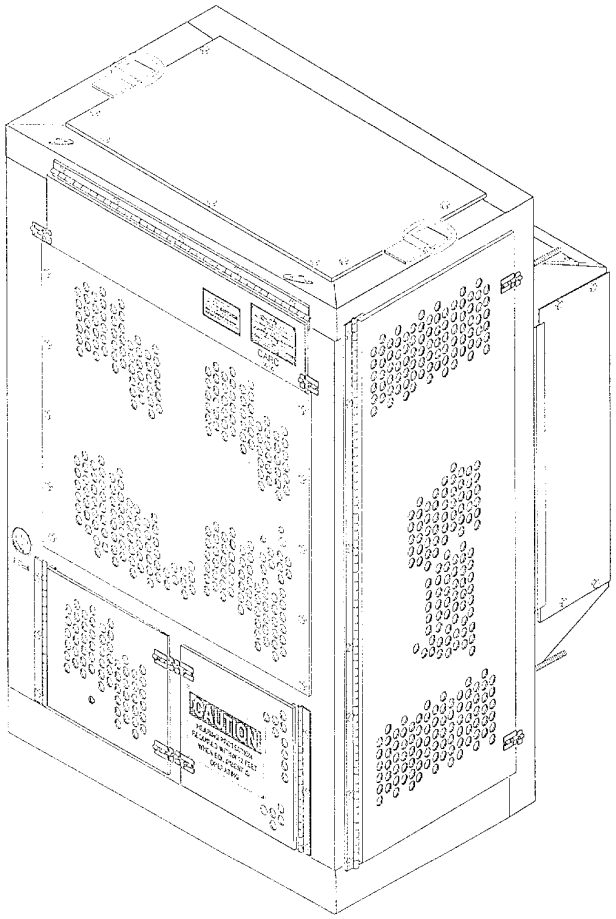
TECHNICAL MANUAL

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



OPERATING INSTRUCTIONS	2-1
OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)	2-6
UNIT MAINTENANCE INSTRUCTIONS	4-1
UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)	4-9
UNIT TROUBLESHOOTING	4-34
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS	5-1
GENERALSUPPORT MAINTENANCE INSTRUCTIONS	6-1
MAINTENANCE ALLOCATION CHART	B-1

REFRIGERATION UNIT, MECHANICAL,
10K BTU, DIESEL
MODEL F10000RD

(4110-01-389-9183)

HEADQUARTERS, DEPARTMENT OF THE ARMY
26 AUGUST 1996

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 May 1997

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

Refrigeration Unit, Mechanical, 10K BTU, Diesel Model F10000RD NSN 4110-01-389-9183

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C1

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03396

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WARNING

- Exposed rotating parts are contained in the refrigeration unit. Personal injury can result if access doors are open when battery is connected.
- Muffler and engine may be hot to touch and can cause serious personal injury. Allow to cool before performing any maintenance functions.
- The fuel used in this refrigeration unit is highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.
- The refrigeration unit engine produces dangerously high noise levels reaching 96 dB (A) at the service position. Approved hearing protection must be worn any time personnel are within 12 feet of an operating unit to avoid temporary or possibly permanent hearing damage.
- Dangerous chemical refrigerant under pressure is used in the refrigeration unit. Sudden and irreversible tissue damage can result from contact with liquid refrigerant. When exposed to high heat or flame, irritating, toxic, and corrosive gases may be released. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible. Do not allow refrigerant to come in contact with high heat or flame. All refrigerant must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any brazing operation.
- Do not attempt any disassembly of refrigerant system components with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously.
- Never introduce high discharge pressure into a refrigerant cylinder. This can cause the cylinder to rupture and injure personnel.
- Never pressurize refrigerant lines with oxygen, mixture with oil could cause an explosion.
- Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.
- The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.
- Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.
- Solder, brazing alloys, and flux contain materials which are hazardous to health. Avoid breathing vapors or fumes from soldering or brazing operations. Perform operations only in well-ventilated areas. Wash hands with soap and water after handling solder, brazing alloys, or flux. Wear thermal gloves and protective goggles or face shield to protect against burns.
- Compressor lubricating oil used in this refrigeration system is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

TECHNICAL MANUAL
NO. 9-4110-257-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., **26 AUGUST 1996**

OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR REFRIGERATION UNIT, MECHANICAL, 10K BTU, DIESEL MODEL F10000RD 4110-01-389-9183

Reporting of Errors

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <daf2028@st-louis-emh7.army.mil>. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceeding the hard copy 2028.

TABLE OF CONTENTS

		Page
CHAPTER 1	INTRODUCTION	1-1
Section I	General Information	1-1
Section II	Equipment Description	1-3
Section III	Principles of Operation	1-5
CHAPTER 2	OPERATING INSTRUCTIONS	2-1
Section I	Description and Use of Operator's Controls and Indicators	2-1
Section II	Preventive Maintenance Checks and Services (PMCS)	2-6
Section III	Operation Under Usual Conditions	2-23
Section IV	Operation Under Unusual Conditions	2-29

TABLE OF CONTENTS - Continued

Page

CHAPTER 3 OPERATOR MAINTENANCE INSTRUCTIONS 3-1

Section I Lubrication 3-1
Section II Troubleshooting Procedures 3-1
Section III Operator's Maintenance Procedures 3-5

CHAPTER 4 UNIT MAINTENANCE INSTRUCTIONS 4-1

Section I Repair Parts, Tools, Special Tools, Test, Measurement, and Diagnostic Equipment (TMDE), and Support Equipment 4-1
Section II Service Upon Receipt 4-1
Section III Unit Preventive Maintenance Checks and Services (PMCS) 4-9
Section IV Troubleshooting Instructions 4-34
Section V Unit Maintenance Instructions 4-38
Section VI Preparation for Storage or Shipment 4-163

CHAPTER 5 DIRECT SUPPORT MAINTENANCE INSTRUCTIONS 5-1

Section I Direct Support Troubleshooting Instructions 5-1
Section II Direct Support Maintenance Instructions 5-3

CHAPTER 6 GENERAL SUPPORT MAINTENANCE INSTRUCTIONS 6-1

APPENDIX A REFERENCES A-1

APPENDIX B MAINTENANCE ALLOCATION CHART B-1

Section I Introduction B-1
Section II Maintenance Allocation Chart for Refrigeration Unit B-5
Section III Tool and Test Equipment Requirements for Refrigeration Unit B-11
Section IV Remarks for Refrigeration Unit B-11

APPENDIX C COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LIST C-1

Section I Introduction C-1
Section II Components of End Item C-1
Section III Basic Issue Items List C-2

APPENDIX D ADDITIONAL AUTHORIZATION LIST D-1

APPENDIX E EXPENDABLE AND DURABLE ITEMS LIST E-1

Section I Introduction E-1
Section II Expendable and Durable Items List E-2

TABLE OF CONTENTS - Continued

		Page
APPENDIX F	ILLUSTRATED LIST OF MANUFACTURED ITEMS	F-1
Section I		F-1
Section II		F-1
APPENDIX G	MANDATORY REPLACEMENT PARTS	G-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-0	Refrigeration Unit	1-0
1-1	Major Components	1-4
1-2	Operating/Electrical System	1-6
1-3	Electrical Schematic	1-7
1-4	Electrical Wiring Diagram	1-8
1-5	Refrigeration System	1-10
1-6	Refrigeration Schematic	1-11
1-7	Air Handling System	1-12
2-1	Operating Controls and Indicators	2-3
2-2	Fault Controls and Indicators	2-5
2-3	Operator PMCS Routing Diagram (Sheet 1 of 2)	2-8
2-3	Operator PMCS Routing Diagram (Sheet 2 of 2)	2-9
2-4	Operator Controls and Indicators	2-24
2-5	Decals and Instruction Plates (Sheet 1 of 2)	2-27
2-5	Decals and Instruction Plates (Sheet 2 of 2)	2-28
4-1	Wall Opening Dimensions	4-2
4-2	Installation	4-3
4-3	Unit Preparation	4-4
4-4	Refrigeration Valve Settings for Normal Operation	4-7
4-5	Defrost Timer Adjustment	4-8
4-6	Lubrication (Sheet 1 of 2)	4-10
4-6	Lubrication (Sheet 2 of 2)	4-11
4-7	Top Panel	4-38
4-8	Condenser Side Doors and Barrel Bolts	4-40
4-9	Front Bottom Doors and Barrel Bolts	4-42
4-10	Control Panel Cover, Barrel Bolts, and Door Holder Clips	4-44
4-11	Evaporator Air Outlet Guard	4-45
4-12	Evaporator Coil Guard	4-46
4-13	Condenser Coil Guard	4-47
4-14	Wires Cables and Harnesses	4-49
4-15	Circuit Breaker	4-55
4-16	Lamp Assembly	4-57
4-17	Fuses	4-59
4-18	Control Relays	4-62
4-19	Time Delay Relay	4-63

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
4-20	Hourmeter	4-66
4-21	Ammeter	4-68
4-22	Toggle Switch	4-70
4-23	Remote Bulb Thermostat (Temperature Control)	4-73
4-24	Defrost Timer	4-77
4-25	Engine Speed Switch	4-79
4-26	Control Transformer T1	4-81
4-27	Refrigeration Temperature Gage (Thermometer)	4-84
4-28	Continuous Duty Solenoid	4-86
4-29	Battery	4-89
4-30	Temperature Switch	4-91
4-31	Push Switches	4-94
4-32	V-Belts	4-97
4-33	Condenser Fan	4-100
4-34	Evaporator Fan	4-102
4-35	Compressor Pulley	4-105
4-36	Engine Pulley	4-106
4-37	Idler Pulley	4-108
4-38	Flange Bearings	4-111
4-39	Fan Clutch	4-113
4-40	Solenoid Valve (Liquid Line)	4-115
4-41	Solenoid Valve (Defrost Line)	4-117
4-42	Oil Filter	4-119
4-43	Air Cleaner	4-121
4-44	Muffler	4-124
4-45	Engine Oil Pressure Switch	4-126
4-46	Engine Temperature Switch	4-128
4-47	Fuel Solenoid	4-131
4-48	Starting Motor	4-132
4-49	Fuel Filter	4-134
4-50	Voltage Regulator	4-136
4-51	Alternator Test Point	4-137
4-52	Glow Plug	4-139
4-53	Fuel Supply Hoses (Sheet 1 of 2)	4-141
4-53	Fuel Supply Hoses (Sheet 2 of 2)	4-142
4-54	Fuel Return Hoses	4-147
4-55	Engine Drain Hose	4-151
4-56	In-line Fuel Filter	4-153
4-57	Fuel Gage	4-154
4-58	Sending Unit	4-156
4-59	Fuel Tank	4-158
4-60	Gasket (Heat Shield)	4-161
4-61	Refrigeration System Pump Down	4-164

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
5-1	Control Panel Cover	5-3
5-2	Control Panel	5-6
5-3	Fan Drive Shaft	5-7
5-4	Service Manifold Installation	5-9
5-5	Discharging Refrigerant	5-12
5-6	Nitrogen Tank Connection	5-14
5-7	Evacuation of Refrigerant System	5-21
5-8	Refrigerant Charging (Total System)	5-23
5-9	Refrigerant Charging (Partial System /Small Quantity Charge)	5-25
5-10	Dehydrator	5-31
5-11	Compound Gage	5-33
5-12	Pressure Gage	5-35
5-13	Strainer	5-37
5-14	Receiver	5-39
5-15	Condenser Coil	5-42
5-16	Pressure Regulator Valve	5-43
5-17	Pressure Regulator Valve	5-45
5-18	Check Valve	5-47
5-19	Metal Hose Assembly	5-48
5-20	Metal Hose Assembly	5-49
5-21	Stop Valve	5-50
5-22	Stop Valve	5-52
5-23	Sight Indicator	5-53
5-24	Solenoid Valve	5-54
5-25	Solenoid Valve	5-56
5-26	Isolation Valves	5-59
5-27	Accumulator	5-60
5-28	Tubing And Fittings	5-63
5-29	Heat Exchanger	5-65
5-30	Expansion Valve	5-67
5-31	Evaporator Coil	5-68
5-32	Differential Oil Pressure Switch	5-71
5-33	Dual Pressure Control Switch	5-74
5-34	Compressor	5-78
5-35	Nozzles	5-85
5-36	Fuel Injection Pumps	5-88
5-37	Fuel Pump	5-93
5-38	Cylinder Head	5-95
5-39	Engine Oil Pump	5-99
5-40	Flywheel	5-102
5-41	Alternator	5-104
5-42	Engine	5-107
5-43	Fuel Tank	5-110
5-44	Housing	5-112
C-1	Basic Issue Items	C-2

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
F-1	Tubing-Copper, Straight Flared, Part Number 12076-3-1000	F-4
F-2	Tubing, Plastic, Part Number 13218E0001-305	F-4
F-3	Gasket, Control Box, Top, Part Number 150K0095	F-4
F-4	Gasket, Various	F-5
F-5	Webbing Fabric, Part Number 150K0119	F-5
F-6	Tube, Distributor to Tee, Part Number 150K0145	F-6
F-7	Tube, Distributor to Street Elbow, Part Number 150K0146	F-6
F-8	Tube, Tee to Isolator, Part Number 150K0157	F-7
F-9	Tube, Accumulator to Crankcase Pressure Regulator, Part Number 150K0158	F-8
F-10	Tube, Copper, Straight, Part Number 150K0197, and 150K0213	F-8
F-11	Tube, Heat Exchanger to Accumulator, Part Number 150K0160	F-9
F-12	Hose, Drain, Part Number 150K0163 and 150K0165	F-9
F-13	Gasket, Side, Part Number 150K0169	F-10
F-14	Gasket, Side Part Number 150K0170	F-10
F-15	Gasket, Top and Bottom, Part Number 150K0171	F-11
F-16	Gasket, Top and Bottom, Part Number 150K0172	F-11
F-17	Braid, Wire, Tubular, Part Number 150K0185-1/1 and 150K0201-1 /1	F-11
F-18	Tube, Reducer to Expansion Valve, Part Number 150K0187-1/T	F-12
F-19	Tube, D.P.R. Valve to Elbow, Part Number 150K0188	F-12
F-20	Tube, Accumulator Inlet, Part Number 150K0196	F-13
F-21	Tube, Straight Flare One End, Part Number 150K0198-1, -3, -5, -9, and -11	F-14
F-22	Tube, Interchanger to Expansion Valve, Part Number 150K0200-1/T	F-14
F-23	Insulation Tubing	F-15
F-24	Tube, Elbow, to Interchanger, Part Number 150K0202	F-15
F-25	Tube, Expansion Valve Equalizer, Part Number 150K0203-1/T	F-16
F-26	Capillary Lines, Part Number 150K0206-1/3, -3/3, and -5/3	F-16
F-27	Tube, Isolator to Compressor, Part Number 150K0208	F-17
F-28	Tube, Strainer, to Solenoid, Part Number 150K0212-1/T	F-17
F-29	Tube, Receiver Inlet, Part Number 150K0214-1/T	F-18
F-30	Tube, Receiver Outlet to Drier, Part Number 151K0215-1/T	F-19
F-31	Tube, Drier to Reducer, Part Number 150K0216-1/T	F-20
F-32	Tube, Tee to Hand Valve, Part Number 150K0217	F-21
F-33	Tube, Sight Glass to Elbow, Part Number 150K0218-1/T	F-21
F-34	Loom 1/2 I.D. Part Number 51206-7, -15, -25, and -39	F-22
F-35	Tape, Adhesive, Part Number 8337032-4	F-22

LIST OF TABLES

Table	Title	Page
2-1	Operator Preventive Maintenance Checks and Services for Model F10000RD	2-10
4-1	Unit Preventive Maintenance Checks and Services for Model F10000RD	4-13
4-2	200 Hour Mandatory Replacement Parts	4-33
4-3	Semi-Annually Mandatory Replacement Parts	4-33
5-1	Pressure Temperature Relationship of Saturated Refrigerant R-134a	5-29
5-2	Nominal Operating Pressure At Suction And Discharge Shut Off Valves	5-30

HOW TO USE THIS MANUAL

Be sure to read all Warnings before using this equipment.

This manual contains instructions for operation and maintenance of the Refrigeration Unit.

The front cover index of this manual lists the areas of the manual used most often and guides you to those sections. Follow the black mark on the cover index edge through the pages to the edge mark on the section you want. The subjects on the front cover index are also boxed in the table of contents. A detailed alphabetical index is located at the back of the manual.

Chapter 1 - Introduces you to the equipment and gives you information such as weight and dimensions used and general theory of operation including principles of operation.

Chapter 2 - Provides the operator with information necessary to identify and service the equipment. Operating instructions for usual and unusual conditions.

Chapter 3 - Provides operator lubrication tasks, troubleshooting procedures for identifying common equipment malfunctions, and maintenance procedures for performing operator maintenance tasks.

Chapter 4 - Provides unit maintenance personnel with procedures for lubrication and service upon receipt of equipment and instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Chapter 5 - Provides direct support maintenance personnel with instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Chapter 6 - Provides general support maintenance personnel with instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Appendix A - Provides a list of frequently used forms and publications referenced or used in this manual.

Appendix B - The maintenance allocation chart identifies repairable components and the maintenance level authorized to perform the repairs.

Appendix C - List of components of end item and basic issue items to help you inventory the equipment.

Appendix D - Lists additional items that are authorized for the support of the refrigeration unit.

Appendix E - Lists expendable and durable items needed to operate and maintain the refrigeration unit.

Appendix F - Provides you with instructions for making items authorized to be manufactured or fabricated at unit, direct support or general support maintenance.

Appendix G - Lists all mandatory replacement parts.

Alphabetical Index - Lists subject matter contained in manual in alphabetical order with the paragraph number.

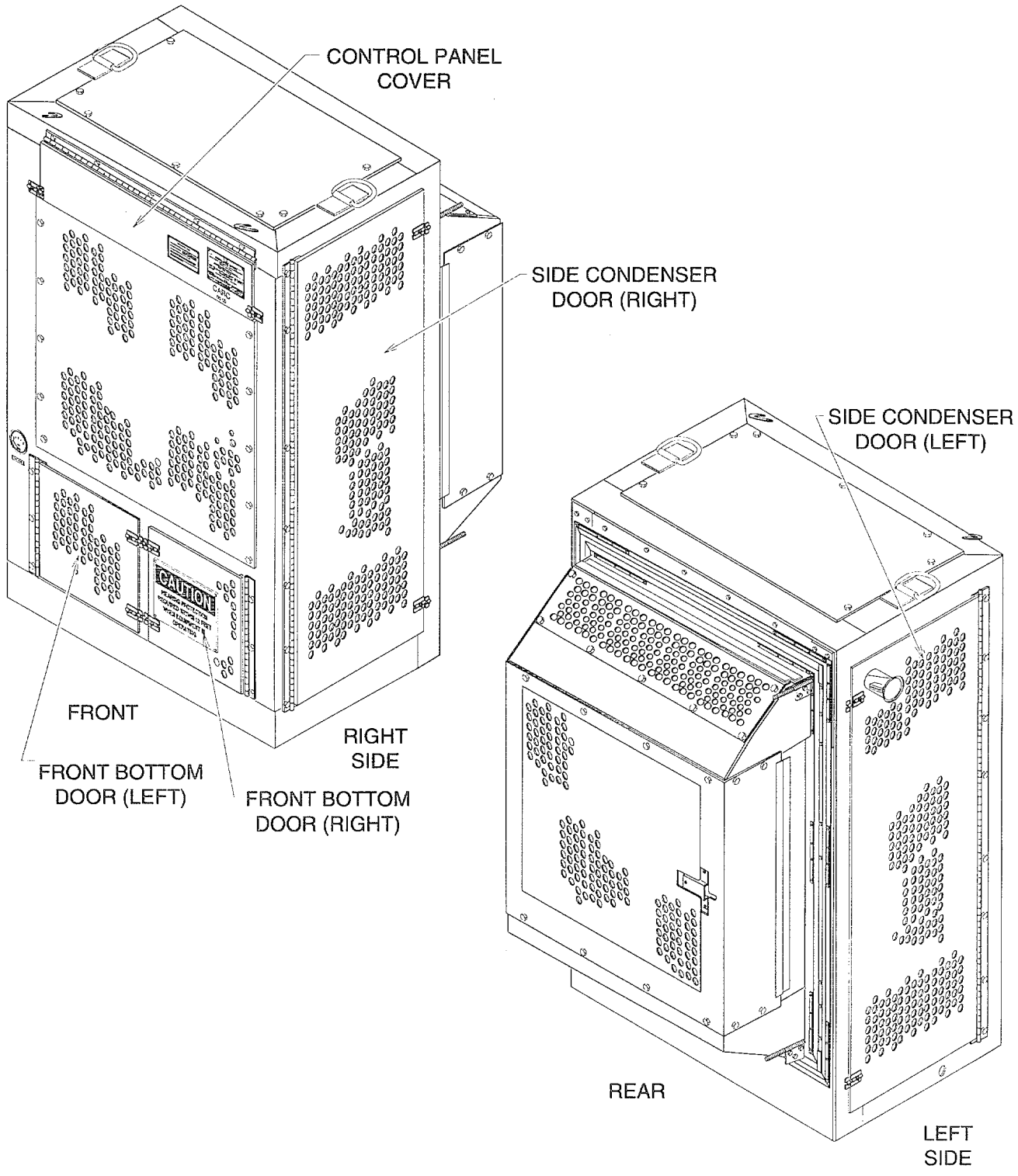


Figure 1-0. Refrigeration Unit

CHAPTER 1

INTRODUCTION

SECTION I GENERAL INFORMATION

1-1. SCOPE.

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

b. Model Number and Equipment Name. The Model F1000ORD, Mechanical, Diesel engine driven, 10,000 Btu per hour Refrigeration Unit.

c. Purpose of Equipment. The refrigeration unit is intended for world-wide Military field use under adverse climatic and operating conditions without added protection from the elements. In use, the units are mounted with evaporator section extending into the opening provided in prefabricated panel type refrigerators conforming to MIL- R-10932.

1-2. MAINTENANCE FORMS, RECORDS AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System.

1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.

Refer to TM 750-244-3 for specific instructions on the destruction of army material to prevent enemy use.

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to Chapter 4 for specific information under the same heading.

1-5. OUALITY ASSURANCE.

Requirement for specific quality assurance steps are not applicable to this equipment.

1-6. OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS.

The following listings include the nomenclature cross-reference list, list of abbreviations, and explanation of terms (glossary) used in this manual.

Nomenclature Cross-Reference List. A shortened nomenclature is used in this manual to make procedures easier for you to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

Manual Nomenclature	Official Nomenclature
Refrigeration Unit	Refrigeration Unit, Mechanical, 10K btu, Diesel, Model F1000ORD
Refrigerator Enclosure	Prefabricated Panel Type Refrigerator

1-7. REPORTING EOUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your Diesel Refrigeration Unit needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to:

Commander
U.S. Army Aviation and Troop Command
ATTN: AMSAT-I-MDO
4300 Goodfellow Blvd.
St. Louis, MO 63120-1798

1-8. WARRANTY INFORMATION.

Refer to TB 9-4110-257-24 for specific warranty information.

1-9. CORROSION PREVENTION AND CONTROL.

a. Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of keywords such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

SECTION II EQUIPMENT DESCRIPTION

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

a. Characteristics. The Keco Model F10000RD, is a self-contained, diesel engine driven, panel-mounted refrigeration unit used with a prefabricated panel type refrigerator. It can be used under adverse climatic and operating conditions without added protection from the elements.

b. Capabilities. The unit is capable of starting and operating in ambient temperature of 0° F to 125° F (-17° C to 52° C) and to automatically maintain a refrigerator temperature of 0° F and 35° F (-17° C and 2° C).

c. Features. The portion of the condensing unit exposed to weather is capable of operating in rainfall of three inches per hour without functional damage or impaired operation. This unit is designed to use R-134a refrigerant.

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

See figure 1-1.

1 CONTROL BOX ASSEMBLY. Houses the automatic and manual engine and electrical control components as well as system monitoring gages.

2 EVAPORATOR COIL. Absorbs heat from the air being circulated through the refrigerator enclosure causing the low pressure liquid refrigerant in the coil to evaporate.

3 COMPRESSOR. Moves the refrigerant through the refrigeration system by raising the pressure of the incoming gas from the evaporator coil and discharging it as a high pressure gas.

4 CONDENSER COIL. Releases heat from the high pressure gas coming from the compressor causing the gas to condense into a high pressure liquid.

5 DIESEL ENGINE. Drives the compressor and air handling components.

6 EVAPORATOR FAN. Circulates air through the refrigerator and across the evaporator coil.

7 CONDENSER FAN. Circulates ambient, outside air across the condenser coil.

8 DUAL PRESSURE CONTROL SWITCH. Provides over/under pressure protection for the refrigeration system. The switch has a manual reset for overpressure conditions.

9 DIFFERENTIAL OIL PRESSURE SWITCH. Provides protection against loss of lubricating oil in the compressor. The switch has a manual reset for low oil conditions.

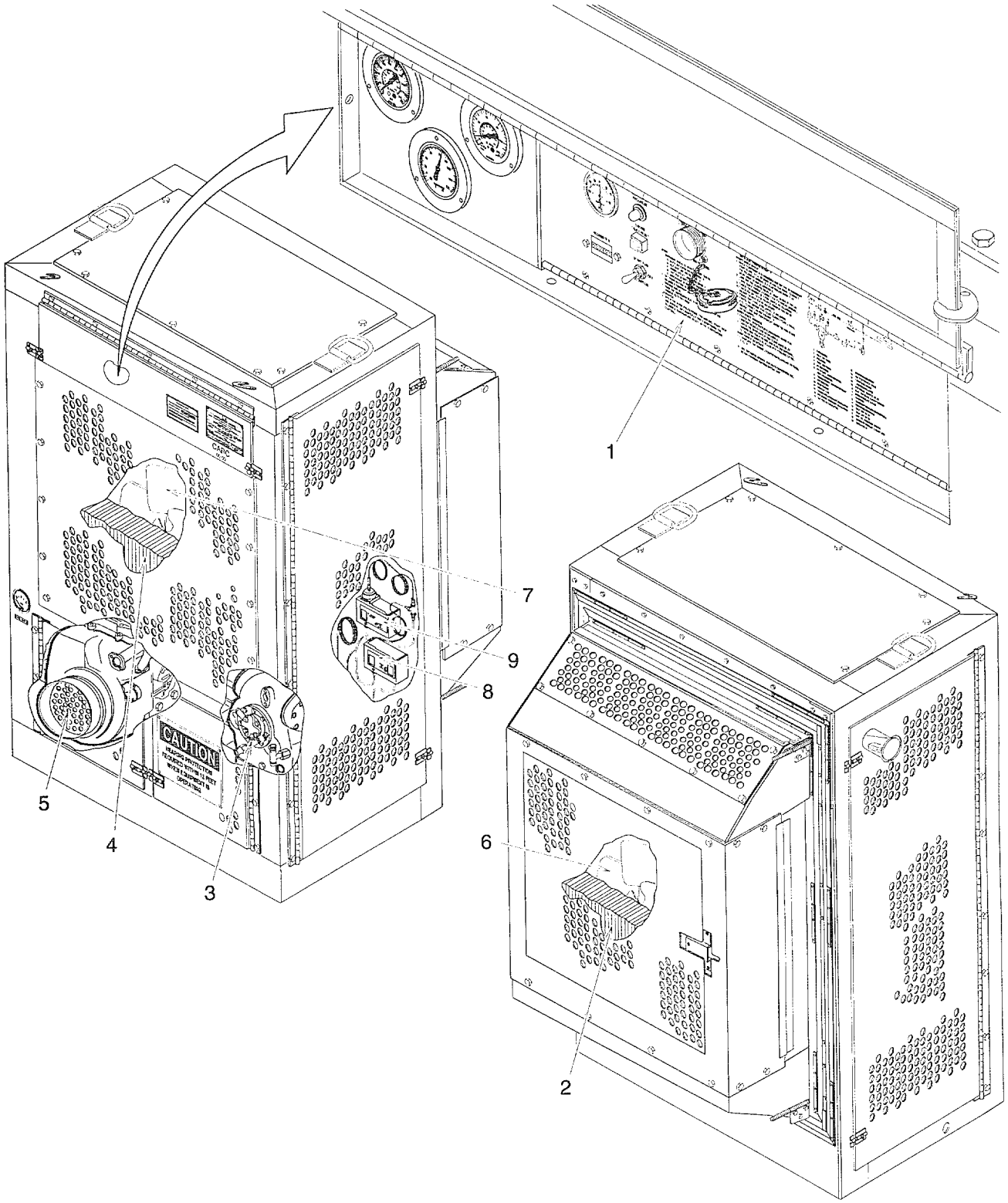


Figure 1-1. Major Components

1-12. EQUIPMENT DATA.

WEIGHTS AND DIMENSIONS

Weight .....1200 lb. (544 Kg)

Width ..... 43.75 in. (111.25 cm)

Height ..... 71.01 in. (180.37 cm)

Depth ..... 42.75 in. (108.59 cm)

PERFORMANCE

Cooling Capacity

0° F (-18° C) .....10,000 btuh

35° F (2° C) .....18,000 btuh

ENGINE CHARACTERISTICS

Horsepower.....11.7

Number of Cylinders 2

RPM.....3,000

FLUID CAPACITIES

Refrigerant R134a..... 16 lb. (7.3 Kg)

Compressor Lubricating Oil ..... 4 pt. (2 1)

Fuel Tank.....16 gal. (61 1)

Engine Lubricating Oil ..... 1.9 qt. (1.8 1)

SECTION III PRINCIPLES OF OPERATION

1-13. OPERATING SYSTEM.

The refrigeration unit is self-contained, using a diesel engine to operate. Fuel for the engine is supplied from a self-contained fuel tank. The engine is started using an electric starter motor powered by a battery in the refrigeration unit. The engine contains an alternator which is controlled by a voltage regulator to provide system power and charge the battery. The engine drives the refrigerant compressor and air handling equipment. The control box assembly houses various automatic and manual components which control the engine/compressor and air handling system. The compressor causes refrigerant flow through the refrigeration system and the air handling system circulates air through the refrigeration unit and refrigerator enclosure.

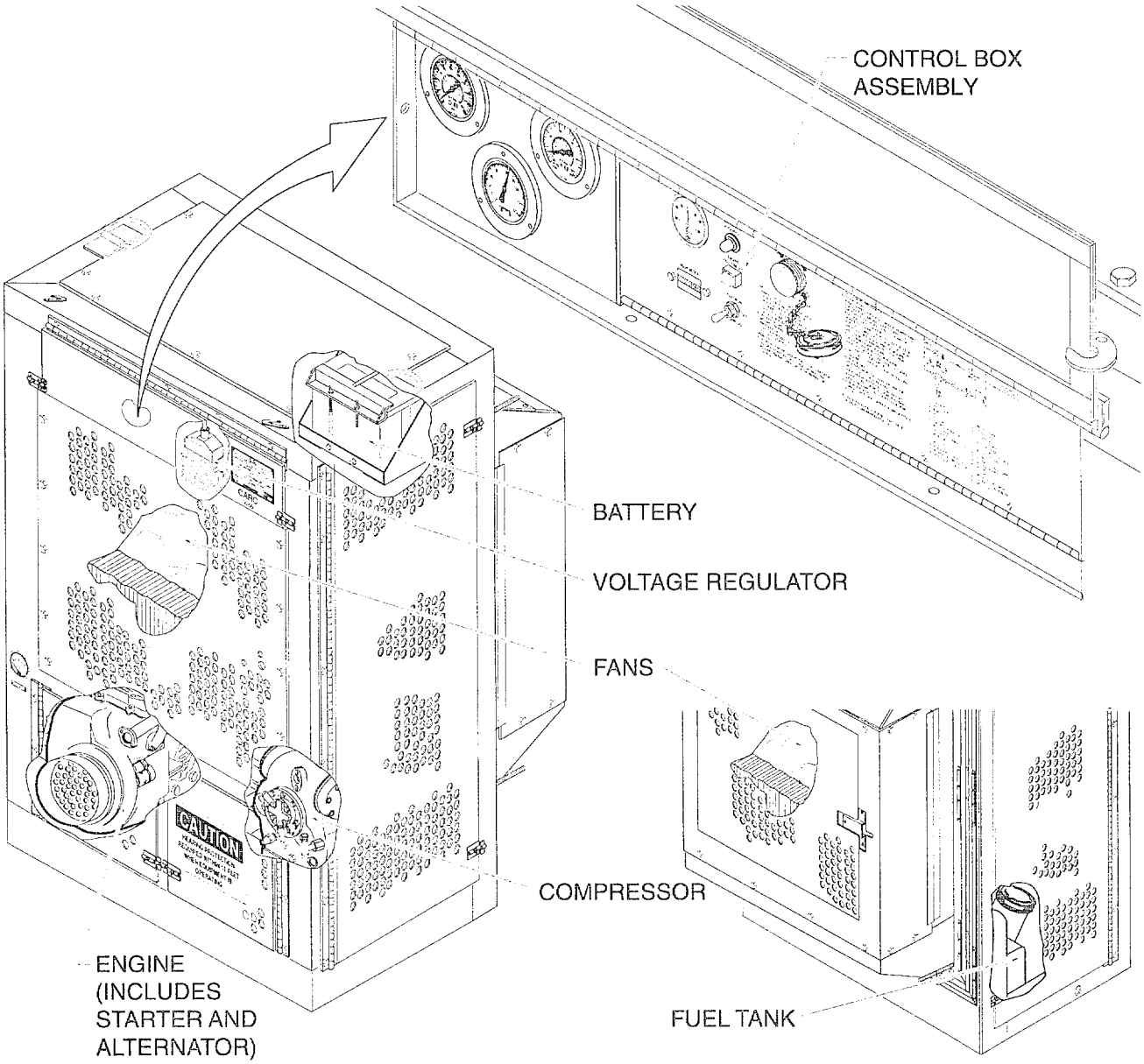
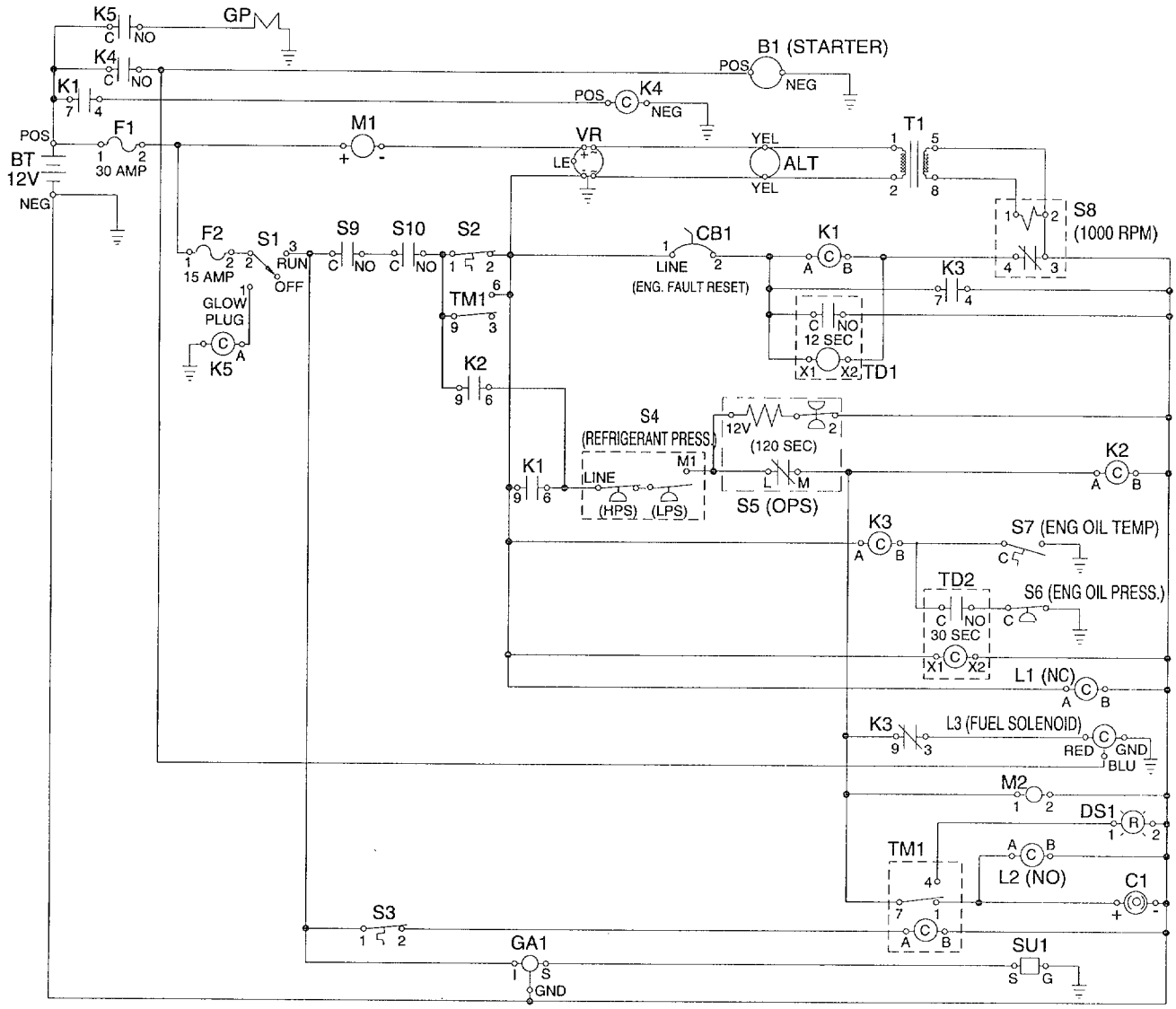
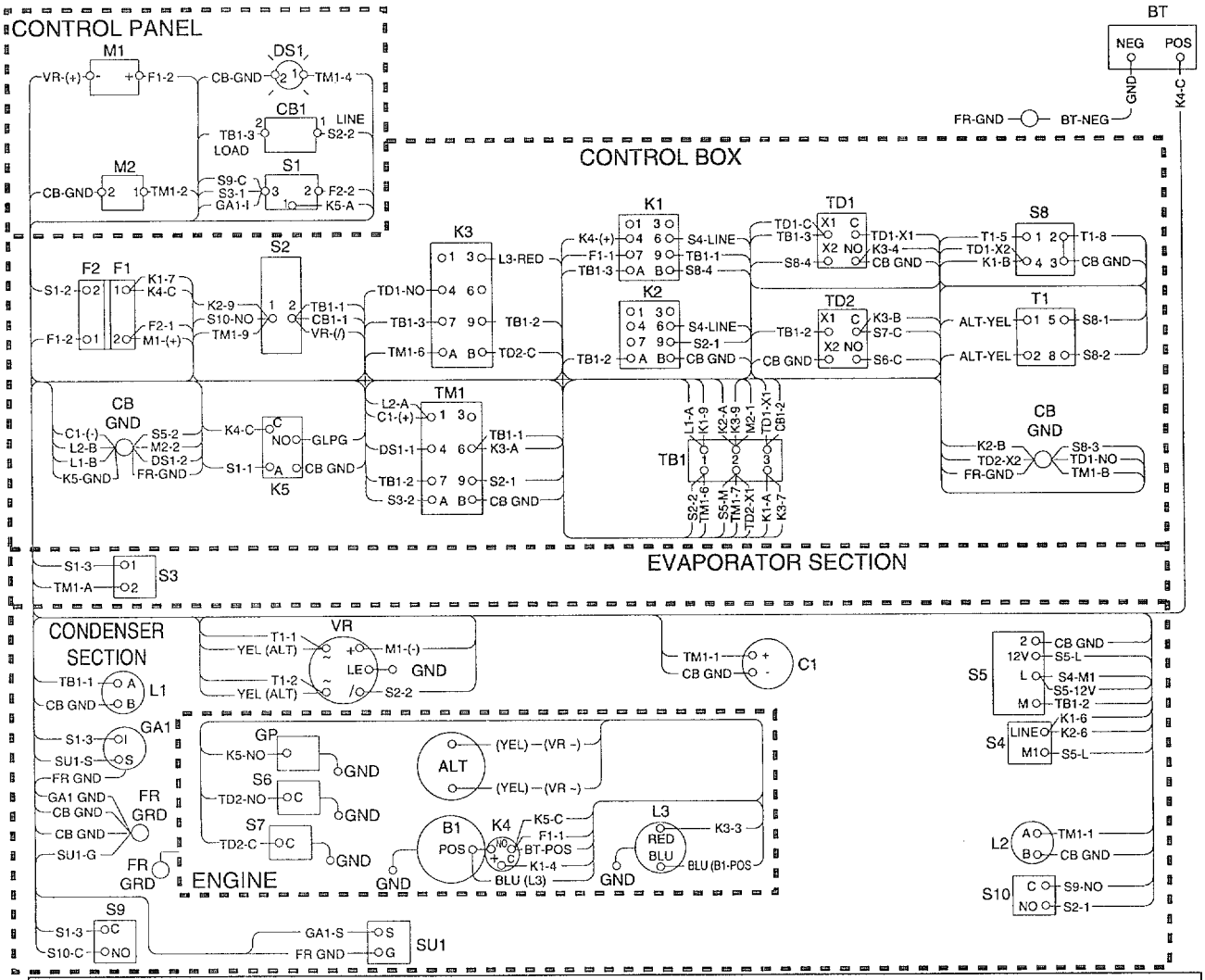


Figure 1-2. Operating/Electrical System



LEGEND			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
ALT	ALTERNATOR (12V, 280W)	M1	AMMETER
B1	STARTER (12V, 1.3 KW)	M2	HOURMETER
BT	BATTERY, 12V	S1	SWITCH, TOGGLE (SELECTOR)
C1	CLUTCH, FAN DRIVE	S2	SWITCH, TEMPERATURE CONTROL
CB1	CIRCUIT BREAKER, 0.5 AMP (ENGINE FAULT RESET)	S3	SWITCH, DEFROST TERMINATION
DS1	LIGHT, INDICATOR (DEFROST)	S4	SWITCH, REFRIGERANT PRESSURE
F1	FUSE (30 AMP)	S5	SWITCH, REFRIGERANT OIL PRESSURE
F2	FUSE (15 AMP)	S6	SWITCH, ENGINE OIL PRESSURE
GA1	GAUGE, FUEL LEVEL	S7	SWITCH, ENGINE TEMPERATURE
GP	GLOW PLUG	S8	SWITCH, ENGINE SPEED
K1	RELAY,STARTER SOLENOID	S9,10	SWITCH, PUSHBUTTON (DOOR)
K2,3	RELAY, CONTROL	SU1	SENDING UNIT, FUEL LEVEL
K4	SOLENOID, STARTER	T1	TRANSFORMER, CONTROL
K5	SOLENOID, CONTINUOUS DUTY	TD1	RELAY TIME DELAY (STARTER)
L1	SOLENOID VALVE, NC (LIQUID LINE)	TD2	RELAY TIME DELAY (ENGINE OIL PRESSURE)
L2	SOLENOID VALVE, NO (DEFROST/EQUALIZER)	TM1	TIMER, DEFROST
L3	SOLENOID, FUEL SHUTOFF (12V)	VR	VOLTAGE REGULATOR

Figure 1-3. Electrical Schematic



LEGEND			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
ALT	ALTERNATOR (12V, 280W)	M2	HOURMETER
B1	STARTER (12V, 1.3 KW)	S1	SWITCH, TOGGLE (SELECTOR)
BT	BATTERY, 12V	S2	SWITCH, TEMPERATURE CONTROL
C1	CLUTCH, FAN DRIVE	S3	SWITCH, DEFROST TERMINATION
CB1	CIRCUIT BREAKER, 0.5 AMP (ENGINE FAULT RESET)	S4	SWITCH, REFRIGERANT PRESSURE
DS1	LIGHT, INDICATOR (DEFROST)	S5	SWITCH, REFRIGERANT OIL PRESSURE
F1	FUSE (30 AMP)	S6	SWITCH, ENGINE OIL PRESSURE
F2	FUSE (15 AMP)	S7	SWITCH, ENGINE TEMPERATURE
GA1	GAUGE, FUEL LEVEL	S8	SWITCH, ENGINE SPEED
GP	GLOW PLUG	S9,10	SWITCH, PUSHBUTTON (DOOR)
K1	RELAY,STARTER SOLENOID	SU1	SENDING UNIT, FUEL LEVEL
K2,3	RELAY, CONTROL	T1	TRANSFORMER, CONTROL
K4	SOLENOID, STARTER	TB1	TERMINAL BOARD
K5	SOLENOID CONTINUOUS DUTY	TD1	RELAY TIME DELAY (STARTER)
L1	SOLENOID VALVE, NC (LIQUID LINE)	TD2	RELAY TIME DELAY (ENGINE OIL PRESSURE)
L2	SOLENOID VALVE, NO (DEFROST/EQUALIZER)	TM1	TIMER, DEFROST
L3	SOLENOID, FUEL SHUTOFF (12V)	VR	VOLTAGE REGULATOR
M1	AMMETER		

Figure 1-4. Electrical Wiring Diagram

1-14. REFRIGERATION SYSTEM.

a. Cooling Cycle. Heat is absorbed from the refrigerator enclosure and released to the outside ambient air using refrigerant flowing through the refrigeration system. The compressor moves the refrigerant through the refrigeration system by raising the pressure of the incoming gas from the evaporator coil (evaporator) and discharging it as a high pressure gas. The high pressure gas passes through the condenser coil (condenser) where heat is released to the outside ambient air causing the high pressure gas to condense to a high pressure liquid. The high pressure liquid, which may contain some gas, is collected in the receiver. The receiver contains a dip tube that allows only liquid to flow from it. The high pressure liquid passes through the heat exchanger where it is cooled by low pressure gas returning to the compressor. The high pressure liquid passes through the expansion valve (thermostatic expansion valve) which causes a pressure drop and automatically meters the amount of liquid passing through it. The rapid drop in pressure causes the liquid to cool. The cool, low pressure liquid passes through the evaporator coil where heat is absorbed from the refrigerator enclosure air causing the low pressure liquid to evaporate to a low pressure gas. The low pressure gas passes through the heat exchanger where it absorbs heat from the high pressure liquid going into the expansion valve. The low pressure gas, which may contain some liquid, is collected in the accumulator (suction accumulator). The accumulator separates the low pressure gas from any liquid and allows only gas to flow from it. The low pressure gas returns to the compressor to begin the cycle again.

b. Defrost Cycle. By lowering the temperature in the refrigerator enclosure to a temperature below freezing, any moisture that accumulates on the evaporator coil will freeze and prevent proper air circulation through the coil. The defrost cycle is automatically controlled by a temperature sensor and electronic timer in the electrical system. The evaporator coil is defrosted when high pressure gas is sent from the compressor directly into the coil. To prevent water from freezing in the evaporator coil drip pan, the warm high pressure gas tubing is routed through the drain hole in the drip pan. The high pressure gas tubing then serpentines across the bottom of the drip pan before entering the coil. The high pressure gas is then returned to the compressor to begin the cycle again. The defrost cycle will continue until either the temperature sensor or electronic timer terminates it.

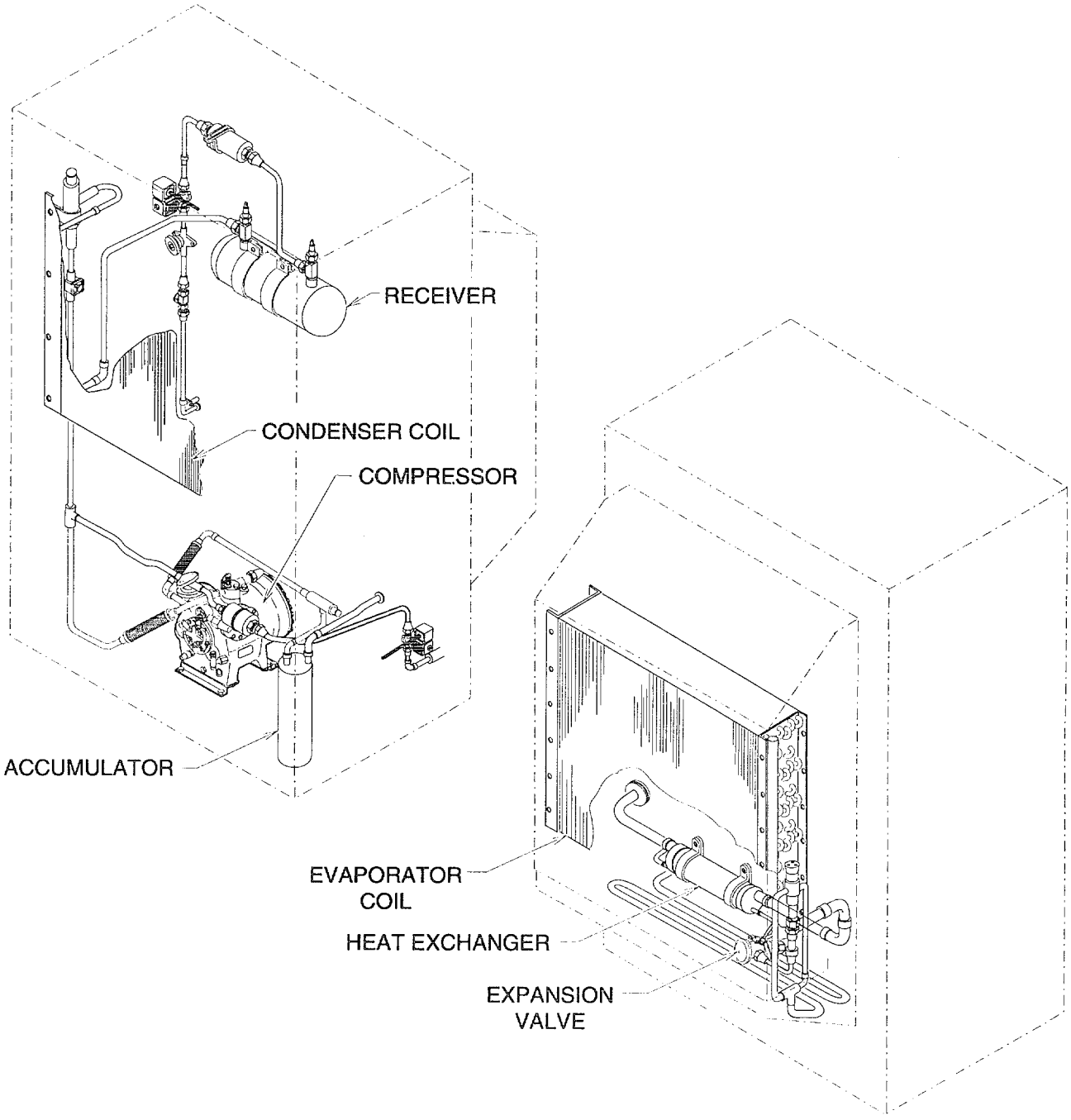
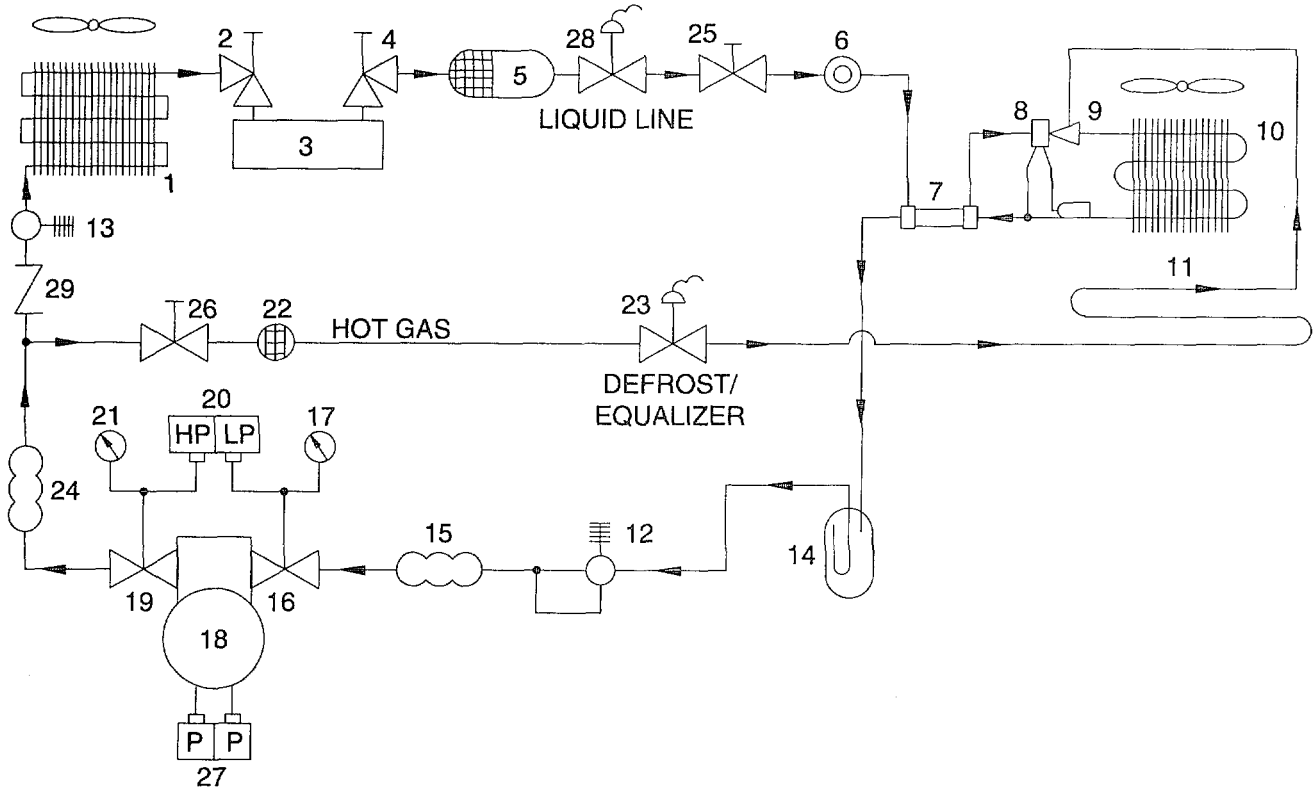


Figure 1-5. Refrigeration System



LEGEND			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	CONDENSER	15	VIBRATION ABSORBER
2	SHUT-OFF VALVE	16	SUCTION SERVICE VALVE
3	RECEIVER	17	COMPOUND GAUGE
4	SHUT-OFF VALVE	18	OPEN COMPRESSOR
5	FILTER DRIER	19	DISCHARGE SERVICE VALVE
6	MOISTURE LIQUID INDICATOR	20	DUAL PRESSURE CUTOUT SWITCH
7	HEAT EXCHANGER	21	HEAD PRESSURE GAUGE
8	THERMOSTATIC EXPANSION VALVE	22	STRAINER
9	DISTRIBUTOR	23	SOLENOID VALVE (DEFROST/EQL) (NO)
10	EVAPORATOR	24	VIBRATION ABSORBER
11	DEFROST COIL	25	SHUT-OFF VALVE
12	CRANKCASE PRESSURE REGULATOR	26	SHUT-OFF VALVE
13	DISCHARGE PRESSURE REGULATOR	27	DIFFERENTIAL OIL PRESSURE SWITCH
14	SUCTION ACCUMULATOR	28	SOLENOID VALVE (LIQUID LINE) (NC)
		29	CHECK VALVE

Figure 1-6. Refrigeration Schematic

1-15. AIR HANDLING SYSTEM.

a. Refrigerator Enclosure. To absorb heat and cool the refrigerator enclosure, air must be circulated through the evaporator section of the refrigeration unit. Refrigerator enclosure air is drawn in through the coil guard and evaporator coil by the evaporator fan. The air is discharged through the evaporator air outlet guard back into the refrigerator enclosure.

b. Outside Ambient. To release heat absorbed in the refrigerator enclosure to the outside ambient, air must be circulated through the condenser section of the refrigeration unit. Outside ambient air is drawn in through the condenser guard and condenser coil by the condenser fan. The air is discharged through the side condenser doors and front bottom doors back to the outside ambient.

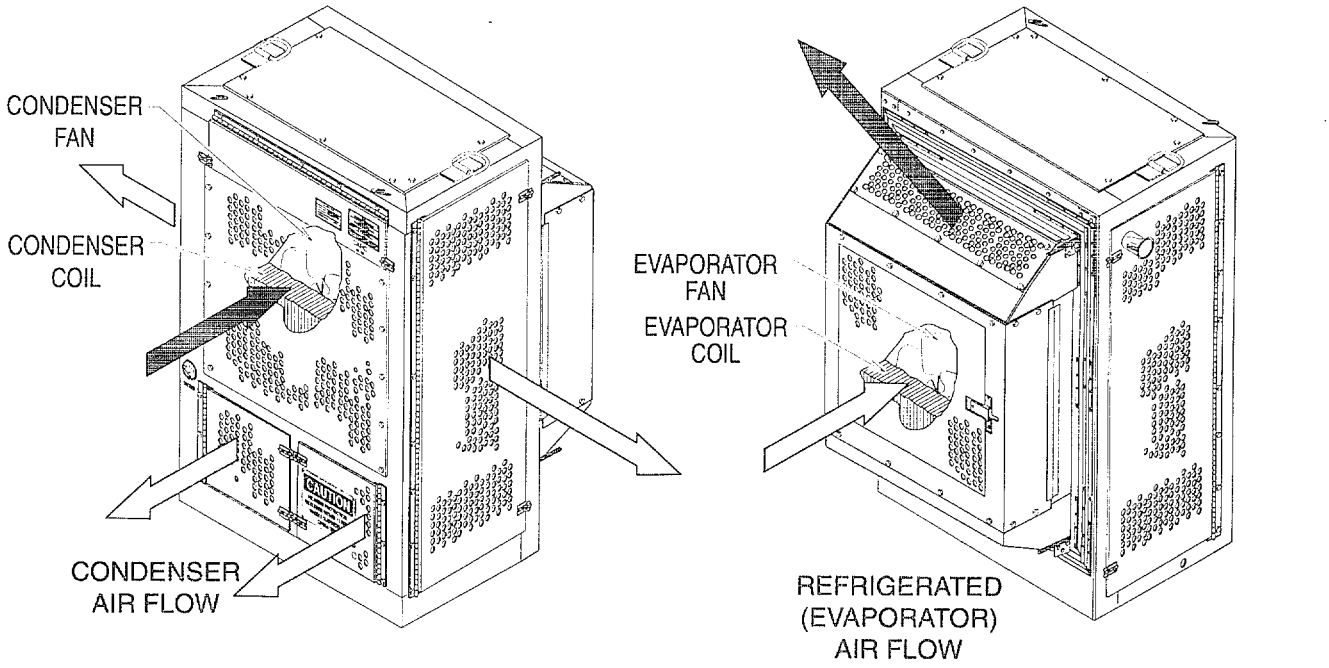


Figure 1-7. Air Handling System

CHAPTER 2

OPERATING INSTRUCTIONS

		Page
SECTION I	DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS	2-1
	2-1 Operating Controls and Indicators	2-1
	2-2 Fault Controls and Indicators	2-4
SECTION II	PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)	2-6
	2-3 General	2-6
SECTION III	OPERATION UNDER USUAL CONDITIONS	2-23
	2-4 Assembly and Preparation for Use	2-23
	2-5 Startup Procedures	2-23
	2-6 Operator Checks	2-25
	2-7 Shutdown Procedures	2-26
	2-8 Decals and Instruction Plates	2-26
SECTION IV	OPERATION UNDER UNUSUAL CONDITIONS	2-29
	2-9 Operation Under Inclement Weather	2-29
	2-10 NBC Decontamination Procedures	2-29

SECTION I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. OPERATING CONTROLS AND INDICATORS.

The controls and indicators needed to operate and monitor the refrigeration unit are located on the control box assembly, housing frame, and inside the housing.

1 Circuit Breaker (ENGINE FAULT RESET). Provides electrical circuit protection for the refrigeration unit control systems. The circuit breaker button can be pushed to place it in either the on (button in with no white band showing) or off (button extended with white band exposed) position. The circuit breaker should normally be kept in the on position.

2 Remote Bulb Thermostat (TEMPERATURE CONTROL). Monitors and automatically controls the temperature inside the refrigerator enclosure. The remote bulb thermostat should be set to the desired refrigerator enclosure temperature.

3 Toggle Switch (START/RUN, OFF, GLOW PLUG). Activates the refrigeration unit in the START/RUN position and activates the glow plug for cold weather starting in the GLOW PLUG position. The toggle switch should be in the START/RUN position to operate the refrigeration unit and the OFF position when not in use.

2-1. OPERATING CONTROLS AND INDICATORS. - Continued

4 Thermometer (REFRIGERATION TEMPERATURE). Indicates the refrigerator enclosure temperature. The thermometer should indicate within 15° F (8° C) of the temperature set on the remote bulb thermostat.

5 Pressure Gage (DISCHARGE PRESSURE). Indicates the pressure of the refrigerant gas leaving the compressor. The pressure gage should generally indicate between 165 and 250 psi (1139 and 1725 kPa), at start up and/or operation in high temperatures, this range can go higher. The inner scale indicates the temperature of the refrigerant at any given pressure.

6 Compound Gage (SUCTION PRESSURE). Indicates the pressure of the refrigerant gas entering the compressor. The compound gage should generally indicate between 0 and 15 psi (O and 104 kPa), at shut down and/or operation in low temperatures, this range can go lower. The inner scale indicates the temperature of the refrigerant at any given pressure.

7 Sight Indicator (REFRIGERANT SIGHT GLASS). Provides a port through which the refrigerant may be observed as it passes through the liquid line of the refrigeration system. The center indicator changes color as it reacts to moisture in the refrigerant. The sight indicator port should be clear, indicating liquid refrigerant passing through it. An occasional flash of bubbles is normal as the refrigerant system automatically adjusts to changing conditions. The center indicator should be green or chartreuse in color.

8 Sight Glass (COMPRESSOR OIL SIGHT GLASS). Provides a port through which the oil level in the compressor may be observed. The sight glass port should show an oil level between 1/4 and 1/2 up the port. Bubbles in or on the oil surface is normal.

9 Hourmeter (HOURMETER). Indicates the total number of hours the engine/compressor has operated.

10 Lamp (DEFROST IN PROGRESS). Indicates, by illuminating, when the refrigeration unit is operating in a defrost cycle.

11 Fuel Gage (FUEL GAGE). Indicates the relative level of fuel in the fuel tank. The gage should always be above 1/4 mark during normal operation.

12 Ammeter (AMMETER). Indicates approximate amperage and relative flow of current to or from the battery. Flow from the battery (discharging) is indicated by negative (-) numbers and flow to the battery (charging) is indicated by positive (+) numbers. The ammeter should indicate a positive flow during normal operation, the amperage will vary depending on conditions.

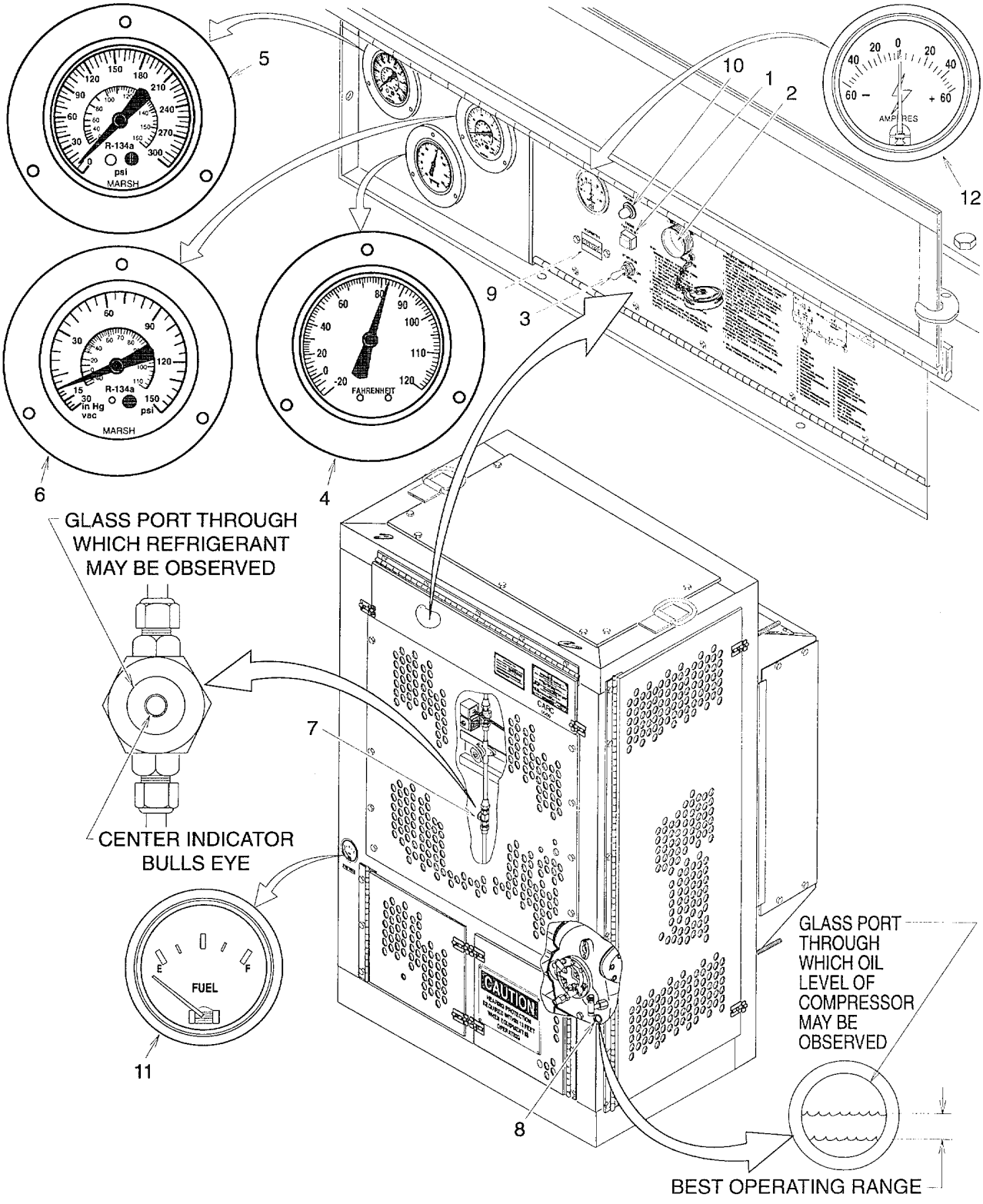


Figure 2-1. Operating Controls and Indicators

2-2. FAULT CONTROLS AND INDICATORS.

The controls and indicators needed to monitor and reset a fault condition on the refrigeration unit are located on the control box assembly and inside the condenser frame.

1 Thermometer (REFRIGERATION TEMPERATURE). The thermometer will indicate more than 15° F (8° C) above or below the remote bulb thermostat setting if a fault occurs in the temperature control system.

2 Pressure Gage (DISCHARGE PRESSURE). The pressure gage will indicate more than 250 psi (1725 kPa) or less than 165 psi (1139 kPa) if a fault occurs in the refrigeration system. At start up, shut down, or operation in high temperatures, this range can go higher.

3 Compound Gage (SUCTION PRESSURE). The compound gage will indicate more than 15 psi (104 kPa) or less than 0 psi (O kPa) if a fault occurs in the refrigeration system. At start up, shut down, or operation in low temperatures, this range can go lower.

4 Circuit Breaker (ENGINE FAULT RESET). The circuit breaker button will be extended with a white band exposed if a fault has caused excessive load on the electrical control system. To reset the circuit breaker, push it in so the white band is no longer exposed.

5 Ammeter (AMMETER). The ammeter will show a negative (-) number indicating the battery is being discharged. This normally indicates a failure in the charging system.

6 Dual Pressure Control Switch. The dual pressure control switch will open the electrical control circuit if a fault in the refrigeration system causes the pressure of the refrigerant gas leaving the compressor to exceed 300 psi (2070 kPa). Push the reset button to reset the dual pressure control switch.

7 Differential Oil Pressure Switch. The differential oil pressure switch will open the electrical control circuit if a fault in the refrigeration system causes the compressor oil pressure to drop. Push the reset button to reset the differential oil pressure switch.

8 Sight Indicator (REFRIGERANT SIGHT GLASS). The sight indicator port will show continuous bubbles or foam in the refrigerant if there is a fault in the refrigeration system. The center indicator color will be yellow if moisture in the refrigerant exceeds safe operating limits.

9 Sight Glass (COMPRESSOR OIL SIGHT GLASS). The sight glass port will show the compressor oil level less than 1/4 up the port or will show the oil foaming if there is a fault in the refrigeration system.

10 Fuel Gage (FUEL GAGE). Indicates below 1/4 level. The fuel tank needs to be filled to maintain a fuel level above 1/4 for reliable operation.

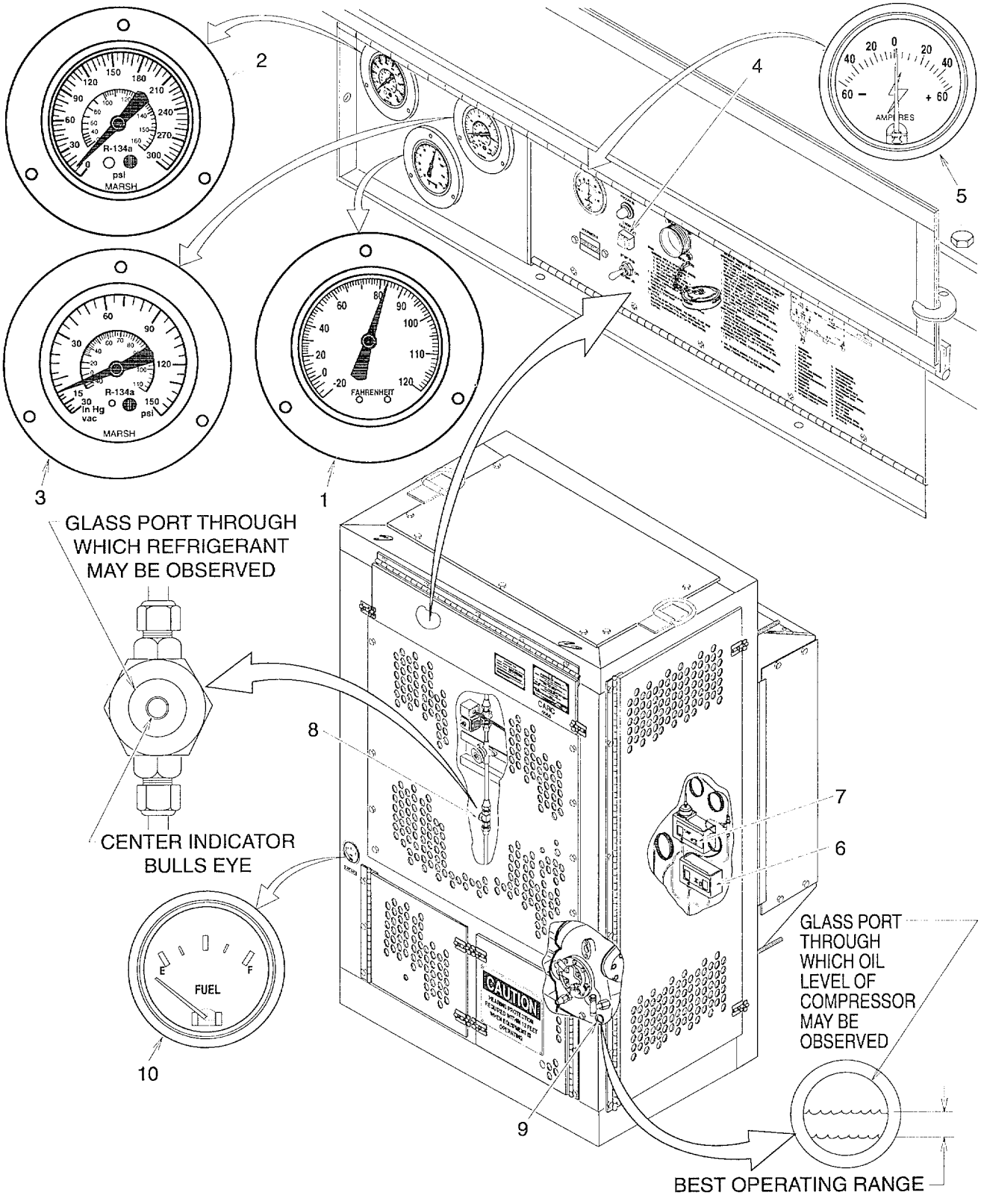


Figure 2-2. Fault Controls and Indicators

SECTION II. OPERATOR PREVENTIVE MAINTENANCE CHECKSAND SERVICES (PMCS)

2-3. GENERAL.

Preventive Maintenance Checks and Services (PMCS) are essential to the efficient operation of the refrigeration unit and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to those functions which can be done from the outside of the cabinet or behind access doors. The Preventive Maintenance Checks and Services Table 2-1 lists the inspections and care of the refrigeration unit required to keep it in good operating condition.

a. Warnings and Cautions. Always observe the WARNINGs and CAUTIONs appearing in your PMCS Table. Warnings and cautions appear before applicable procedures. You must observe these WARNINGs and CAUTIONs to prevent serious injury to yourself and others or prevent your equipment from being damaged.

b. Explanation of Table Entries.

(1) Item Number Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

(2) Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment. When a check and service procedure is required for both WEEKLY and BEFORE intervals, it is not necessary to do the procedure twice if the equipment is operating during the WEEKLY period.

(3) Location, Check/Service Column. This column provides the location and the item to be checked or serviced. The item location is underlined.

(4) Procedure Column. This column gives the procedure you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

(5) Not Fully Mission Capable IF: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you made a check and service procedure that shows faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

c. Other Table Entries. Be sure to observe all special information and notes that appear in your table.

d. Leakage Definitions for Operator PMCS. It is necessary for you to know how fluid leakage affects the status of your refrigeration unit. The following are types/classes of leakages an operator needs to know to be able to determine the status of their unit. When in doubt notify your supervisor.

(1) Refrigerant Leaks. Oil is carried with the refrigerant as it flows through the refrigeration system. If a leak develops in the system, the oil will seep out and soak the copper tubing around the leak or drip and soak or puddle on the housing or other component below the leak. If any oil or seepage is found, a refrigerant leak would be suspected.

WARNING

The accumulation of liquid fuel is a fire hazard.

(2) Engine Fuel Leaks. Fuel is carried from the fuel tank, through filters, into the engine, and back to the fuel tank through various rubber hoses and fittings. If a leak develops, the fuel will seep out and soak the hose or fitting around the leak and may drip and soak or puddle on the housing or other component below the leak. If any fuel seepage is found, a leak would be suspected.

(a) Wipe and wash down such areas or surfaces promptly.

(b) Dispose of any wiping rags in approved containers. Contact your local environmental officer for guidance on how to properly dispose of fuel soaked wiping rags in accordance with local regulations.

(c) Apply no smoking rules within 50 ft of any fuel accumulation.

(3) Engine Lubricating Oil Leaks. Engine lubricating oil is carried from the engine, through filters, and back to the engine through various rubber hoses and fittings. If a leak develops, the oil will seep out and soak the hose or fitting around the leak and may drip and soak or puddle on the housing or other component below the leak. If any oil seepage is found, a leak would be suspected.

CAUTION

- The refrigeration unit will not be operated with an obvious fuel leak.
- Operation is allowable with minor leakages (class I or II) in the engine lubricating oil system. Consideration must be given to oil capacity in the engine.
- When operating with class I or II oil leaks, continue to check oil level as required in your PMCS.
- Class III oil leaks should be reported immediately to your supervisor and the unit must be shut down.

(a) Class I leak is defined as seepage of fluid as indicated by wetness or discoloration but not great enough to form drops.

(b) Class II leak is defined as leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(c) Class III leak is defined as leakage of fluid great enough to form drops that fall from item being checked/inspected.

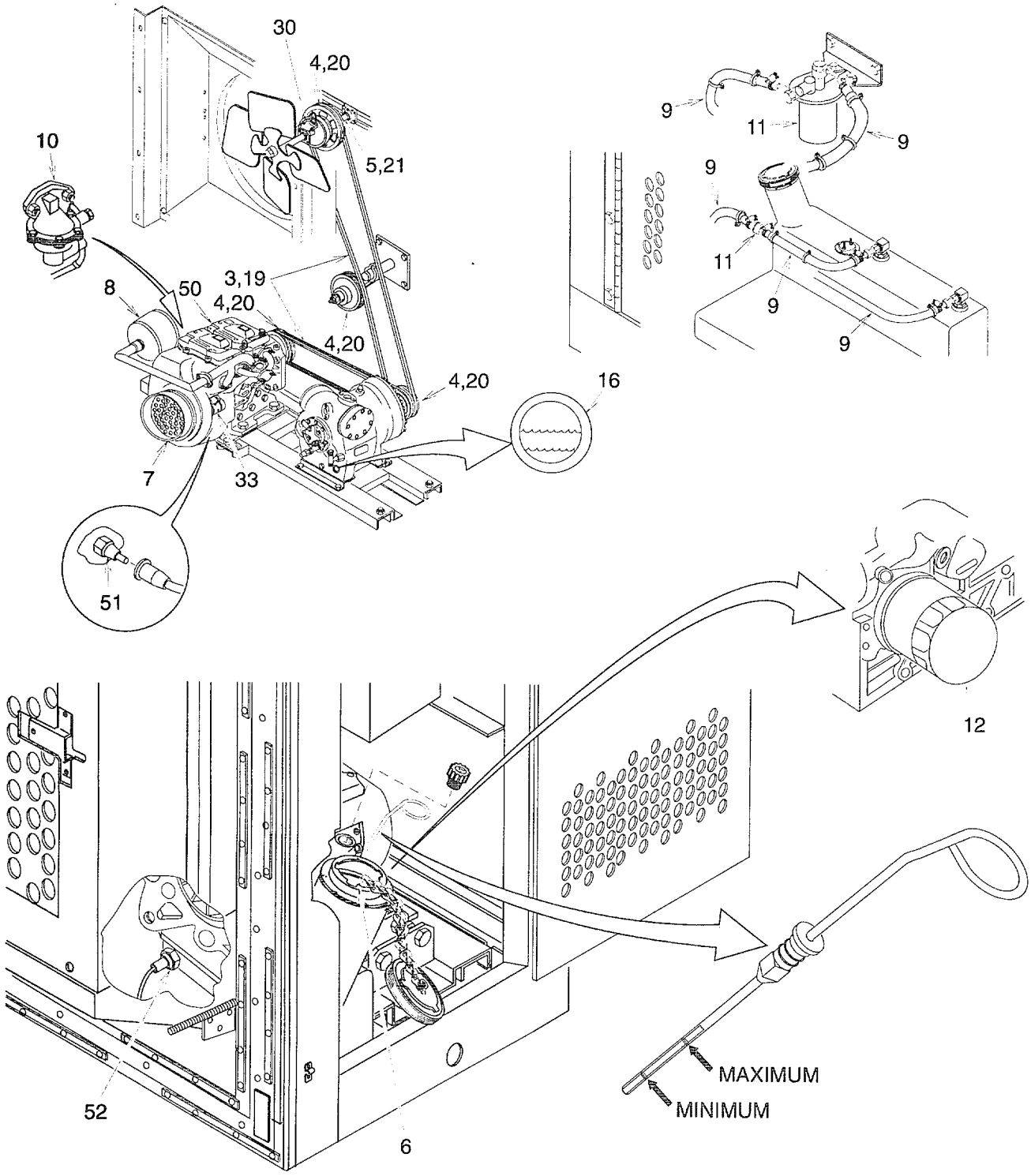


Figure 2-3. Operator PMCS Routing Diagram (Sheet 1 of 2)

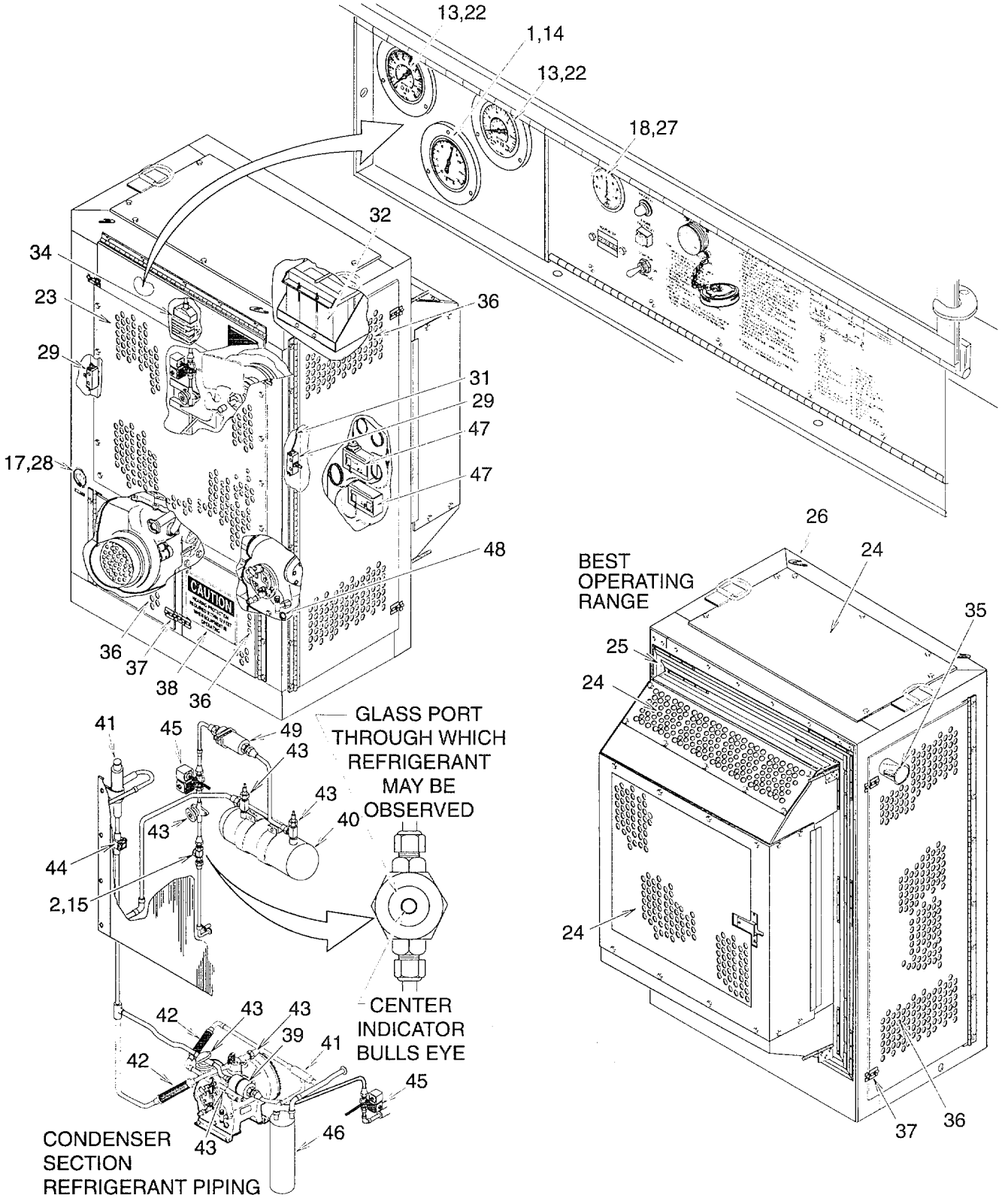


Figure 2-3. Operator PMCS Routing Diagram (Sheet 2 of 2)

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD

NOTE

If the equipment must be kept in continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the equipment is shut down.

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Exterior		
1	Before	Temperature Gage	a. Temperature gage should indicate refrigerator enclosure temperature. If it does not, notify unit maintenance to replace it.	Temperature gage does not indicate refrigerator enclosure temperature.
			b. Inspect the Temperature gage for cracked or missing lens and loose or missing mounting hardware. If damaged or loose, notify until maintenance to tighten or replace it as necessary.	
		Refrigeration Unit Interior	**WARNING** Exposed rotating parts are contained in the refrigeration unit. Care must be taken when doors are open to prevent personal injury.	
2	Before	Sight Indicator	a. Inspect sight indicator port for cracks and note center indicator color. If cracked or yellow, notify direct support maintenance to replace it or evacuate the refrigeration system as necessary.	Sight indicator port is cracked or center indicator color is yellow.
			b. Inspect the sight indicator for evidence of refrigerant leak. If evidence of leaking found, notify direct support maintenance to replace it.	Evidence of leak is found.

Table 2-1. Operator Preventive Maintenance Checks and Services for model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
3	Before	V-Belts	Inspect the V-belts for frayed edges, cracks, glazing, or hard brittle condition. Inspect for excessive looseness or slippage. If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	V-belt is frayed, cracked, glazed, or hard and brittle. V-belt is excessively loose or slipping.
4	Before	Pulleys	Inspect pulleys for cracks, chips, or warpage. Inspect for secure mounting to shaft. If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	Pulley is cracked, chipped, warped, or loose on shaft.
5	Before	Fan Drive Shaft	Inspect fan drive shaft for cracks, chips, or warpage. If damaged, notify direct support maintenance to replace it as necessary. **WARNING** The fuel used in this refrigeration unit is highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.	Fan drive shaft is cracked, chipped, or warped.
6	Before	Fuel Tank	Inspect fuel tank. a. Check for cuts, dents, cracks, or leaks. b. Service fuel tank by checking fuel level. If level is less than 1/4 tank, top off with fuel (27, appendix E) if operating between 5° F (-15° C) and 120° F (49° C) or (28, appendix E) if operating between O° F (-18° C) and 5° F (-15° C).	Fuel tank is cut, cracked, or leak is found. Fuel level is less than 1/4 tank.

Table 2-2. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
7	Before	Engine	Inspect engine.	
			a. Check for fluid leaks.	Any fuel leak or class III oil leak is found.
			b. Service engine by checking oil level. Oil level is at the lower MINIMUM mark or below on the dipstick. Add oil to second MAXIMUM mark. If temperature is above 104° F (40° C) use (item 26, appendix E), if temperature is between 5° F (-15° C) and 104° F (400 C) use (item 5, appendix E), if temperature is below 5° F (-15° C) use (item 25, appendix E).	Oil level is below the lower MINIMUM mark on the dipstick.
8	Before	Air Cleaner	Inspect for missing or damaged air cleaner and attaching hardware.	Damaged or missing air cleaner and attaching hardware.
9	Before	Fuel Lines	Inspect fuel lines (hoses) for cuts, cracks, and any leaking.	If fuel lines (hoses) are cut, cracked, or leak is found.
10	Before	Fuel Pump	Inspect fuel pump for any cracks or leaks.	Fuel pump cracked or leak found.
11	Before	Fuel Filters	Inspect both fuel filters for any dents, cuts, or leaks.	Fuel filter is dented, cut, or leak is found.
12	Before	Oil Filter	Inspect oil filter for any dents, cuts, or leaks.	Oil filter is dented, cut, or class III leak is found.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Exterior	**NOTE** • The gages must not be inspected when the DEFROST IN PROGRESS lamp is on. • Pressures given are the acceptable operating range.	
13	During	Pressure and Compound Gages	Inspect the pressure gage for reading between 160 and 270 psi (1104 and 1863 kPa) and the compound gage for reading between 0 and 15 psi (0 and 104 kPa). If either gage is out of acceptable operating range on a continuous basis, note the readings and shut down the refrigeration unit (para 2-7). Notify unit maintenance of the pressure readings.	Gage reading above or below acceptable operating range.
			NOTE The temperature gage must not be inspected when the DEFROST IN PROGRESS lamp is on.	
14	During Gage	Temperature	Temperature gage should indicate within 15° F (8° C) of remote bulb thermostat setting. If out of this range, shut down refrigeration unit (para 2-7) and notify unit maintenance. setting.	Temperature gage indicates more than 15° F (8° C) above or below remote bulb thermostat

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
15	During	Sight Indicator	**NOTE** • The sight indicator must not be inspected when the DEFROST IN PROGRESS lamp is on. • The sight indicator can be viewed looking through the left side condenser door. Inspect sight indicator port for constant bubbles or foaming and note center indicator color. If constant bubbles or yellow indicator are seen, shut down refrigeration unit (para 2-7) and notify direct support maintenance to leak check and evacuate refrigeration system as necessary.	Sight indicator port shows constant bubbles or foam. Center indicator color is yellow.
16	During	Compressor (Oil Level Sight Glass)	**NOTE** • The sight glass must not be inspected when the DEFROST IN PROGRESS lamp is on. • The sight glass can be viewed looking through the front bottom panel. • Safe operating level is between 1/4 and 1/2 way up the sight glass. Inspect the sight glass port for low or high oil level and foaming. If oil level is out of safe operating range or foaming, shut down refrigeration unit and notify direct support maintenance to leak check and add oil to or remove oil from compressor as necessary.	Sight glass port oil level above or below safe operating range or foaming.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			WARNING The fuel used in this refrigeration unit is highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.	
17	During	Fuel Gage	Check fuel gage, if less than 1/4 full, shut down unit (para 2-7). Fill fuel tank with fuel (27, appendix E) if operating between 5° F (-15° C) and 120° F (49° C) or (28, appendix E) if operating between 0° F (-18° C) and 5° F (-15° C). Start unit (para 2-5).	Fuel level is less than 1/4 full.
18	During	Ammeter Refrigeration Unit Interior	Inspect ammeter indicator reading for normal operating range of 0 to +15 amperes. **WARNING** Exposed rotating parts are contained in the refrigeration unit. Care must be taken when doors are open to prevent personal injury.	Indicator reading outside normal operating range.
19	After	V-Belts	Inspect the V-belts for frayed edges, cracks, glazing, or hard brittle condition. Inspect for excessive looseness or slippage. If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	V-belt is frayed, cracked, glazed, or hard and brittle. V-belt is excessively loose or slipping.
20	After	Pulleys	Inspect pulleys for cracks, chips, or warpage. Inspect for secure mounting to shaft. If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	Pulley is cracked, chipped, warped, or loose on shaft.
21	After	Fan Drive Shaft	Inspect fan drive shaft for cracks, chips, or warpage. If damaged, notify direct support maintenance to replace it as necessary.	Fan drive shaft is cracked, chipped, or warped.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Exterior		
22	Weekly	Pressure and Compound Gages	a. Inspect the gages for cracked or missing lens and loose or missing mounting hardware. If damaged or loose, notify direct support maintenance to tighten or replace it as necessary.	
			b. Inspect the gages for evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Evidence of leak is found.
23	Weekly	Guards	a. Inspect the guards for any debris or foreign material obstructing the openings. Remove any debris or foreign material from the openings. If debris cannot be removed, notify unit maintenance to remove it.	Debris or foreign material obstructs the openings.
			b. Inspect the guards for any cracks, tears, and loose or missing hardware. If cracked, notify direct support maintenance for repair. If hardware is loose or missing, notify unit maintenance to tighten or replace as necessary.	
			c. Inspect for chipped or missing paint and evidence of corrosion. If paint is damaged or shows evidence of corrosion, notify direct support maintenance to paint it.	
24	Weekly	Panels	a. Inspect the access panels for any cracks, tears, and loose or missing hardware. If cracked, notify direct support maintenance for repair. If hardware is loose or missing, notify unit maintenance to tighten or replace it as necessary.	
			b. Inspect for any chipped or missing paint and evidence of corrosion. If paint is damaged or access panel shows evidence of corrosion, notify direct support maintenance to paint it.	

