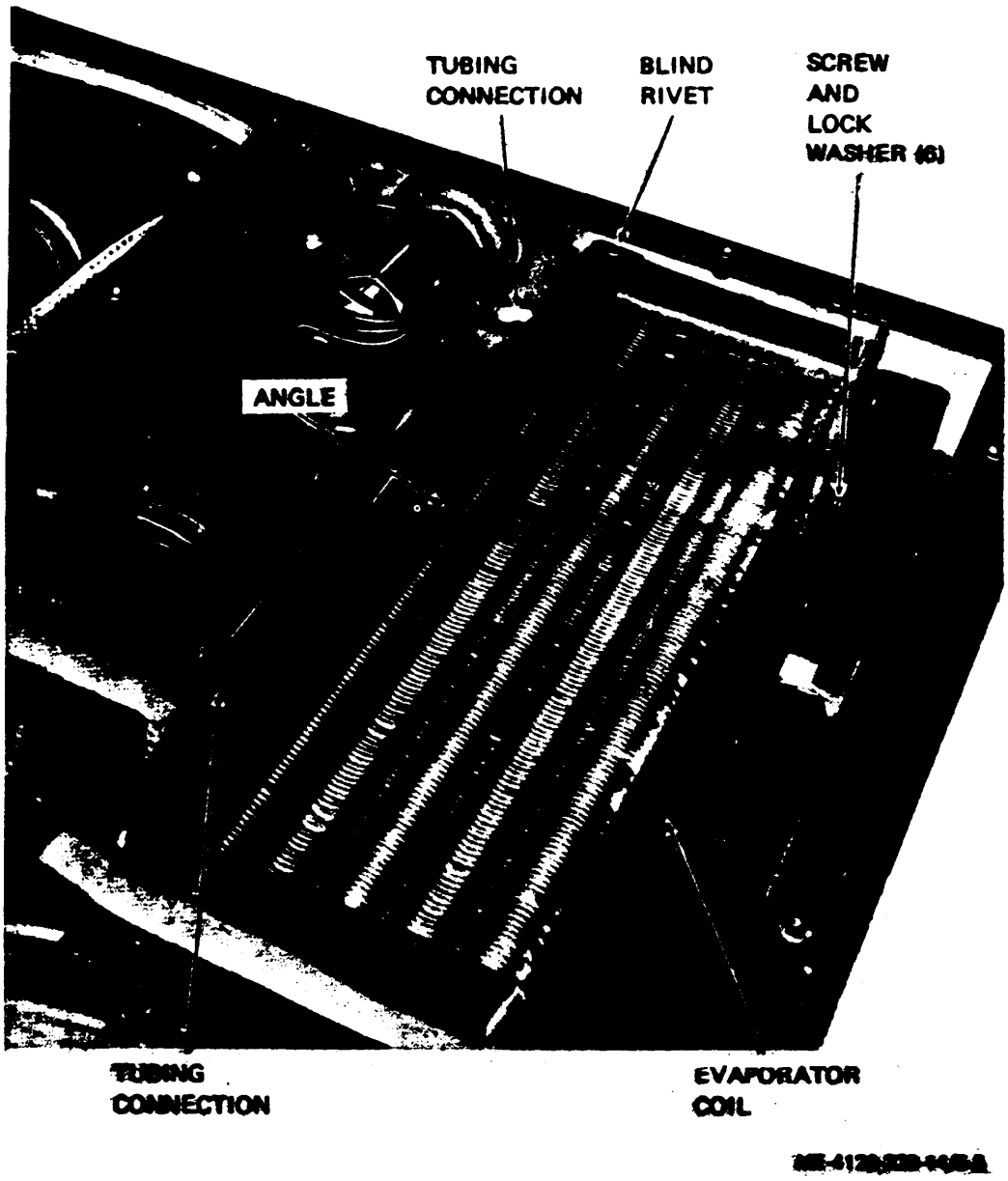


Figure .5-3. Evaporator coil, removal and installation.

b. Installation. Install evaporator coil as follows:

(1) If angle (fig. 5-3) was removed from coil, secure angle to coil with four rivets.

(2) Install coil in air conditioner and secure coil to brackets with six screws and lock washers.

(3) Connect tubing to coil.

(4) Refer to paragraph 4-18 and inst all evaporator air outlet louver.

(5) Refer to paragraph 4-21 and inst all housing top covers.

(6) Refer to paragraph 6-3 and charge the refrigerant system.

5-19. Condenser Coil

a. Removal. Remove condenser coil as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-21 and remove housing top covers.

(3) Refer to figure 5-4 and remove screw that secures bulb well loop clamp to condenser coil angle.

(4) Disconnect tubing from condenser coil and remove other tubing and fittings as required.

(5) Refer to paragraph 4-20 and remove condenser guard.

(6) Remove four countersunk-head screws that securecoil to base of housing.

(7) Remove coil from air conditioner. Use care when removing coil to prevent damage to coils and fins.

(8) To remove angle from coil, grind off four rivets.

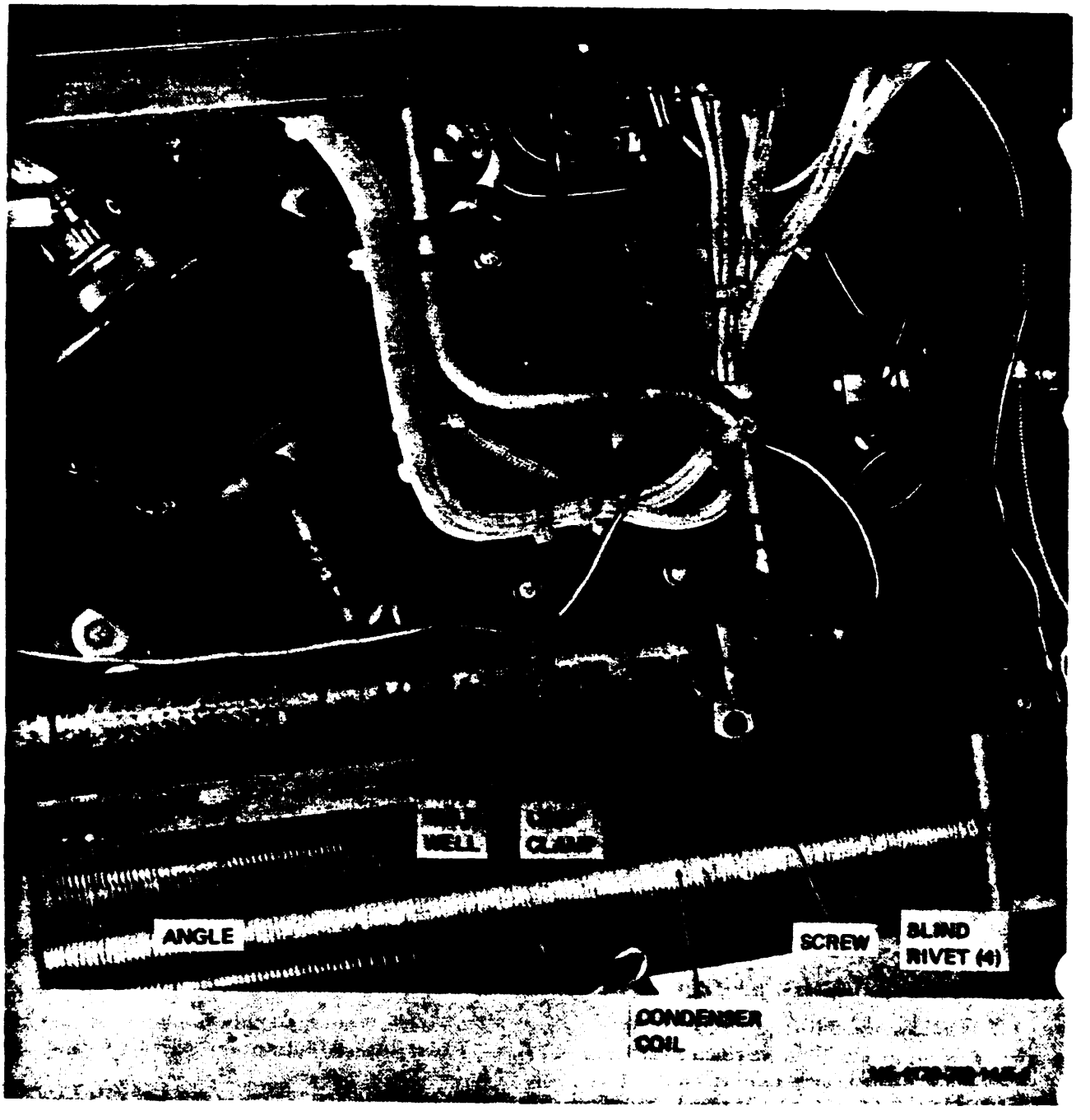


Figure 5-4. Condenser coil. removal and installation.

b. Installation. Install condenser coil as follows:

(1) If angle was removed from condenser, rivet angle to coil with four blind rivets.

(2) Be sure sheet spring nuts are in place on bottom of coil, Position coil in air conditioner and install four countersunk-head screws from underside of housing.

(3) Refer to paragraph 4-20 and install condenser guard.

(4) Connect tubing to condenser and install any other tubes and fittings that were removed.

(5) Attach bulb well clamp to angle with screw.

(6) Refer to paragraph 4-21 and install housing top covers.

(7) Refer to paragraph 6-3 and charge the refrigerant system.

5-20. Condenser Louver Actuator and Control

a. *Removal.* Remove actuator and push-pull control as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-21 and remove housing covers.

(3) Refer to figures 5-5 and 5-6 and loosen mechanical post screws to loosen control wire.

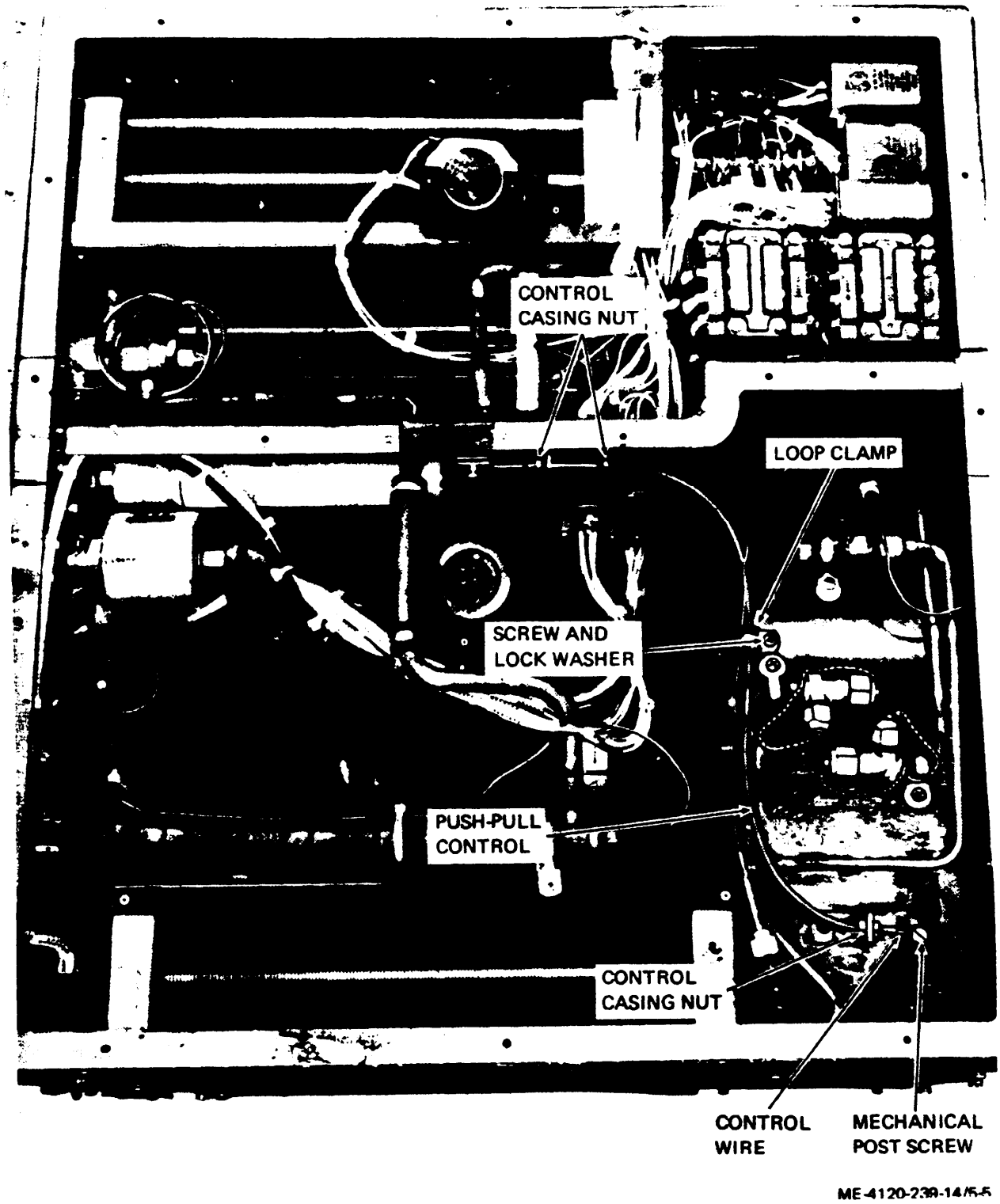


Figure 5-5. Condenser louver control. removal and installation.

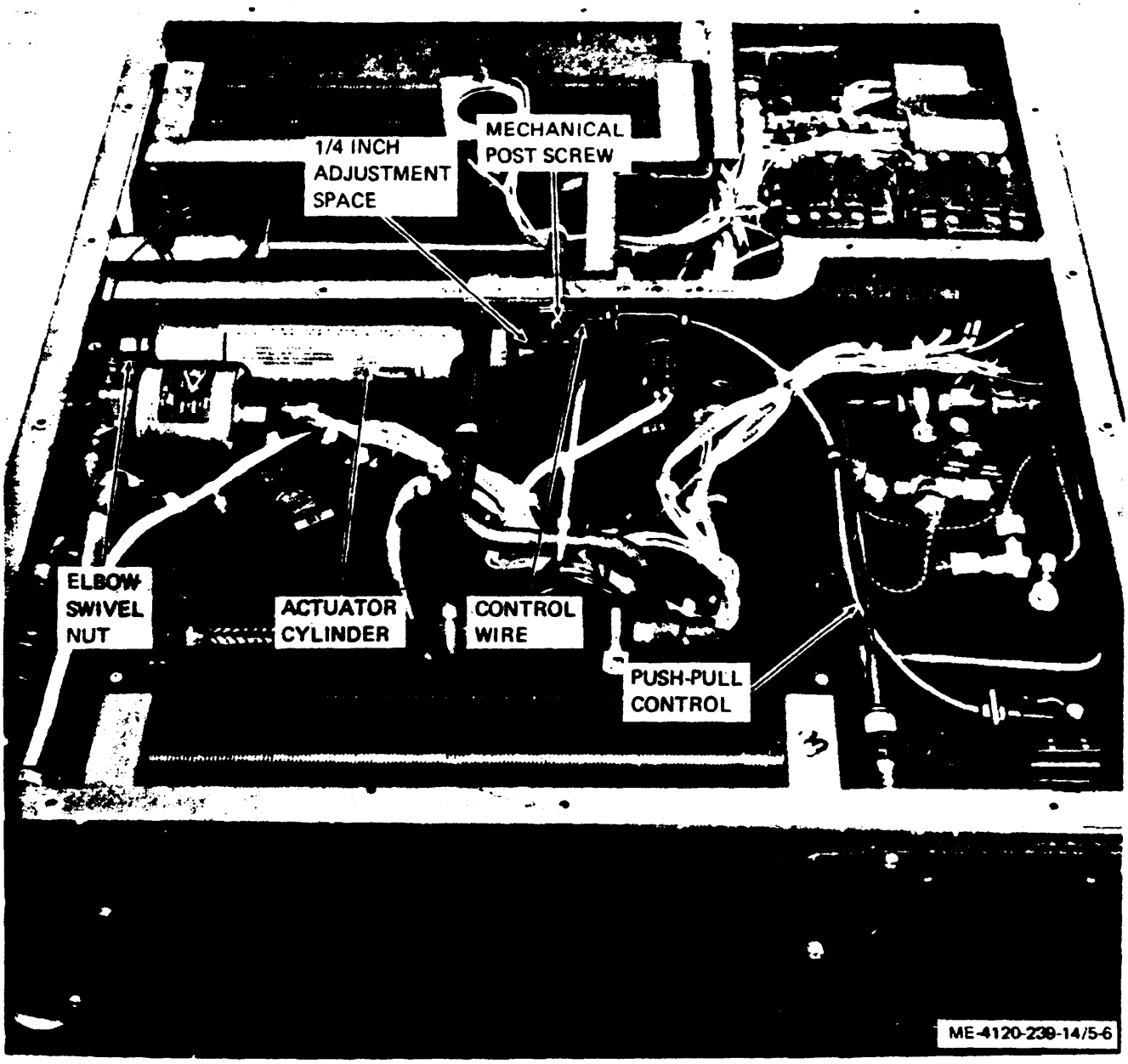


Figure 5-6. Condenser louver actuator cylinder, removal and installation.

