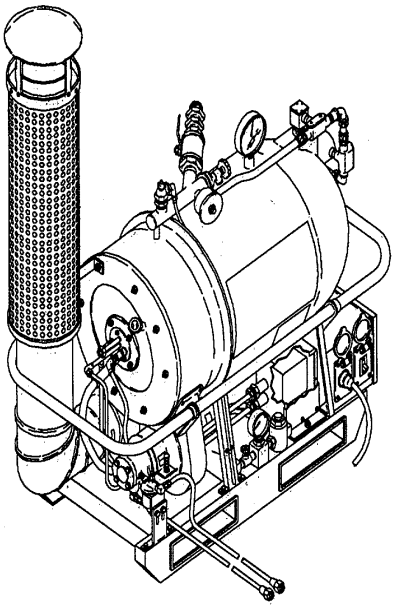
This copy is a reprint which includes current pages from changes 1 and 2.

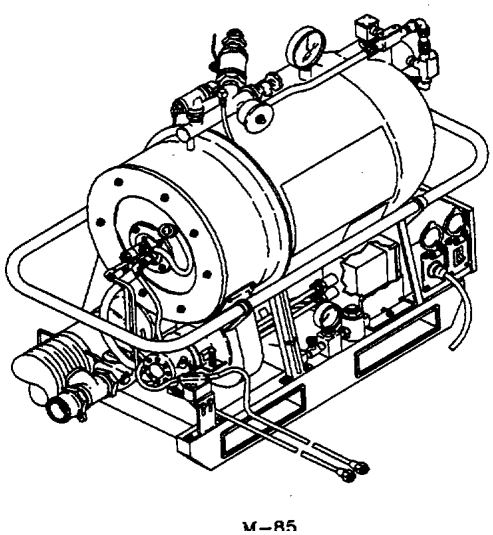
TECHNICAL MANUAL

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FOR HEATER, WATER, LIQUID FUEL

M-80/NSN: 4520-01-162-0385
M-85/NSN: 4520-01-237-3719



M-80



M-85

HEADQUARTERS, DEPARTMENT OF THE ARMY
31 AUGUST 1993

WARNING

Exposed fuel and fuel vapor can ignite or explode, resulting in possible serious injury or death. Observe proper safety precautions when servicing the heater fuel system. Ensure that the heater is cold before servicing the burner.

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire. Do not work on fuel system when burner is hot. Fuel can be ignited by hot burner. Shut off motor and do not smoke when working on fuel system.

WARNING

Drycleaning solvent, P-D-680 (Item 14, Appendix F) is potentially dangerous. Avoid repeated or prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well ventilated places.

WARNING

Lethal voltage is present when the water heater is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

WARNING

Hot water under pressure is present in the water heater. Do not attempt to work on the plumbing until the water heater is cooled down.

WARNING

Do not work on live circuits. Disconnect power before working on live circuits. Contact with the high voltage present in the water heater can cause severe injuries or death.

Refer to FM 21-11 for first aid.

CHANGE

NO.2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 7 December 1994

Operator's, Unit and Direct Support Maintenance Manual
Including Repair Parts and Special Tools List
for

HEATER, WATER, LIQUID FUEL
M-W/NSN: 4520-01-162-0385
M-85/NSN: 4520-01-237-3719

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

TM 10-4520-259-13&P, dated 31 August 1993, is changed as follows:

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

Remove pages	Insert pages
2-21 through 2-24	2-21 through 2-24
4-19 and 4-20	4-19 and 4-20
4-25 and 4-26	4-25 and 4-26
4-29 and 4-30	4-29 and 4-30
4-35 through 4-40	4-35 through 4-40
4-43 through 4-56	4-43 through 4-56
5-9 and 5-10	5-9 and 5-10
5-15 through 5-28	5-15 through 5-28
5-41 and 5-42	5-41 and 5-42
5-45 and 5-46	5-45 and 5-46
F-3/(F-4 blank)	F-3/(F-4 blank)

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

By Order of the Secretary of the Army:

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

Official:

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

07760

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6159, requirements for TM 10-4520-259-13&P.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 FEBRUARY 1994

Operator's, Unit, and Direct Support Maintenance Manual
Including Repair Parts and Special Tools List
for
HEATER, WATER, LIQUID FUEL
M-80/NSN: 4520-01-162-0385
M-85/NSN: 4520-01-237-3719

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

TM 10-4520-259-13&P, 31 August 1993, is changed as follows:

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

Remove pages	Insert pages
i through iv	i through iv
C-1 through C-11	C-1 through C-63

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

By Order of the Secretary of the Army:

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

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
06121

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25-E, block no. 6159, requirements for TM 10-4520-259-13&P.

TECHNICAL MANUAL

NO. 10-4520-259-13&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 31 AUGUST 1993

TECHNICAL MANUAL

Operator's, Unit and Direct Support Maintenance Manual
Including Repair Parts and Special Tools List
for
Heater, Water, Liquid Fuel
M-80/NSN: 4520-01-162-0385
M-85/NSN: 4520-01-237-3719

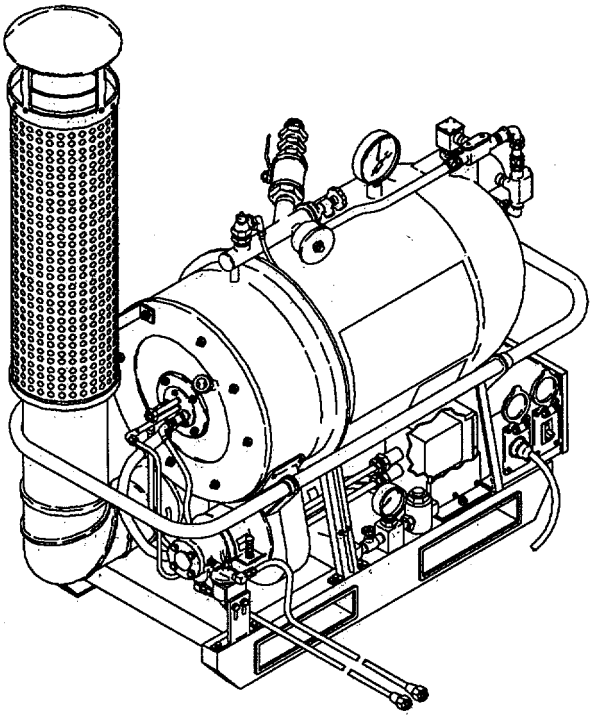
Current as of 20 January 1994

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

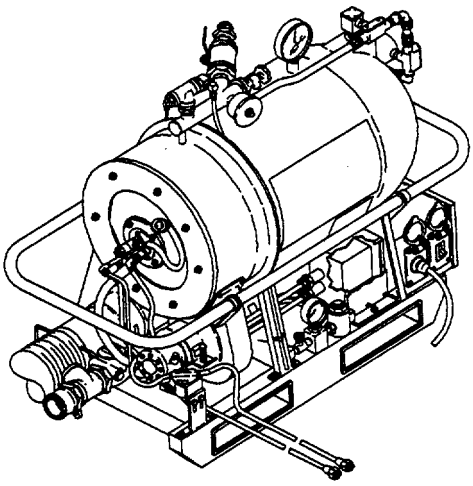
You can help improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army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

.

TABLE OF CONTENTS



M-80



M-85

Figure 1-0. Heater, Water, Liquid Fuel M-80 and M-85

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE. This manual provides operating and operator's, unit and direct support maintenance instructions, including the repair parts and special tools listing for the following equipment:

a. Equipment Name	Model Number
Heater, Water, Liquid Fuel	M-80
Heater, Water, Liquid Fuel	M-85

b. Purpose of Equipment. The M-80 and M-85 Water Heaters are designed to provide heated water to the M-80 Bath Unit and M-85 Field Laundry respectively.

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; DA Pam 738-751, Functional User's Manual for the Army Maintenance Management System - Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE. Department of the Army regulations and procedures for the destruction of equipment to prevent enemy use are contained in TM-750-244-3.

1-4. PREPARATION FOR STORAGE AND SHIPMENT. Procedures for the preparation of the M-80 and M-85 heaters for storage and shipment are described in paragraph 4-24.

1-5. QUALITY ASSURANCE. All maintenance functions will be inspected to assure that applicable Quality Assurance standards are being met. Refer to TM 9-450 and TM 9-237 for metal repair and welding standards respectively.

1-6. NOMENCLATURE CROSS-REFERENCE LIST.

Common Name	Official Nomenclature
Water Heater	Heater, Water, Liquid Fuel, M-80 and M-85

1-7. LIST OF ABBREVIATIONS.

CPC	Corrosion Prevention Control
EIR	Equipment Improvement Report
HZ	Hertz
MWO	Modification Work Order
kPa	Kilopascal(s)
NBC	Nuclear, Biological, Chemical
U/M	Unit of Measure
UOC	Usable on Code

1-8. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If your water heater 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 us at Commander, US Army Aviation and Troop Command, Attn: AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

1-9. WARRANTY INFORMATION. The water heater is warranted for 12 months. The warranty starts on the date found in block 23, DA Form 2408-5 in the logbook. Report all defects in material and workmanship to your supervisor, who will take the appropriate action. Complete warranty information for the M-85 water heater can be found in TB 10-3510-220-24

1-10. SAFETY, CARE, AND HANDLING.

a. General. A new water heater is preserved, packaged, and crated to meet military requirements for domestic shipment. The heater is shipped with all necessary attachments for normal operation.

WARNING

Have all personnel clear the area before lifting the water heater. Death or serious injury could result if the water heater falls on an individual.

b. Unloading Instructions. The crated water heater may be lifted by using a fork lift, crane, or other approved lifting device with capacity of at least 1065 pounds (483 kg). If a crane is used, arrange slings under packing crate carefully to ensure crate will not tip. If a fork lift is used, slide the blades directly under the crate between skid blocks.

c. Uncrating. Carefully uncrate the heater. Ensure that components are not damaged during the process.

1-10. SAFETY, CARE, AND HANDLING. (CONT)

WARNING

Do not leave nails and other debris scattered around area. Injuries to personnel could result.

NOTE

Do not destroy crate. It can be re-used. Remove and retain shipping documents.

d. Unpacking. Unpack all small components packaged and stored around the water vessel. These components can easily be lifted and removed from the packing skid by one or two persons. Remove water vessel assembly. It can be lifted and transported with a fork lift. Insert the fork lift tines into the fork lift pockets of the water vessel skid completely before attempting to lift it.

NOTE

Be sure all components are accounted for. Check all packaging material for loose parts before discarding.

e. Servicing. Remove all protective compounds and covering such as wax paper, waterproof tape, and barrier material. Using a dry cloth, remove all preservatives and grease from unpainted, threaded, or exposed surfaces.

f. Inspection.

(1) Unwrap and examine separately packaged items to ensure these are not damaged. Check for dents, cracks, broken parts, and loose or kinked connections.

(2) Check all instruments for damage.

(3) Check Appendix C and ensure that all parts have been supplied.

(4) Report any deficiencies or damage to your supervisor.

1-11. CORROSION PREVENTION AND CONTROL (CPC). Corrosion Prevention and Control of Army materiel is a continuing concern. It is important that any water heater corrosion problems be reported so that the problem can be corrected and improvements can be made to prevent the problem in the future. 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. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion"'. "rust". "deterioration" or "cracking" will ensure that the information is identified as a CPC problem. Send the form to: Commander, US Army Aviation and Troop Command, Attn: AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-12. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

NOTE

The characteristics, capabilities and features described in this section apply to both types of heaters unless otherwise indicated.

Characteristics, Capabilities and Features

- Portable
- Mounted on skid with forklift pockets
- Provides 9 gallons of water per minute at 100°F (37°C) temperature rise
- Multifuel capability
- Simple to set up, operate, and maintain

1-13. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. While the nomenclature of the components for both types of heaters is similar, Figures 1-1 and 1-2 show the visual differences between the M-80 and M-85 heaters, respectively.

1 Water Vessel. Contains water to be heated.

2 Temperature Limit Control Assembly. Consists of the operating and high limit controls. The operating control regulates the burner to maintain water temperature between 100° and 210°F (370 and 980C). The high limit control deactivates the fuel solenoid valve when water temperature exceeds 190°F (88°C).

1-13. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. (CONT)

3 Control Box Assembly. Contains operating control instruments.

4 Ignition Transformer Assembly. Contains transformer and wiring for ignition.

5 Ignition Cables. Conduct power from the transformer to spark plugs on burner assembly.

6 Fuel Pressure Gage. Indicates fuel pressure during operation.

7 Skid Assembly. Provides mounting platform for heater. Incorporates fork lift pockets for handling.

8 Blower Assembly. Provides air to burner. Incorporates the blower and fuel pump motor, fuel filter, fuel pump and the air shutter assemblies.

9 Fuel Feeder Hose. Provides fuel to burner.

10 Fuel Return Hose. Returns fuel overflow.

11 Lower Manifold Assembly. Serves as water vessel intake.

12 Burner Assembly. Consists of the electrode holder mounting sparkplugs, UV scanner, ignition sight glass, and fuel nozzle assemblies.

13 Sight Glass Assemblv. Allows operator to observe ignition inside burner assembly.

14 Smoke Stack and Guard Assembly. Evacuates burner exhaust gases on M-80 water heater.

15 Exhaust Duct Assembly. Evacuates burner exhaust gases on M-85 water heater.

16 Pressure Relief Valve. Relieves pressure from water vessel when temperature exceeds prescribed limit.

17 Upper Manifold Assembly. Provides for hose connection to draw hot water. Houses pressure relief valve and high limit control.

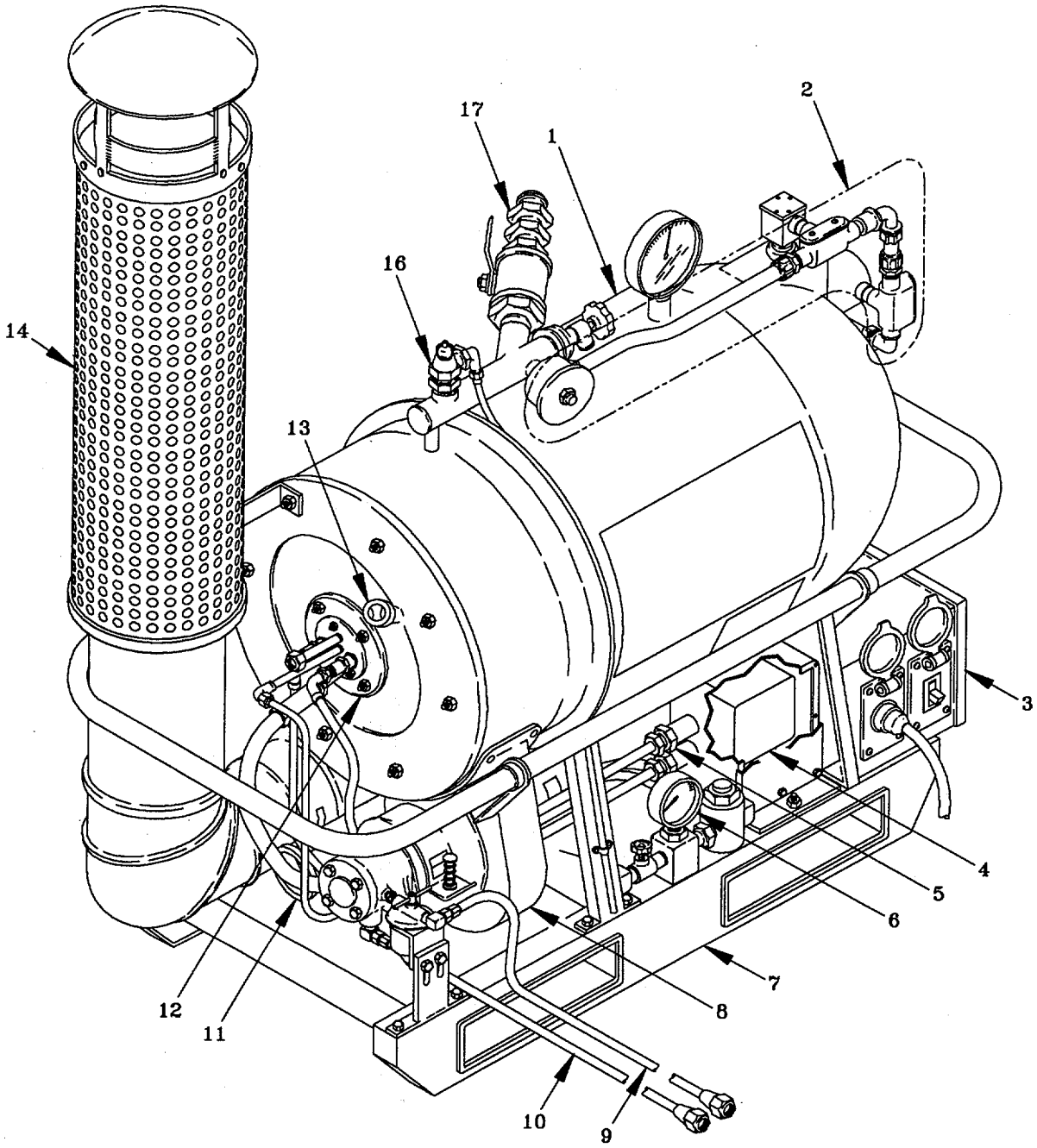


Figure 1-1. M-80 Water Heater

1-13. Location and Description of Major Components. (CONT)