Table 2-1. Operator Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
25	Weekly	Heat Shield Gaskets	Inspect for loose or missing heat shield gasket and for splits or tears. If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	
26	Weekly	Housing	a. Inspect the housing for cracks and loose or missing hardware. If cracked, notify direct support maintenance for repair. If hardware is loose or missing, notify unit maintenance to tighten or replace it as necessary.	
			b. Inspect the housing for any chipped or missing paint and evidence of corrosion. If paint is damaged or enclosure shows evidence of corrosion, notify direct support maintenance to paint it.	
			c. Inspect the evaporator assembly condensate drain plastic tubing for any debris or foreign material obstructing it. Remove any debris or foreign material from the condensate drain tubing. If tubing cannot be cleaned, notify unit maintenance to clean it.	Debris or foreign material obstructing the condensate drain opening.
			d. Inspect for secure mounting to the refrigerator enclosure. If loose, notify unit maintenance to secure it.	Housing is loose on refrigerator enclosure.
			e. Inspect for missing or damaged mounting bolt assembly. If missing or damaged, notify unit maintenance to repair or replace it.	Unit mounting bolt is damaged or missing.
27	Weekly	Ammeter	Inspect ammeter for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
28	Weekly	Fuel Gage	Inspect fuel gage for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Interior	**WARNING** Exposed rotating parts are contained in the refrigeration unit. Care must be taken when doors are open to prevent personal injury.	
29	Weekly	Push (Door) Switches	a. Inspect the push switches for cracked case and loose or missing attaching hardware If damaged or loose, notify unit maintenance to tighten or replace it as necessary.	
			b. Inspect the push switches for smooth operation. If binding, notify unit maintenance to test and replace it as necessary.	The push switches stick. Wire lead frayed or broken.
			c. Inspect the push switches for frayed or broken wire leads. If damaged, notify unit maintenance to repair or replace it as necessary.	
30	Weekly	Fan Clutch	a. Inspect the fan clutch for loose or missing attaching hardware. If loose, notify unit maintenance to tighten it.	Fan clutch loose.
			b. Inspect the fan clutch for frayed or broken wire leads. If damaged, notify unit maintenance to repair or replace it as necessary.	Wire lead frayed or broken.
31	Weekly	Wires, Cables, and Harnesses	Inspect for cut or frayed wires and missing or damaged terminals or clamps.	Wire lead cut or frayed, terminal missing or damaged, or clamp missing or loose.
32	Weekly	Battery	Inspect battery for cracks, damaged terminal, and leaks.	Battery cracked, terminal damaged, or any evidence of leaking.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
33	Weekly	Starting Motor	a. Inspect starting motor for any evidence of overheating such as discoloration of casing or burn marks.	Starting motor shows evidence of overheating.
			b. Inspect the starting motor for frayed or broken wire leads. If damaged, notify unit maintenance to repair or replace it as necessary.	Wire leads are frayed or broken.
34	Weekly	Voltage Regulator	a. Inspect voltage regulator for any evidence of overheating such as discoloration of casing or burn marks.	Voltage regulator shows evidence of overheating.
			b. Inspect the voltage regulator for frayed or broken wire leads. If damaged, notify unit maintenance to repair or replace it as necessary.	Wire leads are frayed or broken.
			WARNING Muffler may be hot to touch and can cause serious personal injury. Allow muffler to cool.	
35	Weekly	Muffler, Exhaust Pipes, and Clamps	Inspect muffler and exhaust pipes for holes or dents and missing or damaged clamps.	Hole in muffler, exhaust pipes or clamps missing or loose.

Table 2-1. Operator Maintenance Checks and Services for Model F10000RD-Contiued

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Exterior		
36	Monthly	Doors/Cover	a. Inspect the side condenser doors, front bottom doors, and control box cover for any cracks, tears, and loose or missing hardware. If cracked, notify direct support maintenance for repair. If hardware is loose or missing, notify unit maintenance to tighten or replace as necessary. b. Inspect the doors and cover for any chipped or missing paint and evidence of corrosion. If paint is damaged or shows evidence of corrosion, notify direct support maintenance to paint it. c. Inspect the hinges for smooth operation and loose or missing attaching hardware. If hinges bind, notify unit maintenance to lubricate them. If attaching hardware is loose or missing, notify direct support maintenance to replace it.	The side condenser doors do not stay closed.
37	Monthly	Barrel Bolts	Inspect the barrel bolts for smooth operation and loose or missing attaching hardware. If barrel bolts bind, notify unit maintenance to lubricate them. If attaching hardware is loose or missing, notify unit maintenance to tighten or replace it as necessary.	
38	Monthly	Plates	Inspect for any damaged, loose, or missing information plates and loose or missing attaching hardware. If information plates are damaged or loose, notify direct support maintenance to tighten or replace them as necessary.	

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Refrigeration Unit Interior	**WARNING** Exposed rotating parts are contained in the refrigeration unit. Care must be taken when doors are open to prevent personal injury.	
39	Monthly	Dehydrator	Inspect the dehydrator for damage or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Dehydrator is damaged or evidence of leak is found.
40	Monthly	Receiver	Inspect the receiver for damage and evidence of refrigerant leak. Inspect the isolation valves for evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Receiver is damaged or evidence of leak is found.
41	Monthly	Pressure Regulator Valves	Inspect the pressure regulator valves for damage or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Pressure regulator valve damaged or evidence of leak is found.
42	Monthly	Metal Hose Assemblies	Inspect the metal hose assemblies for kinks or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Metal hose assembly kinked or evidence of leak is found.
43	Monthly	Valves	Inspect the valves for evidence of refrigerant leak. If evidence of leaking found, notify direct support maintenance to replace it.	Evidence of leak is found.
44	Monthly	Check Valve	Inspect the check valve for evidence of refrigerant leak. If evidence of leaking found, notify direct support maintenance to replace it.	Evidence of leak is found.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
45	Monthly	Solenoid Valves/Coils	Inspect the solenoid valves for frayed or broken wire leads, loose coil, loose or missing cover, and evidence of refrigerant leak. If coil is loose or damaged or wire leads are frayed or broken, notify unit maintenance to repair or replace it as necessary. If evidence of leaking found, notify direct support maintenance to replace it.	Wire lead frayed or broken, coil loose, or evidence of leak is found.
46	Monthly	Accumulator	Inspect the accumulator for damage and evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Accumulator is damaged or evidence of leak is found.
47	Monthly	Pressure Switches	Inspect the pressure switches for frayed or broken wire leads and dented, loose, or missing cover. Inspect for evidence of refrigerant leak. If cover is loose or wire leads are frayed or broken, notify unit maintenance to repair or replace it as necessary. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Wire lead frayed or broken, cover missing, or evidence of leak is found.
48	Monthly	Compressor	Inspect the compressor sight glass for cracks. Inspect for evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to repair or replace as necessary.	Sight glass cracked or evidence of leak is found.
49	Monthly	Strainer	Inspect the strainer for damage or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Strainer is damaged or evidence of leak is found.
50	Monthly	Cylinder Head	a. Inspect cylinder head for any evidence of overheating such as discoloration or burn marks. If overheated, notify direct support maintenance.	Cylinder head shows evidence of overheating.
			b. Inspect cylinder head for damage such as dents or cracks. If damaged, notify direct support maintenance to replace it.	Cylinder head is damaged.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model F10000RD-Contiued

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable if:
51	Monthly	Engine Oil Pressure Switch	Inspect the switch for frayed or broken wire lead and evidence of leak. If wire lead is frayed or broken, notify unit maintenance to repair or replace it as necessary. If evidence of leaking found, notify unit maintenance to replace it.	Wire lead frayed or broken or class III leak is found.
52	Monthly	Engine Temperature Switch	Inspect the switch for frayed or broken wire lead and evidence of leak. If wire lead is frayed or broken, notify unit maintenance to repair or replace it as necessary. If evidence of leaking found, notify unit maintenance to replace it.	Wire lead frayed or broken or class III leak is found.

SECTION III. OPERATION UNDER USUAL CONDITIONS

2-4. ASSEMBLY AND PREPARATION FOR USE.

The refrigeration unit requires specialized unpacking, installation, and initial adjustment procedures. Notify unit maintenance for installation.

WARNING

Operating the refrigeration unit in a building or any enclosed area without the exhaust gases piped outside can result in serious illness or death.

NOTE

The refrigeration unit is designed to operate under adverse environmental conditions such as rain, snow, etc. in temperatures from 0° F to 125° F (-17° C to 520 C). The following startup procedures apply to operation in temperatures from 40° F to 104° F (4° C to 450 C). For temperatures outside this range, see operating instructions for unusual conditions.

2-5. STARTUP PROCEDURES. See figure 2-4.

CAUTION

Operating the refrigeration unit with the service valves improperly set will damage the equipment. Do not operate unless you are sure it has been properly set up for operation. Notify unit maintenance.

a. Be sure the refrigeration unit has been properly prepared and adjusted for operation.

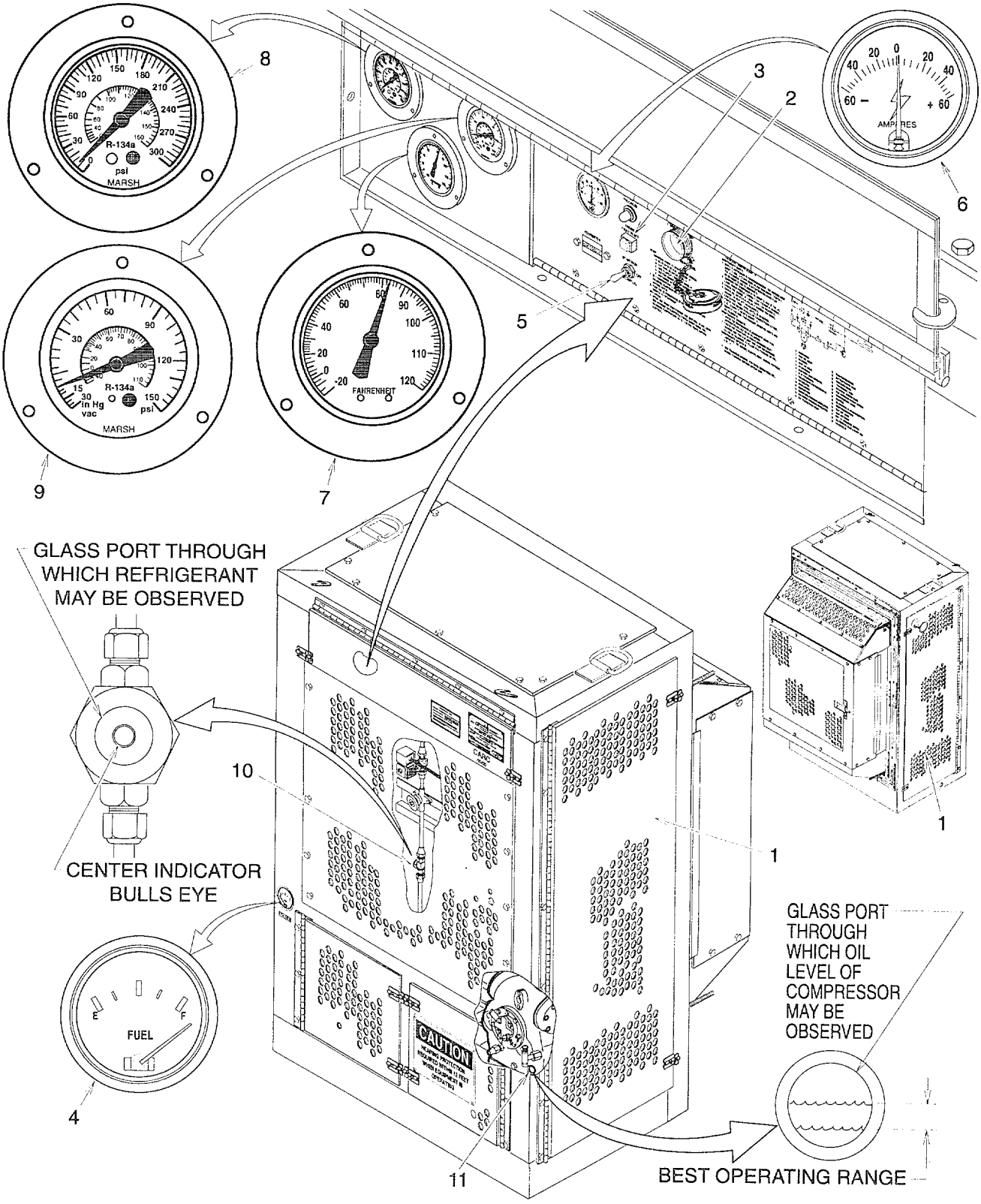


Figure 2-4. Operator Controls and Indicators

2-5. STARTUP PROCEDURES. - Continued

b. Perform all your "BEFORE" PMCS functions (table 2-1).

NOTE

Push switches in the side condenser door frames will prevent the refrigeration unit from operating if the side doors are open.

c. Be sure both side condenser doors (1) are closed and secured.

d. Set the remote bulb thermostat (TEMPERATURE CONTROL) (2) to the desired refrigerator enclosure temperature.

e. Be sure circuit breaker button (ENGINE FAULT RESET) (3) is pushed in (white band is not visible).

f. Be sure the FUEL GAGE (4) is indicating fuel level above 1/4.

WARNING

- The refrigeration unit engine produces dangerously high noise levels reaching 96 dB (A) at the service position. Approved hearing protection must be worn any time personnel are within 12 feet of an operating unit to avoid temporary or possibly permanent hearing damage.

- Engines have fast moving parts that can injure hands, fingers, etc. Take special care while in operation. Engine parts, particularly the exhaust system, can be very hot and cause severe burns. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on hot engine parts which could result in a fire.

g. Place the toggle switch (START/RUN, OFF, GLOW PLUG) (5) handle in the START/RUN position.

2-6. OPERATOR CHECKS. See figure 2-4.

a. Perform all your "DURING" PMCS functions (table 2-1).

b. Check the AMMETER (6) periodically to be sure it is indicating a positive (+) number.

NOTE

All checks must be performed when the DEFROST IN PROGRESS lamp is off.

c. Check the thermometer (REFRIGERATION TEMPERATURE) (7) periodically to be sure it is within 15° F (8° C) of the temperature set on the remote bulb thermostat (TEMPERATURE CONTROL) (2).

2-6. OPERATOR CHECKS. - Continued

d. Check the pressure gage (DISCHARGE PRESSURE) (8) periodically to be sure it is between 165 and 250 psi (1139 and 1725 kPa).

e. Check the compound gage (SUCTION PRESSURE) (9) periodically to be sure it is between 0 and 15 psi (0 and 104 kPa).

NOTE

An occasional flash of bubbles in the sight indicator (SIGHIT GLASS) port is normal. The sight indicator can be viewed looking through the side condenser door.

f. Check the sight indicator (SIGHT GLASS) (10) port to be sure it is clear. The center indicator should be green or chartreuse in color.

NOTE

Occasional bubbles in the compressor sight glass oil is normal. The sight glass can be viewed looking through the front bottom panel.

g. Check the compressor sight glass (11) port to be sure the oil is clear and the level is between 1/4 and 1/2 up the port.

h. Check the FUEL GAGE (4) periodically to be sure it is indicating a fuel level above 1/4.

2-7. SHUTDOWN PROCEDURES. See figure 2-4.

NOTE

If the refrigeration unit is to be left off for several days, it must be pumped down. Notify Unit Maintenance.

a. Place the toggle switch (START/RUN, OFF, GLOW PLUG) (5) handle in the OFF position.

b. When the refrigeration unit stops running, push the circuit breaker button (ENGINE FAULT RESET) (3) to put it in the off position (button extended with white band exposed).

c. Notify unit maintenance if the refrigeration unit is to be put into administrative storage for several days.

2-8. DECALS AND INSTRUCTION PLATES.

Decals and instruction plates are illustrated in the following figure.

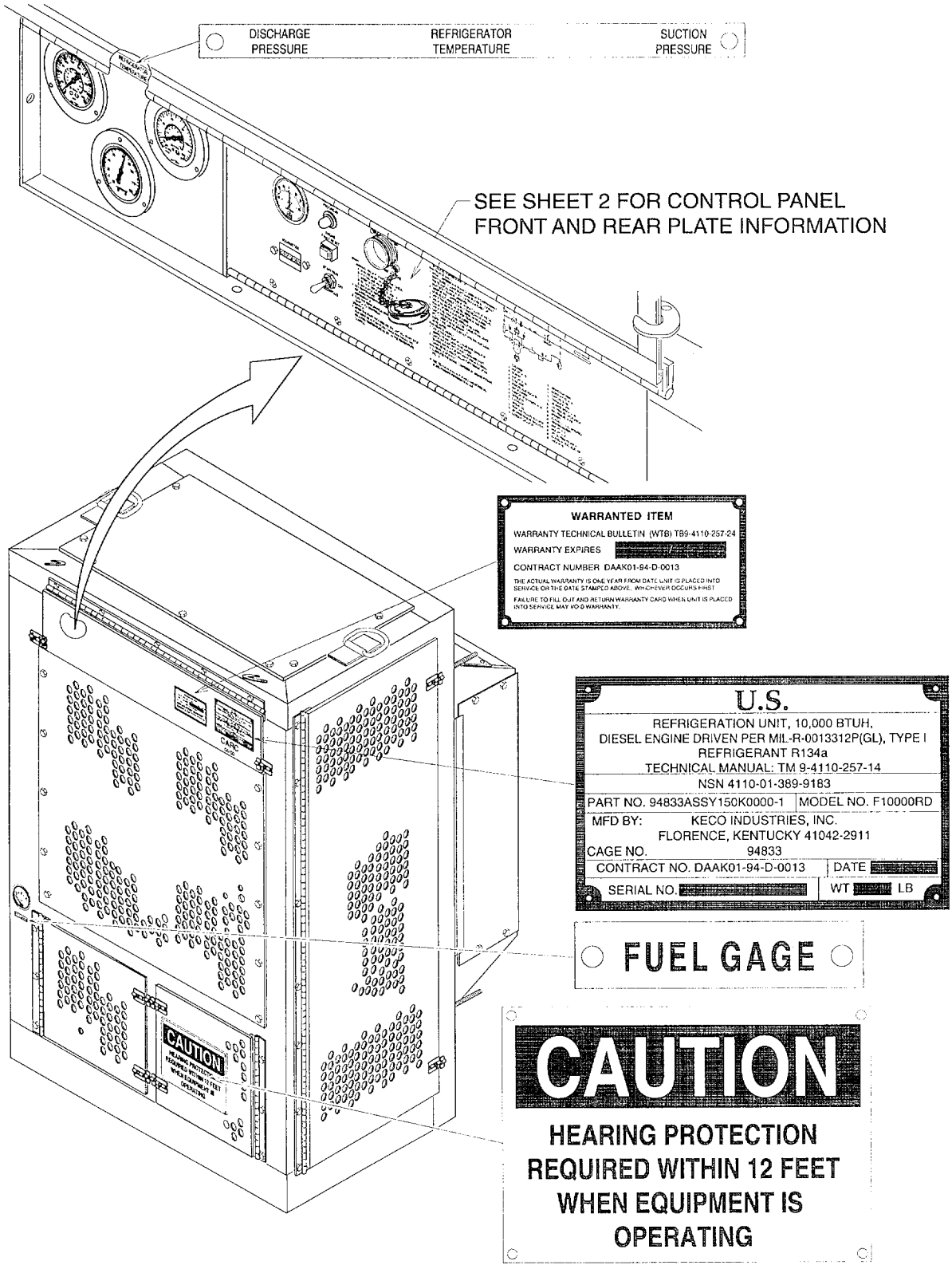
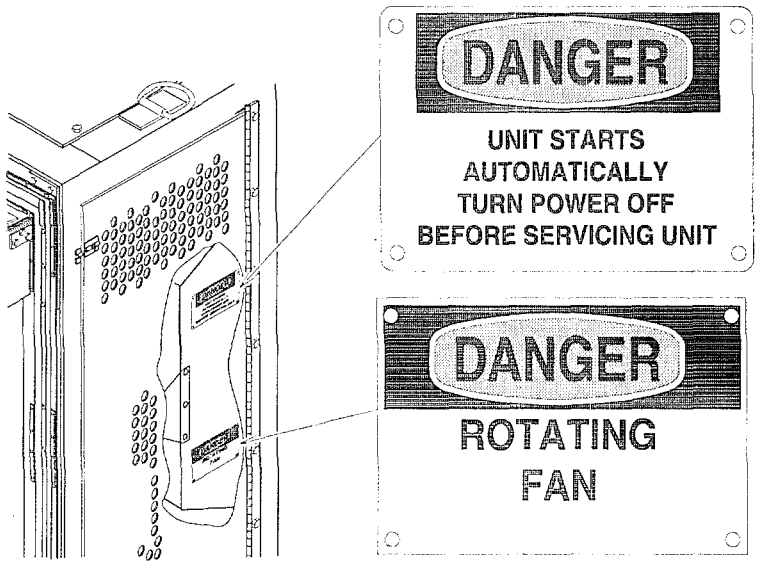
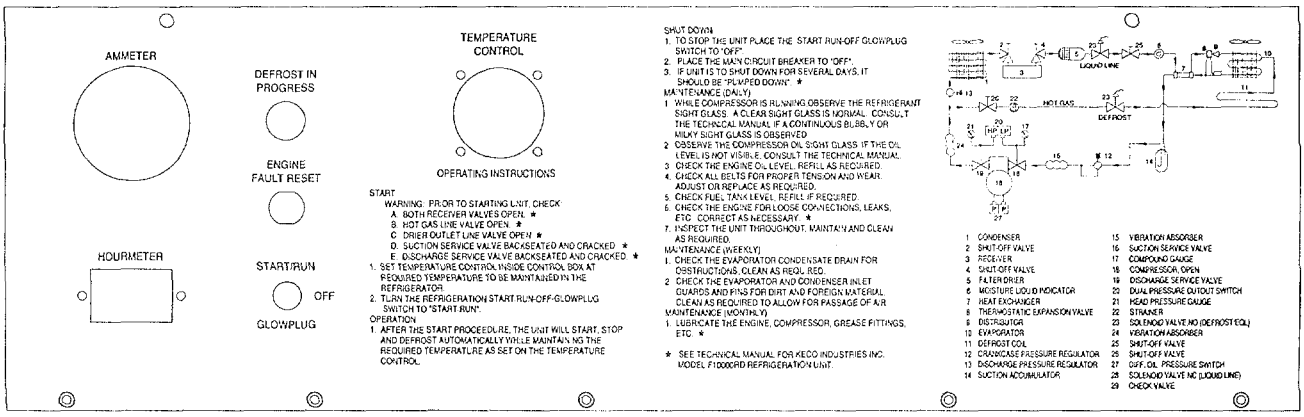


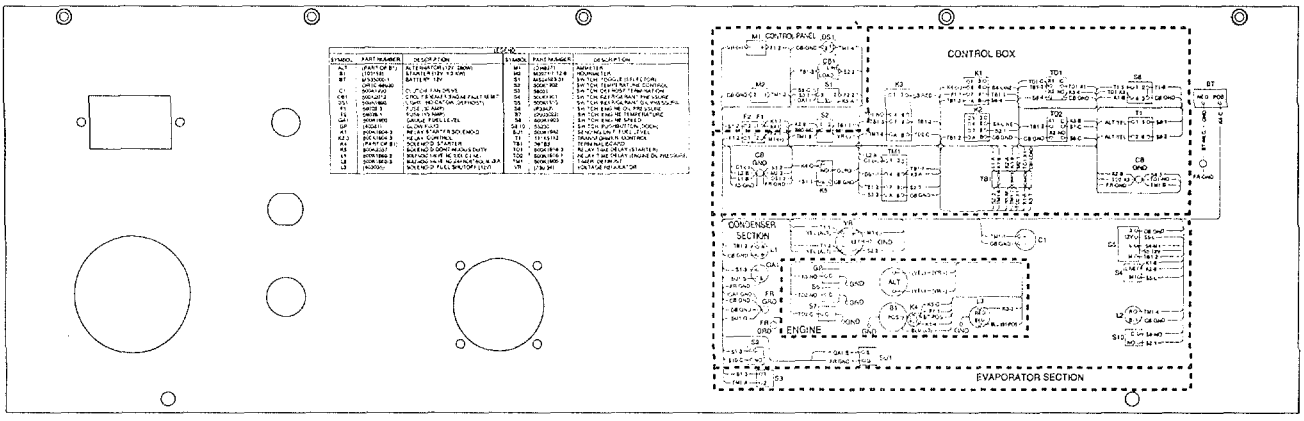
Figure 2-5. Decals and Instruction Plates (Sheet 1 of 2)



THE ABOVE TWO PLATES ARE INSTALLED ON BOTH SIDES OF FAN SHROUD



CONTROL PANEL FRONT



CONTROL PANEL REAR

Figure 2-5. Decals and Instruction Plates (Sheet 2 of 2)

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2-9. OPERATION UNDER INCILEMENT WEATHER.

The refrigeration unit is designed to operate under adverse environmental conditions such as rain, snow, etc. in temperatures from 0° F to 125° F (-17° C to 52° C). Follow the startup procedures given for usual conditions and apply the following procedures, as necessary, for operation in high temperatures (104° F to 125° F (45° C to 52° C)) and low temperatures (40° F to 0° F (4° C to -17° C)).

WARNING

- Operating the refrigeration unit in a building or any enclosed area without the exhaust gases piped outside can result in serious illness or death.
- The refrigeration unit engine produces dangerously high noise levels reaching 96 dB (A) at the service position. Approved hearing protection must be worn any time personnel are within 12 feet of an operating unit to avoid temporary or possibly permanent hearing damage.

a. Hot Weather (104° F to 125° F (45° C to 52° C)). Notify unit maintenance to drain and fill the engine with appropriate lubricating oil for hot weather.

b. Cold Weather (40° F to 5° F (40 C to -15° C)). Before placing the toggle switch (START/RUN, OFF, GLOW PLUG) (5, fig. 2-4) handle in the START/RUN position, place and hold in the GLOW PLUG position for 30 seconds.

c. Cold Weather (5° F to 0° F (-15° C to -17° C)).

(1) Notify unit maintenance to drain and fill the engine with appropriate lubricating oil for cold weather.

(2) Notify unit maintenance to drain and fill the fuel tank with appropriate fuel for cold weather.

(3) Before placing the toggle switch (START/RUN, OFF, GLOW PLUG) (5, fig. 2-4) handle in the START/RUN position, place and hold in the GLOW PLUG position for 30 seconds.

2-10. NBC DECONTAMINATION PROCEDURES.

The following emergency procedures can be performed until field NBC decon facilities are available. If NBC attack is known or suspected, mask at once and continue mission. If outside, follow decon procedures below to avoid taking contamination into controlled area. Do not unmask until told to do so.

NOTE

Detailed decontamination procedures can be found in: FM 3-3, FM 3-4, and FM 3-5.

a. Nuclear Decontamination. Brush fallout from skin, clothing and equipment with available brushes, rags, and tree branches. Wash skin and have radiation check made when tactical situation permits.

b. Biological Decontamination. Remain masked and continue mission until told to unmask.

2-10. NBC DECONTAMINATION PROCEDURES. - Continued

c. Chemical Detection and Decontamination.

WARNING

Some decontamination sprays can cause personal injury and should not be used on personnel.

(1) Contact your local chemical detachment or unit for proper use of decontamination equipment.

(2) If exposure to liquid agent is known or suspected, clean exposed skin, clothing, personal gear, and equipment, in that order, using M258A1 kit. Use the buddy system. Wash exposed skin and thoroughly decontaminate when tactical situation permits.

(3) Use M8 paper from the M256 Chemical Agent Detector Kit or M9 paper to determine if liquid agent is present on the equipment.

(4) If the M8 or M9 paper indicates that liquid chemical agent is present on the equipment, use the NBC-M11 decon apparatus to decon equipment.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

			Page
SECTION I		LUBRICATION	3-1
	3-1	Lubrication	3-1
SECTION II		TROUBLESHOOTING PROCEDURES	3-1
	3-2	Troubleshooting	3-1
SECTION III		OPERATOR'S MAINTENANCE INSTRUCTIONS	3-5
	3-3	General	3-5
	3-4	Cleaning	3-6

SECTION I. LUBRICATION

3-1. LUBRICATION.

Operator lubrication not required.

SECTION II. TROUBLESHOOTING PROCEDURES

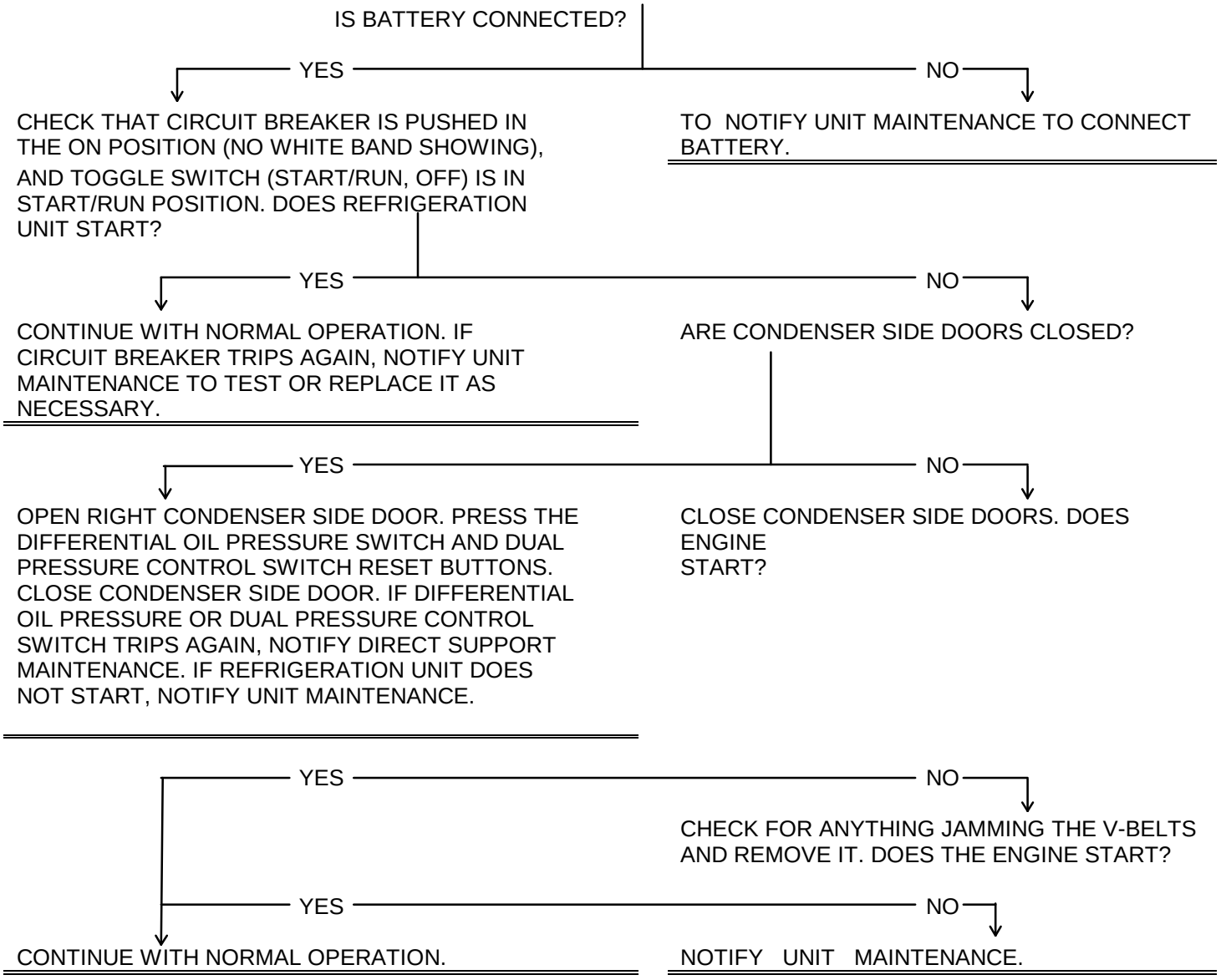
3-2. TROUBLESHOOTING.

The following procedures are listed in order of the most probable malfunctions. Each malfunction is followed by test or inspection procedures in logical order to isolate and identify the fault and actions required to correct it. This section cannot list all the possible malfunctions that may occur with the equipment. If a malfunction occurs that is not listed or actions listed do not correct a malfunction, notify your supervisor.

MALFUNCTION INDEX

	Troubleshooting Procedure Para
Engine does not start	3-2, a.
Thermometer (REFRIGERATOR TEMPERA.TURE) indicates more than 15°F above remote bulb thermostat (TEMPERATURE CONTROL) setting	3-2, b.
Pressure Gage (DISCHARGE PRESSURE) indicates above 250 psi (1725 kPa)	3-2, c.
Pressure Gage (DISCHARGE PRESSURE) indicates below 165 psi (1138.5 kPa)	3-2, d.
Compound Gage (SUCTION PRESSURE) indicates above 15 psi (103.5 kPa)	3-2, e.
Compound Gage (SUCTION PRESSURE) indicates below 0 psi (0kPa)	3-2, f.

a. Engine Does Not Start.



b. Thermometer (REFRIGERATOR TEMPERATURE) Indicates More Than 15°F (7°C) Above Remote Bulb Thermostat (TEMPERATURE CONTROL) Setting.

IS THE REFRIGERATION UNIT RUNNING?

YES	NO
CHECK READINGS ON PRESSURE AND COMPOUND GAGES. IF READINGS ARE ABOVE OR BELOW NORMAL OPERATING RANGE, SEE APPROPRIATE TROUBLE SHOOTING PROCEDURE. IF THE INDICATED TEMPERATURE IS STILL NOT WITHIN RANGE, NOTIFY UNIT MAINTENANCE.	START REFRIGERATION UNIT (PARA 2-5).

c. Pressure Gage (DISCHARGE PRESSURE) Indicates Above 250 psi (1725 kPa). At start up and/or operation in high ambient temperatures, pressures above 250 psi (1725 kPa) are possible.

IS THE CONDENSER GUARD OBSTRUCTED?

YES	NO
SHUT DOWN THE REFRIGERATION UNIT (PARA 2-7) AND CLEAR THE OBSTRUCTION. IF OBSTRUCTION CANNOT BE CLEARED, NOTIFY UNIT MAINTENANCE TO CLEAR IT.	NOTIFY UNIT MAINTENANCE.

d. Pressure Gage (DISCHARGE PRESSURE) Indicates Below 165 psi (1138.5 kPa). During operation in low ambient temperatures, pressures below 165 psi (1.138.5 kPa) are possible.

NOTIFY UNIT MAINTENANCE.

e. Compound Gage (SUCTION PRESSURE) Indicates Above 15 psi (103.5 kPa). At start up and/or operation in high ambient temperatures, pressures above 15 psi (103.5 kPa) are possible.

IS REFRIGERATOR ENCLOSURE DOOR OPEN?

YES	NO
CLOSE REFRIGERATOR ENCLOSURE DOOR.	NOTIFY UNIT MAINTENANCE.

f. Compound Gage (SUCTION PRESSURE) Indicates Below 0 psi (0 kPa). At start up, shut down, or operation in low ambient temperatures, pressures below 0 psi (0 kPa) are possible.

IS THE EVAPORATOR COIL GUARD OBSTRUCTED?

YES → SHUT DOWN THE REFRIGERATION UNIT (PARA 2-7) AND CLEAR THE OBSTRUCTION. IF OBSTRUCTION CANNOT BE CLEARED, NOTIFY UNIT MAINTENANCE TO CLEAR IT.

NO → NOTIFY UNIT MAINTENANCE.

SECTION III. OPERATOR'S MAINTENANCE PROCEDURES

INDEX

	Para
ENCLOSURE	
General	3-5
Cleaning	3-6

3-3. GENERAL.

With the exception of service and inspection procedures noted in the PMCS table 2-1, the following maintenance procedure is the only one authorized to the operator.

3-4. CLEANING.

This task covers: Cleaning

INITIAL SETUP

Equipment Conditions:

Refrigeration unit shut down (para 2-7).
Doors open as necessary.

Materials/Parts:

Detergent
4, Appendix E
Rag
3, Appendix E

General Safety Instructions:

WARNING

Exposed rotating parts are contained in the refrigeration unit. Personal injury can result if not shut down.

Cleaning.

(1) Mix a small quantity of detergent with clean water to make a wash solution.

(2) Dampen a rag with wash solution and clean the equipment.

(3) Dampen a rag with clean water and rinse the equipment. Rinse rag in clean water and continue until all detergent residue has been removed.

(4) Wipe the equipment with a clean dry rag until thoroughly dry.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

SECTION I. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TESTMEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EOUIPMENT.

a. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

b. The Automotive Vehicle Shop Equipment (1) (SC 5180-90-CL-N18) tool kit will be used for all maintenance tasks. Any additional tools required for an individual maintenance task will be identified in the setup information for that task.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EOUIPMENT.

a. The Repair Parts and Special Tools List (RPSTL) (TM 9-4110-257-24P) as well as the Maintenance Allocation Chart (MAC) (appendix B) identify any tools and support equipment needed to maintain the refrigeration unit.

b. There are no special or fabricated tools required to maintain the refrigeration unit.

4-3. REPAIR PARTS.

a. Any mandatory replacement parts needed for the maintenance tasks are identified in the mandatory replacement parts list located in Appendix G.

b. Repair parts are listed and illustrated in the repair parts and special tools list (TM 9-4110-257-24P) covering unit maintenance for this equipment.

SECTION II. SERVICE UPON RECEIPT

4-4. SITE AND SHELTER REOUIREMENTS.

a. The refrigerator enclosure must have an accessible wall area 4 feet (1.2 meters) wide and 5 (1.5 meters) feet high to accommodate the refrigeration unit and mounting angles.

b. The refrigeration unit weighs 1200 lb (544 Kg). The refrigerator enclosure wall must be strong enough to support this weight.

4-5. SERVICE UPON RECEIPT OF MATERIAL.

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

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

4-6. INSTALLATION INSTRUCTIONS.

a. Tools and Equipment. Tools required to install the refrigeration unit include a wrench for tightening the mounting angles, lifting sling(s), spreader-bar (if needed), and hoist or similar lifting device.

b. Refrigerator Enclosure Preparation. The refrigerator enclosure must have an opening 38.00/38.06 inches (96.52/96.67 cm) wide and 55.00/55.06 inches (139.70/139.85 cm) high (fig. 4-1) to insert the refrigeration unit. If an opening does not already exist in the enclosure, see the enclosure manual for information on making such an opening.

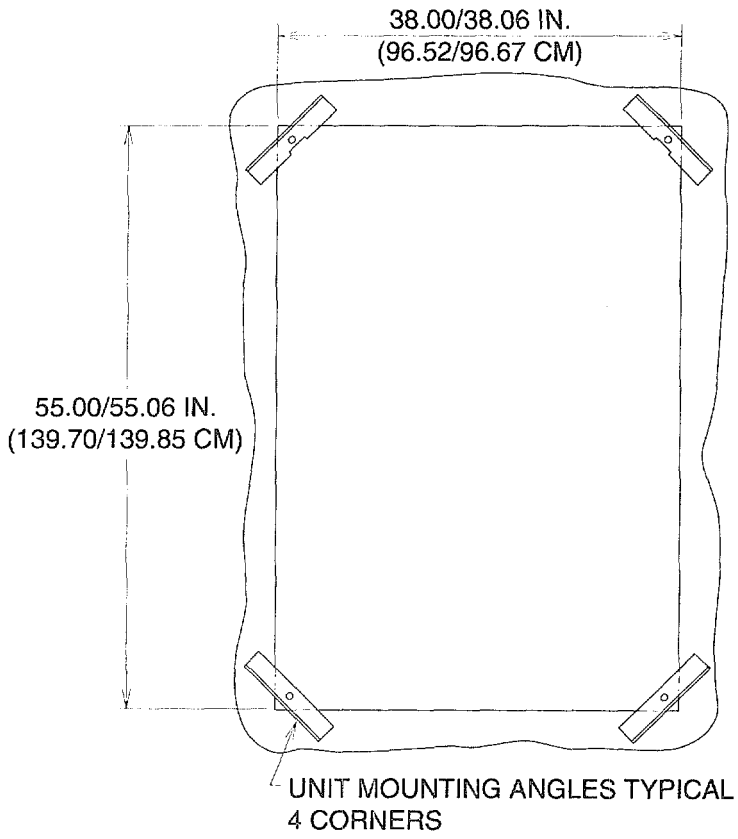


Figure 4-1. Wall Opening Dimensions

c. Installation.

(1) Remove four nuts (1, fig. 4-2), lock washers (2), and unit mounting angles (3) if attached to the refrigeration unit. If the mounting hardware is not attached, locate it now.

(2) Attach the sling(s) (4) to the lifting rings (5).

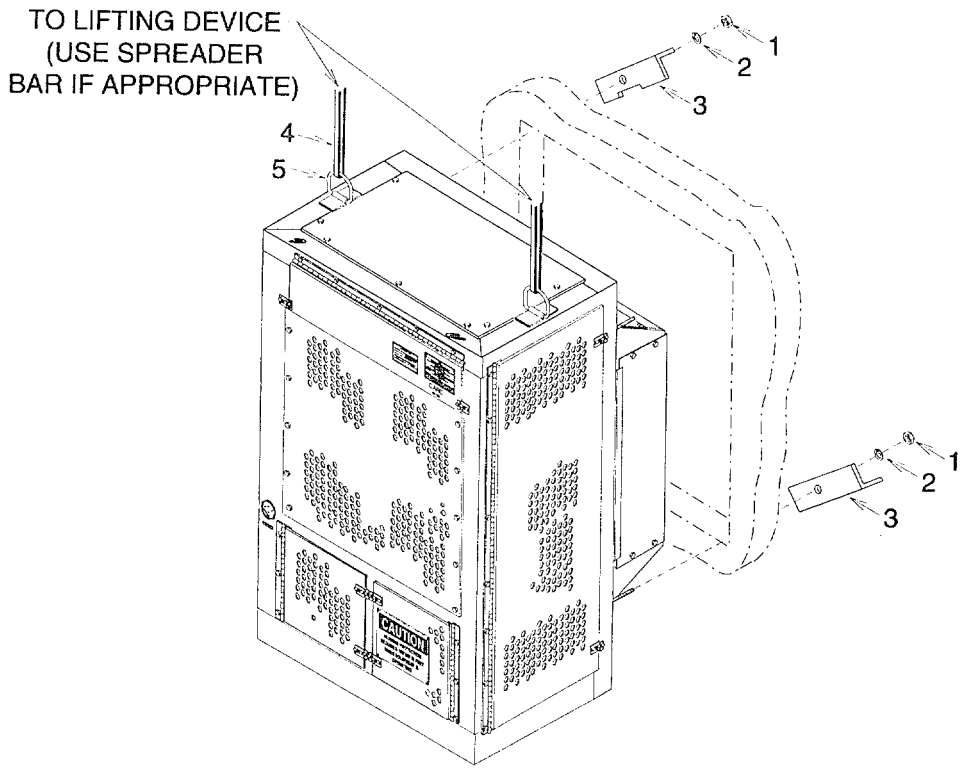


Figure 4-2. Installation

CAUTION

Failure to use a spreader bar or two point lifting device, such as a fork lift, can cause damage to the condenser frame when lifted.

(3) If a single point lifting device is being used, install the spreader bar onto the sling(s) (4) at approximate mid-way point.

WARNING

The refrigeration unit can swing and move when lifted. Personal injury can result if standing near unit when it is lifted.

(4) Connect a hoist or similar lifting device to the sling(s) (4) and lift the refrigeration unit.

(5) Carefully position the refrigeration unit into the refrigerator enclosure opening.

NOTE

The two mounting angles with notches must go on top.

(6) Secure the refrigeration unit to the refrigerator enclosure using four unit mounting angles (3), lock washers (2), and nuts (1).

(7) Remove sling(s) (4).

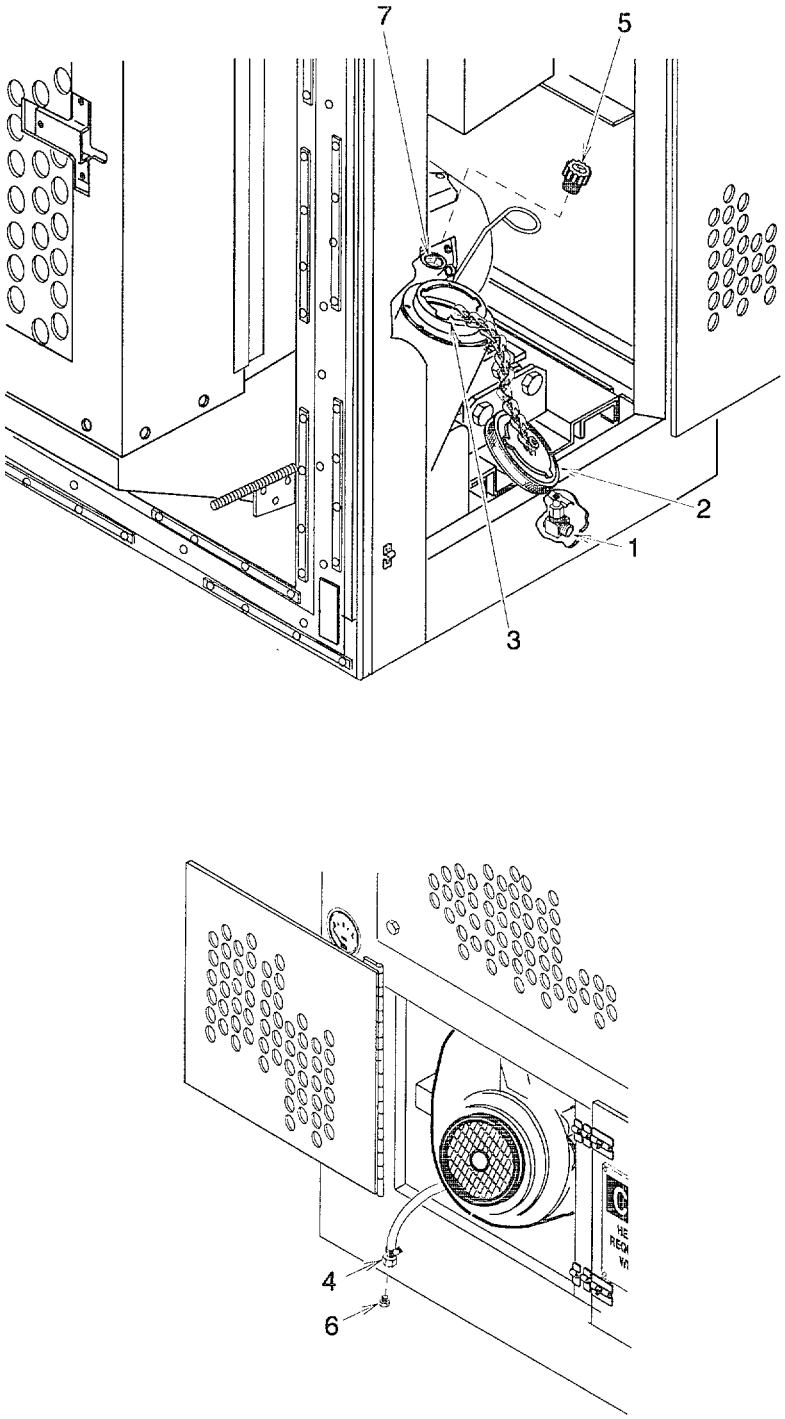


Figure 4-3. Unit Preparation

4-7. PRELIMINARY SERVICING OF EOUIPMENT.

a. Open both side condenser doors and both front bottom doors.

b. Connect Battery Cables (para 4-35).

c. Drain Fuel Tank. The fuel tank may contain residual fuel of questionable quality or preservative oil that must be removed before filling with fresh fuel.

(1) Place drain pan under shut-off cock (1, fig. 4-3).

(2) Loosen shut-off cock (1) and wait for all fuel or preservative oil to drain out. Contact your local environmental officer for guidance on how to properly dispose of fuel or preservative oil in accordance with local regulations.

(3) Tighten shut-off cock (1).

WARNING

- Splashes and spills of fuel can cause eye injury and skin irritation. Wear face shield and approved gloves when handling fuel.
- Immediately remove any articles of clothing or shoes that have become soaked with fuel. Stay in an area free from ignition sources until clothing has been removed.

(4) Remove cap (2) and fill fuel tank (3) with 16 gal. (61 1) fuel (28, appendix E) if operating temperatures are 0° F to 5° F (-18° C to -15° C), or (27, appendix E) if operating temperatures are 5° F to 120° F (-15° C to 49° C).

(5) Install cap (2).

d. Drain and Fill Engine Crankcase. The engine contains preservative oil that must be drained and replaced with the appropriate lubricating oil for the operating conditions.

(1) Place drain pan under engine drain hose (4).

(2) Remove plug (5) and plug (6). Wait for all preservative oil to drain out. Contact your local environmental officer for guidance on how to properly dispose of preservative oil in accordance with local regulations.

(3) Clean plug (6) and drain hose (4) end with a wiping rag (3, appendix E) and install the plug.

(4) Fill engine (7) with 1.9 qt. (1.8 1) lubricating oil (25, appendix E) if operating temperatures are 0° F to 5° F (-18° C to -15° C), or (5, appendix E) if operating temperatures are 5° F to 104° F (-15° C to 40° C), or (26, appendix E) if operating temperatures are 104° F to 120° F (40° C to 49° C).

(5) Install plug (5).

e. Check and adjust V-belts as necessary (para 4-38).

CAUTION

Using excessive force when opening or closing valves can cause damage to the valve seats.

f. Refrigeration System Valves. The refrigeration system has been pumped down and the valves must be properly positioned before operating the refrigeration unit.

(1) Fully open both stop valves (1, fig. 4-4) and (2).

(2) Remove two caps (3) and fully open two isolation valves (4). Install two caps.

NOTE

The compressor shut off valves can be adjusted to three positions, fully closed to block the refrigerant tubes and isolate the compressor and service port, fully open to allow flow from piping to compressor but not the service port, and cracked (one turn closed from fully open) to allow flow from piping to compressor and service port on valve.

(3) Remove two caps (5) and fully open two shut off valves (6). Install two caps.

g. Close both side condenser doors and both front bottom doors.

4-8. PRELIMINARY ADJUSTMENT OF EOUIPMENT.

a. Open control panel cover and secure open with door holder clips.

b. Remove two bolts (1, fig. 4-5) and lock washers (2). Open the control box cover (3). Discard lock washers.

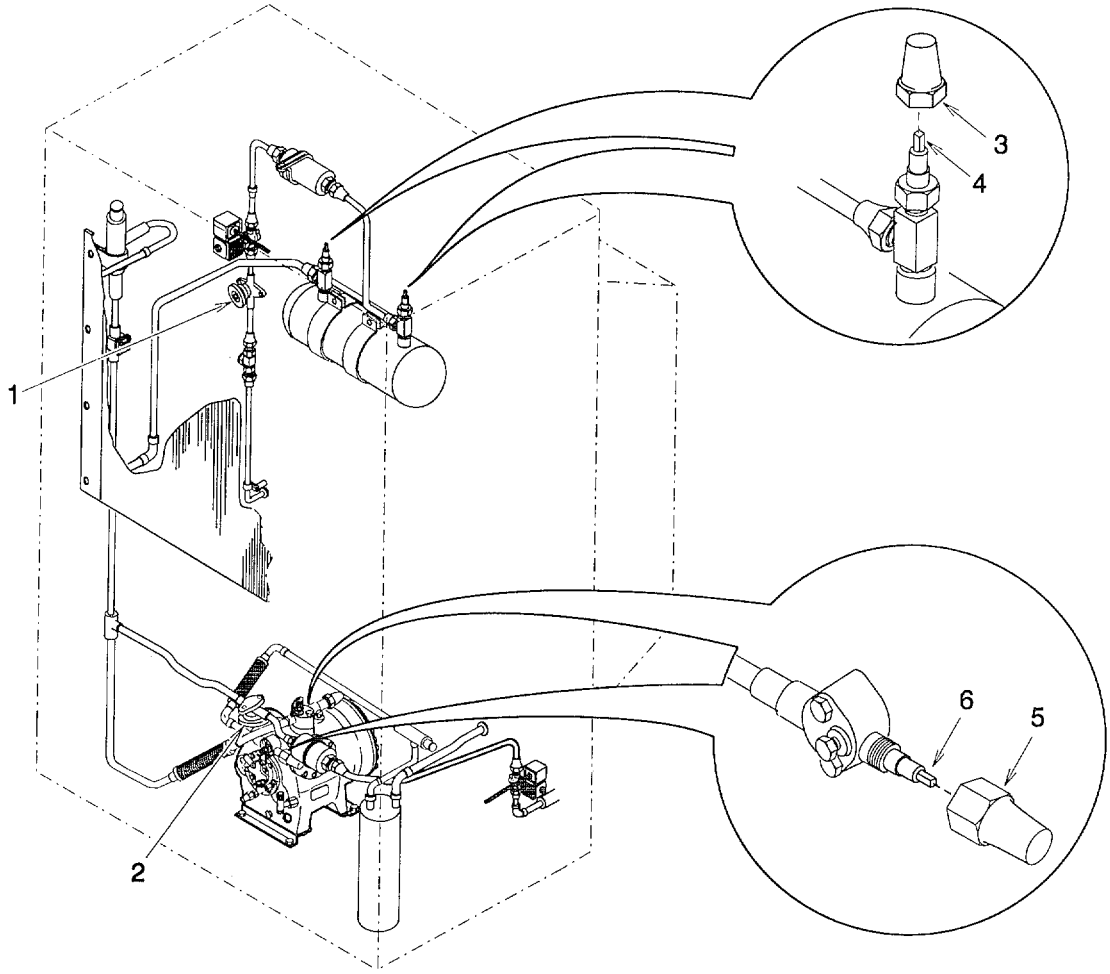


Figure 4-4. Refrigeration Valve Settings for Normal Operation

4-8. PRELIMINARY ADJUSTMENT OF EOUIPMENT. - Continued

NOTE

- The repeat cycle timer controls are marked T1 and T2. Control T1 adjusts the length of time the refrigeration unit will operate continuously before initiating a defrost cycle. Control T2 adjusts the maximum length of time the refrigeration unit will remain in the defrost cycle.

- The timer scales indicate an approximate percentage of time based upon a 24 hours. For example, to set the timer for 6 hours, adjust the control to 25% (6 hours is 25% of 24 hours).

- The timer controls have a minimum setting of 14 minutes when set at 0%.

c. Adjust the repeat cycle timer (4) control T1 to approximately 25% (6 hours) and control T2 to approximately 2% (30 minutes). This is the recommended factory setting, however, the controls can be set as desired to best suit the operating conditions.

d. Close the control box cover (3). Install two bolts (1) with new lock washers (2) (1, appendix G).

e. Close and secure the control panel cover.

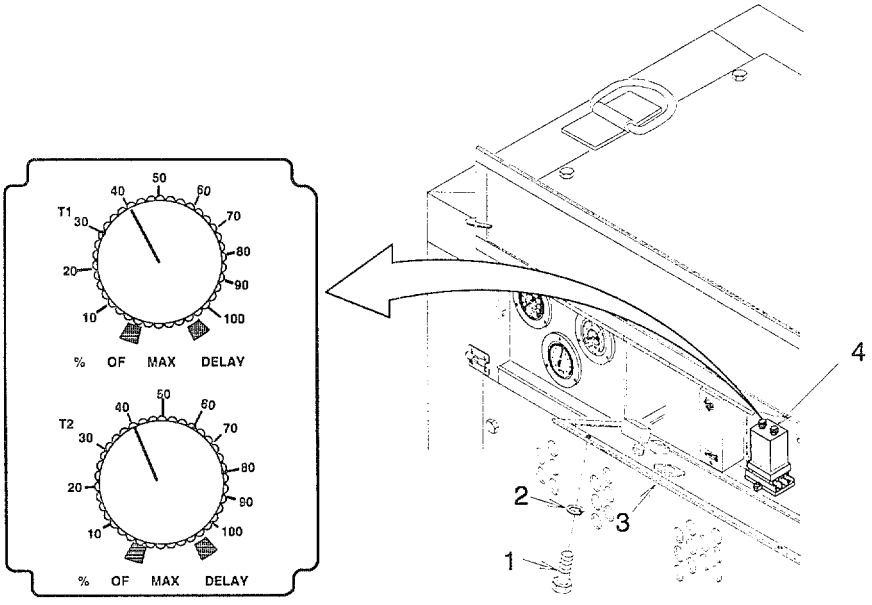


Figure 4-5. Defrost Timer Adjustment

SECTION III. UNIT PREVENTIVE MAINTENANCE CHECKSAND SERVICES (PMCS)

4-9. LUBRICATION.

The lubrication instructions and hardtime intervals contained in Figure 4-6 are mandatory. This refrigeration unit is not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS APPLY.

4-10. GENERAL.

Preventive Maintenance Checks and Services (PMCS) are essential to the efficient operation of the refrigeration unit and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Intervals are determined by hours in operation expressed in applicable units of measure. The Preventive Maintenance Checks and Services Table 4-1 lists procedures done first or most frequently.

a. Warnings and Cautions. Always observe the warnings and cautions appearing in your PMCS Table. Warnings and cautions appear before applicable procedures. You must observe these warnings and cautions to prevent serious injury to yourself and others or prevent your equipment from being damaged.

b. Explanation of Table Entries.

(1) Item Number Column. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

(2) Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment. When a check and service procedure is required for both WEEKLY and BEFORE intervals, it is not necessary to do the procedure twice if the equipment is operating during the WEEKLY period.

(3) Location, Check/Service Column. This column provides the location and the item to be checked or serviced. The item location is underlined.

(4) Procedure Column. This column gives the procedure you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

(5) Not Fully Mission Capable If: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you made a check and service procedure that shows faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

4-10. GENERAL.. - Continued

	LUBRICANT	INTERVAL
FLANGE BEARINGS (TWO EACH) (O)	GGP	M
DOOR HINGE (O)	OE/HDO-15/40	M
BARREL BOLTS (TWO EACH) (O)	OE/HDO-15/40	M
DOOR HINGE (O)	OE/HDO-15/40	M
DOOR HINGE (TWO EACH) (O)	OE/HDO-15/40	M
BARREL BOLTS (TWO EACH DOOR) (O)	OE/HDO-15/40	M
IDLER SHAFT PULLEY (O)	GGP	M
DOOR HINGE (O)	OE/HDO-15/40	M
BARREL BOLTS (TWO EACH) (O)	OE/HDO-15/40	M

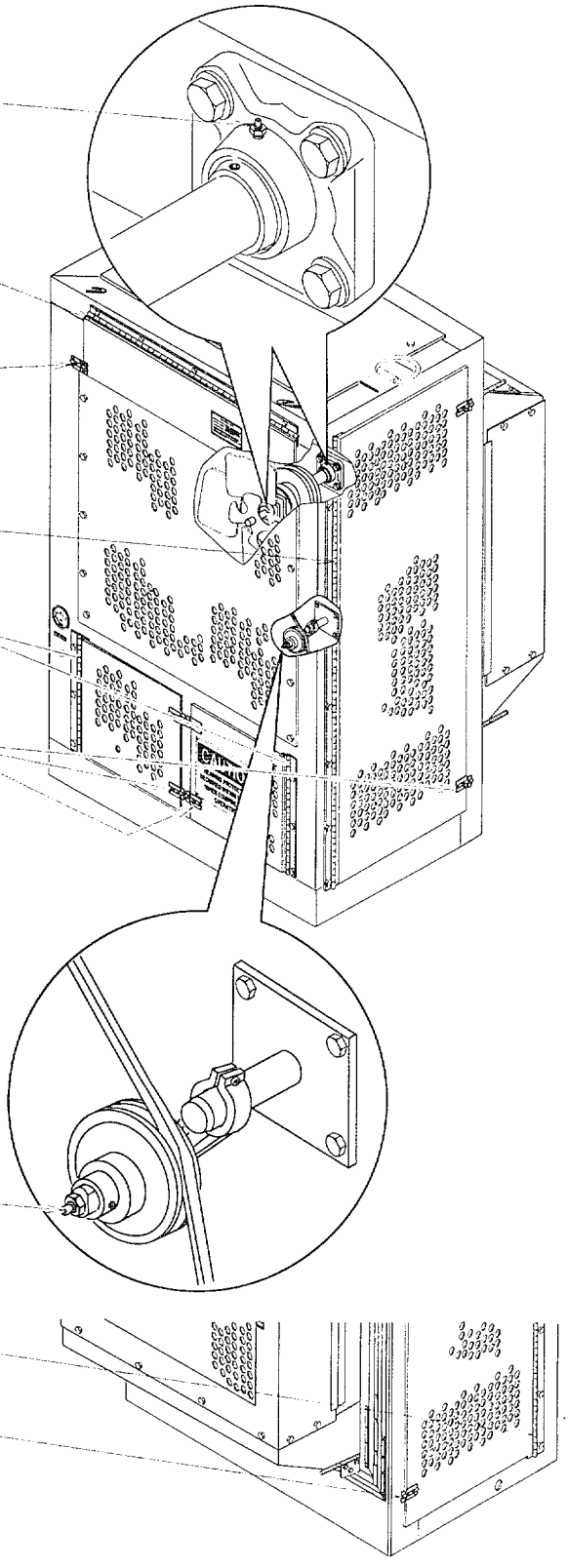
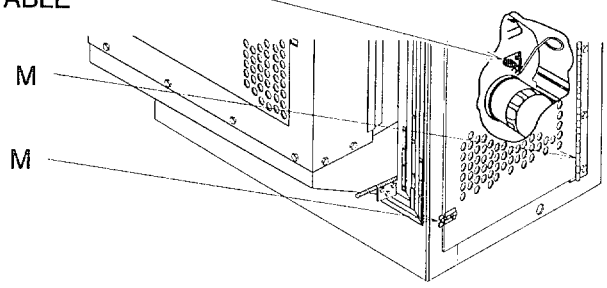


Figure 4-6. Lubrication (Sheet 1 of 2)

	LUBRICANT	INTERVAL
ENGINE CRANKCASE OIL (O)	SEE LUBRICANT TABLE	SEE LUBRICANT TABLE
DOOR HINGE (O)	OE/HDO-15/40	M
BARREL BOLTS (TWO EACH) (O)	OE/HDO-15/40	M



LUBRICANT TABLE

Temperature Range	Lubricant Mil. Symbol (NATO Code) Specification	Capacity	Interval	Man-hour
0^{O} F to 5^{O} F (-18^{O} F to -15^{O} C)	OE/HDO-10 (0-237) MIL-L-2104	1.9 qt (1.8 l)	50 H (initial break-in), 200 H (thereafter)	0.5
5^{O} F to 104^{O} F (-15^{O} F to 40^{O} C)	OE/HDO-15/40 (0-1236) MIL-L-2104	1.9 qt (1.8 l)	50 H (initial break-in), 200 H (thereafter)	0.5
104^{O} F to 120^{O} F (40^{O} F to 49^{O} C)	OE/HDO-50 (N/A) MIL-L-2104	1.9 qt (1.8 l)	50 H (initial break-in), 200 H (thereafter)	0.5

Figure 4-6. Lubrication (Sheet 2 of 2)

4-10. GENERAL. - Continued

c. Special Information Paragraphs.

(1) Corrosion Prevention Control. If a corrosion problem is identified, it can be reported using Standard Form 368, Production Quality Deficiency Report. The form should be submitted to the address specified in DA Pam 738-750. This will result in more definitive actions be taken to prevent future occurrences.

(2) Leakage Definition for Unit PMCS. It is necessary for you to know how fluid leakage affects the status of your refrigeration unit. Oil is carried with the refrigerant as it flows through the refrigeration system. If a leak develops in the system, the oil will seep out and soak the copper tubing around the leak or drip and soak or puddle on the frame or other component below the leak. If any oil or seepage is found, a refrigerant leak would be suspected.

(a) Class I. Class I is defined as seepage of fluid (as indicated by wetness or discoloration) but not great enough to form drops.

(b) Class II. Class II is defined as leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(c) Class III. Class III is defined as leakage of fluid great enough to form drops that fall from item being checked/inspected.

INITIAL SETUP

Tools:

Fin Comb
2, Section III, Appendix B

Materials/Parts:

Wiping Rag
3, Appendix E
Detergent
4, Appendix E
Lubricating Oil (Grade 15/40)
5, Appendix E
Lubricating Oil (Grade 10)
25, Appendix E
Lubricating Oil (Grade 50)
26, Appendix E
Multipurpose Grease
6, Appendix E

General Safety Instructions:

WARNING

Exposed rotating parts are contained in the refrigeration unit. Personal injury can result if battery is connected.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD

NOTE

- If the equipment must be kept in continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the equipment is shut down.
- The hourly intervals listed represent actual engine operation as indicated on the hourmeter.

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable if:
1	8 Hours	Refrigeration Unit Interior Air Cleaner	**WARNING** NOTE The refrigeration unit must be shut down with the battery disconnected, the left side condenser door, and left front bottom door must be open for the following 8 hour PMCS. Service the air cleaner by removing and cleaning it using compressed air. a. Shut down refrigeration unit (para 2-7) and disconnect battery (para 4-35). b. Open left side condenser door and left front bottom door. c. Loosen clamp and remove air cleaner.	Air cleaner is missing or clogged.

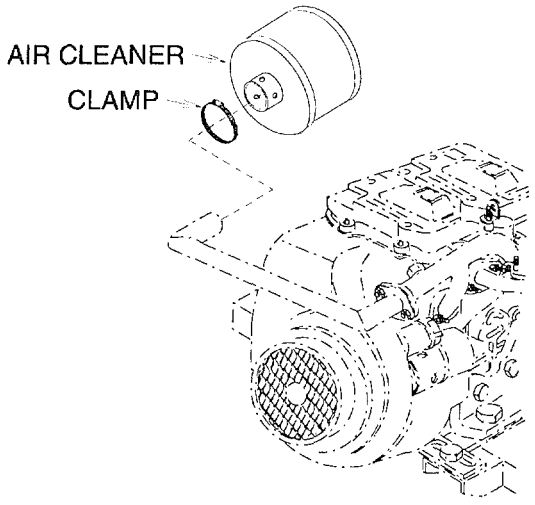


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
1 - Cont			**WARNING** Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psig (207 kPa). When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes. d. Using compressed air at 30 psig (207 kPa) or less, blow dirt out of air cleaner. e. Install air cleaner and tighten clamp.	
2	8 Hours	Engine Oil	Service the engine oil by checking and refilling if necessary with appropriate oil (fig. 4-6). a. Remove dipstick rod and wipe oil from end. Install and remove again. Check that oil level indicated is between minimum and maximum marks. Add oil if necessary.	Engine oil level is below minimum mark on dipstick rod.

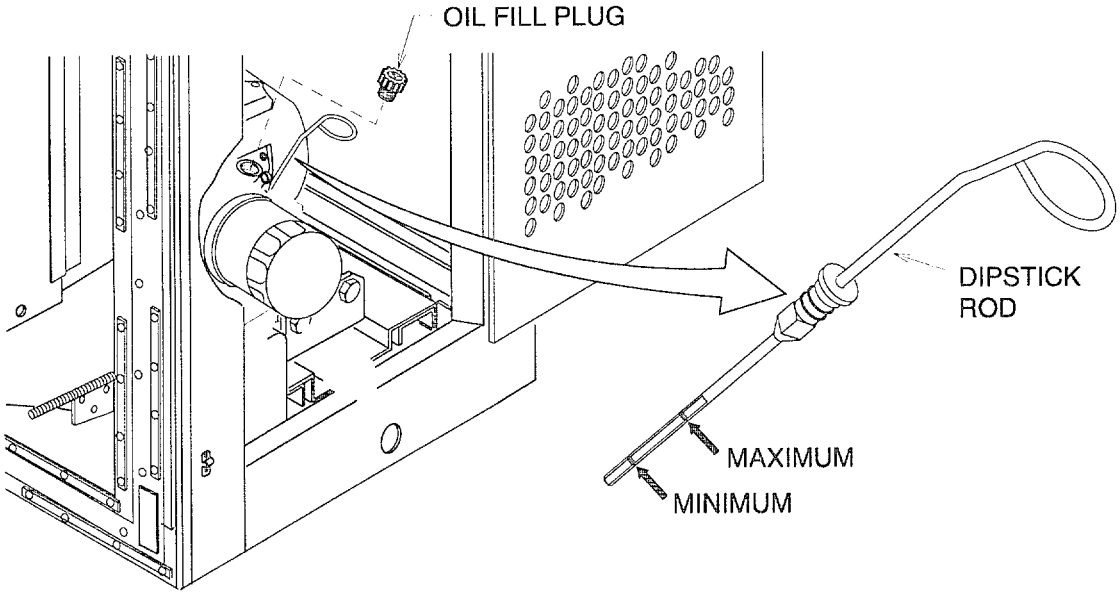


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
2 - Cont			(1) Remove oil fill plug. (2) Add appropriate oil as necessary to bring level up to within minimum and maximum marks. (3) Install oil fill plug. b. Close left front bottom door and left side condenser door. c. Connect battery (para 4-35) and put unit back into service.	
3	100 Hours	Engine Cooling Fins and Flywheel Vanes	Service the engine cooling fins and flywheel vanes by cleaning them using compressed air. a. Shut down refrigeration unit (para 2-7) and disconnect battery (para 4-35). b. Open left side condenser door and left front bottom door. c. Loosen clamp and remove air cleaner. d. Remove two screws, flat washers, and casing.	Cooling fins clogged.

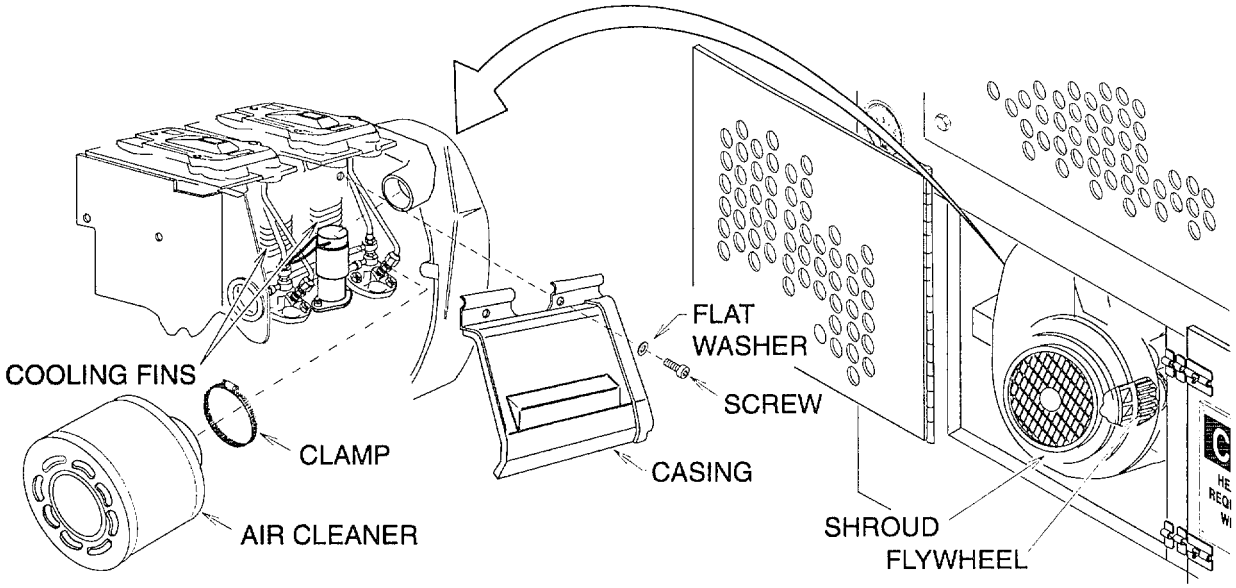


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
3 - Cont			**WARNING** Injury to personnel can result if compressed air used for cleaning purposes exceeds 30 psig (207 kPa). When using compressed air, wear safety glasses or goggles. Dirt can be blown into your eyes. e. Using compressed air at 30 psig (207 kPa) or less, blow dirt out of cooling fins and flywheel vanes. f. Install casing, two flat washers, and screws. g. Install air cleaner and tighten clamp. h. Close left front bottom door and left side condenser door. i. Connect battery (para 4-35) and put unit back into service. **NOTE** The refrigeration unit must be shut down with the battery disconnected, both side condenser doors, and both front bottom doors must be open for the following 200 hour PMCS.	
4	200 Hours	Air Cleaner	a. Shut down refrigeration unit (para 2-7) and disconnect battery (para 4-35).	

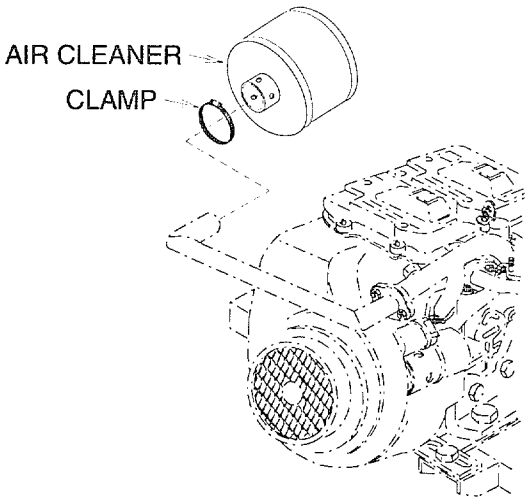


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

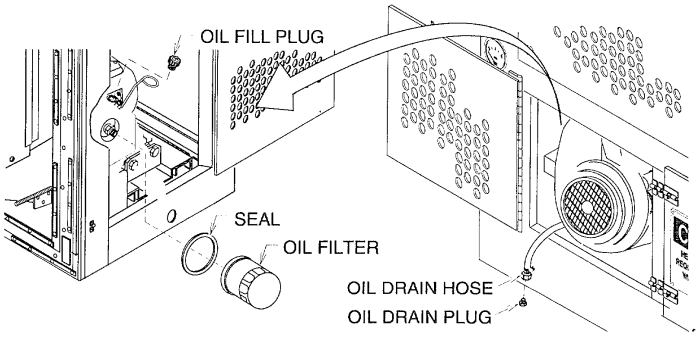
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
4-Cont			b. Open both side condenser doors and both front bottom doors. c. Service the air cleaner by replacing it. (1) Loosen clamp and remove air cleaner. (2) Install clamp onto new air cleaner. (3) Install new air cleaner and tighten clamp.	
5	200 Hours	Engine Oil	Service the engine oil by draining and refilling with appropriate oil (fig. 4-6). a. Remove oil fill plug.	
				
			b. Place drain pan under oil drain hose. c. Remove oil drain plug and allow oil to drain completely. d. Remove oil filter. e. Contact your local environmental officer for guidance on how to properly dispose of used oil and oil filter in accordance with local regulations. f. Lubricate new seal with oil then install new seal and oil filter.	

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
5 - Cont			g. Install oil drain plug and fill engine with appropriate grade and quantity of oil. h. Install oil fill plug.	
6	200 Hours	Fuel Filters	Service the fuel filters by replacing them (para 4-55 and 4-62).	
7	200 Hours	V-Belts	Service the V-Belts by checking and adjusting tension as necessary (para 4-38). **NOTE** The engine must be removed for the following 200 hour PMCS.	V-Belts are loose.
8	200 Hours	Engine Rocker arm	Service the rocker arm by checking the clearance between the rocker arm and valve and adjusting if necessary. a. Notify direct support maintenance to remove engine, check and adjust the rocker arm to valve clearance as necessary, and install engine. b. Close both front bottom doors and both side condenser doors. c. Connect battery (para 4-35) and put unit back into service.	

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			NOTE The engine must be removed for the following 500 hour PMCS.	
9	500 Hours	Injector Nozzles	Service the injector nozzles by removing, cleaning, and testing them. Notify direct support maintenance to remove engine then clean and test the injector nozzles.	
10	500 Hours	Injection Pumps	Service the injection pumps by testing and adjusting the injection timing. Notify direct support maintenance to test and adjust the injection pumps then install engine.	
			NOTE The engine must be removed for the following 2500 hour PMCS.	
11	2500 Hours	Cylinder Head Valve Seats	Service the valve seats by removing the cylinder head and testing them for air leaks. Notify direct support maintenance to remove engine, cylinder head, test the valve seats, and install engine.	
			NOTE The engine must be removed for the following 5000 hour PMCS.	
12	5000 Hours	Engine	The engine must be replaced with a new or rebuilt engine. Notify direct support maintenance to replace engine.	

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
13	Monthly	Refrigeration Unit Exterior Doors/Cover	Service the doors and cover by lubricating the hinges (fig. 4-6). a. Apply lubricating oil (MIL-L-2104) sparingly from oil can onto the hinge moving joint surfaces. b. Wipe away excess lubricating oil with a clean rag.	
14	Monthly	Barrel Bolts	Service the barrel bolts by lubricating them (fig. 4-6). a. Apply lubricating oil (MIL-L-2104) sparingly from oil can onto the barrel bolt moving joint surfaces. b. Wipe away excess lubricating oil with a clean rag.	
15	Monthly	Condenser Coil	a. Inspect as much of coil as possible, without disassembly, for any evidence of refrigerant leak. If evidence of leak is found, notify direct support maintenance to repair or replace it as necessary. b. Inspect coil for obstructions. If coil is obstructed with dirt or fins are bent, remove coil guard (para 4-19) and clean or straighten fins as needed.	Condenser coil is obstructed or evidence of leak is found.

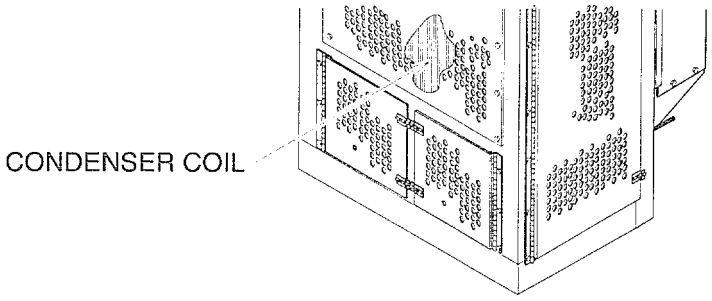


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
15 - Cont			(1) Clean coil if dirty. (a) water to make a wash solution. (b) and clean the fins by carefully brushing up and down. Continue to dip and brush as needed to loosen dirt. (c) and rinse the fins by carefully brushing up and down. Continue to rinse and brush as needed to clean the coil. (2) If fins are bent, carefully straighten them using fin comb. (3) Install coil guard (para 4-19).	Mix a small quantity of detergent with Dip a scrub brush in the wash solution Rinse the scrub brush with clean water
16	Monthly	Evaporator Coil	a. Inspect as much of coil as possible, without disassembly, for any evidence of refrigerant leak. If evidence of leak is found, notify direct support maintenance to repair or replace it as necessary. b. Inspect coil for obstructions. If coil is obstructed with dirt or bent fins, remove coil guard (para 4-18) and clean or straighten fins as needed.	Evaporator coil is obstructed or evidence of leak is found.

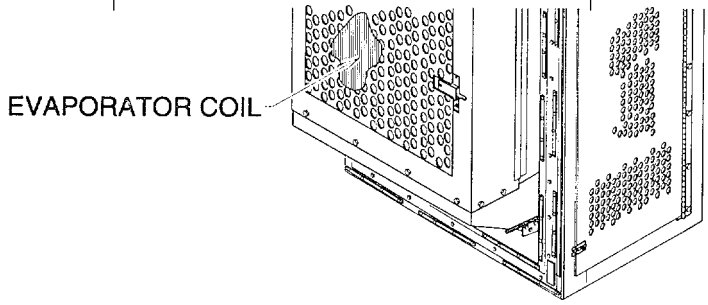


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
16 - Cont			(1) Clean coil if dirty. (a) water to make a wash solution. (b) and clean the fins by carefully brushing up and down. Continue to dip and brush as needed to loosen dirt. (c) and rinse the fins by carefully brushing up and down. Continue to rinse and brush as needed to clean the coil. (2) If fins are bent, carefully straighten them using fin comb. (3) Install coil guard (para 4-18).	Mix a small quantity of detergent with Dip a scrub brush in the wash solution Rinse the scrub brush with clean water
		Refrigeration Unit Interior	**NOTE** The refrigeration unit must be shut down with the battery disconnected, both side condenser doors and both front bottom doors must be open, the control panel must be open, and the evaporator coil guard must be removed for the following semi-annual PMCS.	
17	Monthly	Flange Bearings	a. Service the flange bearings by lubricating them (fig. 4-6). (1) Wipe grease fitting with a clean rag. (2) Pump grease gun handle until a flow of clean grease (MIL-G-23549) comes out nozzle.	Flange bearing mounts are loose or fan drive shaft is loose in bearing.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
17-Cont			(3) Attach grease gun nozzle to grease fitting and pump handle until grease just begins coming out around bearing. (4) Remove grease gun nozzle and wipe away excess grease with a clean rag. b. Inspect flange bearings for loose or missing mounting hardware and looseness of fan drive shaft in bearing. If loose, tighten or replace it as necessary (para 4-44).	
18	Monthly	Condenser and Evaporator Fans	a. Remove evaporator air outlet guard (para 4-17). b. Inspect fans for cracks and tears. Inspect for loose connection to fan drive shaft. If loose, tighten to shaft. If damaged, replace (para 4-39, 4-40). c. Install evaporator air outlet guard (para 4-17).	Fan is cracked, torn, or loose.

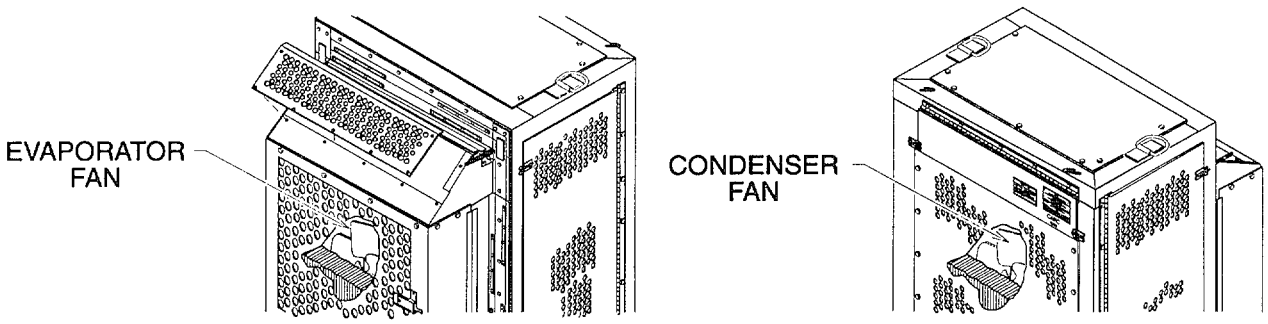


Table 4-1. Unit Preventive Maintenance Checks and Services for Model F100000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
		Control Box Interior	**NOTE** The refrigeration unit must be shut down with the battery disconnected, both side condenser doors and both front bottom doors must be open, the control panel must be open, and the evaporator coil guard must be removed for the following semi-annual PMCS.	
19	Semi-Annually	Fuses	a. Remove the evaporator coil guard (para 4-18). b. Open both side condenser doors and both front bottom doors. c. Open the control panel (para 4-20). d. Check for loose or missing fuse block mounting hardware, loose wire leads, and loose fuse block clips. If mounting hardware or leads are loose, tighten or replace as necessary (para 4-23). If fuse block clips are loose, replace fuse block (para 4-23). e. Check each fuse for broken link or discoloration of case. Replace fuse if link is broken or case is discolored (para 4-23).	Wire lead or fuse clip loose. Fuse link is broken or fuse case is discolored.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

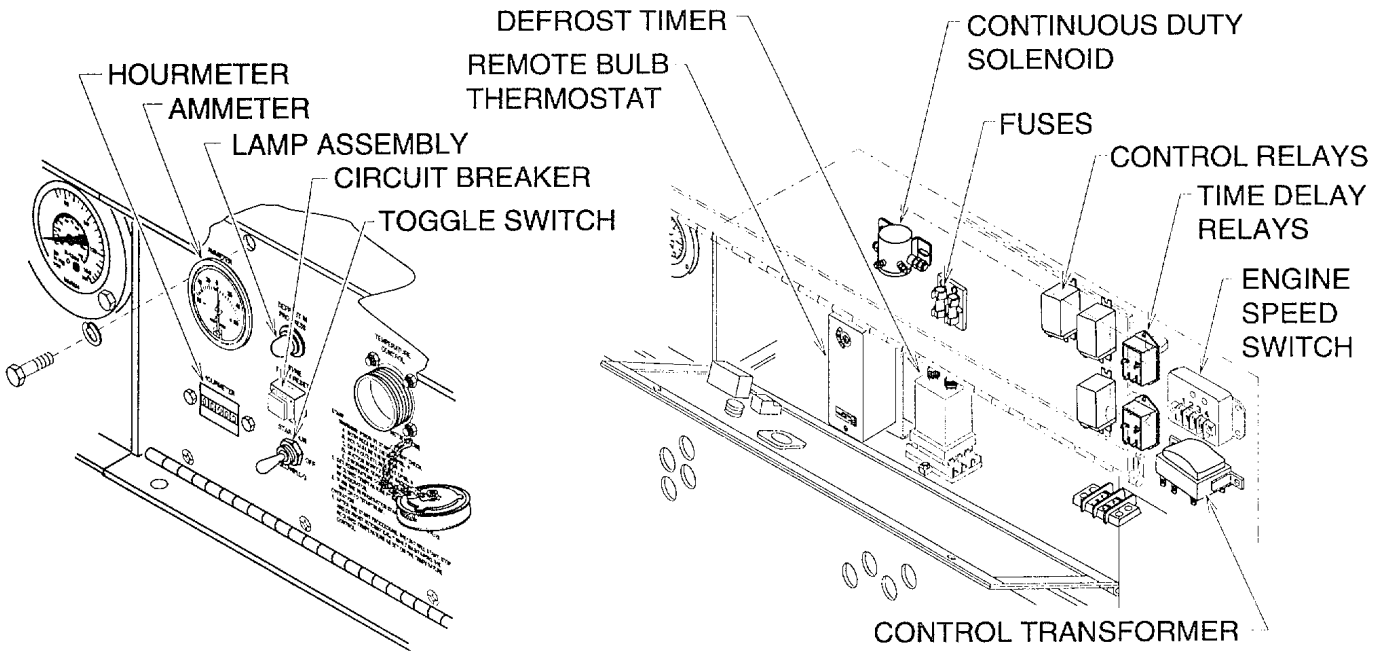
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
20	Semi-Annually	Lamp Assembly	Inspect the lamp assembly for cracked or missing cap, loose base, and loose wire leads. Tighten cap if loose. If damaged, wire leads are loose, or base is loose, test, tighten base or wire leads, or replace as necessary (para 4-22).	Wire leads are loose.
21	Semi-Annually	Hourmeter	Inspect the hourmeter for cracked or missing lens or any other damage and loose or missing mounting hardware and wire leads. If damaged or wire leads or mounting hardware is loose, tighten, or replace as necessary (para 4-26).	Wire leads are loose.
22	Semi-Annually	Ammeter	Inspect the ammeter for cracked or missing lens or any other damage and loose or missing mounting hardware and wire leads. If damaged or wire leads or mounting hardware is loose, tighten, or replace as necessary (para 4-27).	Wire leads are loose.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			NOTE Operating the toggle switch can cause the refrigeration unit to start or shut down.	
23	Semi-Annually	Toggle Switch	Inspect the toggle switch for any damage and loose or missing mounting hardware or wire leads. Inspect for smooth operation to START/RUN and OFF. If damaged, or wire leads or mounting hardware is loose, or operation is stiff or binding, test, tighten, or replace as necessary (para 4-28).	Toggle switch will not stay in START/RUN position. Wire leads are loose.
			NOTE Operating the circuit breaker can cause the refrigeration unit to start or shut down.	
24	Semi-Annually	Circuit Breaker	Inspect the circuit breaker for any damage, secure mounting, or loose wire leads. Push to check for smooth operation to on and off. If damaged, loose mounting, wire leads are loose, or operation is stiff or binding, test, secure, or replace as necessary (para 4-21).	Circuit breaker will not stay in on position or button is damaged. Wire leads are loose.
25	Semi-Annually	Control Relays	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-24). b. Inspect case for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-24).	Mounting hardware or wire terminals are loose. Case is damaged.
26	Semi-Annually	Time Delay Relays	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-25). b. Inspect case for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-25).	Mounting hardware or wire terminals are loose. Case is damaged.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model FL0000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
27	Semi-Annually	Defrost Timer	a. Check for loose or missing mounting socket hardware and wire terminals. Tighten or replace as necessary (para 4-30). b. Inspect case and mounting socket for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-30). c. Check and adjust the timer controls if needed (para 4-30).	Mounting hardware or wire terminals are loose. Case is damaged.
28	Semi-Annually	Remote Bulb Thermostat	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-29). wire terminals are loose. b. Inspect for kinked or broken sensing bulb capillary line. If damaged, replace thermostat (para 4-29). c. Close the control panel (para 4-29).	Sensing bulb capillary line is kinked or broken. Mounting hardware or
29	Semi-Annually	Engine Speed Switch	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-31). b. Inspect case for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-31).	Mounting hardware or wire terminals are loose. Case is damaged.
30	Semi-Annually	Control Transformer	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-32). b. Inspect case for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-32).	Mounting hardware or wire terminals are loose. Case is damaged.
31	Semi-Annually	Continuous Duty Solenoid	a. Check for loose or missing mounting hardware and wire terminals. Tighten or replace as necessary (para 4-34). b. Inspect case for cracks, breaks, or evidence of overheating. Replace if damaged (para 4-34).	Mounting hardware or wire terminals are loose. Case is damaged.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

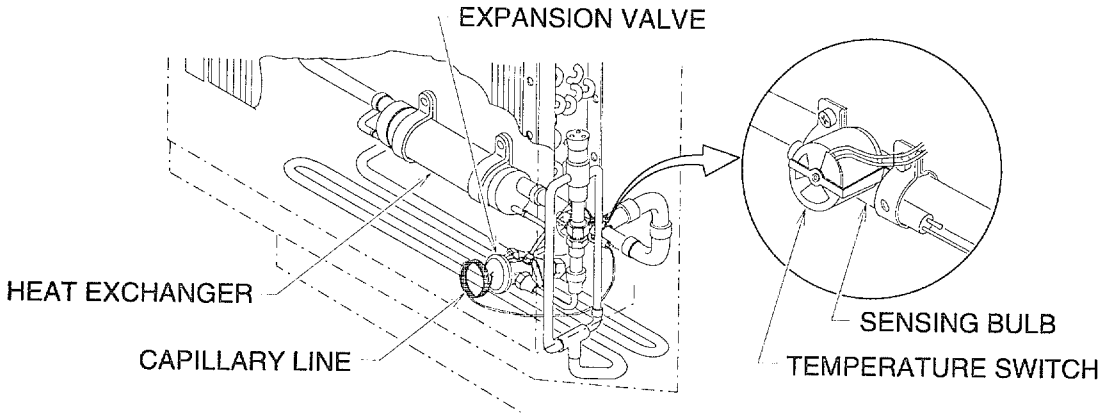
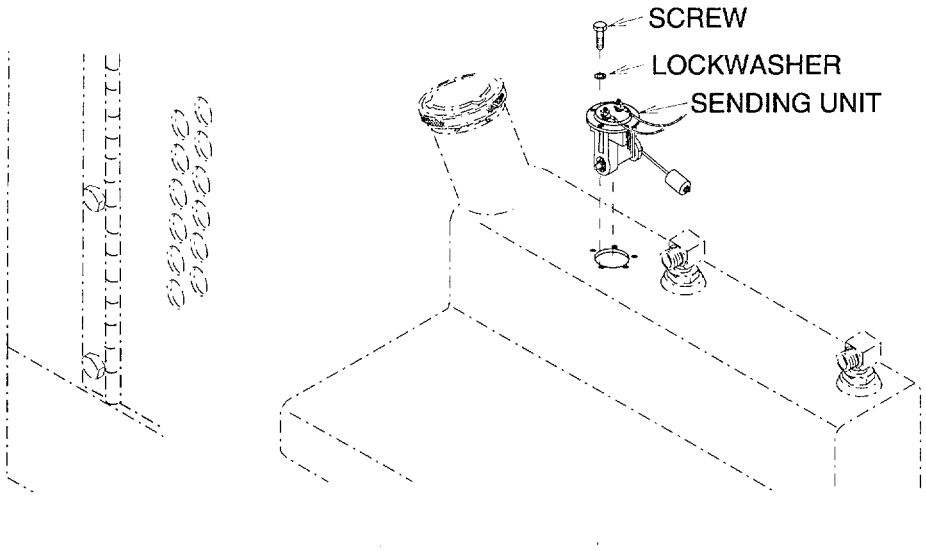
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
32	Semi-Annually	Refrigeration Unit Interior Temperature Switch	a. Inspect for frayed or broken wire leads. If damaged, repair or replace as needed (para 4-36). b. Check that the switch is in contact with the tubing. Tighten if loose.	Wire lead frayed or broken. Temperature switch loose on tubing.
				