(4) Remove screw, lock washer and loop clamp.

(5) Remove control casing outer nuts at each end and remove push-pull control.

(6) Disconnect elbow swivel nut from end of actuator cylinder.

(7) Remove two nuts and lock washers from evaporator side of partition and remove actuator cylinder.

b. Installation. Install actuator cylinder and control as follows:

(1) Install actuator cylinder (fig. 5-6) with studs through openings in partition. Install lock washers and nuts on studs.

(2) Connect elbow swivel nut.

(3) Install push-pull control. Place outer control casing nuts (fig. 5-5) over wire and insert wire ends into openings in mechanical posts on louver lever and actuator cylinders.

(4) Install control casing nuts on casing to hold it in position. Install loop clamp, screw, and lock washer.

(5) Adjust control as described in *c* below.

c. Adjustment. Before system is charged, adjust louver push-pull control as follows:

(1) Close louver blades and tighten screw in mechanical post to lock wire on that end.

(2) Extend actuator rod until there is a ¼

inch spare beteewn inner edge of mechanical post bracket and the face of the cylinder. Tighten the mechanical post screw.

(3) Refer to paragraph 4-21 and install housing top covers.

(4) Refer to paragraph 6-3 and charge the refrigerant system.

5-21. Pressure Switches

a. *Remoral.* Remove pressure cutout switches (fig. 4-21) as follows:

(1) Refer to paragraph 6-3 and discharge the refrigeration system.

(2) Refer to paragraph 4-50 and remove junction box. Disconnect electrical leads. Refer to paragraph 4-21 and remove housing rear and center top covers.

(3) Remove two mounting screws and lock washers from each switch.

(4) Refer to figure 5-7 and disconnect capillary tube nuts. Remove grommet and pull capillary tubes through partition.

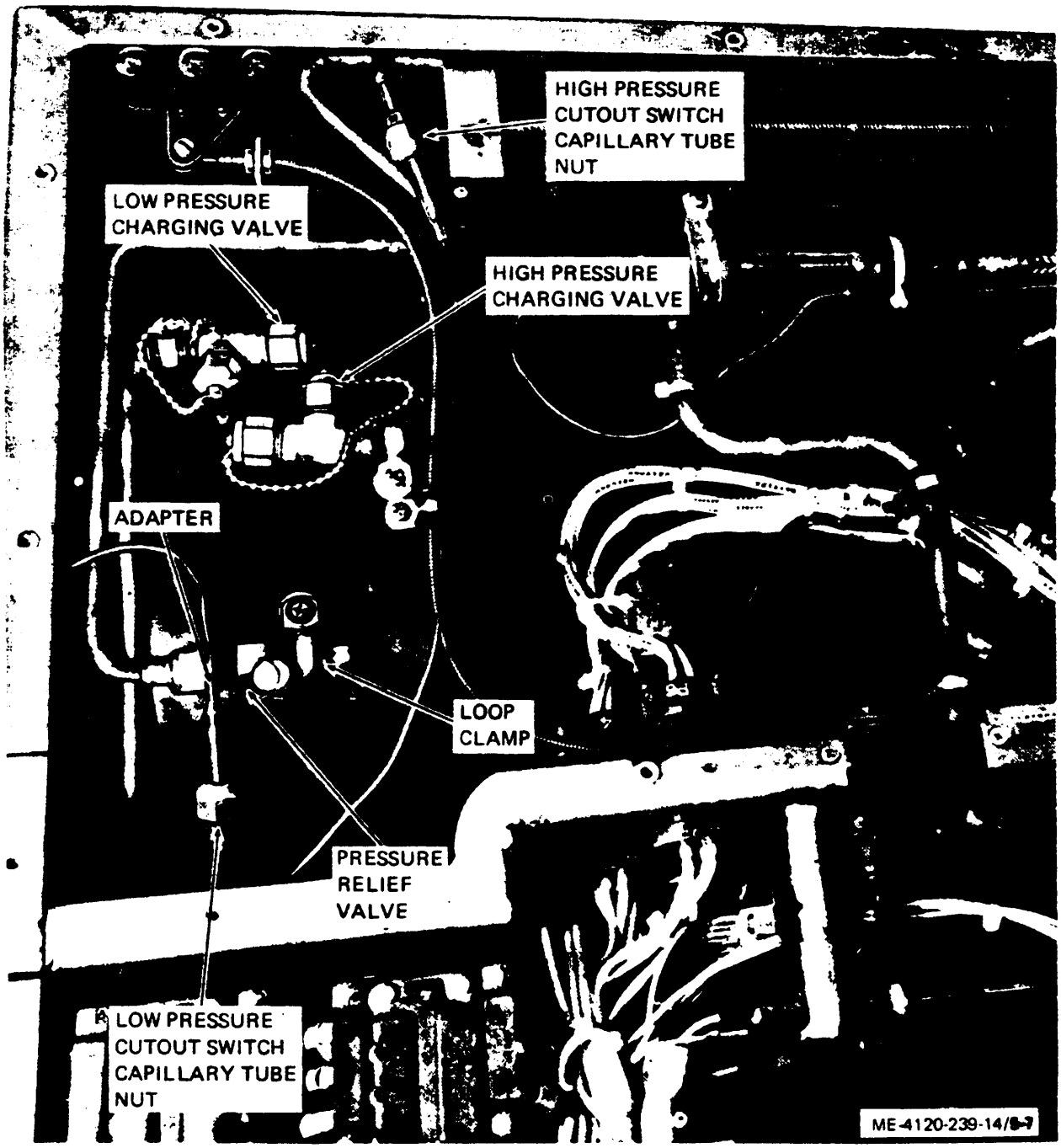


Figure 5-7. Charging valves, pressure relief valve, and pressure switch connections, removal and installation.

b. Installation. Install high and low pressure cutout switches as follows:

(1) Insert capillary tube ends through partition and install grommet (fig. 5-7). Connect capillary tube nuts to fittings.

(2) Install switches (fig. 4-21) and secure each with two screws and lock washers.

(3) Make electrical connections to switches.

(4) Refer to paragraph 4-54 and install junction box. Refer to paragraph 4-21 and install housing top cover.

(5) Refer to paragraph 6-3 and charge the refrigerant system.

5-22. Charging Valves

a. Removal. Refer to paragraph 6-3 and discharge the refrigerant system. Remove housing rear top covers (para 4-21). Remove cap and nut from each charging valve (fig. 5-7). Unsolder charging valves from line.

b. *Installation.* Install charging valves on line and solder. Place valves in slot in support bracket and secure each with nut. Install caps. Refer to paragraph 4-21 and install housing rear top cover. Refer to paragraph 6-3 and charge the refrigerant system.

5-23. Pressure Relief Valve

a. *Removal.* Refer to paragraph 6-3 and discharge the refrigerant system. Refer to paragraph 4-21 and remove housing top covers. Remove screw, lock washer, and loop clamp (fig. 5-7). Remove pressure relief valve from adapter.

b. *Installation.* Install pressure relief valve (fig. 5-7) in adapter. Install loop clamp on valve and secure clamp with screw and lock washer. Install housing top cover (para 4-21). Refer to paragraph 6-3 and charge the refrigerant system.

5-24. Dehydrator

a. *General.* The dehydrator is to be replaced whenever the refrigeration system is opened for maintenance.

b. Removal. Refer to paragraph 6-3 and discharge the refrigerant system. Refer to paragraph 4-21 and remove housing rear top cover. Refer to figure 5-8 and remove four screws and two straps. Disconnect and remove dehydrator.

c. *Installation.* Connect dehydrator to tubing. Install two strap and four screws. Use sealing compound on screw threads. Install rear top cover (para 4-21). Refer to paragraph 6-3 and charge the refrigerant system.

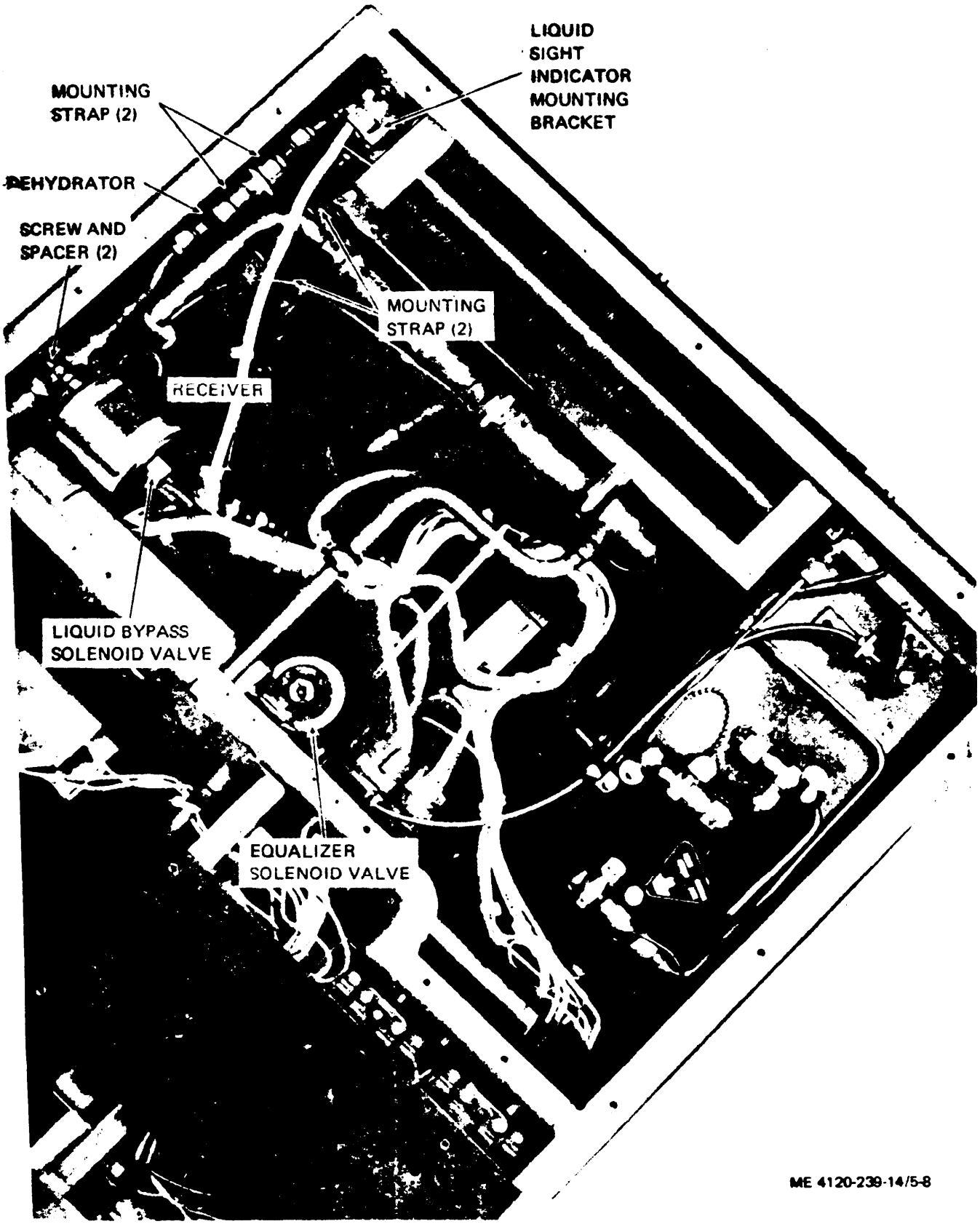


Figure 5-8. Dehydrator. *receiver and* Solenoid valves. *removal and Installation.*

5-25. Receiver

a. Removal. Refer to paragraph 6-3 a nd discharge the refrigerant system. Refer to paragraph 4-21 and remove rear top cover. Remove four screws and two mounting straps (fig. 5-8). Disconnect receiver tubing.

b. Installation. Install receiver and colder connections. Install two mounting straps a nd four screws using sealing compound on screw threads. Refer to paragraph 6-3 and charge the refrigerant system.

5-26. Liquid Sight Indicator

a. Removal. Refer to paragraph 6-3 and discharge the refrigerant system. Remove housing rear top cover (para 4-21). Remove two screws and lock washers from sides of liquid sight indicator (fig. 1-2) and remove mounting bracket (fig. 5-8) from inside housing. Unsolder liquid sight indicator from tubing.

b. Installation. Solder liquid sight indicator on tubing. Place bracket over indicator on inside of housing and secure with two screws and lock washers. Install housing top rear cover (para 4-21). Refer to paragraph 6-3 and charge the refrigerant system.

5-27. Solenoid Valves

a. Removal. Removal procedures for the bypass solenoid valve and the equalizer solenoid valve are the same except for the mounting hardware.

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Refer to paragraph 4-21 and remove housing rear top cover.

(3) Disconnect solenoid valve electrical connector.

(4) Remove two socket-head cap screws from underside of valve body and carefully remove bonnet assembly. Do not drop plunger. Remove diaphragm.

Caution: Remove bonnet assembly and diaphragm before applying heat to valve body.

(5) To remove liquid bypass solenoid valve (fig. 5-8), remove two screws and spacers and unsolder valve body from tubing. Remove bushings.

(6) To remove equalizer solenoid valve, remove two screws a nd lock washers that secure valve body to bracket. Unsolder valve body and remove bushings.

b. Installation. Install solenoid valves as follows:

(1) Install bushings in valve body and solder body on tubing.

(2) When installing equalizer solenoid valve body, secure body to bracket with two screws and lock washers install from underside of bracket into valve body.

(3) When installing liquid bypass solenoid valve body, install spacers between body and housing and install two screws from outside of housing.

(4) Place diaphragm in the body with the pilot port extension away from body. Hold plunger with synthetic seat a gainst pilot port. Make sure preformed packings are in place and lower bonnet assembly over plunger. Install body screws.

(5) Connect electrical connector.

(6) Refer to paragraph 4-21 and install housing rear top cover.

(7) Refer to paragraph 6-3 and charge the refrigerant system.

5-28. Thermal Expansion Valve

a. GeneraI. The main thermal expansion valve is hermetically sealed and cannot be repaired.

b. Rermoval. Remove the thermal expansion valve as follows:

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Remove housing top covers (para 4-21).

(3) Soften mastic in bulb well (fig. 5-9) and remove bulb from well. Take care to prevent dam age to capillary tube.

(4) Unsolder thermal expansion valve from tubing.

Figure 5-9. Thcrmal expansion valve, removal and installation.

c. Installation. Install thermal expansion valve (fig. 5-9) as follows:

(1) Solder valve to tubing.

(2) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(3) Install housing top covers (para 4-21).

(4) Refer to paragraph 6-3 and charge the refrigerant system.

5-29. Quench Thermal Expansion Valve

a. Genera I. The quench thermal expansion valve is hermetically sealed and cannot be repaired.

b. Retmoval. Remove the quench valve as follows :

(1) Refer to paragraph 6-3 and discharge the refrigerant system.

(2) Remove housing rear top cover (para 4 21).

(3) Soften mastic in bulb well (fig. 5-10) and remove bulb from well. Take care to prevent damage to capillary tube.