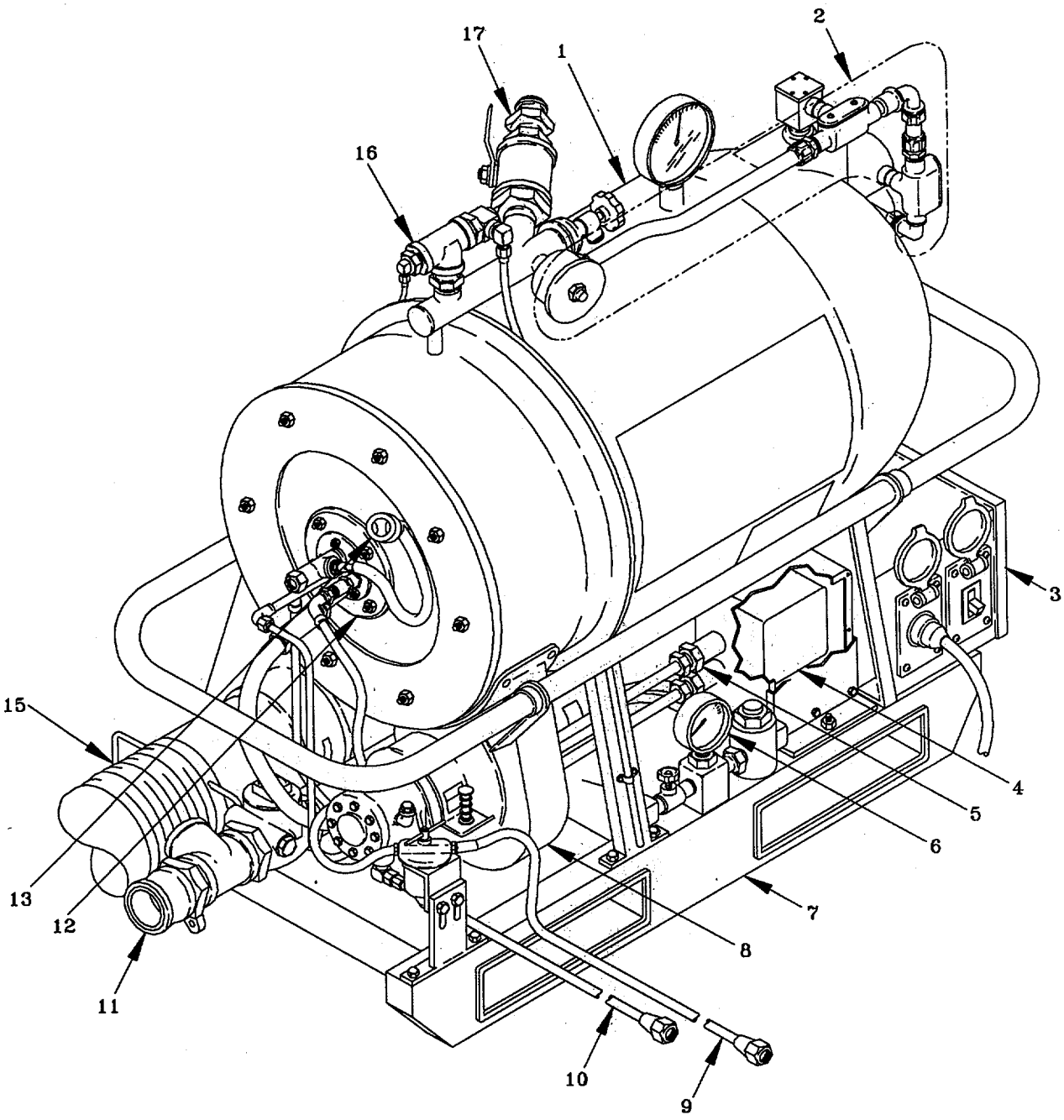


Figure 1-2. M-85 Water Heater

1-14. DIFFERENCES BETWEEN MODELS. Both types of heaters are based on the same design, however, minor differences in the following component assemblies exist due to different heater applications:

Upper Manifold Assembly
Lower Manifold Assembly
Control Box Assembly
Exhaust Assembly
Burner Head Assembly
Blower Assembly
Pressure Relief Valve Assembly

Specific differences in these component assemblies are addressed as applicable throughout the manual.

Ignition transformers procured after 1992 operate on one phase, 110 V ac. In addition, a retrofit kit will modify existing 208 V ac ignition transformers to 110 V ac.

1-15 EQUIPMENT DATA.

M-80 and M-85 Water Heaters.

(1) Water Heater.
Dimensions:
Length ..... 52 inches (132 cm)
Height ..... 47 inches (112 cm)
Width ..... 27 inches (69 cm)
Weight (approximate) ..... 465 pounds (211 Kg)

Capacity (Water) ..... 23.7 gallons (89.7 liters)

(2) Blower and Fuel Pump Motor.
Power Rating ..... 1/3 horsepower (249 W)
Motor Speed ..... 3450 rpm

(3) Fuel Pump
Type ..... 2-stage gear
Pressure ..... 0-150 psi (0-1034 kPa)

SECTION III. PRINCIPLES OF OPERATION

1-16. DESCRIPTION. The Water Heater is a liquid fuel fired, water heating device that supplies hot water. The water heater raises the temperature of the incoming water and maintains it at the desired temperature. Heated water is then discharged through a manifold. The electric power (1.2 kw at 5.7 amps) required to operate the water heaters should be supplied by a self-contained portable 3 Kw, 60 Hz, 208 V, 3-phase power generator. All electrically operated components of the water heater are grounded through a fifth wire.

CHAPTER 2
OPERATING INSTRUCTIONS

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

2-1. GENERAL. This chapter contains instructions for the operation of the water heaters.

2-2. OPERATOR'S CONTROLS AND INDICATORS. This section provides the operator with instructions on the use of the various controls and instruments on the water heater. Controls are located on the water heater as shown in Figure 2-1.

2-2. OPERATOR'S CONTROLS AND INDICATORS. (CONT)

1	Hot Water Output Valve	Controls hot water output from the water heater.
2	Water Temperature Gage	Indicates temperature of water inside water heater.
3	High Limit Control	Preset at the factory. Operates when operating control (4) fails. Deactivates fuel solenoid valve when water temperature exceeds 190°F (88°C) turning off fuel to the water heater.
4	Operating Control	Calibrated for water temperatures from 32° to 250°F (0° to 121°C). Controls water heater burner to maintain water temperature between 100° and 210°F (37° and 98°C).
5	Power switch	Controls all electrical power to the water heater.
6	Fuel Pressure Gage	Indicates pressure of fuel supplied to the burner. Normal pressure is listed in Table 2-1.
7	Fuel Shutoff Valve	Controls fuel flow to burner. 1. Clockwise rotation closes valve. 2. Counterclockwise rotation opens valve.
8	Blower Shutter	Controls amount of air to burner. 1. Turned downward increases air to burner. 2. Turned upward decreases air to burner.
9	Combustion Chamber Sight Glass	Enables operator to visually check combustion in combustion chamber.
10	Burner Assembly Sight Glass	Enables operator to observe electrodes spark.
11	Motor Contactor Reset	Overload reset device breaks the circuit to each blower motor three-phase windings when motor inputs are overloaded.

12	Flame Safeguard	Lockout switch for flame safeguard Control Reset control system. When pressed, resets electrical circuit to allow ignition.
13	Buzzer	Indicates low water condition or ignition failure.
14	Hour Meter	Indicates cumulative time burner has been in operation to allow maintenance at prescribed time intervals.
15	Vent Valve	Allows operator to bleed air from the water heater.
16	Petcock Valve	Allows operator to drain excess fuel from combustion chamber.
17	Drain Valve (M-85 only)	Allows operator to drain water from water vessel.
18	UV Scanner	Initiates safety shutdown when flame inside burner goes out.
19	Burner Assembly	Ignites fuel and controls flame.

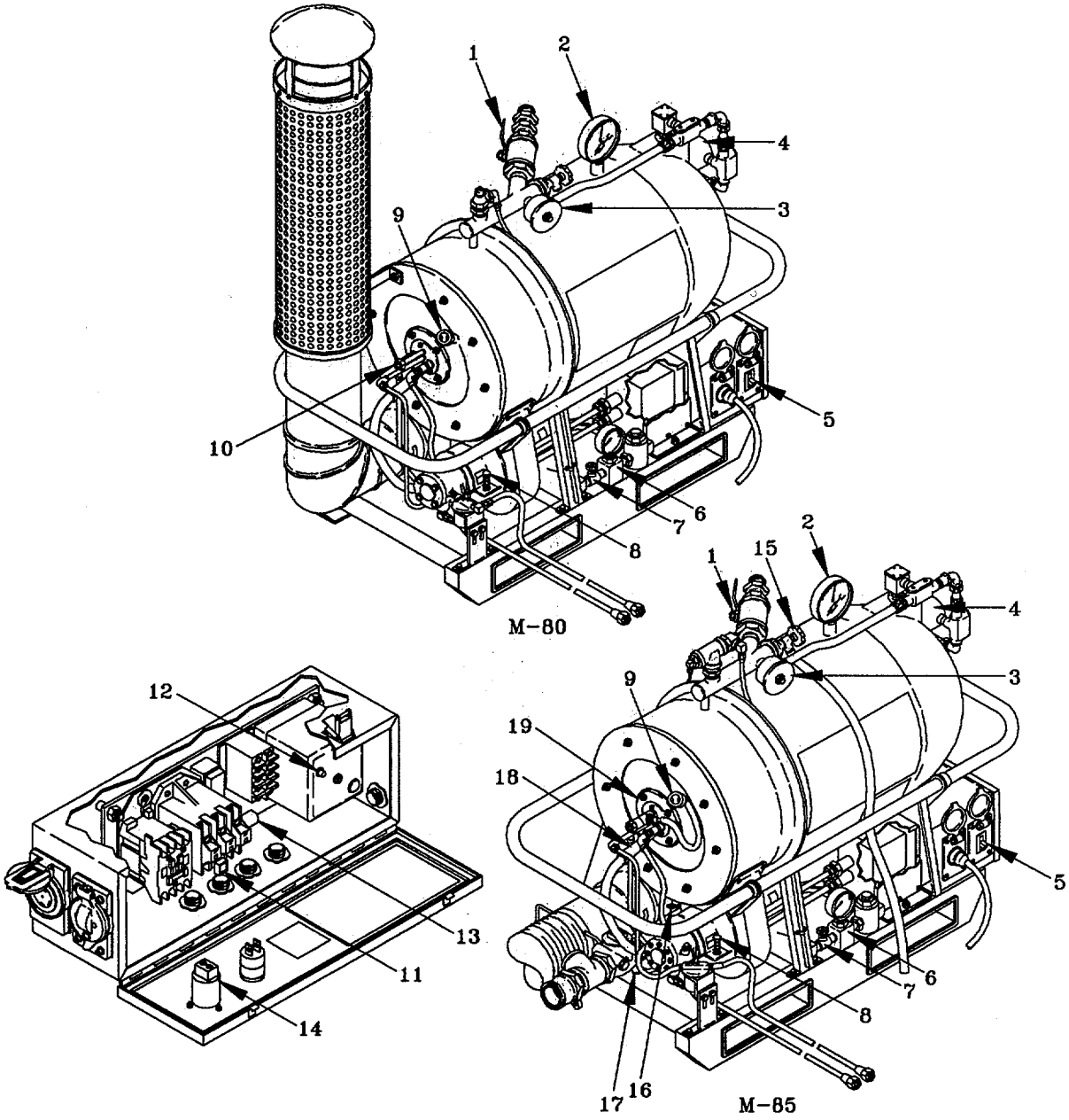


Figure 2-1. Water Heater Controls and Indicators

SECTION II. OPERATOR'S PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-3. GENERAL. Preventive Maintenance Checks and Services (PMCS) means systematic caring, inspecting and servicing of equipment to keep it in good condition and to prevent breakdowns. As the water heater's operator, your mission is to:

a. Be sure to perform your PMCS each time you operate the water heater. Always do your PMCS in the same order, so it gets to be a habit. Once you've had some practice, you'll quickly spot anything wrong.

b. Do your BEFORE PMCS just before you operate the water heater. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

c. Do your DURING PMCS while you operate the water heater. During operation means to monitor the water heater and its related components while it is actually being operated. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

d. Do your AFTER PMCS right after operating the water heater. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

e. Do your WEEKLY PMCS once a week.

f. Do your MONTHLY PMCS once a month.

g. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, and after operation, unless you can fix them. You DO NOT need to record faults that you can fix.

h. Be prepared to assist unit maintenance when they work on the heater. Perform any other services when required by unit maintenance.

2-4. PMCS PROCEDURES.

a. Your Preventive Maintenance Checks and Services Table 2-1 lists inspections and care required to keep your water heater in good operating condition. It is set up so you can make your BEFORE OPERATION checks as you walk around the water heater.

b. The "ITEM NO." column of Table 2-1 indicates sequence of inspection. Use this column to obtain the numbers for the "TM Item No." column of DA Form 2404.

2-4. PMCS PROCEDURES. (CONT)

c. The "INTERVAL" column of Table 2-1 tells you when to do a certain check or service.

d. The "ITEM TO CHECK/SERVICE" column identifies and illustrates the item.

e. The "PROCEDURE" column of Table 2-1 tells you how to do required checks and services. Carefully follow these instructions. If you do not have tools, or if the procedure tells you to, notify your supervisor.

NOTE

The terms "ready/available" and "mission capable" refer to same status: Equipment is on hand and ready to perform its combat missions. (See DA Pam 738-750)

f. The "NOT FULLY MISSION CAPABLE IF:" column in Table 2-1 tells you when your water heater is nonmission capable and why the Water Heater cannot be used.

g. If the water heater does not perform as required, refer to Chapter 3, Section II., Troubleshooting.

h. If anything looks wrong and you can't fix it, write it on your DA Form 2404. IMMEDIATELY report it to your supervisor.

i. When you do your PMCS, you will always need a rag or two. The following are checks common to the water heater:

(1) Keep it clean. Dirt, grease, oil, and debris only get in the way and may cover up more serious problems. Clean as you work and as needed. Use dry cleaning solvent (P-D-680, Appendix F, Item 14) on all metal surfaces. Use soap and water when you clean rubber or plastic material.

(2) Rust and Corrosion. Check water heater body and skid for rust and corrosion. If any is found, report it to your supervisor.

(3) Bolts, Nuts and Screws. Check for obvious looseness, missing, bent, or broken condition. Look for chipped paint, bare metal, or rust around bolt heads. If you find a bolt, nut or screw you think is loose, tighten it or report it to your supervisor.

(4) Welds. Look for loose or chipped paint, rust or gaps, where parts are welded together. If you find a bad weld, report it to your supervisor.

(5) Electric Wires and Connectors. Look for cracked, frayed, or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Report any damaged wires to your supervisor.

(6) Hoses and Fluid Lines. Look for wear, damage, and leaks, and make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to your supervisor.

j. When you check for "operating condition", look at the component to see if it is serviceable.

2-5. CLEANING AGENTS.

WARNINGS

- DO NOT use diesel fuel or gasoline for cleaning. Death or serious injury could result.
- DO NOT SMOKE when using cleaning solvent. NEVER USE IT NEAR AN OPEN FLAME. Be sure there is a fire extinguisher nearby and use cleaning solvent only in well ventilated places. Flash point of solvent is 100°F (37°C)
- USE CAUTION when using cleaning solvents. Cleaning solvents evaporate quickly and can irritate exposed skin if contacted. In cold weather, contact of exposed skin with cleaning solvents can cause frostbite.

CAUTION

When cleaning water heater, it must be COLD (same temperature as outside air). DO NOT point water or steam directly at any electrical connection. DO NOT use high pressure water supply system. Damage to electrical system and other components may result.

2-5. CLEANING AGENTS. (CONT)

NOTE

Use only those authorized cleaning solvents or agents listed in Appendix F.

a. Cleaning the Water Heater.

(1) When using water to clean the heater; use a bucket and brush,or a hose that supplies regular household pressure. Keep water away from electrical parts or cover with plastic before cleaning.

(2) After cleaning, allow the water heater to air dry.

CAUTION

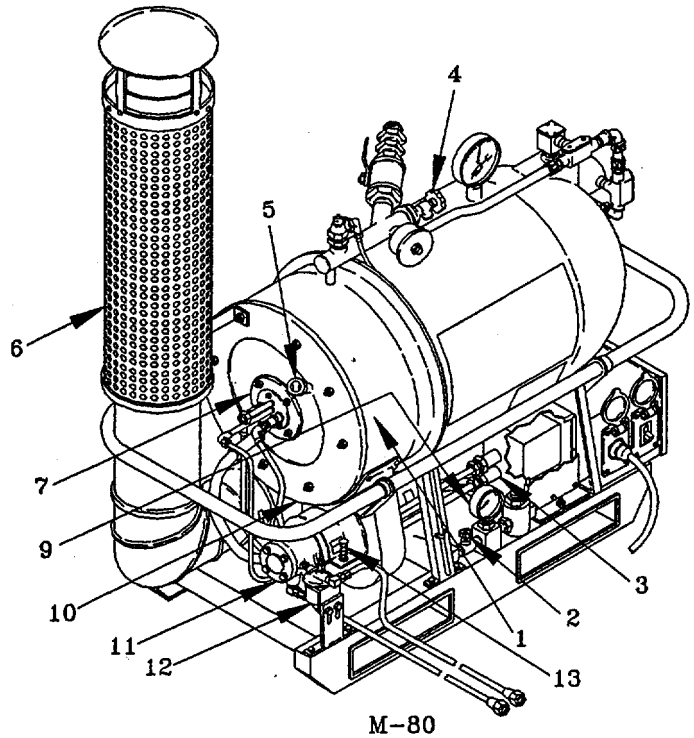
Keep cleaning solvents, gasoline and lubricants away from rubber and plastic parts. They will deteriorate material. (3) When cleaning rusty areas on metal parts, use dry cleaning agent (Item 14, Appendix F).

b. Leakage Definitions for Operator PMCS.

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops but not enough to cause drops to drip from the item being checked.
Class III	Leakage of fluid great enough to form drops that fall from the item being inspected.

CAUTION

Equipment operation is allowable with minor leakage such as Class I or Class II. However, consider fluid capacity of the system that is leaking. If in doubt, notify your supervisor. When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS instructions. Class III fluid leaks must be reported to your supervisor or unit maintenance.