33	Semi-Annually	Heat Exchanger	Inspect the heat exchanger for dents or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to replace it.	Heat exchanger is dented or evidence of leak is found.
34	Semi-Annually	Expansion Valve	a. Inspect the expansion valve for evidence of refrigerant leak. If evidence of leak is found, notify direct support maintenance to replace it. b. Inspect the sensing bulb capillary line for cracks, kinks, or breaks. If damaged, notify direct support maintenance to replace the expansion valve. c. Check that the sensing bulb mounting hardware is secure and the bulb is in contact with the tubing. Tighten the mounting hardware if loose.	Evidence of leak is found, sensing bulb is loose on tubing, or capillary line is kinked or broken.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
35	Semi-Annually	Tubing and Fittings	Inspect the tubing and fittings for kinks, restriction (crushed), or evidence of refrigerant leak. If damaged or evidence of leaking found, notify direct support maintenance to tighten, repair, or replace as necessary.	Tubing or fittings damaged, kinked, or evidence of leak is found.
36	Semi-Annually	Sending Unit	a. Remove five screws, lock washers and sending unit.	



			b. Inspect sending unit for cracks or breaks. Check that the float arm moves freely and does not bind. If damaged or float lever binds, replace sending unit (para 4-64). c. Install sending unit and secure using five new lock washers and screws.	
37	Semi-Annually	Glow Plug	a. Remove nut, tag and remove wire lead. b. Remove glow plug. c. Inspect glow plug for damage to heater element such as swollen/split case or cracks. If damaged, replace glow plug.	

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

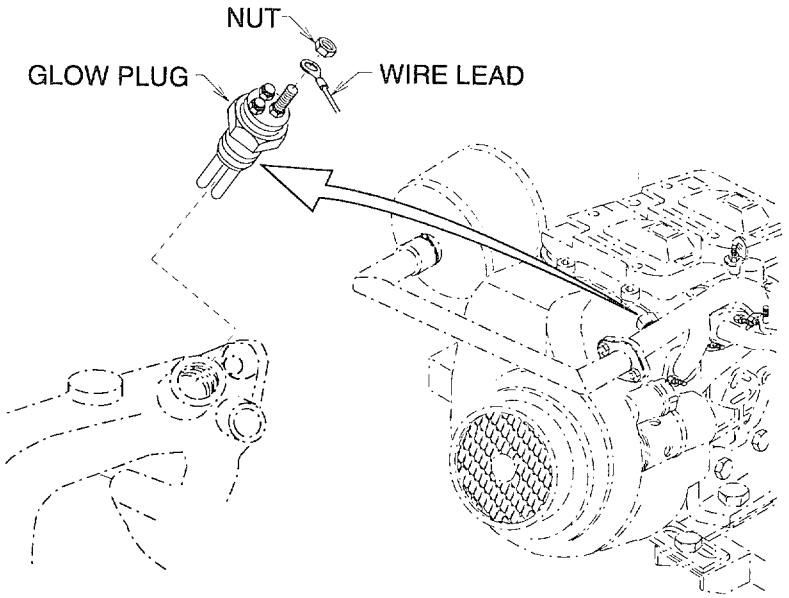
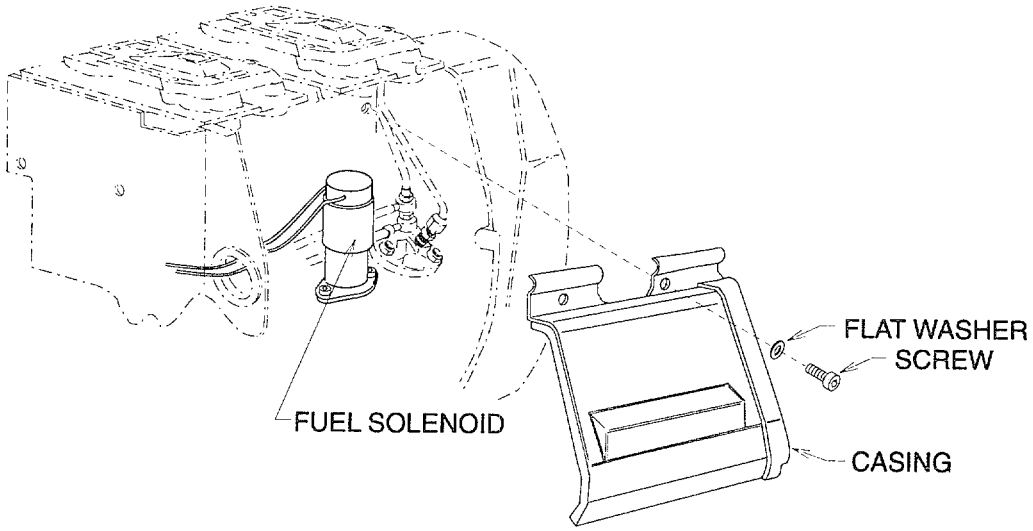
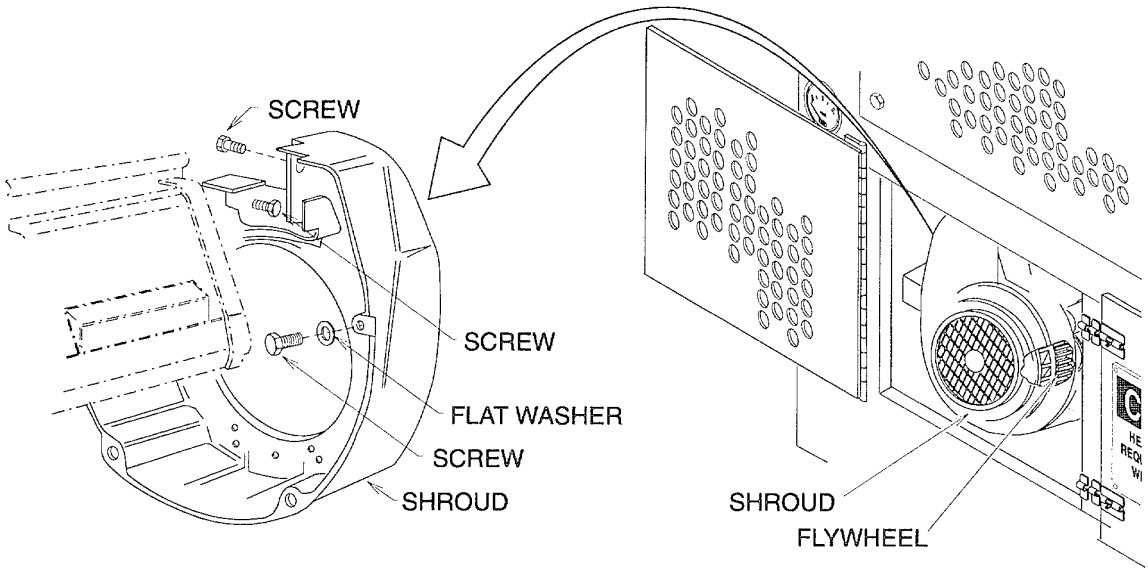
Item No.	Interval	Location: Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
37 - Cont			d. Install glow plug. e. Using tag and wiring diagram (fig. 1-4) install wire lead and nut. Remove tag.	
38	Semi-Annually	Fuel Solenoid	a. Remove two screws, flat washers, and casing.	Fuel solenoid damaged.
				

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
38 - Cont			b. Inspect fuel solenoid for damage such as dented case or evidence of overheating. If damaged, replace it (para 4-53). c. Install casing, two flat washers and screws. d. Install the evaporator coil guard (para 4-18). e. Close the control panel (para 4-20). f. Close both front bottom doors and both side condenser doors. g. Connect battery (para 4-35) and put unit back into service.	
		Refrigeration Unit Interior		
			NOTE The refrigeration unit must be shut down with the battery disconnected, both side condenser doors and both front bottom doors must be open, the control panel must be open, and the evaporator coil guard must be removed for the following annual PMCS.	
39		Annually Flywheel	a. Shut down refrigeration unit (para 2-7) and disconnect battery (para 4-35). b. Open both side condenser doors and both front bottom doors. c. Remove screws, flat washers, and shroud. d. Inspect flywheel for any damage such as cracks, broken or missing air vanes, or broken gear teeth. Notify direct support maintenance to replace it if damaged. e. Install shroud, flat washers, and screws.	Flywheel is broken, cracked, or damaged.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model F10000RD - Continued

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
40	Annually	Wires, Cables, and Harnesses	a. Remove the evaporator coil guard (para 4-18). b. Open the control panel (para 4-20). c. Inspect for frayed or broken wire leads. If damaged, repair or replace as needed (para 4-20.) d. Close the control panel (para 4-20). e. Install the evaporator coil guard (para 4-18). f. Close both side condenser doors and both front bottom doors. g. Connect battery (para 4-35) and put unit back into service.	Wire lead frayed or broken.



4-11. MANDATORY REPLACEMENT PARTS.

The table below lists all items that must be replaced during PMCS whether they have failed or not. The table reflects the interval at which these items must be replaced whether hardtime maintenance or on condition maintenance is the determining factor.

Table 4-2. 200 Hour Mandatory Replacement Parts

Item No.	Part Number	National Stock Number	Nomenclature	Qty
1	ECD06-5003 (18265)		Air Cleaner	1
2	771-7524 (62445)		Oil Filter	1
3	17520 (62445)		Fuel Filter	1
4	000-477-0015		In-line Fuel Filter	1

Table 4-3. Semi-Annually Mandatory Replacement Parts

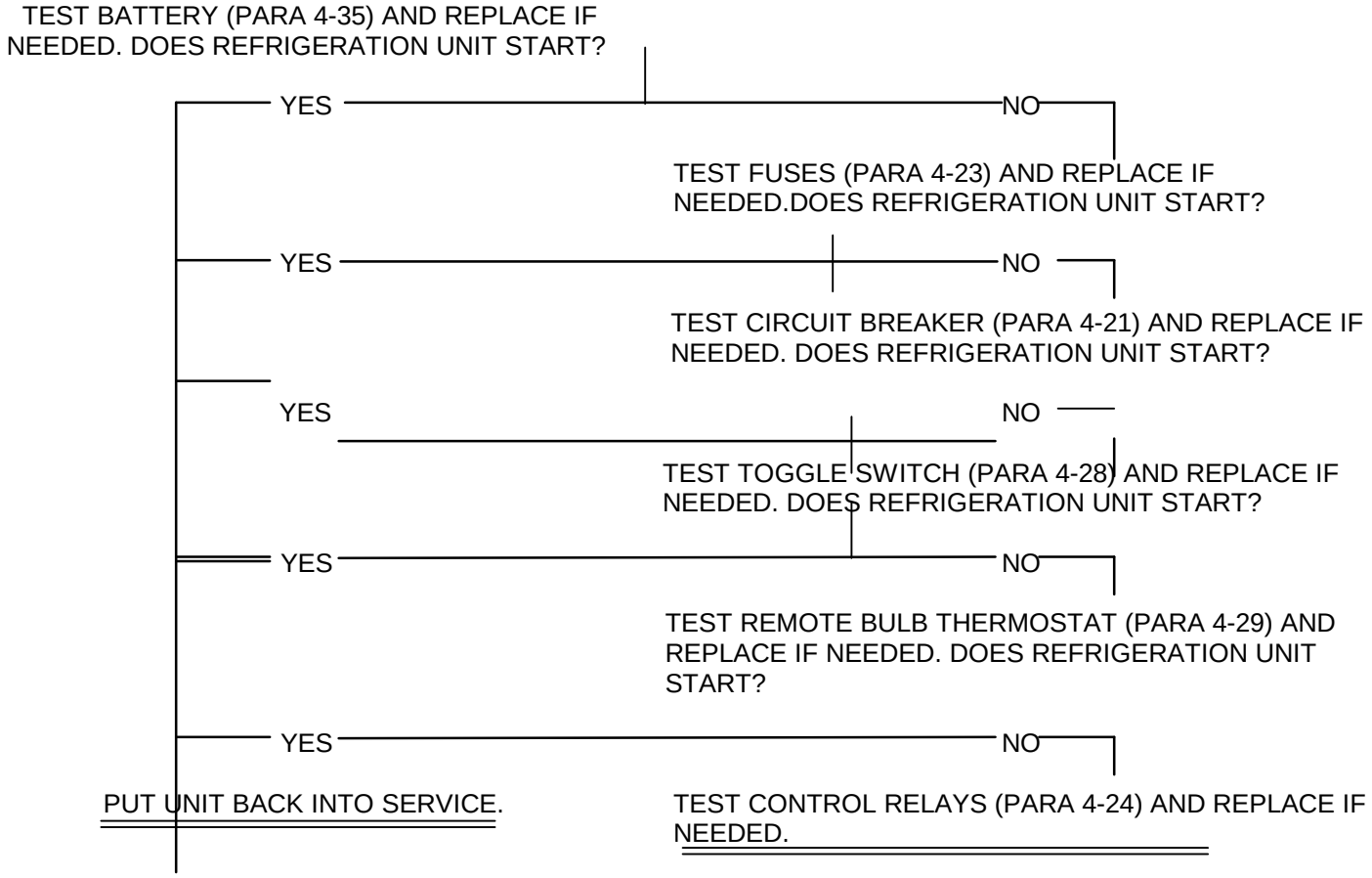
Item No.	Part Number	National Stock Number	Nomenclature	Qty
1	500K1950-3 (94833)		Lock Washer	5

SECTION IV. TROUBLESHOOTING INSTRUCTIONS

4-12. TROUBLESHOOTING.

The following procedures are listed in order of the most probable malfunctions. Each malfunction is followed by test or inspection procedures in logical order to isolate and identify the fault and actions required to correct it. This section cannot list all the possible malfunctions that may occur with the equipment. If a malfunction occurs that is not listed or actions listed do not correct a malfunction, notify your supervisor.

a. Engine Does Not Crank.



b. Engine Cranks But Will Not Start Or Stops During Operation.

CHECK FUEL LEVEL AND FILL IF NEEDED. DOES ENGINE START/RUN?

YES — PUT UNIT BACK INTO SERVICE.

NO — IF FUEL FILTERS ARE SUSPECTED TO BE CLOGGED, REPLACE THEM (PARA 4-55 and 4-62). DOES ENGINESTART/RUN?

YES — PUT UNIT BACK INTO SERVICE.

NO — CHECK AIR CLEANER AND MUFFLER FOR OBSTRUCTIONS AND REPLACE IF NECESSARY (PARA 4-49 and 4-50). DOES ENGINE START/RUN?

YES — PUT UNIT BACK INTO SERVICE.

NO — NOTIFY DIRECT SUPPORT MAINTENANCE TO CHECK AND REPLACE INJECTOR NOZZLES AND/OR INJECTION PUMPS IF NEEDED.

c. Engine Knocks When Operating.

CHECK ENGINE OIL LEVEL AND FILL IF NEEDED. DOES ENGINE STILL KNOCK?

NO — PUT UNIT BACK INTO SERVICE.

YES — CHECK FUEL FOR CONTAMINANTS. DRAIN ~~FUEL TANK IF NECESSARY (PAR~~A 4-65). ANDFILL

4-12. TROUBLESHOOTING. - Continued

d. Temperature Gage Indicates More Than 15° F (8° C) Above or Below Remote Bulb Thermostat Setting.

TEST REMOTE BULB THERMOSTAT (PARA 4-29) AND REPLACE IF NEEDED. OPERATE UNIT (PARA 2-5). DOES TEMPERATURE GAGE INDICATE WITHIN 15° F (8° C) OF REMOTE BULB THERMOSTAT?

YES — PUT UNIT BACK INTO SERVICE.

NO — TEST DEFROST TIMER (PARA 4-30) AND REPLACE IF NEEDED. OPERATE UNIT (PARA 2-5). DOES TEMPERATURE GAGE INDICATE WITHIN 15° F (8° C) OF REMOTE BULB THERMOSTAT?

YES — PUT UNIT BACK INTO SERVICE.

NO — TEST TEMPERATURE SWITCH (PARA 4-36) AND REPLACE IF NEEDED. OPERATE UNIT (PARA 2-5). DOES TEMPERATURE GAGE INDICATE WITHIN 15° F (8° C) OF REMOTE BULB THERMOSTAT?

YES — PUT UNIT BACK INTO SERVICE.

NO — CHECK SETTING AND ADJUST DEFROST TIMER (PARA 4-30) IF NEEDED.

e. Pressure Gage Indicates Above 250 psi (1725 kPa).

OPEN ALL REFRIGERATION VALVES (PARA 4-7). IF ANY VALVES WERE CLOSED, OPERATE UNIT (PARA 2-5). IS PRESSURE GAGE BELOW 250 PSI (1725 kPa)?

YES — PUT UNIT BACK INTO SERVICE.

NO — NOTIFY DIRECT SUPPORT MAINTENANCE TO CHECK AND ADJUST THE REFRIGERANT CHARGE IF NEEDED.

f. Pressure Gage Indicates Below 165 psi (1139 kPa).

OPEN ALL REFRIGERATION VALVES (PARA 4-7). IF ANY VALVES WERE CLOSED, OPERATE UNIT (PARA 2-5). IS PRESSURE GAGE ABOVE 165 PSI (1139 kPa)?

YES — PUT UNIT BACK INTO SERVICE.

NO — NOTIFY DIRECT SUPPORT MAINTENANCE TO CHECK AND ADJUST THE REFRIGERANT CHARGE IF NEEDED.

g. Compound Gage Indicates Above 15 psi (103 kPa).

OPEN ALL REFRIGERATION VALVES (PARA 4-7). IF ANY VALVES WERE CLOSED, OPERATE UNIT (PARA 2-5). IS COMPOUND GAGE BELOW 15 PSI (103 kPa)?

YES — PUT UNIT BACK INTO SERVICE.

NO — NOTIFY DIRECT SUPPORT MAINTENANCE TO CHECK AND ADJUST THE REFRIGERANT CHARGE IF NEEDED.

h. Compound Gage Indicates Below 0 psi (0 kPa).

OPEN ALL REFRIGERATION VALVES (PARA 4-7). IF ANY VALVES WERE CLOSED, OPERATE UNIT (PARA 2-5). IS COMPOUND GAGE ABOVE 0 PSI (0 kPa)?

YES — PUT UNIT BACK INTO SERVICE.

NO — NOTIFY DIRECT SUPPORT MAINTENANCE TO CHECK AND ADJUST THE REFRIGERANT CHARGE IF NEEDED.

SECTION V. UNIT MAINTENANCE INSTRUCTIONS

4-13. CONDENSER TOP PANEL REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (7)
1, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery Disconnected (para 4-35).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal. Remove seven bolts (1), lock washers (2), and panel (3). Discard lock washers.

b. Installation. Install panel (3), seven new lock washers (2), and bolts (1).

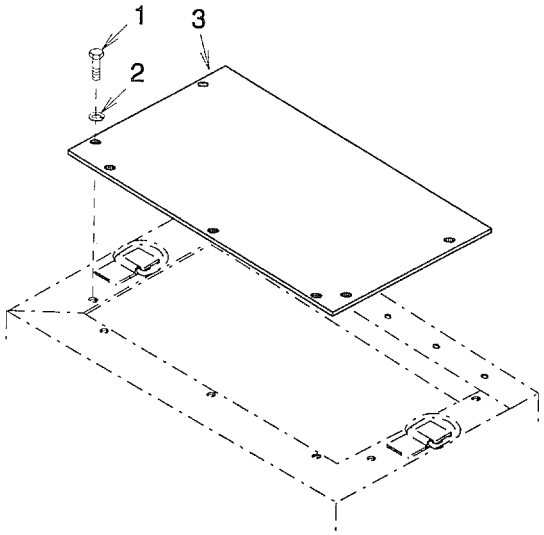


Figure 4-7. Top Panel

NOTE

FOLLOW-ON MAINTENANCE:
Connect battery (para 4-35) and put unit back into service.

4-14. SIDE CONDENSER DOORS AND BARREL BOLTS REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (9) (Each Door)
1, Appendix G
Lock Washers (6) (Each Barrel Bolt Assembly)
1, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Side Condenser Door Replacement.

(1) Removal. Remove nine bolts (1), lock washers (2), flat washers (3), and door (4). Discard lock washers.

(2) Installation.

(a) Remove four bolts (5), lock washers (6), and barrel bolt (7) from old door (4). Repeat for second barrel bolt. Discard lock washers.

(b) Install barrel bolt (7), four new lock washers (6), and bolts (5). Repeat for second barrel bolt.

(c) Install door (4), nine flat washers (3) new lock washers (2), and bolts (1).

b. Barrel Bolt Replacement.

(1) Removal.

(a) Remove four bolts (5), lock washers (6), and barrel bolt (7). Discard lock washers.

(b) Remove two screws (8), lock washers (9), barrel bolt clip (10), and shim (11). Discard lock washers.

4-14. SIDE CONDENSER DOORS AND BARREL BOLTS REPLACEMENT. - Continued

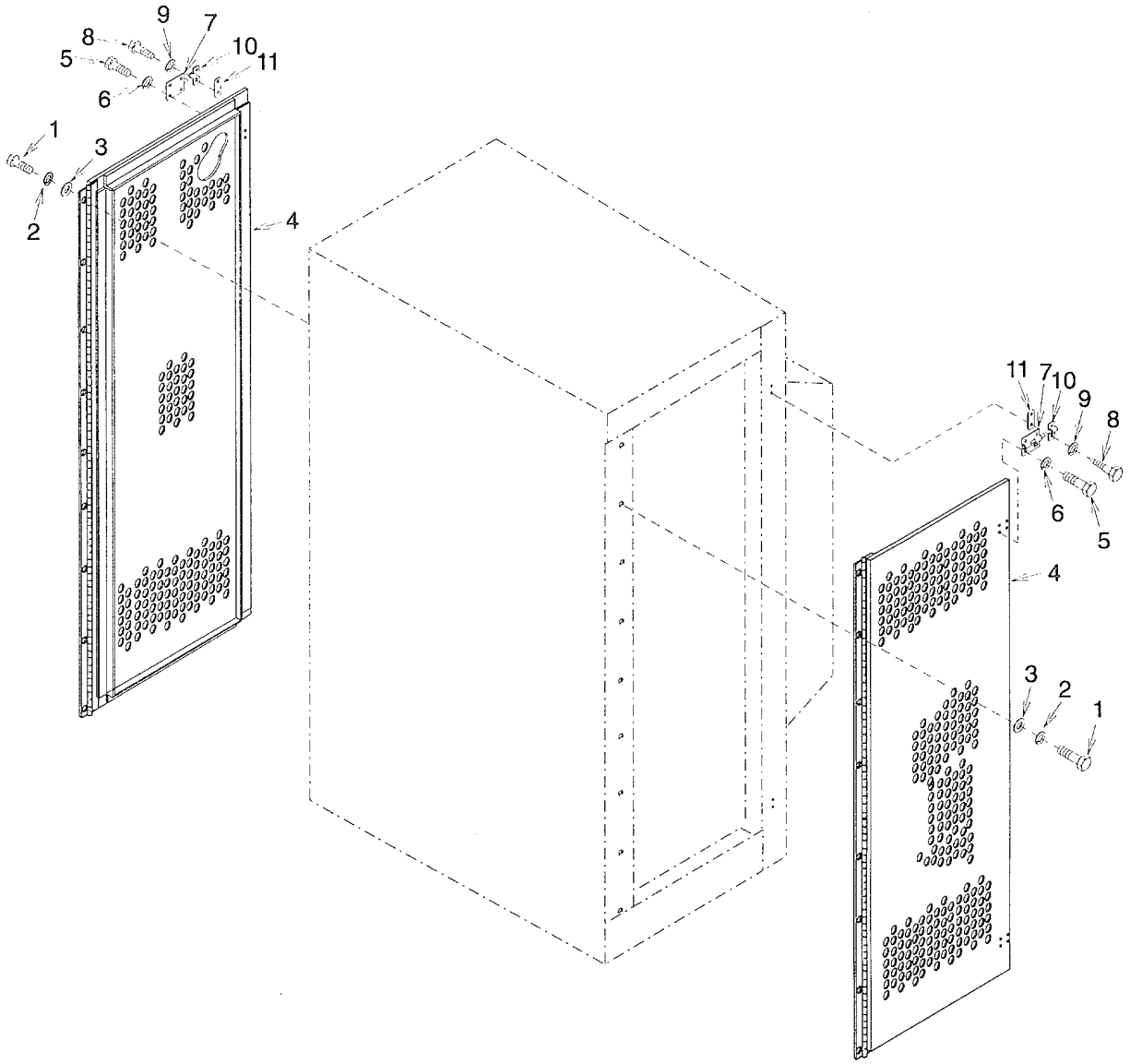


Figure 4-8 . Condenser Side Doors and Barrel Bolts

(2) Installation.

(a) Install shim (11), barrel bolt clip (10), two new lock washers (9), and screws (8).

(b) Install barrel bolt (7), four new lock washers (6), and bolts (5).

NOTE

FOLLOW-ON MAINTENANCE:
Close side condenser doors.
Connect battery (para 4-35) and put unit back into service.

4-15. FRONT BOTTOM DOORS AND BARREL BOLTS REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (3 Each Door)
1, Appendix G
Lock Washers (6 Each Barrel Bolt Assembly)
1, Appendix G
Self Locking Nut (4)
12 Appendix G
Rivets (4)
4, Appendix G
unit. Personal injury can result

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration if battery is connected.

a. Front Bottom Door Replacement.

(1) Removal. Remove three bolts (1), lock washers (2), and door (3). Discard lock washers.

(2) Installation.

(a) Drill out four rivets (4) and data plate (5) from old door (3). If the rivets cannot be removed, notify direct support maintenance to remove them.

(b) Remove four bolts (6), lock washers (7), and barrel bolt (8) from old door (3). Repeat for second barrel bolt. Discard lock washers.

(c) Install data plate (5) and four new rivets (4). If the rivets cannot be installed, notify direct support maintenance to install them.

(d) Install barrel bolt (8), four new lock washers (7), and bolts (6). Repeat for second barrel bolt.

(e) Install door (3), three new lock washers (2), and bolts (1).

b. Barrel Bolt Replacement.

(1) Removal.

(a) Remove four bolts (6), lock washers (7), and barrel bolt (8). Discard lock washers.

(b) Remove two screws (9), lock washers (10), barrel bolt clip (11), and shim (12). Discard lock washers.

(2) Installation.

(a) Install shim (12), barrel bolt clip (11), two new lock washers (10), and screws (9).

(b) Install barrel bolt (8), four new lock washers (7), and bolts (6).

4-15. FRONT BOTTOM DOORS AND BARREL BOLTS REPLACEMENT. - Continued

c. Center Post Replacement.

(1) Removal. Remove four self locking nuts (13), bolts (14), and center post (15). Discard self locking nuts.

(2) Installation.

(a) Remove two bolts (9), lock washers (10), barrel bolt clip (11), and shim (12) from old center post (15). Repeat for three other barrel bolt clips. Discard lock washers.

(c) Install shim (12), barrel bolt clip (11), two new lock washers (10), and bolts (9). Repeat for three other barrel bolt clips.

(d) Install center post (15), four bolts (14), and new self locking nuts (13).

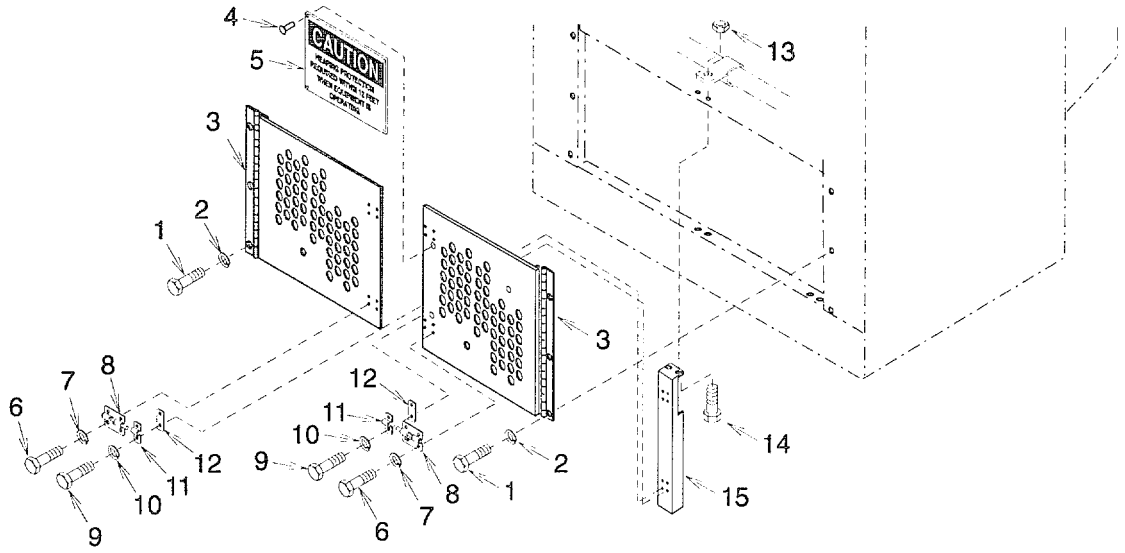


Figure 4-9. Front Bottom Doors and Barrel Bolts

NOTE

FOLLOW-ON MAINTENANCE:
Close front bottom door.
Connect battery (para 4-35) and put unit back into service.

4-16. CONTROL PANEL COVER, DOOR HOLDER CLIPS, AND BARREL BOLTS REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (6 each barrel bolt assembly)
1, Appendix G
Lock Washers (5)
3, Appendix G
Rivets (4 each identification plate)
4, Appendix G
Rivet (1 each door holder clip)
5, Appendix G

Equipment Conditions:

Control panel cover door raised and latched.

a. Control Panel Cover Replacement.

(1) Removal. Remove five bolts (1), lock washers (2), flat washers (3), and control panel cover (4). Discard lock washers.

(2) Installation.

(a) Remove two bolts (5), lock washers (6), and barrel bolt clip (7) from old cover (4). Repeat for second barrel bolt clip. Discard lock washers.

(b) Install barrel bolt clip (7), two new lock washers (6), and bolts (5). Repeat for second barrel bolt clip.

(c) Drill out four rivets (8) and identification plate (9) from old cover (4). If the rivets cannot be removed, notify direct support maintenance to remove them.

(d) Install identification plate (9) and four new rivets (8). If the rivets cannot be installed, notify direct support maintenance to install them.

(e) Drill out four rivets (10) and warranty plate (11) from old cover (4). If the rivets cannot be removed, notify direct support maintenance to remove them.

(f) Install warranty plate (11) and four new rivets (10). If the rivets cannot be installed, notify direct support maintenance to install them.

4-16. CONTROL PANEL COVER, DOOR HOLDER CLIPS, AND BARREL BOLTS REPLACEMENT. - Continued

(g) Check control panel cover (4) for gaskets. If no gaskets are on the cover, notify direct support maintenance to install them.

(h) Install control panel cover (4), five flat washers (3), new lock washers (2), and bolts (1).

b. Barrel Bolt Replacement.

(1) Removal.

(a) Remove four bolts (12), lock washers (13), barrel bolt (14), and shim (15). Discard lock washers.

(b) Remove two bolts (5), lock washers (6), and barrel bolt clip (7). Discard lock washers.

(2) Installation.

(a) Install barrel bolt clip (7), two new lock washers (6), and bolts (5).

(b) Install shim (15), barrel bolt (14), four new lock washers (13), and bolts (12).

c. Door Holder Clip Replacement.

(1) Removal. Drill out rivet (16) and remove door holder clip (17). If the rivet cannot be removed, notify direct support maintenance to remove it.

(2) Installation. Install door holder clip (17) and new rivet (16).

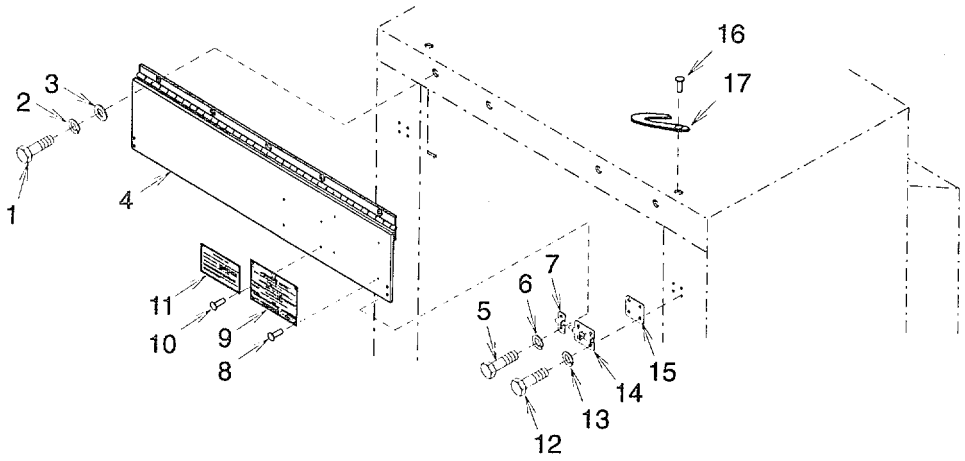


Figure 4-10. Control Panel Cover, Barrel Bolts, and Door Holder Clips

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.

4-17. EVAPORATOR AIR OUTLET GUARD REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (7)
7, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if

a. Removal. Remove seven bolts (1), lock washers (2), flat washers (3), and evaporator air outlet guard (4). Discard lock washers.

b. Installation. Install evaporator air outlet guard (4), seven flat washers (3), new lock washers (2), and bolts (1).

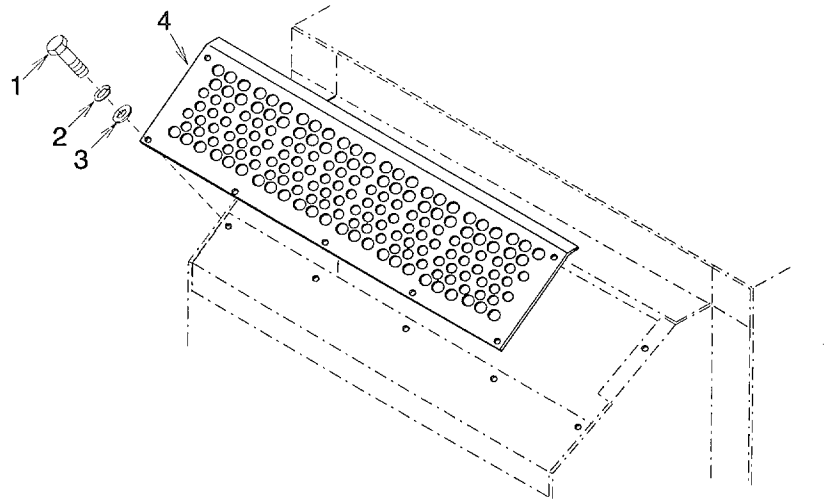


Figure 4-11. Evaporator Air Outlet Guard

NOTE

FOLLOW-ON MAINTENANCE:
Connect battery (para 4-35) and put unit back into service.

4-18. EVAPORATOR COIL GUARD REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (16)
7, Appendix G

a. Removal. Remove 16 bolts (1), lock washers (2), flat washers (3), and evaporator coil guard (4). Discard lock washers.

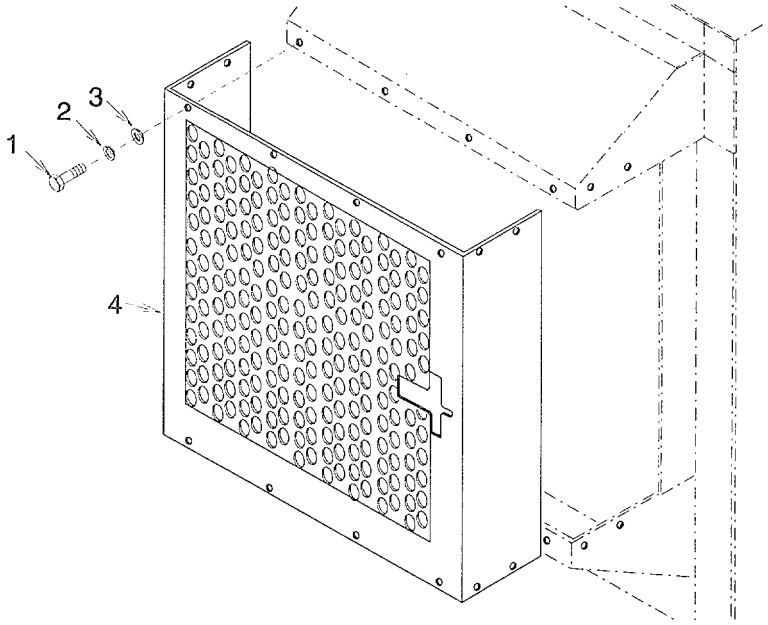


Figure 4-12. Evaporator Coil Guard

b. Installation. Install evaporator coil guard (4), 16 flat washers (3), new lock washers (2), and bolts (1).

4-19. CONDENSER COIL GUARD REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (10)
1, Appendix G

a. Removal. Remove 10 bolts (1), lock washers (2), flat washers (3), and condenser coil guard (4). Discard lock washers.

b. Installation. Install condenser coil guard (4), 10 flat washers (3), new lock washers (2), and bolts (1).

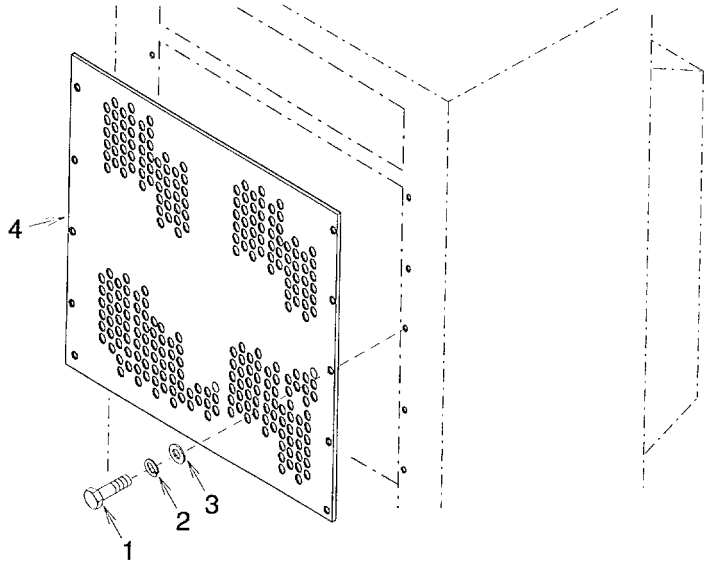


Figure 4-13. Condenser Coil Guard

4-20. WIRES, CABLES, AND HARNESSES TESTING, REPAIR, AND REPLACEMENT.

This task covers: a. Testing b. Repair c. Removal d. Installation

INITIAL SETUP

Tools:

Heat Gun
III, Appendix B

Material/Parts:

Wire (As Required)
Insulation Sleeving (As Required)
Figure F-23, Appendix F
Lock Washers (2)
1, Appendix G
Solder
8, Appendix E
Flux
17, Appendix E
Marker Tag(s) (As Required)
7, Appendix E
Tie Down Strap(s) (As Required)
24, Appendix E
Silicone RTV
20, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and 3, 3, 3,Section battery disconnected (para 4-35).
Side condenser doors open if needed. Control panel cover door raised and latched.

General Safety Instructions

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Tag and disconnect wire leads from components as necessary to isolate the wire or harness being tested.

(3) Using multimeter set to measure continuity, check each end of the wire lead(s) (fig. 1-4 and table 4-4).

(4) Replace any wire lead(s) that do not show continuity (table 4-4).

(5) Connect wire lead(s) per tag and wiring diagram (fig. 1-4).

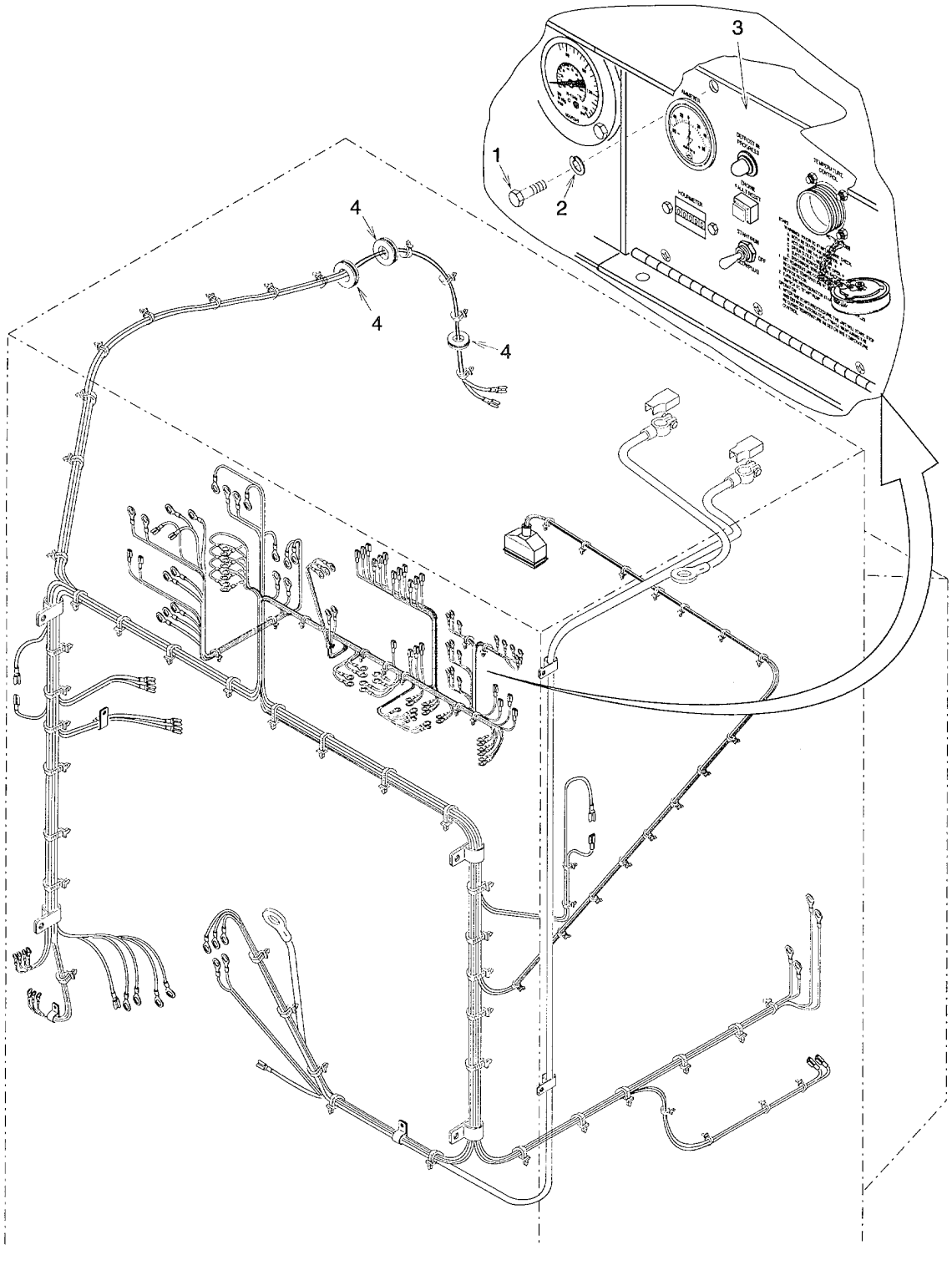


Figure 4-14. Wires Cables and Harnesses

4-20. WIRES, CABLES, AND HARNESSES TESTING, REPAIR, AND REPLACEMENT. - Continued

b. Repair. Repairs can be performed to replace terminal ends or to splice wire when cut.

WARNING

Solder and flux contain materials which are hazardous to health. Avoid breathing vapors or fumes from soldering operations. Perform operations only in well ventilated areas. Wash hands with soap and water after handling solder and flux. Wear thermal gloves and protective goggles or face shield to protect against burns.

(1) Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. Flux should be brushed onto the joint before soldering. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build up of solder "gobs" on the joint should be avoided or removed.

(2) Insulating Joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a length of 1 inch (2.5 cm) for covering joints at terminals or connectors, or to a length about 1/2 inch (1.3 cm) longer than the joint to be insulated. Slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint and shrink in place with moderate heat.

(3) Splicing Wire. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. Solder and apply insulation as described above.

(4) Crimping Terminals. To install a terminal on the end of a wire, strip 1/4-1/2 inch (0.6-1.3 cm) of insulation from the end of the wire and apply a one inch (2.4 cm) piece of heat shrink tubing (if the terminals are of the uninsulated type). Insert wire-end into the shank of the terminal. Crimp the shank and install heat-shrink tubing, if necessary.

NOTE

Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make shift procedures, although the latter may be appropriate for emergency field repairs.

(5) Wire Size and Length. Determine the proper size and length of the wire, or terminal, or connector to be used for replacement by referring to the wire list (table 4-4), and to the wiring diagram (fig. 1-4).

Table 4-4. Wire List

TERMINATION			TERMINATION			AWG WIRE SIZE	LENGTH	
FROM	TERMINAL TYPE		TO	TERMINAL TYPE			IN.	CM
BT-POS	D)35095	(16004)	K4-C	MS25036-127	(96906)	1 AWG	96	244
(D)	80696	(16004)						
BT-NEG	(D) 35095	(16004)	FR GND	MS25036-127	(96906)	1 AWG	18	46
K4-C	MS25036-113	(96906)	F1-1	MS25036-156	(96906)	12 AWG	108	275
F1-1	MS25036-153	(96906)	K1-7	13216E6191-2	(97403)	12 AWG	24	61
F1-2	MS25036-153	(96906)	M1- (+)	MS25036-108	(96906)	12 AWG	24	61
F1-2	MS25036-153	(96906)	F2-1	MS25036-153	(96906)	14 AWG	24	61
F2-2	MS25036-153	(96906)	S1-2	MS25036-106	(96906)	14 AWG	24	61
S10-NO	(D) 82898	(16004)	S2-1	MS25036-153	(96906)	14 AWG	120	305
S2-1	MS25036-153	(96906)	TM1-9	MS25036-106	(96906)	14 AWG	24	61
S2-2	MS25036-153	(96906)	VR- (/)	12712937-1	(19200)	16 AWG	156	397
S2-2	MS25036-153	(96906)	TB1-1	MS25036-106	(96906)	14 AWG	24	61
S2-1	MS25036-153	(96906)	K2-9	13216E6191-2	(97403)	14 AWG	24	61
Ml-(-)	MS25036-108	(96906)	VR- (+)	12712937-1	(19200)	12 AWG	108	275
TB1-2	MS25036-106	(96906)	TM1-7	MS25036-106	(96906)	16 AWG	24	61
M2-2	MS25036-153	(96906)	CB GND	MS25036-108	(96906)	16 AWG	24	61
DSI-1	MS25036-106	(96906)	TM1-4	MS25036-106	(96906)	16 AWG	24	61
DS1-2	MS25036-106	(96906)	CB GND	MS25036-108	(96906)	16 AWG	24	61
CB1-LINE	13216E6191-2	(97403)	S2-2	MS25036-153	(96906)	16 AWG	24	61
CB1-LOAD	13216E6191-2	(97403)	TB1-3	MS25036-106	(96906)	14 AWG	24	61
K1-4	13216E6191-2	(97403)	K4- (+)	13216E6191-2	(97403)	12 AWG	120	305
SEE NOTE 1								
K1-A	13216E6191-2	(97403)	TB1-3	MS25036-106	(96906)	16 AWG	24	61
K1-B	13216E6191-2	(97403)	S8-4	MS25036-106	(96906)	16 AWG	24	61
TB1-2	MS25036-106	(96906)	S5-M	MS25036-153	(96906)	16 AWG	118	300
K2-6	13216E6191-2	(97403)	S4-LINE	MS25036-153	(96906)	14 AWG	108	275
TB1-2	MS25036-106	(96906)	TD2-X1	MS25036-106	(96906)	16 AWG	24	61
K2-B	13216E6191-2	(97403)	CB GND	MS25036-108	(96906)	16 AWG	24	61
K3-4	13216E6191-2	(97403)	TD1-NO	MS25036-106	(96906)	16 AWG	24	61
K3-7	13216E6191-2	(97403)	TB1-3	MS25036-106	(96906)	16 AWG	24	61
K3-A	13216E6191-2	(97403)	TM1-6	MS25036-106	(96906)	16 AWG	24	61
S1-3	MS25036-106	(96906)	S9-C	(D) 82898	(16004)	14 AWG	120	305

Table 4-4. Wire List - Continued

TERMINATION		TERMINATION		AWG WIRE SIZE	LENGTH	
FROM	TERMINAL TYPE	TO	TERMINAL TYPE		IN.	CM
TM1-A	MS25036-106 (96906)	S3-2	12712937-1 (19200) 12712936 (19200)	16 AWG	96	244
S1-3	MS25036-106(96906)	S3-1	12712937-1 (19200) 12712936 (19200)	16 AWG	24	61
TM1-B	MS25036-106 (96906)	CB GND	MS25036-108 (96906)	16 AWG	24	61
CB GND	MS25036-108 (96906)	FR GND	MS25036-109 (96906)	16 AWG	88	224
CB GND	MS25036-108 (96906)	FR GND	MS25036-109 (96906)	16 AWG	88	224
CB GND 12712936	MS25036-108 (96906) (19200)	C1- (-)	12712937-1 (19200)	16 AWG	60	153
CB GND 12712936	MS25036-108 (96906) (19200)	L2-B	12712937-1 (19200)	16 AWG	108	275
CB GND 12712936	MS25036-108 (96906) (19200)	L1-B	12712937-1 (19200)	16 AWG	96	244
CB GND	MS25036-108 (96906)	S5-2	MS25036-153 (96906)	16 AWG	108	275
S4-M1	MS25036-153 (96906)	S5-L	MS25036-153 (96906)	16 AWG	36	92
K3-B	13216E6191-2 (97403)	TD2-C	MS25036-106 (96906)	16 AWG	24	61
TD1-X1	MS25036-106 (96906)	TD1-C	MS25036-106 (96906)	16 AWG	24	61
TD1-X1	MS25036-106 (96906)	TB1-3	MS25036-106 (96906)	16 AWG	24	61
TD1-X2	MS25036-106 (96906)	S8-4	MS25036-106 (96906)	16 AWG	24	61
TD1-NO	MS25036-106 (96906)	CB GND	13216E6191-2 (97403)	16 AWG	24	61
TB1-2	MS25036-106 (96906)	K2-A	13216E6191-2 (97403)	16 AWG	24	61
TD2-X2	MS25036-106 (96906)	CB GND	MS25036-108 (96906)	16 AWG	24	61
TD2-C	MS25036-106 (96906)	S7-C	MS27144-2 (96906)	16 AWG	120	305
TD2-NO	MS25036-106 (96906)	S6-C	12712937-1 (19200)	16 AWG	102	260
S8-1	MS25036-106 (96906)	T1-5	12712937-1 (19200)	16 AWG	24	61
S8-2	MS25036-106 (96906)	T1-8	12712937-1 (19200)	16 AWG	24	61
S8-3	MS25036-106 (96906)	CB GND	MS25036-108 (96906)	16 AWG	24	61
TB1-2	MS25036-106 (96906)	K3-9	13216E6191-2 (97403)	16 AWG	24	61
TB1-2	MS25036-106 (96906)	M2-1	MS25036-153 (96906)	16 AWG	24	61
S5-L	MS25036-153 (96906)	S5-12V	MS25036-153 (96906)	16 AWG	3	8
TB1-1	MS25036-106 (96906)	TM1-6	MS25036-106 (96906)	16 AWG	24	61

Table 4-4. Wire List - Continued

TERMINATION			TERMINATION			AWG WIRE SIZE	LENGTH	
FROM	TERMINAL TYPE		TO	TERMINAL TYPE			IN.	CM
K1-6	13216E6191-2	(97403)	S4-LINE	MS25036-153	(96906)	14 AWG	108	275
TB1-1	MS25036-106	(96906)	L1-A	12712937-1	(19200)	16 AWG	102	260
12712936	(19200)							
TM1-1	MS25036-106	(96906)	C1- (+)	2712937-1	(19200)	16 AWG	64	163
12712936	(19200)							
TM1-1	MS25036-106	(96906)	L2-A	12712937-1	(19200)	16 AWG	108	275
12712936	(19200)							
S1-3	MS25036-106	(96906)	GA1-I	MS25036-108	(96906)	16 AWG	120	305
S9-NO	(D) 82898	(16004)	S10-C	(D) 82898	(16004)	14 AWG	204	519
K3-3	13216E6191-2	(97403)	L3-RED	12712937-1	(19200)	14 AWG	120	305
12712936	(19200)							
GA1-S	MS25036-108	(96906)	SU1-S	MS25036-108	(96906)	16 AWG	62	158
SU1-GND	MS25036-108	(96906)	FR GND	MS25036-109	(96906)	16 AWG	18	46
GA1-GND	MS25036-108	(96906)	FR-GND	MS25036-109	(96906)	16 AWG	6	16
TB1-1	MS25036-106	(96906)	K1-9	13216E6191-2	(97403)	14 AWG	24	61
T1-1	13216E6191-2	(97403)	ALT-YEL	12712937-1	(19200)	16 AWG	156	397
T1-2	13216E6191-2	(97403)	ALT-YEL	12712937-1	(19200)	16 AWG	156	397
YEL (ALT)	1355AS376-1	(30003)	YEL (VR-)	12712937-1	(REF)	14 AWG YEL SEE NOTE 2	156	397
YEL (ALT)	1355AS376-1	(30003)	YEL (VR-)	12712937-1	(REF)	14 AWG YEL SEE NOTE 2	156	397
S1-1	MS25036-106	(96906)	K5-A	MS25036-108	(96906)	14 AWG	24	61
K4-C	MS25036-113	(96906)	K5-C	MS25036-113	(96906)	10 AWG	120	305
K5-NO	MS25036-113	(96906)	GLPG	MS25036-112	(96906)	10 AWG	120	305
CB GND	MS25036-108	(96906)	K5-GND	MS25036-108	(96906)	14 AWG	24	61
Control Panel Mount	MS20659-130	(96906)	TB1 Mount	MS20659-130	(96906)	SEE NOTE 3	4	10
Engine Mount	MS20659-118	(96906)	Unit Frame	MS20659-118	(96906)	SEE NOTE 4	18	46

Table 4-4. Wire List - Continued

NOTE

1 - Use sleeving for marking wires.
2 - No wire markings used on color coded wires.
3 - Make from 2, figure F-17, appendix F and 3, figure F-23, appendix F.
4 - Make from 1, figure F-17, appendix F.

c. Removal.

(1) Tag and disconnect wire lead(s) from component.

(2) Remove tie down straps and loosen clamp(s) as necessary to remove wire(s).

(3) Remove any silicone RTV remaining in evaporator frame grommets (4).

d. Installation.

(1) Carefully route wire lead(s) through clamp(s) and grommet(s) as necessary.

(2) Connect wire lead(s) to component using tags and wiring diagram (fig. 1-4). Remove tags.

(3) Install tie down straps as necessary and tighten any clamp(s) that were loosened for removal.

(4) Apply silicone RTV into evaporator frame grommets (4) to seal evaporator enclosure.

(5) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close condenser side door if open.
Unlatch and close control panel cover.
Connect battery (para 4-35) and put unit back into service.

4-21. CIRCUIT BREAKER CB1 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Marker Tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and,
battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

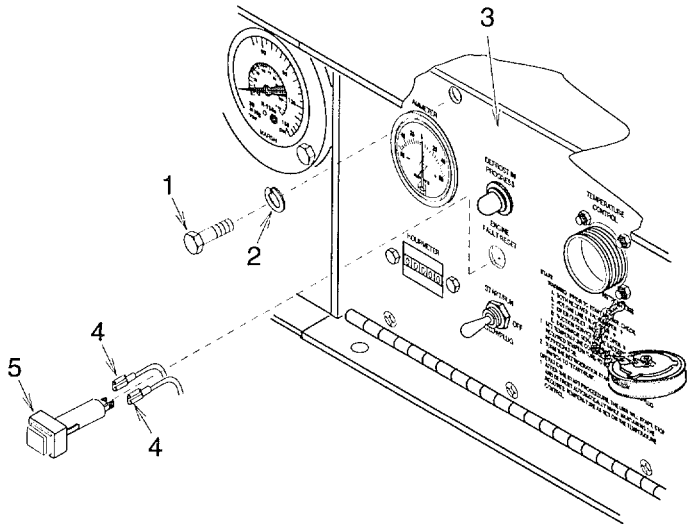


Figure 4-15. Circuit Breaker

(2) Tag and disconnect wire leads (4).

4-21. CIRCUIT BREAKER CB1 TESTING AND REPLACEMENT. - Continued

NOTE

The circuit breaker can be manually operated by pushing the button on it. When on, the button is in. When off, the button is out exposing a white band.

(3) Using multimeter set to measure continuity, check circuit breaker (5) continuity between terminals 1 to 2, with circuit breaker in both the on (button in, no white band showing) and off (button out, white band showing) position. Continuity should be indicated only when circuit breaker (5) is in the on position. If continuity was indicated in the off position or if no continuity was indicated in the on position, replace circuit breaker (5).

(4) If no failure was indicated, install wire leads (4) per tags and wiring diagram (fig. 1-4). Remove tags.

(5) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Tag and disconnect wire lead terminals (4) and remove.

(3) Pinch the side tabs on circuit breaker (5) and remove from the front of the control panel.

c. Installation.

(1) Install circuit breaker (5) through the front of the control panel (3).

(2) Using tags and wiring diagram (fig. 1-4), install wire lead terminals (4). Remove tags.

(3) Close control panel and install two new lock washers (2) and bolts (1).

(4) Be sure circuit breaker button in pushed in, and white band is not showing.

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-22. LAMP ASSEMBLY DS1 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1,Appendix G
Marker Tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove indicator cap (1).

(2) Remove lamp (2).

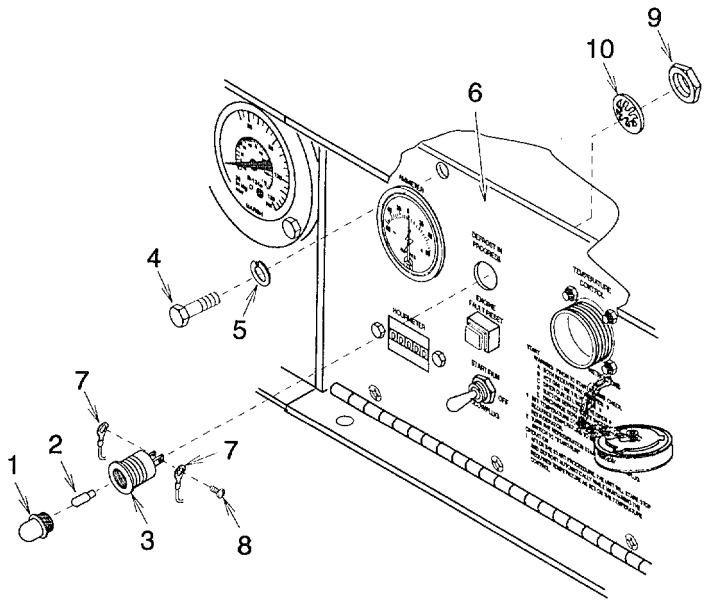


Figure 4-16. Lamp Assembly

(3) Using multimeter set to measure continuity, check lamp (2) continuity between terminals. Continuity should be indicated. If no continuity was indicated, replace lamp.

(4) If indicator base (3) is damaged, replace it.

(5) If no failure was indicated, install lamp (2) and indicator cap (1).

4-22. LAMP ASSEMBLY DS1 TESTING AND REPLACEMENT. - Continued

b. Removal.

(1) Be sure battery has been disconnected and remove indicator cap (1) and lamp (2).

(2) Remove two bolts (4) and lock washers (5). Open control panel (6). Discard lock washers.

NOTE

Terminal and base mounting hardware is supplied with indicator base.

(3) Tag wire lead terminals (7) and remove two screws (8) and wire lead terminals.

(4) Remove nut (9), lock washer (10), and indicator base (3).

c. Installation.

(1) Install indicator base (3), lock washer (10), and nut (9).

(2) Using tags and wiring diagram (fig. 1-4), install wire lead terminals (7) and two screws (8). Remove tags.

(3) Close control panel (6). Install two new lock washers (5) and bolts (4).

(4) Install lamp (2) and indicator cap (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-23. FUSES F1 AND F2 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1,Appendix G
Marker Tags (4)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and ,
battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure power has been disconnected at the source and remove two bolts (1) and lock washers (2). Open control box cover (3). Discard lock washers.

NOTE

One each 15 amp and 30 amp fuse is used.

(2) Note location and remove two fuses (4) and (5).

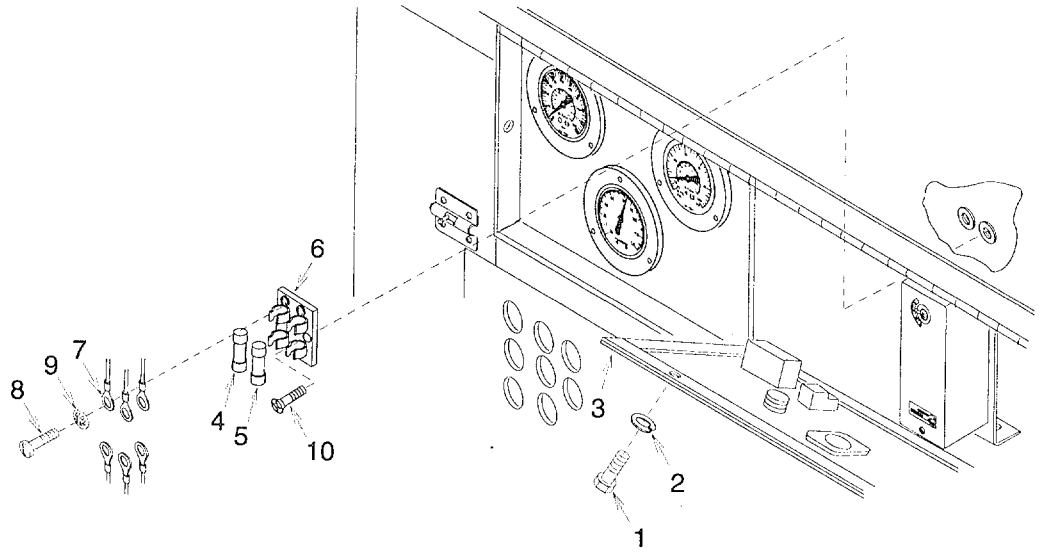


Figure 4-17. Fuses

(3) Using multimeter set to measure continuity, check continuity between each fuse (4) and (5) ends. Continuity should be indicated. If no continuity was indicated, replace fuse (4) and (5).

(4) If fuse block (6) is damaged, replace it.

(5) If no failure was indicated, install fuse (4) and (5), close control panel (3) and install two new lock washers (2) and bolts (1).

4-23. FUSES F1 AND F2 TESTING AND REPLACEMENT. - Continued

b. Removal.

(1) Be sure power has been disconnected at the source and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

NOTE

One each 15 amp and 30 amp fuse is used.

(2) Note location and remove two fuses (4) and (5).

NOTE

Terminal hardware is supplied with fuse block.

(3) Tag wire lead terminals (7) and remove four screws (8), lock washers (9), and wire lead terminals.

(4) Remove two screws (10) and fuse block (6).

c. Installation.

(1) Install fuse block (6) and two screws (10).

(2) Using tags and wiring diagram (fig. 1-4), install wire lead terminals (7), four lock washers (9), and screws (8). Remove tags.

(3) Install two fuses (4) and (5) in location noted during removal.

(4) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-24. CONTROL RELAYS K1, K2 AND K3 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Lock Washer (2 Each Relay)
6, Appendix G
Marker tags (6) (K1, K3)
7, Appendix E
Marker tags (4) (K2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Tag and disconnect wire leads (4).

(3) Using multimeter set to measure continuity, check each control relay (5) coil continuity between terminals A to B. Continuity should be indicated. If no continuity was indicated, replace control relay.

(4) Using multimeter set to measure continuity, check each control relay (5) contact continuity between terminals 7 to 4 (K3 and K4) and 9 to 6 (K4). No continuity should be indicated. If continuity was indicated, replace control relay (5).

(5) If no failure was indicated, using tags and wiring diagram (fig. 1-4), install wire leads (4). Remove tags.

(6) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

4-24. CONTROL RELAYS K1, K2 AND K3 TESTING AND REPLACEMENT. - Continued

NOTE

The following procedures apply to all three control relays K1, K2 and K3. Quantities given are for each relay.

(2) Tag and disconnect wire leads (4).

(3) Remove bolt (6), lock washer (7), flat washer (8), and control relay (5). Discard lock washer.

c. Installation.

NOTE

The following procedures apply to all three control relays K1, K2 and K3. Quantities given are for each relay.

(1) Install control relay (5), flat washer (8), new lock washer (7), and bolt (6).

(2) If wire lead (4) terminals were damaged, repair per paragraph 4-20.

(3) Using tags and wiring diagram (fig. 1-4), install wire leads (4). Remove tags.

(4) Close control panel (3). Install two new lock washers (2) and bolts (1).

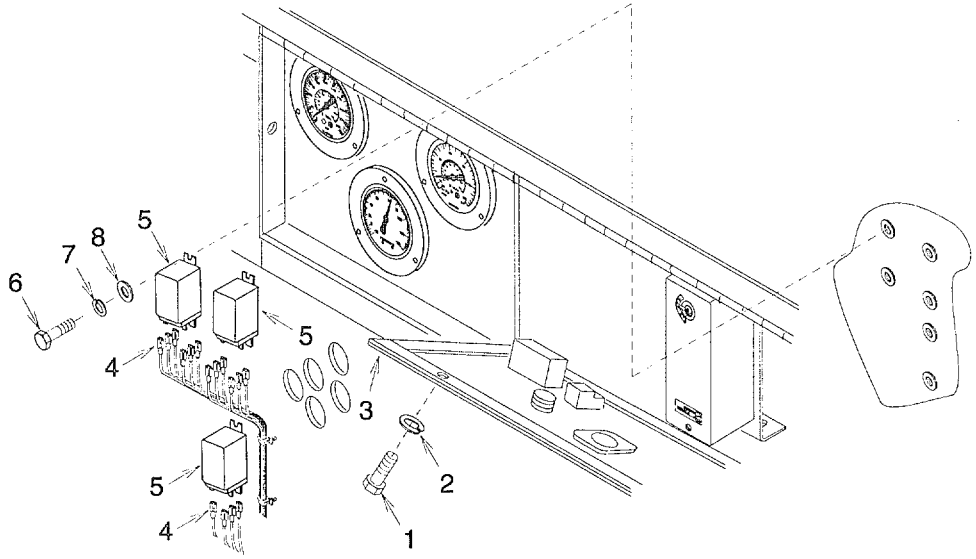


Figure 4-18. Control Relays

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-25. TIME DELAY RELAYS TD1 AND TD2 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Adhesive Tape
Figure F-35, Appendix F
Marker tags (4)
7, Appendix E
Lock Washers (2)
1, Appendix G
Lock Washers (4)
6, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

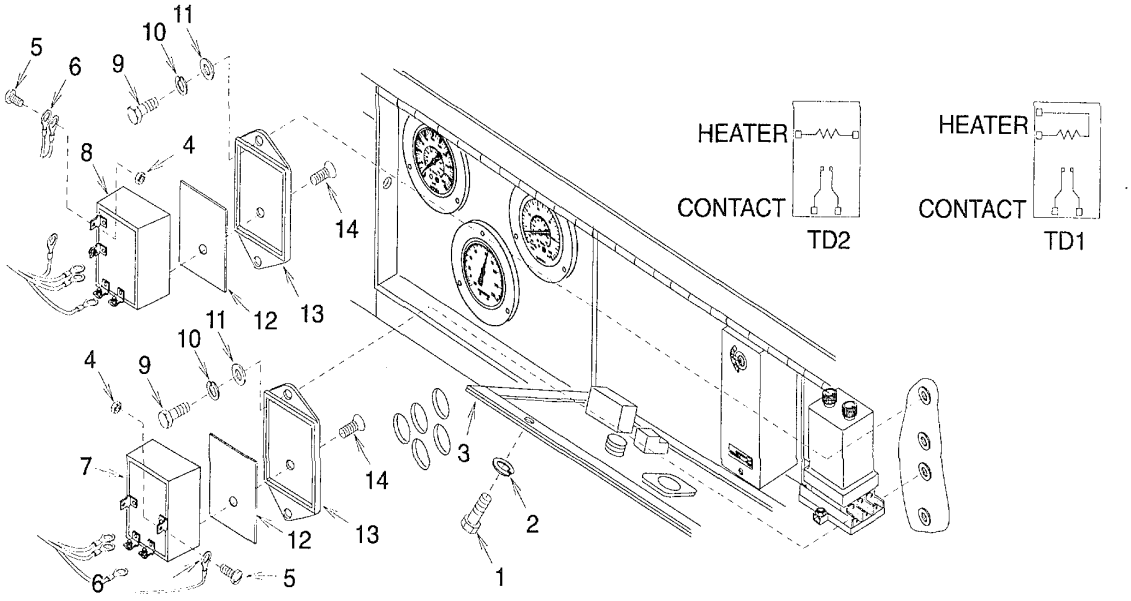


Figure 4-19. Time Delay Relay

4-25. TIME DELAY RELAYS TD1 AND TD2 TESTING AND REPLACEMENT. - Continued

NOTE

- The following procedures apply to both TD1 and TD2. Quantities given are for each relay.
- Terminal hardware is supplied with time delay relay.

(2) Tag wire leads and remove nuts (4), screws (5) and wire leads (6) from time delay relay (7) and (8).

(3) Using multimeter set to measure continuity, check continuity between heater terminals. Continuity should be indicated. If no continuity was indicated, replace time delay relay (7) or (8).

(4) Using multimeter set to measure continuity, check continuity between contact terminals. Continuity should not be indicated. If continuity was indicated, replace time delay relay (7) or (8).

(5) If no failure was indicated, use tags and wiring diagram (fig. 1-4), install wire leads (6), screws (5), and nuts (4). Remove tags.

(6) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

NOTE

- The following procedures apply to both TD1 and TD2. Quantities given are for each relay.
- Terminal hardware is supplied with time delay relay.

(2) Tag wire leads (6) and remove nuts (4), screws (5) and wire leads (6) from time delay relay (7) or (8).

(3) Remove two bolts (9), lock washers (10), flat washers (11), and time delay relay (7) or (8). Discard lock washers.

c. Installation.

NOTE

- The following procedures apply to both TD1 and TD2. Quantities given are for each relay.
- Terminal hardware is supplied with time delay relay.

(1) Install adhesive tape (12) between time delay relay (7) or (8) to mounting plate (13). Install screw (14) to mounting plate.

(2) Install time delay relay (7) or (8), using two flat washers (11), new lock washers (10), and bolts (9).

(3) If wire lead (6) terminals were damaged, repair per paragraph 4-20.

(4) Using tags and wiring diagram (fig. 1-4), install wire leads (6), nuts (4) and screws (5). Remove tags.

(5) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-26. HOURMETER M2 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Locking Nuts (2
8, Appendix G
Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery1, Appendix G disconnected (para 4- Self 35).
Control panel cover door raised and latched

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

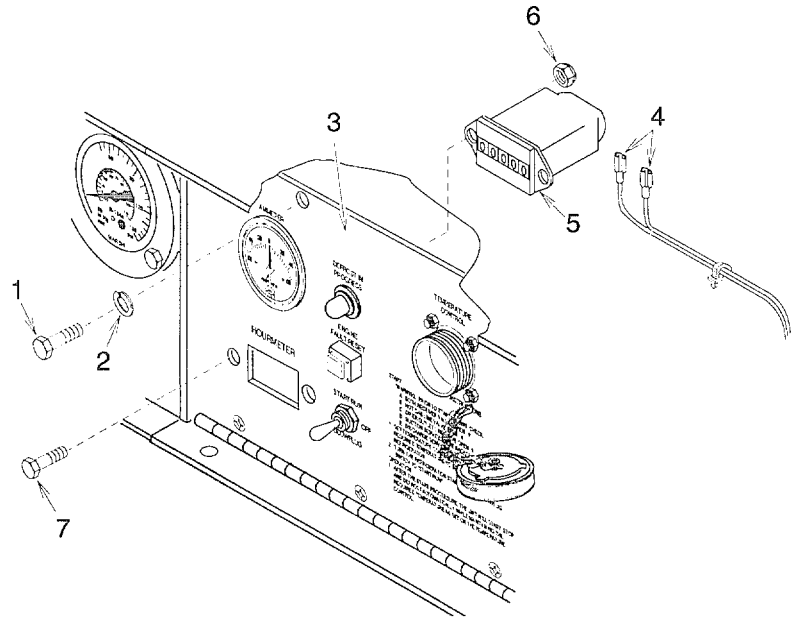


Figure 4-20. Hourmeter

(2) Tag and disconnect wire leads (4).

(3) Using multimeter set to measure continuity, check hourmeter (5) continuity between terminals. Continuity should be indicated. If no continuity was indicated, replace hourmeter.

(4) If no failure was indicated, install wire leads (4) and remove tags.

(5) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

NOTE

Terminal hardware is supplied with hourmeter.

(2) Tag wire leads (4) and remove.

(3) Remove two self locking nuts (6), bolts (7), and hourmeter (5). Discard self locking nuts.

c. Installation.

(1) Install hourmeter (5), two bolts (7), and new self locking nuts (6).

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (4) and remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-27. AMMETER M1 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials / Parts:

Lock Washers (2)
1, Appendix G
Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

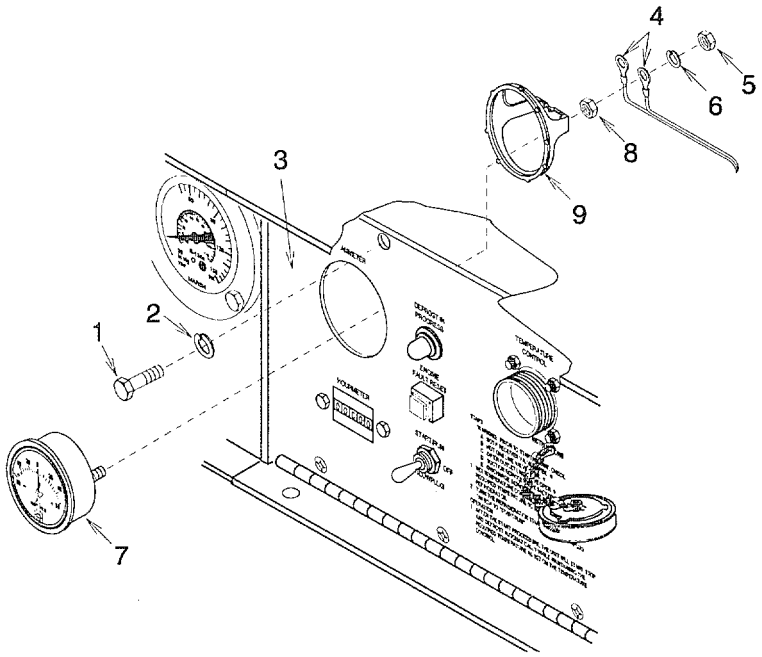


Figure 4-21. Ammeter

NOTE

Terminal hardware is supplied with ammeter.

(2) Tag wire leads (4) and remove two nuts (5), lock washers (6) and wire leads.

(3) Using multimeter set to measure continuity, check ammeter (7) continuity between terminals. Continuity should be indicated. If no continuity was indicated, replace ammeter.

(4) If no failure was indicated, install wire leads (4), lock washers (6), and nuts (5). Remove tags.

(5) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

NOTE

Terminal hardware is supplied with ammeter.

(2) Tag wire leads (4) and remove two nuts (5), lock washers (6) and wire leads.

(3) Remove two self locking nuts (8), plastic bracket (9), and ammeter (7). Discard self locking nuts.

c. Installation.

(1) Install ammeter (7), plastic bracket (9), and two new self locking nuts (8).

NOTE

Terminal hardware is supplied with ammeter.

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (4), two new lock washers (6), and nuts (5). Remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-28. TOGGLE SWITCH S1 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

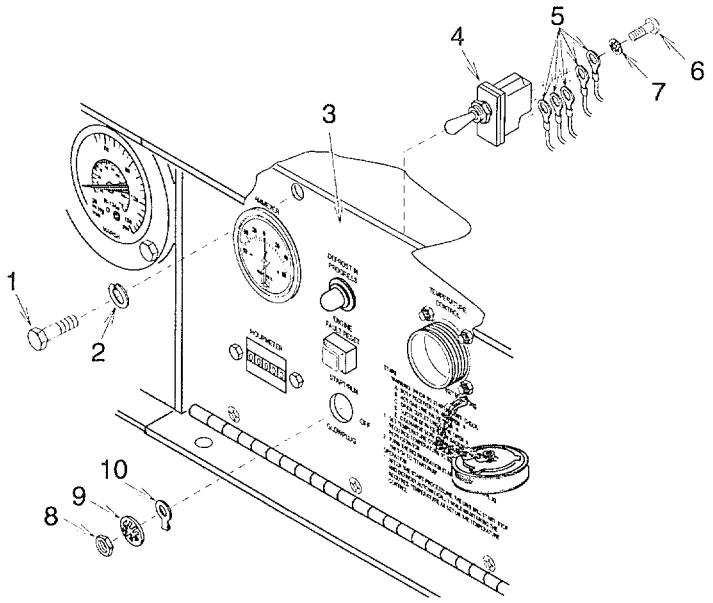


Figure 4-22. Toggle Switch

(2) Using multimeter set to measure continuity, check toggle switch (4) continuity between terminals 2 to 3 with toggle switch in both START/RUN and OFF position. Continuity should be indicated only when toggle switch (4) is in the START/RUN position. If continuity was indicated in the OFF position or if no continuity was indicated in the START/RUN position, replace toggle switch (4).

(3) Using multimeter set to measure continuity, check toggle switch (4) continuity between terminals 2 to 1 with toggle switch in both GLOWPLUG and OFF position. Continuity should be indicated only when toggle switch (4) is in the GLOWPLUG position. If continuity was indicated in the OFF position or if no continuity was indicated in the GLOWPLUG position, replace toggle switch (4).

(4) If no failure was indicated, close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

NOTE

Terminal and mounting hardware is supplied with toggle switch.

(2) Tag wire leads (5) and remove two screws (6), lock washers (7), and wire leads.

(3) Remove nut (8), lock washer (9), retainer (10), and toggle switch (4).

c. Installation.

(1) Install toggle switch (4), retainer (10), lock washer (9), and nut (8).

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (5), two lock washers (7), and screws (6). Remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-29. REMOTE BUILB THERMOSTAT S2 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1,Appendix G
Self Locking Nuts (4) (Thermostat)
8, Appendix G
Self Locking Nuts (2) (Bracket)
8, Appendix G
Self Locking Nuts (4) (Dummy Stowage Connector)
8, Appendix G
Self Locking Nuts (2)
11, Appendix G
Self Locking Nut
12, Appendix G
Tie Down Straps
24, Appendix E
Marker tags (2)
7, Appendix E
Silicone RTV
20, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.
Left side condenser door open.
Evaporator coil guard removed (para 4-18).
Evaporator air outlet guard removed (para 4-17).

General Safety Instructions

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Remove screw (4) and cover (5).

(3) Remove two self locking nuts (6), bolts (7), and sensing bulb bracket (8). Discard self locking nuts.

(4) Remove self locking nut (9), bolt (10), and sensing bulb bracket (8). Discard self locking nut.

(5) Remove clamp (11).

(6) Immerse sensing bulb (12) into a temperature controlled bath at 32° F (0° C). A bath at this temperature can be made by putting the sensing bulb into a container of ice and covering with water. Ice must remain packed around sensing bulb at all times during test.

(7) Using multimeter set to measure continuity, check remote bulb thermostat (13) continuity between terminals 1 and 3 with thermostat setting at 24°F and at 40°F (-4°C and 4°C). Continuity should be indicated only when the setting is at 24°F (-4°C). If continuity was indicated at 40°F (4°C) setting, replace thermostat.

(8) If no failure was indicated, slip clamp (11) over sensing bulb (12).

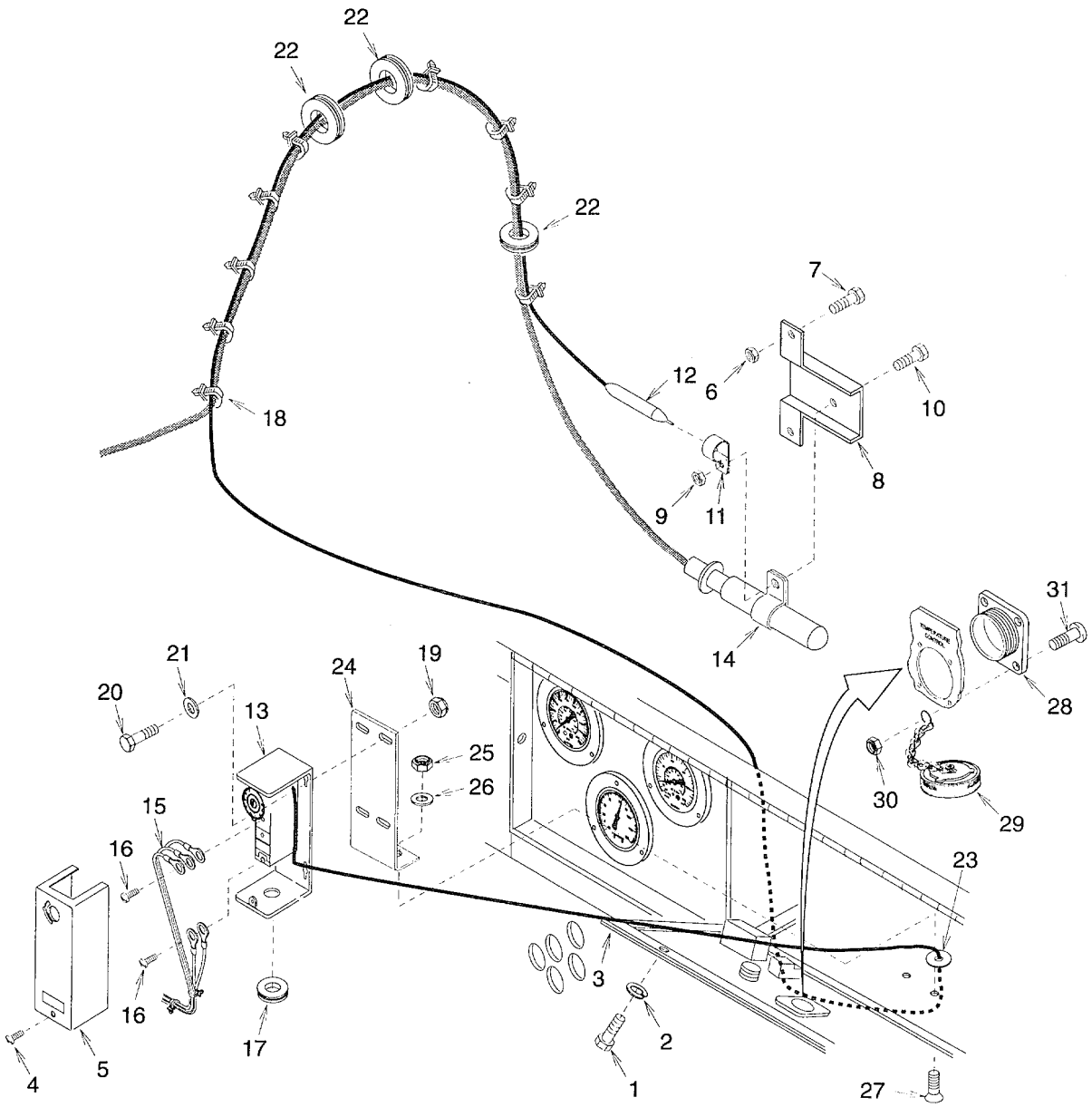


Figure 4-23. Remote Bulb Thermostat (Temperature Control)

4-29. REMOTE BULB THERMOSTAT S2 TESTING AND REPLACEMENT. - Continued

(9) Install clamps (11) and (14), bolt (10), sensing bulb bracket (8), and new self locking nut (9).

(10) Install sensing bulb bracket (8), two bolts (7), and new self locking nuts (6).

(11) Install cover (5) and screw (4).

(12) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Remove screw (4) and cover (5).

(3) Remove two self locking nuts (6), bolts (7), and sensing bulb bracket (8). Discard self locking nuts.

(4) Remove self locking nut (9), bolt (10), and sensing bulb bracket (8). Discard self locking nut.

(5) Remove clamp (11).

(6) Tag wire leads (15) then remove two screws (16) and wire leads.

(7) Pull wire leads (15) from remote bulb thermostat (13) and remove grommet (17).

(8) Remove tie down straps (18).

(9) Remove four self locking nuts (19), bolts (20), and flat washers (21). Discard self locking nuts.

(10) Remove remote bulb thermostat (13), grommets (22) and (23), and sensing bulb (12).

(11) If temperature control switch bracket (24) is damaged, remove two self locking nuts (25), flat washers (26), screws (27), and bracket. Discard self locking nuts.

(12) If dummy stowage connector (28) or cover (29) are damaged, remove four self locking nuts (30), bolts (31), cover, and dummy stowage connector. Discard self locking nuts.

(13) Remove any silicone RTV remaining in evaporator frame grommets (22).

c. Installation.

(1) If removed, install dummy stowage connector (28), four bolts (31), cover (29), and four new self locking nuts (30).