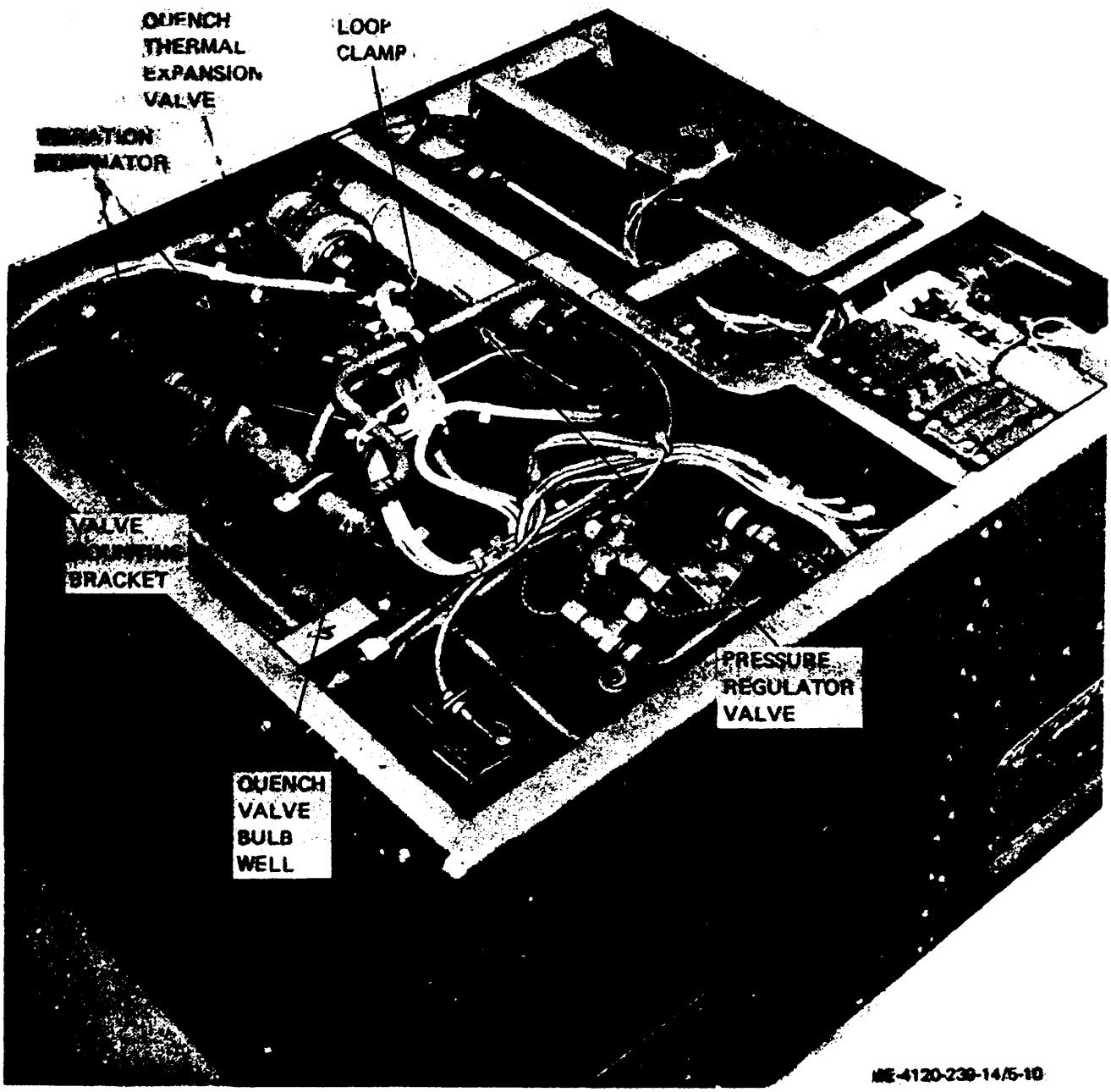


Figure 5-10. Quench valve and pressure regulator valve, removal and installation.

(4) Remove two screws, spacers, self-locking nuts and valve mounting brackets.

(5) Unsolder valve from tubing.

c. Installation. Install the quench thermal expansion valve (fig. 5-10) as follows:

(1) Solder valve to tubing.

(2) Install mounting brackets and two screws, spacers, and self-locking nuts.

(3) Insert approximately one ounce of thermal mastic in bulb well. Insert sensing bulb of expansion valve and move bulb back and forth to distribute mastic and set bulb approximately one inch beyond open end.

(4) Install housing rear top cover (para 4-21).

(5) Refer to paragraph 6-3 and charge the refrigerant system.

5-30. Vibration Eliminators

a. Removal. Refer to paragraph 6-3 and discharge the refrigerant system. Remove housing top covers. Refer to figures 5-9 and 5-10 and unsolder hose type vibration eliminators.

b. Installation. Refer to figures 5-9 and 5-10 and solder vibration eliminators into refrigeration lines. Install housing topcovers. Refer to paragraph 6-3 and charge the refrigerant system.

5-31. Pressure Regulator Valve

a. Removal. Refer to paragraph 6-3 and discharge the refrigerant system. Remove housing top covers (para 4-21). Refer to figure 5-10 and remove screw, lock washer, loop clamp and spacer. Unsolder pressure regulator valve from tubing.

b. *Installation.* Solder pressure regulator valve (fig. 5-10) on tubing and install loop clamp, spacer, screw and lock washer. Install housing top covers (para 4-21). Refer to paragraph 6-3 and charge the refrigerant system.

5-32. Motors

Refer to paragraph 4-38 for removal of motors and to paragraph 4-40 for installation.

5-33. Control Module

Refer to paragraph 4-44 for removal of control module and to paragraph 4-48 for installation.

CHAPTER 6

REPAIR INSTRUCTIONS

Section 1. REFRIGERATION SYSTEM

6-1. General

The refrigerant system, illustrated by the refrigerant flow diagram (fig. 5-1), is a mechanical, vapor cycle-type circuit consisting of the evaporator, thermal expansion valve, motor compressor, condenser, and the necessary valves a nd cutout devices for automatic control during operation. The thermal expansion valve releases high-pressure liquid refrigerant into the evaporator at reduced -pressure. The liquid refrigerant begins to vaporize by absorbing heat from the air passing over the external surface of the evaporator core. The heater vapor is sucked out of the evaporator suction by the motor compressor and forced into the condenser section under high pressure where it is cooled and condensed back into a liquid. The heat released during condensation is carried off by the condensing air stream. The liquid refrigerant flows from the condenser to a receiver, to a sub-cooler, and then to the thermal expansion valve. If the temperature control switch (evaporator return air thermostat) become satisfied, or the evaporator return air temperature is lower than the control switch set point, the refrigerant system will switch to a by-pass condition. The temperature control switch will activate the normally open liquid by-pass solenoid valve, closing the valve, and therefore shutting off the evaporator section of the unit. The motor compressor will continue to pump as usual and the suction pressure will begin to drop. When it reaches approximately 65 psig, the pressure regulating valve will start to open in an effort to maintain the suction pressure above 55 psig (approx.). As the suction temperature increases, due to the pressure regulating valve opening, the quench expansion valve will start to meter liquid refrigerant into the suction line in an effort to maintain the suction temperature below 75° F (approx.) or 30°F super-heat (approx.). This action (the pressure regulator and quench valve actions) is totally automatic and also may occur at extreme conditions in an attempt to maintain the suction pressures (even during the cooling mode) at a condition above 55 psig and the suction temperatures (measured at the quench bulb well) below 75° F. The condenser louvers are operated by a refrigerant powered piston located in high pressure part of the system. This piston should be fully extended (louvers open 80°F approx.) at 250 psig head pressure and fully closed at 165 psig. Failure to perform this function could result in icing of the evaporator coil and / or cutout on the low pressure cutout.

6-2. Pressure Testing the Refrigerant System

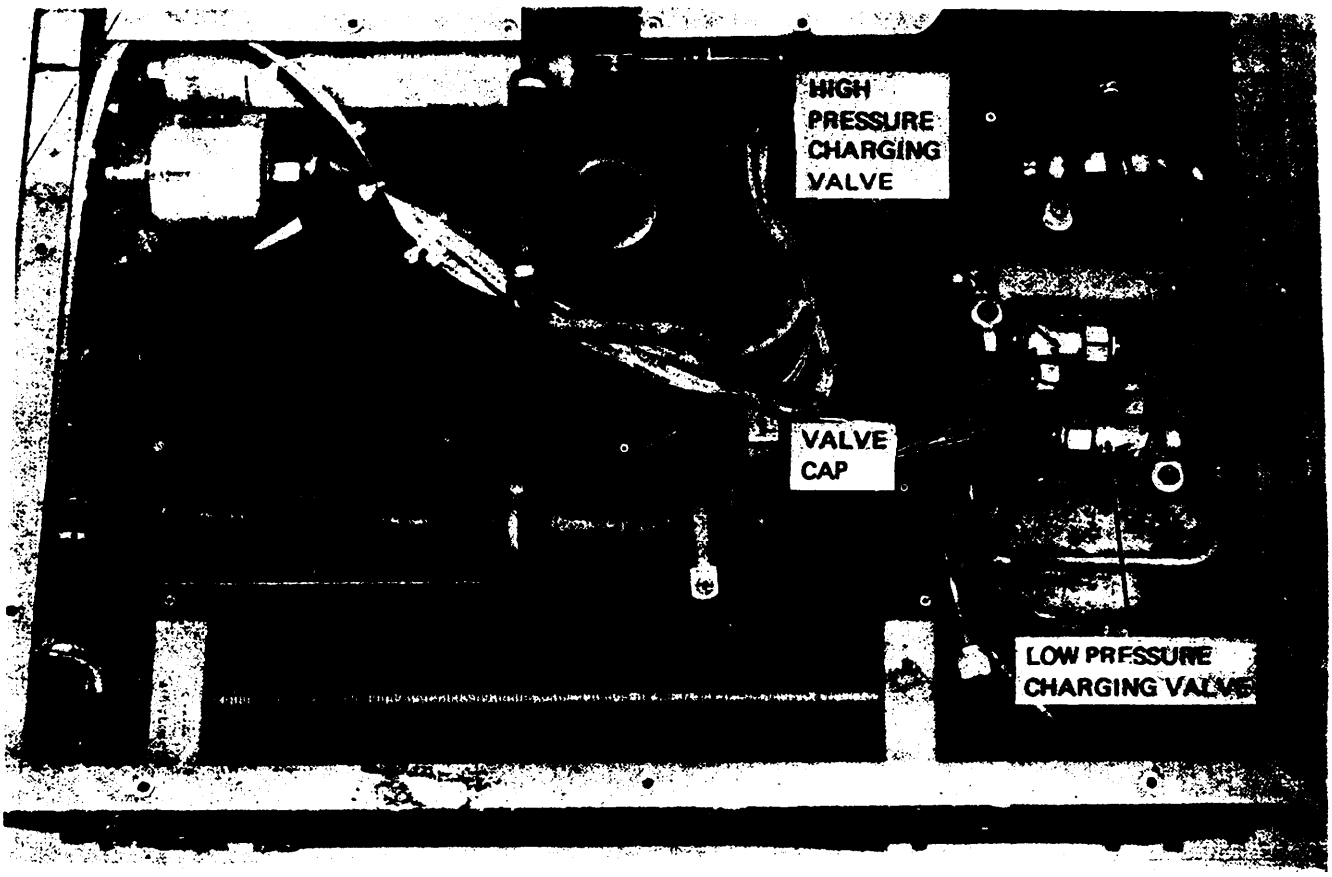
a. GeneruL A pressure test will indicate whether the air conditioner is operating at normal or abnormal pressures. When the air conditioner is not operating at normal pressures the cause should be ascertained and corrected. Refer to Table 5-1 for troubleshooting chart.

b. System Pressure Test. Remove caps from high and low pressure charging valves (fig. 5-71, connect suction and discharge pressure gages to their respective charging valves. Compare the gage reading with the normal range of system pressure shown in Table 6-1.

6-3. Servicing Refrigerant System

a. General, When the air conditioner must undergo maintenance that requires opening the system, the system must be discharged prior to maintenance and purged and charged after maintenance. This paragraph covers the basic procedures involved in servicing the refrigerant system.

b. Discharging and Purging System. Refer to figure 6-1 for discharging or purging the refrigerant system.



To DiSCHARGE SYSTEM:
REMOVE LOW PRESSURE CHARGING VALVE CAP. ATTACH A SUITABLE HOSE 10 CHARGING VALVE AND DISCHARGE REFRIGERANT INTO A SAFE AREA.

NOTE: TO PREVENT EXCESS LOSS OF OIL DISCHARGE SYSTEM SLOWLY OVER A PERIOD OF TWO HOURS

TO PURGE SYSTEM:
REMOVE HIGH PRESSURE CHARGING VALVE CAP. CONNECT VALVE TO A CYLINDER OF DRY NITROGEN. ATTACH A SUITABLE DISCHARGE HOSE TO LOW PRESSURE CHARGING VALVE OPEN. NITROGEN VALVE AND ALLOW NITROGEN TO FLOW THROUGH SYSTEM UNTIL ALL MOISTURE IS FORCED OUT. CLOSE NITROGEN CYLINDER VALVE. CONNECT A VACUUM PUMP TO HIGH AND LOW PRESSURE - CHARGING VALVES AND HOLD A 29.0 HG VACUUM FOR 8 HOURS.

WARNING: AVOID BODILY CONTACT WITH LIQUID REFRIGERANT AND AVOID INHALING REFRIGERANT GAS. BE ESPECIALLY CAREFUL THAT REFRIGERANT -22 DOES NOT COME IN CONTACT WITH EYES. IN CASE OF REFRIGERANT LEAKS, VENTILATE AREA IMMEDIATELY.

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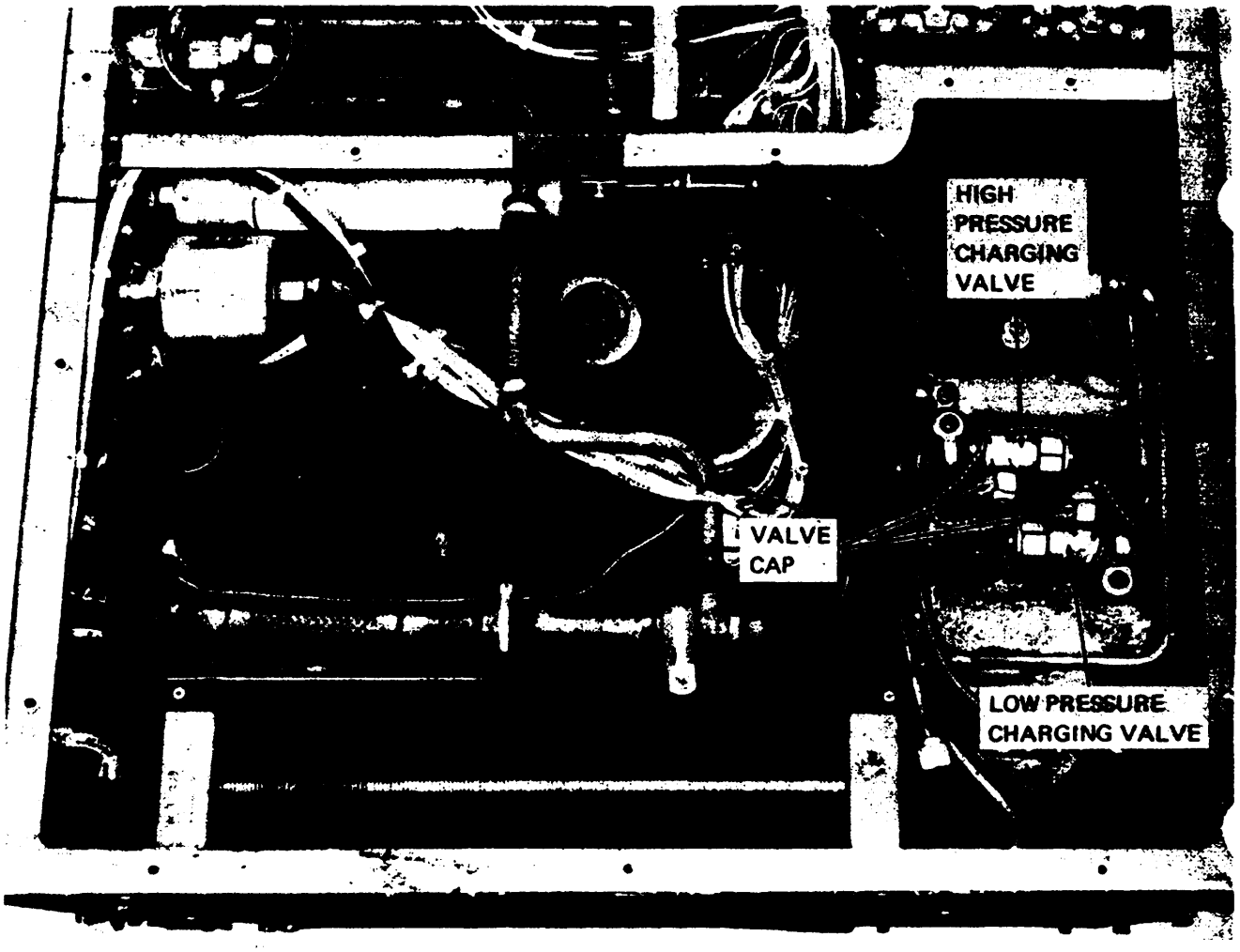
Figure 6-1. Disrharging and purging refrigerant system,

Table 6-1. Normal Operating Pressures

	Outdoor ambient — degrees F			
	50	75	100	120
90°F DB return air to unit				
Suction	58-65	58-70	60-75	75-90
Discharge	125-160	175-210	255-295	370-410
80°F DB return air to unit				
Suction	58-65	58-70	60-75	65-75
Discharge	120-155	170-205	250-290	370-410

c. Charging the system. Refer to figure 6-2 **for Charging he refrigerant system**



NOTE : STEPS 1, 2 AND 3 APPLY ONLY TO A COMPLETE EVACUATED SYSTEM. TO ADD ADDITIONAL REFRIGERANT TO A CHARGED SYSTEM, REFER TO STEPS 6 THROUGH 9.