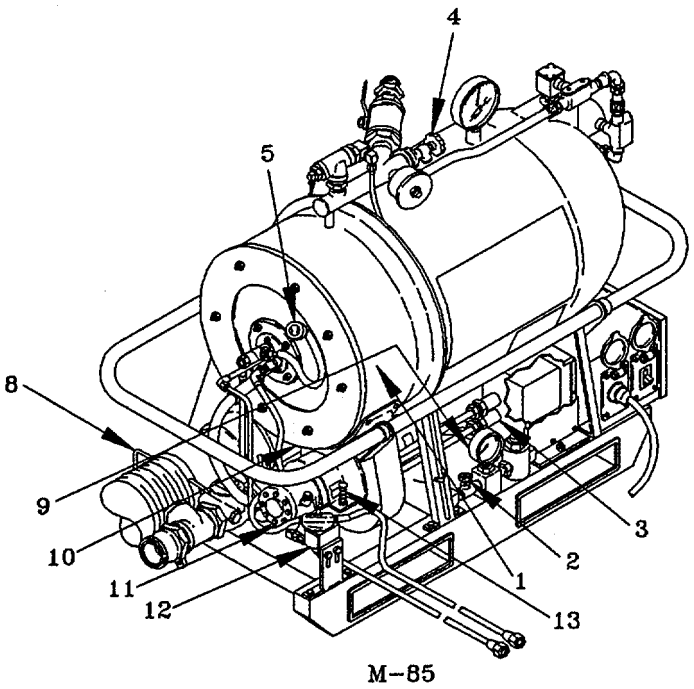


Figure 2-2. PMCS Routing Diagram

TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
1	Before	Water Heater	Inspect overall water heater for signs of obvious damage.	Water heater is damaged.
			NOTE Valve closes clockwise Valve opens counterclockwise	
2	Before	Fuel Shutoff Valve	Place valve in OPEN position. Check for catching or binding.	Valve catches or binds during rotation.
	After	Fuel Shutoff Valve	Place valve in CLOSE position. Check for binding or catching.	Valve catches or binds during rotation

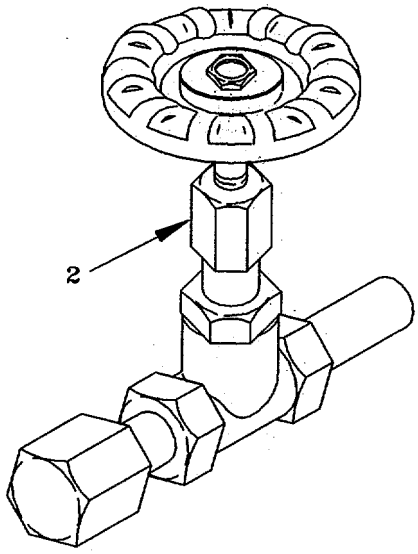
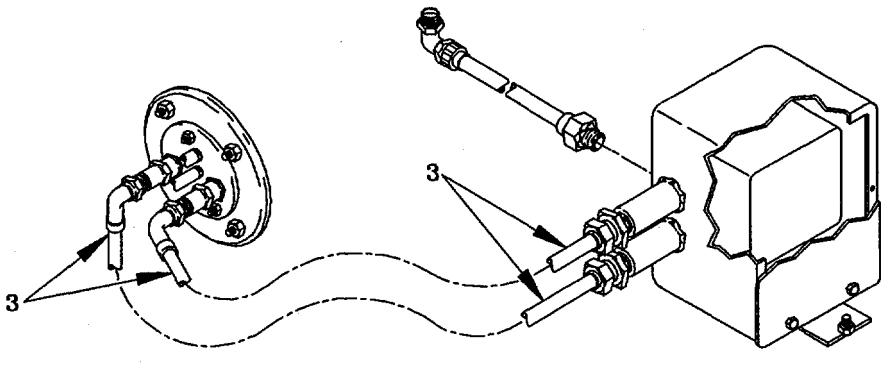
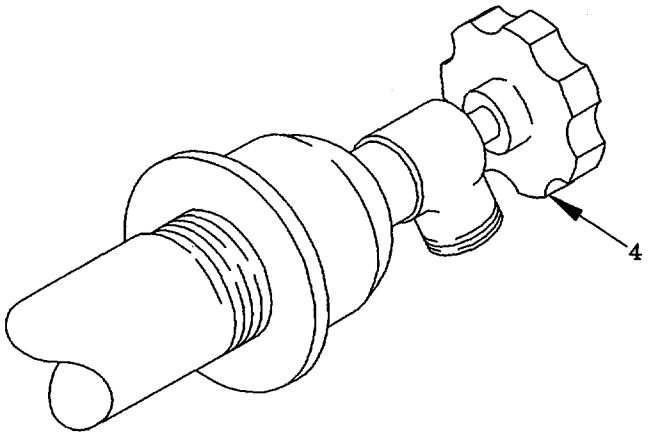


TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 - Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
3	Before	Ignition Cables	Inspect for crushed, broken or loose cables.	Cables are damaged.



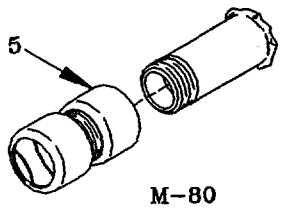
4	Before Valve	Vent	Place valve in CLOSE position. Check for binding or catching.	Valve catches or binds.



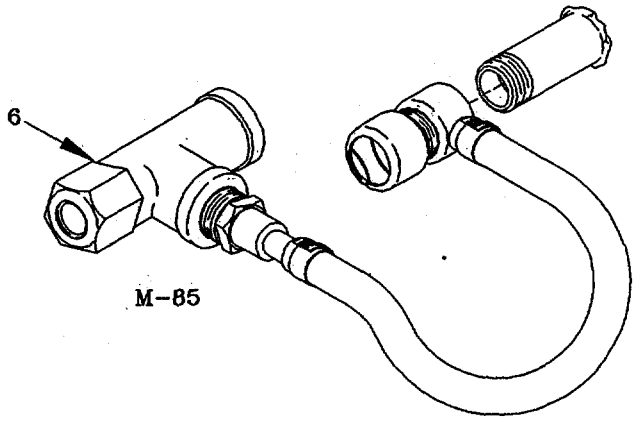
	After		Place valve in OPEN position. Check for binding or catching.	Valve catches or binds.

TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 - Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
5	Before	Sight Glass Assembly and clean.	Inspect for broken or missing glass. Check assemblies are secure	Glass is broken or missing.

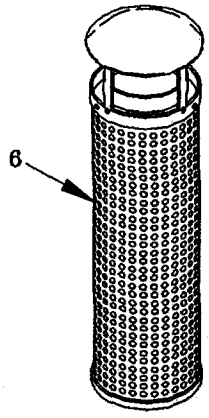


M-80



M-85

6	Before	Smoke Stack and Guard Assembly (M-80)	Check for tight, connections, breaks, leaks or foreign material lodged in pipes.	Defective or damaged exhaust system.



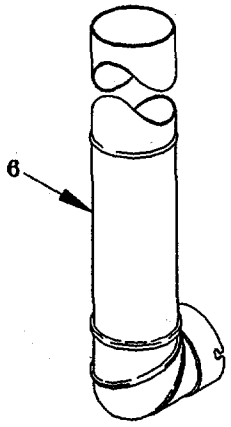
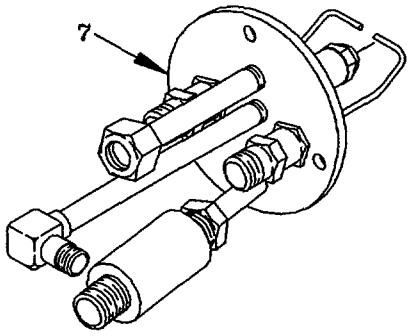
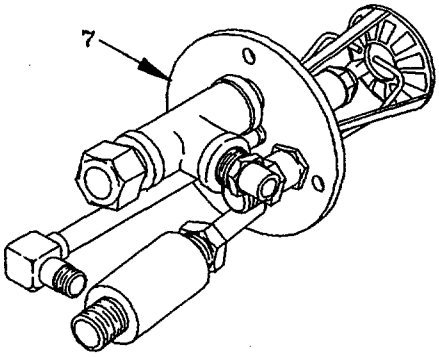


TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 - Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
7	During	Burner Head	Inspect for smoke.	Exhaust leaks from burner.

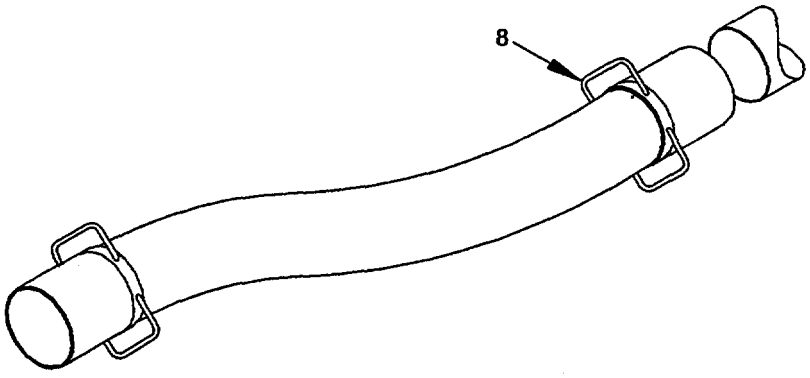


M-80



M-85

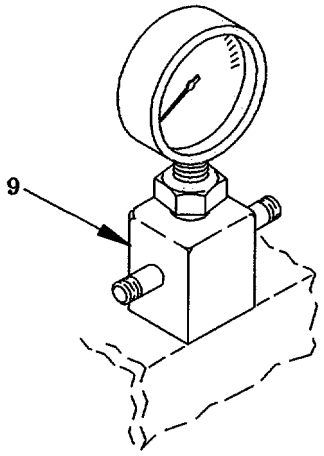
8	Before	Exhaust Duct (M-85)	Check ducts for damage, rust and secure mounting.	Ducts missing or damaged.



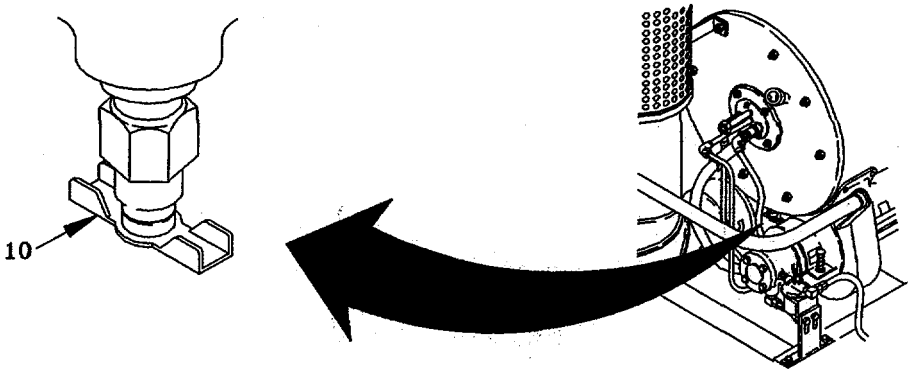
	During		Visually inspect duct for leaks.	Exhaust leaks.

TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 - Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
9	During	Fuel Pressure Gage	Check gage to ensure it reads 75 to 80 PSI (M80), 100 to 105 PSI (M85).	Gage does not read in proper range.



NOTE
Valve closes clockwise
Valve opens counterclockwise



10	After	Petcock Valve	Place valve in open position to drain excess fuel from combustion chamber	Chamber flooded

TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 - Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
11	During	Fuel Supply Assembly	Check fuel pump, line and filter for leaks, loose connections.	Fuel supply lines leak.
12	After	Fuel Filter	Perform operator maintenance on fuel filter as described in paragraph 3-9.	Fuel filter inoperative.

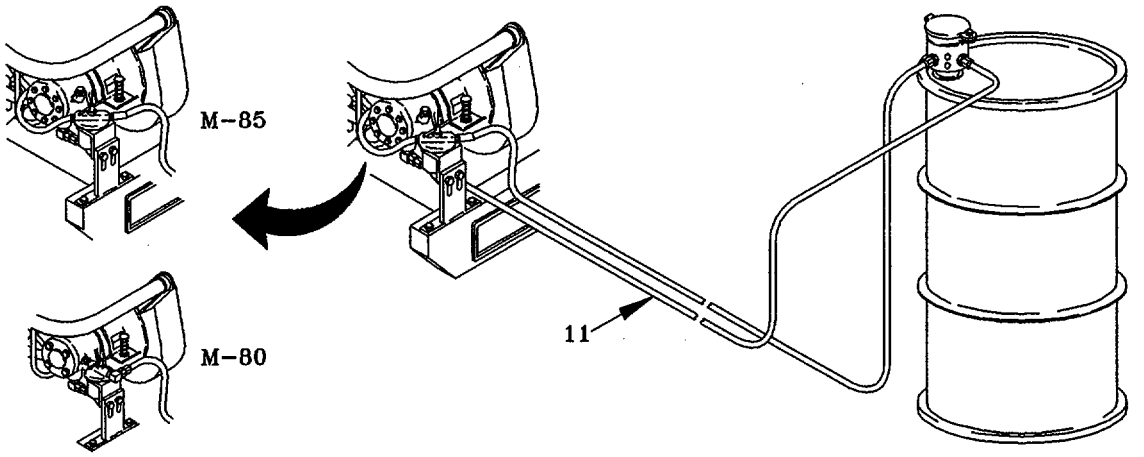
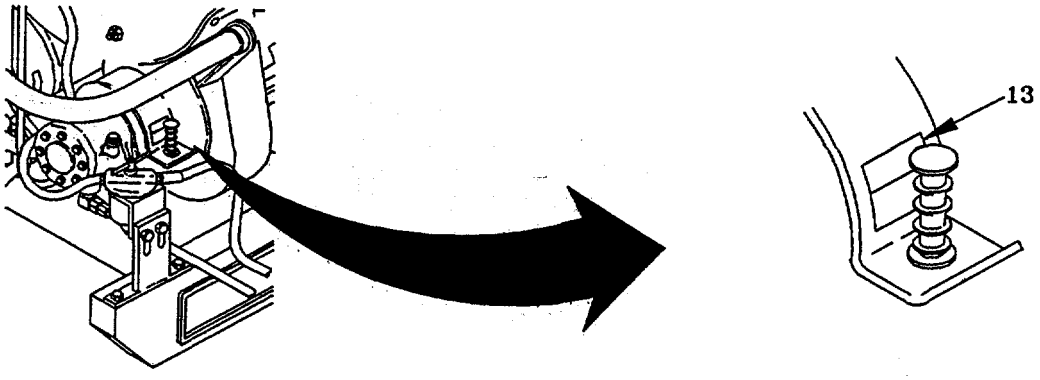


TABLE 2-1. Preventive Maintenance Checks and Services (PMCS)
Water Heater M-80 and M-85 Continued

Item No.	Interval	Location Item To Check/Service	Procedure	Not Fully Mission Capable If:
12	During	Air Shutter Assembly	Check exhaust gases for light heat haze. If haze is present, adjust shutter until exhaust gas is clear.	Blower shutter will not adjust.



SECTION III. OPERATION UNDER USUAL CONDITIONS

2-6. ASSEMBLY AND PREPARATION FOR USE. This section provides all instructions necessary to operate the water heaters under usual conditions.

2-7. SITE SELECTION.

WARNINGS

- Do not connect water heater to unapproved water supply. Contaminated water can cause illness or death.
- Without a pasteurization kit, the water source must be approved by the unit surgeon. Illness may result.

Select a site near a water source. The site should be level and accessible to tactical vehicles. Clear the area of all rocks and underbrush. Locate the water heater in proximity of the equipment with which it will be used. Set the heater on firm ground. If a pressurized source is to be used, discharge the water into an open reservoir, then draw it into the water heater with a water pump.

2-8. UNPACKING AND INSPECTION.
Components are packaged in reusable shipping crates. Unpack crates and visually inspect contents. Make sure that everything is there, including components of end item and basic issue items, as listed in Appendix D. Do not destroy shipping crates. Put the crates away for later use.

2-9. ASSEMBLY. (Fig. 2-3)
To assemble the water heater proceed as follows:

CAUTION

To prevent equipment damage, be sure that hose couplings are free of dirt or foreign matter and that coupling gaskets are in place before coupling hoses.

a. Place water heater (1) on level ground. If possible, arrange suitable shelter or wind break for water heater to conserve fuel.

2-9. ASSEMBLY. (CONT)

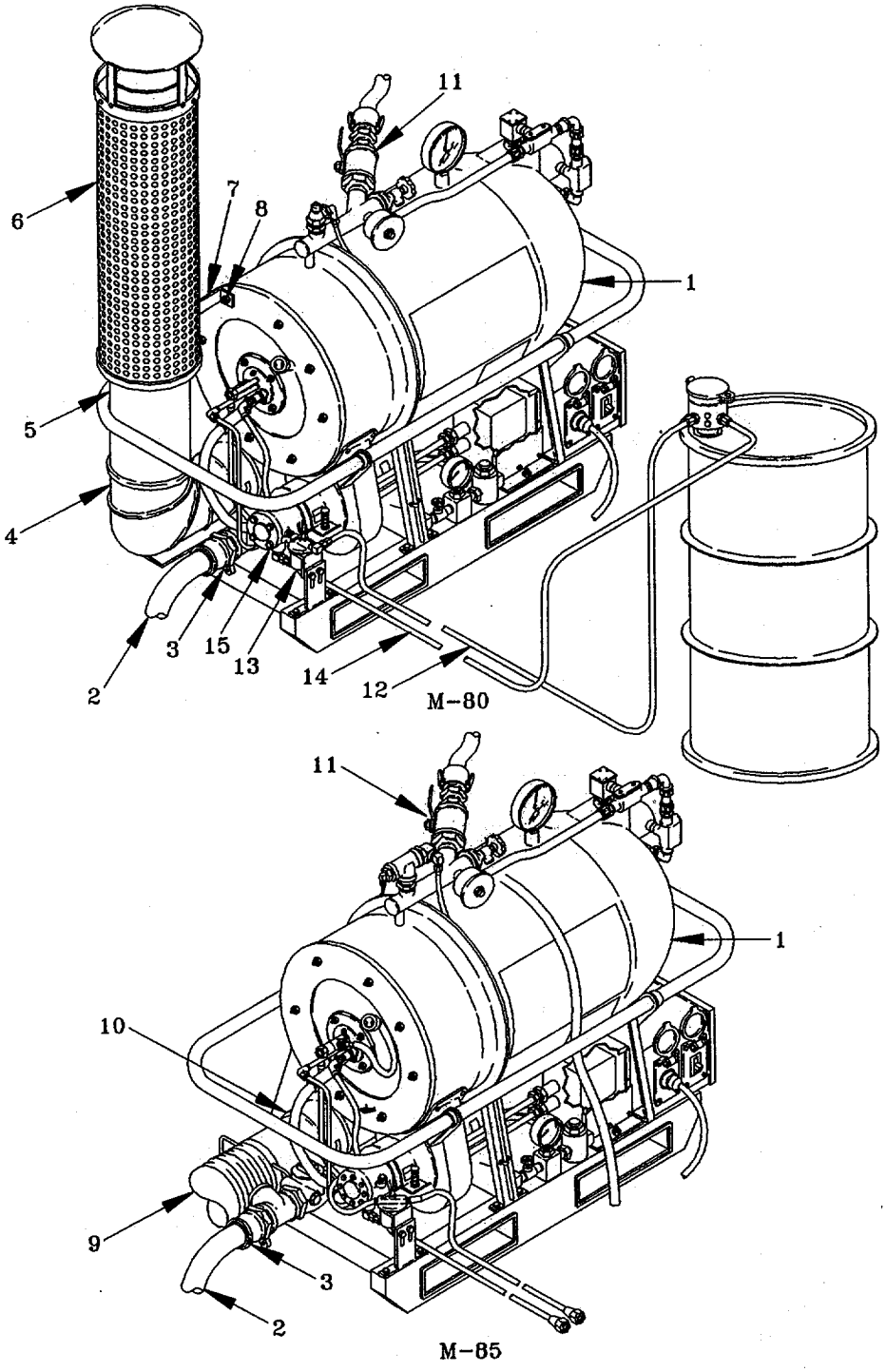


Figure 2-3. Water Heater Assembly

2-9. ASSEMBLY. (CONT)

b. Connect coupling of 1 1/2 inch (38.1 mm) water hose (2) to water heater intake (lower) manifold (3).

c. Install elbow (4) on water heater with a slight turn to right to seat pin in slot.

d. (M-80) Insert guard assembly (5) and smoke stack (6) through bracket (7) onto elbow (4).

e. Tighten screw (8) on bracket (7) to secure smoke stack (6) and guard assembly (5).