(2) If removed, install temperature control bracket (24), two screws (27), flat washers (26), and new self locking nuts (25).

(3) Install remote bulb thermostat (13), sensing bulb (12), and grommets (22) and (23).

(4) Install remote bulb thermostat (13), four flat washers (21), bolts (20), and new self locking nuts (19).

(5) Install tie down straps (18) as necessary.

(6) Install grommet (17) and push wire leads (15) into remote bulb thermostat (13).

(7) Using tags and wiring diagram (fig. 1-4), install wire leads (15) and two screws (16). Remove tags.

(8) Slip clamp (11) over sensing bulb (12).

(9) Install clamps (11) and (14), sensing bulb bracket (8), bolt (10), and new self locking nut (9).

(10) Install sensing bulb bracket (8), two bolts (7), and new self locking nuts (6).

(11) Install cover (5) and screw (4).

(12) Close control panel (3) and install two new lock washers (2) and bolts (1).

(13) Apply silicone RTV into evaporator frame grommets (22) to seal evaporator enclosure.

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Close left side condenser door.
Install evaporator air outlet guard (para 4-17).
Install evaporator coil guard (para 4-18).
Connect battery (para 4-35) and put unit back into service.

4-30. DEFROST TIMER TM1 TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Self Locking Nut (2)
8, Appendix G
Tie Down Strap
23, Appendix E
Marker tags (7)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (I) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Remove and discard tie down strap (4).

(3) Pull defrost timer (5) from relay mounting socket (6).

(4) Using multimeter set to measure continuity, check defrost timer (5) continuity between terminals 1 to 7. Continuity should be indicated. If no continuity was indicated, replace defrost timer.

(5) Using multimeter set to measure continuity, check defrost timer (5) continuity between terminals 4 to 7 and 6 to 9. No continuity should be indicated. If continuity was indicated, replace defrost timer.

(6) If relay mounting socket (6) is damaged, replace it.

(7) If no failure was indicated, push defrost timer (5) into relay mount socket (6) and install new tie down strap (4).

(8) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Remove and discard tie down strap (4).

(3) Pull defrost timer (5) from relay mounting socket (6).

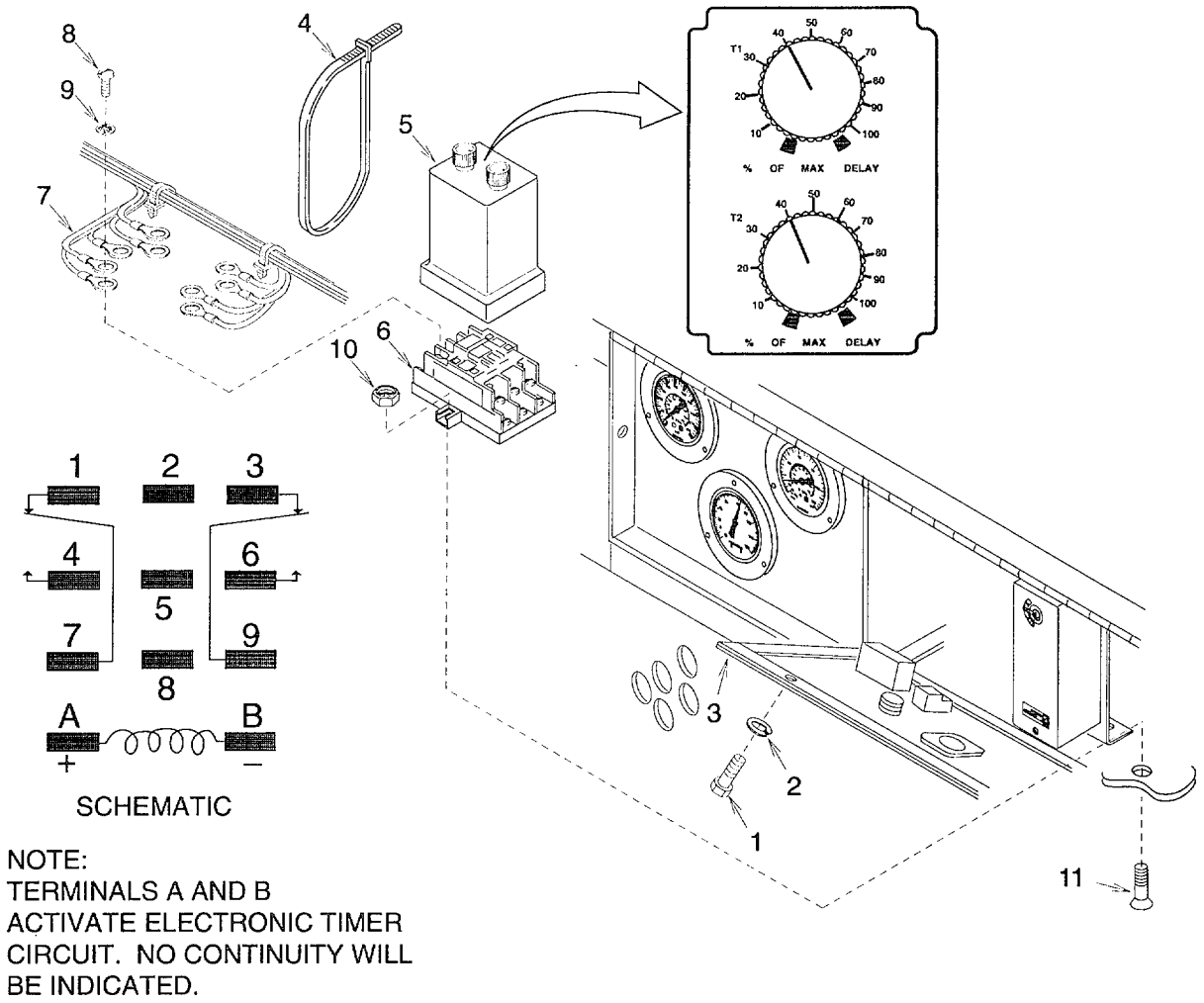


Figure 4-24. Defrost Timer

NOTE

Terminal hardware is supplied with relay mounting socket.

(4) Tag wire leads (7) and remove seven screws (8), lock washers (9), and wire leads.

(5) Remove two self locking nuts (10), screws (11), and relay mounting socket (6). Discard self locking nuts.

4-30. DEFROST TIMER TM1 TESTING AND REPLACEMENT. - Continued

c. Installation.

(1) Install relay mounting socket (6), two screws (11), and new self locking nuts (10).

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (7), seven lock washers (9), and screws (8). Remove tags.

(3) Push defrost timer (5) into relay mount socket (6) and install new tie down strap (4).

(4) Adjust controls (para 4-8) as necessary.

(5) Close control panel (3) and install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-31. ENGINE SPEED SWITCH S8 REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (2)
1, Appendix G
Lock Washers (4)
6, Appendix G
Marker tags (4)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

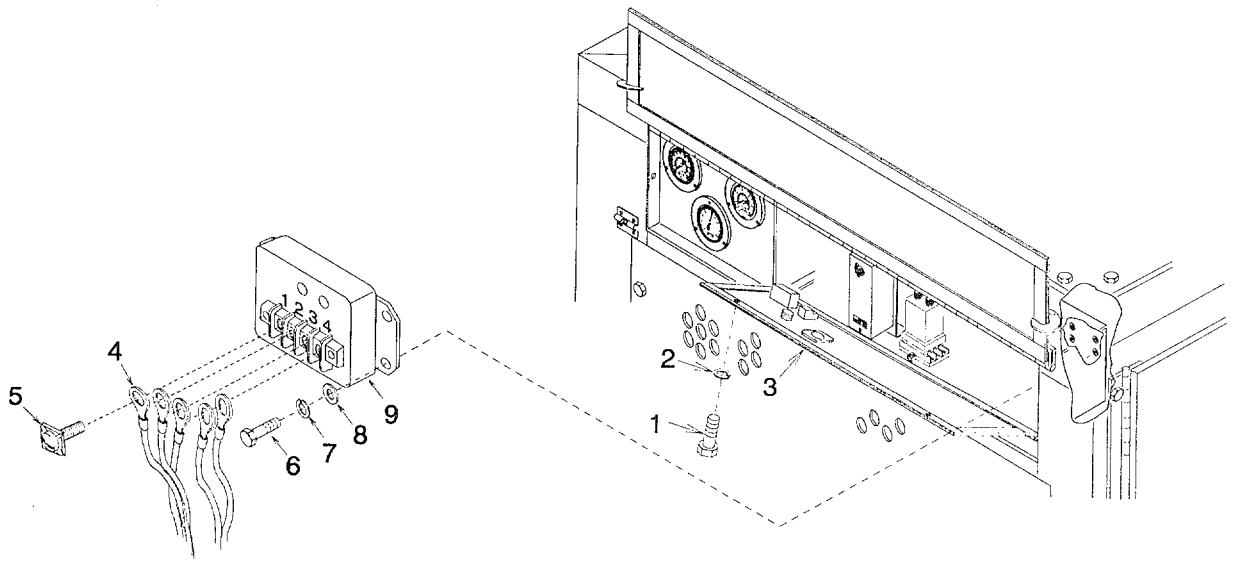


Figure 4-25. Engine Speed Switch

NOTE
Terminal hardware is supplied with engine speed switch.

(2) Tag wire leads (4), and remove four screws (5), and wire leads.

(3) Remove four bolts (6), lock washers (7), flat washers (8) and engine speed switch (9). Discard lock washers.

4-31. ENGINE SPEED SWITCH S8 REPLACEMENT. - Continued

b. Installation.

CAUTION

The engine speed switch must be factory set at 83 hertz for the engine to operate properly. Equipment damage can result if not set to this frequency.

(1) Be sure engine speed switch (9) has been factory set at 83 hertz. Install engine speed switch, four new lock washers (7), flat washers (8), and bolts (6).

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (4), and four screws (5). Remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-32. CONTROL TRANSFORMER T1 TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (2)
1, Appendix G
Self Locking Nuts (2)
8, Appendix G
Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

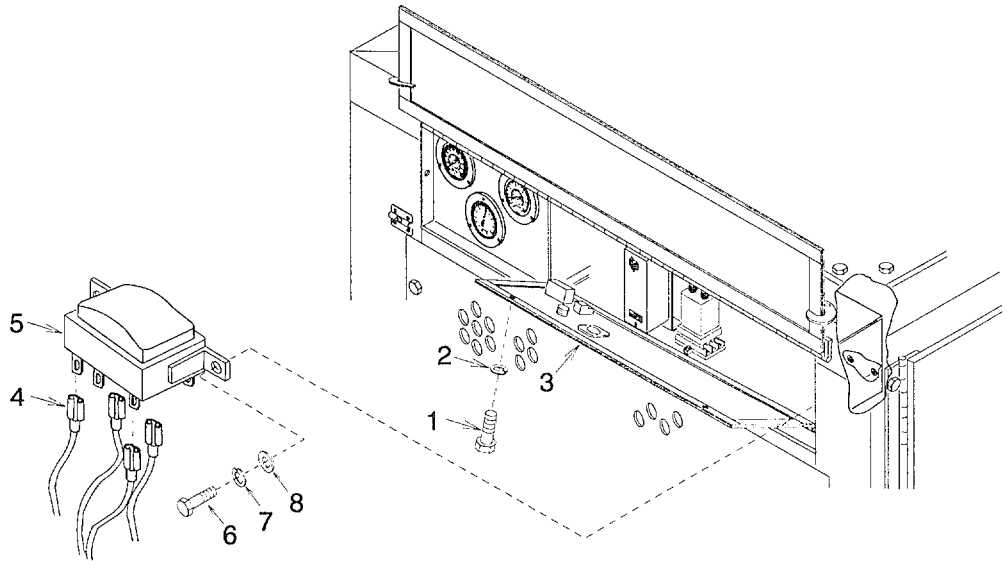


Figure 4-26. Control Transformer T1

(2) Tag and disconnect wire leads (4).
(3) Using multimeter set to measure continuity, check control transformer (5) continuity between terminals 1 to 2 and 5 to 8. Continuity should be indicated. If no continuity was indicated, replace control transformer.
(4) Check continuity between either terminals 1 to 5, or 1 to 8. No continuity should be indicated. If continuity was indicated, replace control transformer.

4-32. CONTROL TRANSFORMER T1 TESTING AND REPLACEMENT. - Continued

(5) Check continuity between each terminal and the case. No continuity should be indicated. If continuity was indicated, replace control transformer.

(6) If no failure was indicated, install wire leads (4) and remove tags.

(7) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Tag wire leads (4) and remove.

(3) Remove two bolts (6), lock washers (7), flat washers (8), and control transformer (5). Discard lock washers.

c. Installation.

(1) Install control transformer (5), two bolts (6), flat washers (8) and new lock washers (7).

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (4) and remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-33. THERMOMETER TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Self Locking Nuts (3)
8, Appendix G
Self Locking Nuts (2)
Self Locking Nuts (2)
S11, Appendix G N

12, Appendix G
Tie Down Straps
24, Appendix E
Silicone RTV
20, Appendix E

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.
Left side condenser door open.
Evaporator coil guard removed (para 4-18).
Evaporator air outlet guard removed (para 4-17).

a. Testing.

(1) Be sure battery has been disconnected and remove two self locking nuts (1), bolts (2), and sensing bulb bracket (3). Discard self locking nuts.

(2) Remove self locking nut (4), bolt (5), and sensing bulb bracket (3). Discard self locking nut.

(3) Remove clamp (6).

(4) Immerse sensing bulb (7) into a temperature controlled bath at 32° F (0° C). A bath at this temperature can be made by putting the sensing bulb into a container of ice and covering with water. Ice must remain packed around sensing bulb at all times during test.

(5) Check temperature indicated on thermometer (8). Temperature indicated should be between 24° F and 40° F (-4° C and 4° C). If temperature indicated is above or below this range, replace thermometer.

(6) If no failure was indicated, slip clamp (6) over sensing bulb (7).

(7) Install clamps (6) and (9), bolt (5), sensing bulb bracket (3), and new self locking nut (4).

(8) Install sensing bulb bracket (3), two bolts (2), and new self locking nuts (1).

4-31. THERMOMETER TESTING AND REPLACEMENT. - Continued

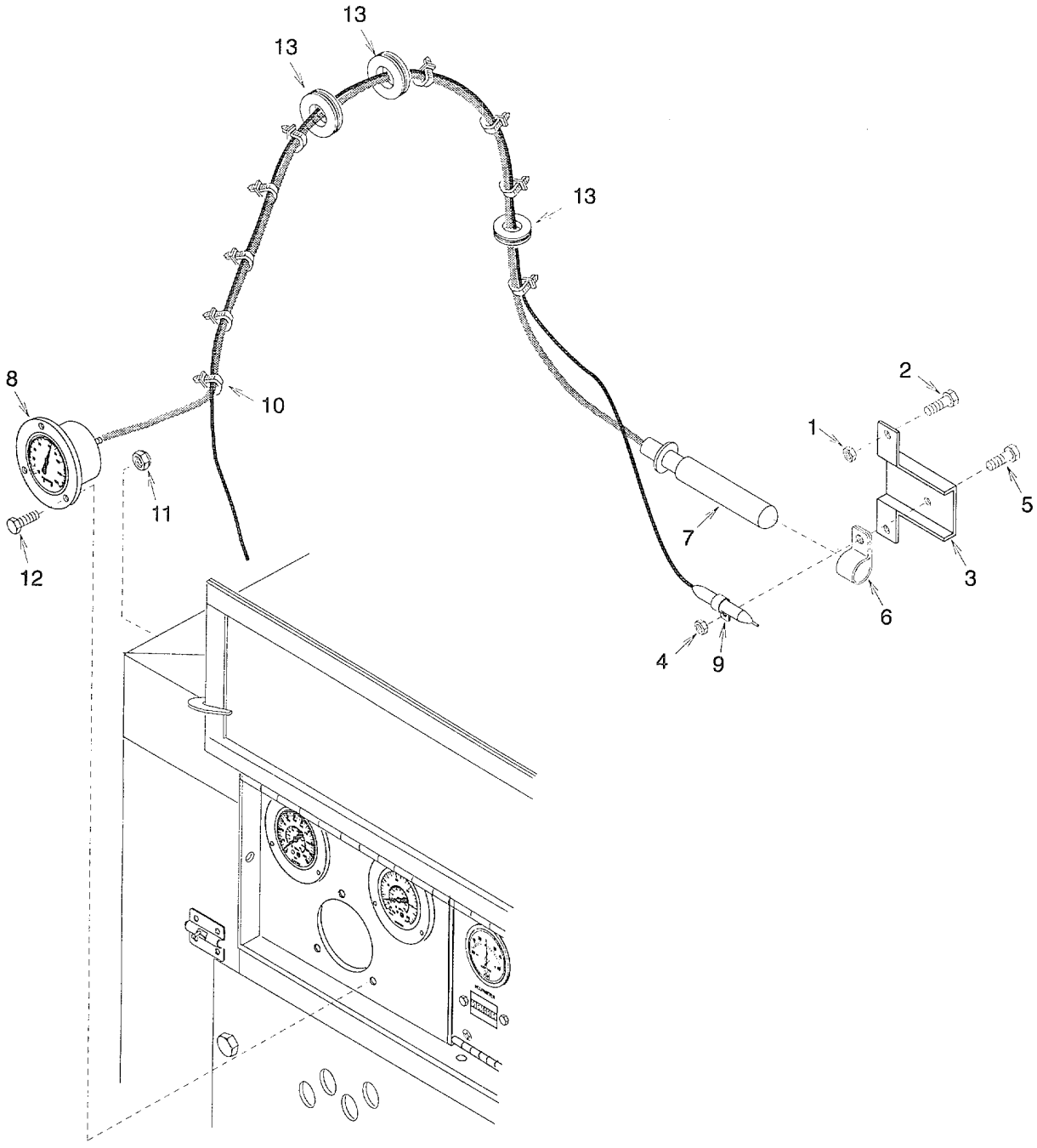


Figure 4-27. Refrigeration Temperature Gage (Thermometer)

b. Removal.

(1) Be sure battery has been disconnected and remove two self locking nuts (1), bolts (2), and sensing bulb bracket (3). Discard self locking nuts.

(2) Remove self locking nut (4), bolt (5), clamps (6) and (9) and sensing bulb bracket (3). Discard self locking nut.

(3) Remove clamp (6) from sensing bulb (7).

(4) Remove tie down straps (10).

(5) Remove three self locking nuts (11) and bolts (12). Discard self locking nuts.

(6) Remove thermometer (8) and any grommets (13) necessary to remove sensing bulb (7).

(7) Remove any silicone RTV remaining in evaporator frame grommets (13).

c. Installation.

(1) Install thermometer (8) routing sensing bulb (7) through grommets (13). Install any grommets removed.

(2) Install thermometer (8), three bolts (12), and new self locking nuts (11).

(3) Install tie down straps (10) as necessary.

(4) Slip clamp (6) over sensing bulb (7).

(5) Install clamps (6) and (9), sensing bulb bracket (3), bolt (5), and new self locking nut (4).

(6) Install sensing bulb bracket (3), two bolts (2), and new self locking nuts (1).

(7) Apply silicone RTV into evaporator frame grommets (13) to seal evaporator enclosure.

(8) Apply silicone RTV around openings in back of thermometer (8) case to seal thermometer.

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Close left side condenser door.
Install evaporator coil guard (para 4-18).
Install evaporator air outlet guard (para 4-17).
Connect battery (para 4-35) and put unit back into service.

4-34. CONTINUOUS DUTY SOLENOID K5 TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (2)
1, Appendix G
Lock Washers (2)
1, Appendix G
Marker tags (4)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Control panel cover door raised and latched.

a. Testing. (See Figure 1-4.)

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

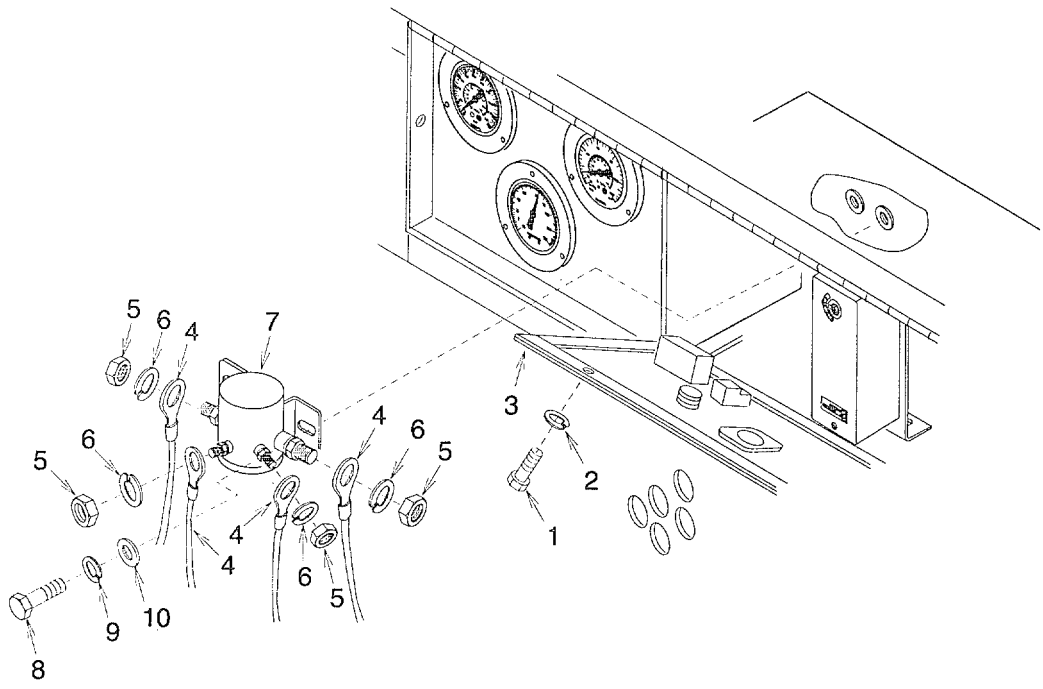


Figure 4-28. Continuous Duty

NOTE
Terminal hardware is supplied with continuous duty solenoid.

(2) Tag wire leads (4) and remove nuts (5), lock washers (6) and wire lead.

(3) Using multimeter set to measure continuity, check continuous duty solenoid (7) continuity between small terminal lugs. Continuity should be indicated. If continuity was not indicated, replace continuous duty solenoid.

(4) Using multimeter set to measure continuity, check continuous duty solenoid (7) continuity between large terminal lugs. Continuity should not be indicated. If continuity was indicated, replace continuous duty solenoid.

(5) Check continuity between each terminal and the case. No continuity should be indicated. If continuity was indicated, replace continuous duty solenoid.

NOTE

Terminal hardware is supplied with continuous duty solenoid.

(6) If no failure was indicated, install wire leads (4) per tags and wiring diagram (fig. 1-4), lock washers (6), and nuts (5). Remove tags.

(7) Close control panel (3) and install two new lock washers (2) and bolts (1).

b. Removal.

(1) Be sure battery has been disconnected and remove two bolts (1) and lock washers (2). Open control panel
(3). Discard lock washers.

NOTE

Terminal hardware is supplied with continuous duty solenoid.

(2) Tag wire leads (4) and remove nuts (5), lock washers (6) and wire leads.

(3) Remove two bolts (8), lock washers (9), flat washers (10) and continuous duty solenoid (7). Discard lock washers.

c. Installation.

(1) Install continuous duty solenoid (7), two bolts (8), new lock washers (9) and flat washers (10).

NOTE

Terminal hardware is supplied with continuous duty solenoid.

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (4), lock washers (6) and nuts (5). Remove tags.

(3) Close control panel (3). Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel cover door.
Connect battery (para 4-35) and put unit back into service.

4-35. BATTERY BT TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (2)
1, Appendix G
Lock Washers (10)
1, Appendix G
Lock Washers (4)
13, Appendix G
Marker tags (2)
Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7).
Right side condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit.

a. Testing. (See Figure 1-4.)

WARNING

Battery explosion and personal injury can occur if negative lug is not removed first or if battery posts are shorted.

(1) Tag wire leads (1) and (2). Pull the black (negative) shield (3) back to expose negative lug (4).

NOTE

Hardware is supplied with lug.

(2) Loosen self locking nut (5) and carefully remove lug (4) from battery (6).

(3) Pull the red (positive) shield (7) back to expose positive lug (8).

(4) Loosen self locking nut (9) and carefully remove lug (8) from battery (6).

(5) Using appropriate tester, check battery (6).

WARNING

Battery explosion and personal injury can occur if positive lug is not installed first or if battery posts are shorted.

(6) If no failure was indicated, install positive lug (8) using tag and wiring diagram (fig. 1-4) and tighten self locking nut (9). Cover lug with red (positive) shield (7). Remove tag.

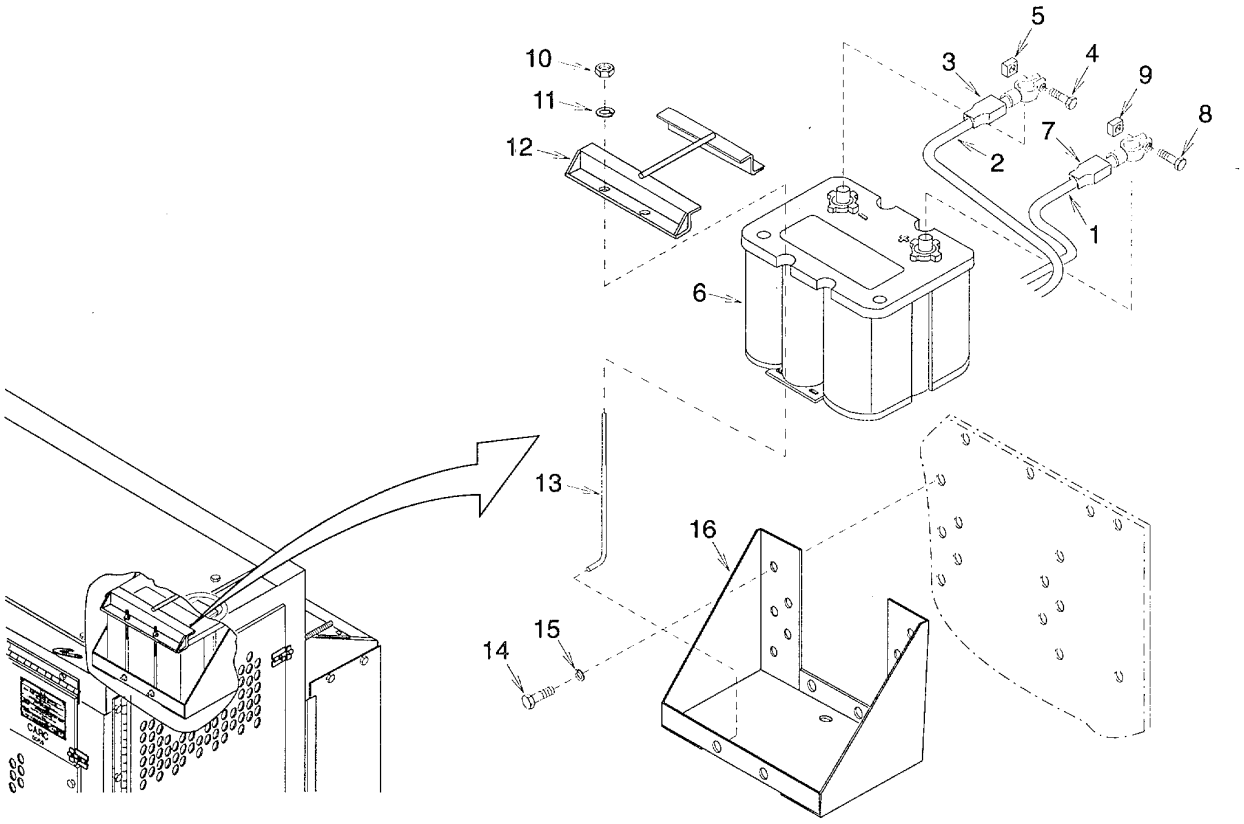


Figure 4-29. Battery

(7) Install negative lug (4) using tag and wiring diagram (fig. 1-4) and tighten self locking nut (5). Cover lug with black (negative) shield (3). Remove tag.

b. Removal.

WARNING

Battery explosion and personal injury can occur if negative lug is not removed first or if battery posts are shorted.

(1) Tag wire leads (1) and (2). Pull the black (negative) shield (3) back to expose negative lug (4).

NOTE

Hardware is supplied with lug.

(2) Loosen self locking nut (5) and carefully remove lug (4) from battery (6).

4-35. BATTERY BT TESTING AND REPLACEMENT. - Continued

(3) Pull the red (positive) shield (7) back to expose positive lug (8).

(4) Loosen self locking nut (9) and carefully remove lug (8) from battery (6).

(5) Remove four nuts (10), lock washers (11), and battery clamp (12). Discard lock washers.

WARNING

Battery can explode and cause injury to personnel and equipment if battery is dropped or punctured. Do not lift battery by terminals.

(6) Remove battery (6) and four L-bolts (13).

(7) Remove ten bolts (14), lock washers (15) and battery frame (16). Discard lock washers.

c. Installation.

(1) Install battery frame (16), ten bolts (14) and new lock washers (15).

WARNING

Battery can explode and cause injury to personnel and equipment if battery is dropped or punctured. Do not lift battery by terminals.

(2) Position four L-bolts (13) in the battery frame (16). Install battery (6).

(3) Install battery clamp (12) over L-bolts.

(4) Install new lock washers (11) and nuts (10).

WARNING

Battery explosion and personal injury can occur if positive lug is not installed first or if battery posts are shorted.

(5) Install positive lug (8) using tag and wiring diagram (fig. 1-4) and tighten self locking nut (9). Cover lug with red (positive) shield (7). Remove tag.

(6) Install negative lug (4) using tag and wiring diagram (fig. 1-4) and tighten self locking nut (5). Cover lug with black (negative) shield (3). Remove tag.

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Put unit back into service.

4-36. TEMPERATURE SWITCH S3 REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Marker tags (2)
7, Appendix E
Insulation Tape
10, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Evaporator coil guard removed (para 4-18).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove insulation as necessary to expose temperature switch (1).

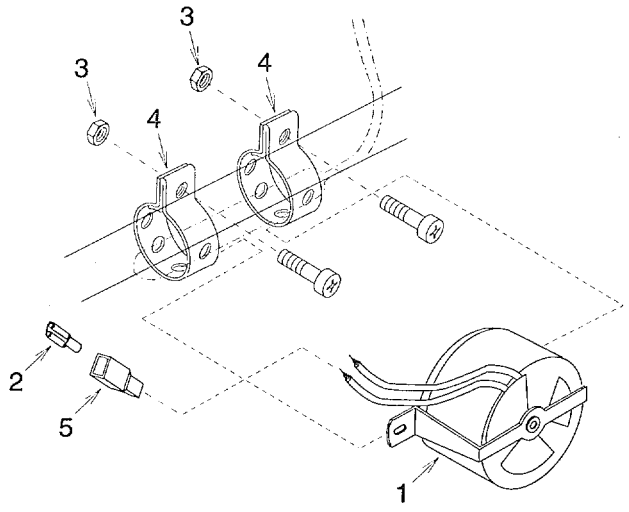


Figure 4-30. Temperature Switch

(2) Be sure battery has been disconnected, then tag and disconnect two tabs (2).

(3) Loosen two nuts (3), slide clamps (4) as necessary and remove temperature switch (1).

4-36. TEMPERATURE SWITCH S3 REPLACEMENT. - Continued

b. Installation.

(1) Install temperature switch (1), slide two clamps (4) over switch, and tighten nuts (3).

(2) Install new tab housing (5) and tab (2) onto each temperature switch (1) wire lead (para 4-20).

(3) Using tags and wiring diagram (fig. 1-4), connect tabs (2). Remove tags.

(4) Install any insulation that was removed and wrap with insulation tape as necessary.

NOTE

FOLLOW-ON MAINTENANCE:
Install evaporator coil guard (para 4-18).
Connect battery (para 4-35) and put unit back into service.

4-37. PUSH SWITCHES S9 AND S10 TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Tools:

Heat Gun
3, Section III, Appendix B

Materials/Parts:

Self Locking Nuts (2 Each Push Switch)
8, Appendix G
Sleeving Insulation (1 Each Push Switch)
1, Figure F-23, Appendix F

Sleeving Insulation (1 Each Push Switch)
Sleev2, Figure F-23, Appendix F
2, Figure F-23, Appendix F
Marker tags (4)
7, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Both side condenser doors open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing.

(1) Remove sleeving insulation (1).

(2) Tag and disconnect wire leads (2).

(3) Using multimeter set to measure continuity, check push switch (3) contact continuity across terminals C and NO with the push button switch out and pushed in. Continuity should only be indicated with the switch pushed in. If continuity was not indicated when switch was pushed in or was indicated with switch out, replace push switch.

NOTE

Smaller diameter sleeving insulation must go over wire lead connecting to push switch terminal C.

(4) If no failure was indicated, install insulation sleeving (1) over wire leads (2).

(5) Using tags and wiring diagram (fig. 1-4), connect wire leads (2). Remove tags.

4-37. PUSH SWITCHES S9 AND S10 TESTING AND REPLACEMENT. - Continued

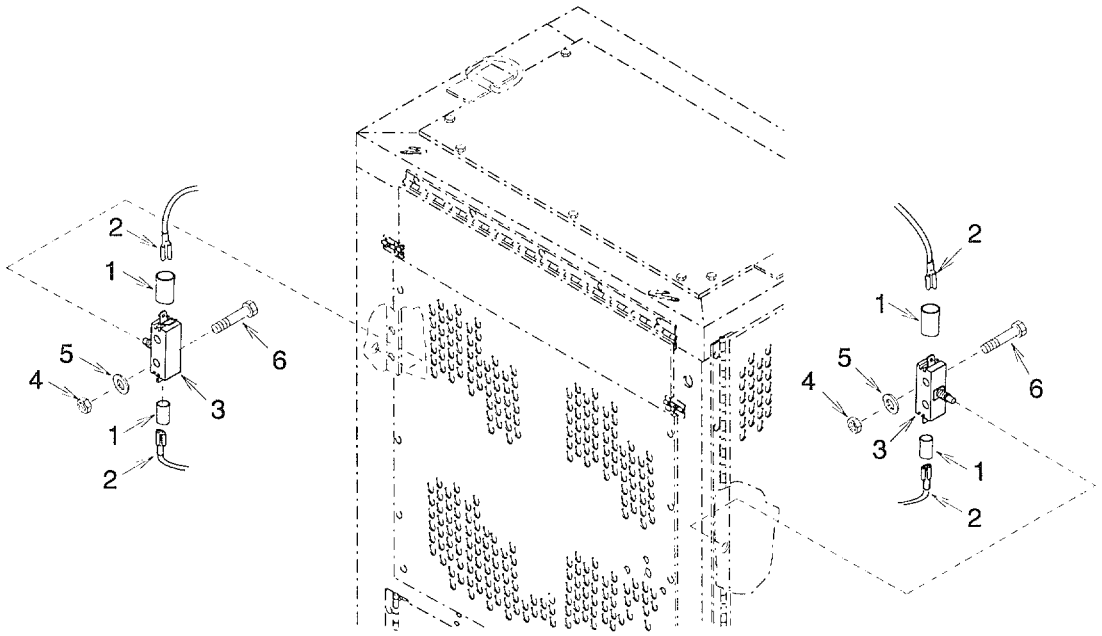


Figure 4-31. Push Switches

NOTE

Sleeving insulation covers only terminal C on one side of push switch, but must cover both terminals NO and NC on the other side.

(6) Slip sleeving insulation (1) over exposed terminals and shrink in place using heat gun.

b. Removal.

(1) Remove sleeving insulation (1).

(2) Tag and disconnect wire leads (2).

(3) Remove two self locking nuts (4), flat washers (5), bolts (6), and push switch (3). Discard self locking nuts.

c. Installation.

(1) Install push switch (3), two bolts (6), flat washers (5), and new self locking nuts (4).

NOTE

Smaller diameter sleeving insulation must go over wire lead connecting to push switch terminal C.

(2) Install insulation sleeving (1) over wire leads (2).

(3) Using tags and wiring diagram (fig. 1-4), connect wire leads (2). Remove tags.

NOTE

Sleeving insulation covers only terminal C on one side of push switch, but must cover both terminals NO and NC on the other side.

(4) Slip sleeving insulation (1) over exposed terminals and shrink in place using heat gun.

NOTE

FOLLOW-ON MAINTENANCE:
Close both side condenser doors.
Connect battery (para 4-35) and put unit back into service.

4-38. V-BELTS REPLACEMENT AND ADJUSTMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (8)
13, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35)
Both side condenser doors open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Fan Belt.

(a) Tag and disconnect connectors (1).

(b) Loosen bolt (2) on idler arm (3) as necessary to release tension on V-belt (4).

(c) Remove V-belt (4) from compressor (5) pulley.

(d) Remove eight bolts (6) and lock washers (7). Discard lock washers.

CAUTION

Moving the fan drive shaft too far can cause damage to the evaporator fan or coil.

(e) Loosen two set screws (8) and carefully move fan drive shaft (9) just enough to work V-belt (4) around support (10) and condenser fan (11).

(2) Compressor Belts.

(a) Remove fan belt (4) per above steps.

(b) Loosen four bolts (12) on engine (13).

(c) Turn two bolts (14) clockwise as necessary to release tension on two V-belts (15) and remove from engine (13) and compressor (5) pulleys.

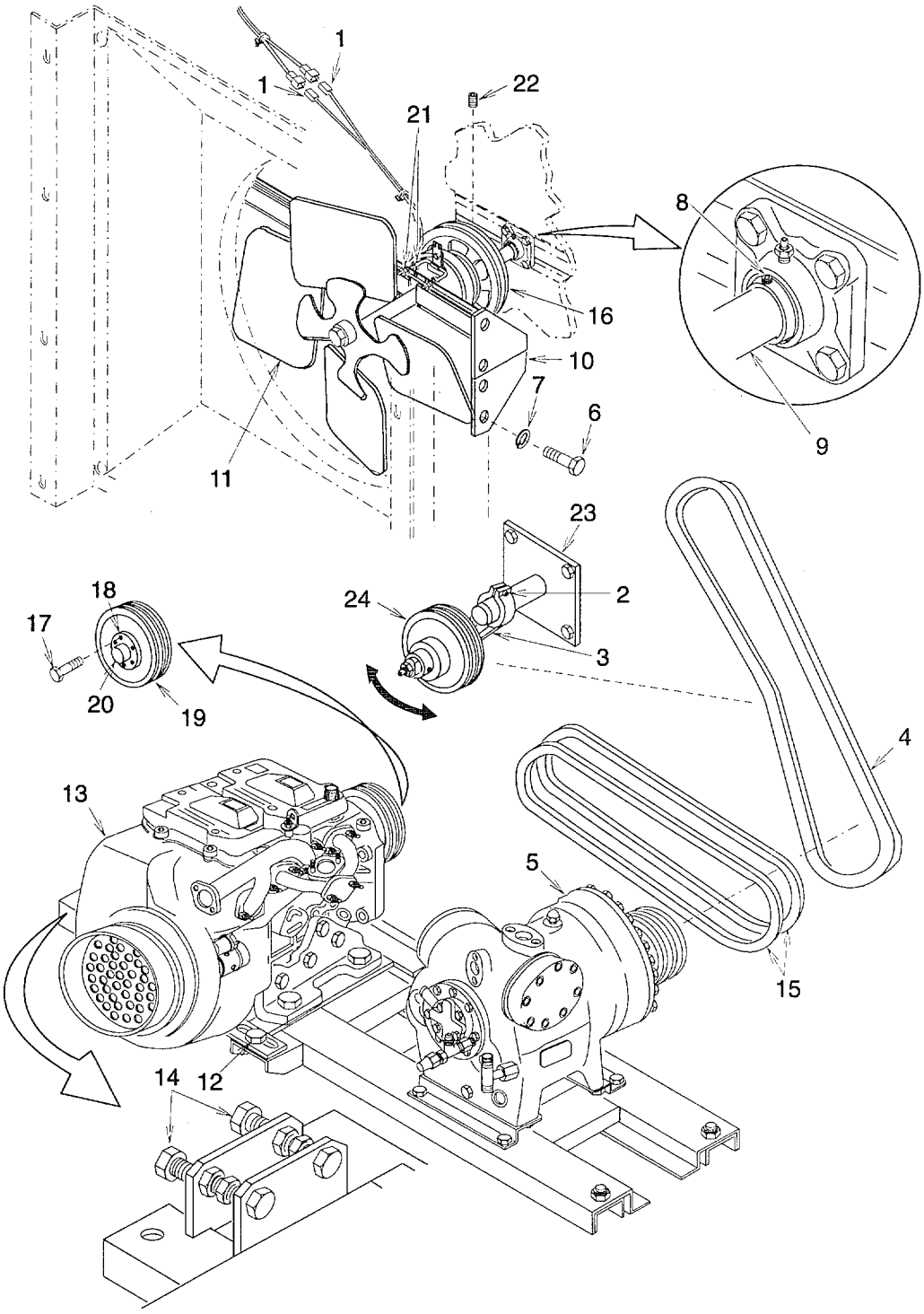


Figure 4-32. V-Belts

4-38. V-BELTS REPLACEMENT AND ADJUSTMENT. - Continued

b. Installation.

(1) Compressor Belts.

(a) Install two V-belts (15) over the engine (13) pulley and compressor (5) pulley.

(b) Adjust V-belts (15) per adjustment procedures below.

(2) Fan Belt.

(a) Work V-belt (4) around support (10) and condenser fan (11).

(b) Move fan drive shaft (9) to align support (10) mounting holes and install eight new lock washers (7) and bolts (6). Tighten two set screws (8) against flat surfaces on shaft.

(c) Slip V-belt (4) over clutch (16) and compressor (5) pulley.

(d) Adjust V-belts per adjustment procedures below.

(e) Using tags and wiring diagram (fig. 1-4), attach connectors (1). Remove tags.

c. Adjustment.

(1) Alinement.

(a) Compressor V-Belts.

1 If engine (13) and compressor (5) pulleys are not aligned, remove three bolts (17), and install two bolts back into threaded holes in bushing (18). Tighten bolts evenly to separate bushing from pulley (19). Remove two bolts from bushing.

2 Slide bushing (18) and pulley (19) on engine drive shaft (20) until they aline with compressor (5) pulley.

3 Install three bolts (17) and tighten evenly to secure pulley (19) to bushing (18).

(b) Fan V-Belt.

1 If compressor (5) and clutch (16) pulleys are not aligned, loosen four nuts (21) and set screw (22).

2 Slide fan clutch (16) on fan drive shaft (9) until it alines with compressor (5) pulley.

3 Tighten set screw (22) and four nuts (21).

4 Loosen bolt (2) and slide idler arm (3) on idler bracket (23) to center pulley (24) under fan V-belt (4).

(2) Tension.

NOTE

The following procedures apply to fan and compressor V-belts. The belts must be adjusted together, they cannot be tensioned independently.

(a) Loosen bolt (2) to relax tension on fan V-belt (4).

(b) Loosen four bolts (12) several turns.

CAUTION

Too little tension causes slippage or slip and grab, causing the belt to break. If the belt does not break, the slip will cause excessive cover wear, burn spots and overheating. Too much tension can cause belt heating and excessive stretch, as well as damage to drive components, such as sheaves and shafts. Excessive tightness will also place heavier loads on the bearings causing them to fail prematurely.

(c) Turn two bolts (14) equally counterclockwise to set compressor V-belts (15) tension. Belt tension is correct when 4 lb (2 kg) force is applied to the mid point of the belt and it deflects 0.38 in. (1 cm). When the correct tension is reached, tighten four bolts (12).

(d) Push on idler arm pulley (24) to set fan V-belt (4) tension. Belt tension is correct when 4 lb (2 kg) force is applied to the mid point of the belt and it deflects 0.38 in. (1 cm). When the correct tension is reached, tighten bolt (2).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-39. CONDENSER FAN REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washer
9, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Right side condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove bolt (1), lock washer (2), and cap (3). Discard lock washer.

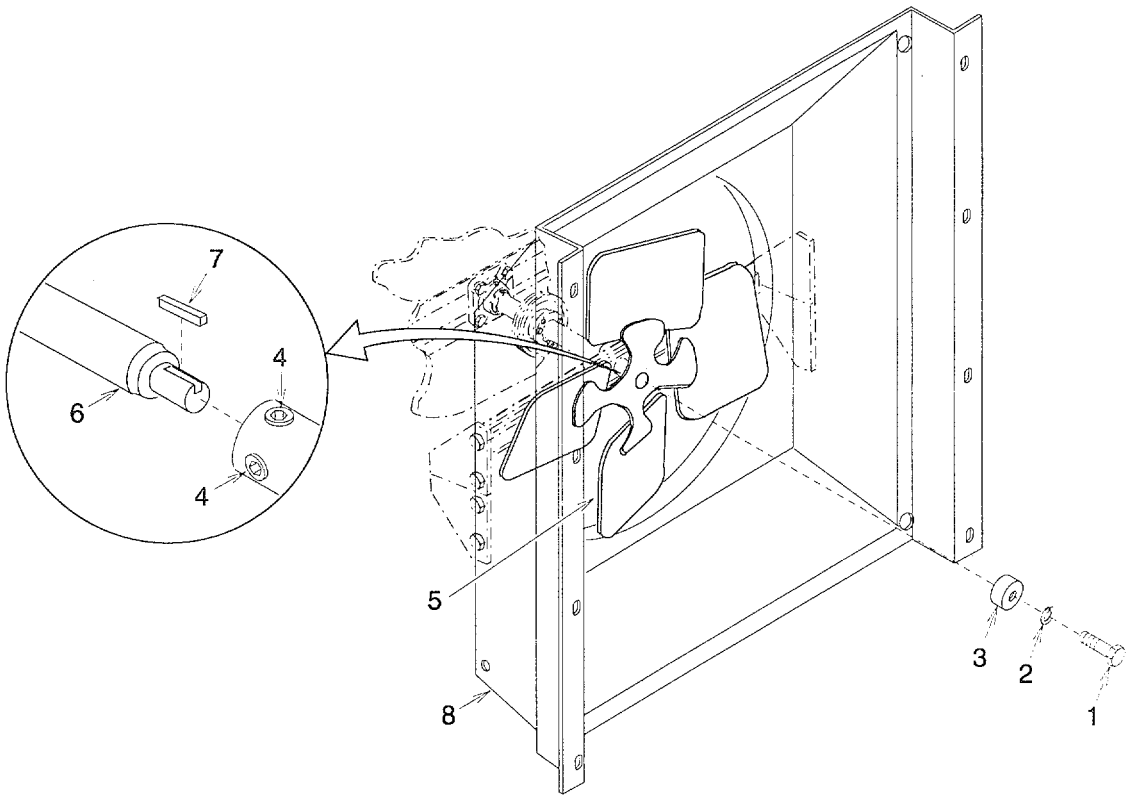


Figure 4-33. Condenser Fan

(2) Loosen two set screws (4).

(3) Carefully pull condenser fan (5) off fan drive shaft (6), being careful not to lose key (7), and remove from condenser shroud (8).

b. Installation.

(1) Place condenser fan (5) into condenser shroud (8).

(2) Aline and install condenser fan (5) and key (7) onto fan drive shaft (6).

(3) Tighten two set screws (4).

(4) Install cap (3), new lock washer (2), and bolt (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-40. EVAPORATOR FAN REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (7)
3, Appendix G

Equipment Conditions:
Refrigeration unit shut down para 2-7) and battery
Refrigeration unit shut down (para 2-7) and disconnected (para 4-35).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove seven bolts (1), lock washers (2), flat washers (3), and evaporator air outlet guard (4). Discard lock washers.

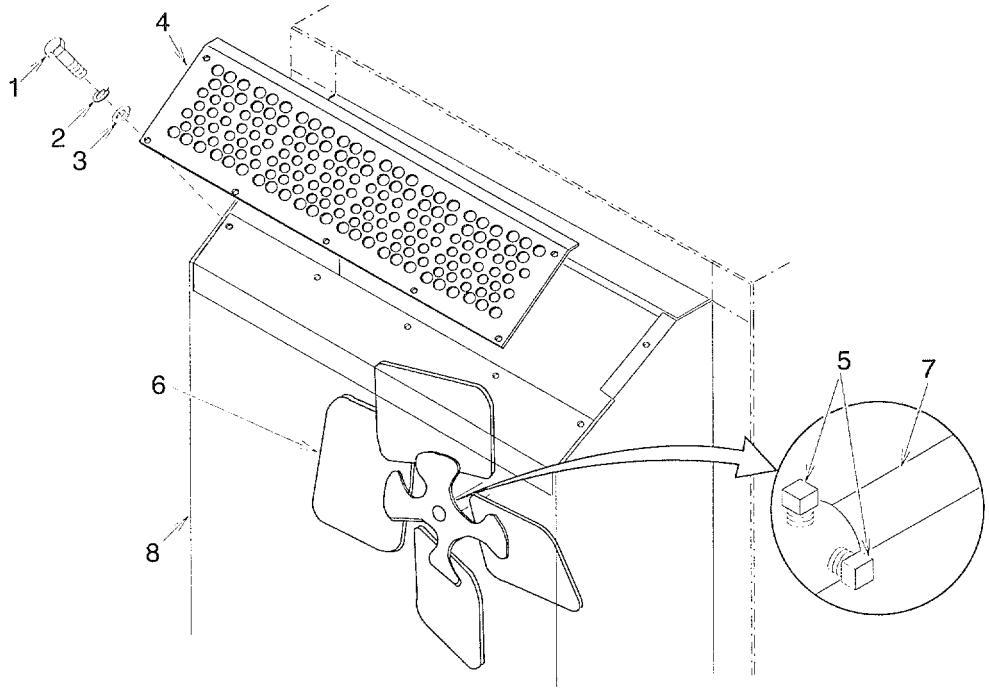


Figure 4-34. Evaporator Fan

(2) Loosen two set screws (5).

(3) Carefully pull evaporator fan (6) off fan drive shaft (7) and remove from evaporator housing (8).

b. Installation.

(1) Place evaporator fan (6) into evaporator housing (8) and install onto fan drive shaft (7).

(2) Tighten two set screws (5) against flat surfaces on fan drive shaft (7).

(3) Install evaporator air outlet guard (4), seven flat washers (3), new lock washers (2), and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Connect battery (para 4-35) and put unit back into service.

4-41. COMPRESSOR PULLEY REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washer
7, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery
Refrigeration unit shut down (para 2-7) and disconnected (para 4-35).
V-belts removed from compressor pulley only (para 4-38).

General Safety Instructions:

WARNIG

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove bolt (1), lock washer (2), and two flat washers (3). Discard lock washer.

(2) Slide pulley (4) off compressor shaft (5) being careful not to lose key (6).

b. Installation.

(1) Install key (6) then aline pulley (4) with key and slide onto compressor shaft (5).

(2) Install two flat washers (3), new lock washer (2) and bolt (1).

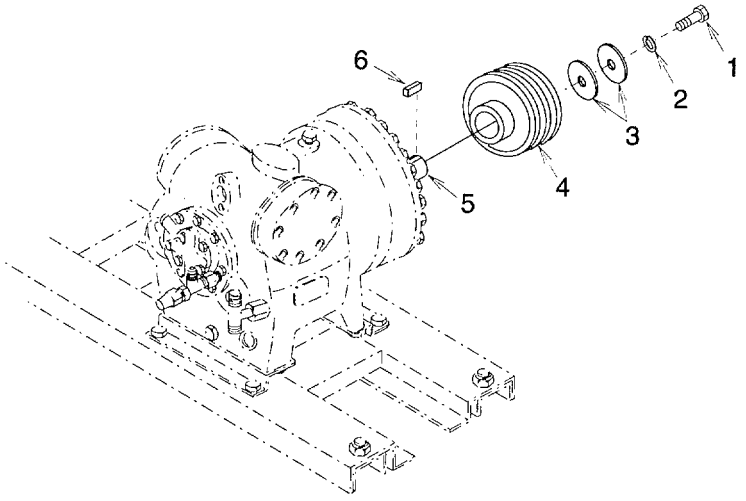


Figure 4-35. Compressor Pulley

NOTE

FOLLOW-ON MAINTENANCE:
Install V-belt onto pulley and adjust (para 4-38).
Connect battery (para 4-35) and put unit back into service.

4-42. ENGINE PULLEY REPLACEMENT.

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

INITIAL SETUP:

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
V-belts removed from engine pulley only (para 4-38).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove three bolts (1), and install two bolts back into threaded holes in bushing (2). Tighten bolts evenly to separate bushing from pulley (3). Remove two bolts from bushing.

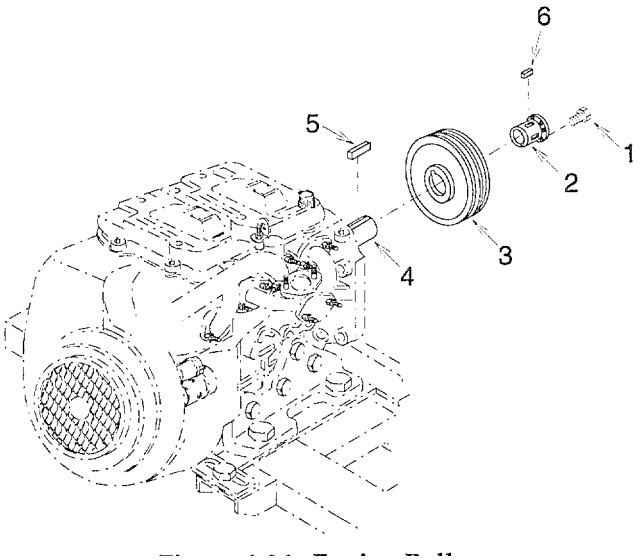


Figure 4-36. Engine Pulley

(2) Slide bushing (2) and pulley (3) off engine drive shaft (4) being careful not to lose keys (5) and (6).

b. Installation.

(1) Install key (5) then slide pulley (3) and bushing (2) onto engine shaft (4). Aline bushing over key.

(2) Install key (6) then aline pulley (3) with key and slide onto bushing (2).

(3) Install three bolts (1) and tighten evenly to secure pulley (3) to bushing (2).

NOTE
FOLLOW-ON MAINTENANCE:
Install V-belts onto pulley and engine, then adjust (para 4-38).
Connect battery (para 4-35) and put unit back into service.

4-43. IDLER PULLEY REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (4)
13, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Loosen bolt (1) to relax tension on fan belt.

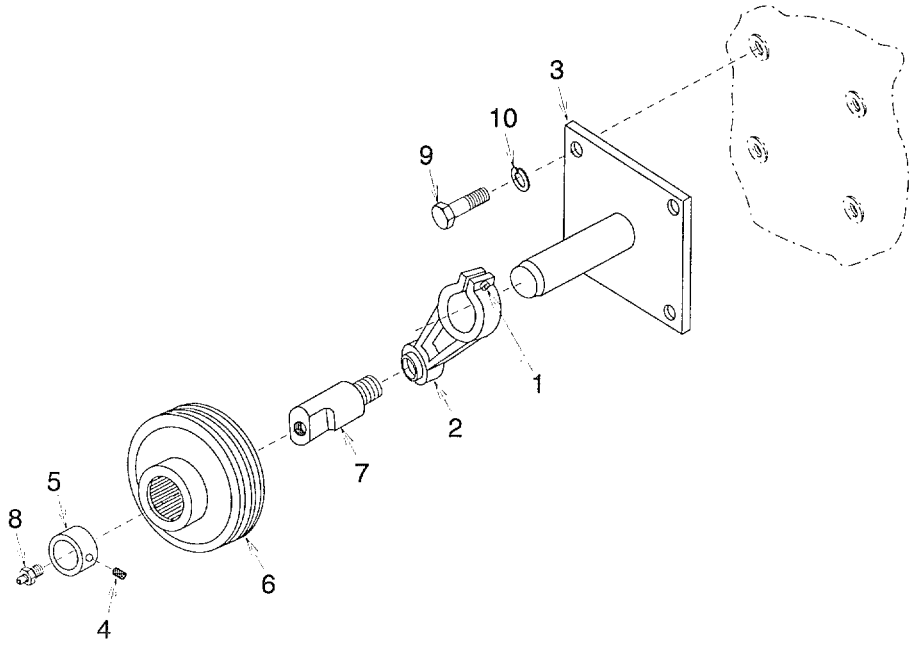


Figure 4-37. Idler Pulley

(2) Slide idler arm (2) off idler bracket (3).

(3) Remove set screw (4), and slide bushing (5) and pulley (6) off idler shaft (7).

(4) Remove idler shaft (7) from idler arm (2). Remove lubrication fitting (8).

(5) Remove four bolts (9), lock washers (10) and idler bracket (3). Discard lock washers.

b. Installation.

(1) Install idler bracket (3), four bolts (9) and new lock washers (10).

(2) Install idler shaft (7), pulley (6) and slide bushing (5). Tighten set screw (4).

(3) Install lubrication fitting (8) into idler shaft (7).

(4) Install idler arm (2).

NOTE

FOLLOW-ON MAINTENANCE:
Adjust V-belts (para 4-38).
Connect battery (para 4-35) and put unit back into service.

4-44. FLANGE BEARINGS REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (4)
16, Appendix G
Lock Washers (6)
13, Appendix G

Self Locking Nuts (4)
17, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Condenser fan removed (para 4-39).
Fan V-belt removed (para 4-38).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove four self locking nuts (1), bolts (2), and flat washers (3) from flange bearing (4). Discard self locking nuts.

(2) Remove two nuts (5), and lock washers (6). Discard lock washers.

(3) Remove six bolts (7), lock washers (8), top support (9), bottom support (10), and two lock washers (11). Discard lock washers.

(4) Loosen two set screws (12) and remove flange bearing (4) from fan drive shaft (13).

(5) Loosen set screw (14) and slide fan clutch (15) off fan drive shaft (13) being careful not to lose key (16).

(6) Remove four bolts (17) and lock washers (18). Discard lock washers.

(7) Slide flange bearing (19) off fan drive shaft (13).

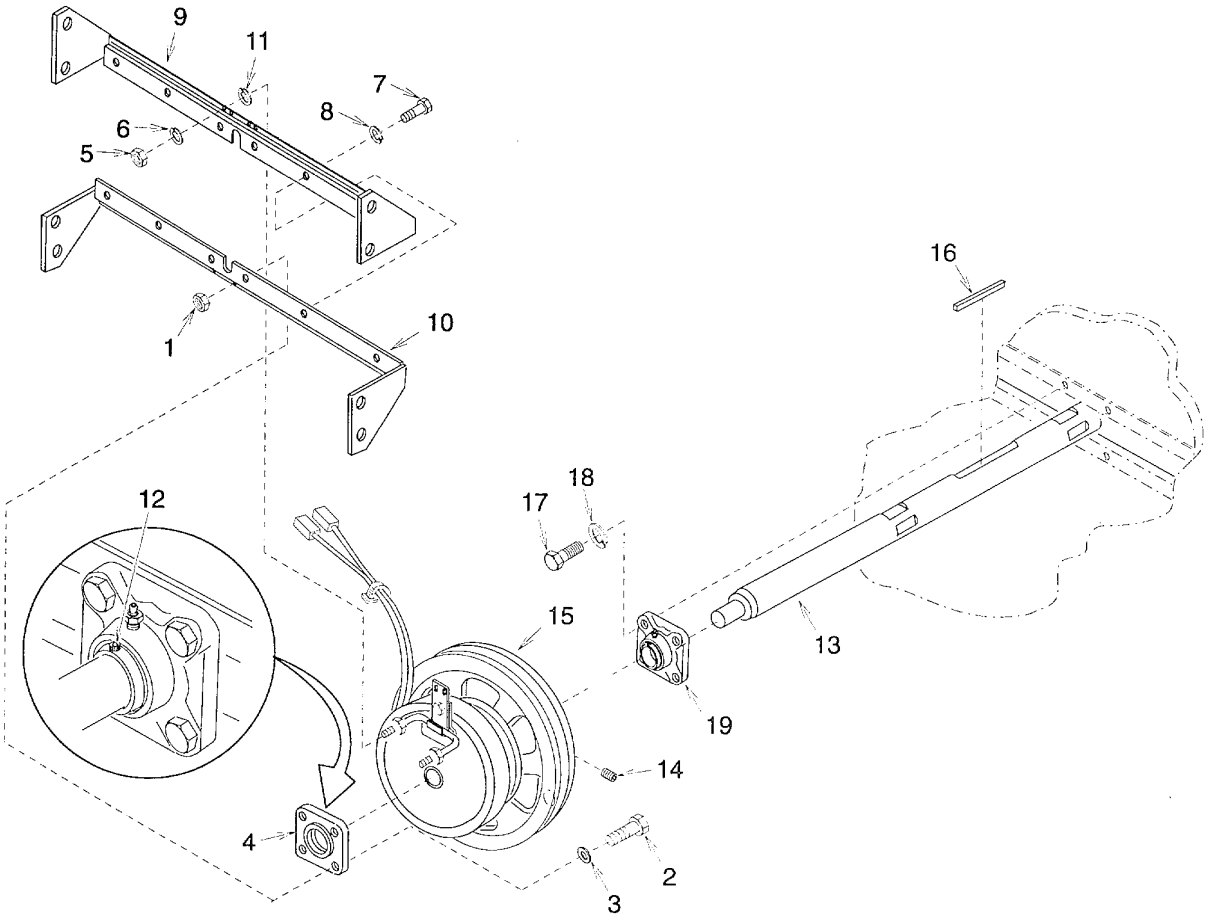


Figure 4-38. Flange Bearings

4-44. FLANGE BEARINGS REPLACEMENT. - Continued

b. Installation.

(1) Slide flange bearing (19) onto fan drive shaft (13).

(2) Install four new lock washers (18) and bolts (17).

(3) Install key (16) and slide fan clutch (15) onto fan drive shaft (13). Aline fan clutch over key.

(4) Slide flange bearing (4) onto fan drive shaft (13).

(5) Install top support (9) and bottom support (10) around fan drive shaft (13). Secure using six new lock washers (8) and bolts (7).

(6) Aline flange bearing with mounting holes and install four flat washers (3), bolts (2) and new self locking nuts (1).

(7) Install two new lock washers (11) and aline fan clutch (15) through top support (9). Install two new lock washers (6) and nuts (5).

NOTE

FOLLOW-ON MAINTENANCE:
Install and adjust fan V-belt (para 4-38).
Install condenser fan (para 4-39).
Connect battery (para 4-35) and put unit back into service.

4-45. FAN CLUTCH C1 TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Self Locking Nut
14, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Condenser fan removed (para 4-39).
Fan V-Belt removed (para 4-38).
Front flange bearing removed (para 4-44).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing.

(1) Tag and disconnect two connectors (1).

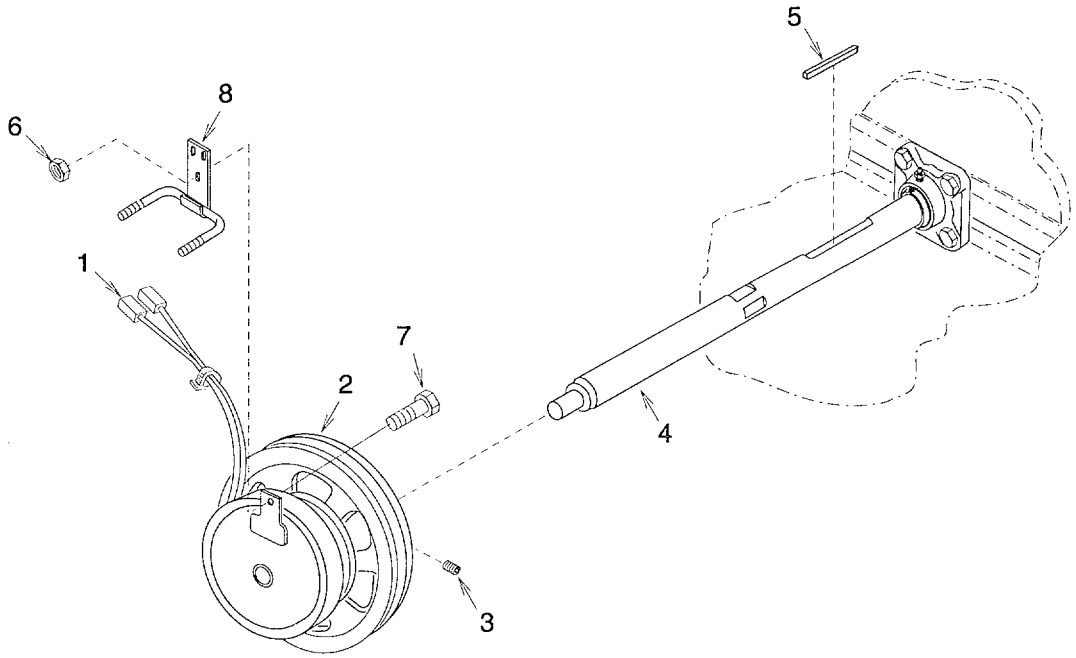


Figure 4-39. Fan Clutch

4-45. FAN CLUTCH C1 TESTING AND REPLACEMENT. - Continued

(2) Using multimeter set to measure continuity, check fan clutch (2) continuity between connectors. Continuity should be indicated. If no continuity was indicated, replace fan clutch.

(3) If no failure was indicated, attach connectors (1) and remove tags.

b. Removal.

(1) Tag and disconnect two connectors (1).

(2) Loosen set screw (3) and slide fan clutch (2) off fan drive shaft (4) being careful not to lose key (5).

(3) Remove self locking nut (6), bolt (7), and clutch bracket (8). Discard self locking nut.

c. Installation.

(1) Install clutch bracket (8), bolt (7), and new self locking nut (6).

(2) Install key (5) then slide fan clutch (2) onto fan drive shaft (4). Aline fan clutch over key.

(3) Using tags and wiring diagram (fig. 1-4), attach connectors (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Install front flange bearing (para 4-44).
Install and adjust V-belt (para 4-38).
Install condenser fan (para 4-39).
Connect battery (para 4-35) and put unit back into service.

4-46. SOLENOID VALVE L1 (LIOUID LINE) TESTING AND REPAIR.

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

INITIAL SETUP:

Materials/Parts:

Marker tags (2)
7, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Testing.

(1) Tag and disconnect tabs (1).

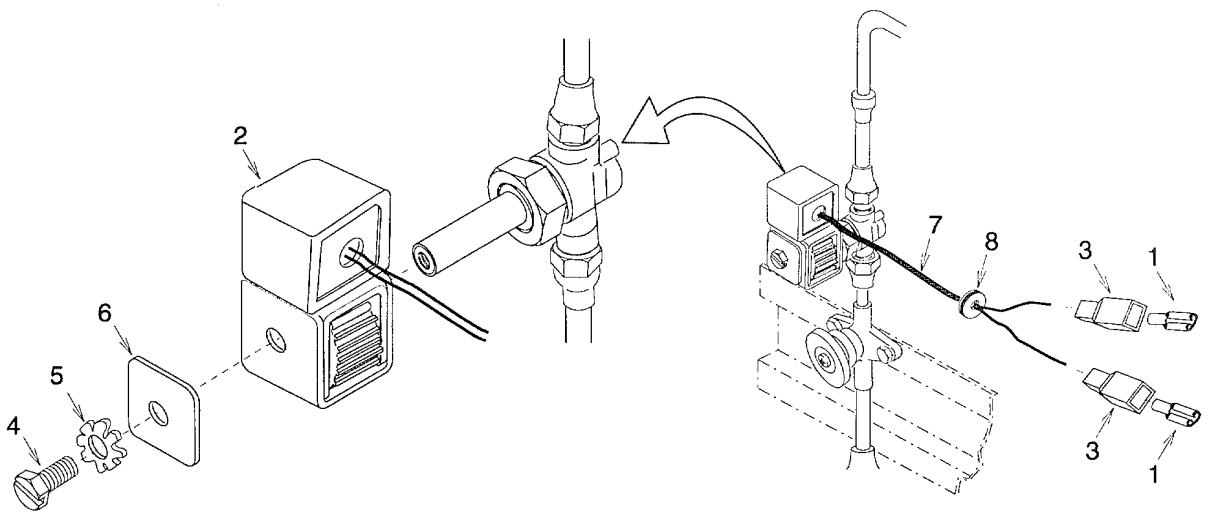


Figure 4-40. Solenoid Valve (Liquid Line)

(2) Using multimeter set to measure continuity, check coil (2) continuity between tabs (1). Continuity should be indicated. If no continuity was indicated, replace coil.

(3) Using multimeter set to measure continuity, check coil (2) continuity between each tab (1) and coil (2) metal case. No continuity should be indicated. If continuity was indicated, replace coil.

4-46. SOLENOID VALVE L1 (LIQUID LINE) TESTING AND REPAIR. - Continued

(4) If no failure was indicated, check tabs (1) and tab housing (3). If damaged, repair or replace per paragraph 4-20.

(5) Using tags and wiring diagram (fig. 1-4), connect tabs (1). Remove tags.

NOTE

The only authorized repair to the solenoid valve is coil replacement. The coil can be replaced without opening the refrigeration pressure system.

b. Removal.

WARNING

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

(1) Tag and disconnect tabs (1).

NOTE

Mounting hardware is not supplied with coil. Screw and lock washer must be retained for use during installation of coil.

(2) Remove screw (4), lock washer (5), data plate (6), and coil (2).

(3) Cut wire leads (7) if necessary and remove grommet (8).

c. Installation.

(1) Push wire leads (7) through grommet (8) and install grommet into coil (2).

(2) Install two tab housings (3) and tabs (1) (para 4-20).

NOTE

Mounting hardware is not supplied with coil. Screw and lock washer must be retained for use during installation of coil.

(3) Install coil (2), data plate (6), lock washer (5), and screw (4).

(4) Using tags and wiring diagram (fig. 1-4), connect tabs (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-47. SOLENOID VALVE L2 (DEFROST LINE) TESTING AND REPAIR.

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

INITIAL SETUP:

Materials/Parts:

Marker tags (2)
7, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).battery is connected.
Right side condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if

a. Testing.

(1) Tag and disconnect tabs (1).

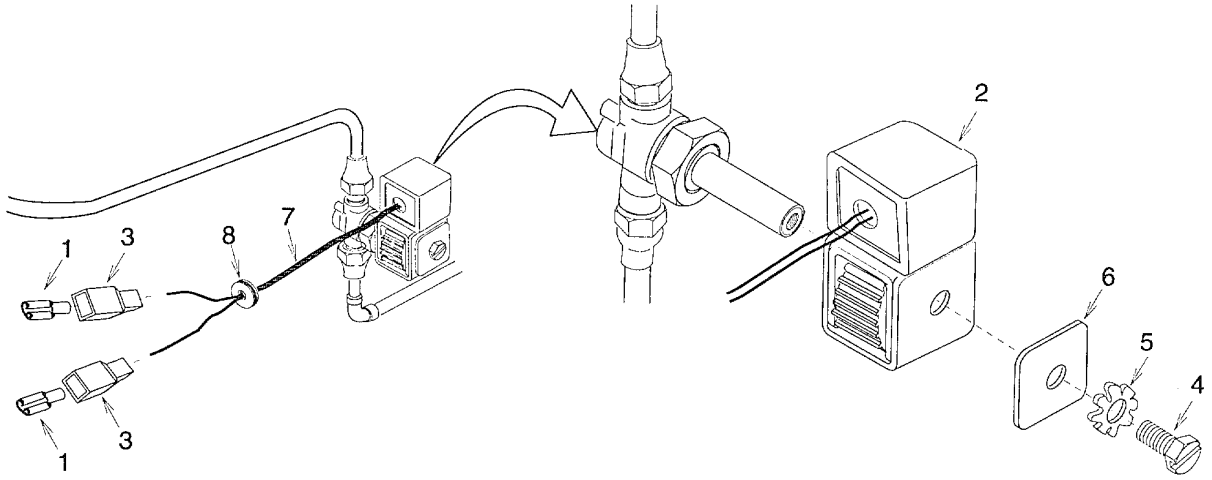


Figure 4-41. Solenoid Valve (Defrost Line)

(2) Using multimeter set to measure continuity, check coil (2) continuity between tabs (1). Continuity should be indicated. If no continuity was indicated, replace coil.

(3) Using multimeter set to measure continuity, check coil (2) continuity between each tab (1) and coil (2) metal case. No continuity should be indicated. If continuity was indicated, replace coil.

(4) If no failure was indicated, check tabs (1) and tab housing (3). If damaged, repair or replace per paragraph 4-20.

(5) Using tags and wiring diagram (fig. 1-4), connect tabs (1). Remove tags.

4-47. SOLENOID VALVE L2 (DEFROST LINE) TESTING AND REPAIR. - Continued

NOTE

The only authorized repair to the solenoid valve is coil replacement. The coil can be replaced without opening the refrigeration pressure system.

b. Removal.

WARNING

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

(1) Tag and disconnect tabs (1).

NOTE

Mounting hardware is not supplied with coil. Screw and lock washer must be retained for use during installation of coil.

(2) Remove screw (4), lock washer (5), data plate (6), and coil (2).

(3) Cut wire leads (7) if necessary and remove grommet (8).

c. Installation.

(1) Push wire leads (7) through grommet (8) and install grommet into coil (2).

(2) Install two tab housings (3) and tabs (1) (para 4-20).

(3) Install coil (2), data plate (6), lock washer (5), and screw (4).

(4) Using tags and wiring diagram (fig. 1-4), connect tabs (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-48. OIL FILTER REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Wiping Rags
3, Appendix E
Lubricating Oil
5, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal.

(1) Remove filter element (1) and seal (2). Discard filter element and seal.

(2) Check condition of union (3) and remove if damaged.

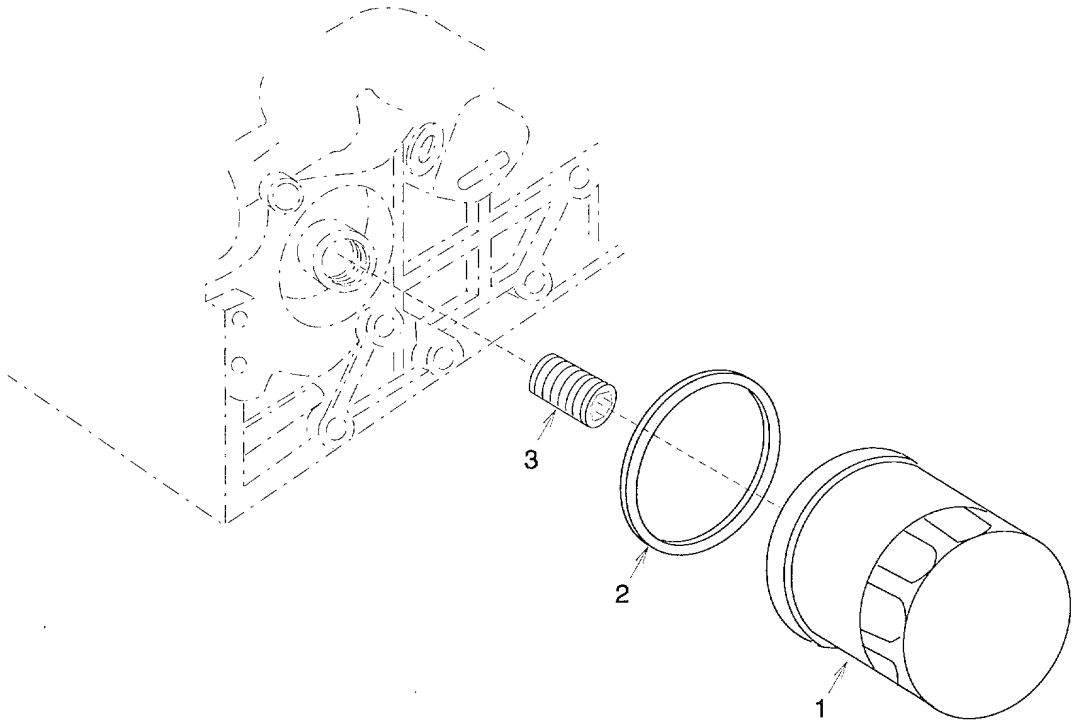


Figure 4-42. Oil Filter

4-48. OIL FILTER REPLACEMENT. - Continued

b. Installation.

(1) Using wiping rag, clean any oil residue remaining.

(2) Install union (3) if removed.

NOTE
Seal is supplied with new filter element.

(3) Lightly coat new seal (2) with lubricating oil and install onto new filter element (1).

CAUTION

Never install a used filter element onto the engine. Damage to engine can result if filter element is clogged.

(4) Install new filter element (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-49. AIR CLEANER REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Gasket
10, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.
Left front bottom door open.

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if

a. Removal.

(1) Loosen clamp (1).

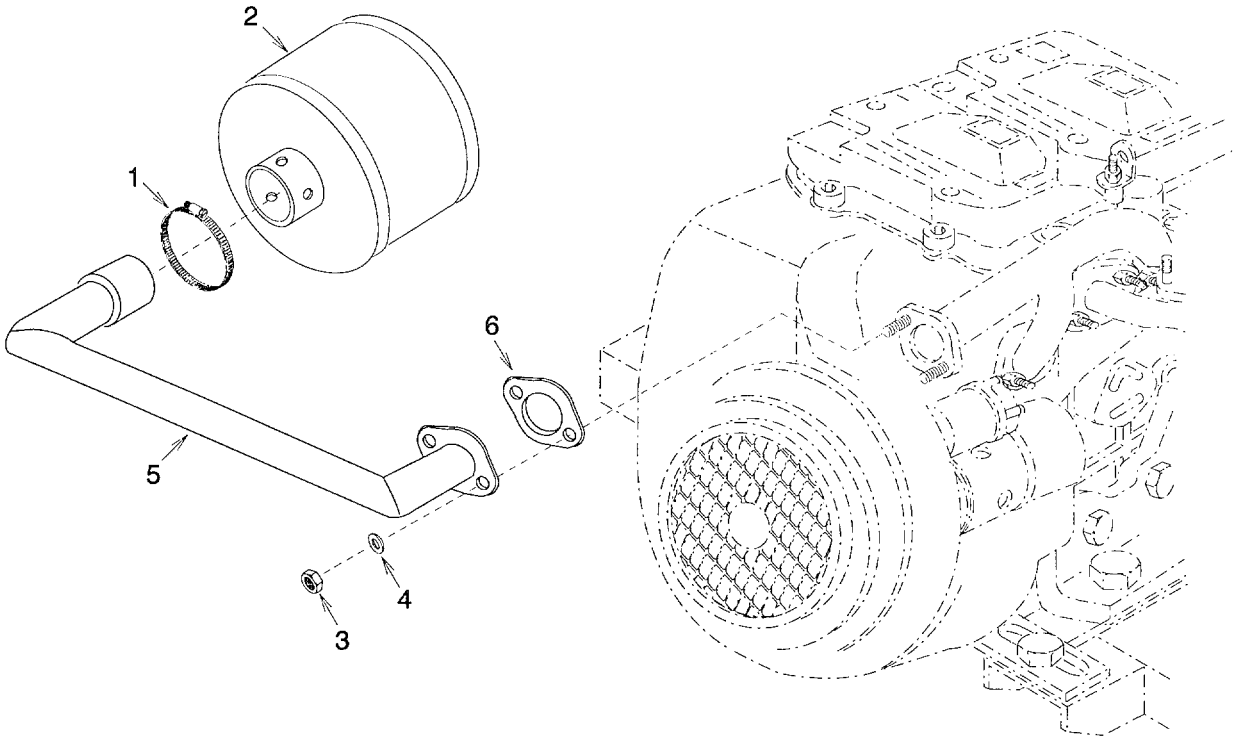


Figure 4-43. Air Cleaner

4-49. AIR CLEANER REPLACEMENT. - Continued

(2) Remove air cleaner (2) and clamp (1). Discard air cleaner.

(3) If adapter (3) is damaged, remove two nuts (4), flat washers (5), gasket (6) and adapter. Discard gasket.

b. Installation.

CAUTION

Never install a used air cleaner onto the adapter. Damage to engine can result if air cleaner is clogged.

(1) Install new gasket (6) and adapter (3) if removed. Secure using two flat washers (5) and nuts (4).

(2) Slip clamp (1) over air cleaner (2).

(3) Install air cleaner (2) and tighten clamp (1).

NOTE
FOLLOW-ON MAINTENANCE:
Close left front bottom door.
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-50. MUFFLER REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (6)
13, Appendix G
Washers (2)
37, Appendix G
Gasket
10, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Removal.

NOTE

Hardware is supplied with muffler clamps.

(1) Loosen two nuts (1) and two nuts (2).

(2) Remove six bolts (3) and lock washers (4). Discard lock washers.

(3) Carefully pull muffler (5) from exhaust adapter (6) and exhaust tube (7). Remove muffler clamps (8) and (9).

(4) Remove two each nuts (10), muffler clamp (11), and muffler bracket (12).

(5) Remove exhaust adapter (6) or exhaust tube (7) if damaged.

(a) Remove two nuts (13), lock washers (14), exhaust adapter (6), and gasket (15). Discard lock washers and gasket.

(b) Loosen nut (16) and remove rain shield (17).

(c) Remove two nuts (18), muffler clamp (19), and exhaust tube (7).

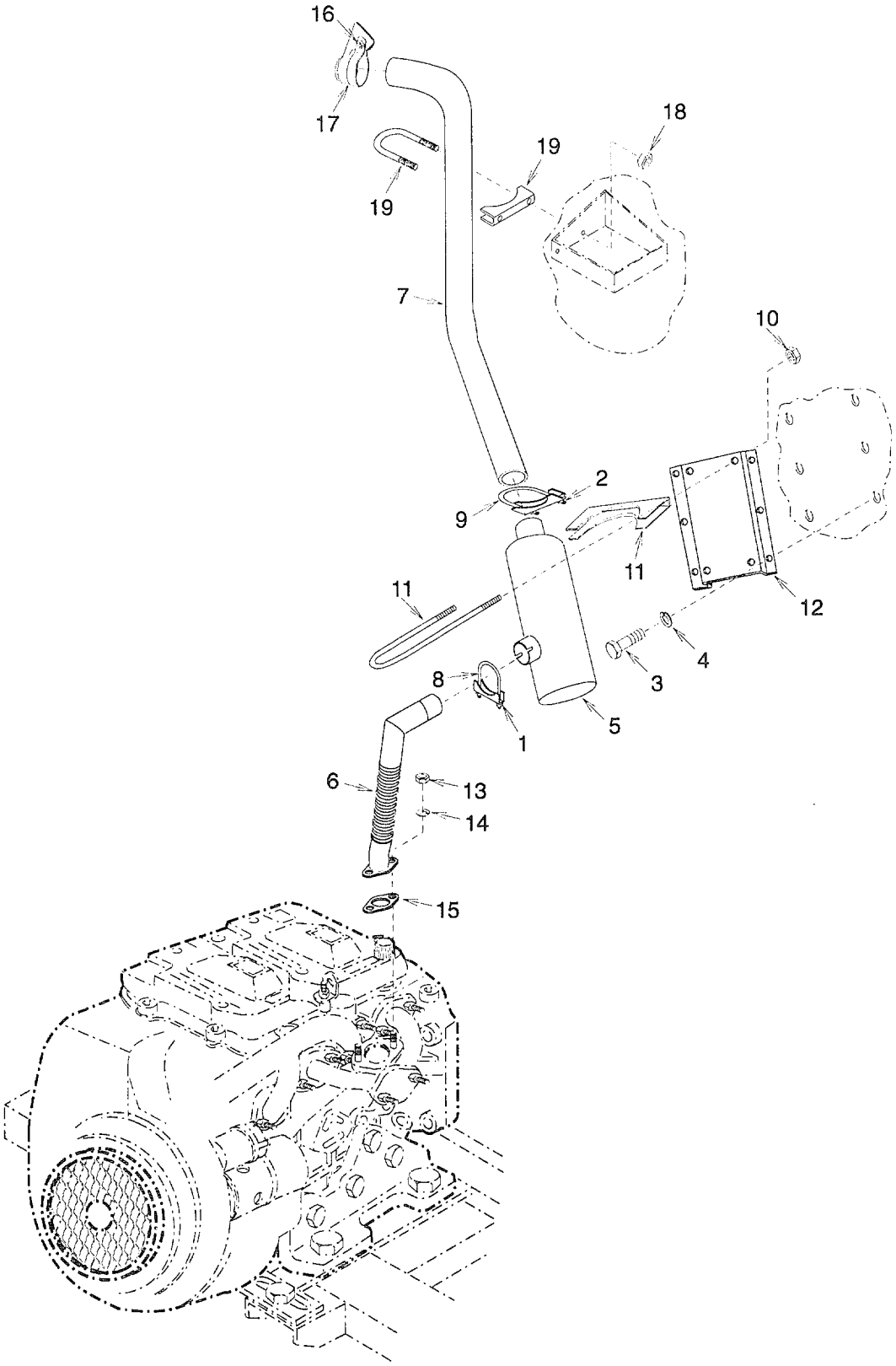


Figure 4-44. Muffler

4-50. MUFFLER REPLACEMENT. - Continued

b. Installation.

(1) Install exhaust adapter (6) and exhaust tube (7) if removed.

(a) Install exhaust tube (7), muffler clamp (19), and loosely install two nuts (18).

(b) Install rain shield (17) facing down and tighten nut (16).

(c) Install new gasket (15), exhaust adapter (6), two new lock washers (14), and nuts (13).

(2) Install two muffler clamps (11) onto muffler (5), then install muffler bracket (12) and two each nuts (10).

(3) Slip muffler clamps (8) and (9) onto muffler (5), but do not tighten, then carefully install muffler onto exhaust adapter (6) and exhaust tube (7).

(4) Align muffler bracket (12) mounting holes then install six new lock washers (4) and bolts (3).

(5) Align exhaust tube (7) then tighten two nuts (1), two nuts (2), and two nuts (18).

FOLLOW-ON MAINTENANCE:
Close right and left side condenser doors.
Connect battery (para 4-35) and put unit back into service.

4-51. ENGINE OIL PRESSURE SWITCH TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Marker tag
7, Appendix E
Washer
45, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left front bottom door open.

a. Testing. (See Figure 1-4.)

(1) Pull cap (1) back to expose engine oil pressure switch (2) connector. Tag and disconnect wire lead (3).

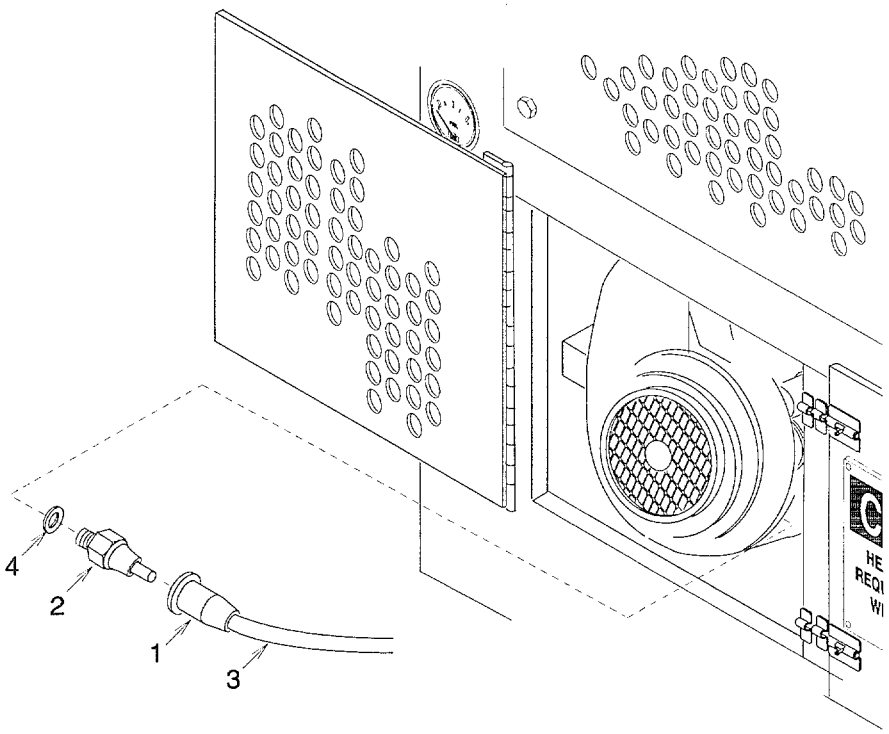


Figure 4-45. Engine Oil Pressure Switch

(2) Using multimeter set to measure continuity, check engine oil pressure switch (2) continuity between connector and base. Continuity should be indicated. If no continuity was indicated, replace engine oil pressure switch.

(3) If no failure was indicated, connect wire lead (3) using tag and wiring diagram (fig. 1-4). Remove tag.

(4) Push cap (1) over engine oil pressure switch (2) connector.

b. Removal.

(1) Pull cap (1) back to expose engine oil pressure switch (2) connector. Tag and disconnect wire lead (3).

(2) Remove engine oil pressure switch (2) and washer (4). Discard washer.

c. Installation.

(1) Install new washer (4) and engine oil pressure switch (2).

(2) Connect wire lead (3) using tag and wiring diagram (fig. 1-4). Remove tag.

(3) Push cap (1) over engine oil pressure switch (2) connector.

NOTE

FOLLOW-ON MAINTENANCE:
Close left front bottom door.
Connect battery (para 4-35) and put unit back into service.

4-52. ENGINE TEMPERATURE SWITCH TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Marker tag
7, Appendix E
Washer
30, Appendix G

Equipment Conditions:

Left side condenser door open.

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

a. Testing. (See Figure 1-4.)

(1) Tag and disconnect wire lead (1).