STEP 1. REMOVE HIGH PRESSURE CHARGING VALVE CAP AND LOOSELY CONNECT CHARGING LINE OF DRUM TO VALVE.

STEP 2. OPEN REFRIGERANT DRUM VALVE SLIGHTLY TO PURGE AIR FROM CHARGING LINE. CLOSE REFRIGERANT DRUM VALVE AND TIGHTEN CONNECTION AT CHARGING VALVE.

ME-4120-239-14/6-2 (1)

Figure 6-2. Charging refrigerant system (Sheet 1 of 2).

STEP 3. SET THE REFRIGERANT DRUM IN AN INVERTED POSITION ON A SCALE, DO NOT OPERATE THE AIR CONDITIONER. OPEN CHARGING LINE VALVE AND CHARGING VALVE AND CHARGE REFRIGERANT SYSTEM UNTIL SYSTEM AND DRUM PRESSURES HAVE EQUALIZED OR UNTIL 3.5 POUNDS OF REFRIGERANT HAVE ENTERED THE SYSTEM.

STEP 4. CLOSE VALVES AND CAREFULLY LOOSEN THE CHARGING LINE TO RELEASE TRAPPED PRESSURE. DISCONNECT CHARGING LINE AND INSTALL CHARGING VALVE CAP. OPERATE AIR CONDITIONER IN COOLING MODE FOR 15 MINUTES.

STEP 5. CHECK LIQUID SIGHT INDICATOR. IF SYSTEM IS SHORT OF REFRIGERANT, GAS BUBBLES WILL APPEAR REGULARLY IN THE INDICATOR. IF REFRIGERANT SYSTEM IS UNDERCHARGED, ADD ADDITIONAL REFRIGERANT FOLLOWING STEPS 6 THROUGH 9.

STEP 6. USING SAME DRUM AND CHARGING LINE, PLACE DRUM IN AN UPRIGHT POSITION ON A SCALE. REMOVE CAP FROM LOW PRESSURE (SUCTION SIDE) CHARGING VALVE AND LOOSELY CONNECT CHARGING LINE TO VALVE. PURGE AIR FROM LINE AS IN STEP 2.

CAUTION: WHEN ADDING REFRIGERANT, USE EXTREME CARE TO AVOID ADDING REFRIGERANT TO THE SYSTEM TOO FAST WHICH WOULD CAUSE SLUGGING AT THE COMPRESSOR.

STEP 7. WITH THE AIR CONDITIONER OPERATING, ADMIT GAS TO SYSTEM SLOWLY (APPROXIMATELY 1 OUNCE PER MINUTE). CONSTANTLY OBSERVE DRUM WEIGHT TO INSURE THAT ONLY 3.5 POUNDS TOTAL WEIGHT OF REFRIGERANT IS IN SYSTEM.

STEP 8. REPEAT STEP 4.

STEP 9. CHECK LIQUID SIGHT INDICATOR. IF INDICATOR REGULARLY SHOWS BUBBLES, REPEAT STEPS 6 THROUGH 9 ADDING REFRIGERANT IN 4 OUNCE INCREMENTS UNTIL INDICATOR IS CLEAR.

ME4120-239-14/6-2 (2)

Figure 6-2. Charging refrigerrnnf system (Sheet 2 Of 2).

6-4. Repairing Refrigerant Leaks

a. Locate leak (para 4-64).

b. **Discharge system (para 6-3), repair leak, and recharge system (para 6-3).**

Note. If soldering is necessary on any part of the system, a constant purge of dry nitrogen must be fed through the system being soldered to prevent scale formation within the system.

6-5. Decontamination

a. ***General.*** **The compressor is a hermetically sealed unit and cannot be repaired. An inoperative compressor is usually due to a mechanical failure or motor burnout. If the compressor is mechanically frozen or sustains a motor burn out it must be replaced. A compressor failure generates high temperature causing a breakdown of oil and refrigerant with the resulting formation of acid, moisture, sludge. These products are extremely corrosive and 'must be flushed from the system or repeated burn outs will occur.**

b. Procedure.

(1) **Discharge system and purge with nitrogen (para 6-3).**

(2) Remove defective motor compressor (para 5-17).

(3) With compressor out of system, purge all lines with dry nitrogen.

(4) Install a new compressor (para 5-17) containing a full and proper oil charge.

(5) Replace the dehydrator (para 5-24). This drhydrator will later be replaced.

(6) Triple evacuate system and charge with refrigerant R22.

(7) Start air conditioner (para 2-10) and operate unit for 24 hours.

(8) Discharge system and purge with nitrogen (para 6-3).

(9) Install new dehydrator (para 5-24).

(10) Evacuate system and recharge with refrigerant (para 6-3).

(11) Operate air conditioner,

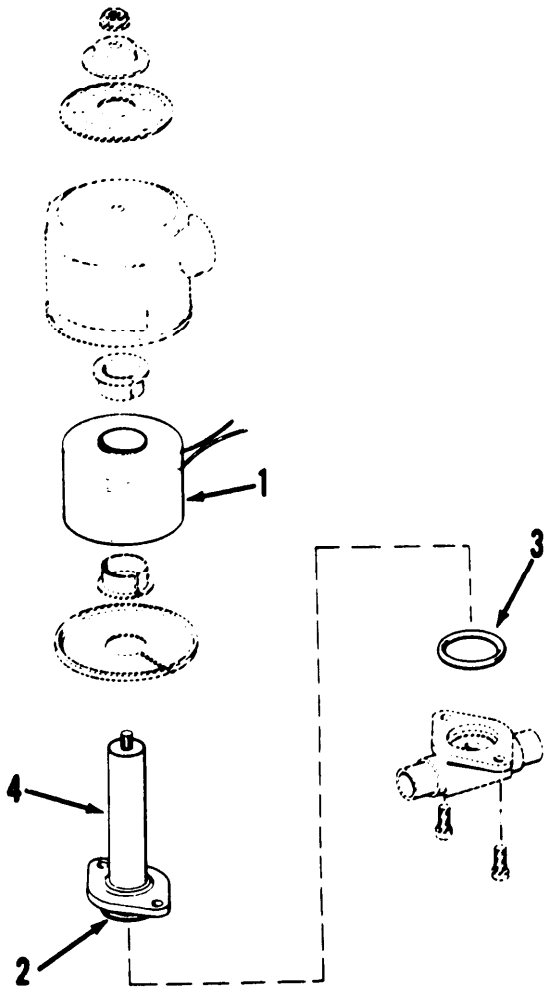
6-6. Evaporator and Condenser Coils

u. *Inspection.* Inspect coils for damaged tubing and bent fins. Inspect threaded holes for damaged or stripped threads.

b. Repair. Repair any leaks. Straighten bent fins. Repair or replace damaged tubing if possible. Replace coil if repair is not practical.

6-7. Solenoid Valves

a. General. The solenoid valves without electrical connectors are identical. Replaceable parts are the coil, bonnet assembly, diaphragm and the preformed packing. See figure 6-3.



1. Coil
2. Diaphragm
3. Preformed packing
4. Bonnet assembly

Figure 6-3. Solenoid valve, exploded view.

b. Coil Replacement. Replace coil as follows:

(1) Remove electrical connector from solenoid valve leads.

(2) Remove nut on top of valve housing, Lift housing and coil assembly from bonnet assembly.

(3) Remove coil from housing.

(4) Install coil bottom plate with edge upward.

(5) Install lower coil sleeve with flange at bottom. Install coil with lead exits at bottom.

(6) Install coil spring with flat edges upward and upper coil sleeve with flange at top. Sleeve passes through the coil spring.

(7) Install coil housing, data plate and nut.

c. Bonnet Assembly and Diaphragm Replacement. Replace parts as follows:

(1) To replace diaphragm (2, fig. 6-3), remove two screws from body flanges and lift housing, coil and bonnet assembly (4) from body. Lift out diaphragm.

(2) To replace bonnet assembly, remove coil housing and coil (b above) from bonnet assembly.

(3) Assemble coil and bonnet assembly. Install diaphragm and preformed packing (3) on body. Install coil and bonnet assembly and secure with two screws.

Section II. ELECTRICAL COMPONENTS

6-8. Fan Motors

a. General. The condenser fan motor and the evaporator fan motor are identical. Motors for air conditioners having different electrical characteristics are similar in construction and the repair instructions contained in this paragraph apply to all motors except as noted.

b. Disassembly. Refer to figure 6-4 and disassemble motor as follows:

(1) Remove four hex nuts (1), four through bolts (2), and eight flat washers (3). Remove rear end bell (4).

(2) Pull out rotor (9) and remove shims (5 and 6), bearing spacers (7) and bearings (8).

(3) Remove screw (10), washer (11), and loop clamp (12). Remove screw (13), washer (14), and ground terminal (15). Disconnect leads and remove cable (16) and strain relief bushing (17).

(4) For single phase motors, remove front end bell (27) from stator (29).

(5) For three phase motors, refer to paragraph 4-39 and remove thermal protector housings (21 and 25), thermal protectors (22 and 26), and attaching hardware. Remove front end bell (28) from stator (29).

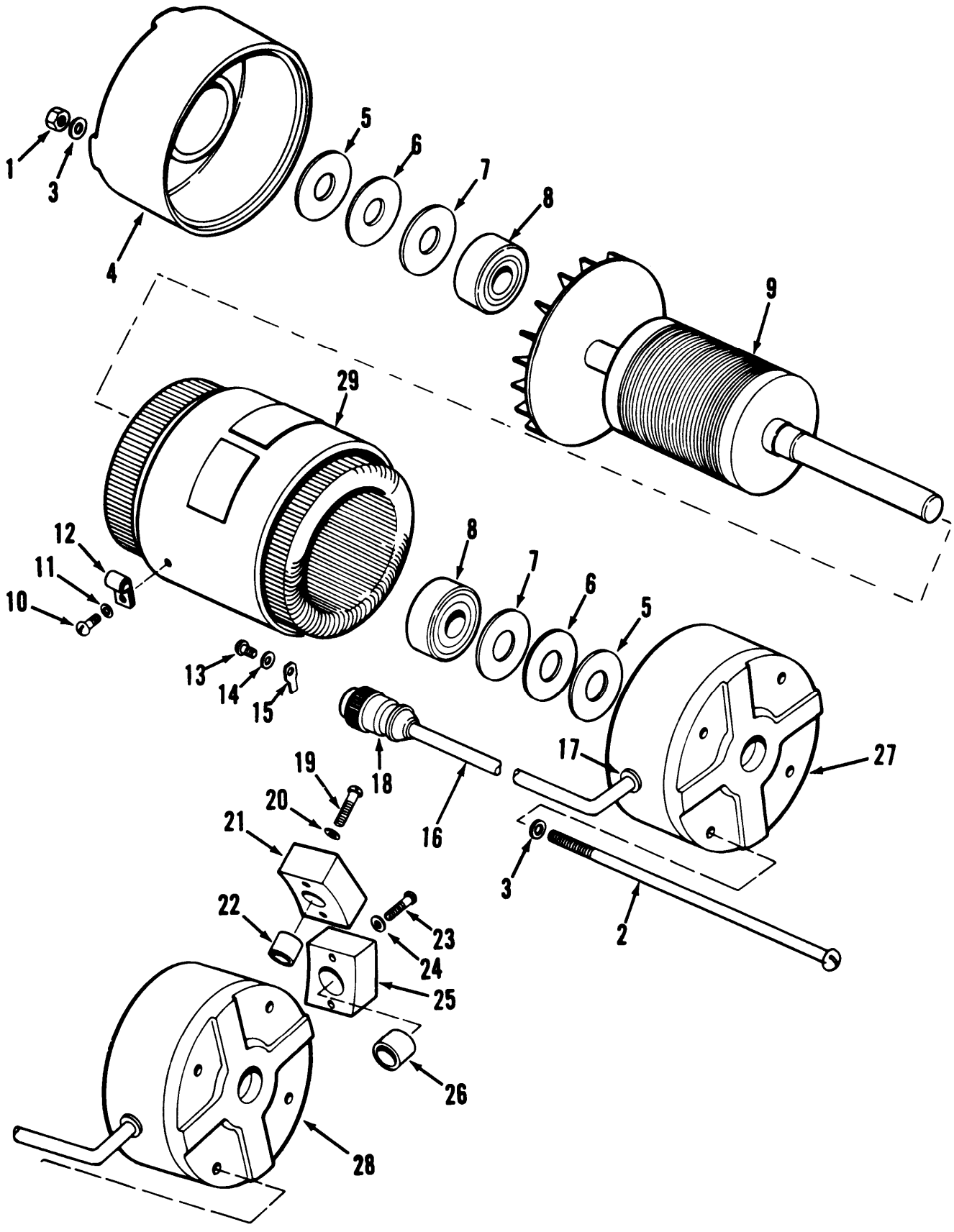


Figure 6-4. Fan motor. exploded **view.**

Key to figure 6-4:

1. Nut, hex
2. Bolt, through
3. Washer, flat
4. End bell, rear
5. Shim
6. Shim
7. Spacer, bearing
8. Bearing, ball, annular
9. Rotor
10. Screw
11. Washer
12. Clamp, loop
13. Screw
14. Washer
15. Terminal
16. Cable
17. Bushing, strain relief
18. Connector
19. Screw
20. Washer
21. Housing, thermal protector
22. Thermal protector
23. Screw
24. Washer
25. Housing, thermal protector
26. Thermal protector
27. End bell, front
28. End bell, front
29. Stator

c. Cleaning, Inspection and Repair. Clean, inspect and repair parts as follows:

(1) Clean metal parts with cleaning solvent (Fed. Spec. *P-D-680).* Wipe off electrical parts with a clean cloth.

(2) Inspect wiring for damaged insulation and broken wiring. Repair damaged insolation.

(3) Inspect connector for damage.

(4) Inspect bearing for wear, galling or flat spots. Replace defective bearings.

(5) Inspect shaft for gouges or worn bearing surface. Repair minor defects.

(6). Inspect stator for damaged, broken or shorted wiring.

d. Assembly. Refer to figure 6-4 and assemble motor as follows:

(1) For three phase motors, install thermal protectors (22 and 26) and housings (21 and 25) in front end bell (28) as described in paragraph 4-39.

(2) Install connector (18) on cable (16). Install cable and strain relief brushing (17) in end bell (27 or 28). Partially install end bell on stator and connect terminal (15) with screw (13) and washer (14). Make electrical connections.

(3) Install shims (5 and 6), bearing spacers (7), bearings (8), and rotor (9).

(4) Install rear end bell (4). Place a flat washer (3) on each through bolt (2). Install through bolts in motor and secure each with a nut (1) and washer (3).

(5) Install loop clamp (12) on cable and secure clamp to stator frame with screw (10) and washer (11).

6-9. Control Module

a. General. This paragraph covers repair of the control module. Disassembly and assembly procedures for modules of different electrical characteristics are the same except for minor details. Testing, removal, and installation of switches and circuit breaker are covered in paragraphs 4-45 through 4-47. Parts of the control module are shown in figure 6-5.