CAUTION

Do not cross power cables, water hoses, or fuel lines. Damage to equipment could occur.

f. (M-85) Connect two 7-inch (178 mm) diameter exhaust ducts (9) together and connect to exhaust port (10). Extend duct away from the water heater.

g. Connect hot water supply hose to the upper manifold (11).

WARNING

Fuel used with the water heater is highly flammable and may cause severe burns or death if handled improperly.

h. Connect fuel supply line (12) to pump filter (13).

i. Connect fuel return line (14) to pump (15).

j. Connect power source to water heater (1).

WARNING

Use only specified fuel. Failure to do so may result in injury to personnel or equipment.

k. Use only the following fuels:

Diesel	VV-F-800 DF-A, DF-1, DF-2
Jet Fuel	MIL-T-5624 JP-4, JP-5
Jet Fuel	MIL-T-83133 JP-8
Fuel Oil	No.2 Commercial

2-10. PREPARATION FOR USE. (Fig. 2-4) Before starting the water heater, perform the "Before Operation" PMCS described in Section II. Then proceed as follows:

a. Ensure power switch (1) is turned to OFF.

b. Ensure that manual fuel shut off valve (2) is closed.

c. Press reset button (3) to ensure that flame safeguard control (4) is not lockedout.

d. Open blower air shutter (5) approximately half way.

e. Open fuel pump primer plug (6) and fill fuel pump (12) with fuel. Replace plug.

f. Ensure that fuel supply hose (7) is connected to supply fitting (8) of fuel filter (9), and return fuel line (10) to return fitting (11) of fuel pump (12).

WARNING

Exposed fuel and fuel vapor can ignite or explode resulting in possible serious injury and even death. Observe proper safety precautions when servicing the fuel system. Ensure that the water heater is cold before servicing the burner.

CAUTION

Excessive water in the fuel supply will decrease heater efficiency and corrode both the chamber and the burner.

NOTE

The operator must periodically monitor the level of the fuel supply. The fuel container should be kept as full as possible to reduce water condensation. The frequency of refueling is dependent on the size of the fuel container.

g. Ensure that all water lines are connected.

h. Ensure that water heater drain cock (13) is closed.

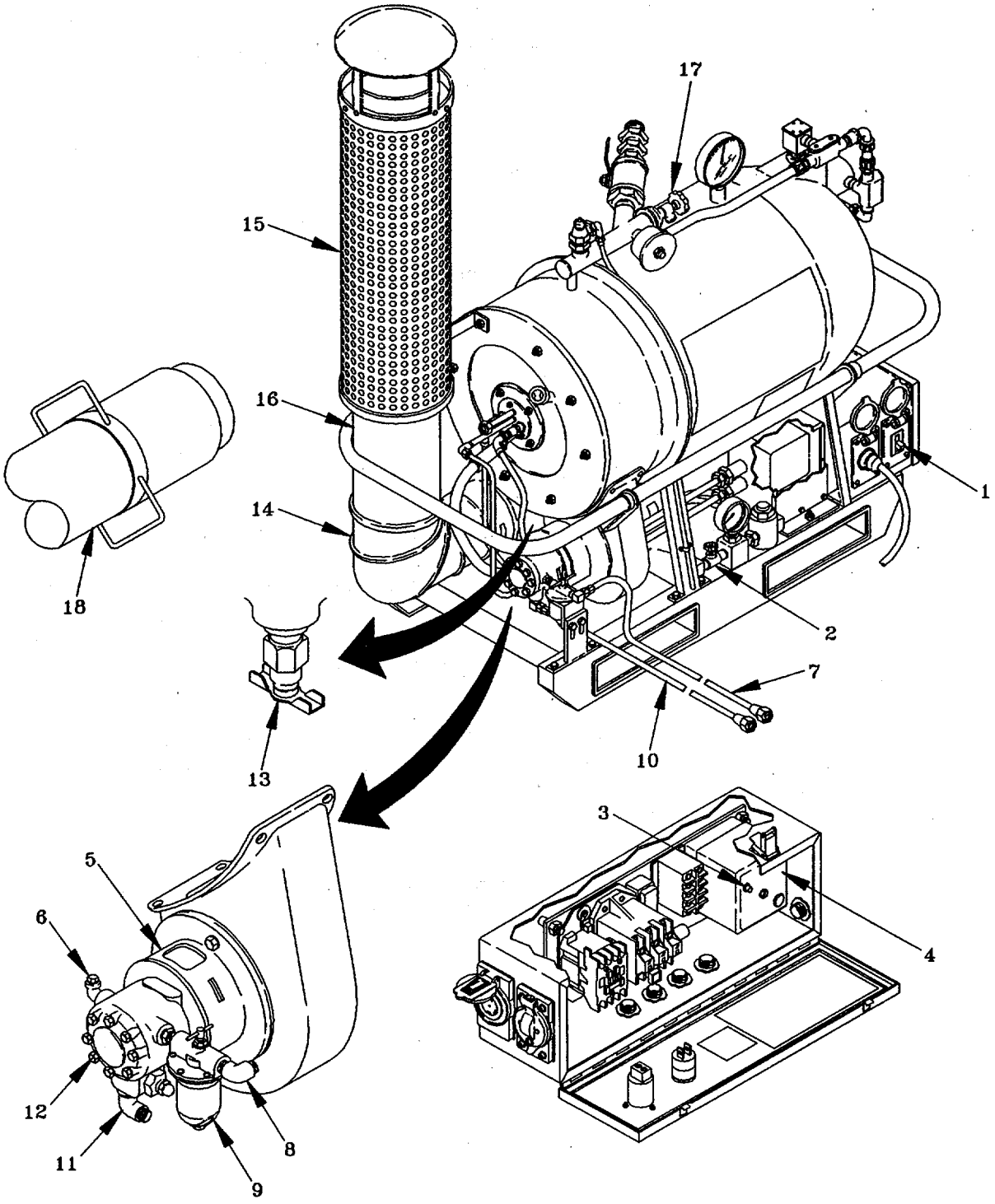


Figure 2-4. Preparation For Use

2-10. PREPARATION FOR-USE. (CONT)

i. Ensure the smoke pipe elbow (14), cap and guard assembly (15) and two lengths of stove pipe (16) are securely installed on the M-80. Ensure the exhaust duct (18) is securely installed on the M-85.

j. Open vent valve (17).

k. Set water temperature control to desired setting.

2-11. START UP PROCEDURES. (Fig. 2-5)

a. Ensure procedures in paragraph 2-10 have been performed.

b. Ensure power source is on.

c. Tun water pump on.

d. Bleed water heater by opening vent valve (1). Close vent valve when completely bled.

e. Open fuel valve (2) and tun power switch ON (3).

f Combustion should occur within seven seconds. Observe through combustion chamber sight glass (4).

g. If combustion fails to occur, water heater will automatically attempt to re-ignite. If combustion still does not occur, buzzer (5) sounds and water heater shuts down.

h. When buzzer sounds, press safety reset button (6). E combustion still does not occur within two minutes, troubleshoot in accordance with paragraph 3-3.

i. After start up, exhaust gasses from exhaust stack (7) or exhaust duct (I 1) should be transparent and smokeless. If smoke is present, slowly adjust air band (8) on blower assembly (9) until exhaust gasses are transparent and smokeless (See step 1, below). The water heater is now in automatic operation.

NOTE

Varying the air band position adjusts the ratio of air to fuel. Normal vibration of the water heater may change the airband adjustment. Check frequently for the presence of smoke.

j. If smoke is visible, adjust air band as follows:

(1) Press air band rivet (1O).

(2) Move air band (8) downward to increase air opening until smoke is no longer visible.

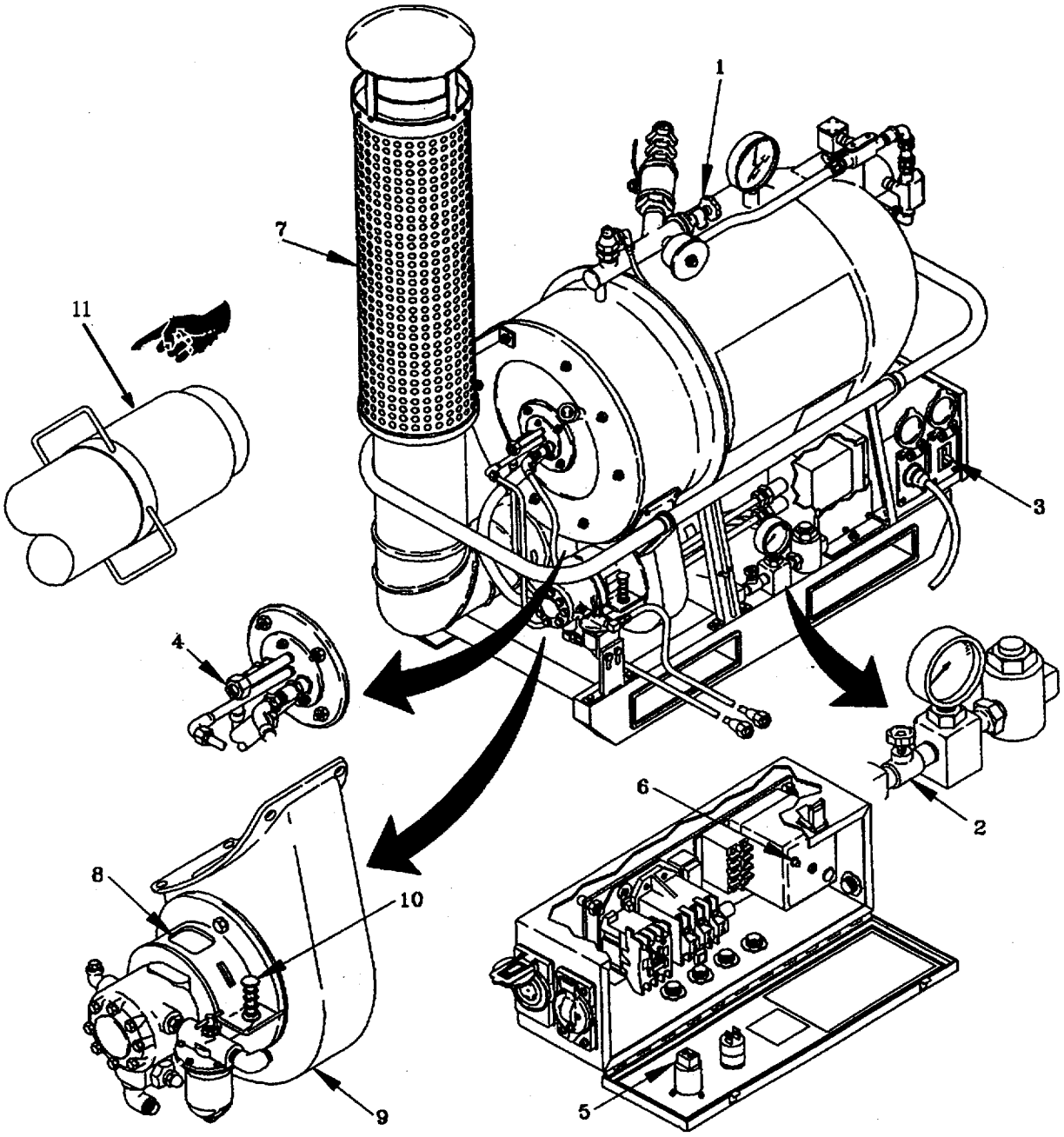


Figure 2-5. Water Heater Startup Procedures

2-12. OPERATING PROCEDURES. (Fig. 2-6)
Perform the start up procedures (paragraph 2-11) to ensure that the equipment is in good working condition. Perform the following procedures for normal operation:

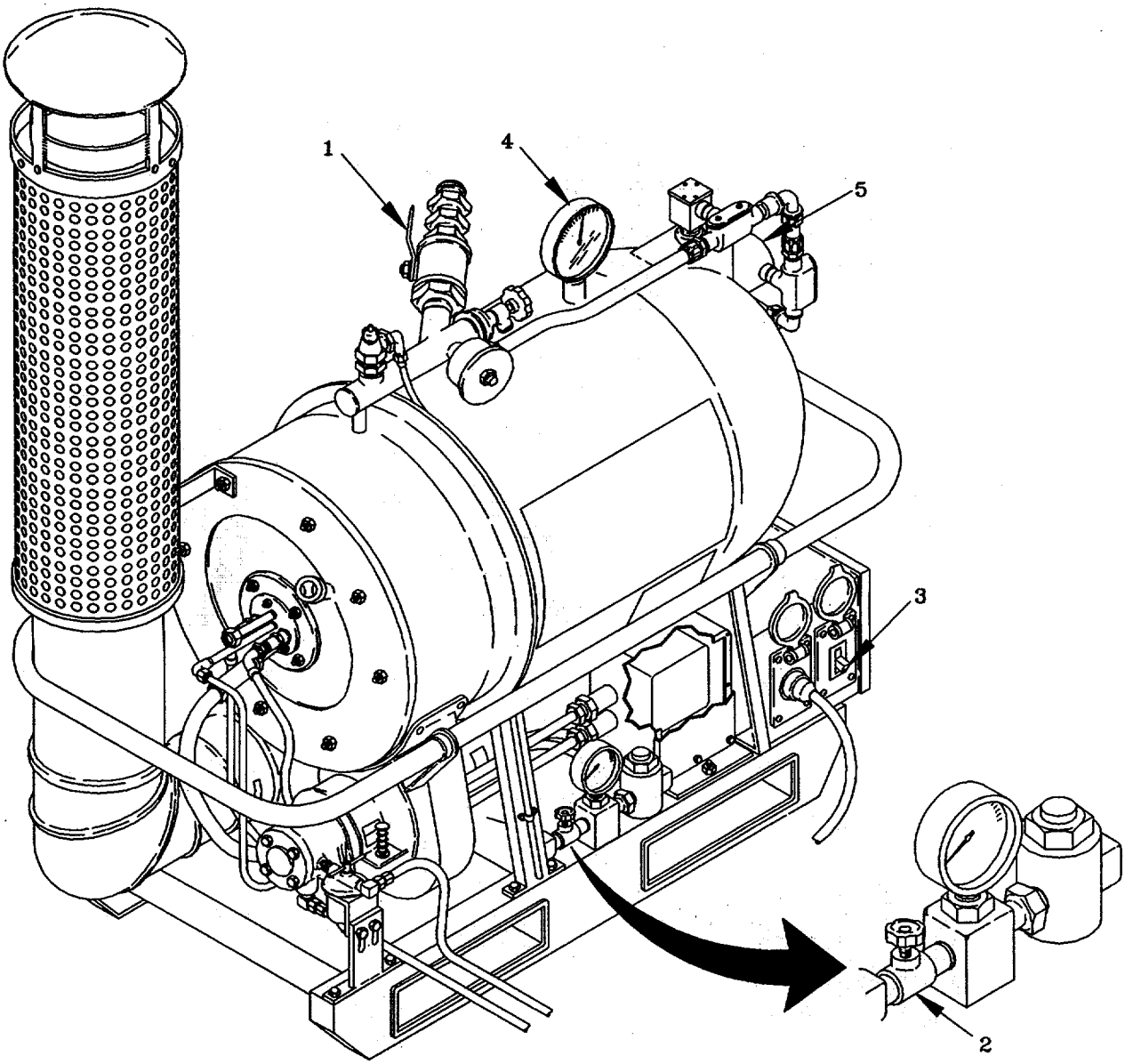


Figure 2-6. Operating Procedures

a. Turn off water heater outlet valve (1).

b. Turn on fuel valve (2).

c. Turn on power switch (3).

d. Set to desired water temperature by adjusting operating temperature control (5).

e. When water temperature gage (4) reaches desired temperature, turn on water heater outlet valve (1).

2-13. SHUTDOWN PROCEDURES. (Fig. 2-7)

Perform the following shutdown procedures after normal use or when the equipment will not be used for an extended period.

a. Turn off fuel valve (1).

b. urn off power switch (2).

If freezing temperatures exist or are expected, or when water heater will not be used for five days or more, continue as follows:

c. Remove fuel supply hose (3) from fuel container (4).

d. Place end of hose (3) into suitable container (5).

e. Drain fuel from hose (3) into suitable container (5).

f. Turn on power switch (2) and allow unit to operate until container (5) is almost empty. Turn off water heater fuel shut off valve (1) and let system operate until flame extinguishes.

g. Turn off power switch (2).

h. Reach under water heater and open drain cock (6) byturning counterclockwise.

i. Disconnect and drain water hoses (7). The M-80 will drain itself when hoses are disconnected. The M-85 must have vent valve (8) opened in order to drain.