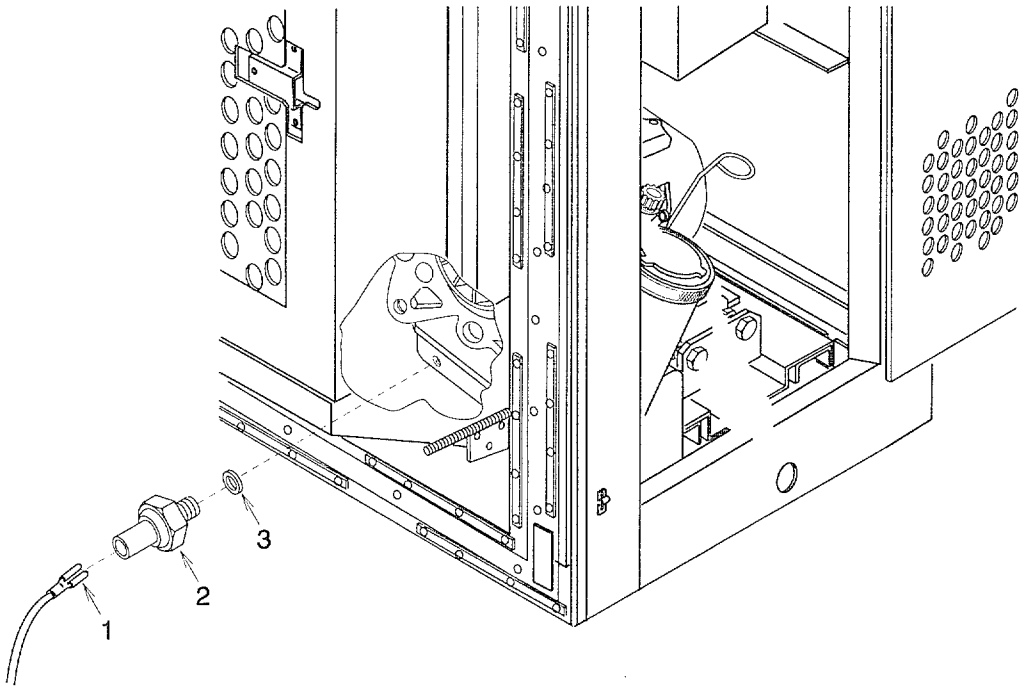


Figure 4-46. Engine Temperature Switch

(2) Using multimeter set to measure continuity, check engine temperature switch (2) continuity between connector and base. Continuity should not be indicated. If continuity was indicated, replace engine temperature switch.

(3) If no failure was indicated, connect wire lead (1) using tag and wiring diagram (fig. 1-4). Remove tag.

b. Removal.

(1) Tag and disconnect wire lead (1).

(2) Remove engine temperature switch (2) and washer (3). Discard washer.

c. Installation.

(1) Install new washer (3) and engine temperature switch (2).

(2) Connect wire lead (1) using tag and wiring diagram (fig. 1-4). Remove tag.

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-53. FUEL SOLENOID TESTING AND REPLACEMENT.

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

INITIAL SETUP

Materials/Parts:

Marker tags (2)
7, Appendix E
Preformed Packing
35, Appendix G
Tie Down Strap
24, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.
Air cleaner removed (para 4-49).

a. Testing.

(1) Tag and disconnect wire leads (1).

(2) Remove two screws (2), flat washers (3), and[cylinder casing (4).

(3) Using multimeter set to measure continuity, check fuel solenoid (5) continuity between terminals. Continuity should be indicated. If no continuity was indicated, replace fuel solenoid.

(4) Using multimeter set to measure continuity, check fuel solenoid (5) continuity between terminals and case. Continuity should not be indicated. If continuity was indicated, replace fuel solenoid.

(5) If no failure was indicated, install wire leads (1) using tags and wiring diagram (fig. 1-4). Remove tags.

(6) Install cylinder casing (4), two flat washers (3) and screws (2).

b. Removal.

(1) Remove two screws (2), flat washers (3), and cylinder casing (4).

(2) Tag and disconnect wire leads (1).

(3) Remove two screws (6), fuel solenoid (5), and preformed packing (7). Discard preformed packing.

c. Installation.

(1) Install new preformed packing (7).

(2) Turn engine lever (8) to the closed (left) position and hold while installing fuel solenoid (5). Be sure that fuel solenoid lever (9) is positioned to hold engine lever in the closed position.

(3) Install two screws (6).

(4) Install cylinder casing (4), two flat washers (3), and screws (2).

(5) Using tags and wiring diagram (fig. 1-4), install wire leads (1). Remove tags.

(6) Install tie down strap (10) on wire leads (1).

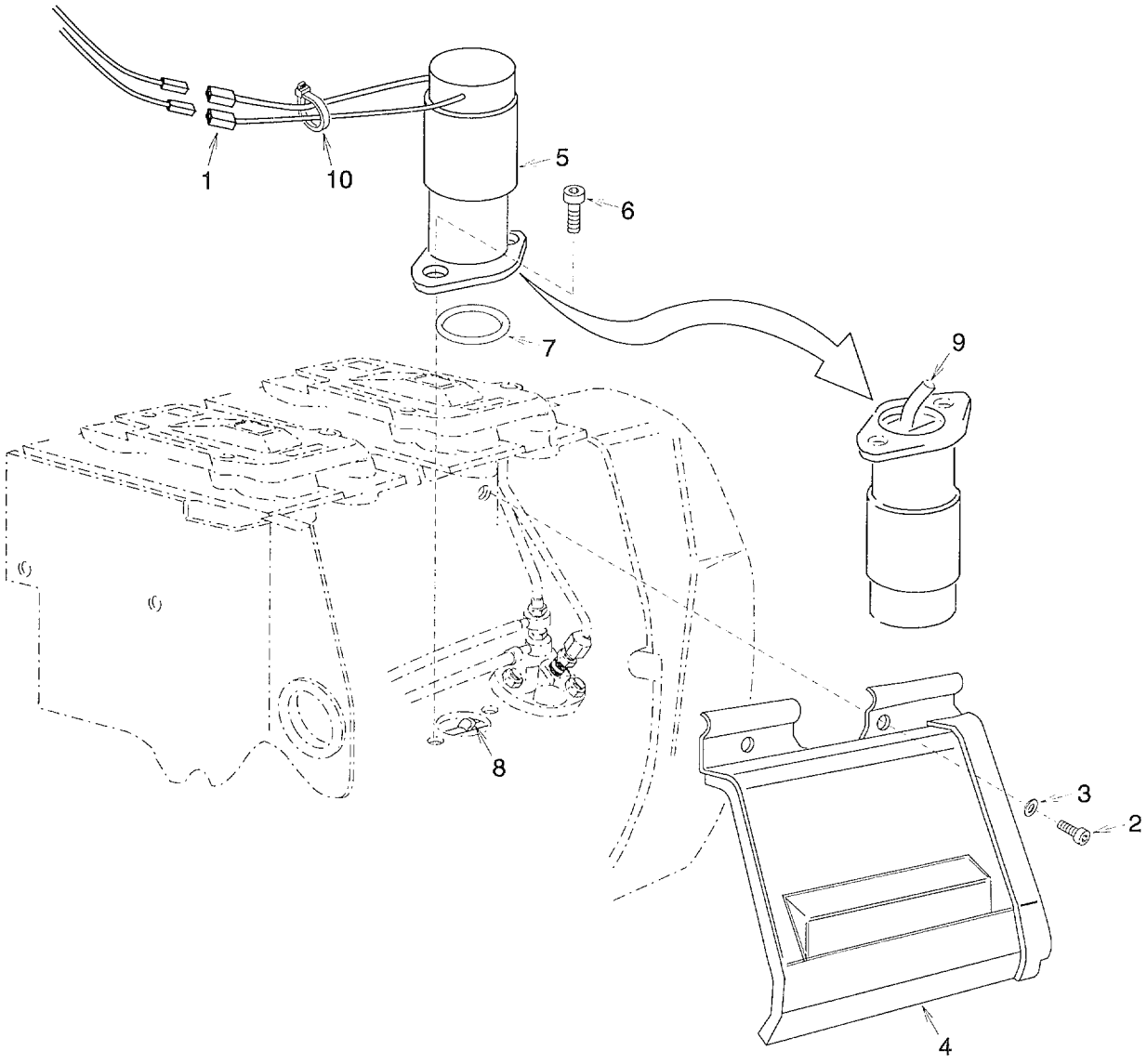


Figure 4-47. Fuel Solenoid

NOTE

FOLLOW-ON MAINTENANCE:
Install air cleaner (para 4-49).
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-54. STARTING MOTOR REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:	Equipment Conditions:
Marker tags (3)	Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
7, Appendix E	

Front bottom doors open.

a. Removal.

(1) Remove two screws (1), flat washers (2), and starting motor (3).

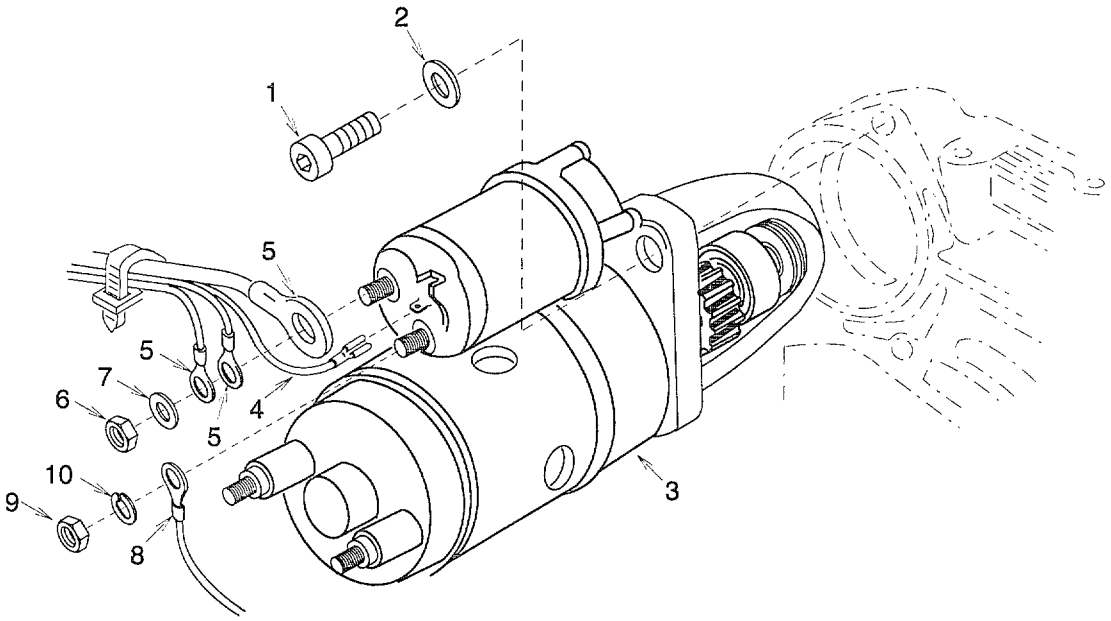


Figure 4-48. Starting Motor

(2) Tag and disconnect wire lead (4).

(3) Tag wire leads (5). Remove nut (6), flat washer (7), and wire leads.

NOTE

Terminal hardware is supplied with starting motor.

(4) Tag wire lead (8). Remove nut (9), lock washer (10), and wire lead.

b. Installation.

NOTE

Terminal hardware is supplied with starting motor.

(1) Using tag and wiring diagram (fig. 1-4), install wire lead (8), lock washer (10), and nut (9). Remove tag.

(2) Using tags and wiring diagram (fig. 1-4), install wire leads (5), flat washer (7), and nut (6). Remove tags.

(3) Using tag and wiring diagram (fig. 1-4), connect wire lead (4). Remove tag.

(4) Install starting motor (3), two flat washers (2), and screws (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close front bottom doors.
Connect battery (para 4-35) and put unit back into service.

4-55. FUEL FILTER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:

Lock Washer (2)
13, Appendix G
Wiping Rags
3, Appendix E
Washers (4)
30, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Removal.

WARNING

- Splashes and spills of fuel can cause eye injury and skin irritation. Wear face shield and approved gloves when handling fuel.
- Immediately remove any articles of clothing or shoes that have become soaked with fuel. Stay in an area free from ignition sources until clothing has been removed.

(1) Place drain pan under fuel filter element (1) and remove fuel filter element, large seal (2), and small seal (3). Drain filter element into drain pan then discard filter element and seals. Contact your local environmental officer for guidance on how to properly dispose of used fuel in accordance with local regulations.

(2) Check condition of union (4) and remove if damaged.

NOTE

The following procedures apply to both eyes.

(3) If eye (5) is damaged, remove it.

(a) Loosen 7).clamp (6) and remove hose (

(b) Remove union (8), washer (9), eye (5), and washer (10). Discard washers.

(4) If fuel filter cover (11) is damaged, remove eye (5) per above procedures, two nuts (12), bolts (13), and fuel filter cover.

(5) If bracket (14) is damaged, remove two bolts (15), lock washers (16), flat washers (17), and bracket. Discard lock washers.

b. Installation.

(1) If bracket (14) was removed, install bracket, two flat washers (17), new lock washers (16), and bolts (15).

(2) If fuel filter cover (13) was removed, install fuel filter cover, two bolts (12), and nuts (11). Install eye (5) per following procedures.

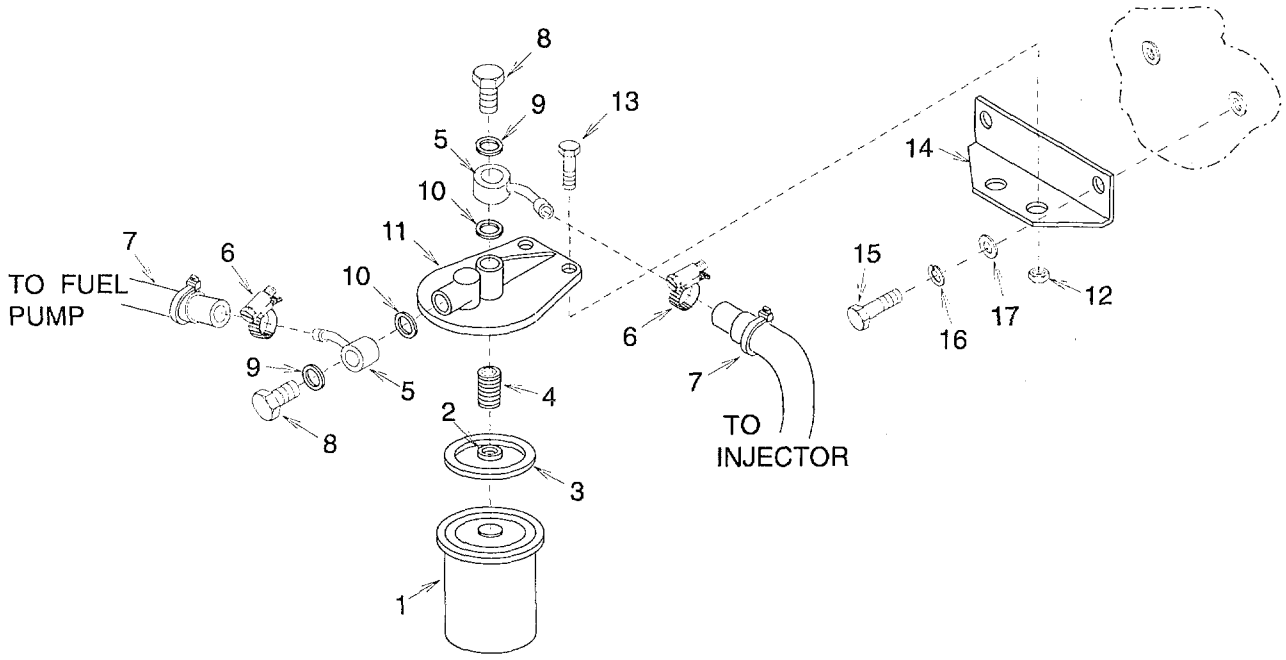


Figure 4-49. Fuel Filter

NOTE

The following procedures apply to both eyes.

(3) If eye (5) was removed, install it.

(a) Install new washer (10), eye (5), new washer (9), and union (8).

(b) Install hose (7), and tighten clamp (6).

(4) If union (4) was removed, install it.

(5) Install new small seal (3), new large seal (2), and new fuel filter element (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-56. VOLTAGE REGULATOR REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials /Parts:
Lock Washers (2)
13, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Right side condenser door open.

a. Removal.

(1) Disconnect connector (1) from voltage regulator (2).

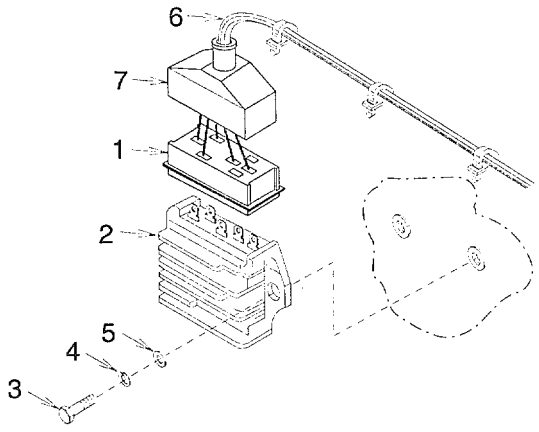


Figure 4-50. Voltage Regulator

(2) Remove two bolts (3), lock washers (4), flat washers (5) and voltage regulator (2). Discard lock washers.

b. Installation.

(1) Install voltage regulator (2), two flat washer (5), new lock washers (4), and bolts (3).

(2) If connection (1) or any wire leads (6) are damaged, pull cap (7) back and replace or repair as necessary per paragraph 4-20.

(3) If cap (7) was pulled back, slip back over connection (1) then plug connection onto voltage regulator (2).

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-57. ALTERNATOR TESTING.

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

INITIAL SETUP:

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Right side condenser door open.

Testing.

(1) Unplug connection (1) from voltage regulator (2).

(2) Using multimeter set to measure resistance, check continuity between terminals G to G (3) on connection (1). Continuity should be indicated. If no continuity was indicated, notify direct support maintenance.

(3) Using multimeter set to measure resistance, check continuity between each terminal G (3) to engine frame. Continuity should not be indicated. If continuity was indicated, notify direct support maintenance.

(4) If no failure was indicated, install connection (1) onto voltage regulator (2).

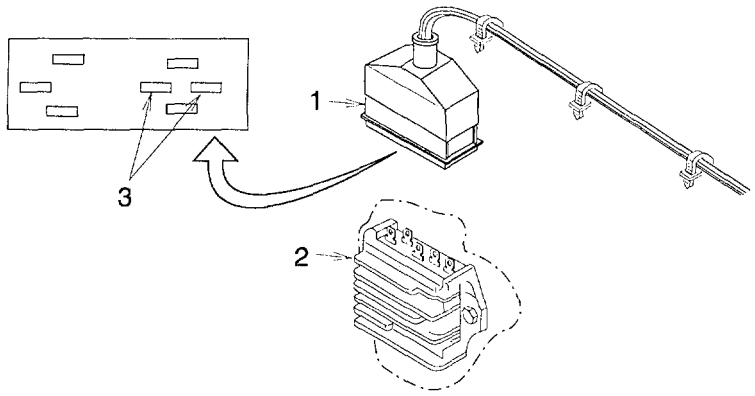


Figure 4-51. Alternator Test Point

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-58. GLOW PLUG TESTING AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:
Marker tag
7, Appendix E
Left side condenser door open.

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

a. Testing.

(1) Tag wire lead (1).

(2) Remove nut (2) and wire lead (1).

(3) Using multimeter set to measure resistance, check glow plug (3) continuity between terminal and base of glow plug. Continuity should be indicated. If no continuity was indicated, replace glow plug.

b. Removal.

(1) Remove nut (2) and wire lead (1).

(2) Remove glow plug (3).

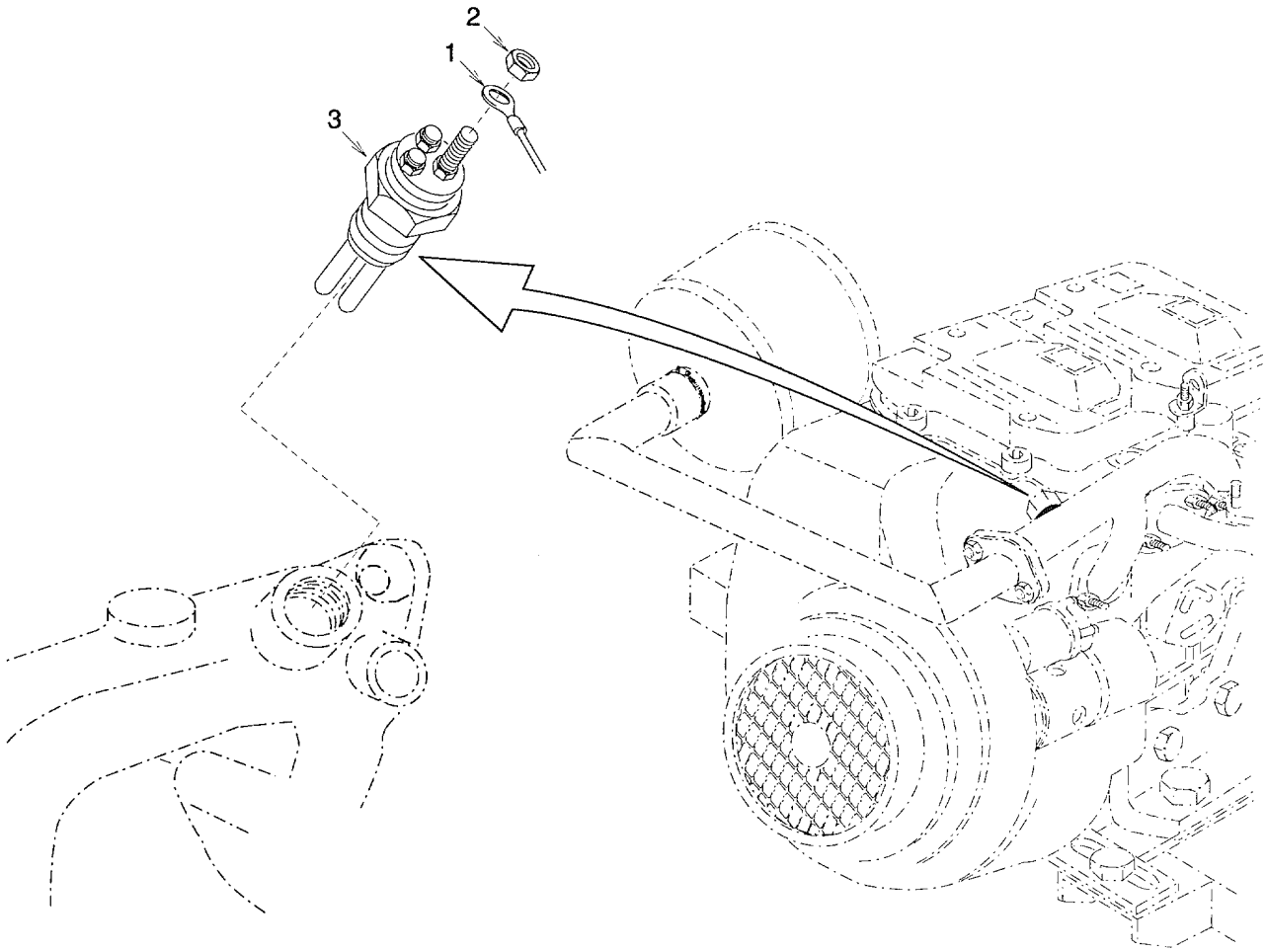


Figure 4-52. Glow Plug

c. Installation.

(1) Install glow plug (3).

(2) Install wire lead (1) and nut (2).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-59. FUEL SUPPLY HOSES/FUEL PIPE REPAIR AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:
Tie Down Straps (As Required)
24, Appendix E
Wiping Rags
3, Appendix E
Washers (4)
29, Appendix G
Washers (4)
30, Appendix G
Washers (2)
31, Appendix G
Washers (2)
32, Appendix G
Washers (4)
33, Appendix G
Washers (4)
34, Appendix G
Gaskets (2)
42, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

NOTE

Hose repair is limited to replacement of damaged components or assemblies.

a. Removal.

WARNING

Hoses and fuel pipe may contain fuel. Injury to personnel can occur when removing. Appropriate actions should be taken to contain spills.

(1) Fuel tank to in-line fuel filter hose assembly.

(a) Cut tie down straps (1) and remove loom (2).

(b) Loosen two clamps (3) and remove hose (4).

NOTE

Connector, nut, and tube ferrule are not re-usable. Do not remove unless any of these parts or fuel inlet elbow must be replaced.

(c) If connector (5) is damaged, loosen nut (6) then remove connector and tube ferrule (7). Fuel inlet elbow (8) may now be removed.

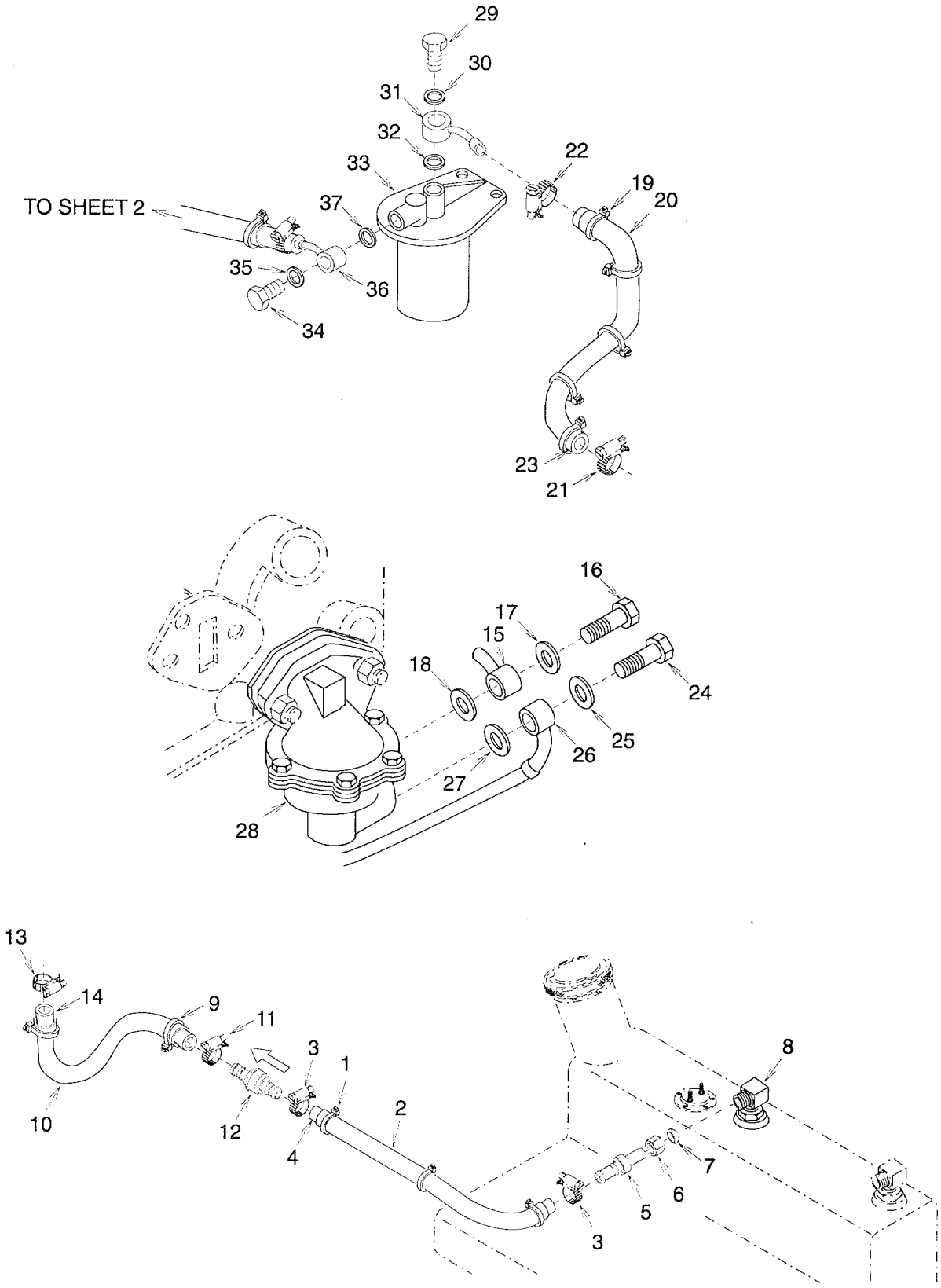


Figure 4-53. Fuel Supply Hoses (Sheet 1 of 2)

4-59. FUEL SUPPLY HOSES/FUEL PIPE REPAIR AND REPLACEMENT. - Continued

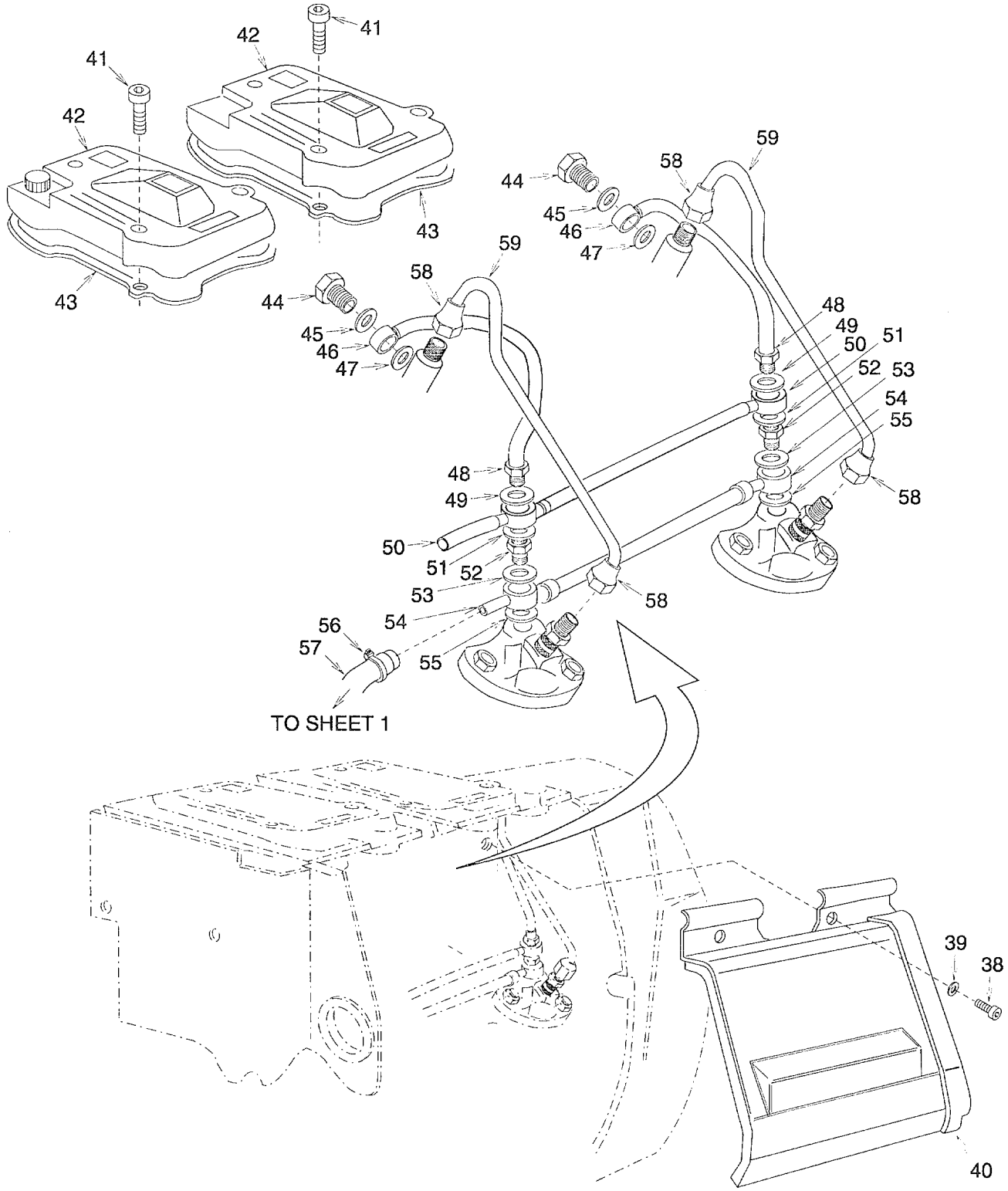


Figure 4-53. Fuel Supply Hoses (Sheet 2 of 2)

(2) In-line fuel filter to fuel pump hose assembly.

(a) Cut tie down straps (9) and remove loom (10).

NOTE

Note fuel filter flow direction prior to removal.

(b) Loosen clamp (11) and remove in-line fuel filter (12).

(c) Loosen clamp (13) and remove hose (14) from eye (15).

NOTE

Do not remove eye unless it must be replaced.

(d) Remove union (16), washer (17), eye (15) and washer (18). Discard washers.

(3) Fuel pump to fuel filter hose assembly.

(a) Cut tie down straps (19) and remove loom (20).

(b) Loosen clamps (21) and (22). Remove hose (23).

NOTE

Do not remove eye unless it must be replaced.

(c) Remove union (24), washer (25), eye (26) and washer (27) from fuel pump (28). Discard washers.

(d) Remove union (29), washer (30), eye (31), and washer (32) from cover (33). Discard washers.

(4) Fuel filter to injection pumps hose assembly.

(a) Remove union (34), washer (35), eye (36), and washer (37). Discard washers.

(b) Remove two screws (38), flat washers (39), and cylinder casing (40).

NOTE

The following procedures apply to both cylinders.

(c) Remove three screws (41), cover (42), and gasket (43). Discard gasket.

(d) Remove union (44), washer (45), eye (46), and washer (47). Discard washers.

(e) Remove union (48), washer (49), eye (50), washer (51), union (52), washer (53), eye (54), and washer (55). Discard washers.

(f) Cut tie down straps (56) and remove loom (57).

4-59. FUEL SUPPLY HOSES/FUEL PIPE REPAIR AND REPLACEMENT. - Continued

(5) Injection pump to nozzle tube assembly.

(a) Remove two screws (38), flat washers (39), and cylinder casing (40).

(b) Remove three screws (41), cover (42), and gasket (43). Discard gasket.

CAUTION

Always use two wrenches when loosening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(c) Loosen two flare nuts (58) and remove fuel pipe (59).

b. Installation.

(1) Fuel tank to in-line fuel filter hose assembly.

(a) Install fuel inlet elbow (8).

NOTE

Connector, nut, and tube ferrule cannot be re-used. If removed, they must be replaced.

(b) If connector (5) was removed, install new nut (6) and new tube ferrule (7) onto new connector. Install connector into fuel inlet elbow (8) and tighten nut to compress tube ferrule.

(c) Slide clamp (3) over hose (4) end and install hose onto connector (6). Tighten clamp.

(d) Install loom (2) over hose (4) and secure using tie down straps (1) as necessary.

NOTE

Be sure to observe in-line filter flow direction noted during removal.

(e) Slide clamp (3) over hose (4) end and install hose onto in-line filter (12). Tighten clamp.

(2) In-line fuel filter to fuel pump hose assembly.

NOTE

Be sure to observe in-line filter flow direction noted during removal.

(a) Slide clamp (11) over hose (14) end and install hose onto in-line filter (12). Tighten clamp.

(b) Slide clamp (13) over hose (14) end and install hose onto eye (15). Tighten clamp.

(c) If eye (15) was removed, install new washer (18), eye, new washer (17) and union (16).

(d) Install loom (10) over hose (14) and secure using tie down straps (9) as necessary.

(3) Fuel pump to fuel filter hose assembly.

(a) Slide clamp (21) over hose (23) end and install hose onto eye (26). Tighten clamp.

(b) If eye (26) was removed, install new washer (27), eye, new washer (25), and union (24).

(c) Slide clamp (22) over hose (23) end and install hose onto eye (31). Tighten clamp.

(d) If eye (31) was removed, install new washer (32), eye, new washer (30), and union (29).

(e) Install loom (20) over hose (23) and secure using tie down straps (19) as necessary.

(4) Fuel filter to injection pump hose assembly.

(a) Install new washer (37), eye (36), new washer (35), and union (34).

(b) Install loom (57) and secure using tie down straps (56) as necessary.

NOTE

The following procedures apply to both cylinders.

(c) Install new washer (55), eye (54), washer (53), union (52), new washer (51), fuel pipe (50), new washer (49), and union (48).

(d) Install new washer (47), eye (46), new washer (45), and union (44).

(e) Install new gasket (43), cover (42) and three screws (41).

(f) Install cylinder casing (40), two flat washers (39), and screws (38).

(5) Injection pump to nozzle tube assembly.

CAUTION

Always use two wrenches when tightening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(a) Install fuel pipe (59) and tighten two flare nuts (58).

(b) Install new gasket (43), cover (42) and three screws (41).

(c) Install cylinder casing (40), two flat washers (39), and screws (38).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-60. FUEL RETURN HOSES REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Tie Down Straps (As Required)
24, Appendix E
Wiping Rags
3, Appendix E
Washers (2)
31, Appendix G
Washers (2)
32, Appendix G
Washers (4)
33, Appendix G
Clamps (4)
29, Appendix E
Gaskets (2)
42, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Both side condenser doors open.

NOTE

Hose repair is limited to replacement of damaged components or assemblies.

a. Removal.

WARNING

Hoses may contain fuel. Injury to personnel can occur when removing. Appropriate actions should be taken to contain spills.

(1) Nozzle to injection pump hose.

(a) Remove two screws (1), flat washers (2) and cylinder casing (3).

NOTE

The following procedures apply to both cylinders.

(b) Remove three screws (4), cover (5), and gasket (6). Discard gasket.

(c) Remove clamps (7) and (8). Discard clamps.

(d) Remove hose (9).

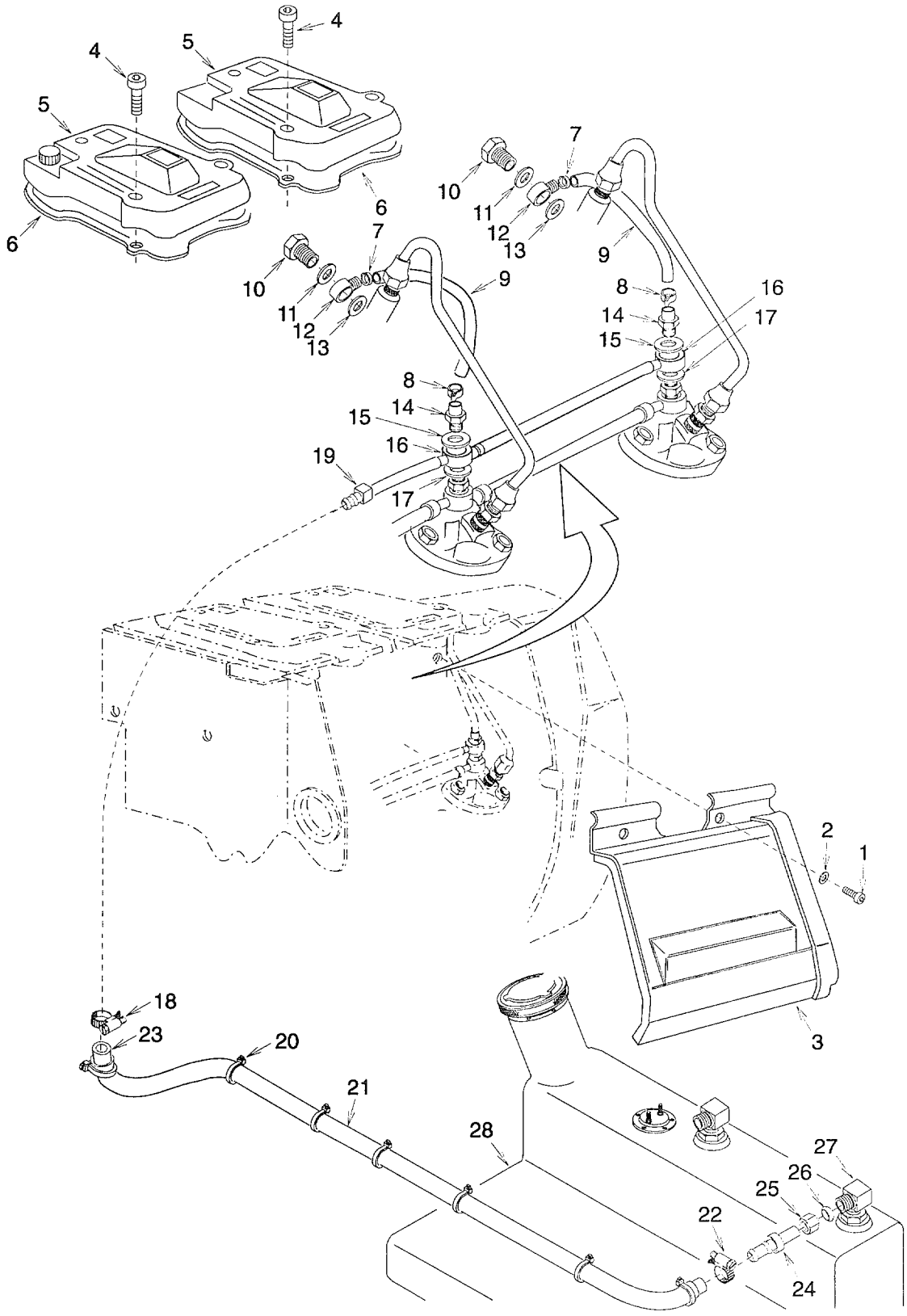


Figure 4-54. Fuel Return Hoses

4-60. FUEL RETURN HOSES REPLACEMENT. - Continued

NOTE
Do not remove eye unless it must be replaced.

(e) Remove union (10), washer (11), eye (12), and washer (13). Discard washers.

(2) Injection pump to fuel tank hose assembly.

(a) Remove two screws (1), flat washers (2) and cylinder casing (3).

NOTE
The following procedures apply to both cylinders.

(b) Remove three screws (4), cover (5), and gasket (6). Discard gasket.

(c) Remove union (10), washer (11), eye (12), and washer (13). Discard washers.

(d) Remove union (14), washer (15), eye (16), and washer (17). Discard washers.

(e) Loosen clamp (18) and remove connector (19).

(3) Fuel tank hose assembly.

(a) Cut tie down straps (20) and remove loom (21).

(b) Loosen clamps (18) and (22). Remove hose (23).

NOTE
Connector, nut, and tube ferrule are not re-usable. Do not remove unless any of these parts or fuel inlet elbow must be replaced.

(c) If connector (24) is damaged, loosen nut (25) then remove connector and tube ferrule (26). Fuel inlet elbow (27) may now be removed.

b. Installation.

(1) Nozzle to injection pump hose.

NOTE
The following procedures apply to both cylinders.

(a) If eye (12) was removed, install new washer (13), eye, new washer (11), and union (10).

(b) Install hose (9) onto union (14) and secure using new clamp (8).

(c) Install hose (9) over eye (12) and secure using new clamp (7).

(d) Install new gasket (6), cover (5), and three screws (4).

(e) Install cylinder casing (3), two flat washers (2) and screws (1).

(2) Injection pump to fuel tank hose assembly.

NOTE

The following procedures apply to both cylinders.

(a) Install new washer (17), eye (16), new washer (15), and union (14).

(b) Install new washer (13), eye (12), new washer (11), and union (10).

(c) Slide clamp (18) over hose (23) end and install connector (19). Tighten clamp.

(d) Install new gasket (6), cover (5), and three screws (4).

(e) Install cylinder casing (3), two flat washers (2) and screws (1).

(3) Fuel tank hose assembly.

(a) If removed, install fuel inlet elbow (27) onto tank (28).

NOTE

Connector, nut, and tube ferrule cannot be re-used. If removed, they must be replaced.

(b) If connector (24) was removed, install new nut (25) and new tube ferrule (26) onto new connector. Install connector into fuel inlet elbow (27) and tighten nut to compress tube ferrule.

(c) Slide clamp (22) over hose (23) end and install hose onto connector (24). Tighten clamp.

(d) Slide clamp (18) over hose (23) end and install hose onto connector (19). Tighten clamp.

(e) Install loom (21) over hose (23) and secure using tie down straps (20) as necessary.

NOTE

FOLLOW-ON MAINTENANCE:
Close both side condenser doors.
Connect battery (para 4-35) and put unit back into service.

4-61. ENGINE DRAIN HOSE REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Wiping Rags
3, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.
Left front bottom door open.

a. Removal.

(1) Drain oil.

(a) Remove oil fill plug (1).

(b) Place drain pan under oil drain hose (2).

(c) Remove oil drain plug (3) and allow oil to drain completely.

(d) Contact your local environmental officer for guidance on how to properly dispose of used oil in accordance with local regulations.

NOTE

Hose may contain oil. Appropriate actions should be taken to contain spills.

(2) Loosen clamp (4) and remove hose end fitting (5).

(3) Loosen clamp (6) and remove hose (2).

(4) Remove hose fitting (7).

b. Installation.

(1) Install hose fitting (7).

(2) Slide clamp (6) over hose (2) end and install hose onto fitting (7). Tighten clamp.

(3) Slide clamp (4) over hose(2) end and install hose end fitting (5) into hose. Tighten clamp.

(4) Install oil drain plug (3).

(5) Fill engine with oil.

(a) Fill engine with appropriate grade and quantity of oil (para 4-7).

(b) Install oil fill plug (1).

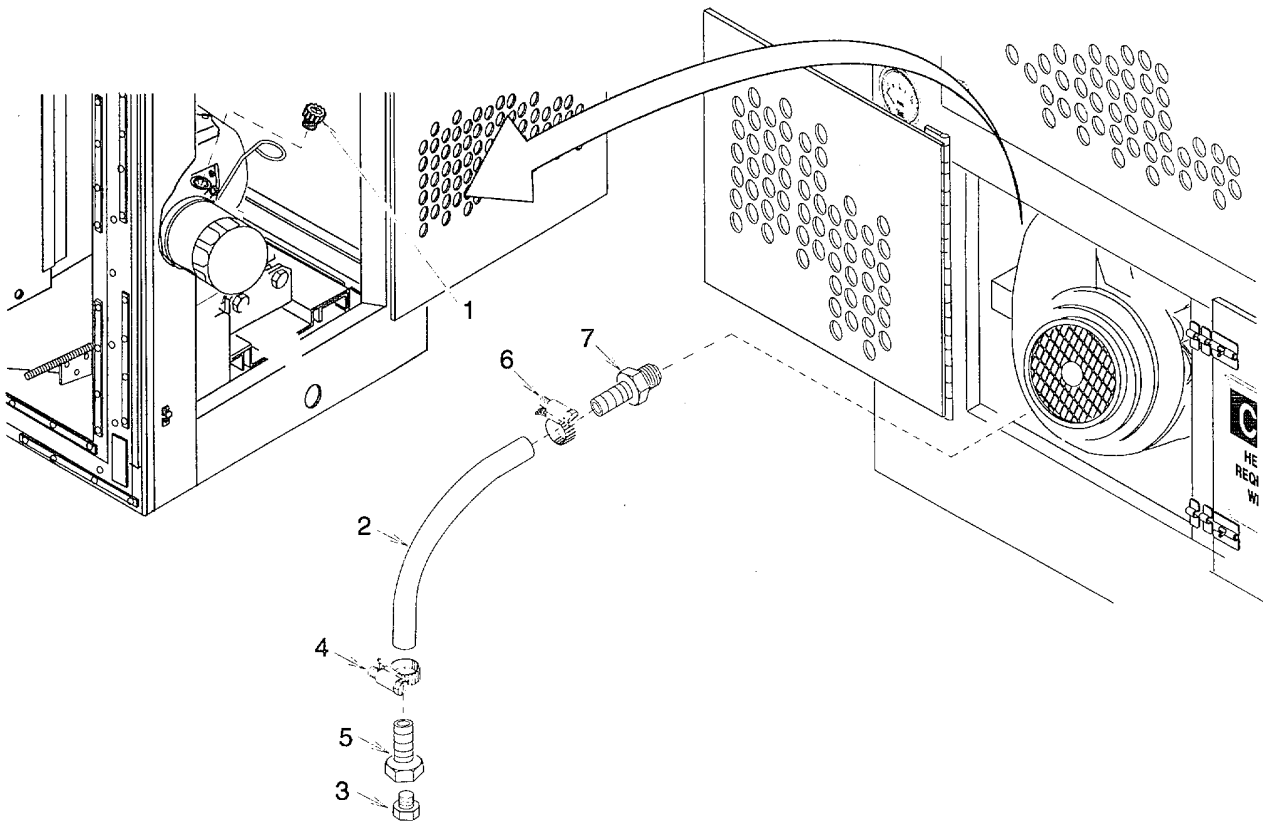


Figure 4-55. Engine Drain Hose

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Close left front bottom door.
Connect battery (para 4-35) and put unit back into service.

4-62. IN-LINE FUEL FILTER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Wiping Rags
3, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

WARNING

Hoses may contain fuel. Injury to personnel can occur when removing. Appropriate actions should be taken to contain spills.

NOTE

Note fuel flow direction before removal.

a. Removal. Loosen two clamps (1) and remove in-,line fuel filter (2) from hoses (3).

b. Installation.

(1) If clamps (1) were removed, slip clamps over hose ends (3).

NOTE

Be sure to observe flow direction noted during removal.

(2) Install in-line fuel filter (2). Tighten clamps (1).

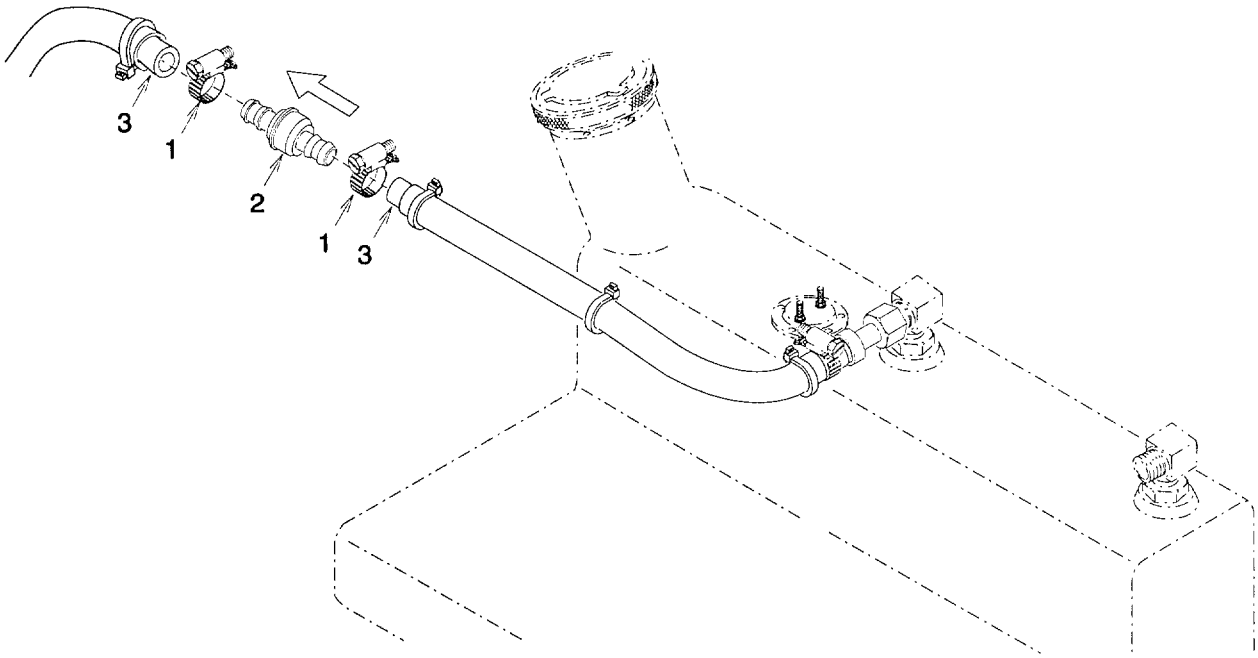


Figure 4-56. In-line Fuel Filter

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-63. FUEL GAGE REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Marker tags (3)
7, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Removal.

(1) Tag wire leads (1).

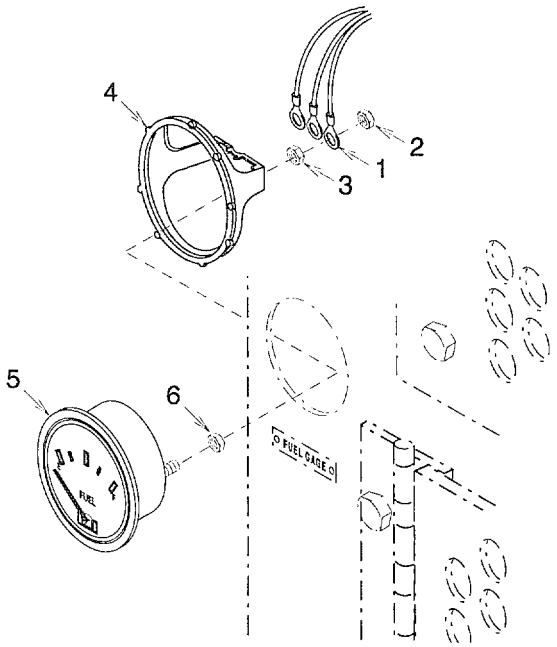


Figure 4-57. Fuel Gage

NOTE

Terminal hardware is supplied with fuel gage.

(2) Remove three nuts (2), and wire leads (1).

(3) Remove three nuts (3) and retainer (4).

(4) Remove fuel gage (5) and three nuts (6).

b. Installation.

(1) Install fuel gage (5) and three nuts (6).

CAUTION

Overtightening retainer nuts will cause the retainer to deform and possibly crack or break.

(2) Install retainer (4) and three nuts (3) being careful not to over tighten.

(3) Tighten nuts (6) against retainer (4).

(4) Using tags and wiring diagram (fig. 1-4), install wire leads (1) and secure using three nuts (2). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-64. SENDING UNIT REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Lock Washers (5)
1, Appendix G
Marker tags (2)
7, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Removal.

(1) Tag wire leads (1).

NOTE

Terminal hardware is supplied with sending unit.

(2) Remove two self locking nuts (2) and wire leads (1).

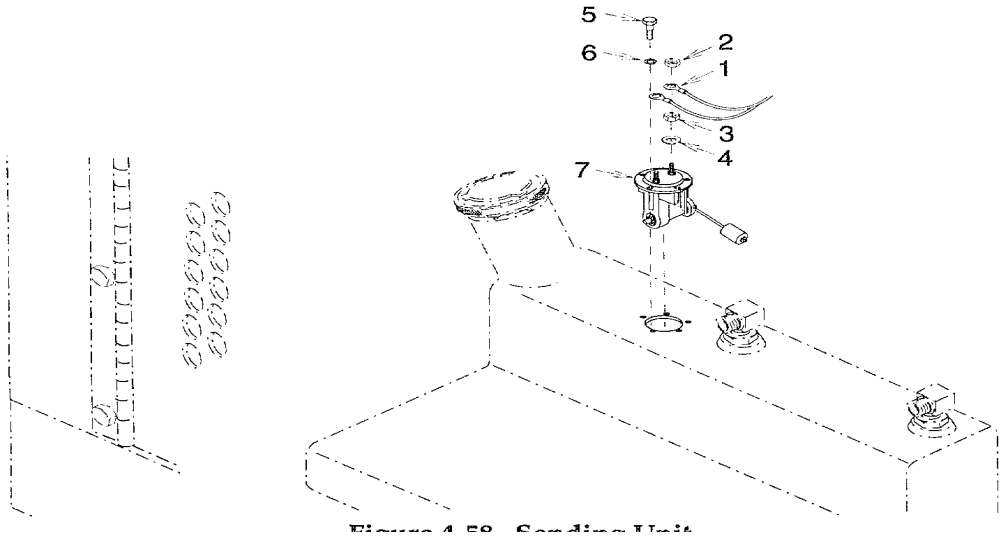


Figure 4-58. Sending Unit

(3) Remove two nuts (3), and flat washers (4).

(4) Remove five screws (5), lock washers (6) and fuel level sender (7). Discard lock washers.

b. Installation.

(1) Install fuel sender (7), five new lock washers (6), and screws (5).

NOTE

Terminal hardware is supplied with sending unit.

(2) Install two flat washers (4), and nuts (3).

(3) Using tags and wiring diagram (fig. 1-4), install wire leads (1) and secure using two self locking nuts (2). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-65. FUEL TANK REPAIR.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Lock Washers (6)
1, Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left and right side condenser door open.

a. Removal.

NOTE

Repair is limited to replacement of damaged components.

(1) Remove cap (1) and unlatch chain (2).

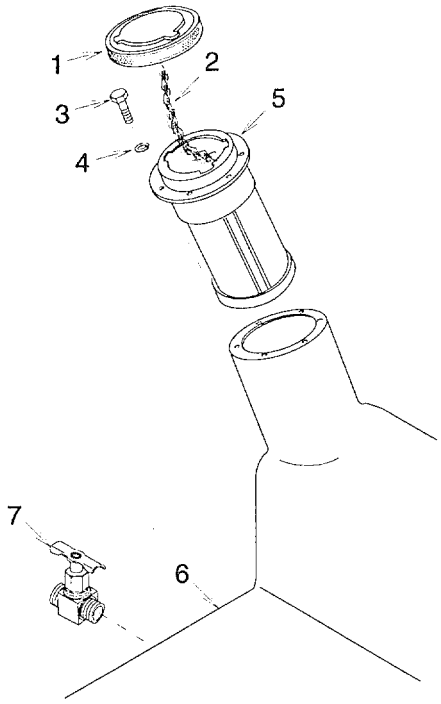


Figure 4-59. Fuel Tank

(2) Remove six screws (3), lock washers (4) and neck fuel tank filler (5). Discard lock washers.

(3) Drain fuel tank (6) (para 4-7) and remove shut-off cock (7).

b. Installation.

(1) Install shut-off cock (7) into tank (6).

(2) Install neck fuel filler (5), new lock washers (4), and six screws (3).

(3) Latch chain (2) to neck fuel tank filler (5) and install cap (1).

(4) Fill tank (6) with appropriate type and quantity fuel (para 4-7).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

4-66. GASKET (HEAT SHIELD) REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP:

Materials/Parts:
Silicone RTV
20, Appendix E
Gasket
F-13, Appendix F
Gasket
F-14, Appendix F
Gasket
F-15, Appendix F
Gasket
F-16, Appendix F

Equipment Conditions:
Refrigeration unit removed from refrigerator enclosure (para 4-6).

a. Removal.

NOTE

Remove only the individual gasket pieces that need to be replaced.

(1) Remove nine screws (1), one each gasket retainer strips (2) and (3), and top outside gasket (4). Repeat for bottom outside gasket.

(2) Remove eight screws (1), two gasket retainer strips (2), and top inside gasket (5). Repeat for bottom inside gasket.

(3) Remove 12 screws (1), three gasket retainer strips (2), and right inside gasket (6). Repeat for left inside gasket.

(4) Remove 13 screws (1), two gasket retainer strips (2), one gasket retainer strip (3), and right outside gasket (7). Repeat for left outside gasket.

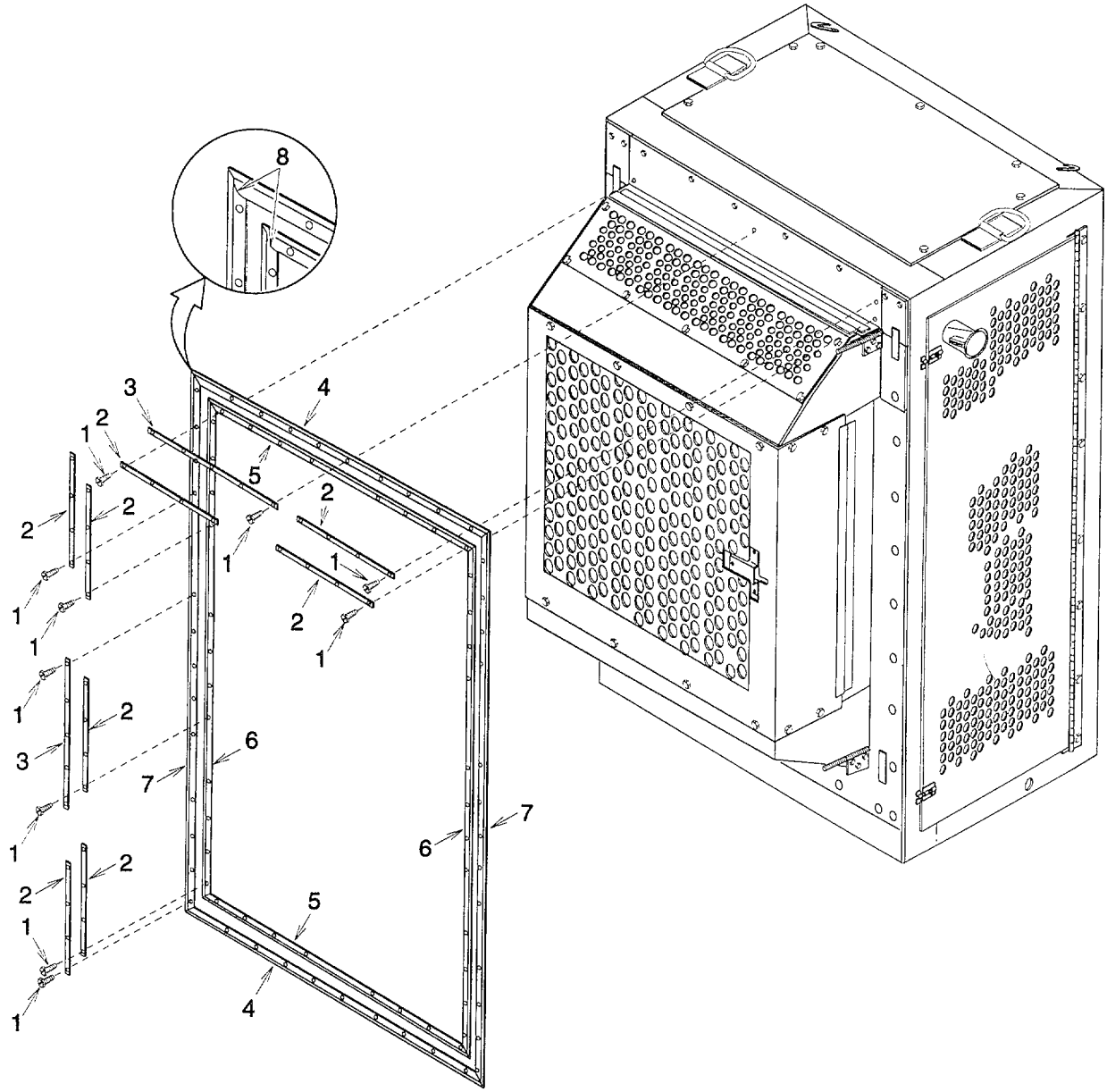


Figure 4-60. Gasket (Heat Shield)

4-66. GASKET (HEAT SHIELD) REPLACEMENT. - Continued

b. Installation.

(1) Fabricate the required gasket(s) (appendix F).

(2) Install right outside gasket (7), one gasket retainer strip (3), two gasket retainer strips (2), and 13 screws (1). Repeat for left outside gasket.

(3) Install right inside gasket (6), three gasket retainer strips (2), and 12 screws (1). Repeat for left inside gasket.

(4) Install top inside gasket (5), two gasket retainer strips (2), and eight screws (1). Repeat for bottom inside gasket.

(5) Install top outside gasket (4), one each gasket retainer strips (2) and (3), and nine screws (1). Repeat for bottom outside gasket.

(6) Coat the cut surfaces of gasket (4), (5), (6), and (7) with silicone RTV to seal foam.

(7) Seal four seams (8) with silicone RTV.

NOTE

FOLLOW-ON MAINTENANCE:
Install refrigeration unit onto refrigerator enclosure (para 4-6).

SECTION VI. PREPARATION FOR STORAGE OR SHIPMENT

4-67. ADMINISTRATIVE STORAGE.

Placement of equipment in administrative storage should be for short periods of time (1 to 45 days) when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

a. Placing the equipment in administrative storage. Before placing the equipment in administrative storage, all current preventive maintenance checks and services should be completed. Shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

b. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers, and other containers may be used.

c. Pump down refrigeration unit.

WARNING

Exposed rotating parts are contained in the refrigeration unit. Personal injury can result if access doors are opened when battery is connected.

NOTE

Refrigeration unit should be pumped down if out of service for longer than 5 days.

(1) Be sure refrigeration unit is shut down (para 2-7) then remove two isolation valve caps (1) and shut off valve caps (2).

(2) Close hot gas stop valve (3).

(3) Close receiver outlet valve (4).

(4) Be sure both condenser side doors are closed and operate the refrigeration unit (para 2-7) until it shuts down automatically.

(5) Close receiver inlet valve (5), compressor shut off valves (6), and liquid stop valve (7).

(6) Install two shut off valve caps (2) and isolation valve caps (1).

(7) Disconnect battery (para 4-35).

(8) Place a marker tag (7, appendix E) on or near the control panel cover stating "THE REFRIGERATION UNIT HAS BEEN PUMPED DOWN, DO NOT OPERATE UNTIL ALL VALVES HAVE BEEN PROPERLY SET, EQUIPMENT DAMAGE WILL OCCUR."

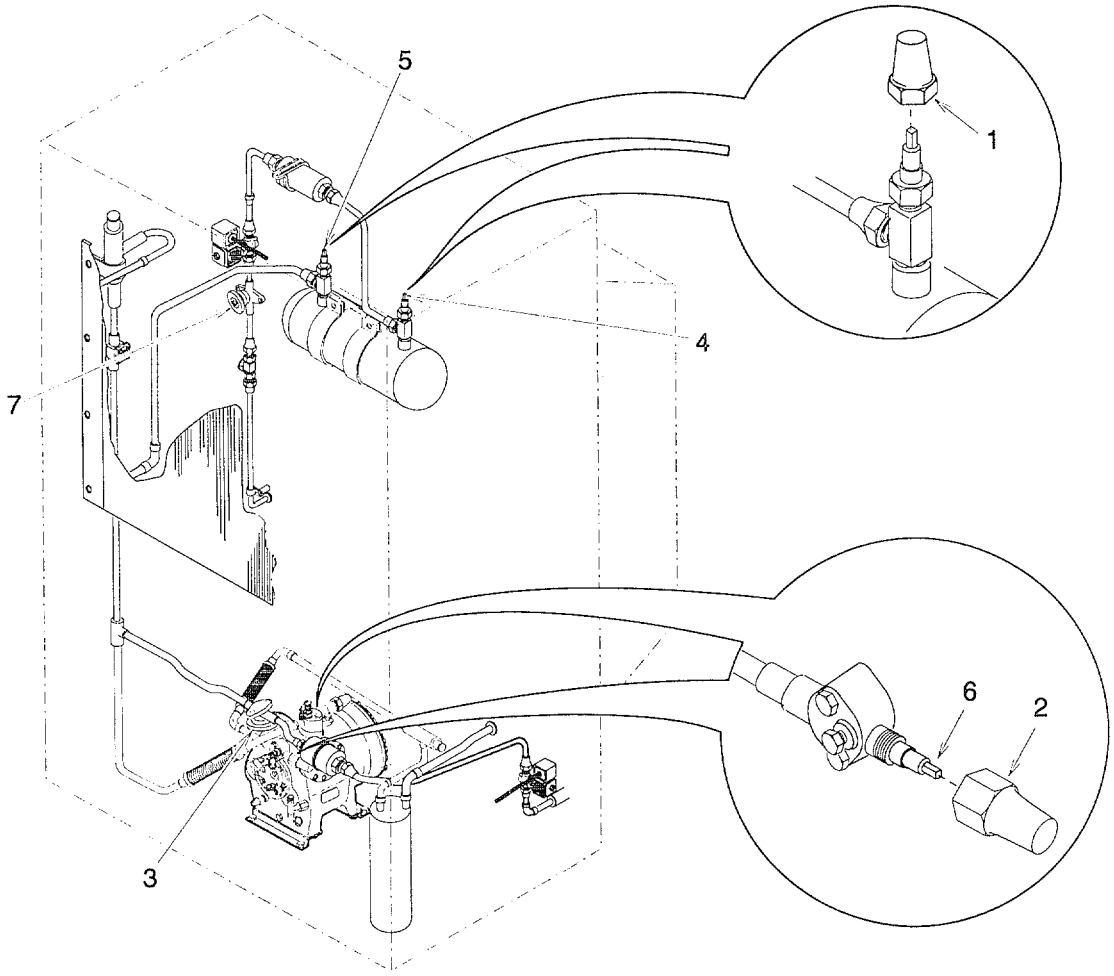


Figure 4-61. Refrigeration System Pump Down

4-68. LONG TERM STORAGE OR SHIPMENT.

Placement of equipment in long term storage should be for extended periods of time (45 days or more).

a. Before placing the equipment in long term storage, current preventive maintenance checks and services should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

b. If refrigeration unit has not been in operation, operate the unit (para 2-7) for 15 minutes.

c. Shut down the refrigeration unit (para 2-7) then open left side condenser door and left front bottom door.

NOTE

Refrigerant and refrigerant lubricating oil will not be removed from the refrigerant system.

d. Drain engine crankcase (para 4-7) and fill with preservative oil MIL-L-21260, T930 (30, Appendix E).

e. Drain fuel tank (para 4-7).

f. Disconnect fuel supply hose from fuel tank (para 4-59). Route hose through left front bottom door and insert into a container of preservative oil VV-L-800, T900 (31, Appendix E).

NOTE

Operation for short periods of time with preservative oils installed will not cause appreciable engine damage.

g. Remove fuel tank fill cap and be sure both side condenser doors are closed. Operate the refrigeration unit (para 2-7) until preservative oil is observed flowing into fuel tank. Pump down the refrigeration unit (para 4-67). Shut down refrigeration unit (para 2-7) and install fuel tank fill cap.

h. Loosen V-belts (para 4-38).

i. Place a marker tag (7, appendix E) on or near the control panel cover stating " THE REFRIGERATION UNIT ENGINE AND FUEL SYSTEM HAVE BEEN PRESERVED, DO NOT OPERATE UNTIL ALL FLUIDS HAVE BEEN DRAINED AND PROPER QUANTITY AND TYPE INSTALLED, EQUIPMENT DAMAGE WILL OCCUR."

j. Open left side condenser door and connect fuel supply hose onto fuel tank (para 4-59).

k. Remove air cleaner adapter (para 4-49) and spray 1 oz (30 cc) MIL-L-21260, T930 (30, appendix E) into engine air intake manifold. Install air cleaner adapter (para 4-49).

l. Spray or brush MIL-C-16173 (32, Appendix E) onto any unpainted surfaces.

m. Close left side condenser door and left front bottom door.

n. Preserve the refrigeration unit in accordance with MIL-P-116, method I.

4-68. LONG TERM STORAGE OR SHIPMENT. - Continued

o. Cover all openings into the evaporator panel, glass gages, name plates and instruction panels, switches, control boxes, engine, etc. with waterproof paper or a barrier material conforming to grade A, PP-C-843 (2, Appendix E) and secured in place with tape conforming to PPP-T-60 (1, Appendix E).

p. Package the refrigeration unit in accordance with ASTM D 3951, level A or Commercial.

q. Refrigeration unit shall be packed upright in a cleated plywood box conforming to style B, type 3 load, PPP-B-601 for overseas. Each unit shall be secured and the container closed and strapped with 3/4 inch by 0.023 inch steel. The strapping shall be applied over the horizontal top, bottom, and intermediate cleats of the side and ends.

r. Shipping containers shall be marked with the words " UP" and " THIS SIDE DOWN" shall appear on each shipping container.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I. DIRECT SUPPORT TROUBLESHOOTING INSTRUCTIONS

5-1. TROUBLESHOOTING.

The following procedures are listed in order of the most probable malfunctions. Each malfunction is followed by test or inspection procedures in logical order to isolate and identify the fault and actions required to correct it. This section cannot list all the possible malfunctions that may occur with the equipment. If a malfunction occurs that is not listed or actions listed do not correct a malfunction, notify your supervisor.

a. Engine Cranks But Will Not Start Or Stops During Operation.

CLEAN AND TEST INJECTOR NOZZLES (PARA. 5-39). REPLACE IF NEEDED. DOES ENGINE START/RUN (PARA. 2-5)?

- YES → PUT UNIT BACK INTO SERVICE.
- NO → TEST INJECTION PUMPS (PARA. 5-40). REPLACE IF NEEDED.

b. Pressure Gage Indicates Above Operating Range.

INSTALL SERVICE MANIFOLD (PARA. 5-6) AND OPERATE REFRIGERATION UNIT (PARA. 2-5). DOES SERVICE MANIFOLD GAGE READING MATCH PRESSURE GAGE READING?

- NO → REPLACE PRESSURE GAGE (PARA. 5-16).
- YES → CHECK REFRIGERANT SYSTEM PRESSURE (PARA. 5-13). IS SYSTEM OVERCHARGED?
  - YES → ADJUST REFRIGERANT CHARGE AS NECESSARY (PARA. 5-12).
  - NO → REPLACE DEHYDRATOR (PARA. 5-14).

5-1. TROUBLESHOOTING. - Continued

c. Compressor Operates For Short Period Then Stops.

OPERATE REFRIGERATION UNIT (PARA. 2-5) AND OBSERVE COMPOUND GAGE. DOES PRESSURE DROP RAPIDLY?

YES — REPLACE LIQUID LINE SOLENOID (PARA. 5-28).

NO — IS PRESSURE GAGE AND COMPOUND GAGE INDICATING WITHIN NORMAL OPERATING RANGE?

YES — TEST COMPRESSOR (PARA. 5-38). REPLACE AS NECESSARY.

NO — REPAIR OR CHECK REFRIGERANT CHARGE (PARA. 5-12) AND ADJUST AS NECESSARY.

d. Pressure Readings Low/Insufficient Cooling.

SHUT DOWN REFRIGERATION UNIT (PARA. 2-7). DOES THE REFRIGERATION UNIT STOP RUNNING?

YES — CHECK REFRIGERANT CHARGE (PARA. 5-12) AND ADJUST AS NECESSARY.

NO — REPLACE COMPRESSOR VALVE PLATE ASSEMBLY (PARA. 5-38).

SECTION II. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

5-2. CONTROL PANEL COVER REPAIR

This task covers: a. Repair

INITIAL SETUP

Materials/Parts:
General Purpose Adhesive
14, Appendix E
Wiping Rag
3, Appendix E
Acetone
18, Appendix E
Methyl-Ethyl Ketone
19, Appendix E
Gaskets (2)
2, Figure F-4, Appendix F
Gasket
3, Figure F-4, Appendix F
Gasket
4, Figure F-4, Appendix F

Equipment Conditions:
Control panel cover door removed (para. 4-16).

General Safety Instructions:

WARNING

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

Repair.

NOTE

Repair is limited to replacement of gasket material.

(1) Remove as much old gasket material (1), (2), or (3) as possible by pulling or scraping it away from the control panel cover (4).

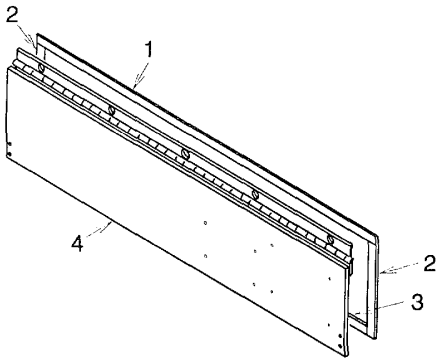


Figure 5-1. Control Panel Cover.

5-2. CONTROL PANEL COVER REPAIR - Continued

(2) Soften and remove old adhesive and gasket (1), (2), or (3) residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(3) Be sure that the attaching surface of the control panel cover (4) is clean and free of paint and old adhesive material.

(4) Coat the mating surfaces of the control panel cover (4) and gasket (1), (2), or (3) with adhesive. Let both surfaces air dry until adhesive is tacky, but will not stick to fingers.

(5) Starting with an end, carefully press gasket (1), (2), or (3) onto the control panel cover (4). Press firmly overall to ensure complete contact.

NOTE

FOLLOW-ON MAINTENANCE:
Install control panel cover door (para. 4-16).

5-3. CONTROL PANEL REPAIR.

This task covers: Repair

INITIAL SETUP

Materials/Parts:
Lock Washers (2)
1, Appendix G
General Purpose Adhesive
14, Appendix E
Wiping Rag
3, Appendix E
Acetone
18, Appendix E
Methyl-Ethyl Ketone
19, Appendix E
Gaskets (2)
1, Figure F-4, Appendix F
Gasket
Figure F-3, Appendix F

Equipment Conditions:
Refrigeration unit shut down (para. 2-7) and battery disconnected (para. 4-35). Control panel cover door raised and latched.

General Safety Instructions:

WARNING

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

Repair.

NOTE

Repair is limited to replacement of gasket material.

(1) Remove two bolts (1) and lock washers (2). Open control panel (3). Discard lock washers.

(2) Remove as much old gasket material (4) or (5) as possible by pulling or scraping it away from the control panel (3).

(3) Soften and remove old adhesive and gasket (4) or (5) residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(4) Be sure that the attaching surface of the control panel (3) is clean and free of paint and old adhesive material.

(5) Coat the mating surfaces of the control panel (3) and gasket (4) or (5) with adhesive. Let both surfaces air dry until adhesive is tacky, but will not stick to fingers.

5-3. CONTROL PANEL REPAIR. - Continued

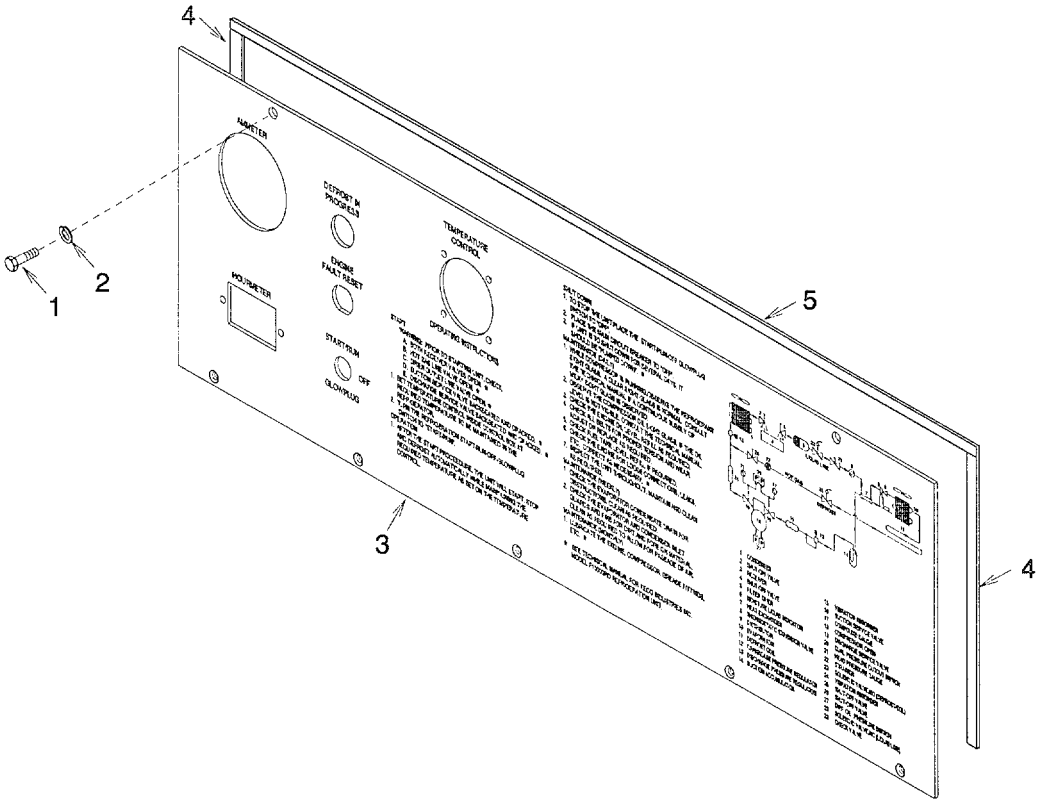


Figure 5-2. Control Panel

(6) Starting with an end, carefully press gasket (4) or (5) onto the control panel (3). Press firmly overall to ensure complete contact.

(7) Install two new lock washers (2) and bolts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Unlatch and close control panel door.

5-4. FAN DRIVE SHAFT REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Equipment Conditions:
Refrigeration unit shut down.
Evaporator fan removed (para. 4-40).
Fan clutch removed (para. 4-45).
Condenser coil removed (para. 5-19).

General Safety Instructions:

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

a. Removal. Remove fan drive shaft (1).

b. Installation. Install fan drive shaft (1).

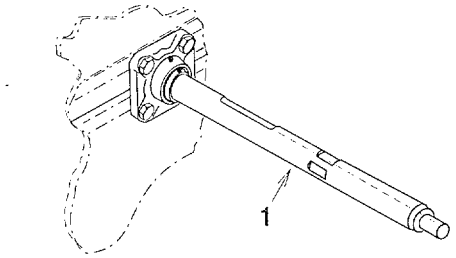


Figure 5-3. Fan Drive Shaft

NOTE

FOLLOW-ON MAINTENANCE:
Install fan clutch (para. 4-45).
Install condenser fan (para. 4-39).
Install evaporator fan (para. 4-40).
Install condenser coil (para. 5-19).
Connect battery (para. 4-35) and put unit back into service.

5-5. REFRIGERATION SYSTEM REPAIRS.

The refrigeration system must be totally discharged (para. 5-7) before any maintenance is performed on system components. Leak testing (para. 5-10) and dehydrator replacement (para. 5-14) are required after any system component has been removed and replaced. The system must be properly evacuated (para. 5-11) and charged (para. 5-12) to function correctly.

5-6. SERVICE MANIFOLD INSTALLATION.

This task covers: a. Installation b. Removal

INITIAL SETUP

Tools:
Refrigeration Unit Service Tool Kit
4, Section III, Appendix B
Refrigerant Recovery and Recycle Unit
5, Section III, Appendix B

Equipment Conditions:

Refrigeration unit shut down (para. 2-7) and battery disconnected (para. 4-35).
Right front bottom door open.
Right side condenser door open.

General Safety Instructions:

WARNING

- Rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.
- Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant. Work in a well ventilated area.

General Safety Instructions:

WARNING

- Sudden and irreversible tissue damage can result from freezing. Wear gloves and face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.
- Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.
- Compressor lubricating oil used in this refrigeration system is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

a. Installation.

CAUTION

Using excessive force when opening or closing valves can cause damage to the valve seats.

NOTE

The compressor shut off valves can be adjusted to three positions, fully closed to block the refrigerant tubes and isolate the compressor and service port, fully open to allow flow from piping to compressor but not the service port, and cracked (one turn closed from fully open) to allow flow from piping to compressor and service port on valve.

(1) Remove two shut off valve caps and turn the shut off valves fully counterclockwise to backseat them.

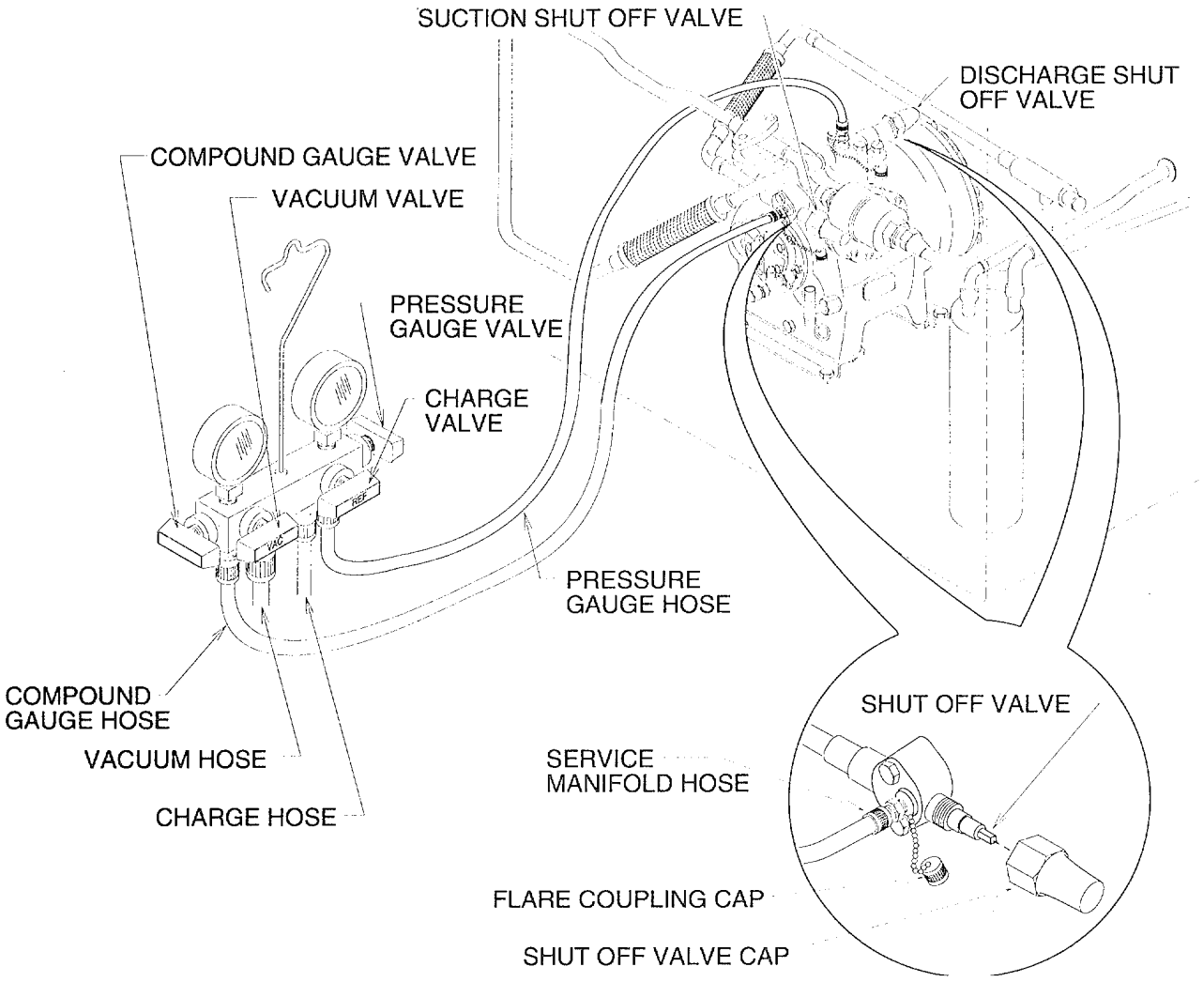


Figure 5-4. Service Manifold Installation

(2) Remove two flare coupling caps.

(3) Check that all four service manifold valves are closed.

5-6. SERVICE MANIFOLD INSTALLATION. - Continued

NOTE

Push switch in condenser side door will prevent refrigeration unit from operating if door is open. Do not pass the service manifold hoses through the condenser side door if the refrigeration unit will need to be operated.

(4) Pass service manifold hoses through front bottom doors and connect service manifold pressure gauge hose to discharge flare coupling and compound gauge hose to suction flare coupling.

(5) Connect service manifold charge hose to recovery unit.

(6) Turn discharge and suction shut off valves one turn clockwise to crack open valves.

(7) Open service manifold pressure gauge valve and charge valve. Operate recovery unit and allow refrigerant to purge for 3-5 seconds. Close pressure gauge and charge valves then shut down recovery unit.

(8) Open service manifold compound gauge valve and charge valve. Operate recovery unit and allow refrigerant to purge for 3-5 seconds. Close compound gauge and charge valves then shut down recovery unit.

b. Removal.

(1) Turn shut off valves fully counterclockwise to backseat them.

(2) Open service manifold pressure and compound gauge valves.

(3) Open service manifold charge valve. Operate recovery unit and allow refrigerant to purge from hoses.

(4) Close service manifold valves.

(5) Shut down recovery unit.

(6) Disconnect service manifold pressure gauge hose from discharge flare coupling and compound gauge hose from suction flare coupling.

(7) Install two shut off valve and flare coupling caps.

NOTE

FOLLOW-ON MAINTENANCE:
Close front bottom doors.
Close right side condenser door.
Connect battery (para. 4-35) and put unit back into service.

5-7. DISCHARGING THE REFRIGERANT SYSTEM.

This task covers: Discharge

INITIAL SETUP

Equipment Conditions:
Service manifold installed (para. 5-6).

Discharge.

(1) Check that the refrigerant system has not been pumped down (para. 4-67). If it has, open necessary valves (para. 4-8) to allow discharge of all refrigerant.

CAUTION

Follow instructions for specific refrigerant recovery unit being used to avoid compressor oil loss. Loss of oil could result in compressor damage.

NOTE

Venting tetrafluoroethane refrigerant into the atmosphere rather than recovering it is subject to pending EPA restrictions. Venting the refrigerant may be a violation of public law and subject to severe penalties.

(2) Open service manifold pressure and compound gauge valves.

(3) Open service manifold charge valve. Operate recovery unit until all refrigerant has been removed from system.

(4) Close service manifold valves.

(5) Shut-down refrigerant recovery unit.