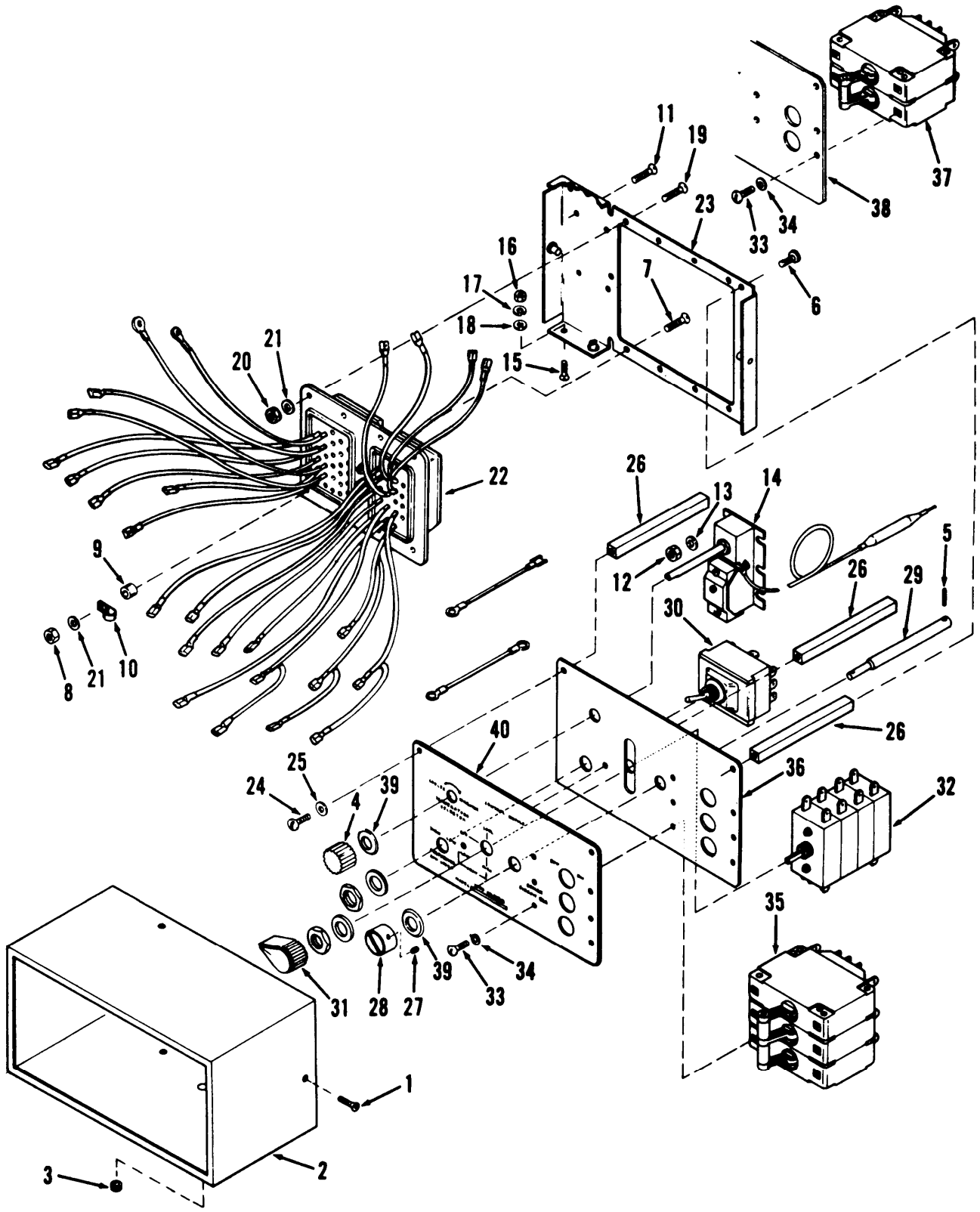


Figure 6-5. Control module, exploded view.

KEY for figure 6-5:

1. Screw, flat csk-hd, 4-40 x 7 / 16
2. Cover
3. Grommet, split
4. Knob
5. Roll pin
6. Screw, self-lkg, flat-hd, 6-32 x 5 / 16
7. Screw, flat csk-hd, 6-32 x7 / 8
8. Nut, hex, self-lkg, 6-32
9. Post, spacer
10. Loop clamp
11. Screw, flat csk-hd, 6-32 x 7 / 16
12. Nut, hex, self-lkg, 6-32
13. Washer, flat, no. 6
14. Switch, temperature control
15. Screw, flat csk-hd, 8-32 x 1 / 2
16. Nut, hex, 8-32
17. Washer, lock, no. 8
18. Washer, flat, no. 8
19. Screw, flat csk-hd, 6-32 x 7 / 16
20. Nut, hex, self-lkg, 6-32
21. Washer, flat, no. 6
22. Connector assembly
23. Mounting frame
24. Screw, self-lkg, pan-hd, 6-32 x 5 / 16
25. Washer, flat, no. 6
26. Post
27. Setscrew, hex-soc, 4-48 x 1 / 8
28. Knob
29 Jackscrew extension
30. Switch, toggle
31. Knob
32. Rotary switch, mode selector
33. Screw, self-lkg, pan-hd, 6-32 x 5 / 16
34. Washer, flat, no. 6
35. Circuit breaker (3 phase)
36. Mounting plate
37. Circuit breaker (1 phase)
38. Mounting plate
39. Grommet
40. Designation plate

b. Disassembly. Refer to figure 6-5 and disassemble the control module as follows:

(1) Remove four screws (1) and split grommet (3). Slide cover (2) from module and pull capillary tube and bulb through opening in bottom of cover.

(2) Remove knob (4). Drive out roll pin (5).

(3) Disconnect leads. Remove three self-locking screws (6) and remove rear mounting frame (23) with connector and temperature control switch attached.

(4) Remove connector mounting screw (7), nut (8), loop clamp (10), washer (21) and spacer post (9) to release temperature control capillary tube.

(5) Remove four screws (11), nuts (12), and washers (13) and remove temperature control switch (14).

(6) Remove screw (15), nut (16), lock washer (17) and two flat washers (18) and disconnect ground lead.

(7) Remove seven remaining screws (19), nuts (20) and washers (21) and remove connector assembly (22) from mounting frame (23). Do not remove leads from connector unless they require replacement.

(8) Remove three screws (24), washers (25) and posts (26).

(9) Remove setscrew (27), knob (28), and jack screw extension (29).

(10) remove toggle switch (30) by removing locknut and washer.

(11) Remove mode selector knob (31), switch nut and washer and remove mode selector rotary switch (32).

(12) Disassemble handle of three phase circuit breaker (35) or single phase circuit breaker (37). Remove six screws (33) and washers (34) securing three phase circuit breaker (35) to mounting plate (36) or four screws and washers securing single phase circuit breaker (37) to mounting plate (38). Remove circuit breaker.

(13) Remove grommets (39) and designation plate (40) from mounting plate.

c. Cleaning, Inspection and Repair.

(1) Clean metal parts with cleaning solvent (Fed. Spec. P-D-680). Wipe off electrical parts with a clean cloth.

(2) Refer to paragraph 4-45 and test switches and circuit breaker. Replace defective parts.

(3) Inspect connector for damaged casing and bent or broken contacts. Check wiring for damaged insulation and broken wires. Check terminals for damage. Repair damaged wiring. Replace connector if defective.

(4) Check cover, frame and plates for bent condition. Straighten bent parts or replace parts as required.

d. Assembly. Refer to figure 6-5 and assemble control module as follows:

(1) Place designation plate (40) on mounting plate (36 or 38) and install circuit breaker (35 or 37) with screws (33) and washers (34). Install grommets (39).

(2) Install rotary switch (32) and secure with switch nut and washer. Install knob (31).

(3) Install toggle switch (30) and secure with switch nut and washer.

(4) Insert jackscrew extension (29) through opening in mounting plate and install knob (28) and setscrew (27).

(5) Install connector assembly (22) on rear mounting frame {23) and secure with seven screws (19), nuts (20), and washers (21). Omit screw in lower corner.

(6) Install screw (15), washers (18) lock washer (17) and nut (16) with ground terminal between the two flat washers (18).

(7) Install temperature control switch (14) on frame and secure switch with four screws (11), nuts (12), and flat washers (13). Install loop damp (10) **on capillary tube and install screw (7), spacer (9), washer (21). clamp and nut (8).**

(8) Assemble three posts (26) to front plates with screws (24) and washers (25). Position poets against frame and install screws (6). Install roll pin (5).

(9) Pass capillary tube through opening in bottom of cover (2) and install cover on module. Install grommet (3) and four screws (1).

APPENDIX A

REFERENCES

A-1. Fire Protection	
TB 5-4200-200-10	**Hand Portable Fire Extinguisher for Army Users**
A-2. Lubrication	
C9100IL	**Fuels, Lubricants, Oils and Waxes**
A-3. Painting	
TM 9-213	**Painting Instructions for Field Use**
A-4. Maintenance	
TM 38-750	**Army Maintenance Management System**
TM 750-244-3	**Procedures for Destruction of Equipment to Prevent Enemy Use**
Fed. Spec. P-D-680	**Dry Cleaning Solvent**
A-S. Shipment and Storage	
TM 740.90-1	**Administration Storage of Equipment**

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

a. Section I provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

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

c. Section 111 lists the special tools and test equipment required for each maintenance operation as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and / or illustrations required for a particular maintenance function.

B-2. Explanation of Columns in Section II

a. Functional Group Number. The functional group is numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 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. Component Assembly Nomenclature. This column contains a brief description of the components of each functional group.

c. *Maintenance Operations and Maintenance* Levels. This column lists the various maintenance operations ('*A" through "K") and indicates the lowest maintenance level authorized to perform these operations. The symbol designations for the various maintenance levels are as follows:

C-Operator and / or *crew*
O-Organizational maintenance
F—Direct support maintenance (DS)
H-General support maintenance (GS)
D—Depot maintenance

The Maintenance Operations are defined as follows :

C-SERVICIE Operations requiring periodically to keep the item in proper operating condition, i.e., to clean, preserve, drain, paint, and replenish fuel, refrigerant lubricants. hydraulic, and deicing fluids, or compressed air supplies.

D—ADJUST: Regulate periodically to prevent malfunction. Adjustments will be made commensurate with adjustrment procedures and associated equipment specification.

E—ALINE: Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted,

F—CALIBRATE: Determine, check. or rectify the graduation of an instrument, weapon. or weapons system or componentds of a weapons system.

A—INDPECTION: VerifY serviceability and detect incipient electrical or mechanical failure by close visual examination.

B-TEST: Verify serviceability} and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Detect leaks in the refrigerant system with the aid of a leak detector. Tests will be made commensurate with test procedures and with calibrated tools and /(w test equipment reference in the MAC.

H—REPLACE : Substitute serviceable components. assemblies and subassemblies for unserviceable counter parts or remote and install the same item when required for the performance of other maintenance operations,

G—INSTALL: To set up for use in an operational environment such as an emplacement. site. or vehicle.

I—REPAIR : Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools. equipment and skills—to include welding, grinding. riveting, straightening. adjusting and facing.

J—OVERHAUL: Restore an item to a completed serviceable condition as prescribed by serviceability standards developed and published by the commodity cornmands) employing techniques of "'inspect and Repair Only as Necessary." (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational. provided the time, tools. equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items. is limited to depot maintenance level.

K—REBUILD: Restore to a condition comparable to new by disassembling to determine the condition of each component part and reassembling using serviceable, rebuilt. or new assemblies, subassemblies and parts.

d. Too/s and Equipment. This column is provided for referencing the SPECIAL TOOL AND TEST EQUIPMENT REQUIREMENTS (sec. 111) and REMARKS (sec. IV) that may be associated with maintenance operation (sec. II).

e. *Remarks.* This column is provided for referencing by codes the remarks (see IV) pertinent to the maintenance functions.

B-3. Explanation of Columns in Section III

a. *Reference Code.* **This column consists *of* a number and a letter separated by a dash. The number references the T & TE requirements column on the MAC. The letter represents the specific maintenance operation the item is to be used with. The letter is representative *of* columns "A" through "J" on the MAC.**

b. Maintenance Level. **This column shows the lowest level of maintenance authorized to use the special tool or test equipment.**

c. *Nomenclature.* **This column lists the name *or* identification of the tool or test equipment.**

cf. *Tool Number.* **This column lists the manufacturer's code and part number, or Federal Stock Number, *of* tools and test equipment.**

B-4. Explanation of Columns in Section IV

a. *Reference Code.* **This column consists *of* two letters separated by a dash, both of which are references to section II. The first letter references column 5, section II and the second letter references a maintenance operation, Column "A" through "K".**

b. Remarks. **This column lists information pertinent to the Maintenance Operation being performed, as indicated on the MAC section II.**

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
	Note. This maintenance allocation chart is subject to prooftesting by disassembly and reassembly of equipment.													
18	BODY													
1801	Body													
	Covers, Louvers and guards	O	..	..	O	..	..	O	O	O				
	Control assembly, push-pull, louver actuator	O	O	..	O	..	..	F	F					
22	BODY CHASSIS OR HULL, AND ACCESSORY ITEMS													
2201	Canvas items													
	Cover, fabric	O	..	..	..	..	..	O	O	O				
40	ELECTRICAL MOTORS													
4000	Motors:													
	Motor assembly, evaporator blower	O	O	..	..	..	..	O	O	F				
	Motor assembly, Condenser fan	O	O	..	..	..	..	O	O	F				
	Protectors, Overload, Thermal	O	O	..	..	..	..	O	O					
4006	Starting and Protective Devices:													
	Capacitors	O	O	..	..	..	..	O	O					
	Relays	O	O	..	..	..	..	O	O					
42	ELECTRICAL EQUIPMENT													
4201	Transformer:													
	Transformer	O	O	..	..	..	..	O	O					
	Rectifier	O	O	..	..	..	..	O	O					
4202	Electrical Controls:													
	Control module	O	O	..	..	..	..	O	O	F				
	Switch, temperature control	..	O	..	..	..	..	..	O					
	Switch, toggle, fan speed	..	O	..	..	..	..	..	O					
	Switch, rotary selector	..	O	..	..	..	..	..	O					
	Circuit breakers	..	O	..	..	..	..	..	O	O				
	Relays	O	O	O	..	..	..	O	O					
4203	Cutout Devices:													
	Pressure Switches	O	O	..	..	..	..	F	F					
4206	Thermostatic Control Devices:													
	Switch, Thermostatic, Heater	..	O	..	..	..	..	..	O					
4216	Miscellaneous Wiring and Fittings:													
	Wiring Harness Assemblies	O	O	..	..	..	..	O	O	O				
47	GAGES (NON-ELECTRICAL)													
4702	Gages, Mounting, Lines and Fittings:													
	Indicator, Liquid Sight	O	..	..	..	..	..	..	F					
52	REFRIGERATION AND AIR CONDITIONING COMPONENTS													
5200	Gas Compressor Assembly:													
	Compressor assembly	O	O	F	..	..	..	H	H	O	..	..	.....	..... A
5217	Refrigerant Piping:													
	Piping	O	O	F	..	..	..	F	F	F				

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
	Hose assembly, metal (vibration eliminators)	O	O	F	..	..	..	F	F					
	Valve, solenoid, liquid	O	O	F	..	..	..	F	F	F	..	..		B
	Valve, solenoid, equalization	O	O	F	..	..	..	F	F	F	..	..		C
	Valve, charging	O	..	..	..	..	..	F	F					
	Cylinder assembly, actuator	O	O	..	O	..	..	F	F					
	Dehydrator	O	..	..	..	..	..	F	F					
	Valve, Expansion	..	O	..	F	..	..	..	F					
	Valve, Pressure Relief	O	O	..	..	..	..	F	F					
	Regulator, Fluid Pressure	O	O	..	..	..	..	F	F					
5230	Condenser:													
	Condenser, Coil	O	O	O	..	..	..	F	F	F				
	Receiver, Liquid	O	O	..	..	..	..	H	H					
5241	Evaporator:													
	Tubes, Drain	O	..	O	..	..	..	O	O					
	Evaporator, Coil	O	O	O	..	..	..	F	F	F				
5244	Thermostatic Controls:													
	Switch, Thermostatic Condenser Fan Speed	..	O	..	..	..	..	..	O					
5245	Air Filter:													
	Filter, Air Conditioning	O	..	O	..	..	..	O	O					
5247	Heating Units:													
	Heating Elements	O	O	..	..	..	..	O	O					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
No Special	Tools or Test	Equipment Required	

Section IV. REMARKS

Reference Code	Remarks
A—B	Includes testing the refrigeration system for refrigerant leaks or proper operating pressure.
A—C	Includes adding or removing refrigerant (see note).
A—I	Repair by replacing unserviceable external electrical components.
B—C	See remarks reference code A—C.
C—C	See remarks reference code A—C.

Note. Reference Code A—C. This is the lowest maintenance level authorized for servicing the refrigeration system when it is necessary to open the system for replacement of related defective components.

APPENDIX C

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. Scope

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

C-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 crew / operator for installation, operation, or maintenance.

b. Maintenance and Operating Supplies—Section III. Not applicable.

C-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):

(1) Source code, indicates the source for the listed item. Source codes are:

Code	*Explanation*
P	Repair parts. Special Tools and Test Equipment supplied from the GSA / DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts, Special Tools and Test Equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
M	Repair parts, Special Tools and Test Equipment which are not procured or stocked, as such, in the Supply System but are to be manufactured at ndicated maintenance levels.
A	Assemblies which are not procured or stocked as such. but are made up of two or more units. such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Repair parts. Special Tools and Test Equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage, the item may be requisitioned with exception data. from the end item manager. for immediate use.
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSC level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

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

Code	*Explanation*
C	Crew / Operator

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable. Recoverability codes are:

code	*Explanation*
R	Applied to repair parts. (assemblies and components) special tools and test equipment which are considered economically reparable at direct and general support maintenance levels. When the item is no longer economically reparable. it is normally disposed of at the GS level. When supply considerations dictate. some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-30. When so listed. they will be replaced by supply on an exchange basis.
S	Repair parts, special tools. test equipment and assemblies which are economically reparable at DSU and GSU activtities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable. they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts. special tools and test equipment which are subject to special handling and are issued on an exchange basis. Such items will be repaired or overhauled at depot maintenance activities only. No repair may be accomplished at lower levels.
U	Repair parts, special tools and test equipment specifically selected for salvage by reclamation units because of precious metal content. critical materials, high dollar value or reusable casings or castings.