2-13. SHUTDOWN PROCEDURES. (CONT)

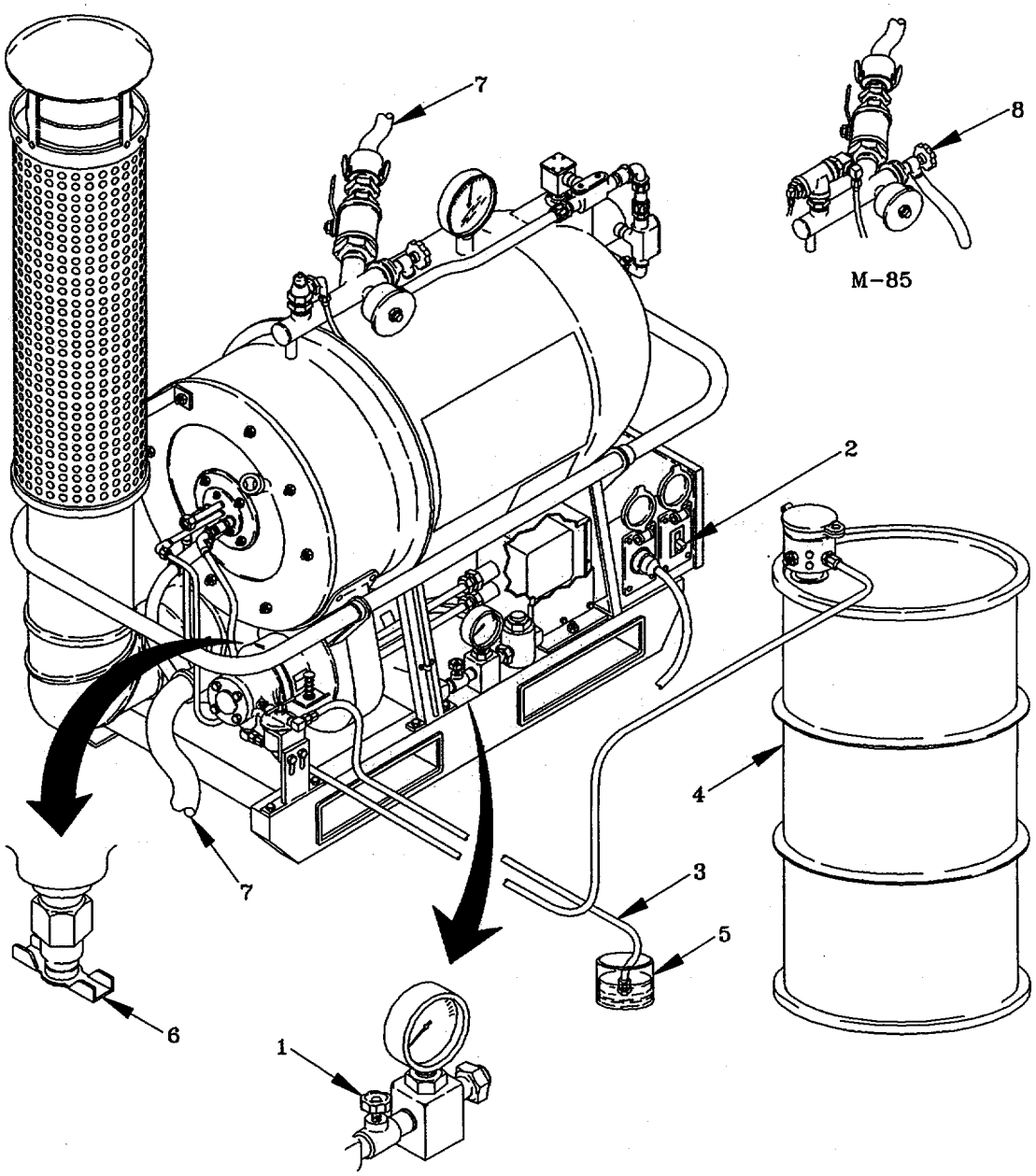


Figure 2-7. Water Heater Shutdown Procedures

2-14. DECALS AND INSTRUCTION PLATES. (Fig. 2-8)

An instruction plate (1) and CAUTION decal (2) is placed directly on the M-80. A DANGER (3) decal is placed on transformer box cover. A wiring diagram decal (4) and a voltage change notice (5) is located inside the control box.

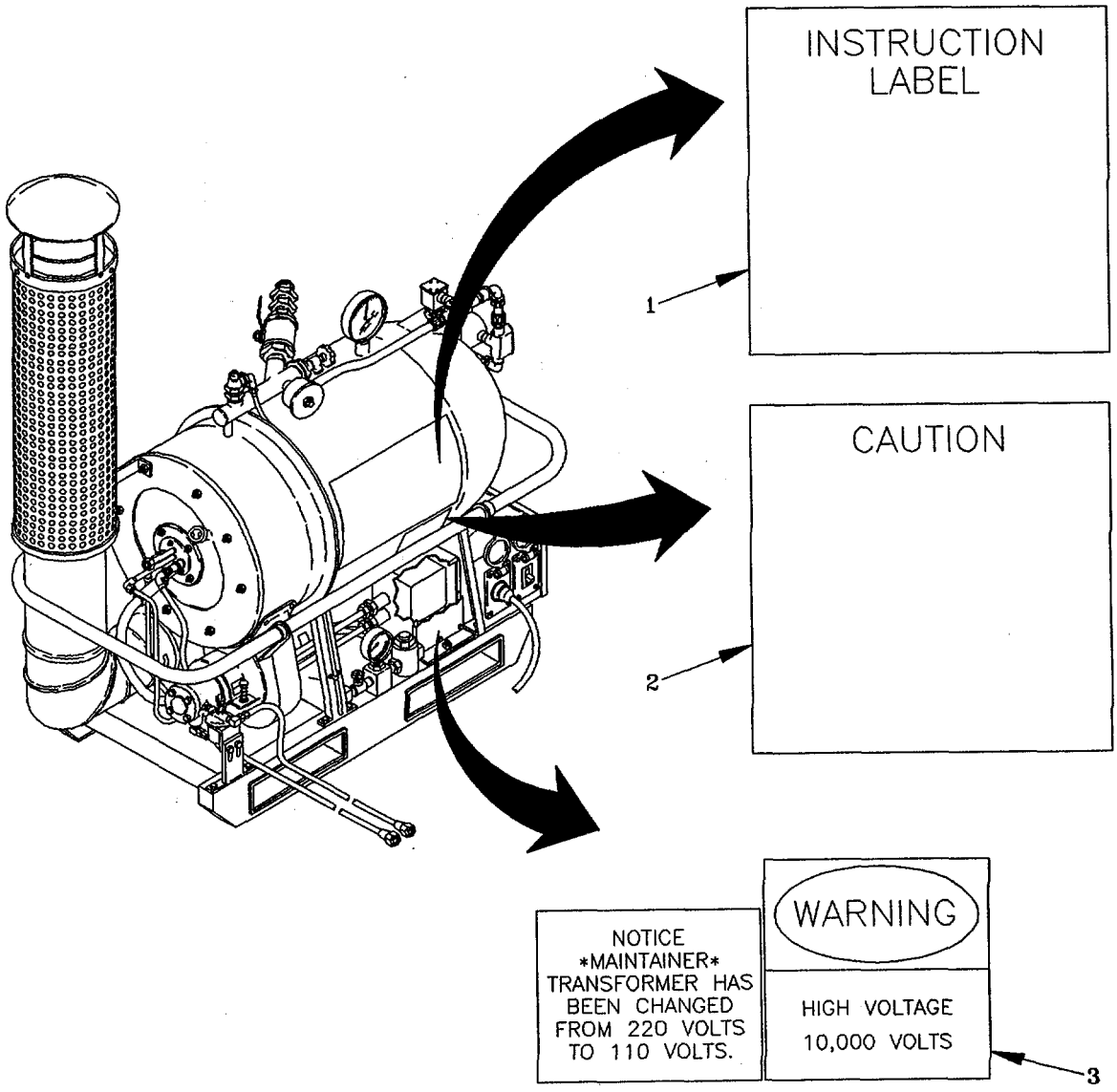


Figure 2-8. Decals and Instruction Plates (Sheet 1 of 5)

2-14. DECALS AND INSTRUCTION PLATES. (CONT)

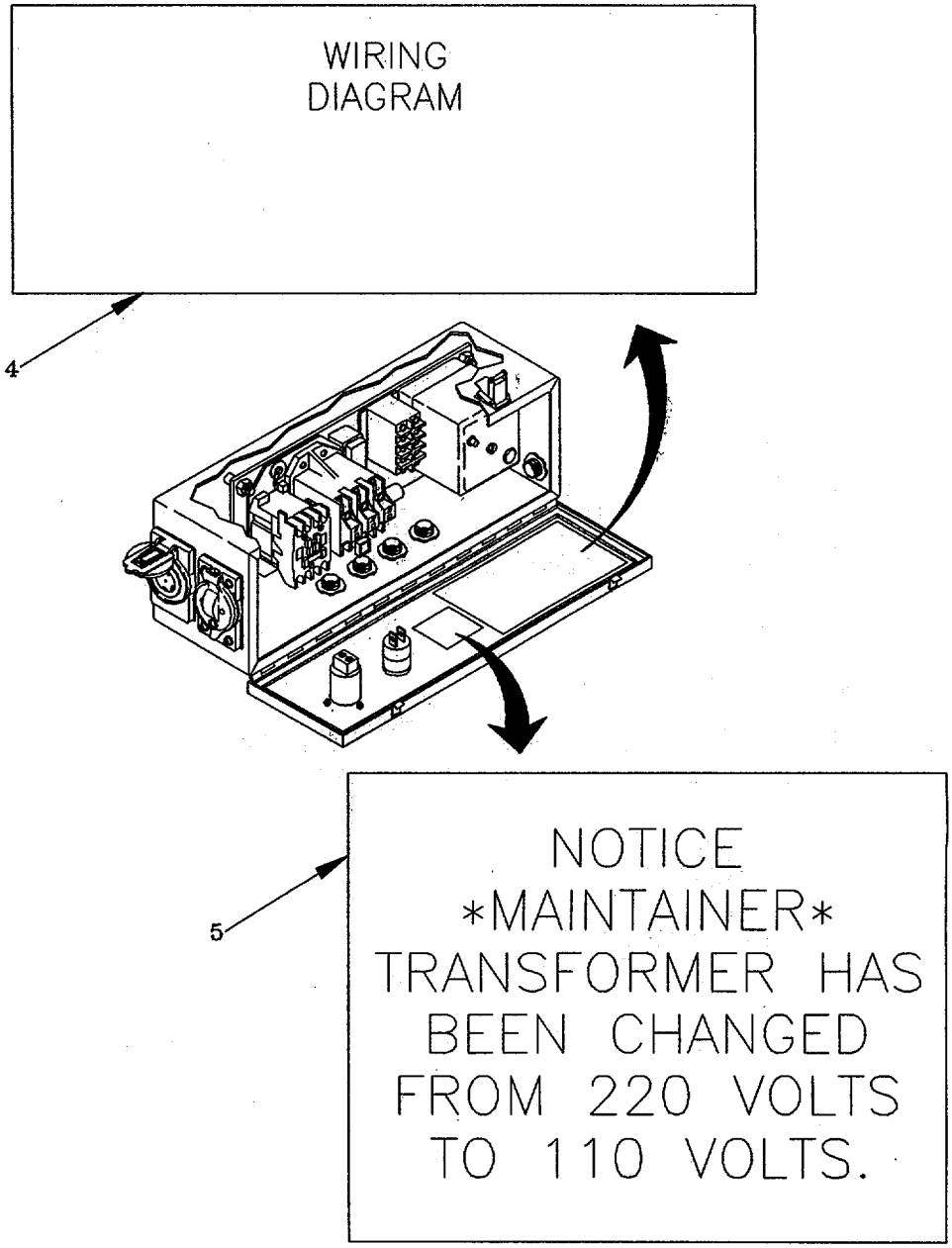


Figure 2-8. Decals and Instruction Plates (Sheet 2 of 5)

CAUTION

I WHEN FIRING THIS WATER HEATER WITH GASOLINE, COMBINE ONE (1) QUART OF OE-30 WITH EACH FIVE (5) GALLONS OF GASOLINE FOR INTERNAL LUBRICATION OF THE FUEL PUMP.

II WHEN WATER HEATER IS OPERATED WTH GASOLINE AND IS TO REMAIN UNUSED FOR FIVE(5) DAYS OR MORE, COMPLY WITH THE FOLLOWING INSTRUCTIONS:

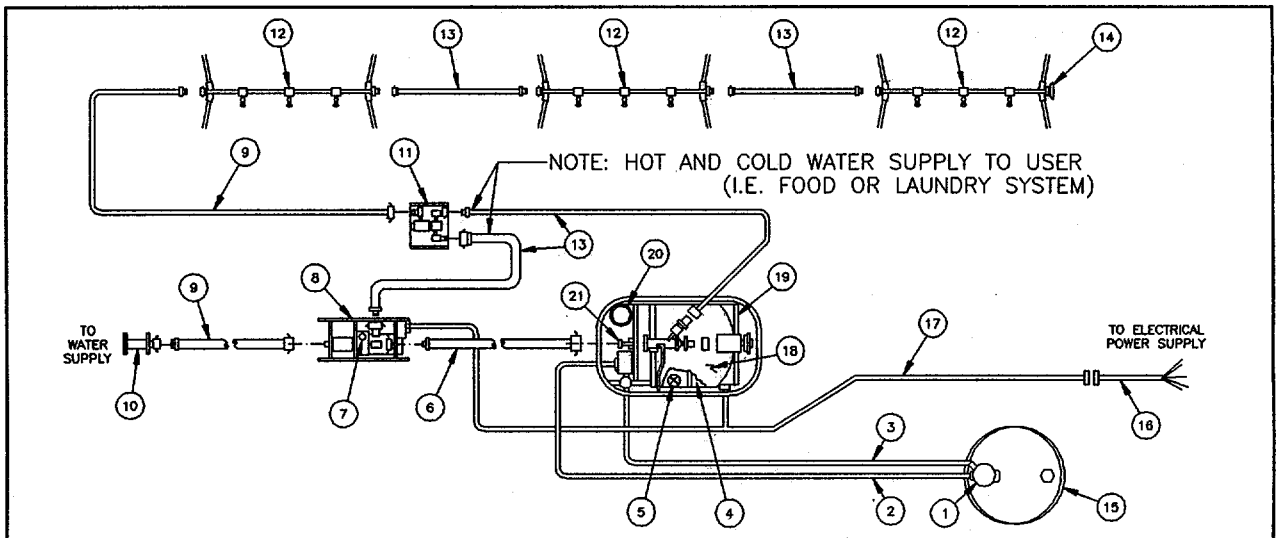
1. REMOVE FUEL PUMP STRAINER COVER, DRAIN FREE OF GASOLINE, WIPE DRY, REINSTALL STRAINER COVER.
2. OPERATE FUEL PUMP, DRAW ONE (1) QUART OF OE-30 INTO FUEL PUMP THRU FUEL INTAKE LINE. SHUT FUEL PUMP OFF.
3. REPEAT ABOVE PROCESS FOR EACH EXTENDED SHUT DOWN PERIOD.

III AFTER SHUT DOWN IN FREEZING TEMPERATURE DRAIN ALL WATER FROM FILTERS, TANKS, PUMPS, AND HOSE. LEAVE DRAIN VALVES OPERN, INSPECT UNIT TO INSURE ALL WATER HAS BEEN DRAINED.

IV WHEN USED IN AREAS WHERE SCHISTOSOMIASIS IS PREVALENT, THIS UNIT SHOULD BE OPERATED IN CONJUNCTION WITH WATER TREATMENT PROCEDURES APPROVED BY THE MAJOR COMMAND SURGEON. (NAVMED P-5052-6A/AFP 16-1-1-7)

Figure 2-8. Decals and Instruction Plates (Sheet 3 of 5)

2-14. DECALS AND INSTRUCTION PLATES. (CONT)



HEATER, WATER, LIQUID FUEL, M-80
SET UP FOR USE WITH BATH UNIT AMH

1. LOCATE PUMP (8) 20 FT FROM WATER SOURCE.
2. CONNECT STRAINER (10) TO END OF 1"X 25' HOSE AND OTHER END TO SUCTION PORT OF PUMP (8).
3. INSTALL SMOKE STACK GUARD ASSY. (20)
4. CONNECT 1 1/2"X 6' HOSE (6) TO PUMP (8) AND HEATER (18).
5. CONNECT 1" X 7.5' HOSE (13) FROM HEATER (18) TO HOT FITTING OF MIXING VALVE (11) AND 1"X 7.5' HOSE (13) FROM OUTLET OF PUMP (8) TO COLD FITTING OF MIXING VALVE (11).
6. ERECT SHOWER-HEAD ASSEMBLY (12) AS REQUIRED. USE 1"X 7.5' HOSE (13) TO CONNECT EACH ASSEMBLY. USE CAP (14) TO PLUG END.
7. SCREW DRUM FILL ADAPTER ASSY (1) INTO A 55 GAL DRUM (15)
8. CONNECT FUEL LINE (3) FROM PUMP STRAINER TO SUCTION FITTING OF DRUM FILL ADAPTER ASSEMBLY (1). CONNECT FUEL LINE (2) FROM PUMP TO RETURN FITTING.
9. CONNECT WIRING HARNESS (16) (17) TO HEATER, PUMP AND SOURCE. GREEN WIRE IS EQUIPMENT GROUND - WHITE IS NUETRAL.
10. FUEL: DIESEL (VV-D-800) OR ANY GASOLINE. SEE CAUTION PLATE IF GASOLINE IS USED.
11. ELECTRICAL: 208V, 3PH, 60HZ, 5 WIRE, (GREEN-GROUND) (WHITE-NEUTRAL

INSTRUCTIONS

HEATER, WATER, LIQUID FUEL, M-80 OPERATION

1. TURN ON ELECTRICAL POWER WITH PUMP AND HEATER SWITCH OFF.
2. MOMENTARILY TURN ON PUMP SWITCH (8) AND CHECK FOR CORRECT ROTATION, SHOWN BY ARROWS. IF INCORRECT, REVERSE ANY TWO OF THE THREE POWER LINES AT THE GENERATOR.
3. REMOVE PUMP PRIME CAP (7) AND FILL WITH WATER. START PUMP AND ONCE SYSTEM IS FILLED WITH WATER STOP PUMP.
4. CLOSE FUEL VALVE (5) AND TURN ON HEATER SWITCH, PUMP IS PRIMED WHEN PRESSURE GAUGE (4) READS 100 PSI. IT MAY BE NECESSARY TO RESET THE FLAME SAFEGAURD CONTROL (19) (LOCATED IN CONTROL BOX) AS FUEL PUMP WILL ONLY RUN FOR 20 SECONDS WITHOUT FIRE (BUZZER WILL SOUND IF FLAME SAFEGAURD CONTROL REQUIRES RESETTING).
5. WITH FUEL PUMP RUNNING, CHECK FOR THE ELECTRODE SPARK (21). OPEN AIR SHUTTER HALF WAY.
6. OPEN FUEL VALVE, BURNER FLAME SHOULD START.
7. ADJUST AIR SHUTTER SO THAT NO SMOKE IS VISIBLE FROM STACK.
8. BURNER SHOULD OPERATE UNTIL WATER TEMPERATURE REACHES 160°F.
9. BUZZER WILL ALSO SOUND IF HEATER IS LOW ON WATER.