5-7. DISCHARGING THE REFRIGERANT SYSTEM. - Continued

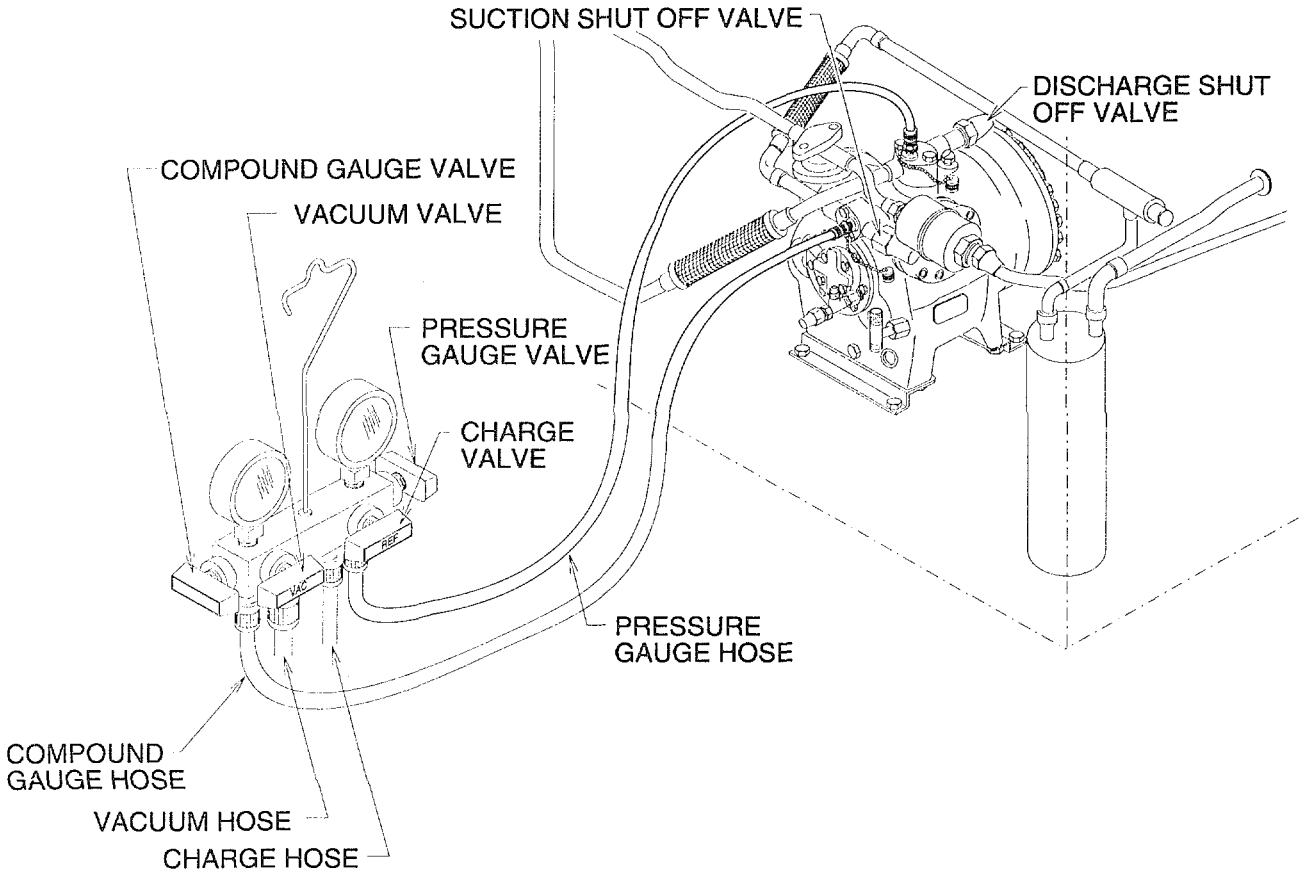


Figure 5-5. Discharging Refrigerant

5-8. PURGING THE REFRIGERANT SYSTEM

This task covers: Purge

INITIAL SETUP

Tools:
Nitrogen Regulator
5, Section III, Appendix B

Materials/Parts:

Nitrogen
11, Appendix E

Equipment Conditions:
Refrigerant system discharged (para. 5-7).

General Safety Instructions:

WARNING

- Never pressurize refrigerant lines with oxygen, mixture with oil could cause an explosion.
- The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.
- Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

Purge. The refrigeration system must be purged with dry nitrogen before brazing is performed on any component. A flow of dry nitrogen should be continued during all brazing operations to minimize internal oxidation and scaling.

(1) Disconnect charge hose from recovery unit and connect to nitrogen regulator and nitrogen tank.

(2) Disconnect the compound gage hose from the service manifold and place end in a suitable container to catch any oil that may come out.

(3) Be sure the service manifold compound gage and vacuum valves are closed.

(4) Open the service manifold pressure gage and charge valves.

(5) Open the nitrogen tank valve and adjust the regulator so that approximately 1-2 cfm (0.028-0.057 m3/minute) of nitrogen flows through the system.

(6) Check discharge from the hose attached to the suction service valve to be sure that no oil is being forced out of the system.

(7) Perform any brazing/debrazing operations necessary (para. 5-9).

(8) When purging is completed, close nitrogen tank valve.

(9) Disconnect the charge hose from nitrogen regulator.

(10) Connect the compound gage hose to service manifold.

5-8. PURGING THE REFRIGERANT SYSTEM. - Continued

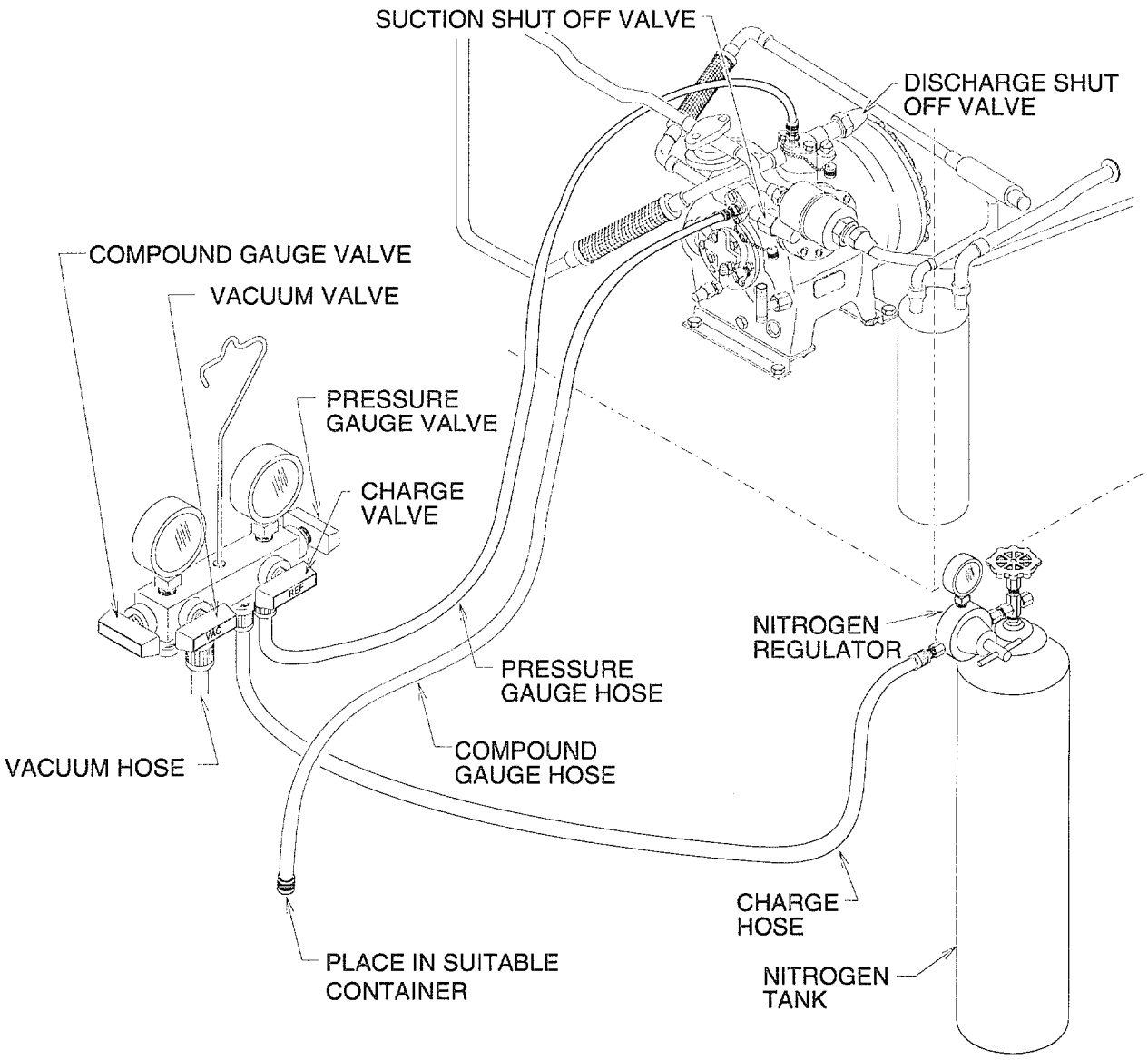


Figure 5-6. Nitrogen Tank Connection

5-9. BRAZING/DEBRAZE PROCEDURE

This task covers: a. Debraze b. Clean c. Braze

INITIAL SETUP

Materials/Parts:

Brazing Alloy
15 or 16, Appendix E
Brazing Flux
9, Appendix E
Rags
3, Appendix E
Abrasive Cloth
13, Appendix E

Equipment Conditions:

Refrigerant system discharged (para. 5-7) and purged (para. 5-8).

General Safety Instructions:

WARNING

Brazing alloys and flux contain materials which are hazardous to health. Avoid breathing vapors or fumes from brazing operations. Perform operations only in well ventilated areas. Wash hands with soap and water after handling brazing alloys and flux. Wear gloves and protective goggles or face shield to protect against burns.

a. Debraze.

(1) Protect wiring harnesses and other components with appropriate heat shields.

NOTE

It may be easier to access a component by cutting or debrazing the copper lines in accessible areas and removing part of the interconnecting tubing with the component.

(2) If debrazing a joint on a valve, disassemble the valve to the extent possible and wrap all but the joint with wet rag to act as a heat sink.

5-9. BRAZING/DEBRAZE PROCEDURE. - Continued

WARNING

Never use a heating torch on any part that contains refrigerant. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. All refrigerant must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any brazing operation.

CAUTION

If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted.

(3) Check that the system is being purged (para. 5-8) and apply sufficient heat uniformly around the joint to quickly melt the filler alloy. Remove heat as soon as the joint is separated.

b. Clean. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler is melted and then wipe it away with a wire brush. Be sure no filler alloy or other debris is left inside any tubing, fitting, or component. Use abrasive cloth as necessary to clean joints.

c. Braze.

(1) Protect wiring harnesses and other components with appropriate heat shields.

NOTE

- All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

- Grade IV or VI brazing alloy and Type-B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade III brazing alloy may be substituted for Grade IV or VI for copper to copper joints, flux is not required for copper to copper joints.

(2) If brazing a joint on a valve, disassemble the valve to the extent possible and wrap all but the joint with a wet rag to act as a heat sink.

NOTE

If interconnecting tubing was removed with a component, braze tubing to the new components before installation.

(3) Position component or assembly into place.

WARNING

Never use a heating torch on any part that contains refrigerant. Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. All refrigerant must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any brazing operation.

CAUTION

- If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted.
- Brazing a joint without nitrogen flowing through the tubing, will cause deposits to form on the inside of the tube and may cause obstructions in the refrigeration system or equipment damage.

(4) Check that the system is being purged (para. 5-8) and apply sufficient heat uniformly around the joint to quickly melt the filler alloy. Remove heat and stop purging as soon as brazing is completed.

5.10 LEAK TESTING THE REFRIGERANT SYSTEM

This task covers: Testing

INITIAL SETUP

Tools:

Refrigeration Unit Service Tool Kit
4, Section III, Appendix B
Nitrogen Regulator
6, Section III, Appendix B

Materials/Parts:

Refrigerant R-134a
12, Appendix E
Nitrogen
11, Appendix E

Equipment Conditions:

Service manifold installed (para. 5-6).

General Safety Instructions:

WARNING

- Never pressurize refrigerant lines with oxygen, mixture with oil could cause an explosion.
- The pressure in a nitrogen cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times to avoid personal injury.
- Nitrogen is an inert gas that can cause suffocation and must be discharged in a well ventilated area.

Testing.

NOTE

- To perform leak test, it is necessary that the system be pressurized with a proportion of refrigerant gas.
- The electronic gas tester is highly sensitive to the presence of a minute quantity of gas in the air, and is quite effective in the detection of small leaks. However, due to rapid dispersion of refrigerant gas into surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated area but draft free area. Use procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas".

(1) To pressurize a system that has some refrigerant charge.

(a) Connect the charge hose to a refrigerant cylinder containing refrigerant R-134a set to deliver gas only.

(b) Check that service manifold vacuum valve is closed.

(c) Open the service manifold compound gage, pressure gage, and charge valves.

(d) Open refrigerant cylinder valve and pressurize system to 100 psi (7.1 kg/cm^2).

(2) To pressurize a system that has been discharged and purged.

(a) Connect the charge hose to a refrigerant cylinder containing refrigerant R-134a set to deliver gas only.

(b) Check that service manifold vacuum valve is closed.

(c) Open the service manifold compound gage, pressure gage, and charge valves.

(d) Open refrigerant cylinder valve and pressurize system to 40-50 psi (2.8-3.5 kg/cm²).

(e) Close service manifold valves and refrigerant cylinder valve.

(f) Disconnect charge hose from the refrigerant cylinder and connect it to a nitrogen regulator and nitrogen cylinder.

(g) Open the service manifold compound gage, pressure gage, and charge valves.

(h) Open nitrogen cylinder valve and pressurize system to 350 psi (24.7 kg/cm2).

(3) Test for leaks at all points of possible leakage using a refrigerant gas leak detector. If a leak is found, take necessary steps to replace damaged components or repair leak.

(4) If no leak was found and refrigerant only was used to pressurize the system, check refrigeration unit charge (para. 5-12).

(5) If no leak was found and nitrogen was used to pressurize the system, discharge (para. 5-7), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration unit.

5-11. EVACUATING THE REFRIGERANT SYSTEM.

This task covers: Evacuate

INITIAL SETUP

Tools:

Refrigeration Unit Service Tool Kit
4, Section III, Appendix B

Equipment Conditions:

Refrigerant system discharged (para. 5-7).

Evacuate. The refrigeration system must be evacuated to remove all moisture and non-condensables before it is charged.

(1) Check that new dehydrator was installed. If not, install one (para. 5-14).

(2) Check that service manifold charge valve is closed.

(3) Connect the vacuum hose to vacuum pump and start pump.

(4) Open service manifold high pressure gauge, compound gauge, and vacuum valves.

(5) Run vacuum pump until at least 29 inches of mercury is measured on compound gage. Continue running vacuum pump for one more hour, while observing the compound gauge. If gage needle moves back and forth, you have a leak which must be located and corrected (para. 5-10).

NOTE

Inability to reach and hold 29 inches of mercury may indicate either a leak or a problem with the vacuum pump.

(6) Close service manifold vacuum valve and stop vacuum pump. Note reading on compound gauge and observe for 10 minutes. If pressure rises, moisture may still be in the system or a leak exists. If pressure rose, repeat evacuation and re-check. If the pressure rise occurs again at the same speed, a leak is in the system and must be found (para. 5-10). If the pressure rise was slower the second time, moisture remains in the system and the evacuation process must be repeated until there is no rise.

(7) Close service manifold high pressure gauge and compound gauge valves.

(8) Disconnect the vacuum hose from vacuum pump.

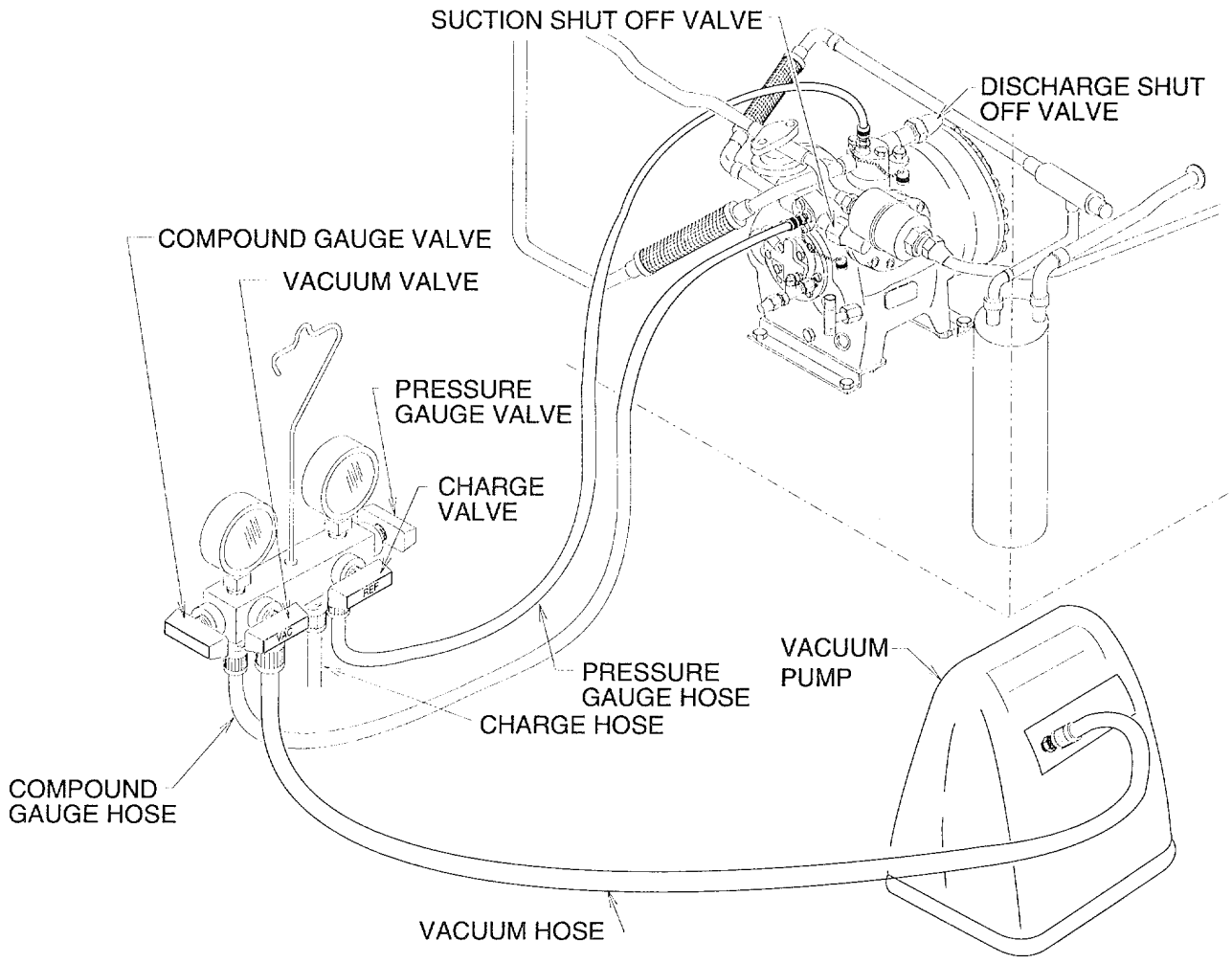


Figure 5-7. Evacuation of Refrigerant System

NOTE

FOLLOW-ON MAINTENANCE:
Charge the refrigeration system (para. 5-12).

5-12. CHARGING THE REFRIGERANT SYSTEM.

This task covers: a. Full Charge b. Partial Charge

INITIAL SETUP

Materials /Parts:

Refrigerant R-134a
12, Appendix E

Equipment Conditions:

Service manifold installed (para. 5-6).
Refrigerant system evacuated (para. 5-11).

General Safety Instructions:

WARNING

- Dangerous chemical refrigerant under pressure is used in the operation of this equipment. Use great care to avoid contact with liquid refrigerant.
- Sudden and irreversible tissue damage can result from freezing. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact with refrigerant is possible.
- Heat may cause the refrigerant to decompose and release irritating, toxic, and corrosive gases. Prevent contact of refrigerant with flame or hot surfaces.
- Never introduce high discharge pressure into a refrigerant cylinder. This can cause the cylinder to rupture and injure personnel.

a. Full Charge.

CAUTION

The system must be evacuated before charging. Moisture in the system will prevent the refrigeration unit from operating properly.

(1) Connect the charge hose to a tank containing refrigerant R-134a set to deliver gas and the vacuum hose to reclaim unit.

(2) Check that compound gauge and pressure gauge valves are closed.

(3) Open vacuum and charge valves.

(4) Open refrigerant tank valve. Operate reclaim unit for 3 to 5 seconds to purge hoses.

(5) Close refrigerant tank, vacuum, and charge valves then stop reclaim unit.

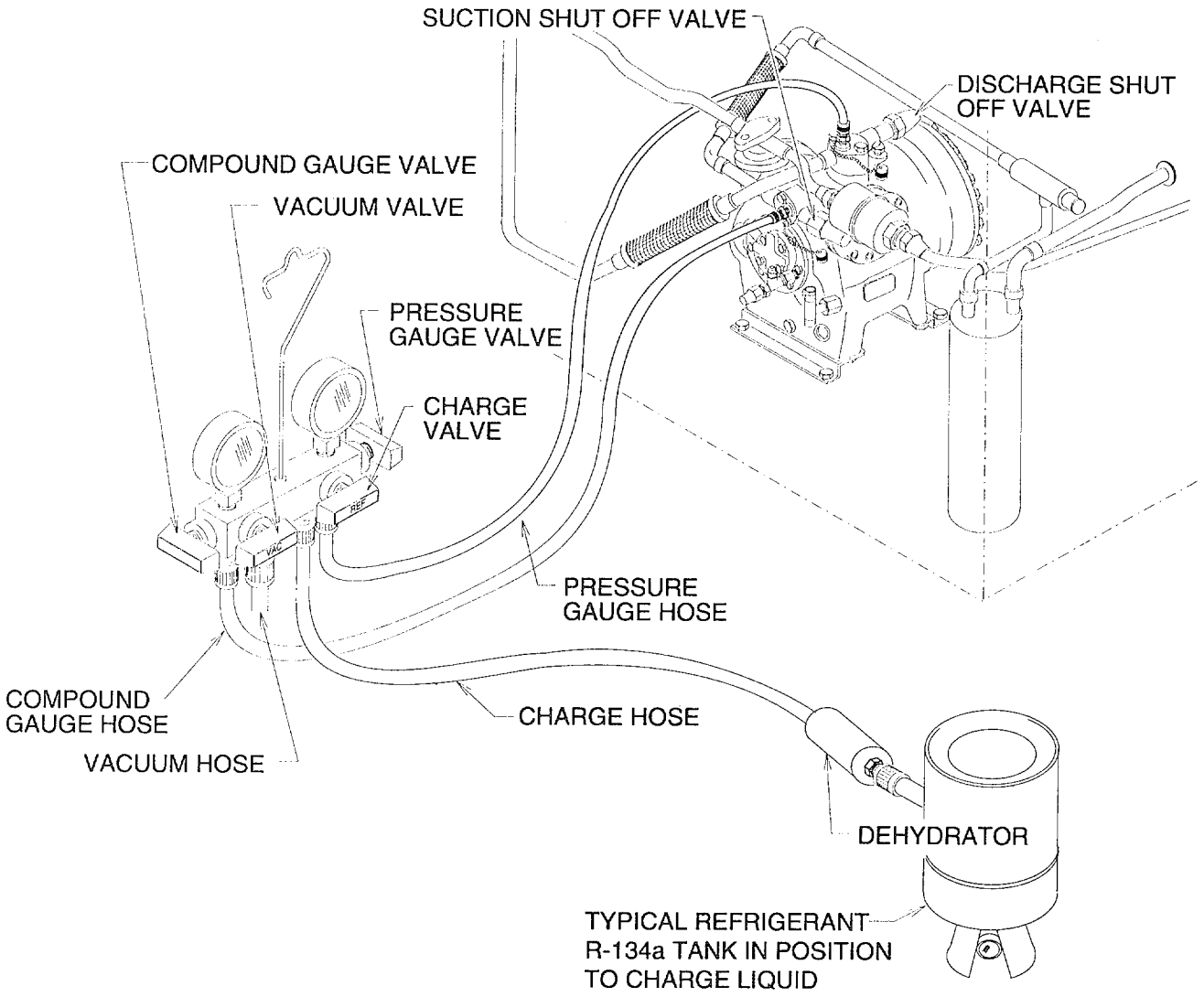


Figure 5-8. Refrigerant Charging (Total System)

(6) Set refrigerant tank to deliver liquid only.

(7) Place refrigerant tank on an accurate scale to measure and record weight.

5-12. CHARGING THE REFRIGERANT SYSTEM. - Continued

CAUTION

Never introduce liquid refrigerant into the suction shut off valve. This can cause damage to the compressor.

(8) Open refrigerant tank, pressure gauge, and charge valves. Allow liquid refrigerant to enter system until tank weight has decreased by 16 pounds (7.3 kg) or until system pressure has equalized, whichever occurs first.

(9) Close refrigerant tank, charge, and pressure gauge valves.

NOTE

If 16 pounds (7.3 kg) full charge was obtained, skip steps (10) through (15).

(10) Connect battery if disconnected (para. 4-35).

WARNING

Engines have fast moving parts that can injure hands, fingers, etc. Take special care while in operation. Engine parts, particularly the exhaust system, can be very hot and cause severe burns.

(11) Turn refrigeration unit on (para. 2-5) and operate at desired temperature setting.

(12) Set refrigerant tank to deliver gas only.

(13) Check that all service manifold valves are closed.

WARNING

Never introduce high discharge pressure into a refrigerant tank. This can cause the tank to rupture and injure personnel.

CAUTION

Never introduce liquid refrigerant into the suction shut off valve. This can cause damage to the compressor.

(14) Open refrigerant tank, compound gauge, and charge valves.

(15) Monitor weight of the refrigerant tank until total 16 pounds (7.3 kg) charge is obtained. When system is fully charged, immediately close refrigerant tank, compound gauge, and charge valves.

(16) Run refrigeration unit for 15 minutes and observe sight glass through left side condenser door.

(a) Green or chartreuse center means refrigerant moisture content is acceptable.

(b) Yellow center means there is too much moisture in system. Discharge (para. 5-7), replace dehydrator (para. 5-14), leak check (para. 5-10), evacuate (para. 5-11), and charge again.

(17) Be sure all service manifold valves are closed.

(18) Shut off refrigeration unit (para. 2-7).

b. Partial Charge.

(1) Connect the charge hose to a tank containing refrigerant R-134a set to deliver gas and the vacuum hose to reclaim unit.

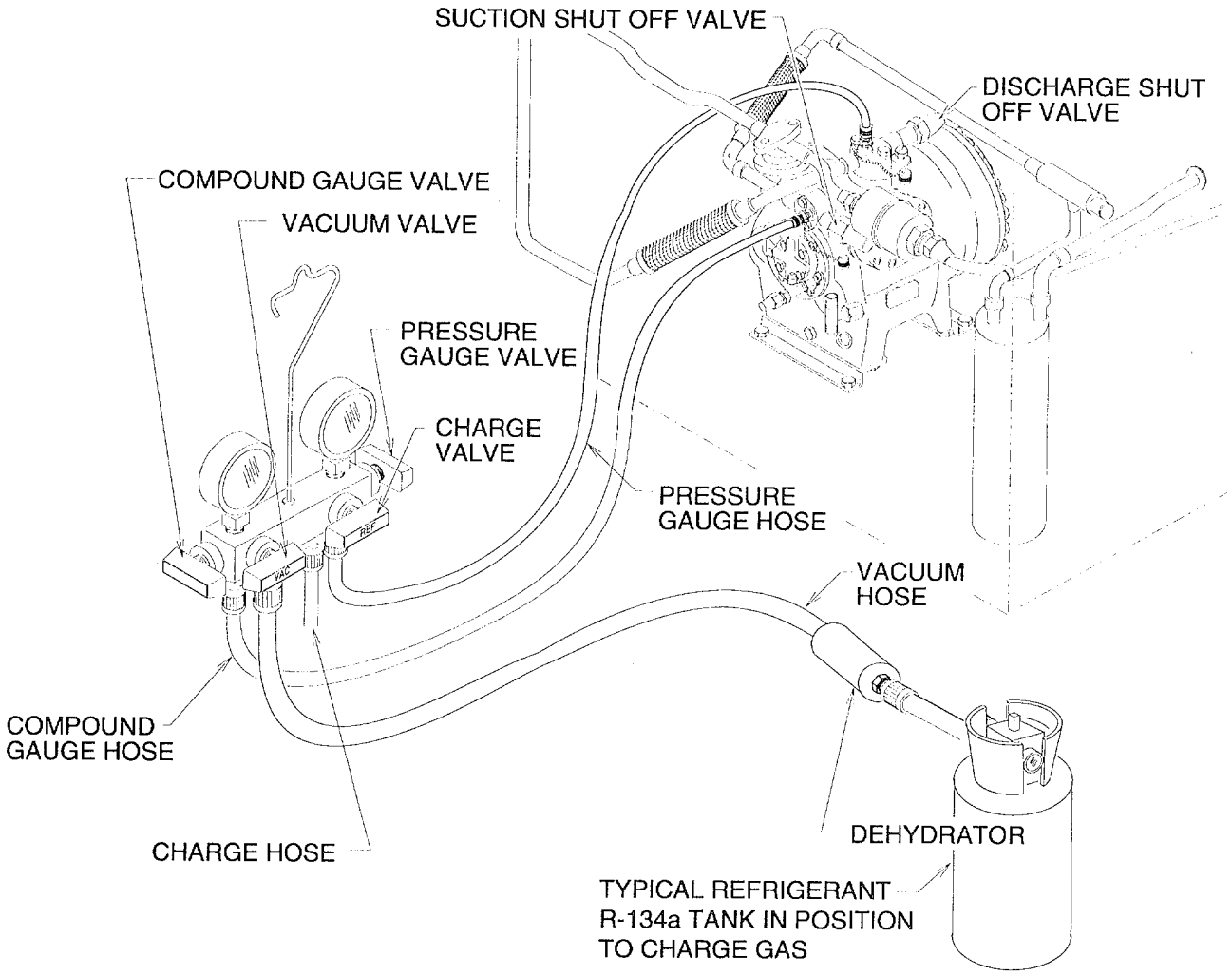


Figure 5-9. Refrigerant Charging (Partial System /Small Quantity Charge)

5-12. CHARGING THE REFRIGERANT SYSTEM. - Continued

(2) Check that compound gauge and pressure gauge valves are closed.

(3) Open vacuum and charge valves.

(4) Open refrigerant tank valve. Operate reclaim unit for 3 to 5 seconds to purge hoses.

(5) Close refrigerant tank, vacuum, and charge valves then stop reclaim unit.

(6) Connect power at power source.

(7) Turn refrigeration unit on (para. 2-5) and operate at desired temperature setting.

(8) Set refrigerant tank to deliver gas only.

(9) Check that all service manifold valves are closed.

WARNING

Never introduce high discharge pressure into a refrigerant tank. This can cause the tank to rupture and injure personnel.

CAUTION

Never introduce liquid refrigerant into the suction shut off valve. This can cause damage to the compressor.

(10) Open refrigerant tank, compound gauge, and charge valves.

(11) Run refrigeration unit for 15 minutes and observe sight glass through left side condenser door.

(a) Green or chartreuse center means refrigerant moisture content is acceptable.

(b) Yellow center means there is too much moisture in system. Discharge (para. 5-7), replace dehydrator (para. 5-14), leak check (para. 5-10), evacuate (para. 5-11), and charge again.

(c) Milky white or bubbly liquid means system has low charge.

(d) Clean bubble free liquid around center means the system is fully charged.

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve. This can cause damage to the compressor.

(12) If charge is low, set refrigerant tank to deliver gas only.

WARNING

Never introduce high discharge pressure into a refrigerant cylinder. This can cause the cylinder to rupture and injure personnel.

(13) Check that pressure gauge valve is closed.

(14) Open refrigerant tank, compound gauge, and charge valves.

(15) Charge until sight glass remains clear and bubble free for 15 minutes.

(16) When system is fully charged, immediately close refrigerant tank, compound gauge, and charge valves.

(17) Shut off refrigeration unit (para. 2-7).

NOTE

FOLLOW-ON MAINTENANCE:
Remove service manifold (para. 5-6).

5-13. REFRIGERANT SYSTEM PRESSURE CHECK.

This task covers: a. Full Charge b. Partial Charge

INITIAL SETUP

Equipment Conditions:

Service manifold installed (para. 5-6).

Testing.

(1) Check that all four service manifold valves are closed.

(2) Service manifold compound and pressure gauges should indicate the same pressure. Check the reading with the appropriate column in Table 5-1. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check. Leak test the refrigeration system (para. 5-10).

WARNING

Engines have fast moving parts that can injure hands, fingers, etc. Take special care while in operation. Engine parts, particularly the exhaust system, can be very hot and cause severe burns.

(3) Turn the refrigeration unit on (para. 2-5) and operate at desired setting.

(4) With the refrigeration unit operating, allow service manifold gauges to stabilize. Compare readings with those listed in Table 5-2.

(a) If discharge and suction pressure are at, or near, the same value, defrost solenoid valve (L2) or compressor (B1) failure is indicated.

(b) If discharge pressure is low and suction pressure is normal, a low refrigerant charge is indicated.

(c) If discharge pressure is normal and suction pressure is either high, or low, failure of the expansion valve is indicated.

(d) If discharge pressure is high and suction pressure is normal, refrigerant overcharge is indicated.

(5) When pressure tests are completed, turn the refrigeration unit off (para. 2-7).

Table 5-1. Pressure Temperature Relationship of Saturated Refrigerant R-134a

Temperature		Pressure	
Deg F	Deg C	psia	kg/cm2
-20	-28.88	12.95	5.87
-18	-27.77	13.63	6.18
-16	-26.66	14.35	6.50
-14	-25.55	15.09	6.84
-12	-24.44	15.87	7.19
-10	-23.33	16.67	7.56
-8	-22.22	17.51	7.94
-6	-21.11	18.38	8.33
-4	-20.00	19.29	8.74
-2	-18.88	20.23	9.17
0	-17.77	21.20	9.61
2	-16.66	22.22	10.07
4	-15.55	23.27	10.55
6	-14.44	24.35	11.04
8	-13.33	25.48	11.55
10	-12.22	26.65	12.08
12	-11.11	27.86	12.63
14	-10.00	29.11	13.20
16	-8.88	30.41	13.79
18	-7.77	31.75	14.40
20	-6.66	33.14	15.03
22	-5.55	34.57	15.68
24	-4.44	36.05	16.35
26	-3.33	37.58	16.78
28	-2.22	39.16	17.76
30	-1.11	40.79	18.50
32	-0	42.47	19.26
34	1.11	44.21	20.05
36	2.22	45.99	20.86
38	3.33	47.84	21.69
40	4.44	49.74	22.56
42	5.55	51.70	23.45
44	6.66	53.71	24.36
46	7.77	55.79	25.30
48	8.88	57.93	26.27
50	10.00	60.13	27.27
52	11.11	62.39	28.29
54	12.22	64.71	29.35
56	13.33	67.11	30.44
58	14.44	69.57	31.55

Temperature		Pressure	
Deg F	Deg C	psia	kg/cm2
60	15.55	72.09	32.69
62	16.66	74.69	33.87
64	17.77	77.36	35.08
66	18.88	80.09	36.32
68	20.00	82.90	37.60
70	21.11	85.79	38.91
72	22.22	88.75	40.25
74	23.33	91.79	41.63
76	24.44	94.90	43.04
78	25.55	98.09	44.49
80	26.66	101.37	45.98
82	27.77	104.73	47.50
84	28.88	108.16	49.06
86	30.00	111.69	50.66
88	31.11	1.15.30	52.16
90	32.22	118.99	53.97
92	33.33	122.78	55.69
94	34.44	126.65	57.44
96	35.55	130.62	59.24
98	36.66	134.68	61.08
100	37.77	138.83	62.59
102	38.88	143.07	64.86
104	40.00	147.42	66.86
106	41.11	151.86	68.88
108	42.22	158.40	71.84
110	43.33	161.04	73.04
112	44.44	165.79	75.20
114	45.55	170.64	77.40
116	46.66	175.79	79.64
118	47.77	180.82	82.58
120	48.88	185.82	84.28
122	50.00	191.11	86.68
124	51.11	196.50	89.13
126	52.22	202.00	91.62
128	53.33	207.62	94.17
130	54.44	213.36	96.77
132	55.55	219.22	99.43
134	56.66	225.19	102.14
136	57.77	231.29	104.91
138	58.88	237.51	107.73

5-13. REFRIGERANT SYSTEM PRESSURE CHECK. - Continued

Table 5-1. Pressure Temperature Relationship of Saturated Refrigerant R-134a - Continued

Temperature		Pressure	
Deg F	Deg C	psia	kg/cm2
140	60.00	243.86	110.06
142	61.11	250.33	113.54
144	62.22	256.94	116.54
146	63.33	263.67	119.59
148	64.44	270.54	122.71
150	65.55	277.54	125.89

Temperature		Pressure	
Deg F	Deg C	psia	kg/cm2
152	66.66	284.67	129.12
154	67.77	291.95	132.42
156	68.88	299.37	135.79
158	70.00	306.64	139.08
160	71.11	314.64	142.71

Table 5-2. Nominal Operating Pressure At Suction And Discharge Shut Off Valves

Air Temperature Entering Evaporator Coil	Air Temperature Entering Condenser Coil 110° F (43° C)
0° F (-18° C)	Suction 1 psi (7 kPa) Discharge 177 psi (1221 kPa)
35° F (2° C)	Suction 10 psi (69 kPa) Discharge 199 psi (1373 kPa)

NOTE

FOLLOW-ON MAINTENANCE:
Remove service manifold (para 5-6).

5-14. DEHYDRATOR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Lock Washers (3)
13, Appendix G
Self Locking Nut
12, Appendix G

Equipment Conditions:

Refrigeration system discharged (para. 5-7).
Left side condenser door open.

a. Removal.

(1) Loosen two flare nuts (1).

NOTE

Note flow direction prior to removal.

(2) Remove self locking nut (2), bolt (3), clamp (4), and dehydrator (5). Discard self locking nut.

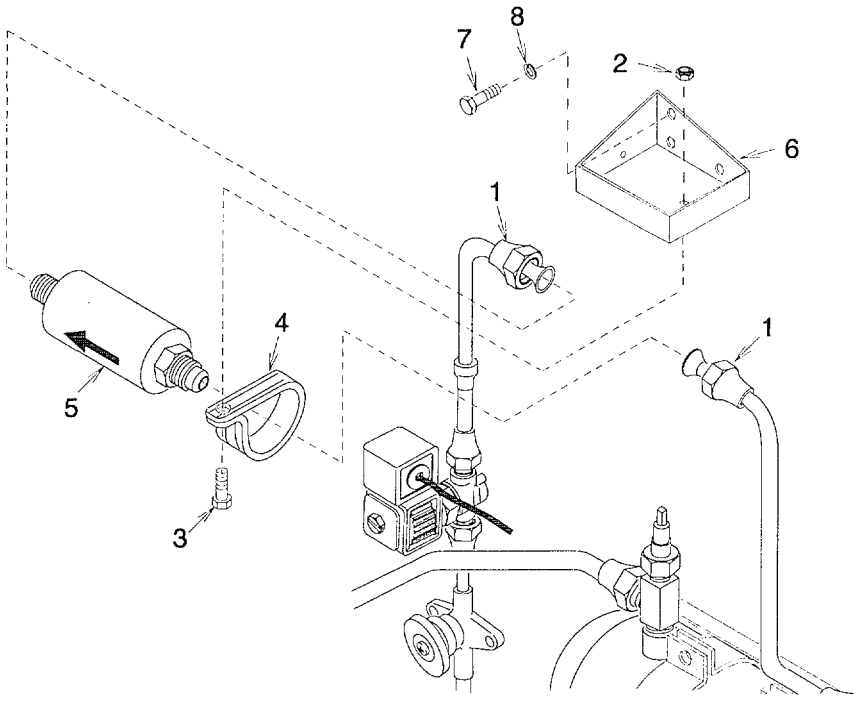


Figure 5-10. Dehydrator

5-14. DEHYDRATOR REPLACEMENT. - Continued

(3) If filter drier bracket (6) is damaged, remove three bolts (7), lock washers (8) and bracket. Discard lock washers.

b. Installation.

(1) If removed, install bracket (6), three new lock washers (8) and bolts (7).

NOTE

Do not remove dehydrator protective caps until just before installation. This will minimize the risk of contaminating the dehydrator. Be sure to observe flow direction noted during removal.

(2) Install new dehydrator (5), clamp (4), bolt (3), and new self locking nut (2).

(3) Tighten two flare nuts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-15. COMPOUND GAGE REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Self Locking Nuts (3)
8, Appendix G
Anti-Seize Tape
22, Appendix E
Silicone RTV
20, Appendix E

Equipment Conditions:

Refrigeration system discharged (para. 5-7).
Left side condenser door open.

a. Removal.

(1) Loosen flare nut (1) and move copper tubing (2) over to one side being careful not to bend or kink tubing.

(2) Remove coupling (3).

(3) Remove three self locking nuts (4), bolts (5) and compound gage (6). Discard self locking nuts.

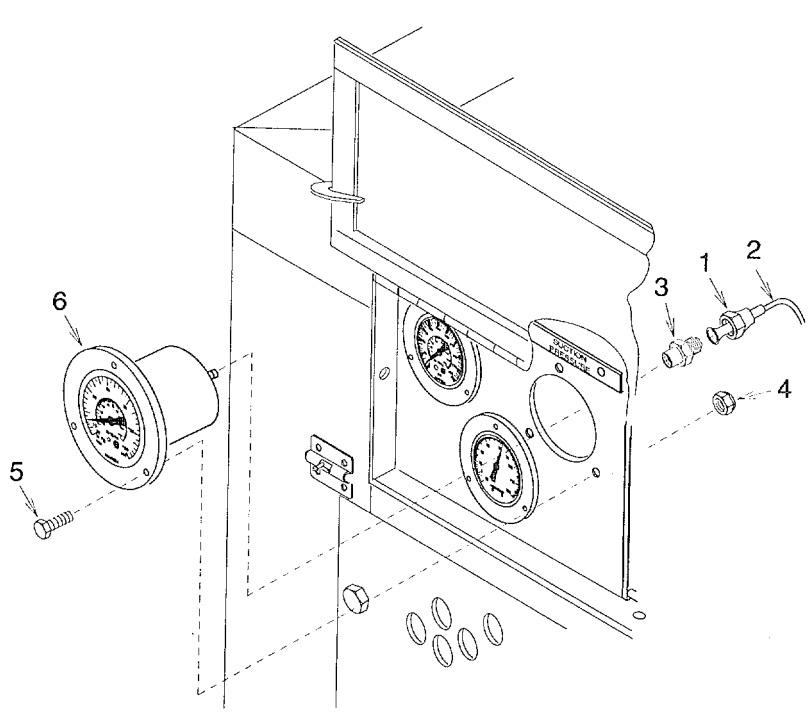


Figure 5-11. Compound Gage

5-15. COMPOUND GAGE REPLACEMENT. - Continued

b. Installation.

(1) Wrap anti-seize tape around compound gage (6) connector threads.

(2) Install compound gage (6), three bolts (5), and new self locking nuts (4).

(3) Install coupling (3).

(4) Align copper tubing (2) and connect flare nut (1) to coupling (3).

(5) Seal any openings in back of compound gage (6) case with silicone RTV.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-16. PRESSURE GAGE REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Self Locking Nuts (3)
8, Appendix G
Anti-Seize Tape
22, Appendix E
Silicone RTV
20, Appendix E

Equipment Conditions:

Refrigeration system discharged (para. 5-7).
Left side condenser door open.

a. Removal.

(1) Loosen flare nut (1) and move copper tubing (2) over to one side being careful not to bend or kink tubing.

(2) Remove coupling (3).

(3) Remove three self locking nuts (4), bolts (5) and pressure gage (6). Discard self locking nuts.

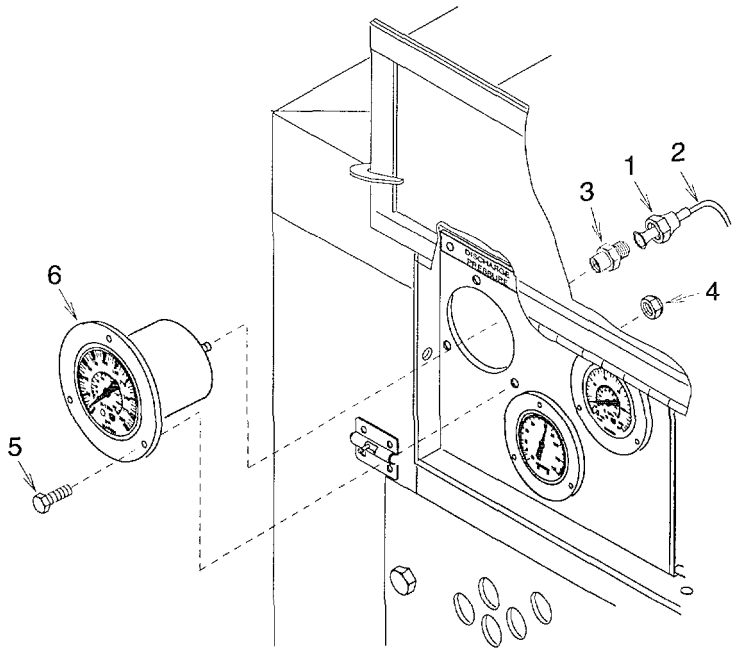


Figure 5-12. Pressure Gage

5-16. PRESSURE GAGE REPLACEMENT. - Continued

b. Installation.

(1) Wrap anti-seize tape around pressure gage (6) connector threads.

(2) Install pressure gage (6), three bolts (5), and new self locking nuts (4).

(3) Install coupling (3).

(4) Align copper tubing (2) and connect flare nut (1) to coupling (3).

(5) Seal any openings in back of pressure gage (6) case with silicone RTV.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-17. STRAINER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Equipment Conditions:

Refrigeration system discharged (para. 5-7).
Both front bottom doors open.

NOTE

Note flow direction prior to removal.

a. Removal. Loosen two flare nuts (1) and strainer (2).

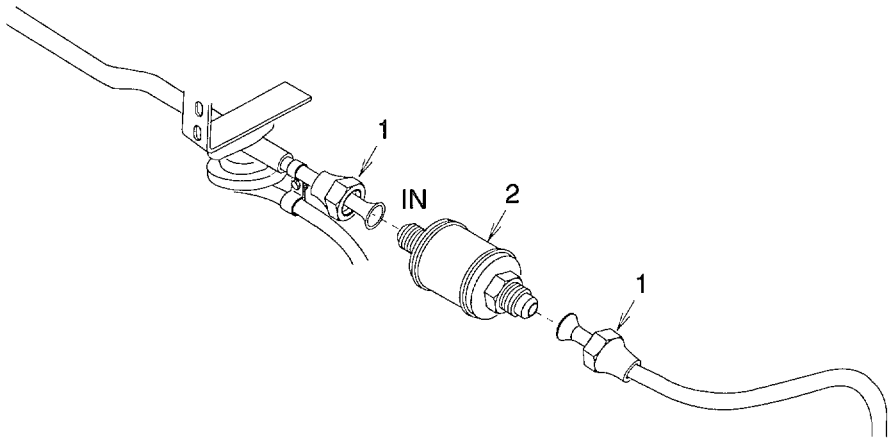


Figure 5-13. Strainer

5-17. STRAINER REPLACEMENT. - Continued

NOTE

Be sure to observe flow direction noted during removal.

b. Installation. Install strainer (2) and tighten two flare nuts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close both front bottom doors.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-18. RECEIVER REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Self Locking Nuts (2)
15, Appendix G
Lubricating Oil
21, Appendix E
Teflon Seals (2)
47, Appendix G

Equipment Conditions:

Refrigeration system discharged (para. 5-7).
Both side condenser doors open.

General Safety Instructions:

WARNING

Compressor lubricating oil used in this refrigeration system is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

a. Removal.

(1) Remove two isolation valve caps (1).

(2) Loosen two flare nuts (2) and move copper tubing (3) away from isolation valve (4) being careful not to bend or kink tubing.

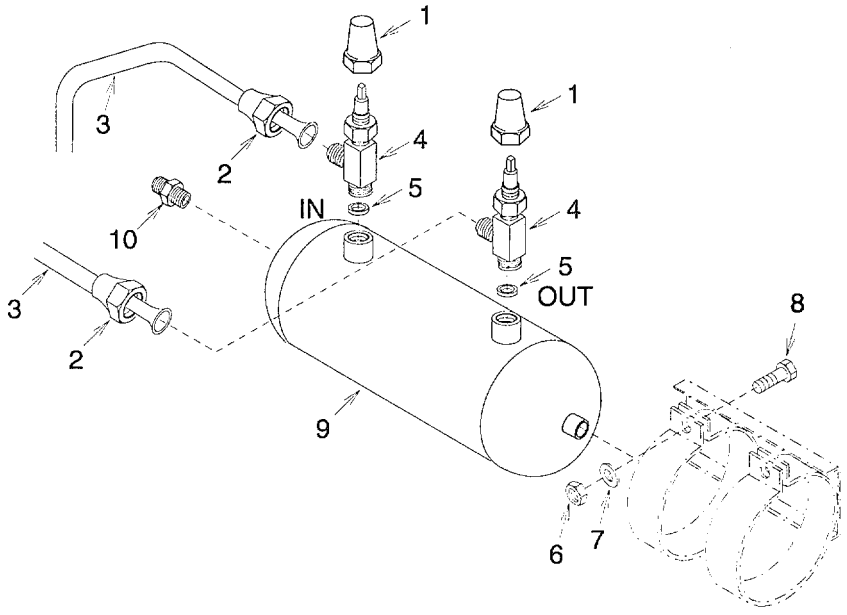


Figure 5-14. Receiver

5-18. RECEIVER REPLACEMENT. - Continued

NOTE

Isolation valve flare connections are different sizes. Note location prior to removal.

(3) Remove two isolation valves (4) and teflon seals (5). Discard teflon seals.

NOTE

Note flow direction prior to removal.

(4) Remove two self locking nuts (6), flat washers (7), bolts (8), and receiver (9). Discard self locking nuts.

(5) Remove fusible plug (10).

b. Installation.

(1) Lightly coat fusible plug (10) copper gasket with lubricating oil.

(2) Install fusible plug (10) and tighten to between 25 and 30 ft-lb (34 and 41 Nm).

NOTE

Be sure to observe flow direction noted during removal.

(3) Install receiver (9), two bolts (8), flat washers (7), and new self locking nuts (6).

NOTE

Isolation valve flare connections are different sizes. Be sure to observe location noted during removal.

(4) Install two new teflon seals (5) and isolation valves (4). Be sure valves are turned toward copper tubing (3) and tighten to between 50 and 60 ft lb (68 and 82 Nm).

(5) Align copper tubing (3) and connect two flare nuts (2) to isolation valves (4).

(6) Be sure two isolation valves (4) are open and install two isolation valve caps (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close both side condenser doors.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-19. CONDENSER COIL REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Self Locking Nuts (8)
17, Appendix G
Self Locking Nuts (10) (Various Clamps)
12, Appendix G

Equipment Conditions:

Refrigeration system discharged (para. 5-7) and purged (para. 5-8).
Both side condenser doors open.
Condenser coil guard removed (para. 4-19).

a. Removal.

(1) Remove self locking nut (1) and bolt (2). Discard self locking nut.

(2) Purge (para. 5-8) and debraze (para. 5-9) two fittings (3) from condenser coil (4).

WARNING

Coil fins are sharp and can cut hands or fingers. Wear gloves to prevent personal injury when handling coil.

(3) Remove eight self locking nuts (5), bolts (6), and condenser coil (4). Discard self locking nuts.

(4) If condenser shroud (7) must be replaced, remove fan drive shaft (para. 5-4).

(5) Remove nine self locking nuts (8), bolts (9), and condenser shroud (7). Discard self locking nuts.

b. Installation.

(1) If condenser shroud (7) was removed, install shroud, aline clamps (10) and install nine bolts (9) and new self locking nuts (8).

(2) Install fan drive shaft (para. 5-4).

5-19. CONDENSER COIL REPLACEMENT. - Continued

WARNING

Coil fins are sharp and can cut hands or fingers. Wear gloves to prevent personal injury when handling coil.

(3) Install condenser coil (4), eight bolts (6), and new self locking nuts (5).

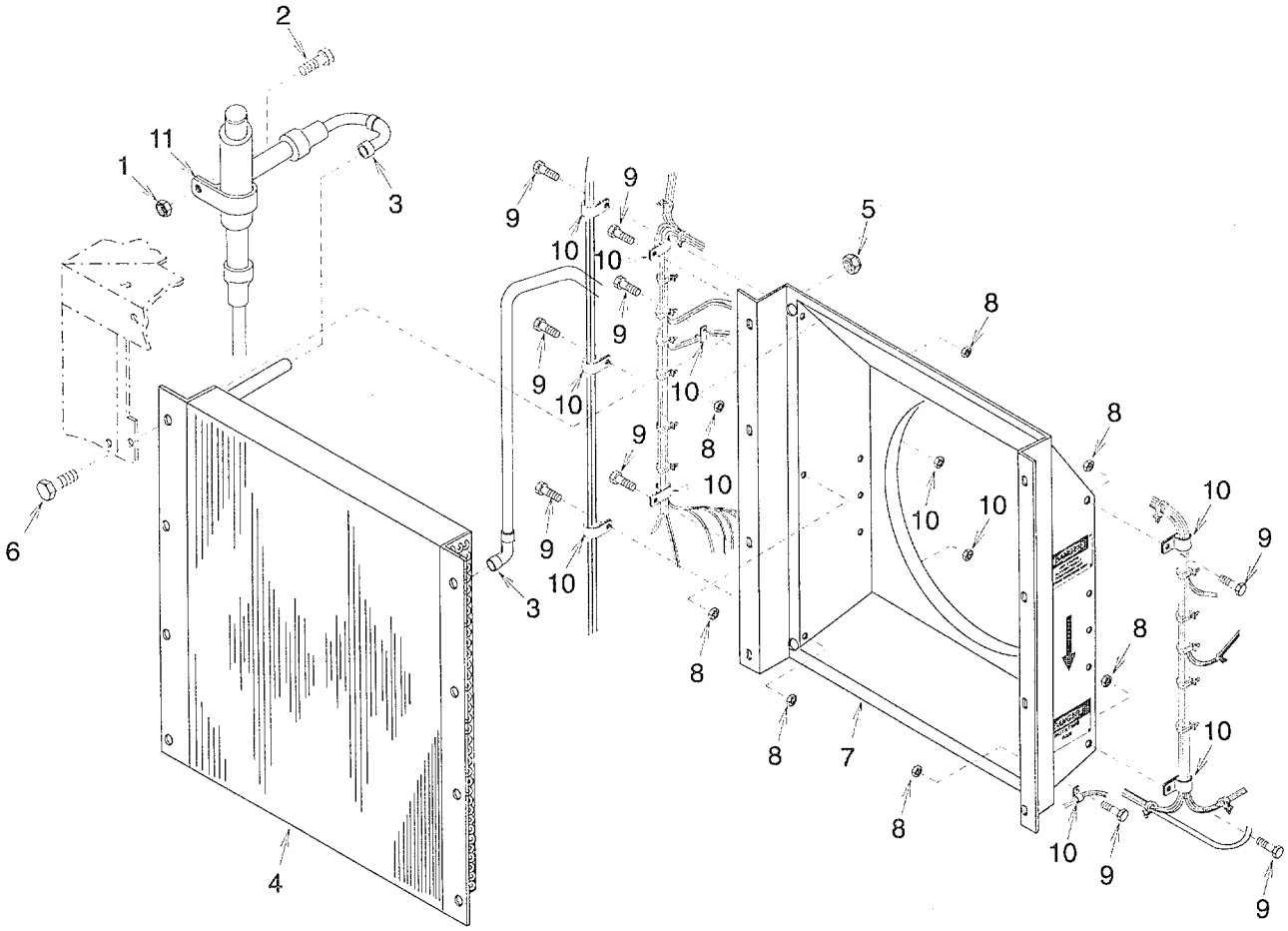


Figure 5-15. Condenser Coil

(4) Purge (para. 5-8) and braze (para. 5-9) two fittings (3) onto condenser coil (4).

(5) Align clamp (11) and install bolt (2) and new self locking nut (1).

NOTE

FOLLOW-ON MAINTENANCE:
Install condenser coil guard (para. 4-19).
Close both side condenser doors.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-20 PRESSURE REGULATOR VALVE (DISCHARGE) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Self Locking Nut
12, Appendix G

Equipment Conditions:

Refrigeration system discharged (para. 5-7) and purged (para. 5-8).
Left side condenser door open.

a. Removal.

(1) Purge (para. 5-8) and de-braze (para. 5-9) two fittings (1) from pressure regulator valve (2).

(2) Remove self locking nut (3), bolt (4), pressure regulator valve (2), and clamp (5). Discard self locking nut.

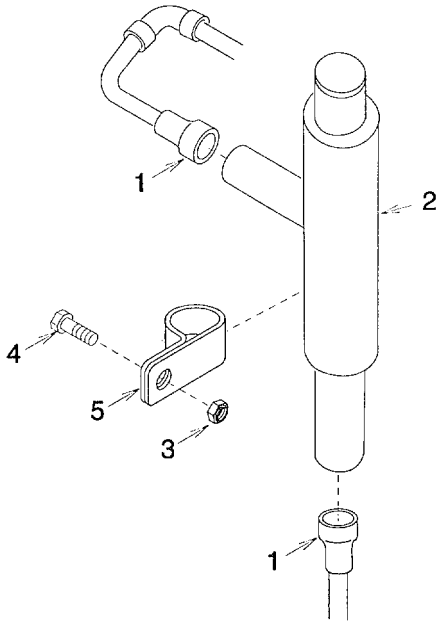


Figure 5-16. Pressure Regulator Valve

5-20. PRESSURE REGULATOR VALVE (DISCHARGE) REPLACEMENT. - Continued

b. Installation.

(1) Install clamp (5) onto pressure regulator valve (2) and aline clamp. Install bolt (4) and new self locking nut (3).

(2) Purge (para. 5-8) and braze (para. 5-9) two fittings (1) onto pressure regulator valve (2).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-21. PRESSURE REGULATOR VALVE (CRANKCASE) REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts:

Insulation Tape
10, Appendix E

Equipment Conditions:

Refrigeration system discharged (para. 5-7) and purged (para. 5-8).
Right side condenser door open.

a. Removal.

(1) Remove insulation (1).

(2) Purge (para. 5-8) and de-braze (para. 5-9) two fittings (2) from pressure regulator valve (3).

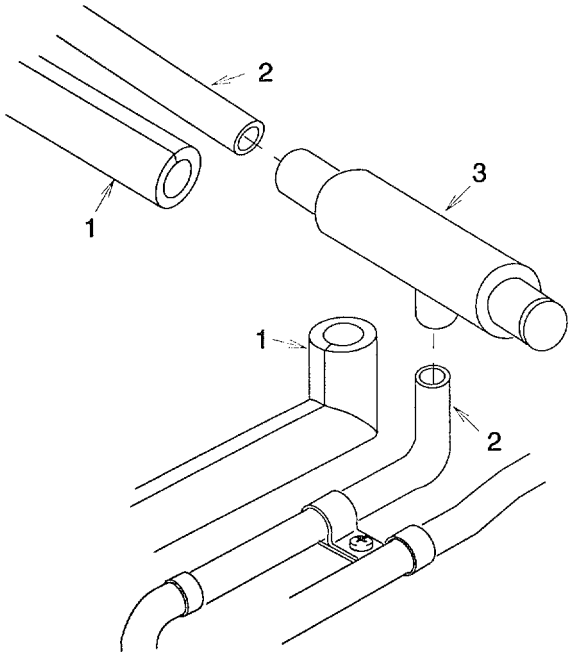


Figure 5-17. Pressure Regulator Valve

5-21. PRESSURE REGULATOR VALVE (CRANKCASE) REPLACEMENT. - Continued

b. Installation.

(1) Purge (para. 5-8) and braze (para. 5-9) two fittings (2) onto pressure regulator valve (3).

(2) Install insulation (1) and wrap with insulation tape.

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-22. CHECK VALVE REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Equipment Conditions:
Refrigeration system discharged (para. 5-7) and purged (para. 5-8).
Left side condenser door open.

a. Removal. Purge (para. 5-8) and de-braze (para. 5-9) two fittings (1) from check valve (2).

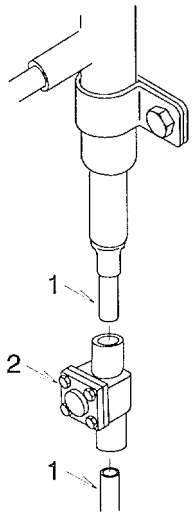


Figure 5-18. Check Valve

b. Installation. Purge (para. 5-8) and braze (para. 5-9) two fittings (1) onto check valve (2).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-23. METAL HOSE ASSEMBLY (DISCHARGE) REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Equipment Conditions:

Refrigeration system discharged (para. 5-7) and purged (para. 5-8).
Right side condenser door open.

a. Removal. Purge (para. 5-8) and de-braze (para. 5-9) two fittings (1) and remove metal hose assembly (2).

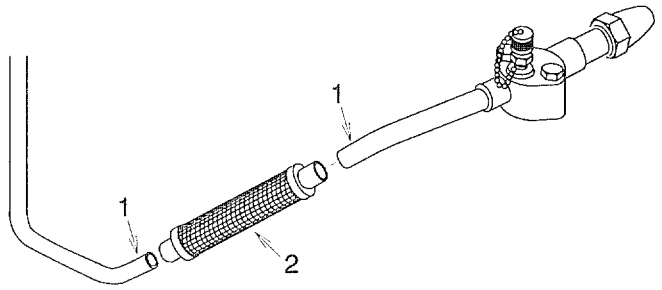


Figure 5-19. Metal Hose Assembly

b. Installation. Install metal hose assembly (2), purge (para. 5-8) and braze (para. 5-9) two fittings (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Replace dehydrator (para. 5-14).
Leak check (para. 5-10), evacuate (para. 5-11), and charge (para. 5-12) the refrigeration system.

5-24. METAL HOSE ASSEMBLY (SUCTION) REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Insulation Tape
10, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Right side condenser door open.

a. Removal.

(1) Remove insulation (1) as necessary.

(2) Purge (para 5-8) and de-braze (para 5-9) two fittings (2) and remove metal hose assembly (3).

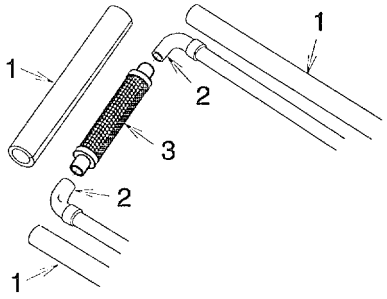


Figure 5-20. Metal Hose Assembly

b. Installation.

(1) Install metal hose assembly (3), purge (para 5-8) and braze (para 5-9) two fittings (2).

(2) Install insulation (1) and secure with insulation tape as necessary.

NOTE

FOLLOW-ON MAINTENANCE: Close right side condenser door. Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-25. STOP VALVE (LIQUID LINE) REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Self Locking Nuts (2)
12, Appendix G

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Left side condenser door open

a. Removal.

(1) Purge (para 5-8) and de-braze (para 5-9) two fittings (1) from stop valve (2).

(2) Remove two self locking nuts (3), bolts (4), and stop valve (2). Discard self locking nuts.

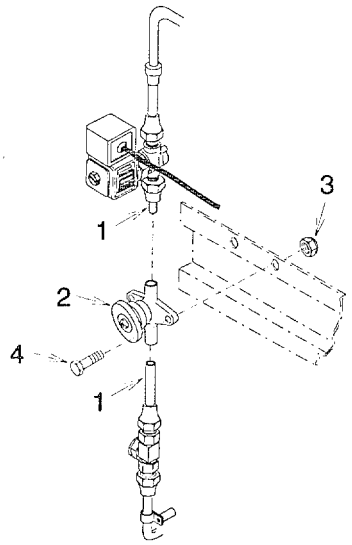


Figure 5-21. Stop Valve

b. Installation.

(1) Install stop valve (2), two bolts (4) and new self locking nuts (3).

(2) Purge (para 5-8) and braze (para 5-9) two fittings (1) onto stop valve (2).

NOTE

FOLLOW-ON MAINTENANCE: Close left side condenser door. Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-26. STOP VALVE (DEFROST LINE) REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Self Locking Nuts (2)
12, Appendix G

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Both front bottom doors open.

a. Removal.

(1) Purge (para 5-8) and de-braze (para 5-9) two fittings (1) from stop valve (2).

(2) Remove two self locking nuts (3), bolts (4), and stop valve (2). Discard self locking nuts.

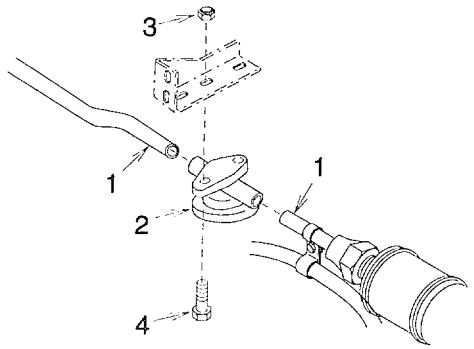


Figure 5-22. Stop Valve

b. Installation.

(1) Install stop valve (2), two bolts (4) and new self locking nuts (3).

(2) Purge (para 5-8) and braze (para 5-9) two fittings (1) onto stop valve (2).

NOTE

FOLLOW-ON MAINTENANCE: Close both front bottom doors. Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-27. SIGHT INDICATOR REPLACEMENT.

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

INITIAL SETUP:

Equipment Conditions:
Refrigeration system discharged (para 5-7).
Left side condenser door open.

a. Removal. Loosen two flare nuts (1) and remove sight indicator (2).

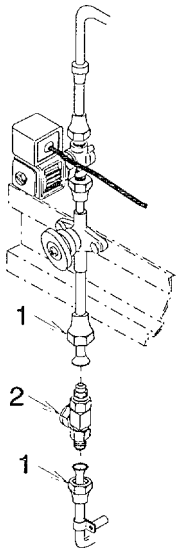


Figure 5-23. Sight Indicator

b. Installation. Install sight indicator (2), aligned facing the side door, and tighten two flare nuts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-28. SOLENOID VALVE L1 (LIQUID LINE) REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7).
Left side condenser door open.

a. Removal.

(1) Tag and disconnect wire leads (1).

NOTE

Solenoid coil mounting hardware is supplied with solenoid valve.

(2) Remove screw (2), lock washer (3), data plate (4), and solenoid coil (5).

NOTE

Note flow direction prior to removal.

(3) Loosen two flare nuts (6) and remove solenoid valve (7).

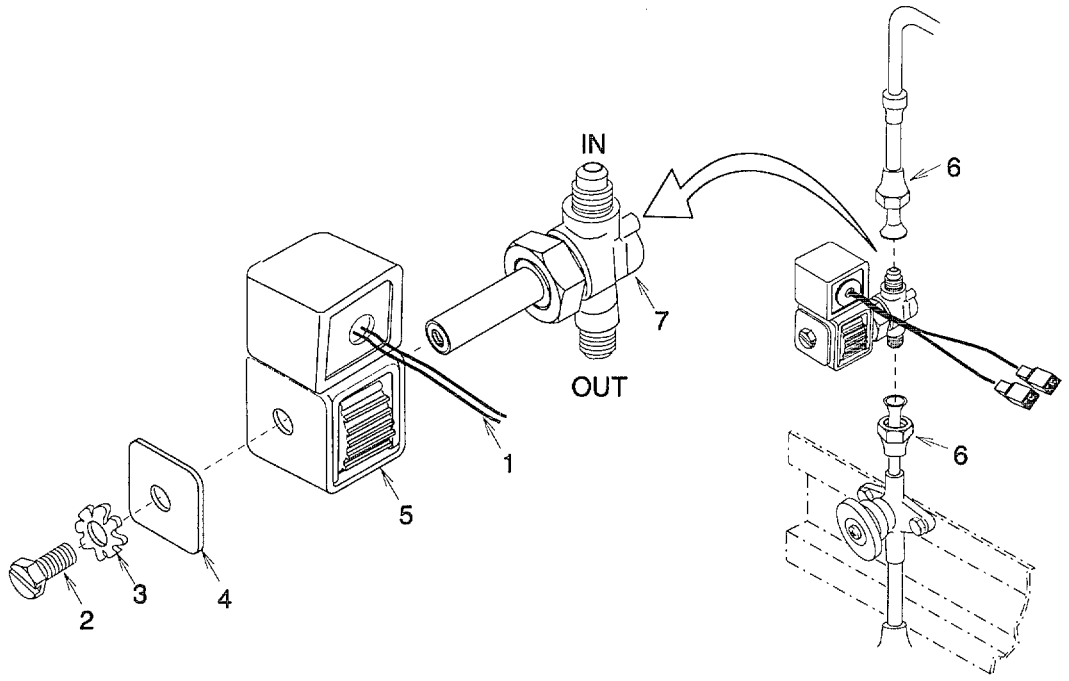


Figure 5-24. Solenoid Valve

b. Installation.

NOTE

Be sure to observe flow direction noted during removal.

(1) Install solenoid valve (7) and tighten two flare nuts (6).

(2) Install solenoid coil (5), data plate (4), lock washer (3), and screw (2).

(3) Using tags and wiring diagram (fig. 2-4), connect wire leads (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-29. SOLENOID VALVE L2 (DEFROST LINE) REPLACEMENT.

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

INITIAL SETUP:

Materials /Parts:

Marker tags (2)
7, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7).
Left side condenser door open.

a. Removal.

(1) Tag and disconnect wire leads (1).

NOTE

Solenoid coil mounting hardware is supplied with solenoid valve.

(2) Remove screw (2), lock washer (3), data plate (4), and solenoid coil (5).

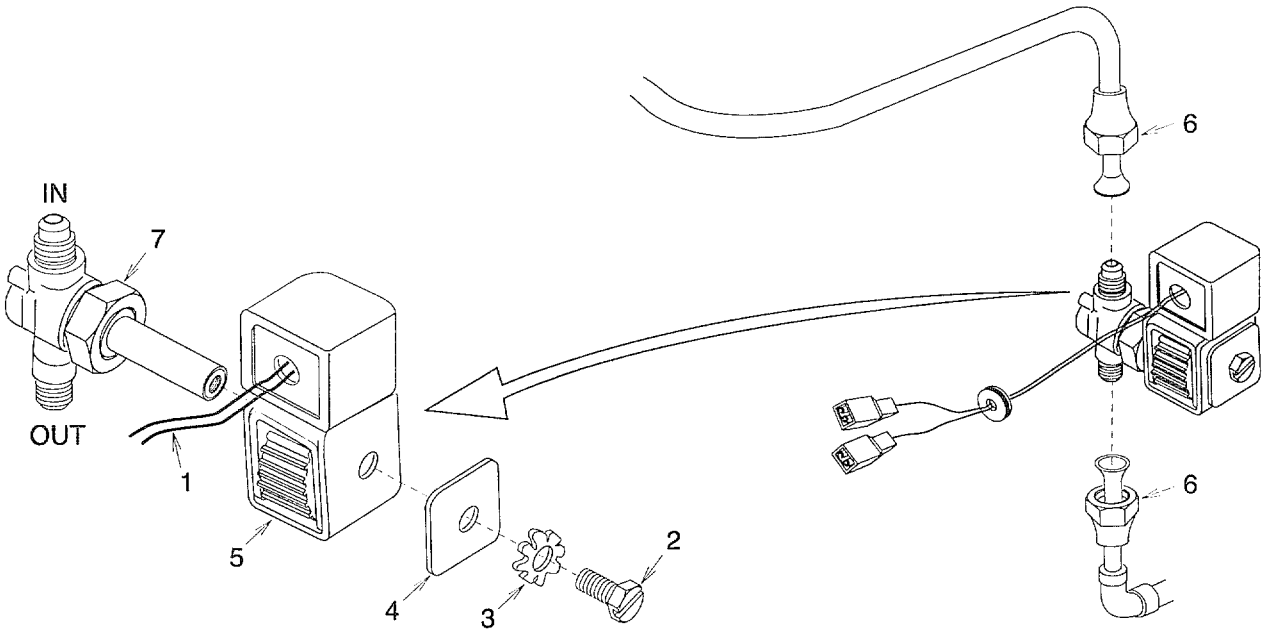


Figure 5-25. Solenoid Valve

NOTE

Note flow direction prior to removal.

(3) Loosen two flare nuts (6) and remove solenoid valve (7).

b. Installation.

NOTE

Be sure to observe flow direction noted during removal.

(1) Install solenoid valve (7) and tighten two flare nuts (6).

(2) Install solenoid coil (5), data plate (4), lock washer (3), and screw (2).

(3) Using tags and wiring diagram (fig. 2-4), connect wire leads (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-30. ISOLATION VALVES REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Teflon Seals(2)
47, Appendix G

Equipment Conditions:

Refrigeration system discharged (para 5-7).
Both side condenser doors open.

a. Removal.

(1) Remove two isolation valve caps (1).

(2) Loosen two flare nuts (2) and move copper tubing (3) away from isolation valve (4) being careful not to bend or kink tubing.

NOTE

Isolation valve flare connections are different sizes. Note location prior to removal.

(3) Remove two isolation valves (4) and teflon seals (5). Discard teflon seals.

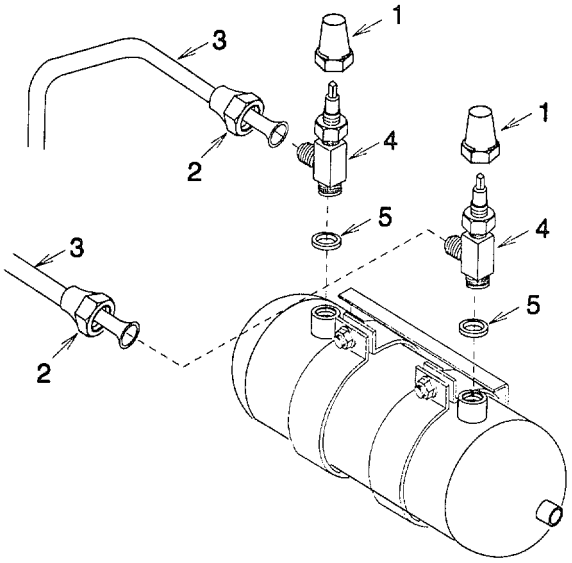


Figure 5-26. Isolation Valves

b. Installation.

NOTE

Isolation valve flare connections are different sizes. Be sure to observe location noted during removal.

(1) Install two new teflon seals (5) and isolation valves (4). Be sure valves are turned toward copper tubing (3) and tighten to between 50 and 60 ft lb (68 Nm and 82 Nm).

(2) Aline copper tubing (3) and connect two flare nuts (2) to isolation valves (4).

(3) Be sure two isolation valves (4) are open and install two isolation valve caps (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close both side condenser doors.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-31. ACCUMULATOR REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (4)
1, Appendix G
Self Locking Nut
17, Appendix G
Insulation Tape
10, Appendix E
Lubricating Oil
21, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Left side condenser door open.

General Safety Instructions:

WARNING

Compressor lubricating oil used in this refrigeration system is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

a. Removal.

(1) Remove insulation (1) as necessary.

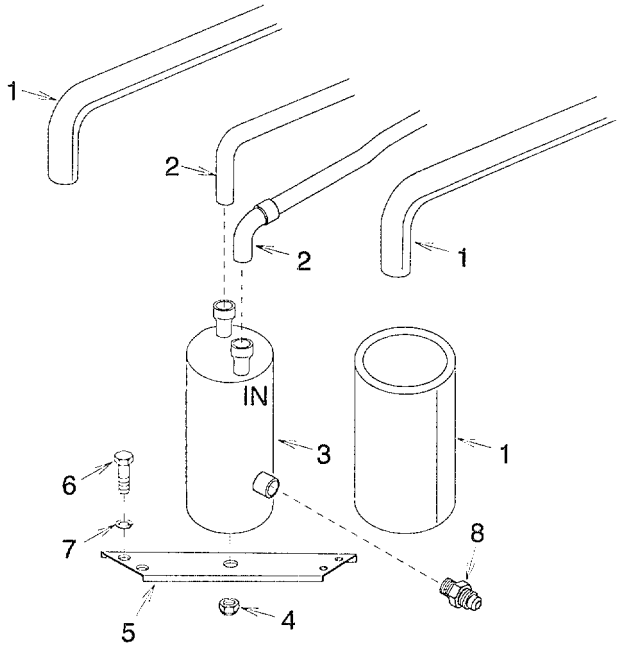


Figure 5-27. Accumulator

(2) Purge (para 5-8) and de-braze (para 5-9) two fittings (2) from accumulator (3).

(3) Remove self locking nut (4) and accumulator (3). Discard self locking nut.

(4 If channel (5) is to be replaced, remove four bolts (6), lock washers (7), and channel. Discard lock washers.

(5) Remove fusible plug (8).

b. Installation.

(1) Lightly coat fusible plug (8) copper gasket with lubricating oil.

(2) Install fusible plug (8) and tighten to between 25 and 30 ft-lb. (34 and 41 Nm).

(3) If channel (5) was removed, install channel, four new lock washers (7), and bolts (6).

(4) Install accumulator (3) and new self locking nut (4).

(5) Purge (para 5-8) and braze (para 5-9) two fittings (2) onto accumulator (3).

(6) Install insulation (1) and secure with insulation tape as necessary.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-32. TUBING AND FITTINGS TESTING, REPAIR, AND REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:
Silicone RTV
20, Appendix E
Tie Down Strap(s) (As Required)
24, Appendix E

Equipment Conditions:

Doors, panels, guards open/removed as necessary.

General Safety Instructions:

WARNING

High voltage and rotating parts are used in the refrigeration unit. Personal injury can result if power is connected.

a. Testing. Leak test the tubing and fittings (para 5-10).

NOTE

Repair consists of replacing damaged or leaking tubing and/or fittings.

b. Removal.

(1) Discharge (para 5-7) the refrigeration system.

(2) If a flare connection was leaking, loosen flare nut and cut the damaged flare off the tubing end.

(3) Purge (para 5-8) and de-braze (para 5-9) any fitting or tubing that was leaking or was too short to flare.

(4) Remove any silicone RTV remaining in evaporator frame grommets.

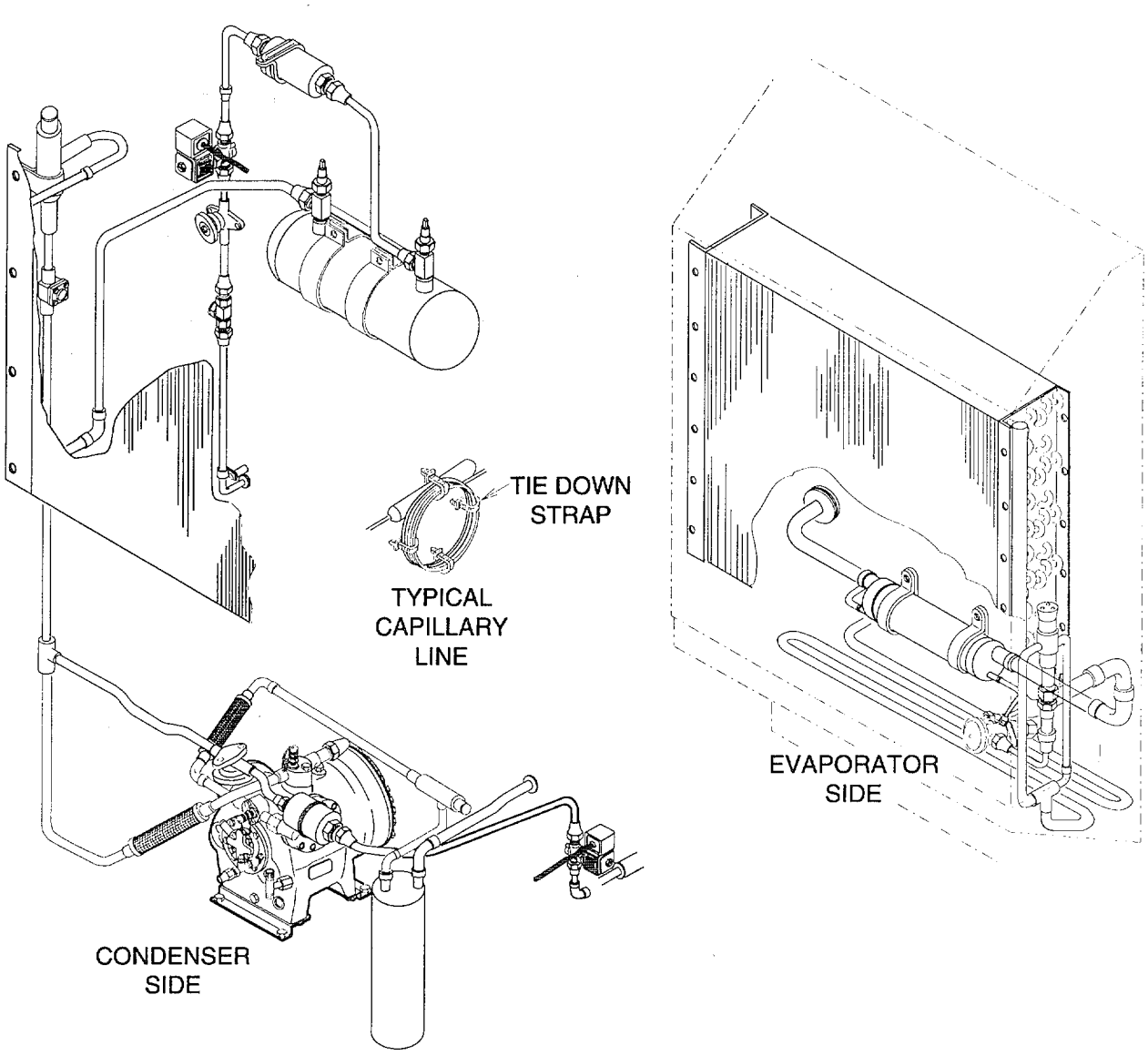


Figure 5-28. Tubing And Fittings

5-32. TUBING AND FITTINGS TESTING, REPAIR, AND REPLACEMENT. - Continued

c. Installation.

(1) Purge (para 5-8) and braze (para 5-9) any loose tubing or fitting connections.

(2) Flare tubing end where damaged flare was removed or on end of new tube if it was too short to flare.

(3) Replace dehydrator (para 5-14).

(4) Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(5) Apply silicone RTV into evaporator frame grommets to seal evaporator enclosure.

(6) Secure capillary lines to pipe illustrated using tie down strap(s) as necessary.

NOTE

FOLLOW-ON MAINTENANCE:
Close/install any doors, panels, guards removed.

5-33. HEAT EXCHANGER REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (2)
1, Appendix G
Insulation Tape
10, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Evaporator coil guard removed (para 4-18).

a. Removal.

(1) Remove insulation (1) as necessary.

(2) Purge (para 5-8) and de-braze (para 5-9) four fittings (2) from heat exchanger (3).

NOTE

Note flow direction prior to removal.

(3) Remove two bolts (4), lock washers (5), heat exchanger (3), and clamps (6). Discard lock washers.

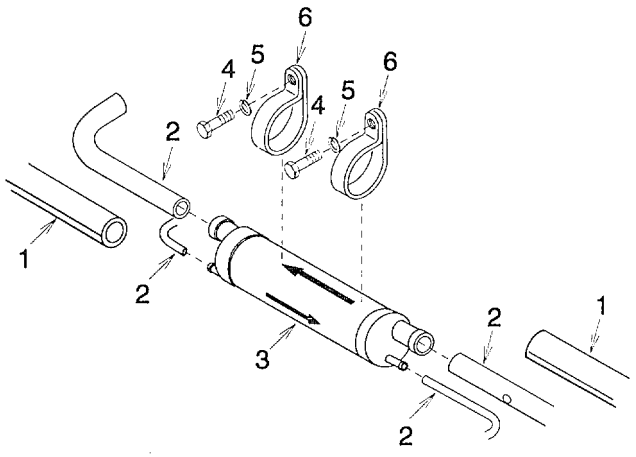


Figure 5-29. Heat Exchanger

5-33. HEAT EXCHANGER REPLACEMENT. - Continued

b. Installation.

NOTE

Be sure to observe flow direction noted during removal.

(1) Install two clamps (6) onto heat exchanger (3), then install heat exchanger, two new lock washers (5), and bolts (4).

(2) Purge (para 5-8) and braze (para 5-9) four fittings (2) onto heat exchanger (3).

(3) Install insulation (1) and secure with insulation tape.

NOTE

FOLLOW-ON MAINTENANCE:
Install evaporator coil guard (para 4-18).
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-34. EXPANSION VALVE REPLACEMENT.

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

INITIAL SETUP:

Equipment Conditions:

Refrigeration system discharged (para 5-7).
Defrost temperature switch removed (para 4-30).

a. Removal.

(1) Slip expansion valve sensing bulb (1) out from under two clamps (2).

(2) Loosen three flare nuts (3) and remove expansion valve (4).

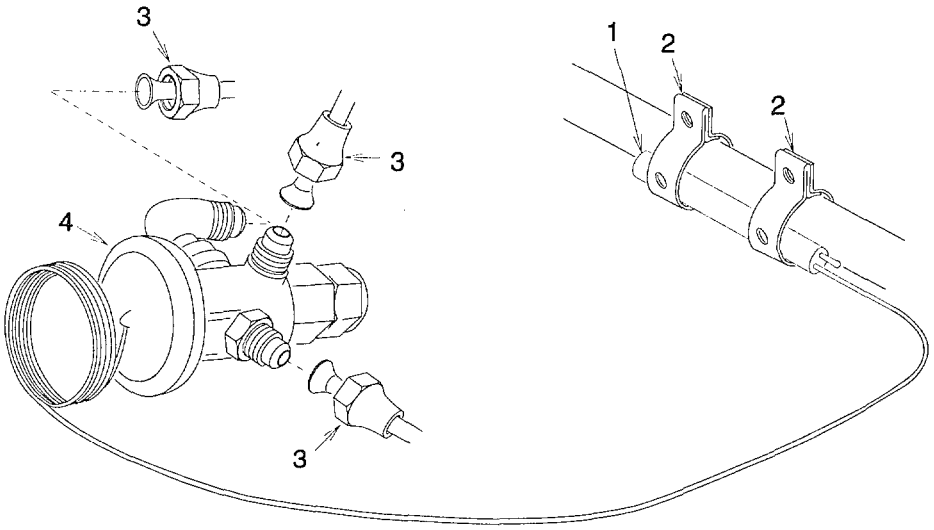


Figure 5-30. Expansion Valve

b. Installation.

(1) Install expansion valve (4) and tighten three flare nuts (3).

(2) Slip expansion valve sensing bulb (1) under two clamps (2).

NOTE

FOLLOW-ON MAINTENANCE:
Install defrost temperature switch (para 4-30).
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-35. EVAPORATOR COIL REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (12)
1, Appendix G

Equipment Conditions:

Refrigeration system discharged (para 5-7) and purged (para 5-8).
Evaporator coil guard removed (para 4-18).

a. Removal.

(1) Loosen flare nut (1) and move copper tubing (2) to the side being careful not to kink or bend tubing.

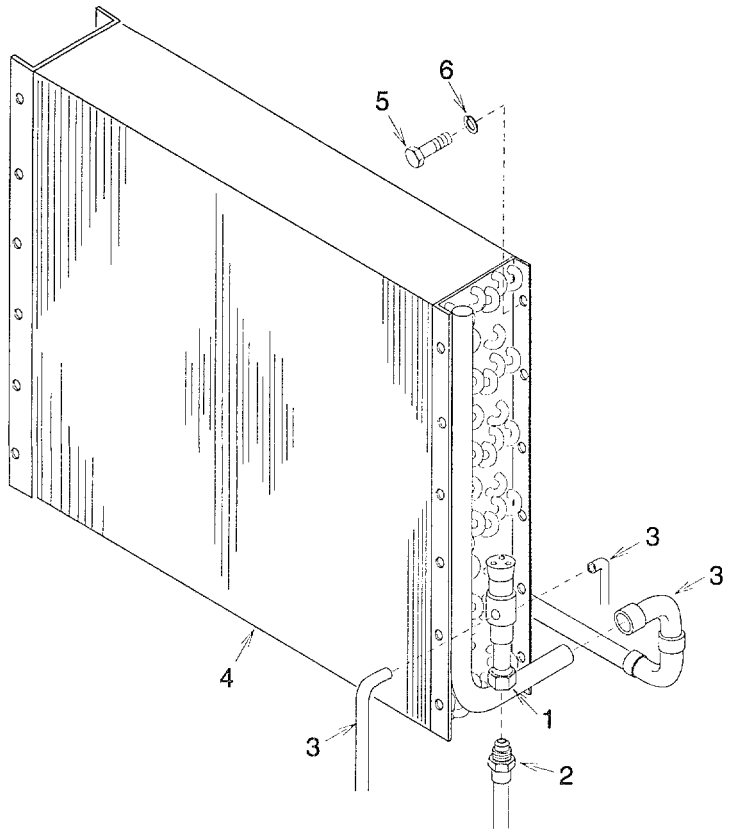


Figure 5-31. Evaporator Coil

(2) Purge (para 5-8) and de-braze (para 5-9) three fittings (3) from evaporator coil (4).

WARNING

Coil fins are sharp and can cut hands or fingers. Wear gloves to prevent personal injury when handling coil.

(3) Remove 12 bolts (5), lock washers (6), and evaporator coil (4). Discard lock washers.

b. Installation.

WARNING

Coil fins are sharp and can cut hands or fingers.
Wear gloves to prevent personal injury when handling coil.

(1) Install evaporator coil (4), 12 new lock washers (6), and bolts (5).

(2) Purge (para 5-8) and braze (para 5-9) three fittings (3) onto evaporator coil (4).

(3) Aline copper tubing (2) and tighten flare nut (1).

NOTE

FOLLOW-ON MAINTENANCE:
Install evaporator coil guard (para 4-18).
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-36. DIFFERENTIAL OIL PRESSURE SWITCH S5 REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Marker tags (4)
7, Appendix E

Tie Down Straps (2)
24, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7).
Left side condenser door open.

a. Removal.

(1) Loosen screw (1) and remove cover (2).

NOTE

Terminal hardware is supplied with oil pressure switch.

(2) Tag wire leads (3). Remove three screws (4) and pull leads out of differential oil pressure switch (5).

(3) Remove two tie down straps (6).