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. The abbreviation "w / e", when used as a part of the nomenclature, indicates the Federal stock number, includes all armament, equipment, accessories, and repair parts issued with the item. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parenthesis. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. *Unit of Measure (U/ M).* A two-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.* This column. indicates the quantity of the item in the assembly group. A "V" appearing in this column in lieu *of* a quantity indicates that a definite quantity cannot be indicated (e.g. shims, spacers, etc.).

f. Quantity Furnished With Equipment. This column indicates the quantity of an item furnished with the equipment.

g. *Illustration.* This column is divided as follows :

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

Section II. BASIC ISSUE ITEMS

(1) SMR code	(2) Federal stock number	(3) Description Ref No. & Mfr Code / Useable on code	(4) Unit of mess	(s) Qty inc in unit	(6) Qty furn with equip	(7) Illustration (A) Fig No	(B) Item No
PC	7510-889-3494	BINDER. Looseleaf	EA		1		
PC	7520-559-9618	CASE. Operator's manual	EA		1		
		ARMY TECHNICAL MANUAL TM 5-4120-239-14	EA		1		

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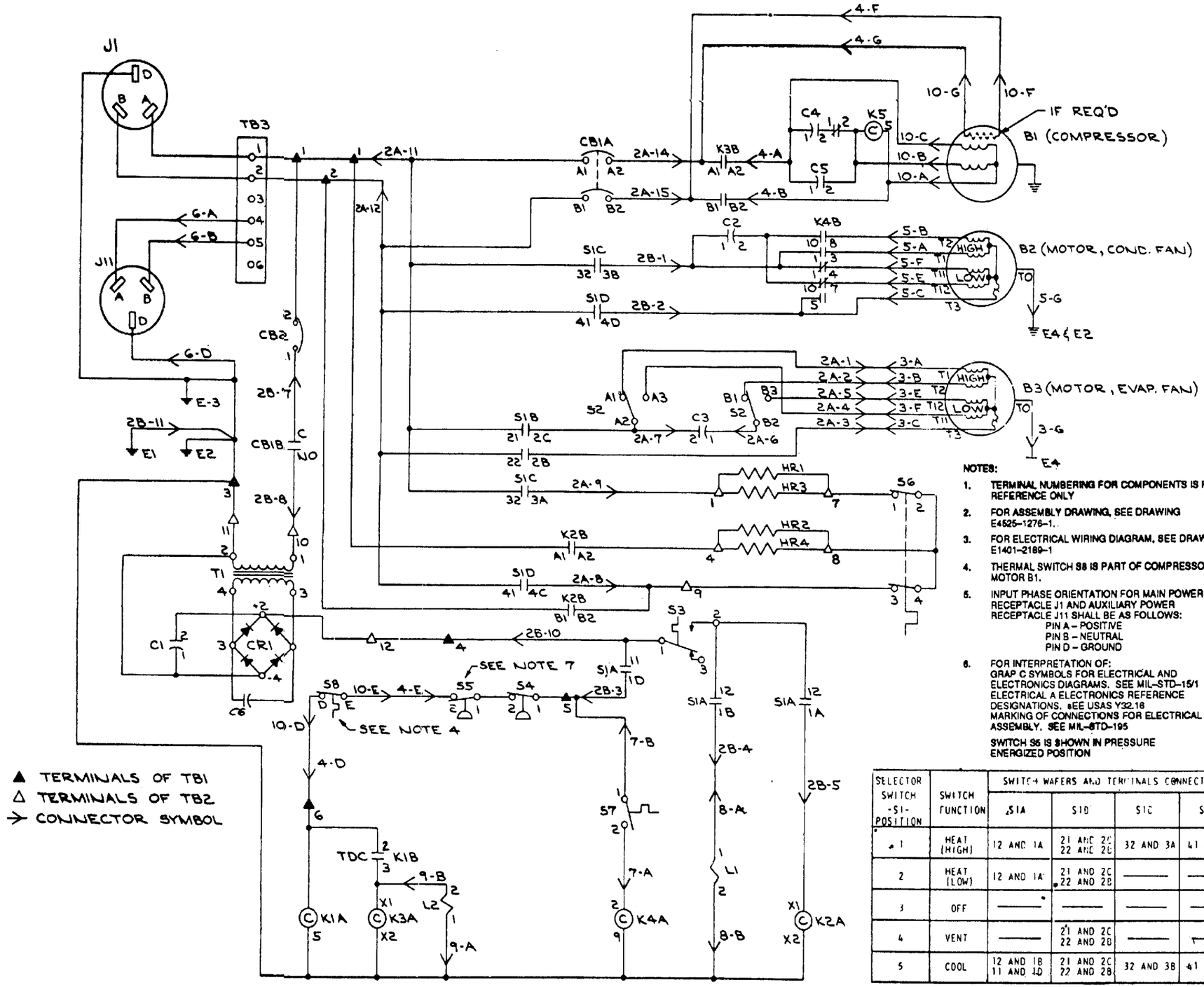

NOTES:

1. TERMINAL NUMBERING FOR COMPONENTS IS FOR REFERENCE ONLY
2. FOR ASSEMBLY DRAWING, SEE DRAWING E4525-1276-1.
3. FOR ELECTRICAL WIRING DIAGRAM, SEE DRAWING E1401-2189-1
4. THERMAL SWITCH S6 IS PART OF COMPRESSOR MOTOR B1.
5. INPUT PHASE ORIENTATION FOR MAIN POWER RECEPTACLE J1 AND AUXILIARY POWER RECEPTACLE J11 SHALL BE AS FOLLOWS:
   PIN A – POSITIVE
   PIN B – NEUTRAL
   PIN D – GROUND
6. FOR INTERPRETATION OF:
   GRAP C SYMBOLS FOR ELECTRICAL AND ELECTRONICS DIAGRAMS. SEE MIL-STD-15/1
   ELECTRICAL A ELECTRONICS REFERENCE DESIGNATIONS. sEE USAS Y32.16
   MARKING OF CONNECTIONS FOR ELECTRICAL ASSEMBLY. SEE MIL-STD-195

SWITCH S6 IS SHOWN IN PRESSURE ENERGIZED POSITION

SELECTOR SWITCH -S1- POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	32 AND 3A	41 AND 4C
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	———	———
3	OFF	———	———	———	———
4	VENT	———	21 AND 2C 22 AND 2B	———	———
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	32 AND 3B	41 AND 4D

COMPONENT REFERENCE LIST	
ELEC ASY DESIG	DESCRIPTION
B1	COMPRESSOR, ROTARY
B2	MOTOR, CONDENSER FAN
B3	MOTOR, EVAPORATOR FAN
C6	CAPACITOR, FILTER
C1	CAPACITOR, FILTER
C2	CAPACITOR, CONDENSER RUN
C3	CAPACITOR, EVAPORATOR RUN
C4	CAPACITOR, COMPRESSOR START
C5	CAPACITOR, COMPRESSOR RUN
CB1	CIRCUIT BREAKER, COMPRESSOR
CB2	CIRCUIT BREAKER, CONTROL
CR1	RECTIFIER, SEMICONDUCTOR DEVICE
E1	TERMINAL STUD (CONTROL MODULE GRD)
E2	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 4	HEATER ELEMENT
J1 AND J11	CONNECTOR, RECEPTACLE, POWER INPUT
J2	CONNECTOR, RECEPTACLE, JUNCTION
	BOX
J3	CONNECTOR, RECEPTACLE,
	EVAPORATOR FAN
J4	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	CONNECTOR, RECEPTACLE,
	CONDENSER FAN
J6	CONNECTOR, RECEPTACLE,
	POWER INPUT
J7	CONNECTOR, RECEPTACLE,
	THERMOSTATIC SWITCH
J8	CONNECTOR, RECEPTACLE,
	SOLENOID VALVE BY-PASS
J9	CONNECTOR, RECEPTACLE, SOLENOID
	VALVE EQUALIZER
J10	CONNECTOR, RECEPTACLE,
	COMPRESSOR
K1	RELAY, TIME DELAY
K2	RELAY, HEATER
K3	RELAY, COMPRESSOR MOTOR
K4	RELAY, CONDENSER FAN
K5	RELAY, COMPRESSOR START
L1	VALVE, SOLENOID, BY-PASS
L2	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	CONNECTOR, PLUG, POWER INPUT
P2	CONNECTOR, PLUG, CONTROL MODULE
P3	CONNECTOR, PLUG, EVAPORATOR
	FAN
P4	CONNECTOR, PLUG, COMPRESSOR
P5	CONNECTOR, PLUG, CONDENSER
	FAN
P6	CONNECTOR, PLUG, POWER INPUT
P7	CONNECTOR, PLUG, THERMOSTATIC
	SWITCH
P8	CONNECTOR, PLUG, SOLENOID
	VALVE BY-PASS
P9	CONNECTOR, PLUG, SOLENOID
	VALVE EQUALIZER
P10	CONNECTOR, PLUG, COMPRESSOR
S1	SWITCH, ROTARY SELECTOR
S2	SWITCH, TOGGLE
S3	SWITCH, TEMPERATURE CONTROL
S4	SWITCH, HIGH PRESSURE CUTOUT
S5	SWITCH, LOW PRESSURE CUTOUT
S6	SWITCH, HEATER CUTOUT
S7	SWITCH, THERMOSTATIC
T1	TRANSFORMER
TB1	TERMINAL BOARD, JUNCTION BOX
TB2	TERMINAL BOARD
TB3	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS X1B12V AND X2B12V ON TB3-1 AND -2 MUST BE CHANGED TO TB3-4 AND -5 RESPECTIVELY

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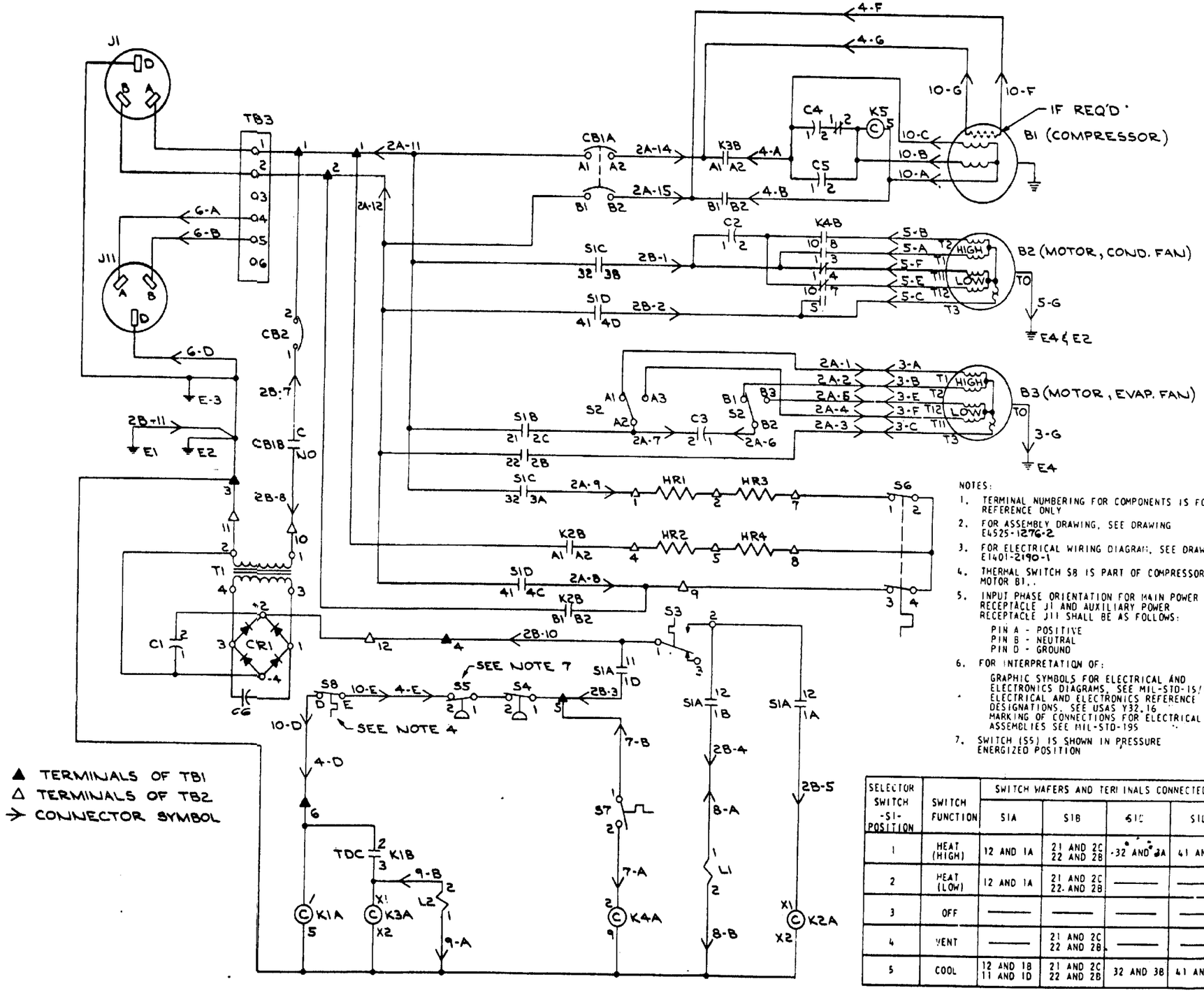
Figure 1-4. Control system schematic diagram, 1 phase, 50 / 60 hertz, 115 volts.

Figure 1-4



NOTES:

1. TERMINAL NUMBERING FOR COMPONENTS IS FOR REFERENCE ONLY
2. FOR ASSEMBLY DRAWING, SEE DRAWING E4525-1276-2
3. FOR ELECTRICAL WIRING DIAGRAM, SEE DRAWING E1401-2190-1
4. THERMAL SWITCH S8 IS PART OF COMPRESSOR MOTOR B1.
5. INPUT PHASE ORIENTATION FOR MAIN POWER RECEPTACLE J1 AND AUXILIARY POWER RECEPTACLE J11 SHALL BE AS FOLLOWS:
   PIN A - POSITIVE
   PIN B - NEUTRAL
   PIN D - GROUND
6. FOR INTERPRETATION OF:
   GRAPHIC SYMBOLS FOR ELECTRICAL AND ELECTRONICS DIAGRAMS, SEE MIL-STD-15/1
   ELECTRICAL AND ELECTRONICS REFERENCE DESIGNATIONS, SEE USAS Y32.16
   MARKING OF CONNECTIONS FOR ELECTRICAL ASSEMBLIES SEE MIL-STD-195
7. SWITCH (S5) IS SHOWN IN PRESSURE ENERGIZED POSITION

SELECTOR SWITCH -S1- POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	32 AND 3A	41 AND 4C
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	———	———
3	OFF	———	———	———	———
4	VENT	———	21 AND 2C 22 AND 2B	———	———
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	32 AND 3B	41 AND 4D

COMPONENT REFERENCE LIST	
ELEC REF DESIG	DESCRIPTION
B1	COMPRESSOR, ROTARY
B2	MOTOR, CONDENSER FAN
B3	MOTOR, EVAPORATOR FAN
C6	CAPACITOR, FILTER
C1	CAPACITOR, FILTER
C2	CAPACITOR, CONDENSER RUN
C3	CAPACITOR, EVAPORATOR RUN
C4	CAPACITOR, COMPRESSOR START
C5	CAPACITOR, COMPRESSOR RUN
CB1	CIRCUIT BREAKER, COMPRESSOR
CB2	CIRCUIT BREAKER, CONTROL
CR1	RECTIFIER, SEMICONDUCTOR DEVICE
E1	TERMINAL STUD (CONTROL MODULE GRD)
E2	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 4	HEATER ELEMENT
J1 AND J11	CONNECTOR, RECEPTACLE, POWER INPUT
J2	CONNECTOR, RECEPTACLE, JUNCTION
	BOX
J3	CONNECTOR, RECEPTACLE,
	EVAPORATOR FAN
J4	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	CONNECTOR, RECEPTACLE,
	CONDENSER FAN
J6	CONNECTOR, RECEPTACLE,
	POWER INPUT
J7	CONNECTOR, RECEPTACLE,
	THERMOSTATIC SWITCH
J8	CONNECTOR, RECEPTACLE,
	SOLENOID VALVE BY-PASS
J9	CONNECTOR, RECEPTACLE, SOLENOID
	VALVE EQUALIZER
J10	CONNECTOR, RECEPTACLE,
	COMPRESSOR
K1	RELAY, TIME DELAY
K2	RELAY, HEATER
K3	RELAY, COMPRESSOR MOTOR
K4	RELAY, CONDENSER FAN
K5	RELAY, COMPRESSOR START
L1	VALVE, SOLENOID, BY-PASS
L2	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	CONNECTOR, PLUG, POWER INPUT
P2	CONNECTOR, PLUG, CONTROL MODULE
P3	CONNECTOR, PLUG, EVAPORATOR
	FAN
P4	CONNECTOR, PLUG, COMPRESSOR
P5	CONNECTOR, PLUG, CONDENSER
	FAN
P6	CONNECTOR, PLUG, POWER INPUT
P7	CONNECTOR, PLUG, THERMOSTATIC
	SWITCH
P8	CONNECTOR, PLUG, SOLENOID
	VALVE BY-PASS
P9	CONNECTOR, PLUG, SOLENOID
	VALVE EQUALIZER
P10	CONNECTOR, PLUG, COMPRESSOR
S1	SWITCH, ROTARY SELECTOR
S2	SWITCH, TOGGLE
S3	SWITCH, TEMPERATURE CONTROL
S4	SWITCH, HIGH PRESSURE CUTOUT
S5	SWITCH, LOW PRESSURE CUTOUT
S6	SWITCH, HEATER CUTOUT
S7	SWITCH, THERMOSTATIC
T1	TRANSFORMER
TB1	TERMINAL BOARD, JUNCTION BOX
TB2	TERMINAL BOARD
TB3	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS X1B12V AND X2B12V ON TB3-1 AND-2 MUST BE CHANGED TO TB3-4 AND -5 RESPECTIVELY