Figure 2-8. Decals and Instruction Plates (Sheet 4 of 5)

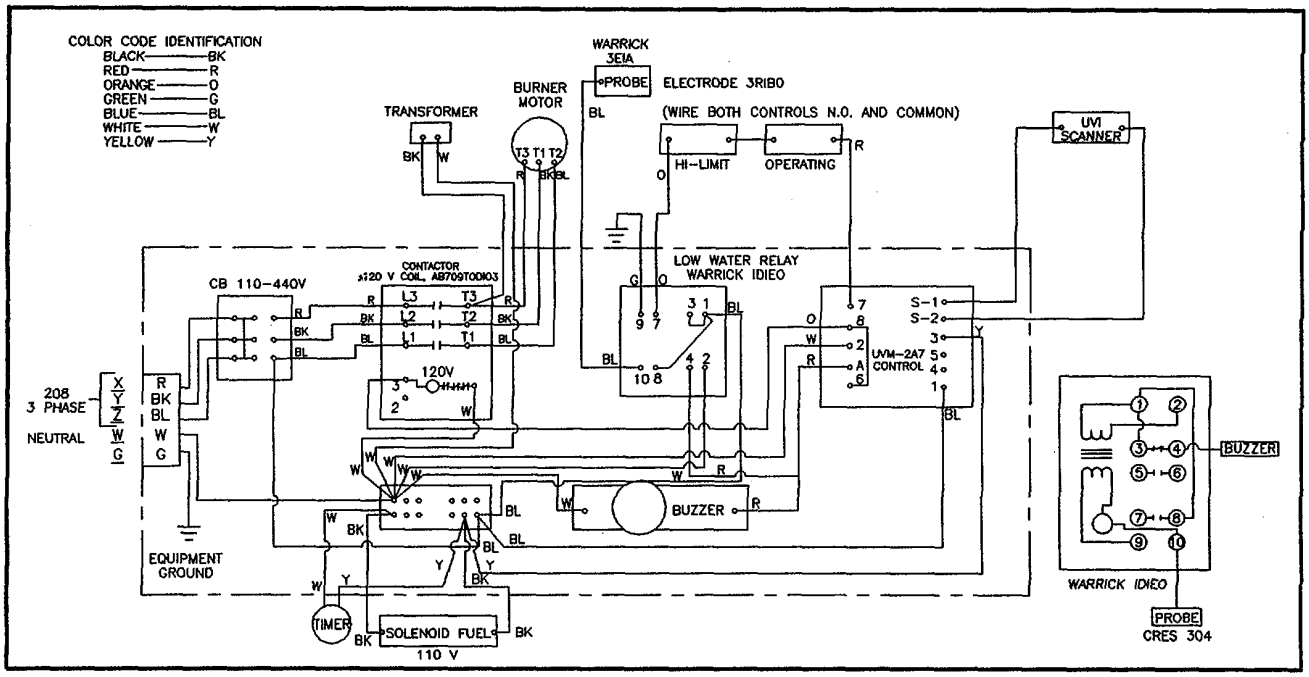


Figure 2-8. Decals and Instruction Plates (Sheet 5 of 5)

2-15. PREPARATION FOR MOVEMENT. (Fig. 2-9) To prepare the water heater for movement, follow the procedures below.

a. Perform shutdown procedures as described in paragraph 2-13.

WARNING

Do not attempt to move the water heater before disconnecting all electrical power from the heater. Death or serious injury may result.

b. As time and circumstances allow, perform operator PMCS "After" services described in Section II.

c. Clean and dry the water heater and its auxiliary equipment as described in paragraph 2-5.

d. Disconnect power cable (1) from receptacle (2).

e. (M-80) Disconnect smokestack (3).

f. (M-85) Disconnect exhaust ducts (4).

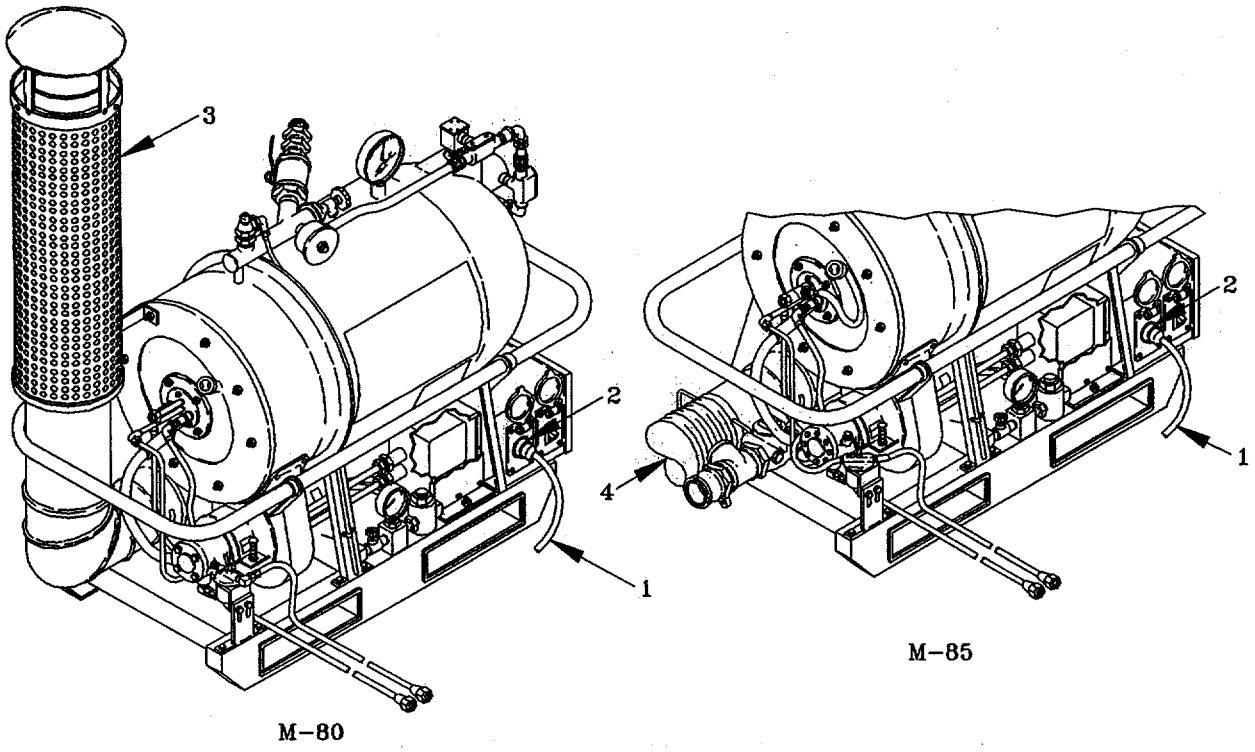


Figure 2-9. Preparation For Movement

g. Cover or shelter the water heater when it is not in use for extended periods of time.

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2-16. GENERAL. While it is not possible to prepare for all unusual conditions the water heater will be exposed to, the following information should be helpful during unusual climatic conditions or nuclear, biological and chemical contamination.

a. Operation in cold weather.

(1) Fill water heater fuel drum after operation to prevent formation and collection of moisture.

(2) Check for frozen or ruptured pipes, joints, connections and hoses immediately after starting up the heater.

(3) Take precautions to prevent water hose assemblies, water pump, and water heater from freezing.

(4) After operation in freezing weather, the water heater must be drained. Drain cocks must be left open the drain plug removed. Drain water from all hoses. Disassemble if necessary.

b. Operation in dusty conditions.

(1) Keep all fuel containers covered tightly to prevent dust from contaminating fuel. Protect water heater and water pump from dust by enclosing units in a tent or by setting up a windbreak.

(2) During operation, inspect burner electrodes through sight tube glass for proper spark. If spark moves up and down on electrodes instead of firing at electrode gap, notify unit maintenance.

WARNING

If shelter is used during operation of the heater, ensure exhaust fumes are properly vented. Exhaust fumes are poisonous and may cause severe injury or death.

2-15. PREPARATION FOR MOVEMENT. (CONT)

c. Nuclear, Biological, and Chemical-(NBC) decontamination.

(1) If chemical or biological contamination is expected, perform shutdown procedures described in paragraph 2-13.

NOTE

Perform unit level decontamination of the water heater only under supervision of unit NBC personnel.

(2) If water heater is set up, shut it down and let it cool. Decontaminate it, if appropriate, by applying super tropical bleach (STB) slurry or by brushing with hot, soapy water.

(3) Prepare slurry by mixing approximately equal parts of water with STB. Use a swab, or brook to scrub slurry into fabric.

(4) Remove slurry promptly with brush and liberal quantities of water, preferably hot and soapy, then rinse with clear water.

(5) If not in use, aerate the water heater for two to three days in the sun and bright light.

(6) Aeration is not effective against V agents. If contaminated by V-agent, the entire water heater must be decontaminated with DS2 slurry.

CHAPTER 3
OPERATOR MAINTENANCE INSTRUCTIONS

SECTION I. LUBRICATION INSTRUCTIONS

Lubrication Not Required.

Section II. OPERATOR TROUBLESHOOTING PROCEDURES

3-1. GENERAL.

This chapter provides operator maintenance information and includes lubrication, troubleshooting and general maintenance procedures.

3-2. GENERAL INSTRUCTIONS.

a. This section contains troubleshooting procedures for locating and correcting most of the malfunctions that may develop in the water heaters. The common malfunctions that occur during operation or maintenance of the heaters are listed in Table 3-1. Inspections, tests and corrective actions are presented for each malfunction. They must be performed in the order listed.

b. Table 3-1 cannot list all malfunctions that may occur, all tests and inspections needed or corrective actions. If a malfunction is not listed or is not corrected by the prescribed action, notify your supervisor.

3-3. TROUBLESHOOTING.

MALFUNCTION INDEX

Table 3-1. Operator Troubleshooting Procedures

Malfunction
Test or Inspection
Corrective Action

1. WATER HEATER FAILS TO START

Step 1. Check that 208 V 3-ph electrical power is available and correctly comected to the water heater. Check power connections to water heater.

If not correctly connected, check power source and cables.

Step 2. Check load limit switch, if water heater has one, to see if it is tripped.

If tripped, reset load limit switch.

Step 3. Check reset button on blower motor if water heater does not have a load limit switch.

Reset blower motor.

Table 3-1. Operator Troubleshooting Procedures - Continued

Malfunction Test or Inspection Corrective Action

Step 4. Check water supply in water heater tank.

Fill tank with water if not full.

Step 5. Check flame safeguard control lockout switch.

Reset flame safeguard control switch.

Step 6. Check blower motor overload switch.

Reset blower motor overload switch.

Step 7. Check motor contactor in control box.

If tripped, reset contactor.

Step 8. Check that water temperature thermostat is set high enough to start the heater.

Increase thermostat setting.

2. FLAME FAILS IN BURNER.

WARNING

Exposed fuel and fuel vapors can ignite or explode resulting in severe injury or death. Observe proper safety precautions when servicing fuel systems. Ensure water heater is cooled down before servicing fuel system.

Step 1. Check fuel supply in fuel drum.

If insufficient, fill fuel drum.

Step 2. Inspect fuel hose connections for leaks.

Tighten fuel hose connections.

Step 3. Check fuel hose for clogs.

Disconnect fuel hose and clear all foreign matter clogging the line.

Table 3-1. Operator Troubleshooting Procedures - Continued

Malfunction Test or Inspection Corrective Action

Step 4. Check supply and return fuel hose assemblies to see if they are reversed.

If reversed, disconnect and reconnect fuel hose assemblies correctly.

Step 5. Check fuel pump to verify that it has been primed.

Prime pump as described in paragraph 2-10.

Step 6. Check ignition cable assemblies for loose connections at spark plug and transformer end.

Tighten any loose connections.

3. FUEL PRESSURE TOO HIGH OR TOO LOW

Step 1. Check burner fuel control valve.

Ensure valve is fully open.

Step 2. Check hoses and make certain they are not clogged or kinked.

Remove kinks and/or replace clogged hoses.

Step 3. Check for clogged fuel filter and/or strainer.

If clogged, drain.

4. FUEL PRESSURE PULSATES

Step 1. Check fuel feed hose connections for leaks.

Tighten fuel hose connections.

Step 2. Check for clogged fuel filter.

If clogged, drain.

Table 3-1. Operator Troubleshooting Procedures - Continued

Malfunction Test or Inspection Corrective Action

Step 3. Inspect strainer cover for loose hardware.

Tighten cover screws.

Step 4. Inspect fuel hoses for rupturesand leaks.

Replace hoses.

Step 5. Check coupling between motor and fuel pump for slippage.

Tighten coupling or replace.

5. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire. Do not work on fuel system when burner is hot. Fuel can be ignited by hot burner. Shut off motor and do not smoke when working on fuel system.

Step 1. Check fuel supply in fuel drum.

Fill drum with fuel.

Step 2. Check both ends of fuel hoses for air leaks.

Tighten hose connections.

Step 3. Check supply and return hose assemblies to see if they are reversed.

Disconnect and reconnect hose assemblies properly.

Step 4. Check fuel pump to verify it has been primed.

Prime fuel pump as in paragraph 2-10.

Table 3-1. Operator Troubleshooting Procedures - Continued

Malfunction Test or Inspection Corrective Action
Step 5. Check coupling between motor and fuel pump for slippage. If loose, notify supervisor.
Step 6. Check for clogged fuel filter and/or strainer. If clogged, drain.
6. BLACK SMOKE EXITS FROM BURNER EXHAUST DUCT
Check to see if fuel-to-air ratio adjustment is correct as described in paragraph 2-11. Adjust shutter for proper volume of air intake.

SECTION III. OPERATOR'S MAINTENANCE PROCEDURES

3-4. INTRODUCTION. This section provides operator maintenance instructions for the water heaters, including cleaning, inspection, service and adjustment of the following components:

3-5. CLEANING PROCEDURES
Clean the water heaters as described in paragraph 2-5.

3-6. MAINTENANCE PROCEDURES
Perform the following maintenance procedures when necessary or when PMCS indicates faulty components.

3-7. FUEL SUPPLY CONTROL ASSEMBLY

This task covers:

a. Inspect

INITIAL SETUP:

Tools:

None

Materials/Parts:

Rag, Wiping (Appendix F, Item 15)

Equipment Condition:
Water heater in operation (para 2-12).

General Safety Instructions

Do not wear jewelry when working on water heater.

INSPECT

1. Inspect components of fuel supply control assembly (1) as follows:

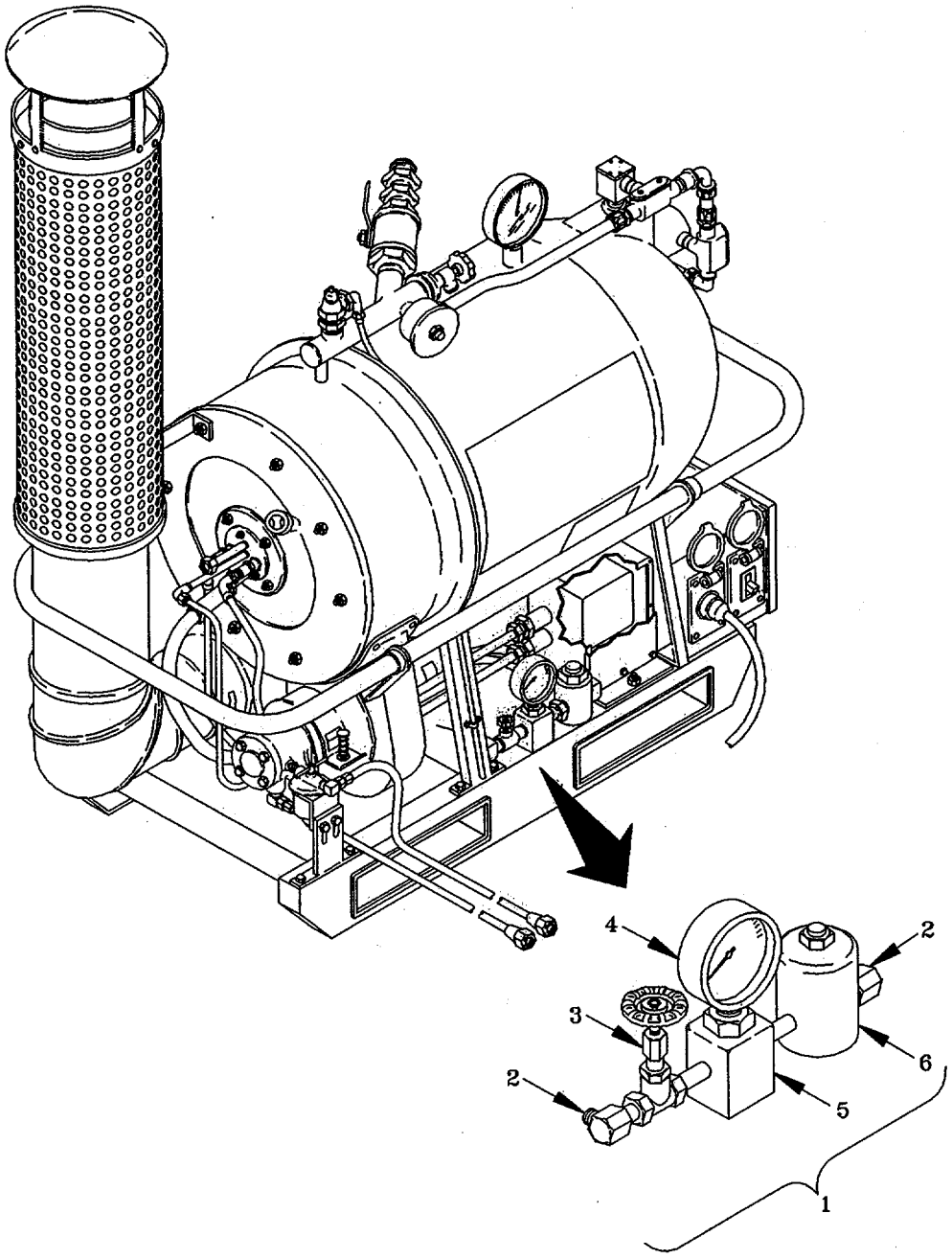
   (a) Inspect connections between the elbows (2), control valve (3), pressure gage (4), fuel line tee (5) and solenoid valve (6) for leaks.