(4) Tag capillary tubes (7) and loosen two flare nuts (8). Move capillary tubes to the side being careful not to kink or bend tubing.

(5) Remove two screws (9) and differential oil pressure switch (5). Remove grommet (10).

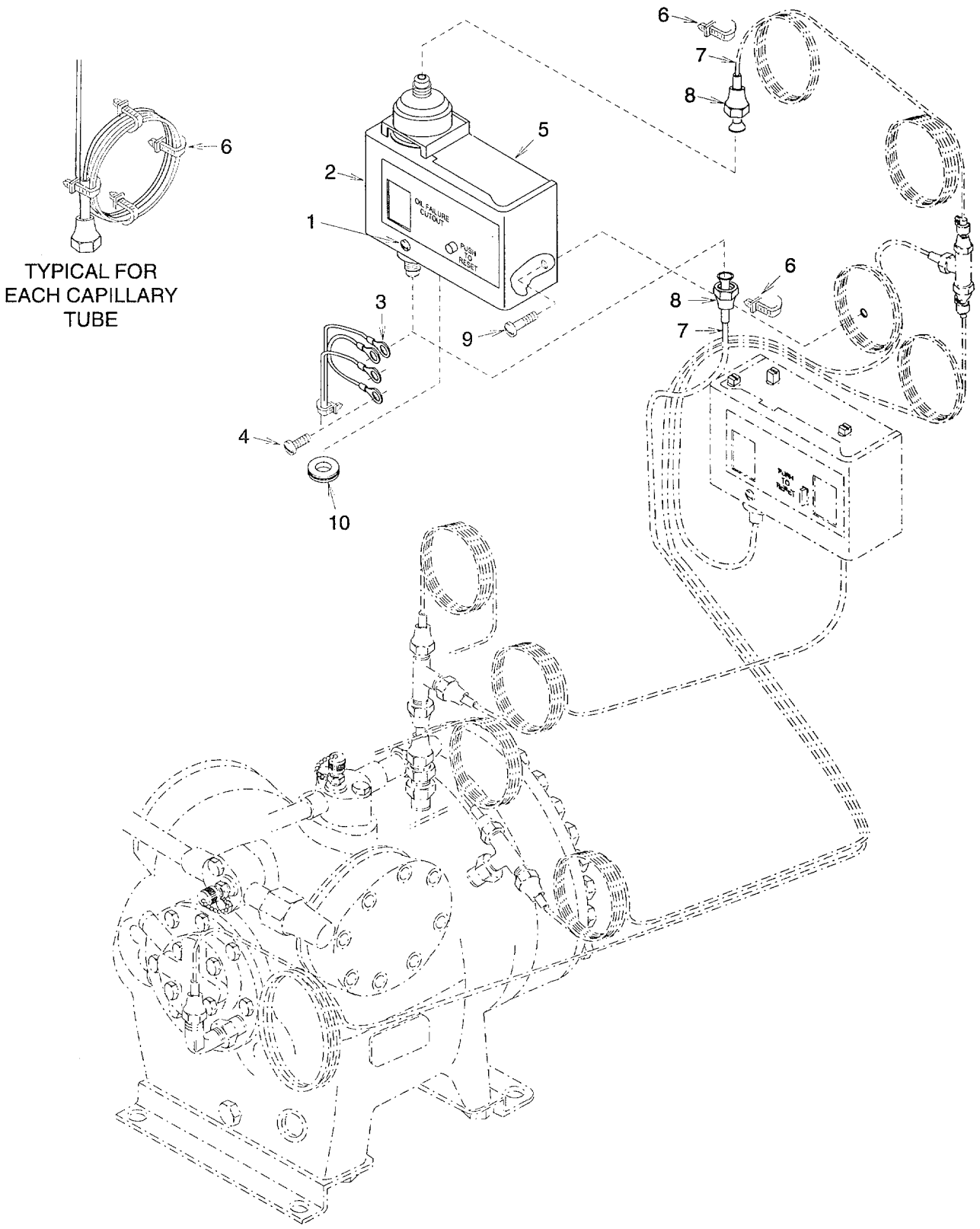


Figure 5-32. Differential Oil Pressure Switch

5-36. DIFFERENTIAL OIL PRESSURE SWITCH S5 REPLACEMENT. - Continued

b. Installation.

(1) Loosen screw (1) and remove cover (2) from new differential oil pressure switch (5).

(2) Install grommet (10) into bottom of differential oil pressure switch (5).

(3) Install differential oil pressure switch (5) and two screws (9).

(4) Using tags on old differential oil pressure switch (5) for reference, align capillary tubes (7) and tighten two flare nuts (8). Secure each capillary tube with tie down strap (6) as shown.

(5) Push leads (3) into differential oil pressure switch (5) and using tags and wiring diagram (fig. 2-4), install wire leads and three screws (4). Remove tags.

(6) Install cover (2) and tighten screw (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close right side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-37. DUAL PRESSURE CONTROL SWITCH S4 REPLACEMENT.

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

INITIAL SETUP:

Materials/Parts:

Lock Washers (2)
1, Appendix G
Marker tags (4)
7, Appendix E
Tie Down Straps (2)
24, Appendix E

Equipment Conditions:

Refrigeration system discharged (para 5-7).

Right side condenser door open.

a. Removal.

(1) Loosen screw (1) and remove cover (2).

(2) Tag wire leads (3). Remove two screws (4) and pull leads out of dual pressure control switch (5).

(3) Remove two bolts (6), lock washers (7), and clamps (8). Discard lock washers.

(4) Remove two tie down straps (9).

(5) Tag each capillary tube (10) and loosen two flare nuts (11).

(6) Remove two screws (12) and dual pressure control switch (5). Remove grommet (13).

5-40. DUAL PRESSURE CONTROL SWITCH 54 REPLACEMENT. - Continued

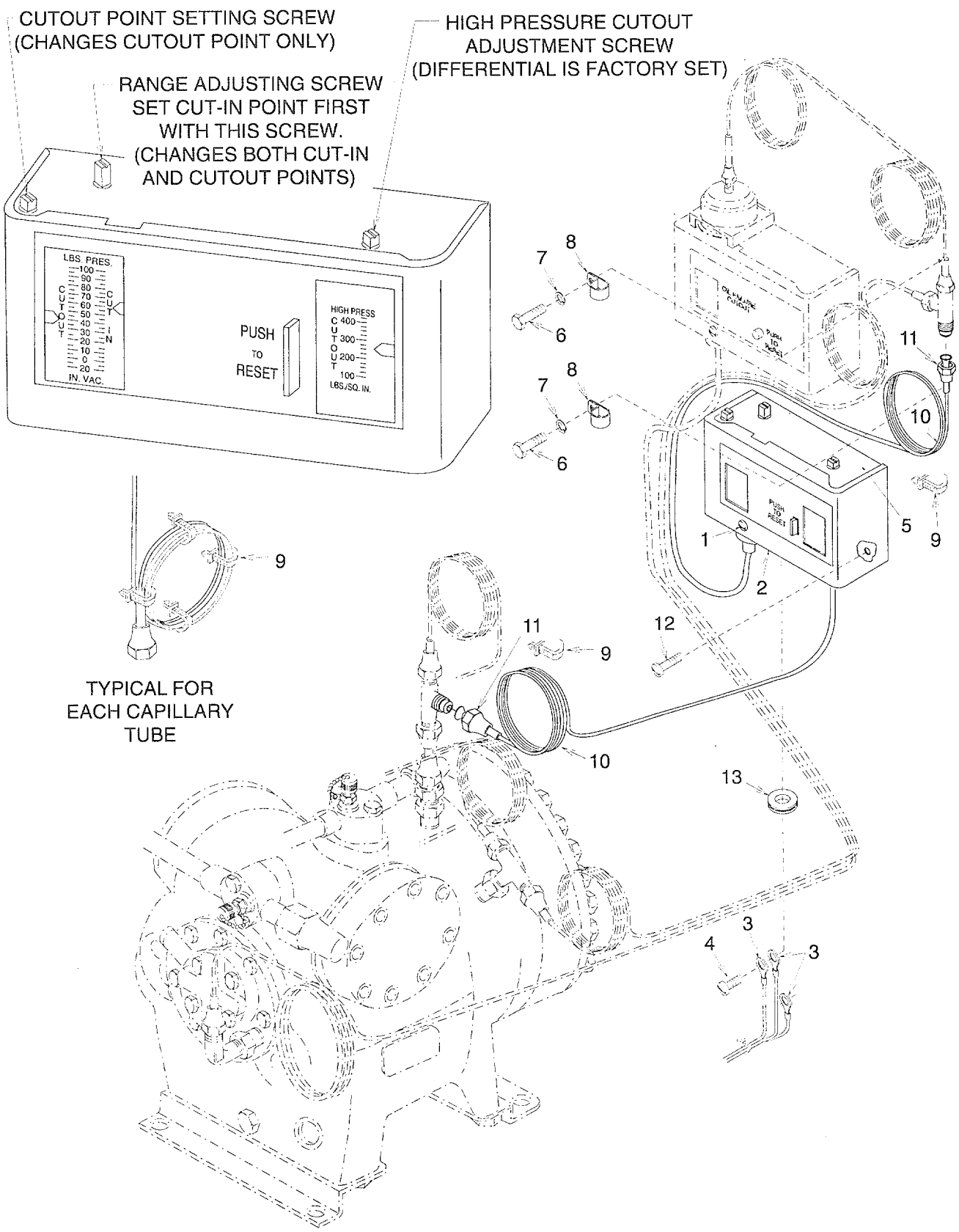


Figure 5-33. Dual Pressure Control Switch

b. Installation.

(1) Loosen screw (1) and remove cover (2) from new dual pressure control switch (5).

(2) Install grommet (13) into bottom of dual pressure control switch (5).

(3) Install dual pressure control switch (5) and two screws (12).

(4) Using tags on old dual pressure control switch (5) for reference, neatly route new capillary tubing to tees and carefully coil excess tubing as necessary.

(5) Aline each capillary tube (10) and tighten two flare nuts (11).

(6) Install clamp (8) around each capillary tube (10). Install new lock washer (7) and bolt (6).

(7) Secure each capillary tube (10) with tie down strap (9) as shown.

(8) Push wire leads (3) into dual pressure control switch (5). Using tags and wiring diagram (fig. 2-4), install wire leads and two screws (4). Remove tags.

(9) Install cover (2) and tighten screw (1).

(10) Adjust HIGH PRESSURE CUTOUT to 305, low pressure CUT IN to 0, and low pressure CUTOUT to 15 IN. VAC.

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Replace dehydrator (para 5-14).
Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

5-38. COMPRESSOR B1 TESTING, SERVICE, REPAIR, AND REPLACEMENT.

This task covers: a. Testing b. Service c. Repair d. Removal e. installation

INITIAL SETUP:

Materials/Parts:

Lock Washers (4)
9, Appendix G
Lock Washers (8)
23, Appendix G
Discharge Valves (2)
24, Appendix G
Suction Valves (2)
26, Appendix G
Gaskets (2)
19, Appendix G
Gaskets (2)
20, Appendix G
Gasket
2, Appendix G
Gasket
18, Appendix G
Gasket
21, Appendix G
Gasket
27, Appendix G

Materials/Parts:

Marker tags (4)
7, Appendix E
Anti-Seize Tape
22, Appendix E
Compressor Lubricating Oil
21, Appendix E
Insulation Tape
10, Appendix E

Equipment Conditions:

Both front bottom doors open.
Both side condenser doors open.

General Safety Instructions:

WARNING

Compressor lubricating oil used in this refrigeration system is caustic. Wear gloves and a face protector or safety glasses in any situation where skin or eye contact is possible. If oil does contact skin, wash with soap and water.

a. Testing.

(1) Remove compressor V-belts (para 4-38).

(2) Discharge the refrigeration system (para 5-7).

(3) Remove two bolts (1). Pull service valve (2) away from compressor (3) being careful not to bend or kink tubing (4). Remove service valve gasket (5) and suction screen (6). Discard gasket.

WARNING

Dangerous pressure can remain trapped in compressor cylinder head. Removal of cylinder head screws prior to relieving pressure can result in personal injury.

NOTE

The following procedures apply to both pairs of cylinders.

(4) Loosen but do not remove eight screws (7). If cylinder head (8) is not loose, tap with lightweight hammer to loosen.

NOTE

Valve plate, suction valves, position springs, and dowel pins may come off when removing cylinder head.

(5) Remove eight screws (7), cylinder head (8), and cylinder head gasket (9). Discard cylinder head gasket.

(6) Remove four screws (10), lock washers (11), two discharge valve stops (12), and discharge valves (13). Discard lock washers and discharge valves.

(7) Install two screws (10), without lock washers (11), into the outermost discharge valves (13) mounting holes to act as jackscrews to release valve plate (14).

(8) Remove valve plate (14), valve plate gasket (15) two suction valves (16), position springs (17), and four dowel pins (18). Discard valve plate gasket and suction valves.

(9) Examine compressor (3) cylinder walls for any scoring or excessive wear indicated by a groove at top of piston (19) travel. Replace compressor if scored or excessively worn.

(10) Press on top of highest piston (19). When pushed down, the piston should have some resistance and the other piston should move. Repeat for other piston when at highest point. If either piston was loose or did not cause the other one to move, replace compressor.

(11) If no failure was indicated, remove any gasket material from all machined gasket surfaces and install four dowel pins (18), two position springs (17) contacting on the ends and bowed out in the middle, new suction valves (16), new valve plate gasket (15), and valve plate (14).

(12) Check that suction valves (16) do not bind on valve plate gasket (15) by gently pushing on suction valve through intake hole in valve plate (14). Adjust valve plate gasket as necessary to prevent suction valve binding.

(13) Install two new discharge valves (13), discharge valve stops (12), four new lock washers (11), screws (10), new cylinder head gasket (9), cylinder head (8), and eight screws (7). Torque screws to between 40 and 55 - lb (54 and 75 Nm).

(14) Install suction screen (6). Carefully align service valve (2) being careful not to bend or kink tubing (4). Install new service valve gasket (5) and two bolts (1). Torque bolts to between 15 and 25 ft-lb (20 and 34 Nm).

5-38. COMPRESSOR B1 TESTING, SERVICE. REPAIR, AND REPLACEMENT. - Continued

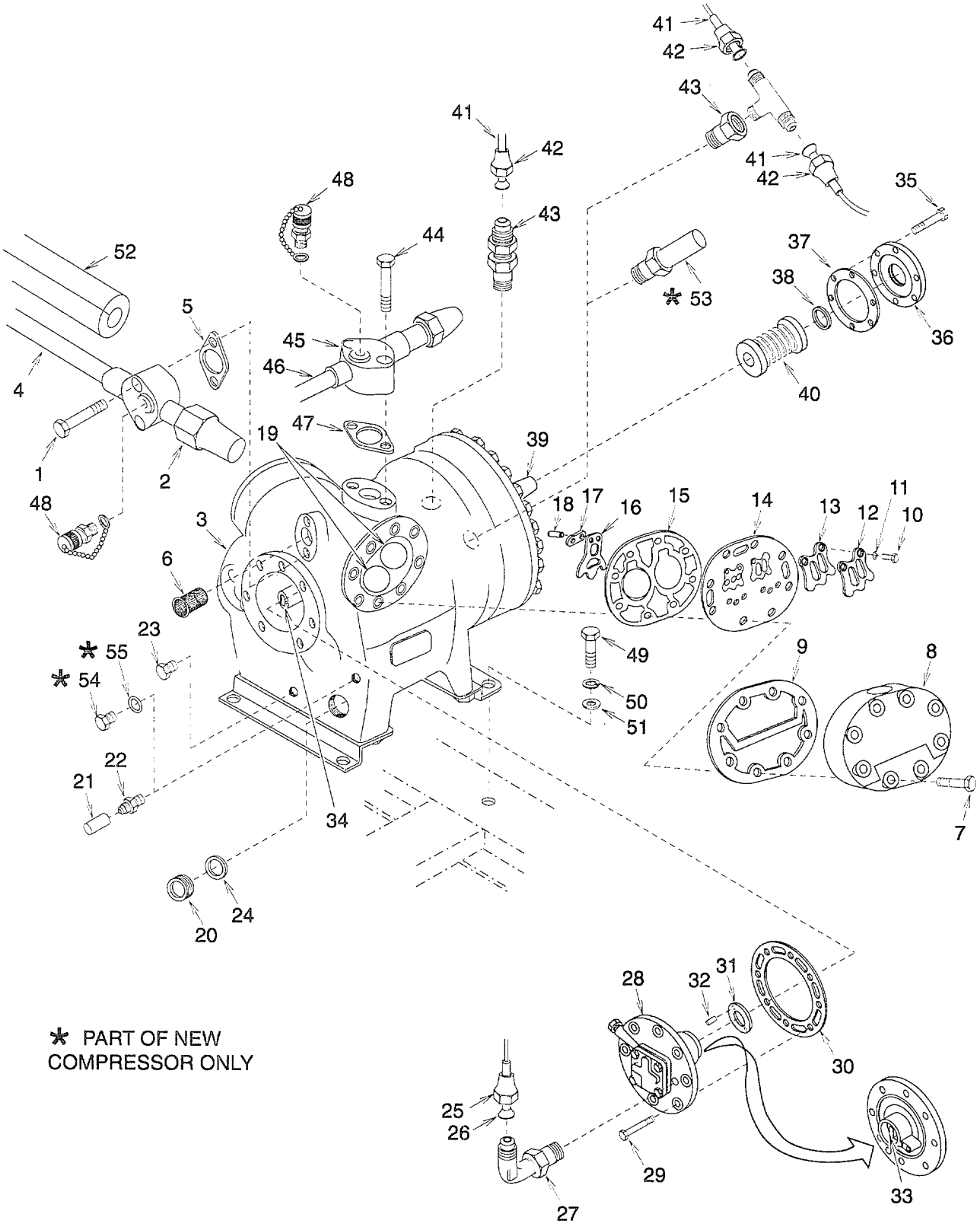


Figure 5-34. Compressor

(15) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(16) Install and adjust compressor V-belts (para 4-38).

b. Service. Check compressor lubricating oil level at sight glass (20). Level should be between 1/8 and 1/2 way up sight glass. Add or remove oil as necessary.

(1) Discharge the refrigerant system (para 5-7).

(2) Add Oil.

(a) Remove cap (21).

(b) Add oil as necessary through schrader valve (22).

(c) Install cap (21).

(3) Remove Oil.

(a) Place drain pan under drain plug (23).

(b) Remove drain plug (23) and allow oil to drain as necessary.

(c) Install drain plug (23). Contact your local environmental officer for guidance on how to properly dispose of compressor oil in accordance with local regulation.

(4) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

c. Repair. Repair is limited to replacement of damaged components.

(1) Valve Plate Assembly.

(a) Discharge the refrigeration system (para 5-7).

(b) Remove two bolts (1). Pull service valve (2) away from compressor (3) being careful not to bend or kink tubing (4). Remove service valve gasket (5) and suction screen (6). Discard gasket.

WARNING

Dangerous pressure can remain trapped in compressor cylinder head. Removal of cylinder head screws prior to relieving pressure can result in personal injury.

NOTE

The following procedures apply to both pairs of cylinders.

(c) Loosen but do not remove eight screws (7). If cylinder head (8) is not loose, tap with lightweight hammer to loosen.

5-38. COMPRESSOR B1 TESTING, SERVICE, REPAIR. AND REPLACEMENT. - Continued

NOTE

Valve plate, suction valves, position springs, and dowel pins may come off when removing cylinder head.

(d) Remove eight screws (7), cylinder head (8), and cylinder head gasket (9). Discard cylinder head gasket.

(e) Remove four screws (10), lock washers (11), two discharge valve stops (12), and discharge valves (13). Discard lock washers, discharge valve stops, and discharge valves.

(f) Install two screws (10), without lock washers (11), into the outermost discharge valves (13) mounting holes to act as jackscrews to release valve plate (14).

(g) Remove valve plate (14), valve plate gasket (15) two suction valves (16), position springs (17), and four dowel pins (18). Discard valve plate, valve plate gasket, suction valves, and position springs.

(h) Remove any gasket material from all machined gasket surfaces and install four dowel pins (18), two new position springs (17) contacting on the ends and bowed out in the middle, new suction valves (16), new valve plate gasket (15), and new valve plate (14).

(I) Check that suction valves (16) do not bind on valve plate gasket (15) by gently pushing on suction valve through intake hole in valve plate (14). Adjust valve plate gasket as necessary to prevent suction valve binding.

(j) Install two new discharge valves (13), new discharge valve stops (12), four new lock washers (11), new screws (10), new cylinder head gasket (9), cylinder head (8), and eight screws (7). Torque screws to between 40 and 55 ft-lb (54 and 75 Nm).

(k) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(2) Sight Glass.

(a) Discharge the refrigeration system (para 5-7).

(b) Remove sight glass (20) and gasket (24). Discard gasket.

(c) Remove any gasket material from all machined gasket surfaces. Install new gasket (24) and sight glass (20). Torque sight glass to between 35 and 50 ft-lb (48 and 68 Nm).

(d) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(3) Oil Pump.

(a) Discharge the refrigeration system (para 5-7).

(b) Loosen flare nut (25) and carefully pull tube (26) away being careful not to bend or kink tube.

(c) Remove adapter (27).

(d) Note position of oil pump (28) and remove eight bolts (29), oil pump, gasket (30), thrust washer (31), and two pins (32). Discard gasket.

(e) Remove any gasket material from all machined gasket surfaces.

(f) Rotate oil pump coupling (33) to align with slot in compressor shaft (34). Install two pins (32), thrust washer (31), new gasket (30), oil pump (28) positioned as noted during removal, and eight bolts (29). Torque bolts to between 6 and 10 ft-lb (8 and 14 Nm).

(g) Wrap anti-seize tape around adapter (27) threads and install adapter.

(h) Align tube (26) being careful not to bend or kink tube. Tighten flare nut (25).

(i) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(4) Shaft Seal.

CAUTION

- Carbon seals are fragile and must be handled with care to prevent damage.
- Do not touch sealing surfaces of carbon seals with fingers. Acids in the skin will damage seal.

(a) Discharge the refrigeration system (para 5-7).

(b) Remove compressor pulley (para 4-41).

(c) Remove six bolts (35), seal plate (36), gasket (37), and carbon ring (38) being careful not to touch carbon sealing surfaces with fingers. Discard gasket, retain carbon ring and seal plate for use during assembly.

(d) Tap crankshaft (39) using lightweight hammer to loosen shaft seal (40).

(e) Using two long screwdrivers, remove shaft seal (40) by carefully prying it out. Discard shaft seal.

(f) Remove new carbon ring (38) from new shaft seal (40) being careful not to touch carbon sealing surfaces with fingers.

(g) Apply a small amount of lubricating oil onto shaft seal (40) neoprene bellows where it contacts the crankshaft (39). Slide shaft seal onto crankshaft until it just starts to grip shaft being careful not to touch carbon sealing surfaces with fingers.

CAUTION

Carbon ring notches must be aligned with seal plate tabs when installed to prevent damaged.

(h) Install old carbon ring (38) into old seal plate (36). Be sure notches in carbon ring align with tabs in seal plate. Be careful not to touch carbon sealing surfaces with fingers. Install seal plate and two bolts (35) on opposing sides. Tighten bolts to seat new shaft seal (40).

5-38. COMPRESSOR B1 TESTING, SERVICE. REPAIR, AND REPLACEMENT. - Continued

(i) Remove two bolts (35), old seal plate (36), and old carbon ring (38). Be careful not to touch new shaft seal (40) carbon sealing surface with fingers. Discard seal plate and carbon ring.

(j) Apply a small amount of lubricating oil onto new carbon ring (38) and new seal plate (36) where it contacts carbon ring being careful not to touch carbon sealing surfaces with fingers.

CAUTION

Carbon ring notches must be aligned with seal plate tabs when installed to prevent damaged.

(k) Install new carbon ring (38) into new seal plate (36). Be sure notches in carbon ring align with tabs in seal plate. Be careful not to touch carbon sealing surfaces with fingers.

(l) Remove any gasket material from all machined gasket surfaces. Install new gasket (37), new seal plate (36) with new carbon ring (38), and six bolts (35). Be careful not to touch carbon sealing surfaces with fingers. Torque bolts to between 15 and 21 ft-lb (20 and 29 Nm).

(m) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

(n) Install compressor pulley (para 4-41). Install and adjust compressor V-belts (para 4-38).

d. Removal.

(1) Discharge the refrigeration system (para 5-7).

(2) Remove compressor pulley (para 4-41).

(3) Remove center post (para 4-15).

(4) Tag tube (26) and three tubes (41). Loosen flare nut (25) and three flare nuts (42). Carefully pull tubes away being careful not to bend or kink tubes.

(5) Remove adapter (27) and two adapters (43).

(6) Remove two bolts (1) and two bolts (44). Pull service valve (2) and service valve (45) away from compressor (3) being careful not to bend or kink tubing (4) or tubing (46). Remove service valve gasket (5) and service valve gasket (47) and suction screen (6). Discard gaskets.

(7) If damaged, remove two couplings (48).

(8) Remove four bolts (49), lock washers (50), and flat washers (51). Discard lock washers.

WARNING

Compressor weight exceeds 108 lb. (49 kg). Use appropriate lifting device to avoid personal injury.

(9) Remove compressor (3).

(10) If damaged, purge (para 5-8) and de-braze (para 5-9) service valve (2) and service valve (45) from tubing (4) and tubing (46). Remove insulation (52) as necessary. Remove two couplings (48), if attached.

e. Installation.

(1) Prepare New Compressor.

(a) Remove schrader valve (53).

(b) Remove plug (54) with o-ring (55) and discard.

(c) Wrap anti-seize tape around threaded end of schrader valve (53) and install where plug (54) was removed.

(2) If removed, install service valve (2) and service valve (45) onto tubing (4) and tubing (46) with mounting surfaces at right angles to each other, then purge (para 5-8) and braze (para 5-9) connections.

(3) If removed, wrap anti-seize tape around threaded end of two couplings (48) and install.

WARNING

Compressor weight exceeds 108 lb. (49 kg). Use appropriate lifting device to avoid personal injury.

(4) Install compressor (3) and align mounting holes.

(5) Install four flat washers (51), new lock washers (50), and bolts (49).

(6) Install suction screen (6). Carefully aline service valve (2) and service valve (45) being careful not to bend or kink tubing (4) and tubing (46). Install new service valve gasket (5), service valve gasket (47), two bolts (1) and two bolts (44). Torque bolts to between 15 and 25 ft-lb (20 and 34 Nm).

(7) Wrap anti-seize tape around threaded end of adapter (27) and two adapters (43). Install adapters.

(8) Aline tube (26) and three tubes (41) using tags as reference. Be careful not to bend or kink tubes. Tighten flare nut (25) and three flare nuts (42). Remove tags.

(9) Install compressor pulley (para 4-41). Install and adjust compressor V-belts (para 4-38).

(10) Install center post (para 4-15).

(11) Replace dehydrator (para 5-14). Leak check (para 5-10), evacuate (para 5-11), and charge (para 5-12) the refrigeration system.

NOTE

FOLLOW-ON MAINTENANCE:
Close both side condenser doors.
Close both front bottom doors.

5-39. NOZZLE TESTING AND REPLACEMENT

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

INITIAL SETUP

Tools:

Injector Test Bench
7, Section III, Appendix B
Injector Extractor
10, Section III, Appendix B
Mechanical Puller
11, Section III, Appendix B

Equipment Conditions:

Engine removed (para 5-46).
Fuel supply tube removed from nozzle (para 4-59).
Fuel return hose removed from nozzle (para 4-60).

Materials/Parts:

Wiping Rags
3, Appendix E
Washer(s) (As Required)
48, Appendix G
Washer(s) (As Required)
49, Appendix G

a. Removal.

NOTE

The following procedures apply to both nozzles. (1) Remove nut (1) and washer (2).

NOTE

The nozzle assembly uses special washers as spacers/seals. The washers are not re-usable and must be replaced with the same quantity and thickness washers during installation.

(2) Assemble injector extractor and mechanical puller, attach to nozzle assembly (3) and remove nozzle assembly with washer(s) (4) and brace (5). Note quantity and thickness of washers. Discard washers.

(3) If stud (6) is damaged, remove it.

b. Testing.

(1) Place the nozzle assembly (3) on the injector test bench and bypass the pressure gauge so it does not read injector test bench pressure.

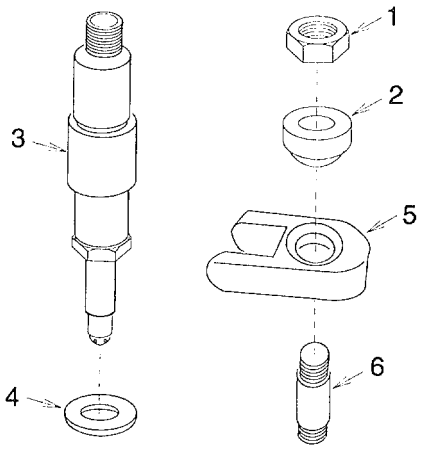


Figure 5-35. Nozzles

WARNING

- Before applying pressure to the nozzle tester, be sure that all connections are tight, and that the fittings are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

- Fuel from the spray orifices can penetrate clothing and skin causing serious personal injury. The nozzle tip should always be directed away from the operator. Enclosing the nozzle in a transparent cover is recommended. Place a clear, protective shield around spray zone to avoid possible personal injury from spray.

- If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

(2) Operate the injector test bench lever rapidly. The nozzle assembly (3) should chatter audibly and spray evenly.

(3) With pressure gage reading injector test bench pressure, press the lever slowly and steadily until fuel is sprayed from nozzle assembly (3). The pressure registered on the gauge should be 3,071 to 3,471 psi (21,190 to 23,950 kPa). If pressure is not met, replace nozzle.

(4) Slowly press injector test bench hand lever until the pressure gauge reads 2,986 psi (20,603 kPa). Hold at this pressure for 10 seconds. No diesel fuel should accumulates at the nozzle tip. If fuel is detected, replace nozzle.

(5) If no failure was indicated, install nozzle assembly (3).

5-39. NOZZLE SERVICING, TESTING AND REPLACEMENT. - Continued

c. Installation.

NOTE

The following procedures apply to both nozzles.

(1) If removed, install stud (6).

NOTE

- The nozzle assembly uses special washers as spacers/seals. The washers are not re-usable and must be replaced with the same quantity and thickness washers removed.
- The mounting brace is beveled to cup the bevel on the mating washer.

(2) Install new washer(s) (4) as noted during removal, nozzle (3), brace (5) with bevel up, washer (2) with bevel down, and nut (1). Torque nut to between 27 and 31 ft lb (37 and 42 Nm).

NOTE

FOLLOW-ON MAINTENANCE:
Install fuel supply tube onto nozzle (para 4-59).
Install fuel return hose onto nozzle (para 4-60).
Install engine (para 5-46).

5-40. INJECTION PUMP TESTING, REPLACEMENT, AND ADJUSTMENT.

This task covers: a. Testing b. Removal c. Installation d. Adjustment

INITIAL SETUP:

Tools:
Fuel Delivery Sight
8, Section III, Appendix B

Materials/Parts:
Wiping Rags
3, Appendix E
Gaskets (2)
42, Appendix G
Gasket
52, Appendix G
Gasket(s) (As Required)
36, Appendix G

Materials/Parts:

Gasket(s) (As Required)
50, Appendix G
Gasket(s) (As Required)
51, Appendix G
Washers (2)
31, Appendix G

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Testing.

(1) Remove two screws (1), flat washers (2), and cylinder casing (3).

(2) Remove three screws (4), cover (5), and gasket (6). Discard gasket.

CAUTION

Always use two wrenches when loosening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(3) Loosen two flare nuts (7) and remove fuel pipe (8).

(4) Remove three screws (9) and flat washers (10).

NOTE

The lower two cover screws use special sealing washers.

(5) Remove two screws (11) and washers (12). Discard washers.

(6) Remove nut (13), flat washer (14), cover (15), and gasket (16). Discard gasket.

(7) If stud (17) is damaged, remove it.

(8) Using a pressure gauge with a reading capacity of 8,532 psi (58,871 kPa) full scale, connect the pressure gauge to the M12 x 1.5 injection pump fitting (18).

(9) Set and secure the connecting rod (19) to the full open position (right).

5-40. INJECTION PUMP TESTING AND REPLACEMENT. - Continued

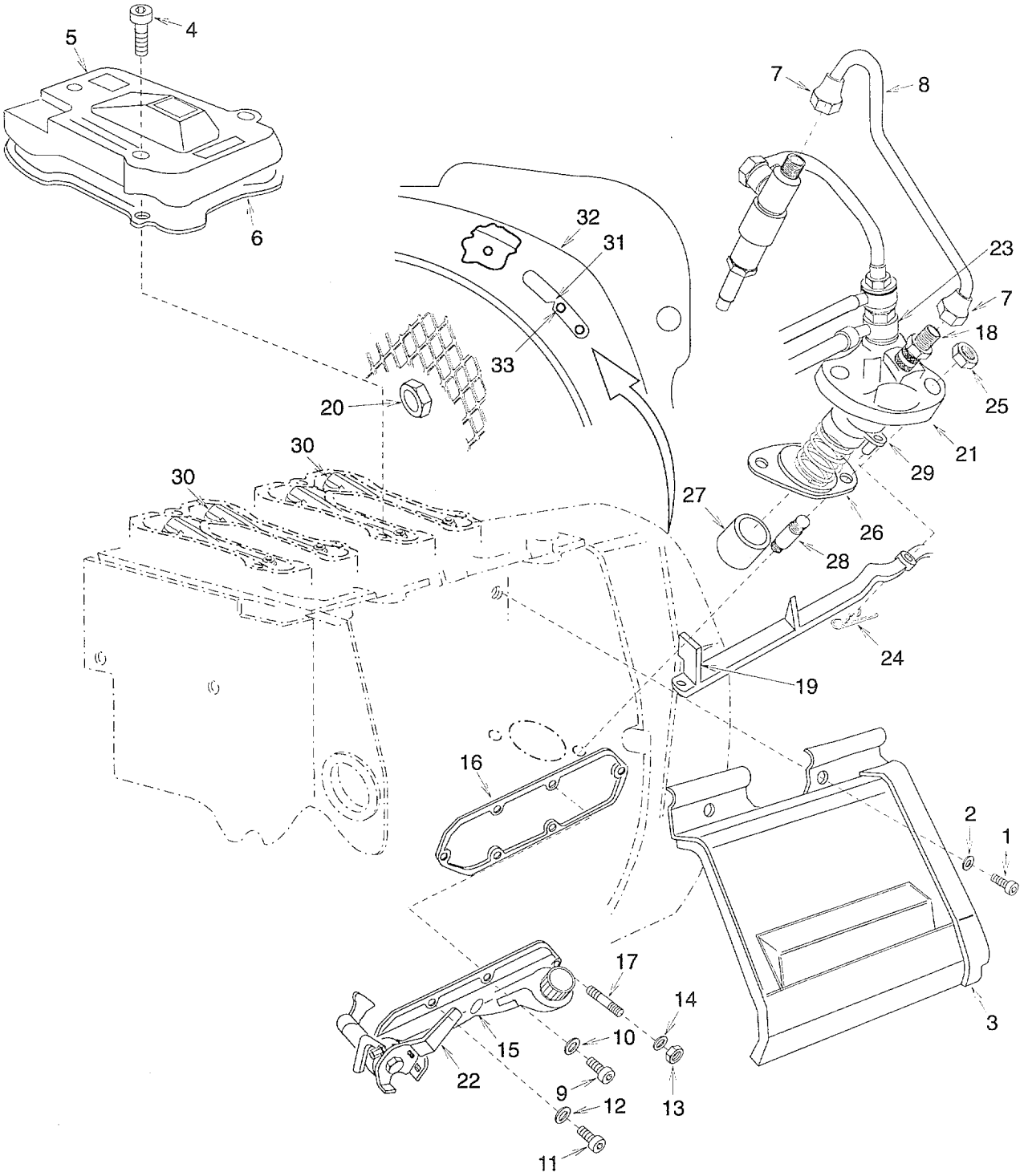


Figure 5-36. Fuel Injection Pumps

WARNING

Before applying pressure to the gauge, be sure that all connections are tight, and that the fittings are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

(10) Monitor the pressure gage reading and slowly turn the engine flywheel (20) clockwise. Note the maximum pressure indicated on the gage. If the pressure does not reach 4,266 psi (29,435 kPa) or above, the injection pump (21) must be replaced.

(11) Monitor the pressure gage reading and slowly turn the engine flywheel (20) clockwise. The reading on the gauge will show a progressive pressure increase to the maximum value noted in step (10) above, then will begin to drop suddenly. Stop turning the engine pulley at this point and monitor the gage reading as well as the time it takes the pressure to stop dropping. Note the final pressure reading, to establish the pressure drop, and the elapsed time.

(a) If the total pressure drop was greater than 50 psi (4906 kPa), replace the injection pump (20).

(b) If the drop occured in less than 7 seconds, replace the injection pump (20).

(c) If the pressure dropped suddenly as expected but continued to fall slowly, replace the injection pump (20).

CAUTION

Always use two wrenches when tightening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(12) If no failure was indicated, remove pressure gage and install fuel pipe (8). Tighten two flare nuts (7) to between 11 and 18 ft-lb (15 and 25 Nm).

(13) Release connecting rod (19).

(14) Position manual shut down lever (22) fully to the right (clockwise).

(15) If stud (17) was removed, install it.

(16) Install new gasket (16), cover (15), flat washer (14), and nut (13).

(17) Install three flat washers (10) and screws (9).

NOTE

The lower two cover screws use special sealing washers.

(18) Install two new washers (12) and screws (11).

(19) Install new gasket (6), cover (5) and three screws (4).

(20) Install cylinder casing (3), two flat washers (2), and screws (1).

5-40. INJECTION PUMP TESTING AND REPLACEMENT. - Continued

b. Removal.

(1) Remove two screws (1), flat washers (2), and cylinder casing (3).

(2) Remove three screws (4), cover (5) and gasket (6). Discard gasket.

CAUTION

Always use two wrenches when loosening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(3) Loosen two flare nuts (7) and remove fuel pipe (8).

(4) Remove fuel filter to injection pumps hose assembly (23) (para 4-59).

(5) Remove three screws (9) and flat washers (10).

NOTE

The lower two cover screws use special sealing washers.

(6) Remove two screws (11) and washers (12). Discard washers.

(7) Remove nut (13), flat washer (14), cover (15), and gasket (16). Discard gasket.

(8) If stud (17) is damaged, remove it.

(9) Remove clip (24).

NOTE

The injection pump uses special gaskets as shims/seals and are not re-usable.
The quantity and thickness of gaskets determines the timing of the injection pump.

(10) Remove two nuts (25), injection pump (21), and gasket(s) (26). Note quantity and thickness of gasket(s). Discard gasket(s).

NOTE

The injection pump tappet can remain in the engine.

(11) If tappet (27) is attached to injection pump (21) spring, remove it.

(12) Remove stud(s) (28) if damaged.

c. Installation.

(1) If removed, install stud(s) (28).

NOTE

The injection pump uses special gaskets as shims/seals and are not re-usable.
The quantity and thickness of gaskets determines the timing of the injection pump.

(2) Install tappet (27) if removed, new gasket(s) (26) as noted during removal, and injection pump (21) being careful to align lever arm (29) with hole in connecting rod (19). Install two nuts (25) and clip (24). Torque nuts to between 27 and 31 ft lb (37 and 42 Nm).

(3) Install fuel filter to injection pumps hose assembly (23) (para 4-59).

NOTE

The intake rocker arm will be in line with the intake manifold port.

(4) Place a rag over injection pump fitting (18). Slowly rotate engine flywheel (20) clockwise and observe the intake rocker arm (30) movement. The intake rocker arm will move down during an intake stroke and then begin to rise as the compression stroke begins. Stop rotating the engine flywheel at this point.

(5) Set and secure the connecting rod (19) to the full open position (right).

(6) Install the fuel delivery sight onto the injection pump fitting (18).

NOTE

It may be necessary to rotate the flywheel several turns in order
to get fuel to become visible in the fuel delivery sight.

(7) Slowly rotate engine flywheel (20) clockwise until the column of diesel fuel inside the fuel delivery sight starts to move. This indicates the start of static injection.

(8) The reference mark (31) on shroud (32) should match the static injection point (33) (middle dot) punched onto the flywheel (20).

NOTE

Each 0.003 inch (0.1 mm) gasket inserted beneath the injection pump
correspond to 1.380 of rotation on the flywheel.

(9) If the static injection point (33) is to the left (counterclockwise) side of reference mark (31), the timing is too advanced and the injection pump (21) must be removed and installed with additional gasket(s) (26).

(10) If the static injection point (33) is to the right (clockwise) side of reference mark (31), the timing is too retarded and the injection pump (21) must be removed and installed with fewer gasket(s) (26).

5-40. INJECTION PUMP TESTING AND REPLACEMENT. - Continued

(11) Release connecting rod (19).

(12) Position manual shut down lever (22) fully to the right (clockwise).

(13) If stud (17) was removed, install it.

(14) Install new gasket (16), cover (15), flat washer (14), and nut (13).

(15) Install three flat washers (10) and screws (9).

NOTE

The lower two cover screws use special sealing washers.

(16) Install two new washers (12) and screws (11).

CAUTION

Always use two wrenches when tightening the fuel pipe to prevent turning the nozzle or injection pump fitting.

(17) Install fuel pipe (8) and tighten two flare nuts (7). Torque flare nuts to between 11 and 18 ft-lb (15 and 25 Nm).

(18) Install new gasket (6), cover (5), and three screws (4).

(19) Install cylinder casing (3), two flat washers (2), and screws (1).

NOTE

FOLLOW-ON MAINTENANCE:
Connect battery (para 4-35) and put unit back into service.

5-41. FUEL PUMP REPLACEMENT.

This task covers:	a. Removal	b. Installation

INITIAL SETUP:

Materials/Parts:

Wiping Rags
3, Appendix E
Gasket(s) (As Required)
53, Appendix G
Gasket(s) (As Required)
22, Appendix G
Washers (4)
29 Appendix G

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Left side condenser door open.

a. Removal.

WARNING

Fuel pump may contain fuel. Injury to personnel can occur when removing. Appropriate actions should be taken to contain spills.

(1) Remove two unions (1), washers (2), eyes (3), and washers (4). Discard washers.

NOTE

The fuel pump uses special gaskets as shims/seals and are not re-usable.

(2) Remove two nuts (5), fuel pump (6), and gasket(s) (7). Note quantity and thickness of gasket(s). Discard gasket(s).

(3) Do not loose tappet (8).

(4) Remove stud(s) (9) if damaged.

b. Installation.

(1) If removed, install stud(s) (9).

(2) Push tappet (8) with finger and slowly rotate engine pulley (10) counterclockwise until tappet is at lowest point (farthest into the engine).

5-41. FUEL PUMP REPLACEMENT. - Continued

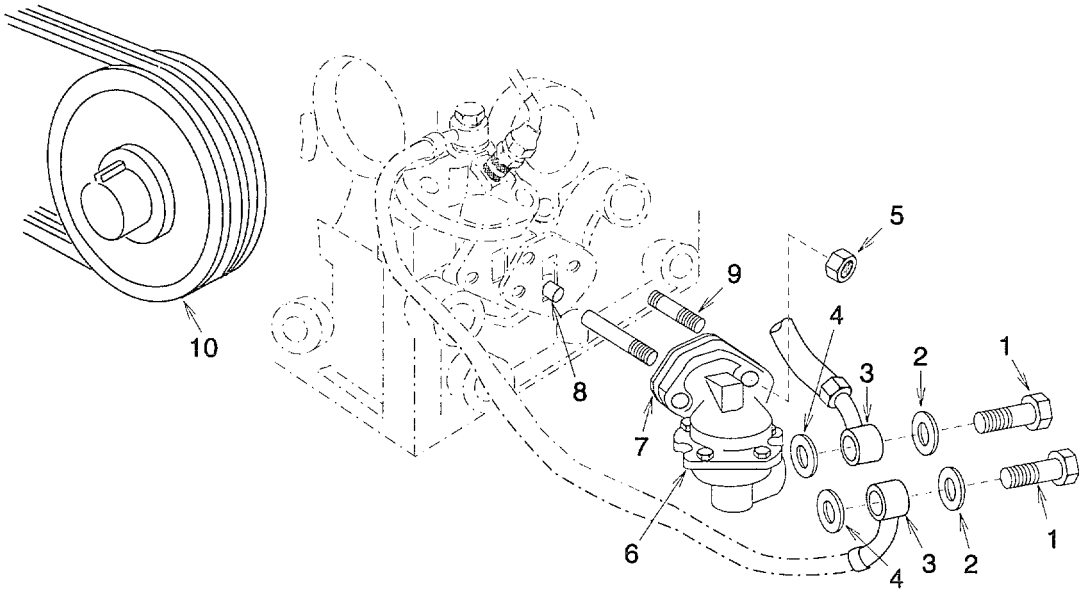


Figure 5-37. Fuel Pump

CAUTION

The fuel pump uses special gaskets as shims/seals. The quantity and thickness of gaskets is important to prevent damage to the fuel pump.

NOTE

Gasket thickness is either 0.008 in. (0.2 mm) or 0.040 in. (1.0 mm).

(3) Install new gasket(s) (7) as noted during removal. Measure the distance from the gasket(s) surface to the end of tappet (8). Increase or decrease gaskets to attain a distance between 0.045 in. and 0.067 in. (1.3 mm and 1.7 mm).

(4) Install fuel pump (6) and two nuts (5).

(5) Install two new washers (4), eyes (3), new washers (2), and unions (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.
Connect battery (para 4-35) and put unit back into service.

5-42. CYLINDER HEAD TESTING, REPLACEMENT, AND ADJUSTMENT.

This task covers:

a. Removal **b. Test** **c. Installation**

INITIAL SETUP:

Tools:
Valve Adjustment Tool
12, Section III, Appendix B
Materials / Parts:

Wiping Rag 3,
Appendix E
Diesel Fuel 27,
Appendix E
Gaskets (2) 38,
Appendix G
Gaskets (2) 41, Appendix G
Gaskets (2) 28,
Appendix G
Gaskets (2) 42,
Appendix G
O-Rings (8) 46,
Appendix G
Equipment Conditions:

Engine removed (para 5-46).
Fuel supply tube removed from nozzle (para 4-59).
Fuel return hose removed from nozzle (para 4-60).

a. Removal.

CAUTION

Removal of the cylinder heads when the engine is hot could result in damage or deformation of the cylinder heads.

(1) Remove two bolts (1), flat washers (2), and bracket (3).

(2) Remove two screws (4).

(3) Remove four screws (5), fiat washers (6), exhaust manifold (7) and two gaskets (8). Discard gaskets.

(4) Loosen and slide clamp (9) down hose (10) and remove hose from intake manifold (11).

(5) Remove four screws (12), flat washers (13), intake manifold (11) and two gaskets (14). Discard gaskets.

(6) Remove nut (15), flat washer (16), and hook (17). Note location of hook for installation.

(7) Using valve adjustment tool, loosen rocker adjusting screws (18).

(8) Remove nut (19) and flat washer (20). Note location of nut and flat washer for installation.

(9) Remove seven nuts (21) and flat washers (22).

5-42. CYLINDER HEAD TESTING, REPLACEMENT, AND ADJUSTMENT. - Continued

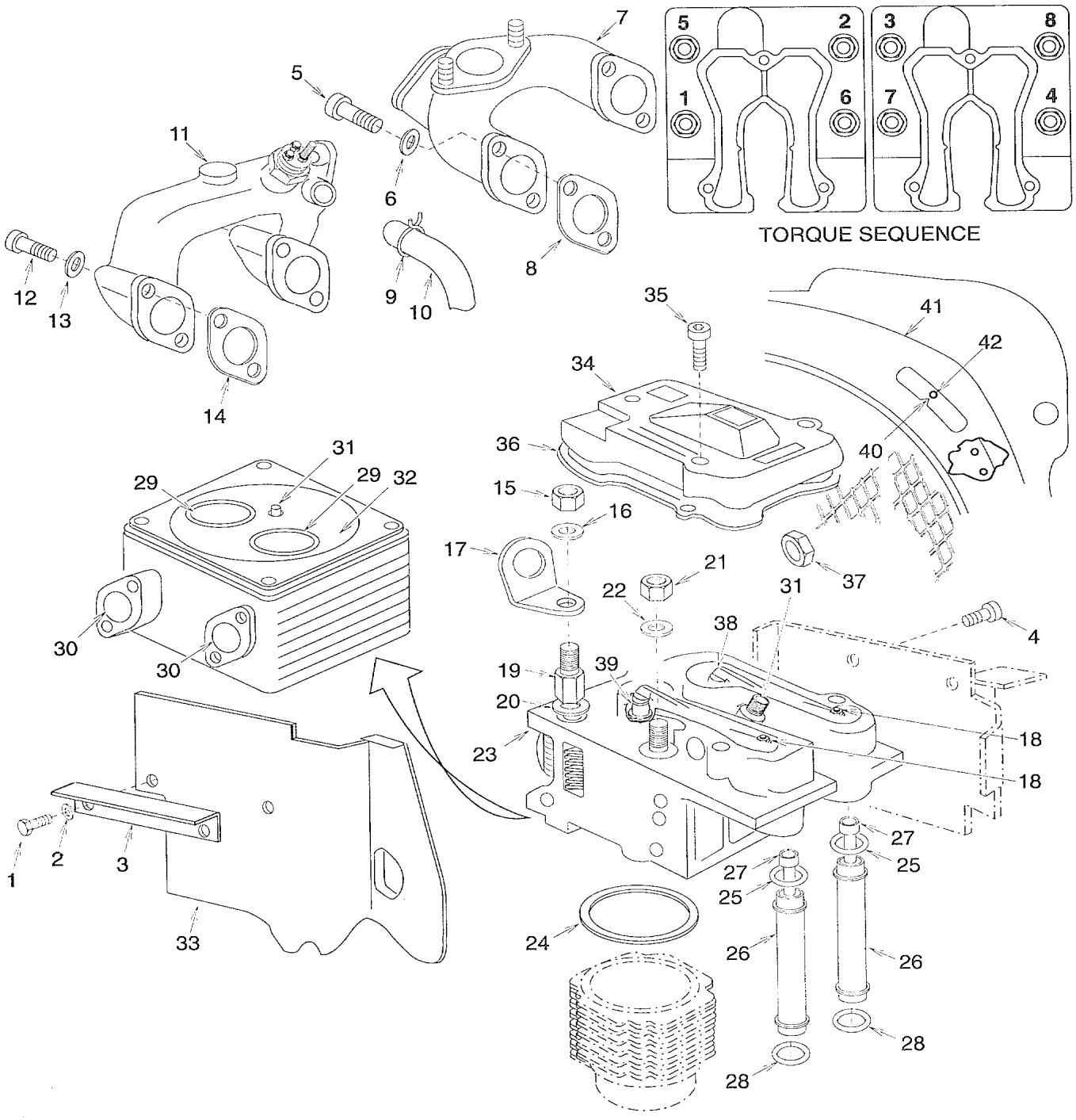


Figure 5-38. Cylinder Head

CAUTION

Cylinder head is made of soft metal. Screwdrivers or pry bars used between cylinder block and cylinder head to loosen it can cause damage.

(10) Carefully remove two cylinder heads (23), gaskets (24), four o-rings (25), protection pipes (26), rods (27), and o-rings (28). Discard gaskets and o-rings.

b. Testing.

(1) Remove two cylinder heads (23) per above procedures.

(2) Invert each cylinder head (23) and pour enough diesel fuel into each cylinder head to pool around valve seats (29).

(3) Examine each port (30) for three minutes. If fuel accumulates in a port, replace the cylinder head (23). Contact your local environmental officer for guidance on how to properly dispose of diesel fuel in accordance with local regulation.

(4) If no failure was indicated, install two cylinder heads (23).

(5) If a cylinder head (23) must be replaced, remove nozzle (31) (para 5-39) from it.

c. Installation.

(1) Clean carbon deposits from all mating surfaces. Check each cylinder head (23) for any cracks or other damage that would affect operation of the engine. If damaged, cylinder head must be replaced.

(2) Install nozzle (31) if removed (para 5-39).

(3) If nozzle (31) was removed, check the distance between nozzle tip and cylinder head face (32). The distance must be between 0.069 in. and 0.089 in. (1.75 mm and 2.25 mm). If the distance is not within this range, remove and install the nozzle (para 5-39) adding or removing washers as necessary between nozzle and cylinder head (23).

(4) Install four o-rings (28), protection pipes (26), rods (27), and o-rings (25).

(5) Install two new gaskets (24).

(6) Install two cylinder heads (23) being careful to align them onto protection pipes (26).

(7) Install flat washer (20), and nut (19) as noted during removal. Do not tighten nut.

(8) Install seven flat washers (22) and nuts (21). Do not tighten nuts.

NOTE

Intake manifold must be installed onto the cylinder heads to align them. The manifold mounting screws must not be tightened to the point of preventing movement/alignment of the cylinder heads.

(9) Install two new gaskets (14), intake manifold (11), four flat washers (13) and screws (12). Only tighten screws snugly, do not fully tighten.

5-42. CYLINDER HEAD TESTING, REPLACEMENT, AND ADJUSTMENT. - Continued

(10) Torque nut (19) and seven nuts (21) in increments of 13 ft LB (18 Nm) each in the order shown until 53 ft LB (83 Nm) is reached.

(11) Tighten four screws (12).

(12) Install hose (10) onto intake manifold (11) and secure with clamp (9).

(13) Install two new gaskets (8), exhaust manifold (7), four flat washers (6) and screws (5).

(14) Install hook (17) as noted during removal, flat washer (16), and nut (15).

(15) Install two screws (4).

(16) Align gate (33) mounting holes and install bracket (3), two flat washers (2) and bolts (1).

c. Adjustment.

CAUTION

Engine must be cooled down to ambient temperature before adjusting.

(1) If covers (34) are installed, remove six screws (35), two covers, and gaskets (36). Discard gaskets.

NOTE

Rocker arm to valve stem clearance must be adjusted for each cylinder independently with the piston at the compression top dead center position.

(2) Press on both rocker adjusting screws (18) while rotating engine flywheel (37) clockwise until both rocker arms (38) are up off valve stems (39) and the reference mark (40) on shroud (41) is aligned with the piston top dead center point (42) (third/last dot) punched onto the flywheel (37).

(3) Using valve adjustment tool, adjust each rocker arm (38) for a clearance to the valve stem (39) of 0.006 in. (0.15 mm).

(4) Repeat the above procedures for the second cylinder.

(5) Install two new gaskets (36), covers (34), and six screws (35).

NOTE

FOLLOW-ON MAINTENANCE:
Install engine (para 5-46).
Install fuel supply tube onto nozzle (para 4-59).
Install fuel return hose onto nozzle (para 4-60).

5-43. ENGINE OIL PUMP INSPECTION AND REPLACEMENT.

This task covers:

a. Removal **b. Inspection** **c. Installation**

INITIAL SETUP:

Materials/Parts:
O-ring
39, Appendix G

Equipment Conditions:
Left side condenser door open.

a. Removal.

(1) Remove one nut (1), two screws (2), cover (3) and o-ring (4). Discard o-ring.

(2) Remove internal rotor (5), external rotor (6).

(3) Remove stud (7) if damaged.

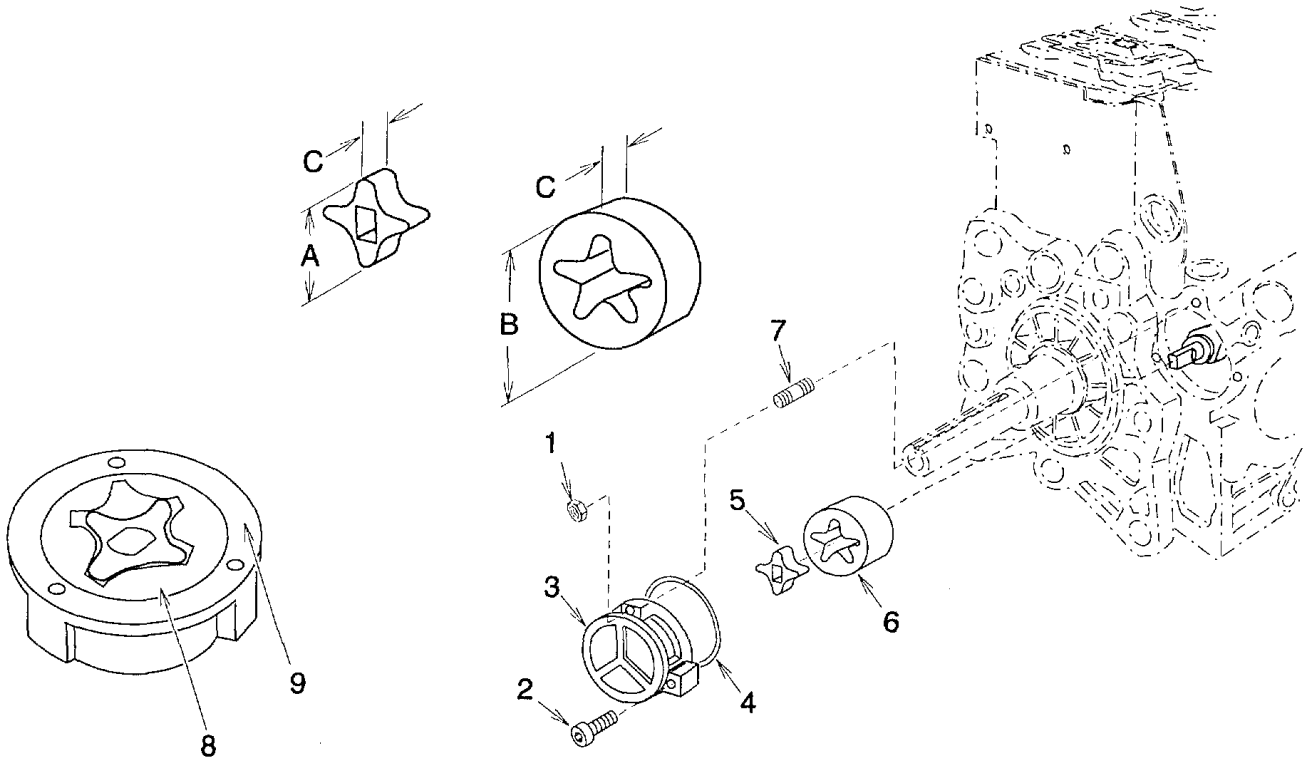


Figure 5-39. Engine Oil Pump

5-43. ENGINE OIL PUMP INSPECTION AND REPLACEMENT. - Continued

b. Inspection.

(1) Check rotor (5) and (6) wear by measuring them and checking against the following dimensions. Replace rotor if not between these dimensions.

A	1.167 in. and 1.172 in. (29.65 mm and 29.77 mm)
B	1.592 in. and 1.597 in. (40.45 mm and 40.576 mm)
C	0.704 in. and 0.706 in. (17.89 mm and 17.94 mm)

NOTE

The rotor must be within dimensions before checking cover wear.

(2) Check cover (3) wear by placing rotor (6) inside cover. Be sure o-ring (4) is not installed in cover and measure the distance between rotor surface (8) and cover edge (9). The dimension should be between 0.010 in. and 0.023 in. (0.27 mm and 0.60 mm). Replace the cover if not between these dimensions.

c. Installation.

(1) Install stud (7) if removed.

(2) Install rotor (5) with the bevel facing out.

(3) Install rotor (6) with bevel facing out.

(4) Install new o-ring (4) into cover (3).

(5) Install cover (3), two screws (2), and nut (1). Torque screws and nut to between 65 ft lb and 80 ft lb (88 Nm and 109 Nm).

NOTE

FOLLOW-ON MAINTENANCE:
Close left side condenser door.

5-44. FLYWHEEL REPLACEMENT.

This task covers:

a. Removal **b. Installation**

INITIAL SETUP:

Tools:	Equipment Conditions:
Flywheel puller	Left side condenser door open.
9, Appendix B	Left front bottom door open.

a. Removal.

(1) Remove two screws (1), flat washers (2), and cylinder casing (3).

(2) Remove two screws (4).

(3) Remove screw (5) and flat washer (6).

(4) Remove three screws (7), flat washers (8), and shroud (9).

(5) Remove nut (10), washer (11), and screen (12).

(6) Install flywheel puller onto flywheel (13).

CAUTION!

Striking the center of the engine shaft or end of flywheel puller T-handle against the engine shaft to loosen the flywheel will damage the engine.

(7) Turn flywheel puller T-handle clockwise to remove flywheel (13). Striking the T-handle to rotate in a clockwise direction can help loosen flywheel and will not cause damage.

(8) Remove flywheel (13) being careful not to lose key (14).

(9) Remove five screws (15) and alternator magnet (16).

5-44. FLYWHEEL REPLACEMENT. - Continued

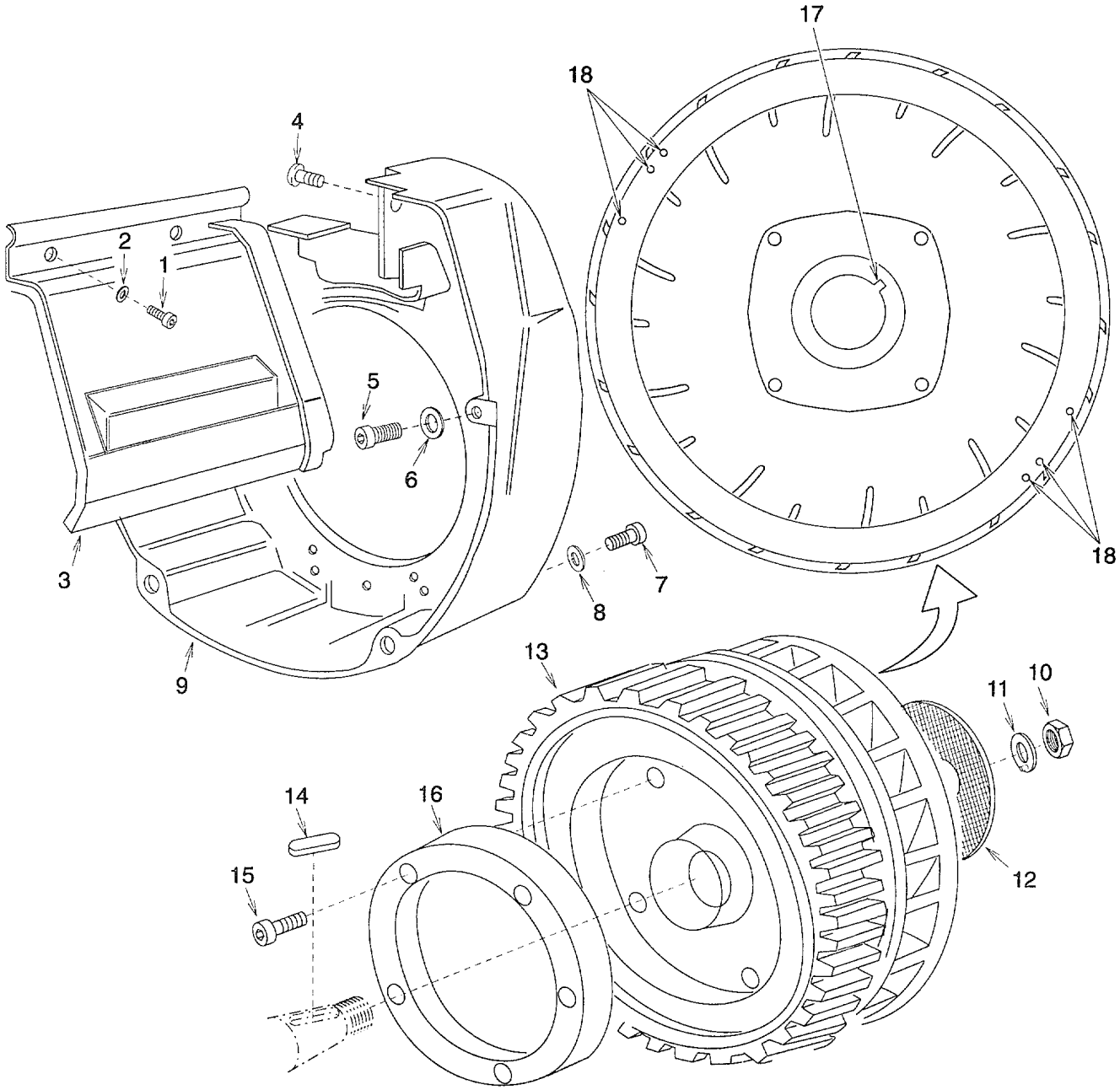


Figure 5-40. Flywheel

b. Installation.

CAUTION

A new flywheel must have two groupings of three punch marks in the same position as the old flywheel to allow proper timing of the engine.

NOTE

When installed, the indicator mark on the shroud will point to the furthest counterclockwise punch mark in a grouping of three when the corresponding piston is at top dead center of the compression stroke. The other two punch marks should then be at 170 and 22° respectively from vertical.

(1) Place the old flywheel (13) on top of new flywheel using the keyways (17) as reference to align them. Locate the two groupings of three punch marks (18) on the old flywheel and make punch marks on the new flywheel in as close to the same position as possible.

(2) Install alternator magnet (16) and five screws (15).

(3) Install key (14) and flywheel (13).

(4) Install screen (12), washer (11), and nut (10).

(5) Torque nut (10) to between 2393 ft LB and 2925 ft LB (3245 Nm and 3966 Nm).

(6) Install shroud (9), three flat washers (8), and screws (7).

(7) Install flat washer (6) and screw (5).

(8) Install two screws (4).

(9) Install cylinder casing (3), two flat washers (2), and screws (1).

NOTE

FOLLOW-ON MAINTENANCE:
Close left front bottom door.
Close left side condenser door.

5-45. ALTERNATOR REPLACEMENT.

This task covers:

a. Removal **b. Installation**

INITIAL SETUP:

Materials/Parts:

Marker tags (2)
7, Appendix E

Equipment Conditions:

Flywheel removed (para 5-44).

a. Removal.

(1) Remove five screws (1) and alternator magnet (2).

(2) Remove two screws (3), flat washers (4), and safety plates (5).

(3) Tag and disconnect wire leads (6) by removing two wire splices (7).

(4) Remove four screws (8) and alternator coil (9).

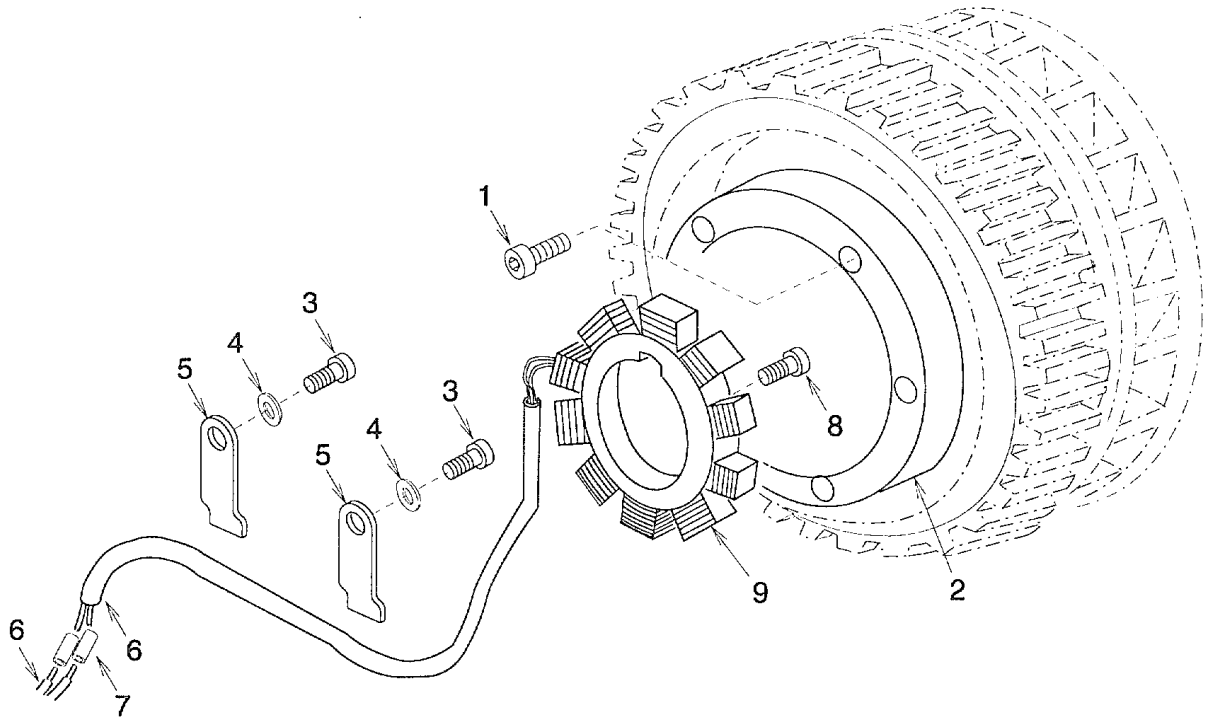


Figure 5-41. Alternator

b. Installation.

(1) Install alternator coil (9) and secure with four screws (8).

(2) Route alternator coil (9) leads as necessary and install two safety plates (5), flat washers (4), and screws (3).

(3) Using tags and wiring diagram (fig. 1-4), connect wire leads (6) with splices (7) (para 4-20). Remove tags.

(4) Install alternator magnet (2) and secure with five screws (1).

NOTE

FOLLOW-ON MAINTENANCE:
Install flywheel (para 5-44).

5-46. ENGINE REPLACEMENT.

This task covers:

a. Removal **b. Installation**

INITIAL SETUP:

Materials / Parts:
Lock Washers (4)
9, Appendix G
Wiping Rags
3, Appendix E
Marker tags (2)
7, Appendix E

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).
Condenser coil removed (para 5-19).
Front bottom doors open.
Muffler and exhaust adapter removed (para 4-50).
Air cleaner and adapter removed (para 4-49).

Equipment Conditions:
Starting motor wire leads disconnected (para 4-54).
Engine oil pressure switch wire lead disconnected (para 4-51).
Engine temperature switch wire lead disconnected (para 4-52).
Fuel solenoid wire leads disconnected (para 4-53).
Engine pulley removed (para 4-42).
Engine drain hose removed (para 4-61).
Injection pump to fuel filter hose assembly disconnected at fuel filter (para 4-59).
Fuel supply hoses disconnected from fuel pump (para 4-59).
Fuel return hose disconnected at hose connector (para 4-60).
Fuel filter and cover removed (para 4-55).

a. Removal.

(1) Tag and disconnect wire leads (1) by removing two wire splices (2).

(2) Remove four bolts (3), lock washers (4), and ground strap (5). Discard lock washers.

WARNING

Engine weight exceeds 110 LB (50 kg). Use appropriate lifting device to avoid personal injury.

(3) Using an appropriate lifting device, carefully remove engine (6).

b. Installation.

(1) Prepare New Engine. Certain components shipped with new engine must be removed prior to installation.

NOTE

Hoses may contain fuel. Appropriate actions should be taken to contain spills.

(a) Remove and discard protective cap (7) from fuel pump (8).

(b) Remove union (9), washer (10), eye (11), and washer (12) from fuel pump (8).

(c) Remove union (13), washer (14), eye (15), and washer (16) from fuel filter assembly (17).

(d) Place drain pan under fuel filter assembly (17). Remove nut (18), bolt (19), and spacer (20). Invert fuel filter assembly to drain fuel into drain pan. Retain fuel filter assembly for use as spare part.

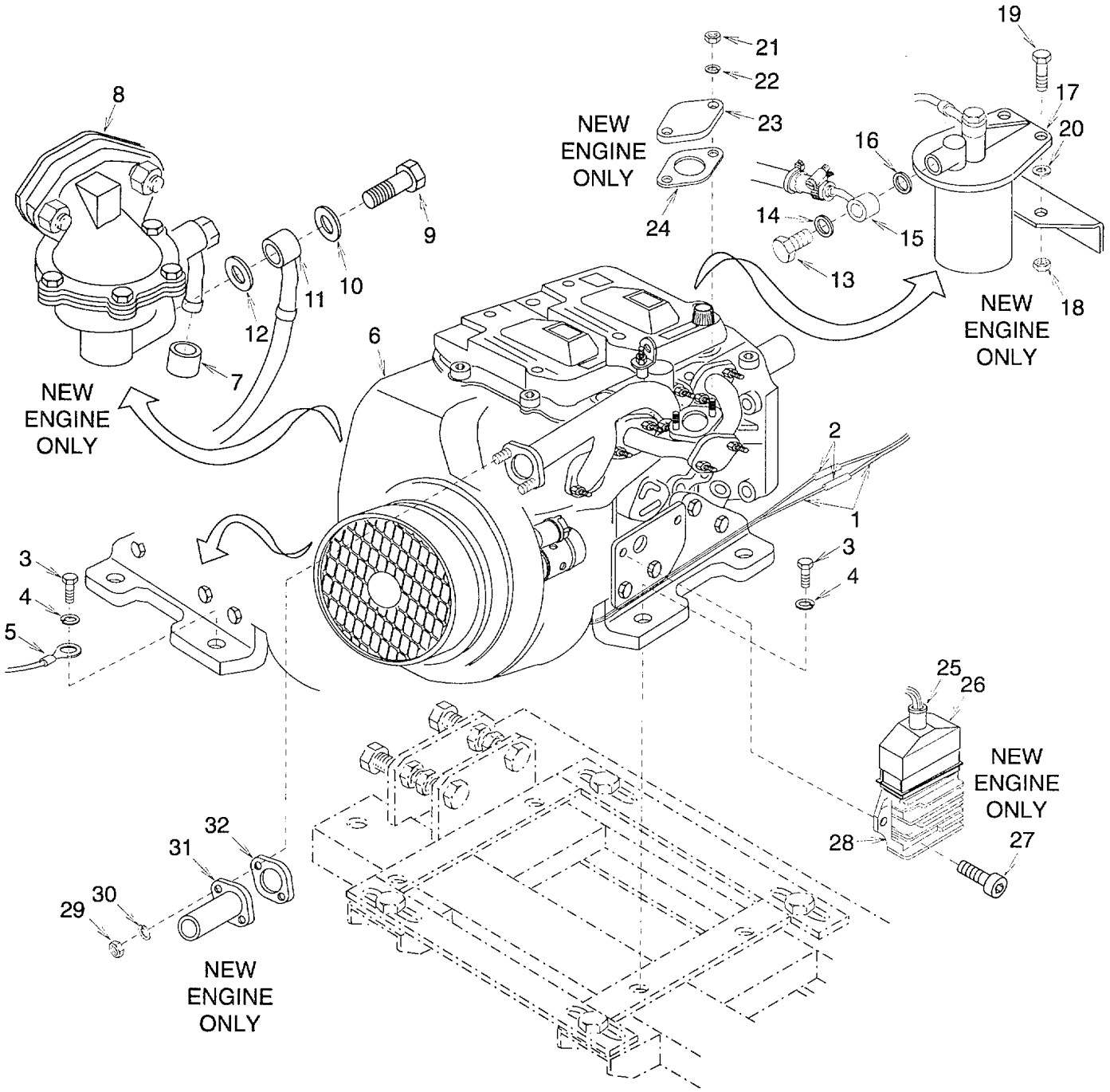


Figure 5-42. Engine

5-46. ENGINE REPLACEMENT. - Continued

(e) Contact your local environmental officer for guidance on how to properly dispose of used fuel in accordance with local regulations.

(f) Remove two nuts (21), lock washers (22), plate (23), and gasket (24). Retain gasket for use during installation.

(g) Cut wire lead (25) just above cap (26).

(h) Remove two screws (27) and voltage regulator (28). Retain voltage regulator for use as spare part.

(i) Remove two nuts (29), lock washers (30), adapter (31), and gasket (32). Retain gasket for use during installation.

WARNING

Engine weight exceeds 110 LB (50 kg). Use appropriate lifting device to avoid personal injury.

(2) Using an appropriate lifting device, carefully install engine (6). Aline mounting holes.

(3) Install four new lock washers (4), ground strap (5), and four bolts (3).

(4) Using tags and wiring diagram (fig. 1-4), connect wire leads (1). Remove tags.

NOTE

FOLLOW-ON MAINTENANCE:
Install fuel filter and cover (para 4-55).
Connect fuel return hose to hose connector (para 4-60).
Connect fuel supply hoses to fuel pump (para 4-59).
Connect injection pump to fuel filter hose assembly onto fuel filter (para 4-59).
Install engine drain hose (para 4-61).
Install engine pulley (para 4-42).
Install and adjust V-belts (para 4-38).
Connect fuel solenoid wire leads (para 4-53).
Connect engine temperature switch wire lead (para 4-52).
Connect engine oil pressure switch wire lead (para 4-51).
Connect starting motor wire leads (para 4-54).
Install air cleaner and adapter (para 4-49).
Install muffler and exhaust adapter (para 4-50).
Fill engine with appropriate lubricating oil (para 4-7).
Install condenser coil (para 5-19).
Close left side condenser door.
Close front bottom doors.
Connect battery (para 4-35) and put unit back into service.

5-47. FUEL TANK REPLACEMENT.

This task covers:

a. Removal **b. Installation**

INITIAL SETUP:

Materials/Parts:

Self Locking Nuts (4)
15, Appendix G
Lock Washers (4)
7 Appendix G
Webbing Fabric (2)
Figure F-5, Appendix F

Equipment Conditions:

Engine removed (para 5-46).
Compressor removed (para 5-38).
Sending unit removed (para 4-64).
Fuel supply and return hoses with inlet elbows removed from fuel tank (para 4-59, 4-60).
Fuel tank filler neck and shut-off cock removed (para 4-65).

a. Removal.

(1) Remove four self locking nuts (1) and base (2). Discard self locking nuts.

(2) Remove four bolts (3), lock washers (4), fuel tank strap (5) and fabric webbing (6). Discard lock washers and fabric webbing.

(3) Remove fuel tank (7).

b. Installation.

(1) Install fuel tank (7).

(2) Install new fabric webbing (6), fuel tank strap (5), four new lock washers (4) and bolts (3).

(3) Install base (2) onto four isolator mounts (8). Install four new self locking nuts (1).

NOTE

FOLLOW-ON MAINTENANCE:
Install fuel tank filler neck and shut-off cock (para 4-65).
Install fuel supply and return hoses with inlet elbows onto fuel tank (para 4-59, 4-60).
Install sending unit (para 4-64).
Install compressor (para 5-38).
Install engine (para 5-46).

5-47. FUEL TANK REPLACEMENT. - Continued

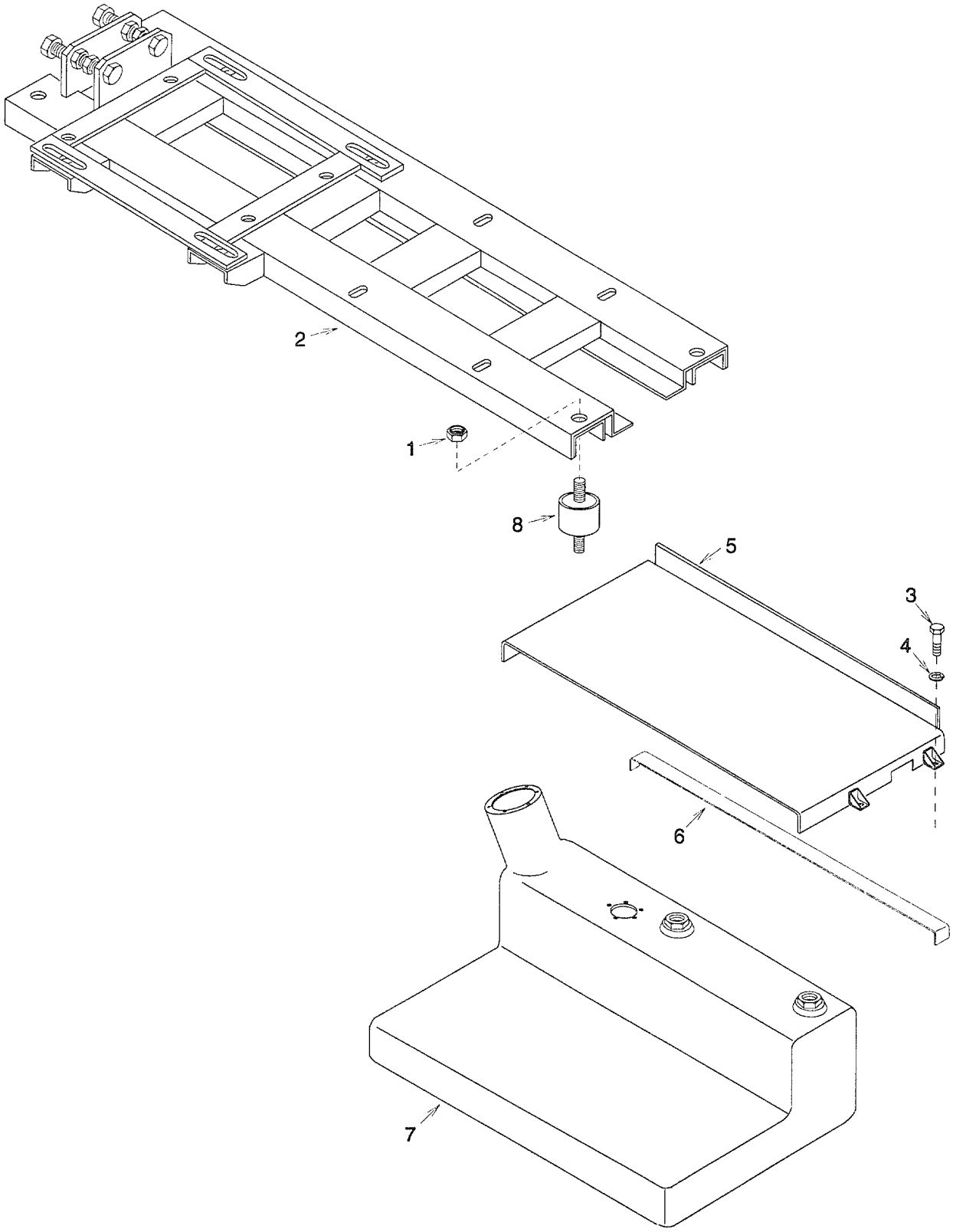


Figure 5-43. Fuel Tank

5-48. HOUSING REPAIR.

This task covers:

a. Repair

INITIAL SETUP:

Materials/Parts:

Self Locking Nuts (12)
17, Appendix G
Self Locking Nuts (34)
25 Appendix G
Self Locking Nut
12, Appendix G
Lock Washer (2)
1, Appendix G
Plastic Tubing
Figure F-2, Appendix F
Silicone RTV
20, Appendix E

Equipment Conditions:

Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

General Safety Instructions

WARNING

Exposed rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

Repair.

NOTE

Repair to housing at this maintenance level is limited to replacement of any damaged rivets or blind rivet nuts and replacement of evaporator housing and heat shield.

(1) Drill through rivet or blind rivet nut using drill bit slightly smaller than rivet diameter.

(2) Remove any remaining rivet material.

(3) Defrost Tube And Bracket Assembly Removal.

NOTE

Remove only items necessary to replace damaged component(s).

(a) Remove hose clamp (1) and plastic tubing (2).

(b) Remove self locking nut (3), bolt (4), and clamp (5). Discard self locking nut.

(c) Remove two bolts (6), lock washers (7), and defrost tube bracket (8). Discard lock washers.

(d) Remove grommet (9).

(e) Remove any silicone RTV remaining in grommet (9).

5-48. HOUSING REPAIR. - Continued

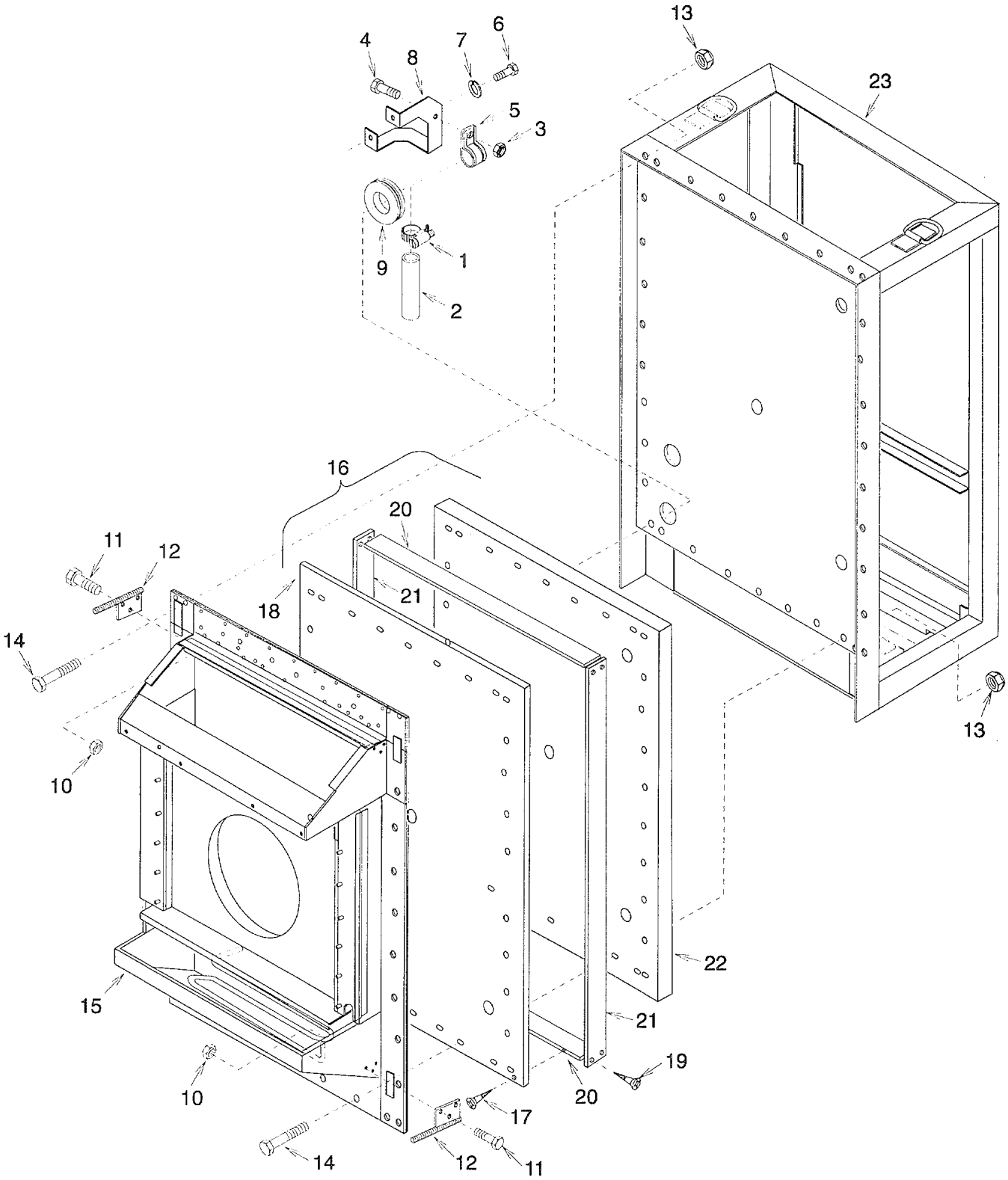


Figure 5-44. Housing

(4) Evaporator Housing And Heat Shield Removal.

NOTE

Remove only items necessary to replace damaged component(s).

(a) Remove gasket (heat shield) (para 4-66).

(b) Remove heat exchanger (para 5-33).

(c) Remove expansion valve (para 5-34).

(d) Remove evaporator coil (para 5-35).

(e) Remove evaporator housing tubing and fittings (para 5-32).

(f) Remove 12 self locking nuts (10), bolts (11), and four unit mounts (12). Discard self locking nuts.

NOTE

Heat shield assembly will be loose when evaporator housing is removed.

(g) Remove 34 self locking nuts (13), bolts (14), evaporator housing (15), and heat shield assembly (16). Discard self locking nuts.

(h) Remove 34 screws (17) and heat shield panel (18).

(i) Remove eight screws (19), four heat shield beams (20) and (21), and heat shield insulation (22).

5-48. HOUSING REPAIR. - Continued

(5) Evaporator Housing And Heat Shield Installation.

(a) Install heat shield beams (20) and (21) around heat shield insulation (22) and install eight screws (19).

(b) Install heat shield panel (18) and 34 screws (17).

(c) Aline heat shield assembly (16) and evaporator housing (15) onto condenser frame (23) then install 34 bolts (14) and new self locking nuts (13).

(d) Install four unit mounts (12), 12 bolts (11), and new self locking nuts (10).

(e) Install evaporator housing tubing and fittings (para 5-32).

(f) Install evaporator coil (para 5-35).

(g) Install expansion valve (para 5-34).

(h) Install heat exchanger (para 5-33).

(i) Install gasket (heat shield) (para 4-66).

(j) Install refrigeration unit onto refrigerator enclosure (para 4-6).

(6) Defrost Tube And Bracket Assembly Installation.

(a) Install grommet (9).

(b) Install defrost tube bracket (8), two new lock washers (7), and bolts (6).

(c) Install clamp (5), bolt (4), and new self locking nut (3).

(d) Install plastic tubing (2) and hose clamp (1).

(e) Apply silicone RTV into grommet (9) to seal evaporator enclosure.

NOTE

FOLLOW-ON MAINTENANCE:
Connect battery (para 4-35) and put unit back into service.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

6-1. GENERAL.

The only item authorized by the Maintenance Allocation Chart (MAC) to the general support maintenance level is welding repair to the housing. However, general support maintenance may be called upon to perform any or all of the MAC items listed for unit and direct support maintenance for rehabilitation or overhaul of the refrigeration unit.

6-2. HOUSING REPAIR.

This task covers:

a. Repair

INITIAL SETUP:

Tools:
Torch Set
1, Section III, Appendix B

Equipment Conditions:
Refrigeration unit shut down (para 2-7) and battery disconnected (para 4-35).