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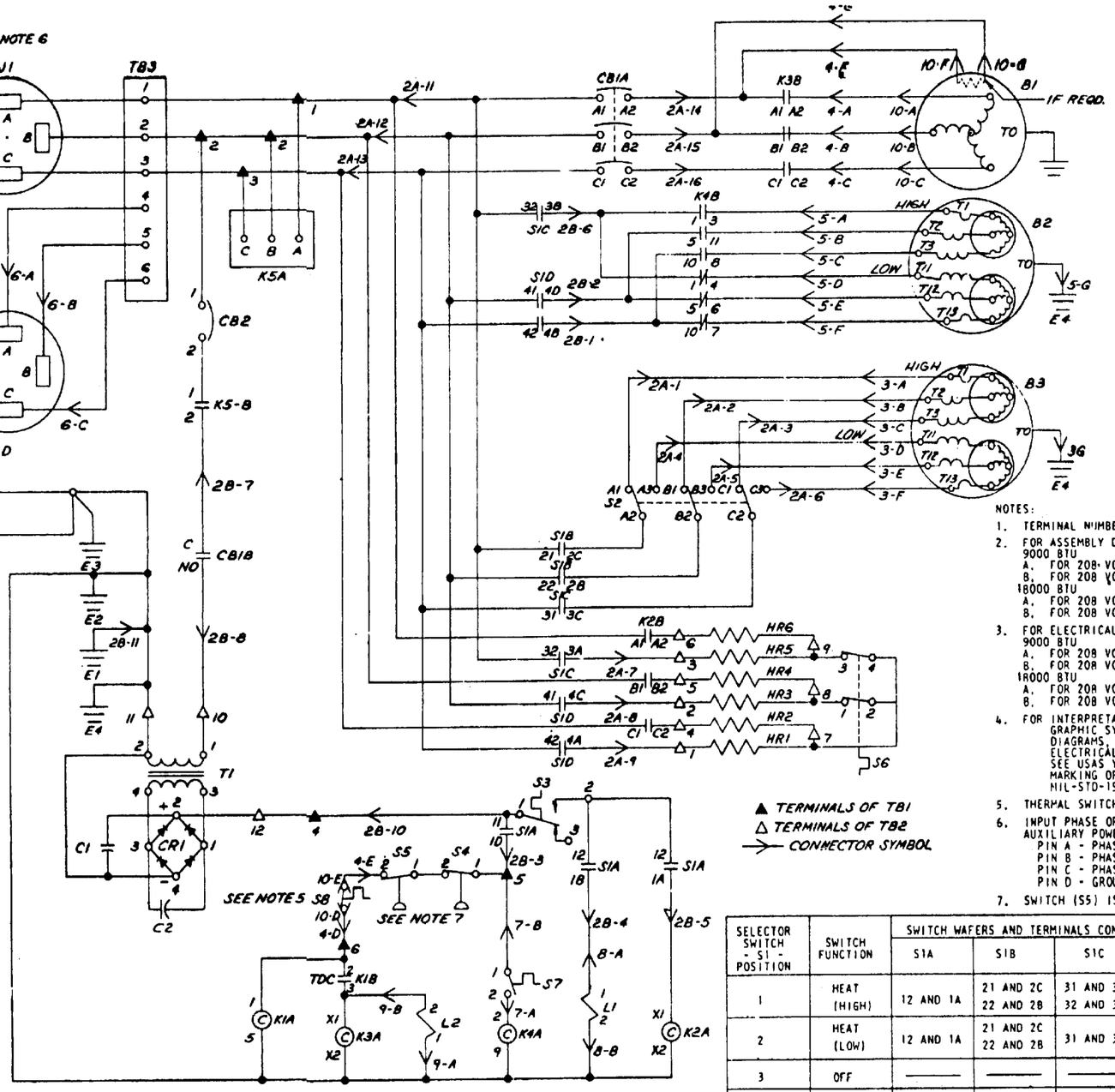
Figure 1-5. Control system schematic diagram, 1 phase, 50 / 60 hertz, 230 volts.

Figure 1-5



▲ TERMINALS OF TB1
△ TERMINALS OF TB2
→ CONNECTOR SYMBOL

NOTES:

1. TERMINAL NUMBERING FOR COMPONENTS IS FOR REFERENCE ONLY.
2. FOR ASSEMBLY DRAWING, SEE THE FOLLOWING:
   9000 BTU
   A. FOR 208 VOLT, 60 HZ, 3 PHASE, SEE E4525-1276-3
   B. FOR 208 VOLT, 400 HZ, 3 PHASE, SEE E4525-1276-4
   18000 BTU
   A. FOR 208 VOLT, 60 HZ, 3 PHASE, SEE E4525-1501-2
   B. FOR 208 VOLT, 400 HZ, 3 PHASE, SEE E4525-1501-3
3. FOR ELECTRICAL WIRING DIAGRAM, SEE THE FOLLOWING:
   9000 BTU
   A. FOR 208 VOLT, 60 HZ, 3 PHASE, SEE E1401-2187-1
   B. FOR 208 VOLT, 400 HZ, 3 PHASE, SEE E1401-2188-1
   18000 BTU
   A. FOR 208 VOLT, 60 HZ, 3 PHASE, SEE E1401-2192-1
   B. FOR 208 VOLT, 400 HZ, 3 PHASE, SEE E1401-2193-1
4. FOR INTERPRETATION OF:
   GRAPHIC SYMBOLS FOR ELECTRICAL AND ELECTRONICS DIAGRAMS, SEE MIL-STD-15/1
   ELECTRICAL AND ELECTRONICS REFERENCE DESIGNATIONS SEE USAS Y32 16
   MARKING OF CONNECTIONS FOR ELECTRICAL ASSEMBLIES SEE MIL-STD-195
5. THERMAL SWITCH S8 IS PART OF COMPRESSOR MOTOR B1.
6. INPUT PHASE ORIENTATION FOR MAIN POWER RECEPTACLE J1 AND AUXILIARY POWER RECEPTACLE J11 SHALL BE AS FOLLOWS:
   PIN A - PHASE A
   PIN B - PHASE B
   PIN C - PHASE C
   PIN D - GROUND
7. SWITCH (S5) IS SHOWN IN PRESSURE ENERGIZED POSITION.

SELECTOR SWITCH - S1 - POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C	———
3	OFF	———	———	———	———
4	VENT	———	21 AND 2C 22 AND 2B	31 AND 3C	———
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	32 AND 3B 31 AND 3C	42 AND 4B 41 AND 4D

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

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

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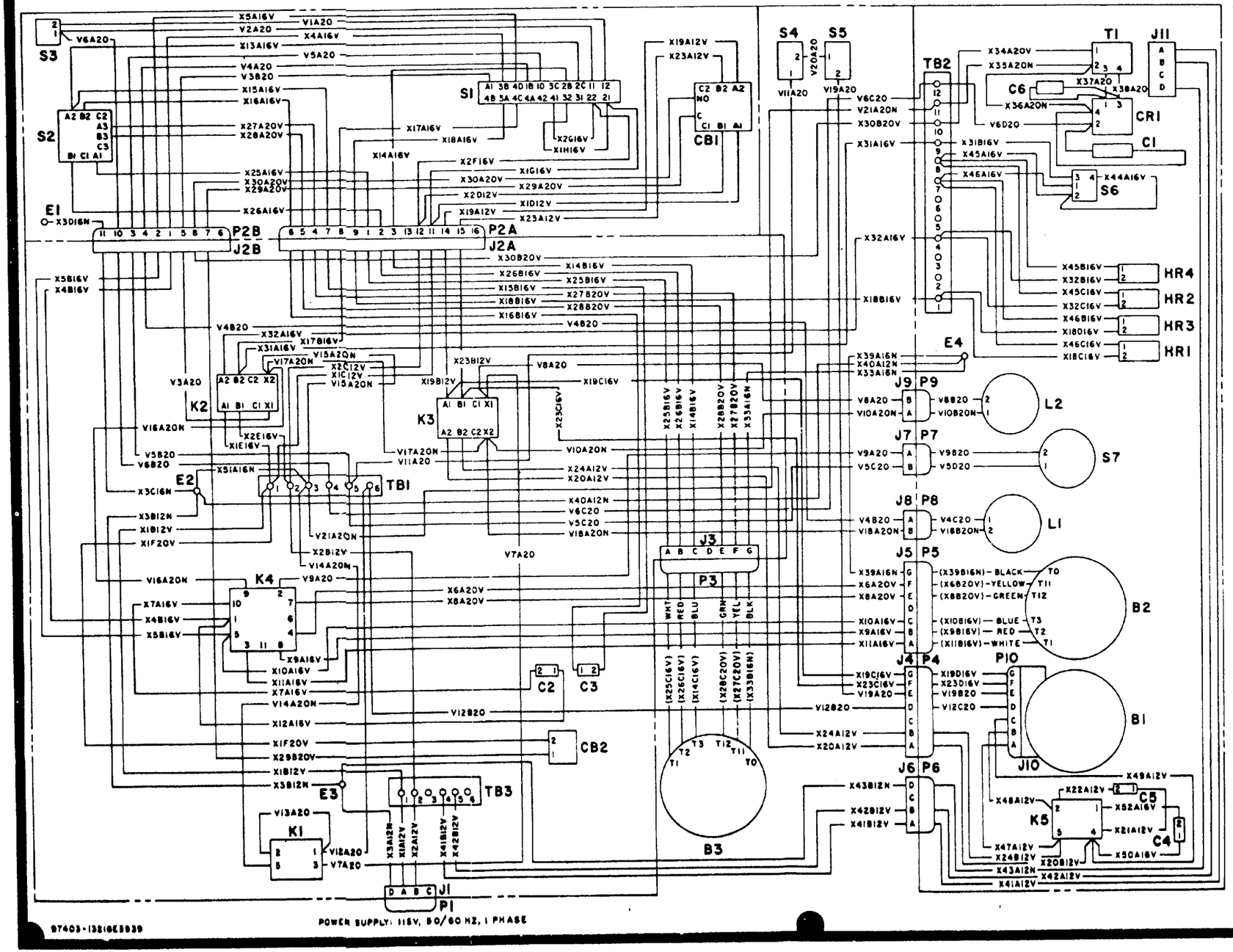
Figure 1-6. Control system schematic diagram, 3 phase, 50 / 60 hertz and 400 hertz, 208 volts.

Figure 1-6



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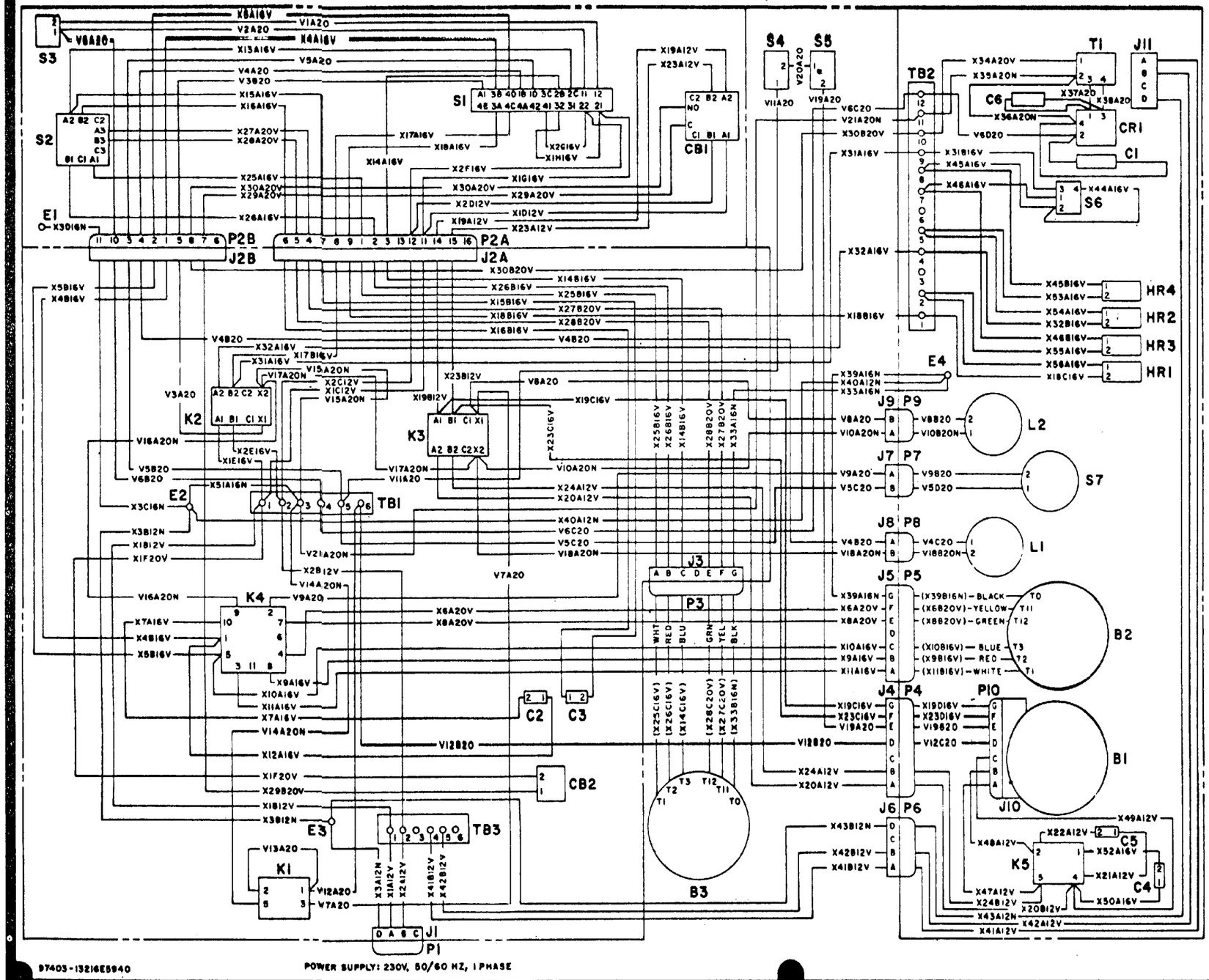
COMPONENT REFERENCE LIST		
ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	DI3208E4182-1	COMPRESSOR, ROTARY
B2	DI3216E6140-1	MOTOR, CONDENSER FAN
B3	DI3216E6140-1	MOTOR, EVAPORATOR FAN
C6	BI3218E6961	CAPACITOR, FILTER
C1	CK14AX103K	CAPACITOR, FILTER
	MIL-C-11015/20	
C2	DI3216E6236-1	CAPACITOR, CONDENSER RUN
C3	DI3216E6236-1	CAPACITOR, EVAPORATOR RUN
C4	CI3216E6239	CAPACITOR, COMPRESSOR START
C5	DI3216E6236-2	CAPACITOR, COMPRESSOR RUN
CB1	DI3216E6206-1	CIRCUIT BREAKER, COMPRESSOR
CB2	CI3216E6178-1	CIRCUIT BREAKER, CONTROL
CR1	DI3216E6223	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S50	TERMINAL STUD (CONTROL MODULE GRD)
E2	MS24693-S52	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	MS35206-246	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 4	CI3216E6124-1	HEATER ELEMENT
J1 AND J11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	DI3216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	DI3216E6193-2	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	DI3216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	DI3216E6193-2	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	DI3216E6193-5	CONNECTOR, RECEPTACLE, POWER INPUT
J7	DI3216E6193-4	CONNECTOR, RECEPTACLE, THERMOSTATIC SWITCH
J8	DI3216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE BY-PASS
J9	DI3216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE EQUALIZER
J10	PART OF DI3208E4182-1	CONNECTOR, RECEPTACLE, COMPRESSOR
K1	CI3216E6182	RELAY, TIME DELAY
K2	MS24192D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	CI3216E6184	RELAY, CONDENSER FAN
K5	DI3216E6240	RELAY, COMPRESSOR START
L1	CI3216E6158	VALVE, SOLENOID, BY-PASS
L2	CI3216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	DI3216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF DI3216E6140-1	CONNECTOR, PLUG, EVAPORATOR FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF DI3216E6140-1	CONNECTOR, PLUG, CONDENSER FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P7	MS3106R-16-10P	CONNECTOR, PLUG, THERMOSTATIC SWITCH
P8	BI3216E6173	CONNECTOR, PLUG, SOLENOID VALVE BY-PASS
P9	BI3216E6173	CONNECTOR, PLUG, SOLENOID VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	DI3216E6201	SWITCH, ROTARY SELECTOR
S2	CI3216E6200	SWITCH, TOGGLE
S3	DI3216E6203	SWITCH, TEMPERATURE CONTROL
S4	CI3216E6215-3	SWITCH, HIGH PRESSURE CUTOUT
S5	CI3216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	CI3216E6224	SWITCH, HEATER CUTOUT
S7	CI3216E6217	SWITCH, THERMOSTATIC
T1	CI3216E6214	TRANSFORMER
TB1	CI3216E6232	TERMINAL BOARD, JUNCTION BOX
TB2	CI3216E6220-1	TERMINAL BOARD
TB3	CI3216E6232	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS X1B12V AND X2B12V ON TB3-1 AND-2 MUST BE CHANGED TO TB3-4 AND-5 RESPECTIVELY

Figure 1-7. Wiring Diagram 1 phase, 50 / 60 hertz, 115 volts.