   (b) Inspect pressure gage (4) for legibility and presence of serviceable glass cover.

   (c) Turn control valve (3) and determine proper operation.

2. Notify unit maintenance of any leaks or damage found.

13-7. FUEL SUPPLY CONTROL ASSEMBLY - Continued



3-8. IGNITION CABLE ASSEMBLY

This task covers:

a. Inspect

INITIAL SETUP:

Tools:

None

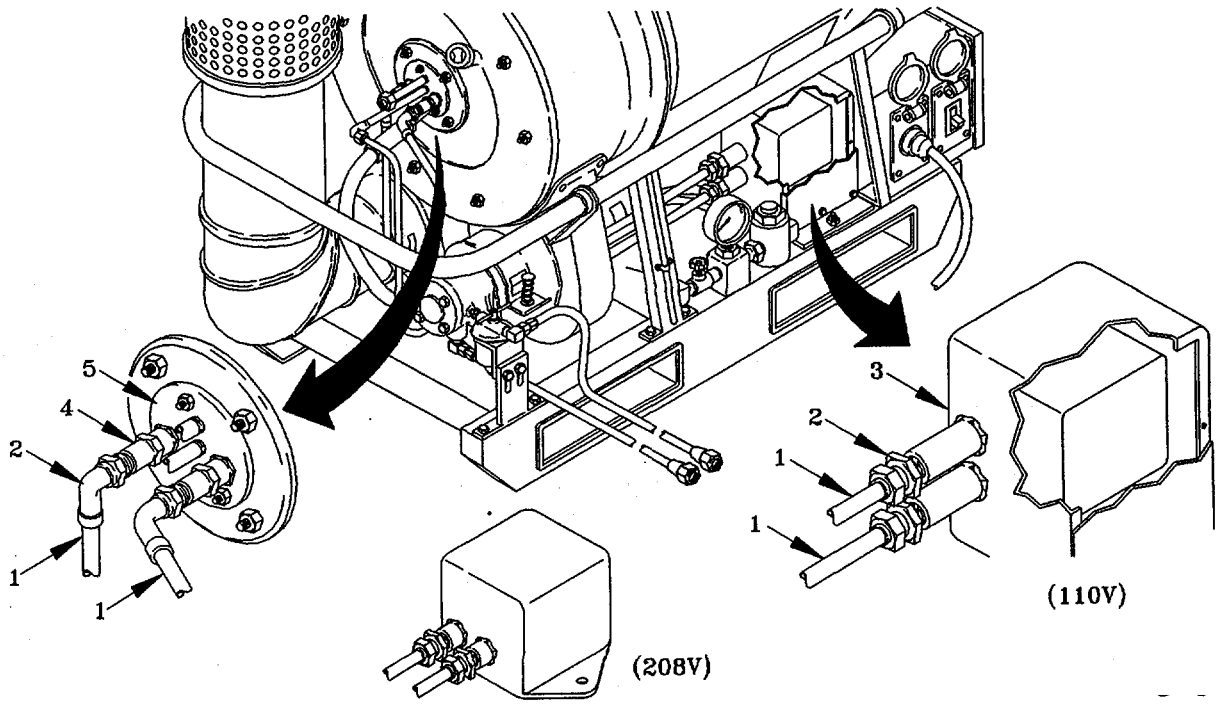
Materials/Parts:

Rag, Wiping (Appendix F, Item 15)

Equipment Condition:
Water heater shut off and cooled down.

INSPECT

Inspect ignition cables (1) for damage such as frayed, cracked or ripped insulation, loose connectors (2) at ignition transformer (3) or spark plugs (4) on burner head assembly (5). Refer any damage to unit maintenance.



3-9. BLOWER ASSEMBLY

This task covers:

a. Inspect
b. Service
c. Adjust

INITIAL SETUP:

Tools:

None

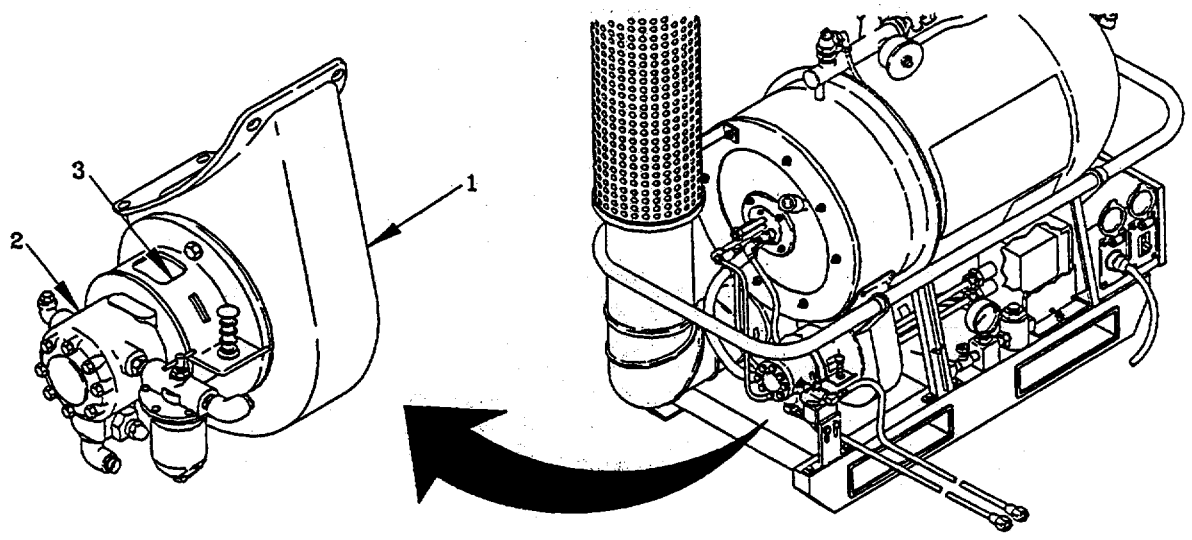
Materials/Parts:

Rag, Wiping (Appendix F, Item 15)

Equipment Condition:
Water heater shut off and cooled down.

INSPECT

Inspect blower assembly (1) for rust, corrosion, missing mounting hardware, loose connections on fuel pump (2), and free movement of air shutter assembly (3).



SERVICE

1. Service the filter assembly (4) by turning the handle (5) a few times to clean the permanent element.

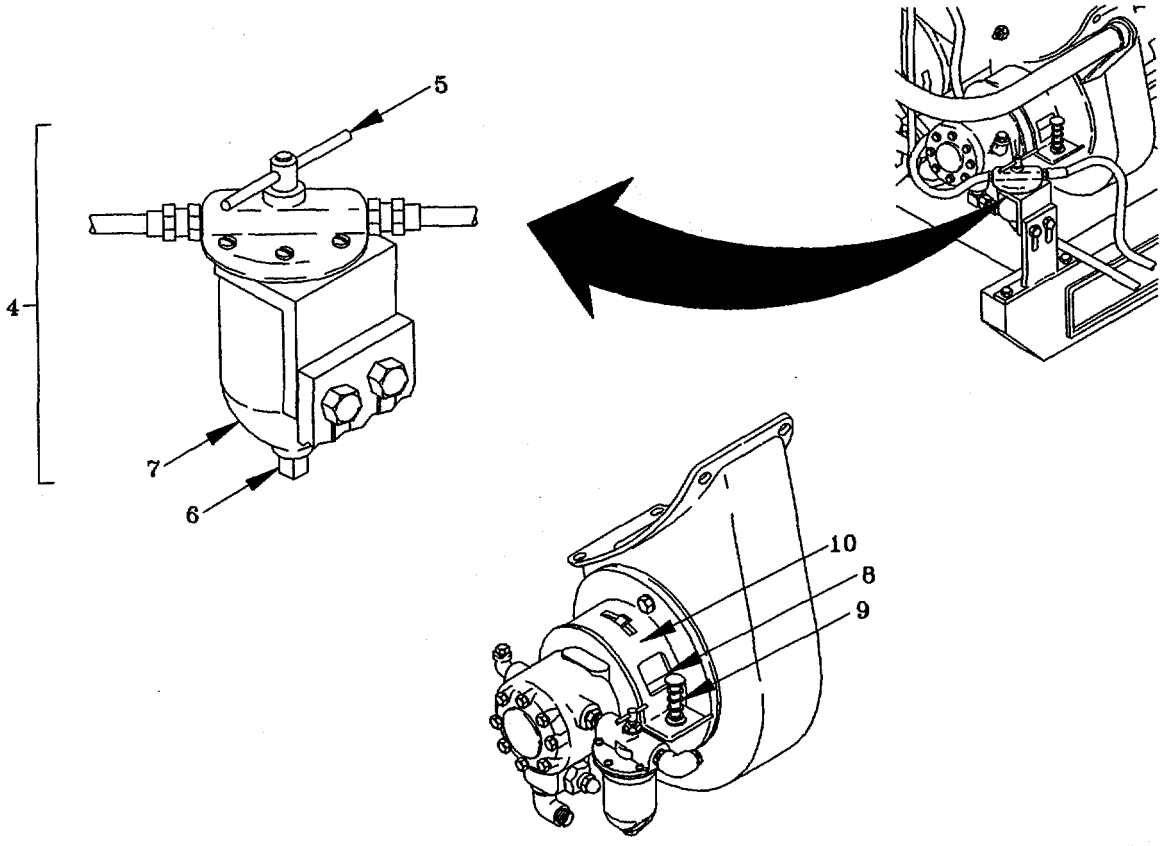
2. Remove the drain plug (6) and allow moisture and sediment to drain from bowl (7).

3. Reinstall drain plug (6).

ADJUST

1. Adjust air opening (8) by depressing air band rivet (9) and rotating air band (10) up or down to increase or decrease air flow.

2. Make final adjustment during heater operation to obtain a transparent exhaust.



3-10. WATER VESSEL AND SKID ASSEMBLY

This task covers:

a. Inspect **b. Repair**

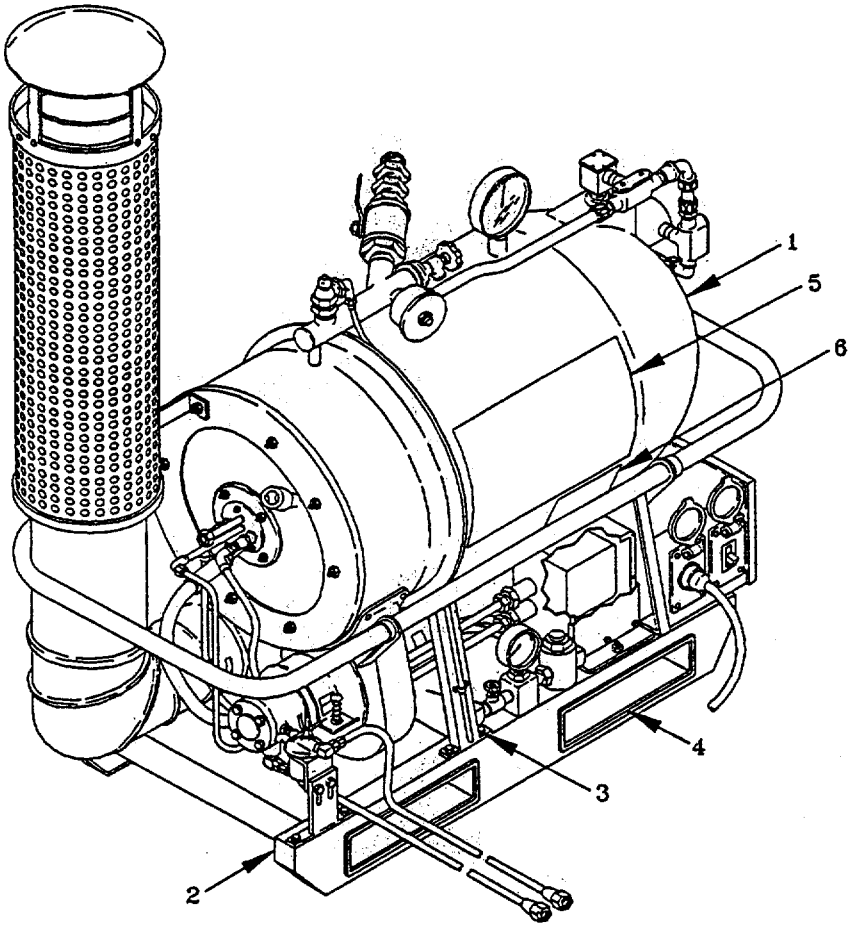
INITIAL SETUP:

Tools:

Wrench, Adjustable (Appendix E)

Materials/Parts:
Rag, Wiping (Item 15, Appendix F)

Equipment Condition:
Water heater shut off and cooled down.



INSPECT

1. Inspect the water vessel (1) and skid assembly (2) for rust, chipped paint, corrosion, and loose mounting bolts (3).

2. Check for bends or damage to skid around forklift pockets (4).

3. Verify presence and legibility of instruction plate (5) and caution decal (6) (M-80 only).

REPAIR

Tighten any loose mounting bolts (3) on skid assembly (2).

CHAPTER 4
UNIT MAINTENANCE INSTRUCTIONS

SECTION I.

REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

4-1. COMMON TOOLS AND EQUIPMENT.
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.

4-2. SPECIAL TOOL, TMDE, AND SUPPORT EQUIPMENT.
No special tools or support equipment are required for the maintenance of the water heater. Test equipment requirements for heater maintenance are listed in Section III., Appendix B, Tool and Test Equipment List.

4-3. REPAIR PARTS.
Repair parts for the water heater are listed and illustrated in Appendix C, Repair Parts and Special Tools-List.

SECTION II. SERVICE UPON RECEIPT

4-4. UNPACKING.
Unpack the water heater as described in paragraph 2-8.

4-5. INSPECTING UNPACKED WATER HEATER.

a. Inspect water heater for damage sustained during shipment. If damage is found report it on SF 364, Report of Item Discrepancy.

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

c. Check to see if the water heater has been retrofitted with the 110 V transformer as described in paragraph 1-14.

4-6. PROCESSING UNPACKED WATER HEATER.

a. Perform depreservation as required by removing preservative materials and cleaning the water heater as described in paragraph 2-5.

b. Perform the "BEFORE" PMCS described in Chapter 2.

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

4-7. GENERAL.

Always keep in mind the WARNINGS and CAUTIONS when you perform your checks and services. PMCS is performed upon receipt and quarterly thereafter. Record all defects found during performance of PMCS and, if applicable, the steps taken to correct them, on DA Form 2404, Equipment Inspection and Maintenance Worksheet. Instructions for reporting/correcting noted deficiencies are provided in DA PAM 738-750.

4-8. UNIT PMCS PROCEDURES.

Table 4-1 lists the specific PMCS that must be performed by unit maintenance personnel on a quarterly schedule. If your equipment fails to operate, troubleshoot as described in Section IV.

a. Purpose. PMCS is accomplished to insure that the equipment is ready for use at all times and all deficiencies are corrected promptly. These checks and services are designed to help you find and correct defects before the equipment is damaged or fails to operate.

b. The "ITEM" column of Table 4-1 indicates sequence of inspection. Use this column to obtain the numbers for the "TM Item No." column of DA Form 2404.

c. The "INTERVAL" column of Table 4-1 tells you when to do a certain check or service.

d. The "ITEM TO CHECK/SERVICE" column identifies and illustrates the item.

e. The "PROCEDURE" column of Table 4-1 tells you the procedure by which the inspection is to be performed and the expected results are described.

Table 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY

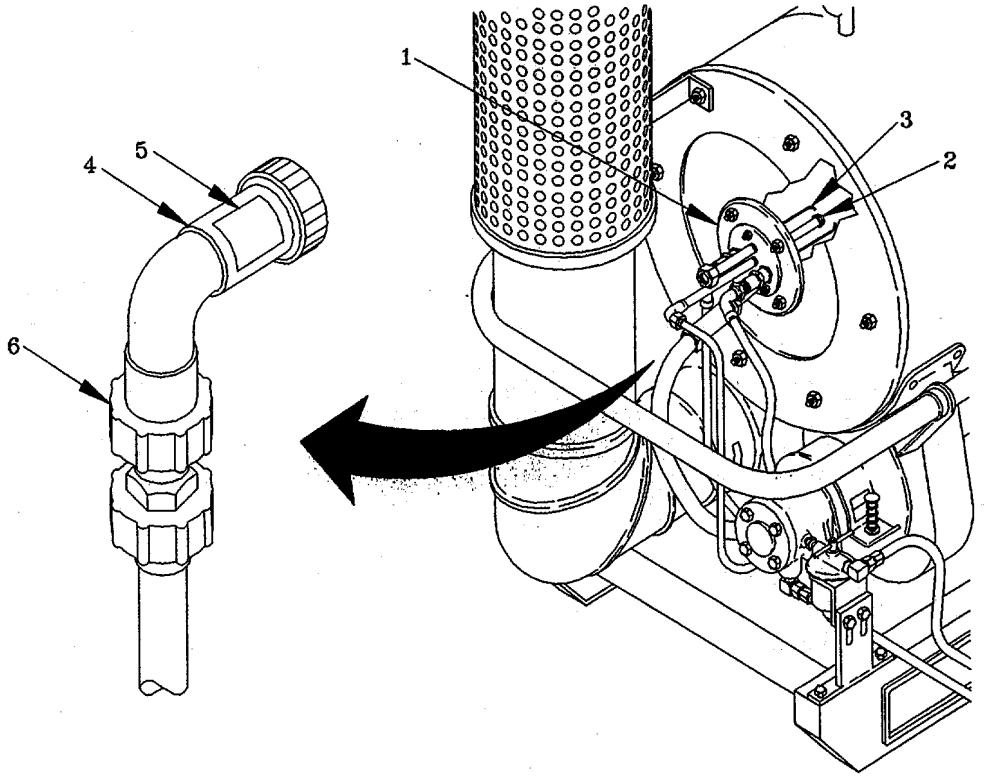
Item	Interval	Item to check/service	Procedure
1	Quarterly	Burner Head Assembly	Check assembly (1) for rust corrosion or damage Check burner nozzle (2) for carbon and spark plugs (3) for carbon buildup. Check gap in accordance with para 4-14h.
			