General Safety Instructions:

WARNING

Rotating parts are used in the refrigeration unit. Personal injury can result if battery is connected.

Repair.

(1) Disassemble refrigeration unit as necessary and make repairs as indicated.

(2) Repair any minor sheet metal dents and bent edges by straightening using common sheet metal repair procedures.

(3) Weld any cracks or breaks in frame members or welds per MIL-B-7883.

(4) Touch-up any painted surfaces per TM 43-0139.

(5) Assemble refrigeration unit as necessary to return to service.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix list all forms, field manuals, and technical manuals referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications.....DA Form 2028

Recommended Changes to Equipment Technical Manuals .....DA Form 2028-2

Product Quality Deficiency Report.....Standard Form 368

Log Book .....DA Form 2408-9

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

A-3. FIELD MANUALS.

NBC Contamination Avoidance.....FM 3-3

NBC Protection.....FM 3-4

NBC Decontamination .....FM 3-5

A-4. TECHNICAL MANUALS.

Destruction of Army Material to Prevent Enemy Use .....TM 750-244-3

Unit, Direct Support, and General Support Maintenance
Repair Parts and Special Tools List .....TM 9-4110-257-24P

A-5. MISCELLANEOUS PUBLICATIONS.

Army Logistics Readiness and Sustainability.....AR 700-138

Army Maintenance Management System (TAMMS).....DA Pam 738-750

Expendable Items
(Except Medical Class V, Repair Parts and Heraldic Items).....CTA 50-970

Army Medical Department Expendable/Durable Items .....CTA 8-100

Methods of Preservation MIL-P-116

Crates, Wood, Open And Covered MIL-C-52950

A-6. WARRANTY TECHNICAL BULLETIN.

Refrigeration Unit, Mechanical, Panel Mounted for Refrigerator,
Prefabricated, Panel Type, Diesel Engine Driven,
10,000 BTU Model F10000RD .....TB 9-4110-257-24

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I. INTRODUCTION

B-1. THE ARMY MAINTENANCE SYSTEM MAC.

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

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

Unit - Includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - Includes an F subcolumn

General support - Includes an H subcolumn.

Depot - Includes a D subcolumn.

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

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

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and defined as follows:

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

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

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

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

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

B-2. MAINTENANCE FUNCTIONS. - Continued

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

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

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

i. Repair. The application of maintenance services1, including fault location/troubleshooting2, removal/installation, and disassembly/assembly3 procedures, and maintenance actions4 to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

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

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

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

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

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

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

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[1]Services - Inspect, test, service, adjust, align, calibrate, and/or replace.

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

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

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

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

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

C Operator or Crew Maintenance

O Unit Maintenance

F Direct Support Maintenance

H General Support Maintenance

e. Column 5. Tools and Equipment Reference Code. Column 5 specifies, by code, those common tool sets (not individual tools) common, TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in section 1II.

f. Column 6, Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

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[5]This maintenance level is not included in Section II, column (4) of the Maintenance Allocation Chart. Functions to this level of maintenance are identified by a work-time figure in the "H" column of Section II, column (4), and an associated reference code is used in the Remarks column (6). This code is keyed to Section IV, Remarks, and the SRA complete repair application is explained there.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EOUIPMENT REOUIREMENTS, SECTION III.

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

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

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

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number or type number.

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

a. Column 1, Remarks Code. The code recorded in column 6, Section II.

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

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	REFRIGERATION UNIT								
01	CABINET, PANELS, DOORS & SCREENS								
	Panel	Inspect	0.1						
		Replace		0.5				1	
	Doors	Inspect	0.1						
		Service		0.5				1	
		Repair			1.0			1	A
		Replace		0.5				1	
	Guards	Inspect	0.1						
		Replace		0.5				1	
02	ELECTRICAL AND CONTROL								
	Wires, Cables, & Harnesses	Inspect	0.5					1	
		Test	0.5					1	
		Repair	1.0					1, 3	
		Replace	2.0					1, 3	
	Circuit Breaker	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1	
	Lamp, Miniature	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1	
	Fuses	Inspect	0.1					1	
		Test	0.5					1	
		Replace	0.2					1	
	Relays, Control	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1, 3	
	Relays, Time Delay	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1, 3	
	Hourmeter	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1	
	Ammeter	Inspect	0.1					1	
		Test	0.5					1	
		Replace	1.0					1	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Switch, Toggle	Inspect		0.1				1	
		Test		0.5				1	
		Replace		1.0				1	
	Thermostat, Remote Bulb	Inspect		0.1				1	
		Test		0.5				1	
		Replace		1.0				1	
	Timer, Defrost	Inspect		0.1				1	
		Test		0.5				1	
		Replace		1.0				1	
	Switch, Engine Speed	Inspect		0.1				1	
		Replace		1.0				1	
	Transformer, Control	Inspect		0.1				1	
		Test		0.5					
		Replace		1.0				1	
	Temperature Gage (Thermometer)	Inspect	0.1						
		Test		1.0				1	
		Replace		0.5				1	
	Solenoid, Continuous Duty	Inspect		0.1				1	
		Test		0.5				1	
		Replace		1.0				1	
	Battery	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
	Switch, Temperature (Defrost	Inspect		0.1				1	
	Termination)	Test		0.5				1	
		Replace		1.0				1	
	Switch, Push (Door)Inspect		0.1						
		Test	0.5	1, 3					
	Replace			1.0				1, 3	
03	POWER TRANSMISSION/AIR HANDLING								
	V-Belts	Inspect	0.1						
		Service	0.5					1	
		Adjust	0.5					1	
		Replace	0.5					1	
	Fans	Inspect	0.1					1	
		Replace	0.1					1	
	Pulleys (Sheaves) (Idler)	Inspect	0.1						
	Replace		0.1					1	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Shaft, Fan Drive	Inspect	0.1						
		Replace			2.0			1, 4, 5, 6	
	Bearings, Flange	Inspect		0.1					
		Service		0.2				1	
		Replace		2.0				1	
	Clutch, Fan	Inspect	0.1					1	
		Test		0.5				1	
		Replace		1.5					
	04 REFRIGERATION SYSTEM								
	Dehydrator	Inspect	0.1						
		Replace			3.0			4, 5	
	Gages	Inspect	0.1						
		Replace			3.0			4, 5	
	Strainer	Inspect	0.1						
		Replace			3.0			4, 5	
	Receiver	Inspect	0.1						
		Replace			3.0			4, 5	
	Condenser Coil	Inspect		0.1				1	
		Service		1.0				1, 2	
		Replace			4.0			4, 5, 6	
	Valves, Pressure Regulator	Inspect	0.1						
		Replace			3.0			4, 5, 6	
	Valve, Check	Inspect	0.1						
		Replace			3.0			4, 5, 6	
	Hose Assemblies, Metal	Inspect	0.1						
		Replace			3.0			4, 5, 6	
	Valves, Stop	Inspect	0.1						
		Replace			3.0			4, 5, 6	
	Indicator, Sight	Inspect	0.1						
		Replace			3.0			4, 5	
	Valves, Solenoid	Inspect	0.1						
		Test		0.3				1	
		Repair		1.0	3.0			4, 5	B
		Replace			3.0			4, 5	
	Valves, Isolation	Inspect	0.1						
		Replace			3.0			4, 5	
	Accumulator	Inspect	0.1						
		Replace			3.0			4, 5, 6	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Tubing and Fittings	Inspect		1.0			1		
		Test		1.0				4, 5, 6	
		Repair		1.0				4, 5, 6	
		Replace			3.0			4, 5, 6	
	Heat Exchanger	Inspect		0.1				1	
		Replace			3.0			4, 5, 6	
	Valve, Expansion	Inspect		0.1			1		
		Replace			3.0			4, 5	
	Evaporator Coil	Inspect		0.1			1		
		Service		1.0				1, 2	
		Replace			4.0			4, 5, 6	
	Switches, Pressure	Inspect	0.1						
		Replace			3.0			4, 5	
	Compressor	Inspect	0.1						
		Service			0.5			4, 5	
		Test			0.5			4, 5	
		Repair			10.0			4, 5, 6	
		Replace			6.0			4, 5, 6	
05	ENGINE								
	Oil Filter	Inspect	0.2						
		Service		0.2				1	
		Replace		0.2				1	
	Air Cleaner	Inspect	0.1						
		Service		0.3				1	
		Replace		0.3				1	
	Muffler	Inspect	0.1						
		Replace		0.8				1	
	Switch, Engine Oil Pressure	Inspect	0.1						
		Test	0.5					1	
		Replace	1.0					1	
	Switch, Engine Temperature	Inspect	0.1						
		Test		0.5				1	
		Replace		1.0				1	
	Solenoid, Fuel	Inspect		0.1					
		Test		0.5				1	
		Replace		1.0				1	
	Motor, Starting	Inspect	0.1						
		Replace		0.5				1	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Nozzle	Test			1.0			1,7,10,11	
		Replace			1.0			1,10,11	
	Pump, Injection	Test			1.0			1	
		Replace			1.0			1	
		Adjust			1.0			1, 8	
	Fuel Filter	Inspect	0.1						
		Service		0.3				1	
		Replace		0.3				1	
	Voltage Regulator	Inspect	0.1						
		Replace		0.5				1	
	Fuel Pump	Inspect	0.5					1	
		Replace			1.0			1	
	Head, Cylinder	Inspect	0.1						
		Test			2.0			1	
		Replace			2.0			1	
		Adjust		1.0				1, 12	
	Engine Oil Pump	Inspect			1.0			1	
		Replace			2.0			1	
	Flywheel	Inspect		1.0				1	
		Replace			4.0			1, 9	
	Alternator	Test		1.0				1	
		Replace			4.0			1	
	Glow Plug	Inspect		0.5				1	
		Test		0.5				1	
		Replace		0.5				1	
	Engine	Inspect		0.1					
		Service	1.0					1	
		Repair		5.0	5.0			1	C
		Replace			6.0			1	
06	FUEL								
	Hose	Inspect	0.1						
		Repair		0.8				1	
		Replace		0.3				1	
	Filter, Fuel Line	Inspect	0.1						
		Service		0.5				1	
		Replace		0.5				1	
	Fuel Gage	Inspect	0.1						
		Replace		0.5				1	

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	Sending Unit	Inspect		0.1				1	
		Replace		0.5				1	
	Fuel Tank	Inspect	0.1						
		Repair		0.8				1	D
		Replace			5.0			4, 5	
07	HOUSING								
	Heat Shield Gasket	Inspect	0.1						
		Replace		1.0				1	
	Housing	Inspect	0.1						
		Repair			6.0	6.0		1	E

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR REFRIGERATION UNIT

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
		NOTE Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II		
1	O	Shop Equipment (1), Automotive Vehicle	4910-00-754-0654	SC 4910-95-CLI-A74
2	O	Comb, Fin	5120-00-157-2180	
3	O	Heat Gun	3439-01-037-7268	
4	F	Tool Kit, Service, Refrigeration Unit	5180-00-597-1474	SC 5180-90-CL-N18
5	F	Recovery and Recycle Unit, Refrigerant	4130-01.-338-2707	
6	F	Nitrogen Regulator	6680-00-503-1327	
7	F	Injector Test Bench		(62445) 773-6543 (A4521) 365.43
8	F	Fuel Delivery Sight	5120-01(-413-8732)	(62445) 773-6594 (A4521) 365.94
9	F	Flywheel Puller	(62445) 773-6502	(A4521) 365.02
10	F	Injector Extractor (Without Mechanical Puller)	5120-01-333-3140	(62445) 003-0536 (A4521) 305.36
11	F	Mechanical Puller (Use With Injector Extractor)	5120-01-247-6131	(62445) 003-0463 (A4521) 304.63
12	F	Valve Adjustment Tool	5120-01-410-8568	(62445) 773-6601 (A4521) 366.01

SECTION IV. REMARKS FOR REFRIGERATION UNIT

Reference Code	Remarks
A	Repair is limited to replacement of damaged gaskets.
B	Repair at unit maintenance level is limited to replacement of electric coil.
C	Repair is limited to replacement of damaged components only.
D	Repair is limited to replacement of damaged components.
E	Repair at direct support maintenance level is limited to replacement of damaged components.

APPENDIX C

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LIST

SECTION I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of the end item and basic issue items for the refrigeration unit to help you inventory the items for safe and efficient operation of the equipment.

C-2. GENERAL.

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

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

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

c. Explanation of Columns.

(1) Column (1), Illus Number, gives you the number of the item illustrated.

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

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

(4) Column (4), U/I (unit of issue), indicates how the item is issued for the National Stock Number shown in column two.

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

SECTION II. COMPONENTS OF END ITEM

There are no loose or separate components supplied with this refrigeration unit.

SECTION III. BASIC ISSUE ITEMS LIST

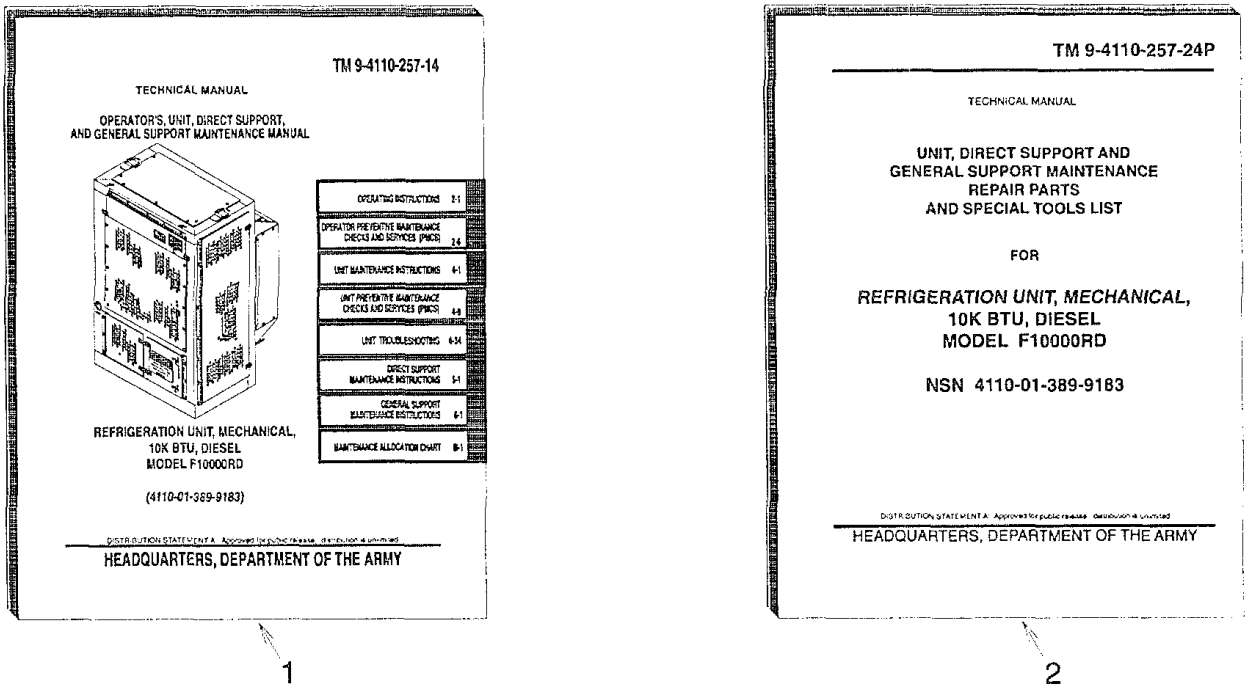


Figure C-1. Basic Issue Items

(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) U/M	(5) Qty Rqd.
1		ARMY TECHNICAL MANUAL Operator's, Unit, Direct Support and General Support Maintenance for Refrigeration Unit, Mechanical 10K BTU Diesel, Model F10000RD TM 9-4110-257-14	EA	1
2		ARMY TECHNICAL MANUAL Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Refrigeration Unit, Mechanical, 10K BTU, Diesel Model F10000RD TM 9-4110-257-24P	EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

There are no additional authorized items required for this refrigeration unit.

APPENDIX E

EXPENDABLE AND DURABLE ITEMS LIST

SECTION I. INTRODUCTION

E-1. SCOPE.

This appendix lists expendable and durable items you will need to maintain the refrigeration unit. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized by CTA 50-970, expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS.

a. Column (1) - Item Number. This number is assigned to the entry in the listing for referencing when required.

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

C - Operator/Crew

O - Unit Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. Column (3) - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the federal item name and, if required a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M) Unit of Issue (U/I). This measure is expressed by a two character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue as shown in the Army Master Data File (AMDF) requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) IDESCRIPTION	(5) (U/M)/ (U/I)
1	O	7510-00-266-5006	Tape, Waterproof Packaging, PPP-T-60, Type IV	roll
2	O	8135-00-664-6958	Greaseproofed, Waterproof, Flexible Barrier Material, PP-C 843, Type II Class B	roll
3	O	7920-00-205-1711	Wiping Rag	bl
4	O	7930-00-985-6911	Detergent (81349) MIL-D-16791	gl
5	O	9150-01-178-4725	Lubricating Oil, Engine, MIL-L-2104, OE/HDO-15/40	qt
6	O	9150-00-985-7316	Grease, Multipurpose MIL-G-23549	lb
7	O	9905-00-537-8954	Marker Tag, MIL-T-12755	box
8	O	5935-00-725-4153	Solder, Lead-Tin, QQ-S-571 Type SN60WRP2	
9	F	3439-00-640-3713	Flux, Brazing O-F-499, type B	oz
10	O	5640-00-580-6276	Insulation Tape	roll
11	F	6830-00-292-0732	Nitrogen	cy
12	F	6830-01-380-4960	Refrigerant, R134a	cy
13	O	5350-00-192-5047	Abrasive Cloth	pg
14	O	3040-00-644-0439	Adhesive, General Purpose,	pt
15	F		Brazing Alloy, Silver QQ-B-564, grade O, I or II	oz
16	F		Brazing Alloy, Silver QQ-B-564, grade III	oz
17	O	3439-01-045-7940	Flux, Solder, Liquid, Rosin Base MIL-F-14256	qt
18	F		Acetone	gl
19	F		Methyl-ethyl Ketone	gl
20	O		Adhesive-Sealant, Silicone RTV MIL-A-46106, Type I	oz

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) (U/M)/ (U/I)
21	F	9150-01-410-8972	Lubricating Oil, Refrigerant, Compressor, (2R128) SW-68	qt
22	F		Tape, Anti-Seize MIL-T-27730, Size 1	roll
23	O		Tie Down Strap, (96906), MS3367-4-9	hd
24	O		Tie Down Strap, (96906), MS3367-2-9	hd
25	O	9150-01-177-3988	Lubricating Oil, Engine, MIL-L-2104,OE/HDO-10	qt
26	O	9150-00-188-9864	Lubricating Oil, Engine, MIL-L-2104,OE/HDO-50	qt
27	O		Fuel, Diesel, VV-F-800, DF-2	bl
28	O		Fuel, Diesel, VV-F-800, DF-A	bl
29	O		Clamp, (62445), 773-7572	ea
30	O		Lubricating Oil, Engine Preservative, MIL-L-21260, T930	qt
31	O		Oil, Preservative, VV-E-800, T900	gl
32	O		Compound, MIL-C-16173	qt

*U.S. GOVERNMENT PRINTING OFFICE: 1997 - 554-024/60161

APPENDIX F

ILLUSTRATED LISTOF MANUFACTURED ITEMS

SECTION I.

F-1. SCOPE.

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit, and direct support maintenance.

a. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

b. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

c. All dimensions are given in inches with centimeters shown in parenthesis.

D For fabrication information of electrical wires including lengths and markings, see Table 4-3.

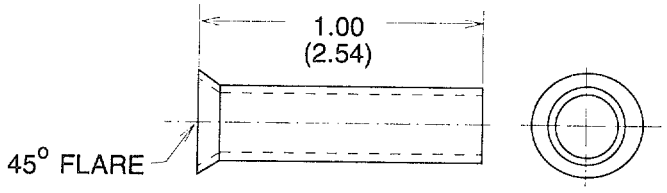
SECTION II.

F-2. MANUFACTURED ITEMS PART NUMBER LIST.

Part Number	Figure Number
12076-3-1000	F-1
13218E0001-305	F-2
150K0000-1/229	F-23
150K0000-1/230	F-23
150K0000-1/305	F-23
150K0095	F-3
150K0096	F-4
150K0119	F-5
150K0145	F-6
150K0146	F-7
150K0157	F-8
150K0158	F-9
150K0159-5	F-10
150K0159-7	F-10
150K0159-9	F-10
150K0160	F-11

Part Number	Figure Number
150K0163-1	F-12
150K0165-1	F-12
150K0165-3	F-12
150K0165-7.	F-12
150K0165-15	F-12
150K0169	F-13
150K0170	F-14
150K0171	F-15
150K0172	F-16
150K0175-1 .	F-4
150K0175-3 .	F-4
150K0175-5 .	F-4
150K0185-1-1	F-17
150K0187-1/T	F-18
150K0188	F-19
150K0196	F-20
150K0197	F-10
150K0198-1	F-21
150K0198-3	F-21
150K0198-5	F-21
150K0198-9	F-21
150K0198-11	F-21
150K0200-1/T.	F-22
150K0201-1/1	F-17
150K0201-1/3	F-23
150K0202	F-24
150K0203-1/T	F-25
150K0206-1/3	F-26
150K0206-3/3	F-26
150K0206-5/3	F-26
150K0208	F-27
150K0212-1/T	F-28
150K0213-1	F-10
150K0213-3	F-10
150K0214-1/T	F-29

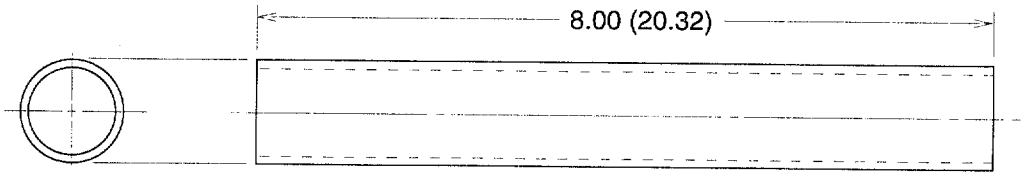
Part Number	Figure Number
150K0215-1/T	F-30
150K0216-1/T	F-31
150K0217	F-32
150K0218	F-33
51206-7	F-34
51206-15	F-34
51206-25	F-34
51206-39	F-34
8337032-4	F-35



NOTE

1. FABRICATE FROM .25 (0.64) O.D. X 0.030 (0.076) WALL ASTM B280 COPPER TUBING

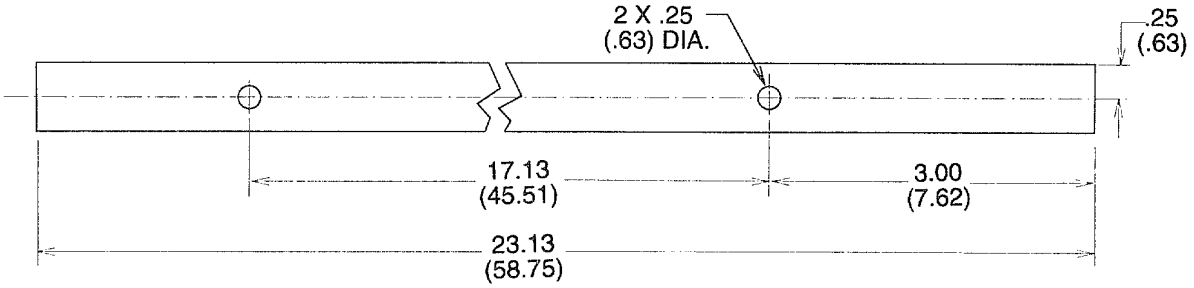
Figure F-1. Tubing-Copper, Straight Flared, Part Number 12076-3-1000



NOTE

1. FABRICATE FROM ZZ-T-831, TYPE VI, CLASS 6 0.75 (1.905) ID X .125 (.316) WALL PLASTIC TUBING

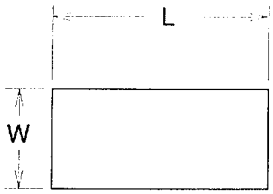
Figure F-2. Tubing, Plastic, Part Number 13218E0001-305



NOTE

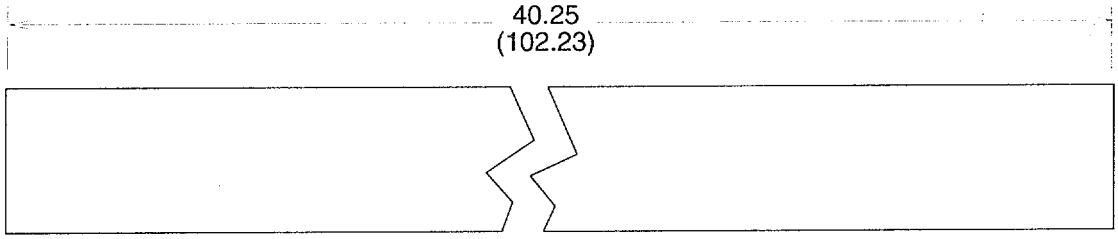
1. FABRICATE FROM 0.125 (.317) X .500 (1.27) RUBBER GASKET

Figure F-3. Gasket, Control Box, Top, Part Number 150K0095



ITEM	PART NUMBER	W DIM	L DIM	FABRICATE FROM
1	150K0096	.50 (1.27)	6.84 (17.37)	ASTM D1056-2A2C2F2 0.125 (0.318) THICK RUBBER GASKET
2	150K0175-1	.88 (2.24)	8.00 (20.32)	ASTM D1056-2A2C2F2 0.125 (0.318) THICK RUBBER GASKET
3	150K0175-3	.88 (2.24)	32.69 (83.03)	ASTM D1056-2A2C2F2 0.125 (0.318) THICK RUBBER GASKET
4	150K0175-5	.84 (2.13)	34.75 (88.27)	ASTM D1056-2A2C2F2 0.125 (0.318) THICK RUBBER GASKET

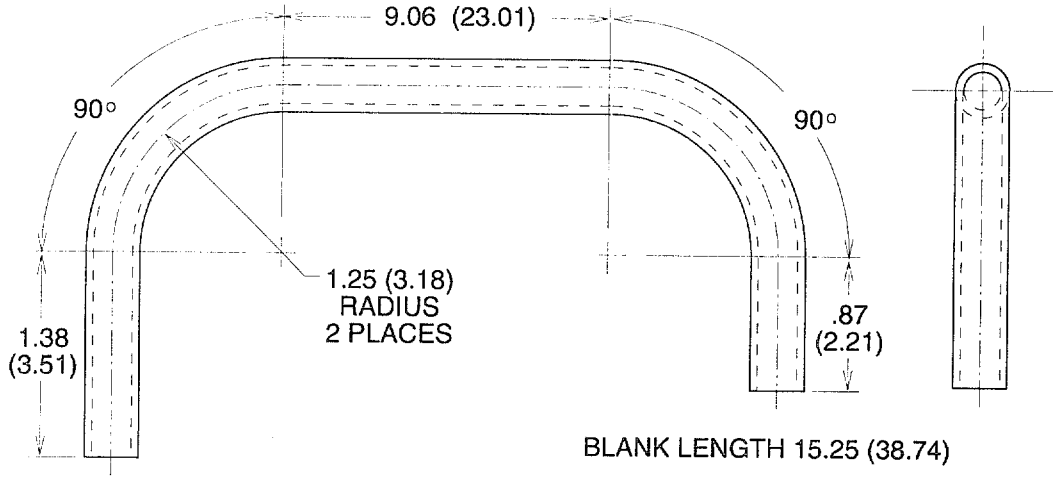
Figure F-4. Gasket, Various



NOTE

1. FABRICATE FROM (70470) 572320 WEBBING FABRIC

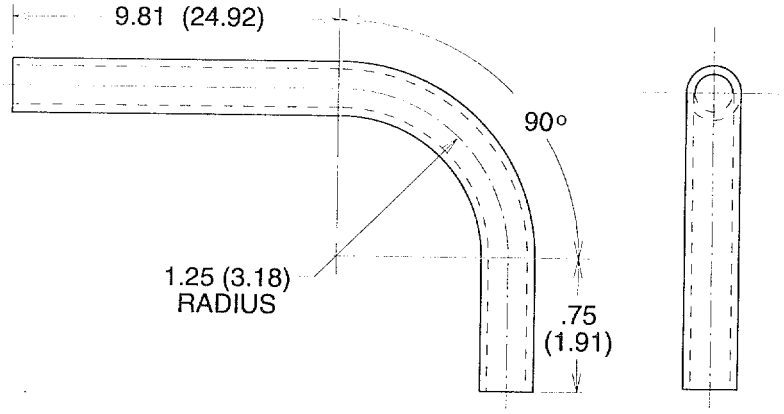
Figure F-5. Webbing Fabric, Part Number 150K0119



NOTE

1. FABRICATE FROM 0.50 (1.27) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

Figure F-6. Tube, Distributor to Tee, Part Number 150K0145

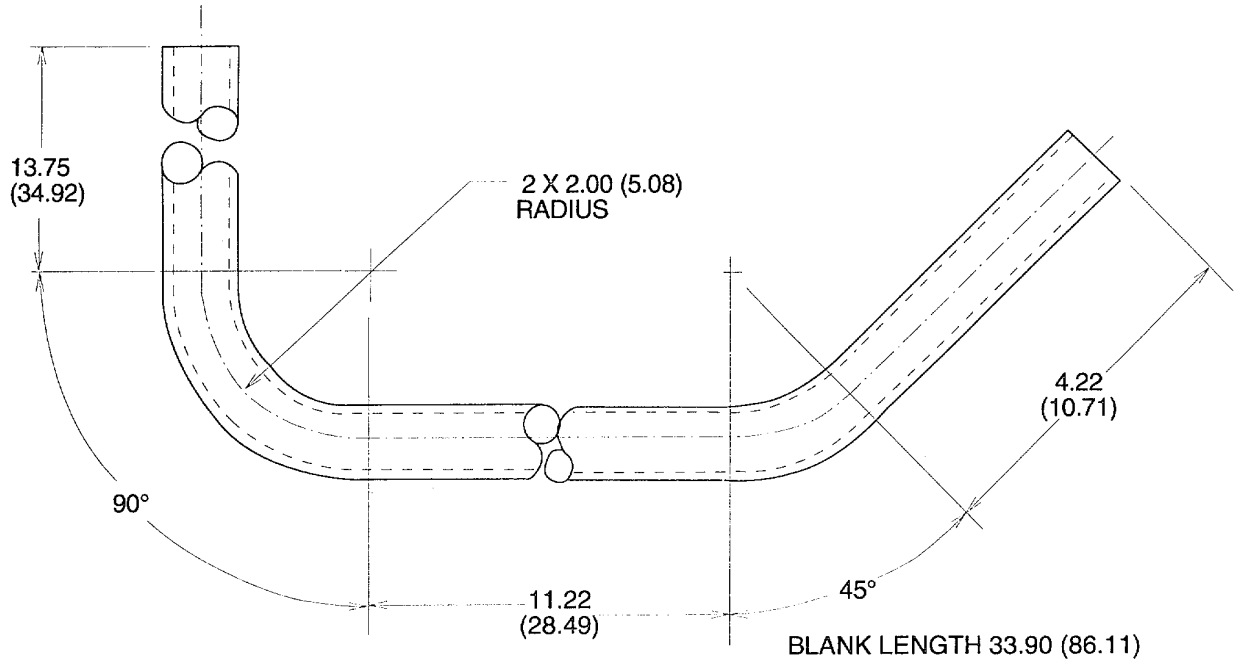


BLANK LENGTH 12.53 (31.83)

NOTE

1. FABRICATE FROM 0.50 (1.27) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

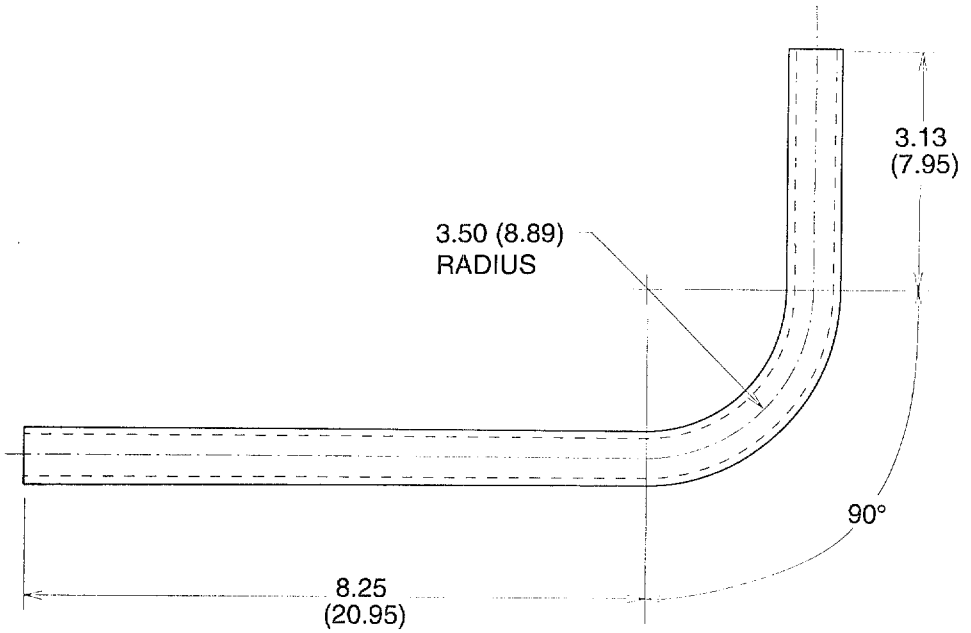
Figure F-7. Tube, Distributor to Street Elbow, Part Number 150K0146



NOTE

1. FABRICATE FROM .875(2.22) O.D. X 0.045 (1.14) WALL ASTM B280 COPPER TUBING

Figure F-8. Tube, Tee to Isolator, Part Number 150K0157

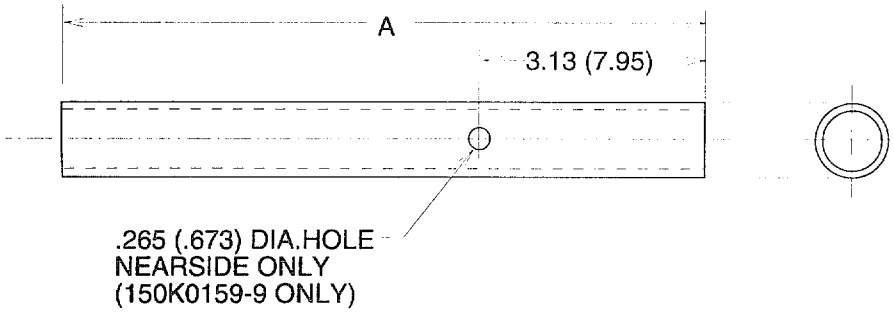


BLANK LENGTH 16.88 (42.87)

NOTE

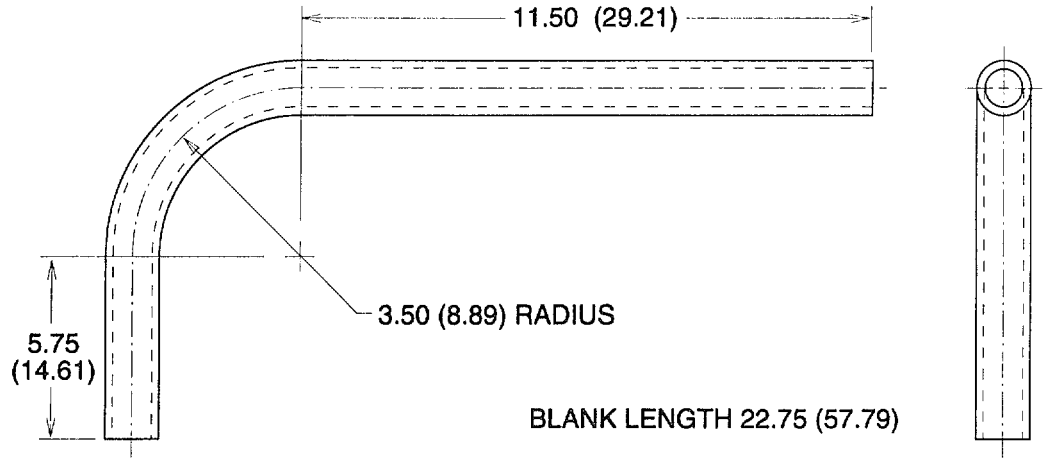
1. FABRICATE FROM 1.125 (2.85) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING

Figure F-9. Tube, Accumulator to Crankcase Pressure Regulator, Part Number 150K0158



ITEM	PART NO.	DIM "A"	FABRICATE FROM
1	150K0159-5	5.13 (13.03)	1.125 (2.857) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING
2	150K0159-7	10.62 (26.97)	1.125 (2.857) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING
3	150K0159-9	7.50 (19.05)	1.125 (2.857) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING
4	150K0197	2.00 (5.08)	.625 (1.59) O.D. X 0.035 (0.089) WALL ASTM B280 COPPER TUBING
5	150K0213-1	3.12 (7.92)	.875 (2.223) O.D. X 0.045 (0.114) WALL ASTM B280 COPPER TUBING
6	150K0213-3	20.63 (52.40)	.875 (2.223) O.D. X 0.045 (0.114) WALL ASTM B280 COPPER TUBING

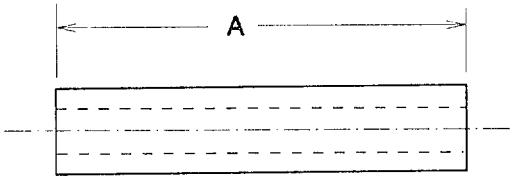
Figure F-10. Tube, Copper, Straight, Part Number 150K0197, and 150K0213



NOTE

1. FABRICATE FROM 1.25 (3.175) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING

Figure F-11. Tube, Heat Exchanger to Accumulator, Part Number 150K0160

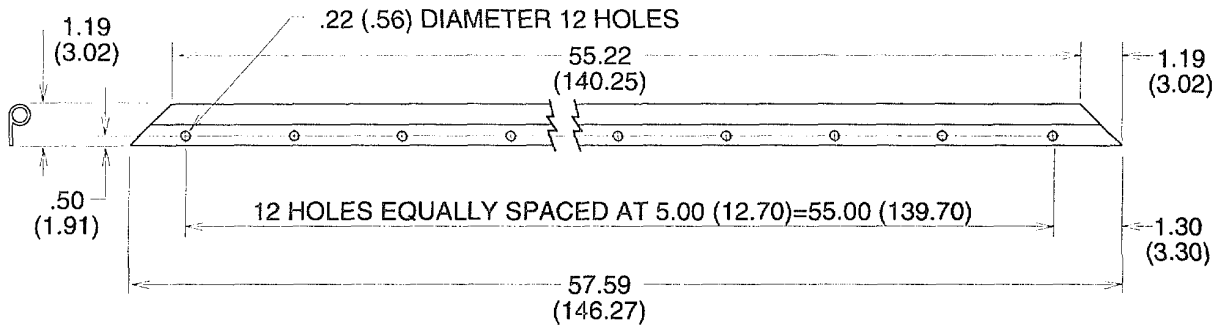


ITEM	PART NO.	DIM "A"
1	150K0163-1	8.00 (20.32)
2	150K0165-1	42.00 (106.68)
3	150K0165-3	18.00 (45.72)
4	150K0165-7	28.00 (71.12)
5	150K0165-15	9.00 (22.86)

NOTE

1. FABRICATE FROM (24161) 70001 (OR EQUAL) .25 (.64) ID RUBBER HOSE

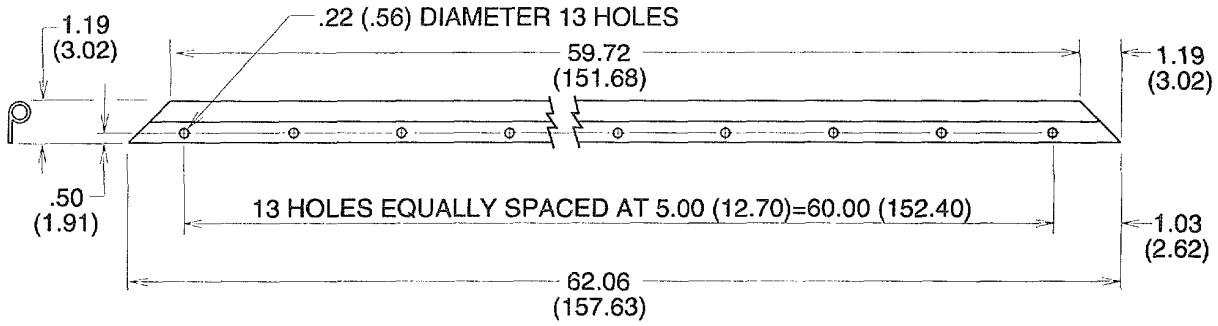
Figure F-12. Hose, Drain, Part Number 150K0163 and 150K0165



NOTE

1. FABRICATE FROM (74951) V-1234-100

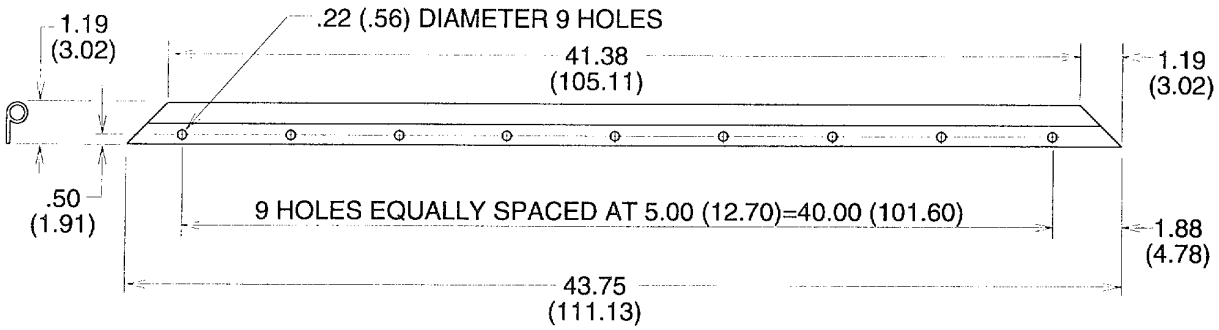
Figure F-13. Gasket, Side, Part Number 150K0169



NOTE

1. FABRICATE FROM (74951) V-1234-100

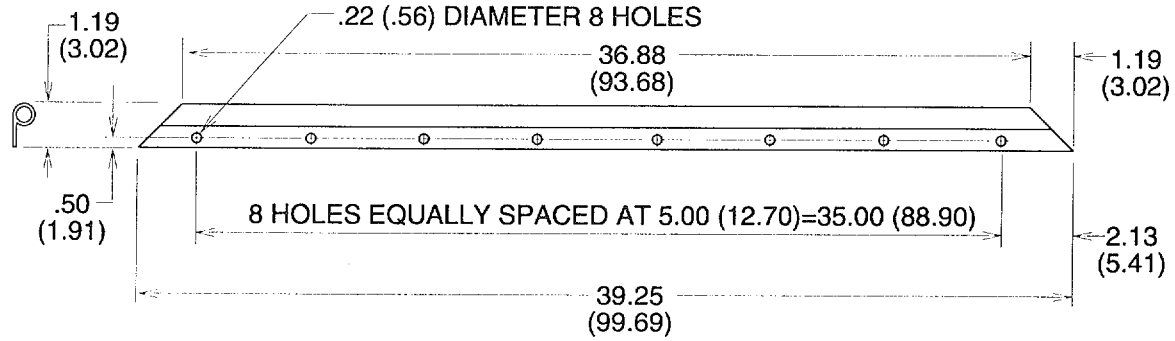
Figure F-14. Gasket, Side Part Number 150K0170



NOTE

1. FABRICATE FROM (74951) V-1234-100

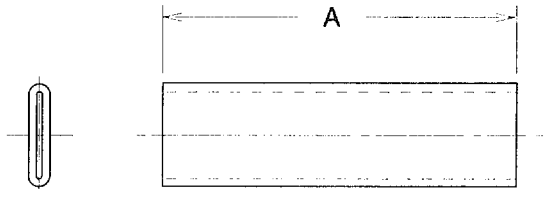
Figure F-15. Gasket, Top and Bottom, Part Number 150K0171



NOTE

1. FABRICATE FROM (74951) V-1234-100

Figure F-16. Gasket, Top and Bottom, Part Number 150K0172

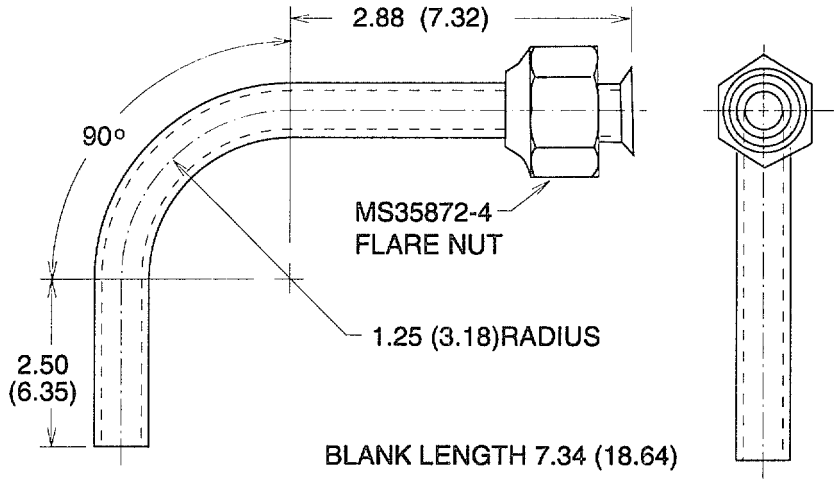


ITEM	PART NO.	DIM "A"
1	150K0185-1/1	18.00 (45.72)
2	150K0201-1/1	4.00 (10.16)

NOTE

1. FABRICATE FROM QQ-B-575/R30T281

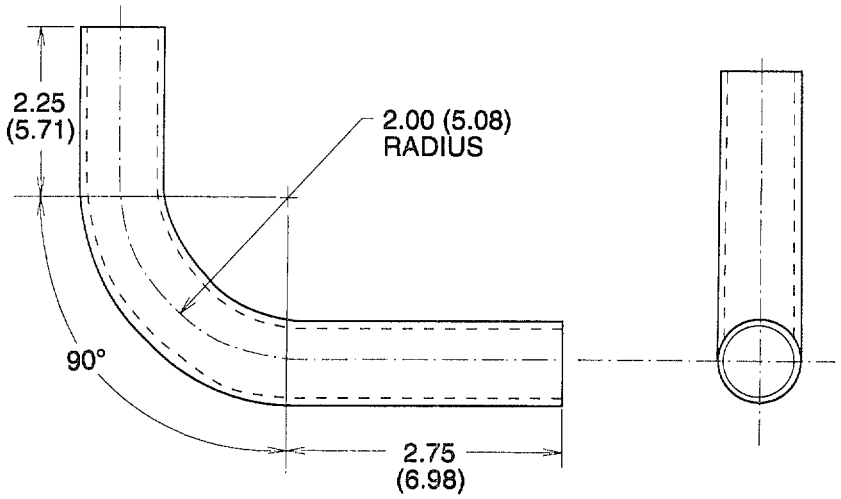
Figure F-17. Braid, Wire, Tubular, Part Number 150K0185-1/1 and 150K0201-1/1



NOTE

1. FABRICATE FROM 0.50 (1.27) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

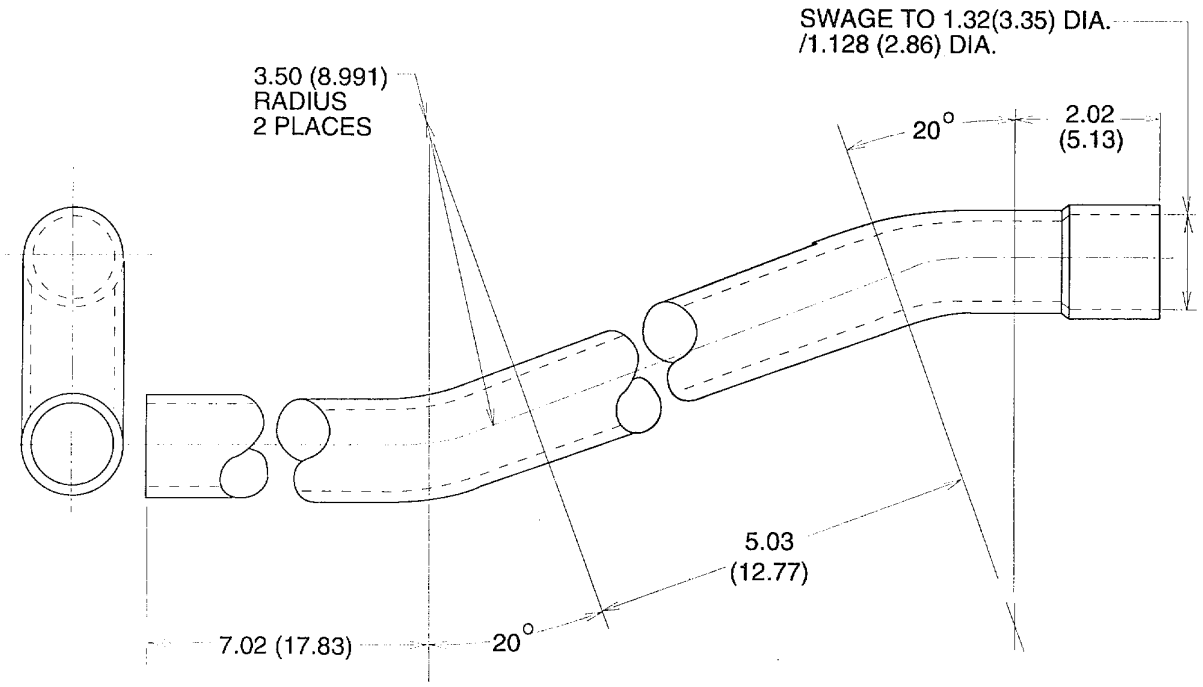
Figure F-18. Tube, Reducer to Expansion Valve, Part Number 150K0187-1/T



NOTE

1. FABRICATE FROM .875 (2.22) O.D. X 0.045 (.114) WALL ASTM B280 COPPER TUBING

Figure F-19. Tube, D.P.R. Valve to Elbow, Part Number 150K0188

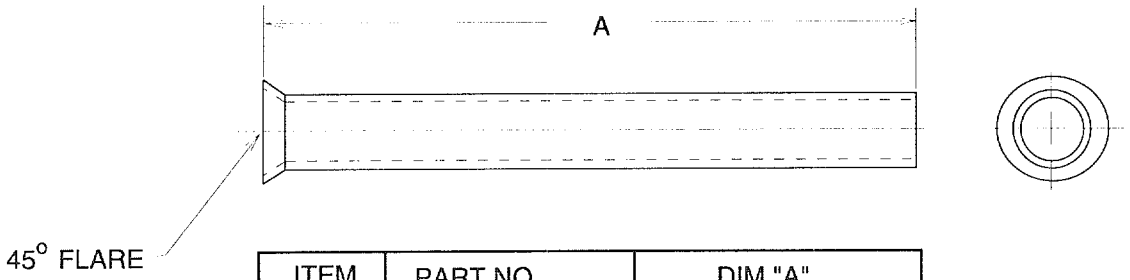


BLANK LENGTH 16.51(41.94)

NOTE

1. FABRICATE FROM 1.125 (2.857) O.D. X 0.050 (0.127) WALL ASTM B280 COPPER TUBING

Figure F-20. Tube, Accumulator Inlet, Part Number 150K0196

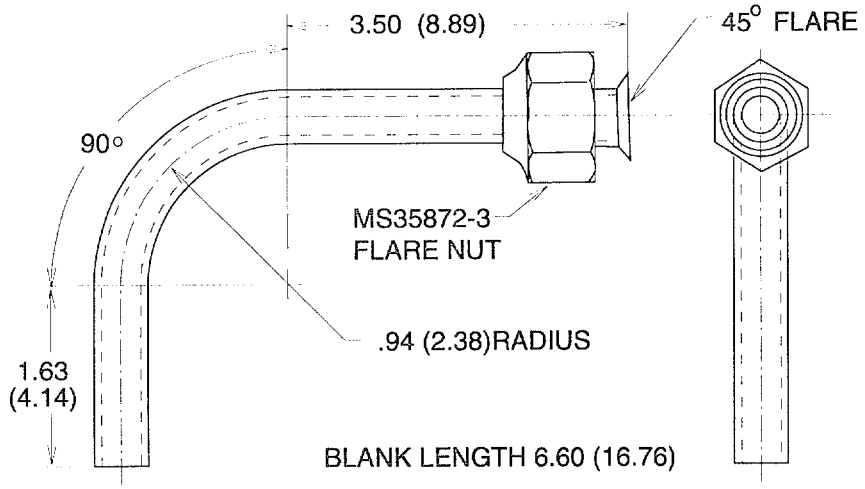


ITEM	PART NO.	DIM "A"
1	150K0198-1	1.75 (4.45)
2	150K0198-3	2.00 (5.08)
3	150K0198-5	2.25 (5.71)
4	150K0198-9	3.00 (7.62)
5	150K0198-11	5.88 (14.94)

NOTE

1. FABRICATE FROM .375 (0.952) O.D. X 0.032 (0.0812) WALL ASTM B280 COPPER TUBING

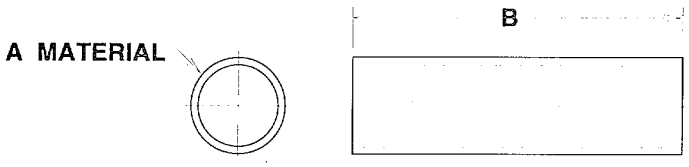
Figure F-21. Tube, Straight Flare One End, Part Number 150K0198-1, -3, -5, -9, and -11



NOTE

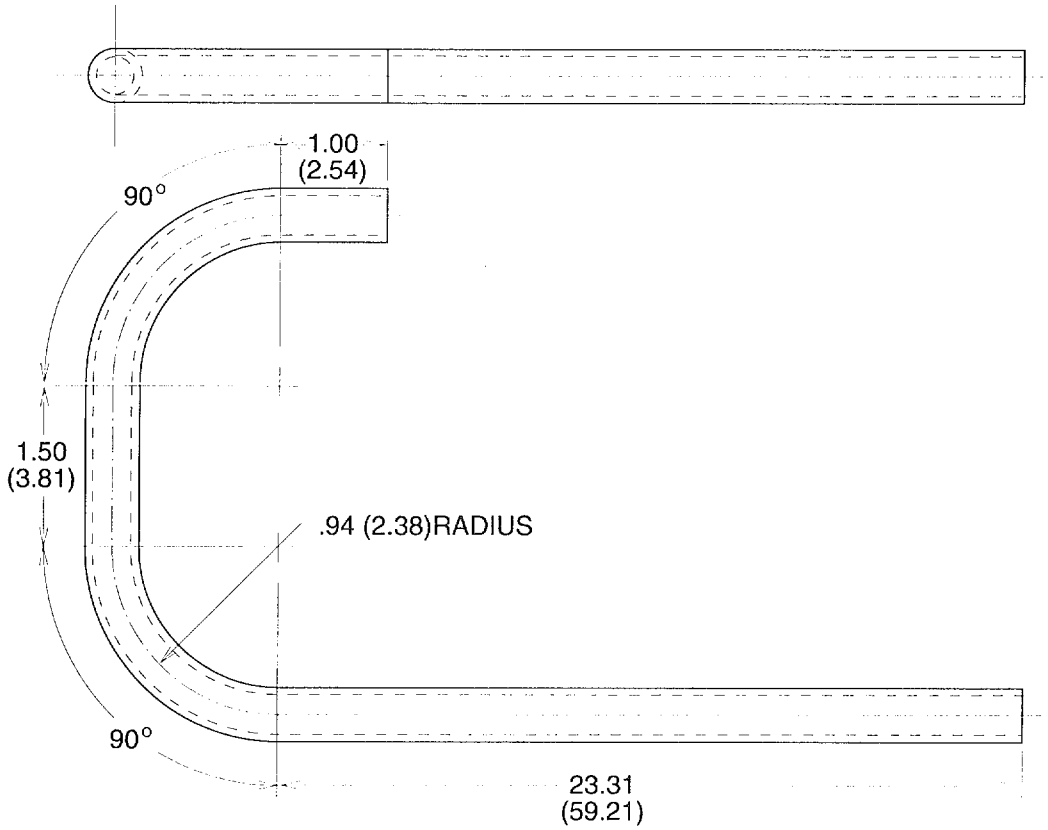
1. FABRICATE FROM 0.375 (.953) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

Figure F-22. Tube, Interchanger to Expansion Valve, Part Number 150K0200-1/T



ITEM	PART NUMBER	FABRICATE FROM MATERIAL A		B LENGTH
1	150K0000-1/229	M23053/5-106-9	INSULATION, SLEEVING, HEAT SHRINKABLE	1.50 (3.81)
2	150K0000-1/230	M23053/5-107-9	INSULATION, SLEEVING, HEAT SHRINKABLE	1.50 (3.81)
3	150K0201-1/3	M23053/5-107-0	INSULATION, SLEEVING, HEAT SHRINKABLE	4.00 (10.16)

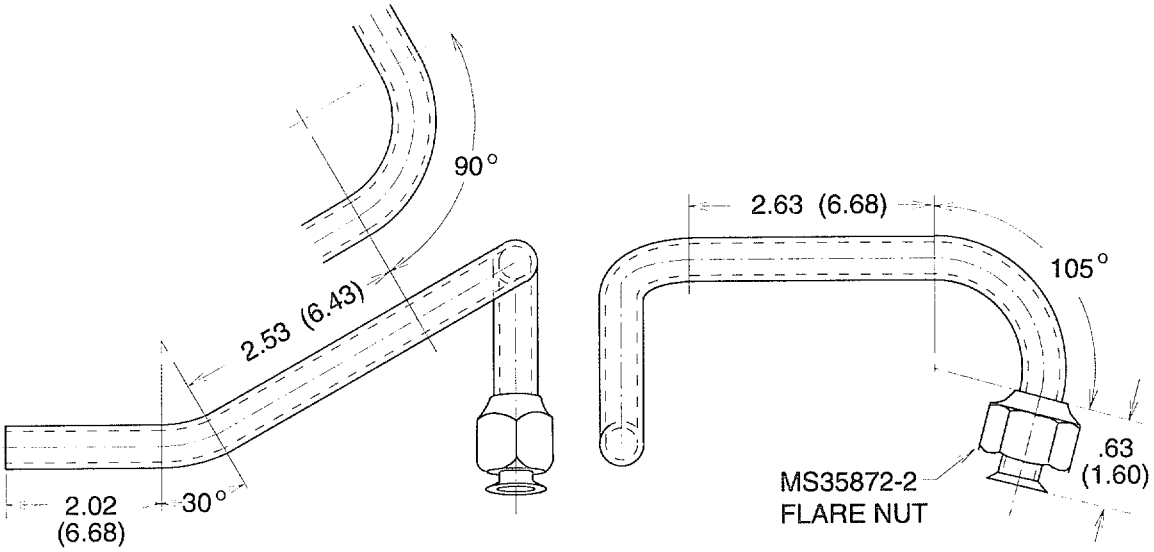
Figure F-23. Insulation Tubing



NOTE

1. FABRICATE FROM 0.375 (.953) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

Figure F-24. Tube, Elbow, to Interchanger, Part Number 150K0202

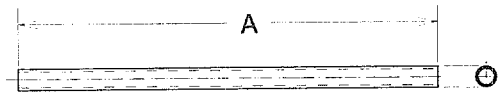


BLANK LENGTH 10.27 (26.09)

NOTE

1. FABRICATE FROM .25 (0.64) O.D. X 0.030 (0.076) WALL ASTM B280 COPPER TUBING

Figure F-25. Tube, Expansion Valve Equalizer, Part Number 150K0203-1/T

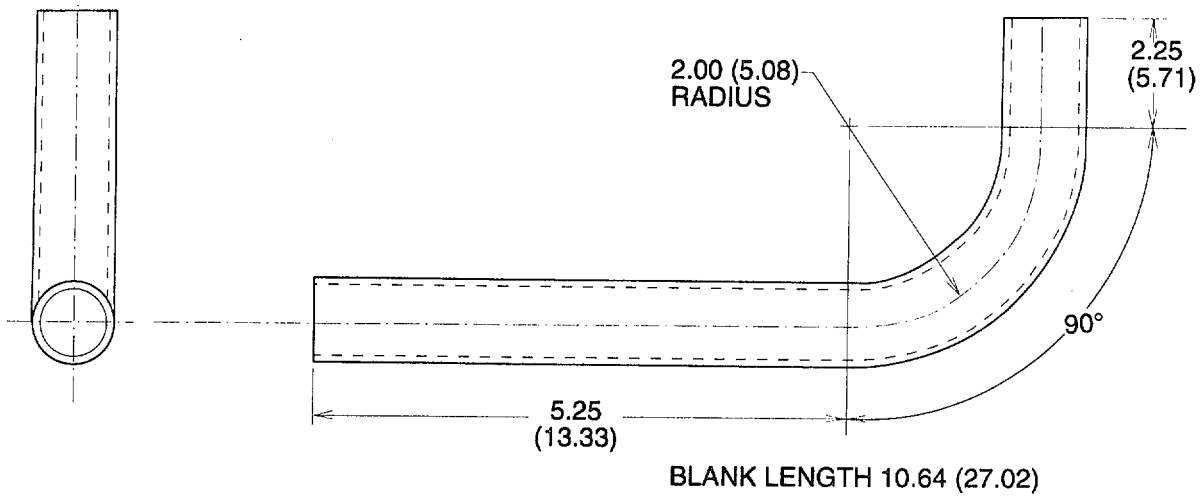


ITEM	PART NO.	DIM "A"
1	150K0206-1/3	108.00 (274.32)
2	150K0206-3/3	60.00 (152.40)
3	150K0206-5/3	39.96 (101.50)

NOTE

1. FABRICATE FROM .125 (.318) O.D. X 0.030 (0.076) WALL ASTM B280 COPPER TUBING

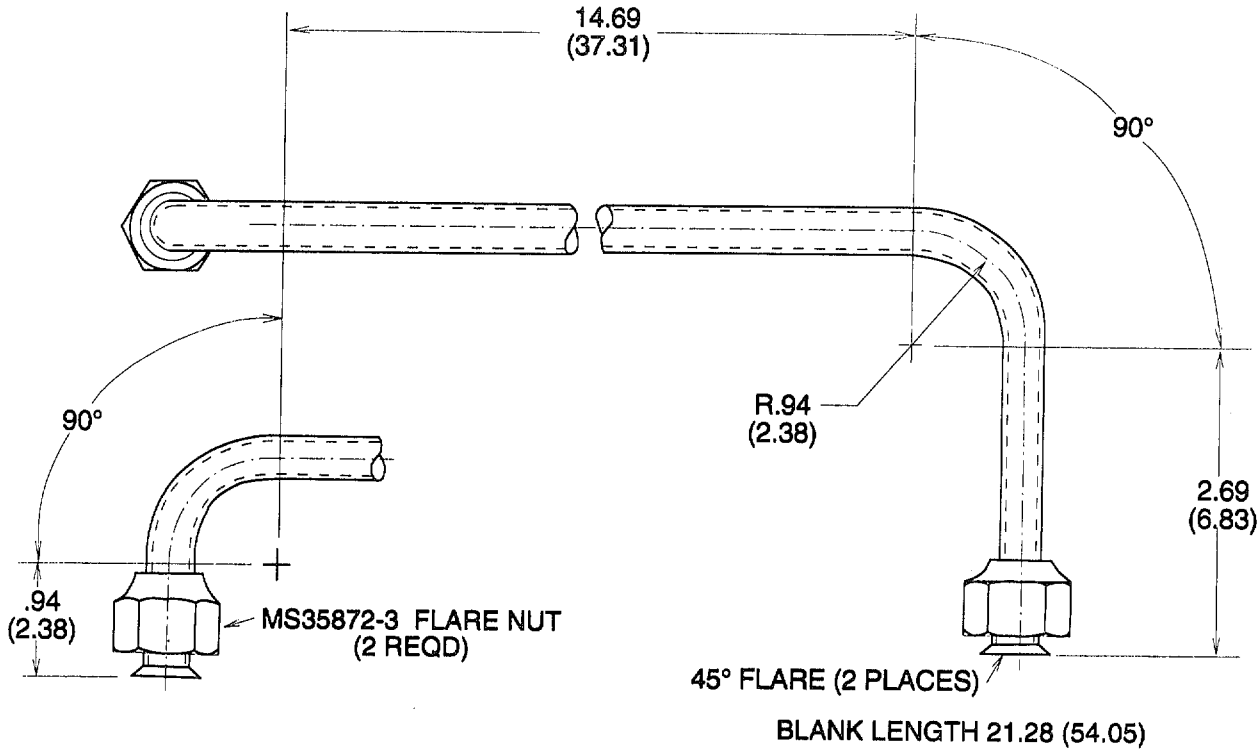
Figure F-26. Capillary Lines, Part Number 150K0206-1/3, -3/3, and -5/3



NOTE

1. FABRICATE FROM .875 (2.22) O.D. X 0.045 (.114) WALL ASTM B280 COPPER TUBING

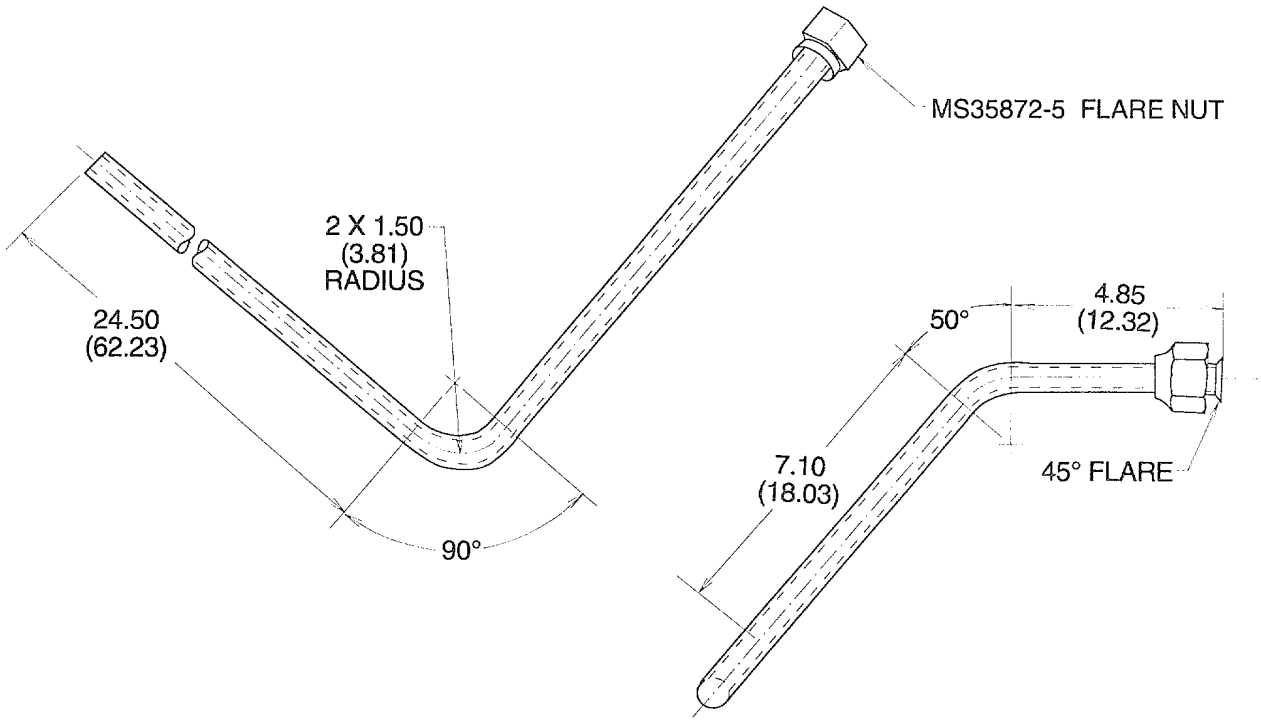
Figure F-27. Tube, Isolator to Compressor, Part Number 150K0208



NOTE

1. FABRICATE FROM .375 (.953) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

Figure F-28. Tube, Strainer, to Solenoid, Part Number 150K0212-1/T

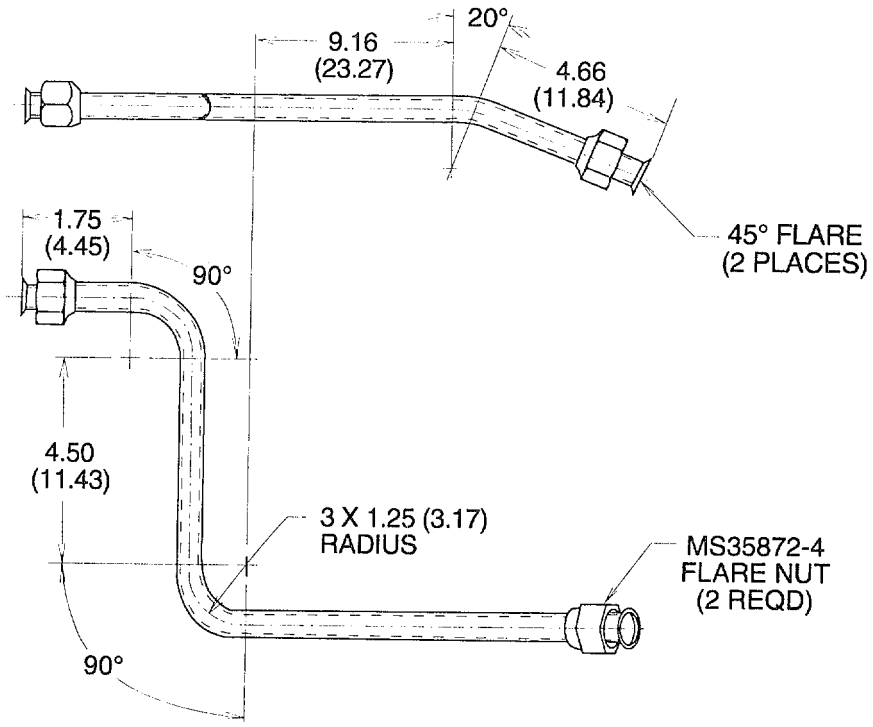


BLANK LENGTH 40.12 (101.90)

NOTE

1. FABRICATE FROM .625 (1.587) O.D. X 0.035 (0.088) WALL ASTM B280 COPPER TUBING

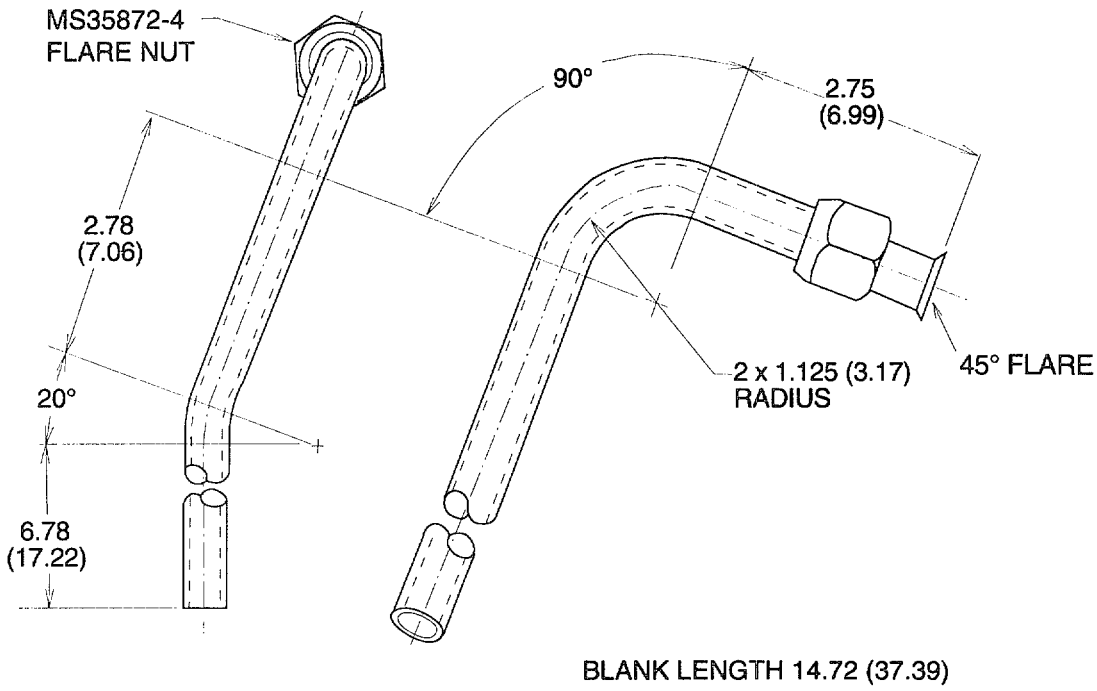
Figure F-29. Tube, Receiver Inlet, Part Number 150K0214-1/T



NOTE

1. FABRICATE FROM .500 (1.27) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

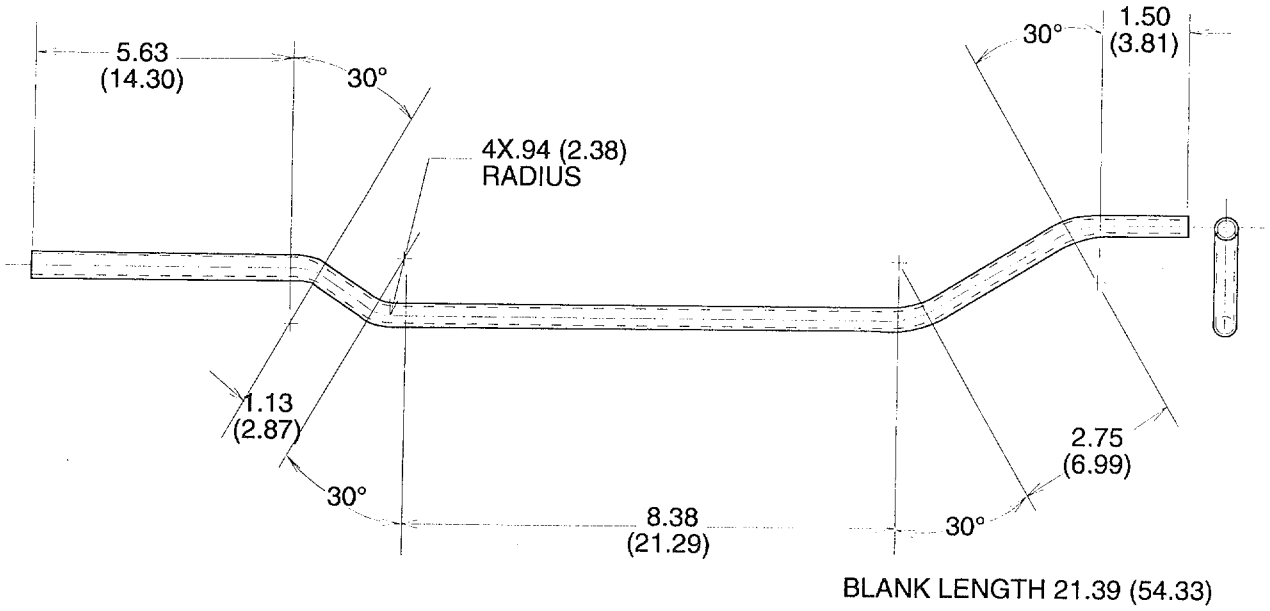
Figure F-30. Tube, Receiver Outlet to Drier, Part Number 151K0215-1/T



NOTE

1. FABRICATE FROM .500 (1.27) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

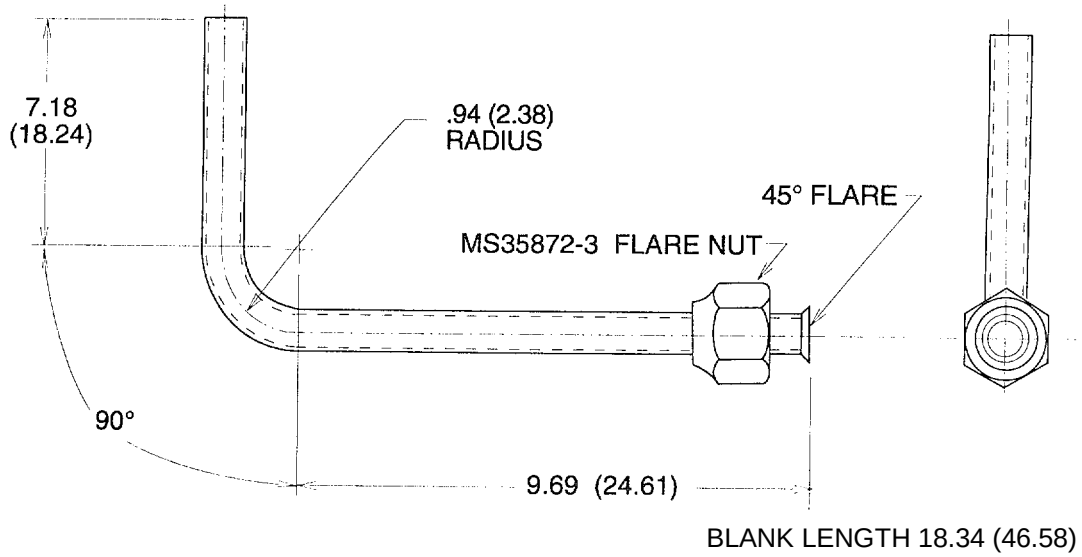
Figure F-31. Tube, Drier to Reducer, Part Number 150K0216-1/T



NOTE

1. FABRICATE FROM .375 (.952) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

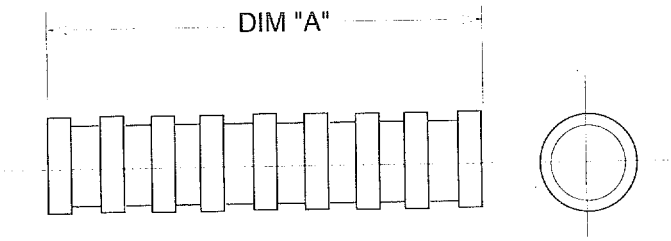
Figure F-32. Tube, Tee to Hand Valve, Part Number 150K0217



NOTE

1. FABRICATE FROM .375 (.953) O.D. X 0.032 (0.081) WALL ASTM B280 COPPER TUBING

Figure F-33. Tube, Sight Glass to Elbow, Part Number 150K0218-1/T

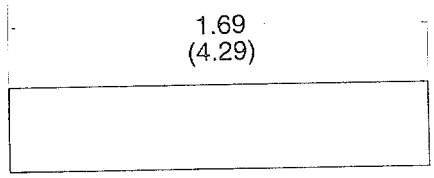


ITEM	PART NO.	DIM "A"
1	51206-7	7.00 (17.78)
2	51206-15	15.00 (38.1)
3	51206-25	25.00 (63.5)
4	51206-39	39.00 (99.06)

NOTE

1. FABRICATE FROM (1W654) PLS-1/2 (OR EQUAL) LOOM

Figure F-34. Loom 11/2 I.D. Part Number 51206-7, -15, -25, and -39



NOTE

1. FABRICATE FROM (70563) 1332 X 1.125 (2.858) WIDE

Figure F-35. Tape, Adhesive, Part Number 8337032-4

APPENDIX G

MANDATORY REPLACEMENT PARTS

Item Number	Nomenclature	Part Number	
1	Lock Washer	500K1950-3	(94833)
2	Gasket	17-10811-05	(10855)
3	Lock Washer	500K1950-2	(94833)
4	Rivet	13214E3789-2	(97403)
5	Rivet	13214E3789-5	(97403)
6	Lock Washer	500K1950-1	(94833)
7	Lock Washer	500K1950-5	(94833)
8	Self Locking Nut	500K1927-1	(94833)
9	Lock Washer	500K1950-8	(94833)
10	Gasket	774-5035	(62445)
11	Self Locking Nut	52054-9	(94833)
12	Self Locking Nut	500K1927-3	(94833)
13	Lock Washer	500K1950-4	(94833)
14	Self Locking Nut	500K1927-2	(94833)
15	Self Locking Nut	500K1927-5	(94833)
16	Lock Washer	500K1950-6	(94833)
17	Self Locking Nut	500K1927-6	(94833)
18	Gasket	17-21003	(10855)
19	Gasket	17-44124-00	(10855)
20	Gasket	17-55002	(10855)
21	Gasket	17-10218-02	(10855)
22	Gasket (1.0)	774-5076	(62445)

Item Number	Nomenclature	Part Number	
23	Lock Washer	17-10715	(10855)
24	Discharge Valve	17-40086	(10855)
25	Self Locking Nut	500K1927-4	(94833)
26	Suction Valve	17-44111-00	(10855)
27	Gasket	17-40078	(10855)
28	Gasket	774-5072	(62445)
29	Washer	777-5409	(62445)
30	Washer	777-5401	(62445)
31	Washer	777-5439	(62445)
32	Washer	777-5450	(62445)
33	Washer	777-5402	(62445)
34	Washer	777-5408	(62445)
35	Preformed Packing	775-7979	(62445)
36	Gasket (0.1)	774-5067	(62445)
37	Washer	777-6302	(62445)
38	Gasket	774-5062	(62445)
39	O-Ring	775-7949	(62445)
40	Gasket	774-4814	(62445)
41	Gasket	774-5124	(62445)
42	Gasket	774-5131	(62445)
43	Gasket	774-5125	(62445)
44	Lock Washer	500K1950-10	(94833)
45	Washer	777-5402	(62445)
46	O-Ring	775-7912	(6244:5)
47	Teflon Seal	24591	(97765)

Item Number	Nomenclature	Part Number	
48	Washer (1.0)	777-5435	(62445)
49	Washer (0.5)	777-5451	(62445)
50	Gasket (0.2)	774-5066	(62445)
51	Gasket (0.3)	774-5065	(62445)
52	Gasket	774-5108	(62445)
53	Gasket (0.2)	774-5075	(62445)

ALPHABETICAL INDEX

A

Accumulator 5-31
Administrative Storage 4-67
Air Cleaner Replacement 4-49
Air Handling System 1-15
Alternator Replacement 5-45
Alternator Testing 4-57
Ammeter M1 Testing and Replacement 4-27
Assembly and Preparation for Use 2-4

B

Battery BT Testing And Replacement 4-35
Brazing/Debraze Procedure 5-9

C

Charging the Refrigerant System 5-12
Check Valve Replacement 5-22
Circuit Breaker CB1 Testing and Replacement 4-21
Cleaning 3-4
Common Tools and Equipment 4-1
Compound Gage Replacement 5-15
Compressor B1 Testing, Service, Repair, and Replacement 5-38
Compressor Pulley Replacement 4-41
Condenser Coil Guard Replacement 4-19
Condenser Coil Replacement 5-19
Condenser Fan Replacement 4-39
Condenser Top Panel Replacement 4-13
Continuous Duty Solenoid K5 Testing and Replacement 4-34
Control Panel Cover Repair 5-2
Control Panel Cover, Door Holder Clips, and Barrel Bolts Replacement 4-16
Control Panel Repair 5-3
Control Relays K1, K2 and K3 Testing and Replacement 4-24
Control Transformer T1 Testing and Replacement 4-32
Corrosion Prevention and Control 1-9
Cylinder Head Testing, Replacement, and Adjustment 5-42

D

Decals and Instruction Plates 2-8
Defrost Timer TM1 Testing and Replacement 4-30
Dehydrator Replacement 5-14
Destruction of Army Material to Prevent Enemy Use 1-3
Differential Oil Pressure Switch S5 Replacement 5-36
Discharging the Refrigerant System 5-7
Dual Pressure Control Switch S4 Replacement 5-37

E

Engine Drain Hose Replacement 4-61
Engine Oil Pressure Switch Testing and Replacement 4-51
Engine Oil Pump Inspection and Replacement 5-43
Engine Pulley Replacement 4-42
Engine Replacement 5-46
Engine Speed Switch S8 Replacement 4-31
Engine Temperature Switch Testing and Replacement 4-52

E
Equipment Characteristics, Capabilities and Features 1-10
Equipment Data 1-12
Evacuating the Refrigerant System 5-11
Evaporator Air Outlet Guard Replacement 4-17
Evaporator Coil Guard Replacement 4-18
Evaporator Coil Replacement 5-35
Evaporator Fan Replacement 4-40
Expansion Valve Replacement 5-34
F
Fan Clutch C1 Testing and Replacement 4-45
Fan Drive Shaft Replacement 5-4
Fault Controls And Indicators 2-2
Flange Bearings Replacement 4-44
Flywheel Replacement 5-44
Front Bottom Doors and Barrel Bolts Replacement 4-15
Fuel Filter Replacement 4-55
Fuel Gage Replacement 4-63
Fuel Pump Replacement 5-41
Fuel Return Hoses Replacement 4-60
Fuel Solenoid Testing And Replacement 4-53
Fuel Supply Hoses/Fuel Pipe Repair and Replacement 4-59
Fuel Tank Repair 4-65
Fuel Tank Replacement 5-47
Fuses F1 and F2 Testing and Replacement 4-23
G
Gasket (Heat Shield) Replacement 4-66
General 2-3, 3-3, 4-10, 6-1
Glow Plug Testing and Replacement 4-58
H
Heat Exchanger Replacement 5-33
Hourmeter M2 Testing and Replacement 4-26
Housing Repair 5-48, 6-2
I
Idler Pulley Replacement 4-43
In-Line Fuel Filter Replacement 4-62
Injection Pump Testing, Replacement, and Adjustment 5-40
Installation Instructions 4-6
Isolation Valves Replacement 5-30
L
Lamp Assembly DS1 Testing and Replacement 4-22
Leak Testing the Refrigerant System 5-10
Location and Description of Major Components 1-11
Long Term Storage or Shipment. 4-68
Lubrication 3-1, 4-9
M
Maintenance Forms, Records and Reports 1-2
Mandatory Replacement Parts 4-11
Metal Hose Assembly (Discharge) Replacement 5-23
Metal Hose Assembly (Suction) Replacement 5-24
Muffler Replacement 4-50
N
NBC Decontamination Procedures 2-10
Nozzle Testing and Replacement 5-39

O
Official Nomenclature, Names and Designations 1-6
Oil Filter Replacement 4-48
Operating Controls and Indicators 2-1
Operating System 1-13
Operation Under Inclement Weather 2-9
Operator Checks 2-6

P
Preliminary Adjustment of Equipment 4-8
Preliminary Servicing of Equipment 4-7
Preparation for Storage or Shipment 1-4
Pressure Gage Replacement 5-16
Pressure Regulator Valve (Crankcase) Replacement 5-21
Pressure Regulator Valve (Discharge) Replacement 5-20
Purging the Refrigerant System 5-8
Push Switches S9 and S10 Testing and Replacement 4-37

Q
Quality Assurance 1-5

R
Receiver Replacement 5-18
Refrigerant System Pressure Check 5-13
Refrigeration System 1-14
Refrigeration System Repairs 5-5
Remote Bulb Thermostat S2 Testing and Replacement 4-29
Repair Parts 4-3
Reporting Equipment Improvement Recommendations (EIR) 1-7

S
Scope 1-1
Sending Unit Replacement 4-64
Service Manifold Installation 5-6
Service Upon Receipt of Material 4-5
Shutdown Procedures 2-7
Side Condenser Doors and Barrel Bolts Replacement 4-14
Sight Indicator Replacement 5-27
Site and Shelter Requirements 4-4
Solenoid Valve L1 (Liquid Line) Replacement 5-28
Solenoid Valve L1 (Liquid Line) Testing and Repair 4-46
Solenoid Valve L2 (Defrost Line) Replacement 5-29
Solenoid Valve L2 (Defrost Line) Testing and Repair 4-47
Special Tools, TMDE, and Support Equipment 4-2
Starting Motor Replacement 4-54
Startup Procedures 2-5
Stop Valve (Defrost Line) Replacement 5-26
Stop Valve (Liquid Line) Replacement 5-25
Strainer Replacement 5-17

T
Temperature Switch S3 Replacement 4-36
Thermometer Testing and Replacement 4-33
Time Delay Relays TD1 and TD2 Testing and Replacement 4-25
Toggle Switch S1 Testing and Replacement 4-28
Troubleshooting 3-2, 4-12, 5-1
Tubing and Fittings Testing, Repair, and Replacement 5-32

V

V-Belts Replacement and Adjustment 4-38
Voltage Regulator Replacement 4-56

W

Warranty Information 1-8
Wires, Cables, and Harnesses Testing, Repair, and Replacement 4-20

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General, United States Army
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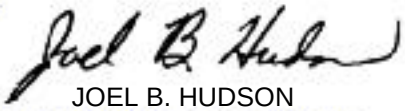

JOEL B. HUDSON
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'NEAR MEASURE

. 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

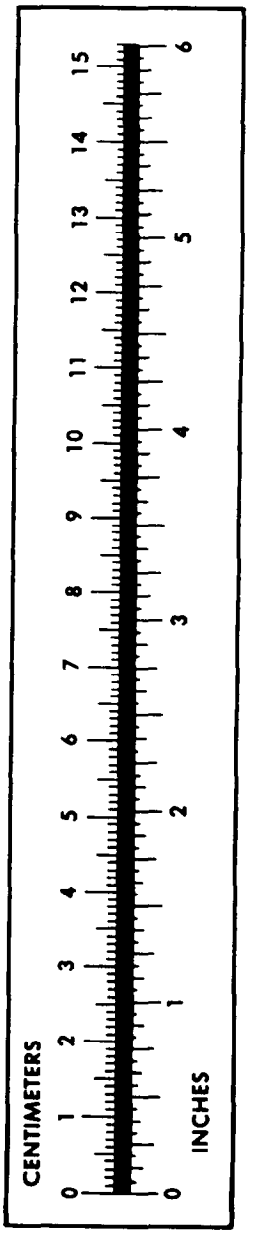
TEMPERATURE

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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