Figure 1-7



COMPONENT REFERENCE LIST		
ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	D13208E4182-4	COMPRESSOR, ROTARY
B2	D13216E6140-2	MOTOR, CONDENSER FAN
B3	D13216E6140-2	MOTOR, EVAPORATOR FAN
C6	B13216E6991	CAPACITOR, FILTER
C1	CK14AX103K	CAPACITOR, FILTER
	MIL-C-11015/20	
C2	D13216E6236-3	CAPACITOR, CONDENSER RUN
C3	D13216E6236-3	CAPACITOR, EVAPORATOR RUN
C4	C13216E6239	CAPACITOR, COMPRESSOR START
C5	D13216E6236-2	CAPACITOR, COMPRESSOR RUN
CB1	D13216E6206-2	CIRCUIT BREAKER, COMPRESSOR
CB2	C13216E6178-1	CIRCUIT BREAKER, CONTROL
CR1	D13216E6223	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-550	TERMINAL STUD (CONTROL MODULE GRD)
E2	MS24693-552	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	MS35206-246	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 4	C13216E6124-1	HEATER ELEMENT
J1 AND J11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	D13216E6177	CONNECTOR, RECEPTACLE, JUNCTION
		BOX
J3	D13216E6193-2	CONNECTOR, RECEPTACLE,
		EVAPORATOR FAN
J4	D13216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	D13216E6193-2	CONNECTOR, RECEPTACLE,
		CONDENSER FAN
J6	D13216E6193-5	CONNECTOR, RECEPTACLE,
		POWER INPUT
J7	D13216E6193-4	CONNECTOR, RECEPTACLE,
		THERMOSTATIC SWITCH
J8	D13216E6193-1	CONNECTOR, RECEPTACLE,
		SOLENOID VALVE BY-PASS
J9	D13216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID
		VALVE EQUALIZER
J10	PART OF	CONNECTOR, RECEPTACLE,
	D13208E4182-4	COMPRESSOR
K1	C13216E6182	RELAY, TIME DELAY
K2	MS24192D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	C13216E6184	RELAY, CONDENSER FAN
K5	D13216E6240	RELAY, COMPRESSOR START
L1	C13216E6158	VALVE, SOLENOID, BY-PASS
L2	C13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	D13216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF	CONNECTOR, PLUG, EVAPORATOR
	D13216E6140-2	FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF	CONNECTOR, PLUG, CONDENSER
	D13216E6140-2	FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P7	MS3106R-16-10P	CONNECTOR, PLUG, THERMOSTATIC
		SWITCH
P8	B13216E6173	CONNECTOR, PLUG, SOLENOID
		VALVE BY-PASS
P9	B13216E6173	CONNECTOR, PLUG, SOLENOID
		VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	D13216E6201	SWITCH, ROTARY SELECTOR
S2	C13216E6200	SWITCH, TOGGLE
S3	D13216E6203	SWITCH, TEMPERATURE CONTROL
S4	C13216E6215-3	SWITCH, HIGH PRESSURE CUTOUT
S5	C13216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	C13216E6224	SWITCH, HEATER CUTOUT
S7	C13216E6217	SWITCH, THERMOSTATIC
T1	C13216E6214	TRANSFORMER
TB1	C13216E6231	TERMINAL BOARD, JUNCTION BOX
TB2	C13216E6220-1	TERMINAL BOARD
TB3	C13216E6232	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS X1B12V AND X2B12V ON TB3-1 AND-2 MUST BE CHANGED TO TB3-4 AND-5 RESPECTIVELY

ME-4120-239-14/1-8

Figure 1-8. Wiring Diagram 1 phase, 50 / 60 hertz, 230 volts.

COMPONENT REFERENCE LIST		
ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	D13208E4182-3	COMPRESSOR, ROTARY
B2	D13216E6140-3	MOTOR, CONDENSER FAN
B3	D13216E6140-3	MOTOR, EVAPORATOR FAN
C1	CKI4AX103K	CAPACITOR, FILTER
	MIL-C-11015/ZD	
C2	B13218E6961	CAPACITOR, FILTER
	MIL-C-11015/20	
CB1	D13216E6205-1	CIRCUIT BREAKER, COMPRESSOR
CB2	C13216E6178-1	CIRCUIT BREAKER, CONTROL
CR1	D13218E6223	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S80	TERMINAL STUD (CONTROL MODULE GRD)
E2	MS24693-S52	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	MS35206-246	TERMINAL STUD (SYSTEM GRD)
HR1 THRU 6	C13216E6124-2	HEATER ELEMENT
J1 AND J11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	D13216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	D13216E6193-2	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	D13216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	D13216E6193-2	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	D13216E6193-6	CONNECTOR, RECEPTACLE, POWER INPUT
J7	D13216E6193-4	CONNECTOR, RECEPTACLE, THERMOSTATIC SWITCH
J8	D13216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE BY-PASS
J9	D13216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE EQUALIZER
J10	PART OF	CONNECTOR, RECEPTACLE,
	D13208E4182-3	COMPRESSOR
K1	C13216E6182	RELAY, TIME DELAY
K2	MS24192D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	C13216E6184	RELAY, CONDENSER FAN
K5	C13216E6163-1	RELAY, PHASE SEQUENCE
L1	C13216E6158	VALVE, SOLENOID, BY-PASS
L2	C13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	D13216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF	CONNECTOR, PLUG, EVAPORATOR
	D13216E6140-3	FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF	CONNECTOR, PLUG, CONDENSER
	D13216E6140-3	FAN
P6	MS3106R-14-11S	CONNECTOR, PLUG, POWER INPUT
P7	MS3106R-16-10P	CONNECTOR, PLUG, THERMOSTATIC SWITCH
P8	B13216E6173	CONNECTOR, PLUG, SOLENOID VALVE BY-PASS
P9	B13216E6173	CONNECTOR, PLUG, SOLENOID VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	D13216E6201	SWITCH, ROTARY SELECTOR
S2	C13216E6200	SWITCH, TOGGLE
S3	D13216E6203	SWITCH, TEMPERATURE CONTROL
S4	C13216E6215-3	SWITCH, HIGH PRESSURE CUTOUT
S5	C13216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	C13216E6224	SWITCH, HEATER CUTOUT
S7	C13216E6217	SWITCH, THERMOSTATIC
T1	C13216E6214	TRANSFORMER
TB1	C13216E6231	TERMINAL BOARD, JUNCTION BOX
TB2	C13216E6220-1	TERMINAL BOARD
TB3	C13216E6232	TERMINAL BOARD, POWER INPUT

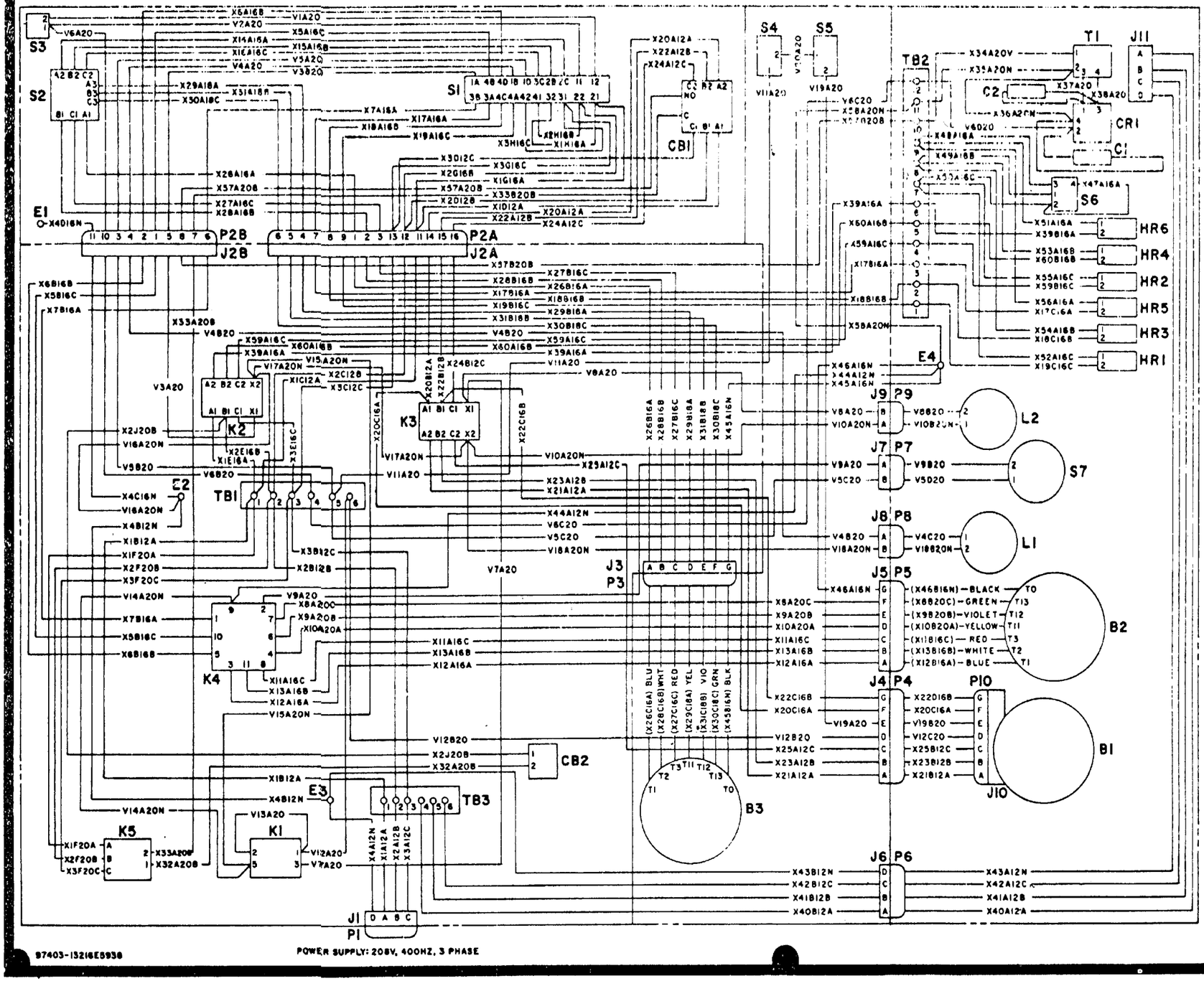
TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS X1B12A, X2B12B, AND X3B12C ON TB3-1, -2, AND -3 MUST BE CHANGED TO TB3-4, -5, AND -6 RESPECTIVELY.

97403-13216E6937

POWER SUPPLY: 208V, 50/60HZ, 3 PHASE

ME-4120-239-14/1-9

Figure 1-9. Wiring Diagram 3 phase, 50 / 60 hertz, 208 volts.



COMPONENT REFERENCE LIST		
ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	013208E4182-2	COMPRESSOR, ROTARY
B2	013216E6140-4	MOTOR, CONDENSER FAN
B3	013216E6140-4	MOTOR, EVAPORATOR FAN
C1	CK14AX103K	CAPACITOR, FILTER
	MIL-C-11015/20	
C2	013216E8961	CAPACITOR, FILTER
CB1	013216E6205-2	CIRCUIT BREAKER, COMPRESSOR
CB2	013216E6170-2	CIRCUIT BREAKER, CONTROL
CR1	013216E6223	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S55	TERMINAL STUD (CONTROL MODULE GRD)
E2	MS24693-S52	TERMINAL STUD (JUNCTION BOX GRD)
E3 AND E4	MS35206-246	TERMINAL STUD (SYSTEM GRD)
HR1THRU 6	013216E6124-2	HEATER ELEMENT
J1 AND J11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	013216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	013216E6193-2	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	013216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	013216E6193-2	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	013216E6193-5	CONNECTOR, RECEPTACLE, POWER INPUT
J7	013216E6193-4	CONNECTOR, RECEPTACLE, THERMOSTATIC SWITCH
J8	013216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE BY-PASS
J9	013216E6193-1	CONNECTOR, RECEPTACLE, SOLENOID VALVE EQUALIZER
J10	PART OF	CONNECTOR, RECEPTACLE,
	013208E4182-2	COMPRESSOR
K1	C13216E6182	RELAY, TIME DELAY
K2	MS24192D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	C13216E6184	RELAY, CONDENSER FAN
K5	C13216E6183-2	RELAY, PHASE SEQUENCE
L1	C13216E6158	VALVE, SOLENOID, BY-PASS
L2	C13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	013216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF	CONNECTOR, PLUG, EVAPORATOR
	013216E6140-4	FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF	CONNECTOR, PLUG, CONDENSER
	013216E6140-4	FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P7	MS3106R-16-10P	CONNECTOR, PLUG, THERMOSTATIC SWITCH
P8	813216E6173	CONNECTOR, PLUG, SOLENOID VALVE BY-PASS
P9	813216E6173	CONNECTOR, PLUG, SOLENOID VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	013216E6201	SWITCH, ROTARY SELECTOR
S2	C13216E6200	SWITCH, TOGGLE
S3	013216E6203	SWITCH, TEMPERATURE CONTROL
S4	C13216E6215-3	SWITCH, HIGH PRESSURE CUTOUT
S5	C13216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	C13216E6224	SWITCH, HEATER CUTOUT
S7	C13216E6217	SWITCH, THERMOSTATIC
T1	C13216E6214	TRANSFORMER
TB1	C13216E6231	TERMINAL BOARD, JUNCTION BOX
TB2	C13216E6220-1	TERMINAL BOARD
TB3	C13216E6232	TERMINAL BOARD, POWER INPUT

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

ME-4120-239-14/1-10

Figure 1-10. Wiring Diagram 3 phase, 400 hertz, 208 volts.

Figure 1-10

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official :

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

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

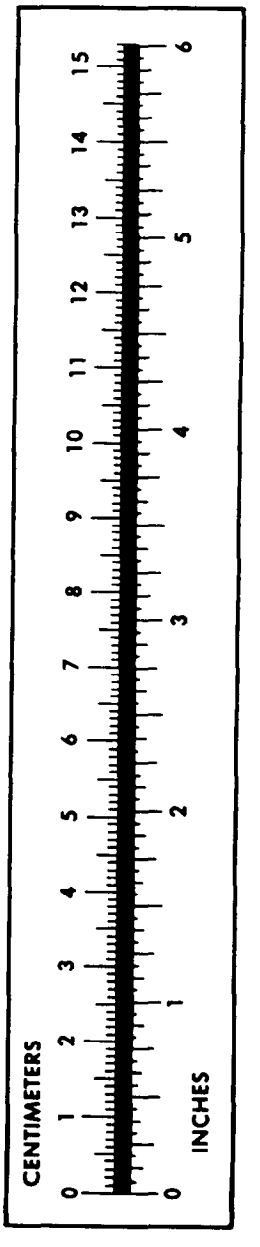
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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