2	Quarterly	UV Scanner	Check assembly (4) for presence of sight scanner tube instructions (5). Check scanner mounting (6) for security.

Table 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
QUARTERLY - CONTINUED

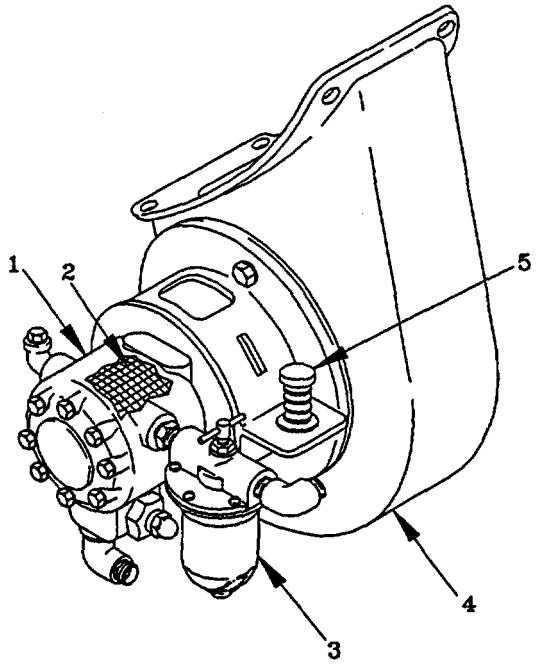
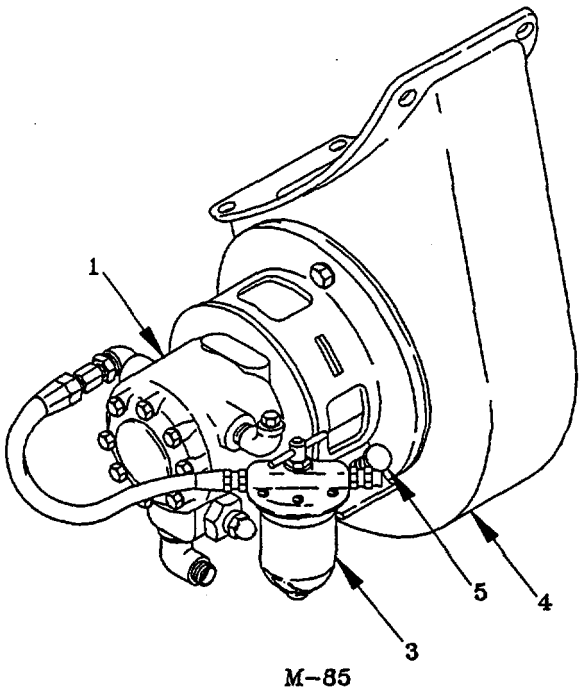
Item	Interval	Item to check/service	Procedure
3	Quarterly	Fuel Pump Assembly	Check assembly (1) for leaks and damage. Service pump assembly by replacing or cleaning fuel pump strainer (2) and fuel filter (3).
			 M-80  M-85
4	Quarterly	Blower Motor Assembly	Check that assembly (4) is securely mounted. Check the air band rivet (5) for weakness.

Table 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
QUARTERLY - CONTINUED

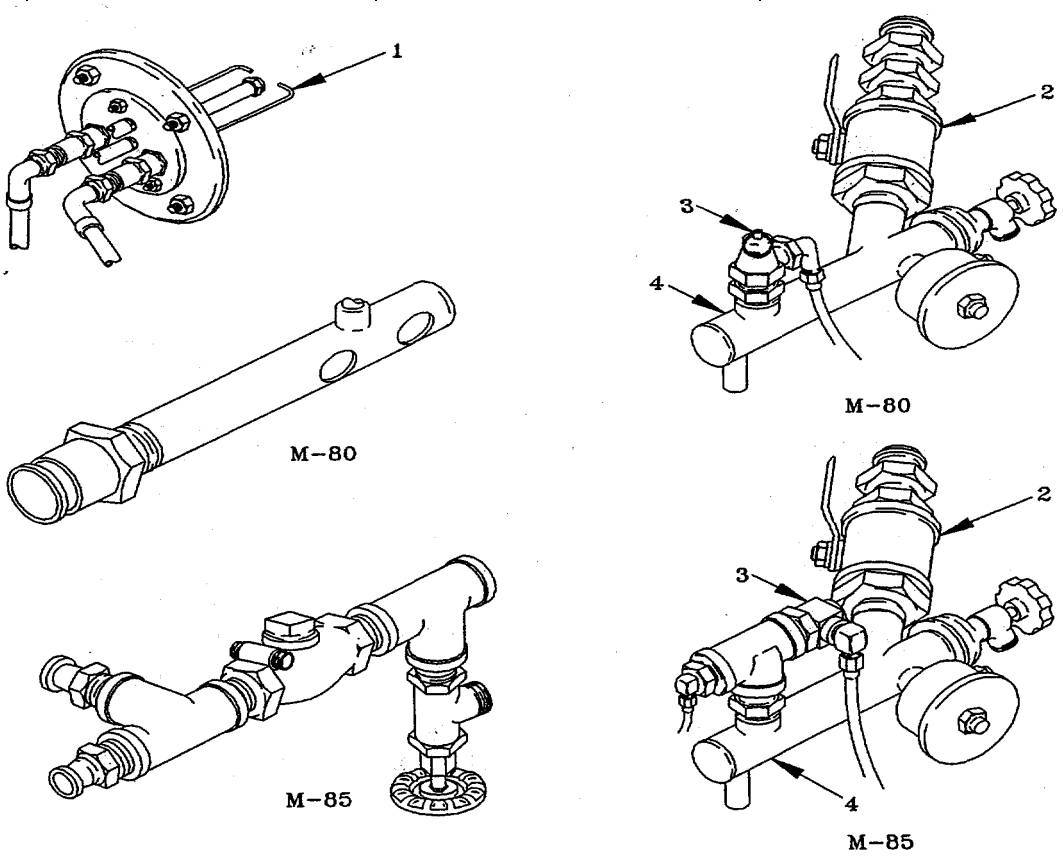
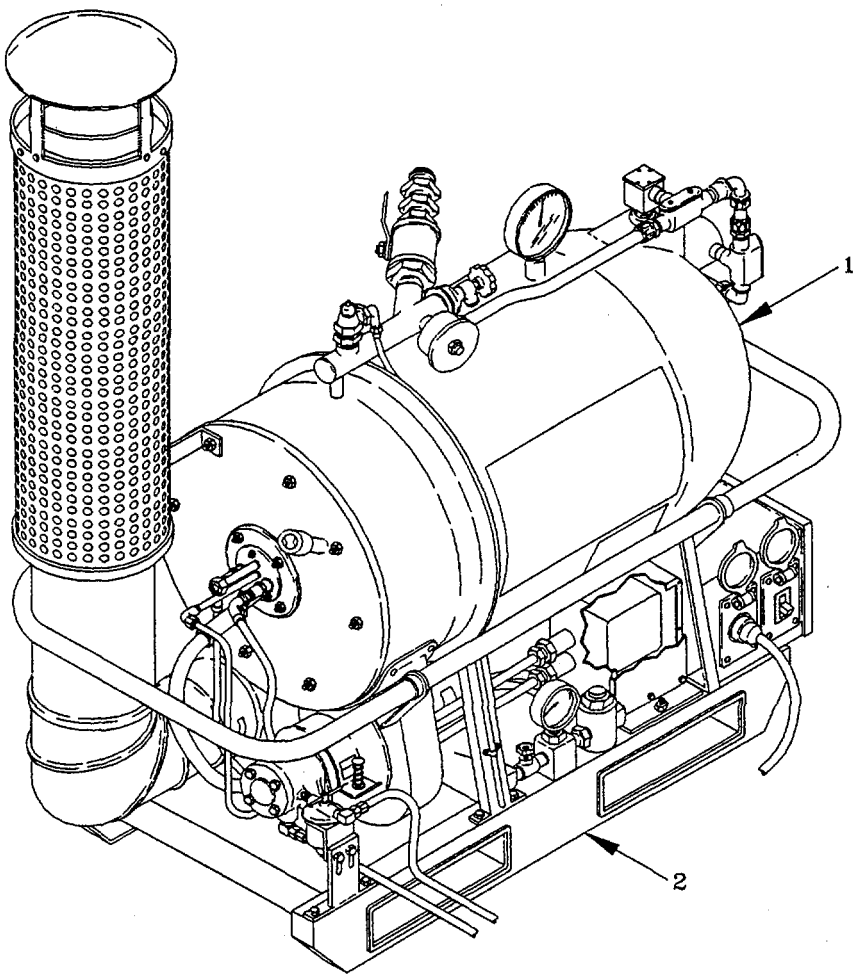
Item	Interval	Item to check/service	Procedure
5	Quarterly	Electrode Assembly	Check spark plugs (1) for proper spark.
			
6	Quarterly	Manifold Assemblies	Check assemblies (2) for rust or damaged/inoperative relief valve (3). Check for cracks around manifold base (4)

Table 4-1. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
QUARTERLY - CONTINUED

Item	Interval	Item to check/service	Procedure
7	Quarterly	Water Vessel and Skid Assemblies	Check assemblies (1) and (2) respectively for dents, or broken welds. If these conditions are found, notify supervisor.



SECTION IV. UNIT TROUBLESHOOTING PROCEDURES

4-9. GENERAL.
This section contains procedures to isolate water heater defects that can be corrected by unit maintenance. Perform the checks and corrective actions in the order listed.

4-10. GENERAL INSTRUCTIONS.
The symptom index lists the common malfunctions which may be found during water heater operation. Use this index for quick access to the troubleshooting procedures in Table 4-2. This manual can not list all possible malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

4-11. TROUBLESHOOTING.

MALFUNCTION INDEX

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

WARNING

Lethal voltage is present when the water heater is connected to power source. Disconnect power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

WARNING

Exposed fuel and fuel vapor can ignite or explode resulting in severe injury or death. Observe proper safety precautions when servicing fuel system. Ensure water heater is cooled down before servicing fuel system.

WARNING

Remove rings, bracelets, wristwatches, and neckchains before working around or on the water heater. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
1.	WATER HEATER FAILS TO START
Step 1.	Check low water probe for defects.
	Notify direct support maintenance if it is defective.
Step 2.	Check low water relay for defects.
	Notify direct support maintenance if it is defective.
2.	FLAME FAILURE DURING FIRING CYCLE.
Step 1.	Check fuel nozzle for dirt and clogs.
	Clean or replace nozzle.
	CAUTION The scanner is a sensitive device. Rough handling can damage the scanner and result in possible failure of the flame safeguard control.
Step 2.	Check UV scanner tube to see if it is clogged.
	Clear obstructions from UV scanner tube.
Step 3.	Check operation of flame safeguard control to see if it is defective.
	Notify direct support maintenance if defect is noted.
Step 4.	Check UV scanner for defects.
	Notify direct support maintenance if defect is found.
Step 5.	Inspect fuel pump strainer to see if it is clogged.
	Remove and clean strainer.
Step 6.	Check fuel pump drive coupling for looseness.
	Tighten fuel pump drive coupling.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 7.	Check fuel pump for defects.
	Replace fuel pump.
Step 8.	Check power to solenoid fuel valve at terminal board.
	Notify direct support maintenance if voltage is not present.
Step 9.	Check solenoid fuel valve for defects.
	Replace solenoid fuel valve.
3. FUEL PRESSURE GAGE INDICATES PRESSURE TOO LOW OR TOO HIGH.	
Step 1.	Check fuel shutoff valve for defects.
	Replace fuel shutoff valve.
Step 2.	Check fuel pump pressure. It should be 100 psi (689 kPa).
	Adjust pump pressure.
Step 3.	Check fuel filter for clogs or dirt.
	Clean fuel filter.
Step 4.	Check for breaks or restrictions in fuel hoses or loose couplings.
	Tighten couplings, remove restrictions or replace hose.
Step 5.	Check fuel pressure gage for defects.
	Replace fuel pressure gage.
Step 6.	Check fuel nozzle for clog or defects.
	Clean or replace fuel nozzle.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
4.	NOISY FUEL PUMP
Step 1.	Check suction hose for leaks.
	Tighten suction hose connections. Replace suction hose if cracked or leaking.
Step 2.	Inspect fuel pump strainer for clogging.
	Clean or replace fuel pump strainer.
Step 3.	Inspect fuel filter for dirt or clogging.
	Clean or replace fuel filter if necessary.
Step 4.	Inspect fuel pump for overheating.
	Replace fuel pump if necessary.
Step 5.	Check fuel pump for proper priming.
	Prime fuel pump if necessary.
5.	PRESSURE GAGE INDICATES PULSATING,PRESSURE
Step 1.	Inspect suction hose for leaks.
	Tighten suction hose connections.
Step 2.	Inspect strainer cover for loose hardware.
	Tighten cover screws.
Step 3.	Inspect fuel pump strainer for clogging.
	Clean or replace fuel pump strainer.
Step 4.	Inspect fuel filter for dirt or clogging.
	Replace fuel filter if necessary.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 5. Inspect burner nozzle for defects.	Replace burner nozzle if necessary.
Step 6. Inspect fuel pressure gage for defects.	Replace fuel pressure gage if necessary.
6. FUEL PUMP LEAKS	
Step 1. Check to see if strainer cover is loose.	Tighten all cover screws as necessary.
Step 2. Check to see if plugs are loose.	Tighten plugs as necessary.
Step 3. Inspect shaft seals for leaks.	Replace fuel pump if necessary.
Step 4. Inspect fuel pump housing for cracks.	Replace fuel pump if necessary.
7. FUEL PUMP FAILS TO DELIVER FUEL TO BURNER	
Step 1. Check for reversed pump rotation.	Interchange any two of the three 208 volt 3-phase electrical supply lines at the power source.
Step 2. Inspect fuel nozzle for clogs.	Clean fuel nozzle. Replace if necessary.
Step 3. Check to see if fuel pump drive coupling is loose.	Tighten fuel pump drive coupling.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 4.	Check to see if solenoid valve activates. Notify direct support maintenance if it does not activate.
Step 5.	Inspect fuel hoses for restrictions. Disconnect and remove restriction from fuel hose, or replace hose as necessary.
8. BURNER FAILS TO IGNITE OR IGNITION IS DELAYED	
Step 1.	Determine if sufficient fuel is in the fuel container. Fill fuel container as necessary.
Step 2.	Determine if fuel is contaminated with water. Drain fuel supply into another container and refill fuel container with uncontaminated fuel.
Step 3.	Inspect spark plugs for carbon deposits. Clean spark plugs as necessary.
Step 4.	Inspect spark plugs for proper adjustment. Adjust spark plugs as required.
Step 5.	Inspect ignition transformer for damage. Replace ignition transformer if necessary.
Step 6.	Determine if cable assembly connection from transformer to burner is disconnected. Reconnect if disconnected.
Step 7.	Inspect spark plug porcelain for breaks or cracks. Replace spark plug if necessary.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
9.	BLOWER MOTOR CONTACTOR CONTINUES TO TRIP
	Inspect fuel pump and motor for obstructions or binding.
	Loosen set screw at fuel pump shaft and check blower rotation. Replace fuel pump motor if necessary.
10.	EXHAUST GAS FROM SMOKE STACK (M-80) OR EXHAUST DUCT (M-85) IS SMOKY
	Step 1. Inspect burner spark plug spark.
	Adjust or replace spark plugs as necessary.
	Step 2. Determine if fuel is contaminated.
	Drain fuel supply into another container and refill fuel container with uncontaminated fuel as necessary.
	Step 3. Determine if fuel nozzle or screen is clogged.
	Clean or replace clogged nozzles as necessary.
	Step 4. Inspect blower operation for obstruction.
	Loosen setscrew at fuel pump shaft and check blower rotation.
	Step 5. Determine if power source provides adequate voltage.
	If power source is inadequate, notify your supervisor.
11.	SMOKE ESCAPING FROM AROUND SMOKEBOX COVER
	Step 1. Inspect smoke box gasket for excess wear and deterioration.
	Replace gasket if necessary.

Table 4-2. Unit Troubleshooting Procedure

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
Step 2.	Determine if nuts securing smoke box cover and burner head assembly are torqued properly.
Torque nuts in accordance with Appendix H.	
12. WATER TEMPERATURE GAGE INDICATES WATER OVERHEATING	
Step 1.	Inspect 320-250°F (0-121° C) temperature control setting and determine if it is set too high.
	Adjust 320-250°F temperature control.
Step 2.	Inspect 32°-250°F temperature control for any defects.
	Replace 320-250°F temperature control.
Step 3.	Determine if low water probe is defective.
	Notify direct support maintenance if any defects are found.
13. BLOWER AND FUEL PUMP MOTOR ARE NOISY	
Step 1.	Inspect blower for any obstructions.
	Remove obstructions.
Step 2.	Check for overheated blower.
	a. Loosen setscrew at fuel pump shaft and check blower rotation.
	b. If noise continues, replace blower.
	c. If noise ceases, replace fuel pump.

Section V. UNIT MAINTENANCE PROCEDURES

4-12. GENERAL.

This section contains unit maintenance procedures for the water heater as authorized by the Maintenance Allocation Chart (MAC), Appendix B, of this manual. Procedures include instructions for inspecting, servicing, replacing or repairing assemblies and subassemblies. All maintenance procedures in this section can be performed by one person unless otherwise indicated in the initial setup. Read all, warnings, cautions, notes and instructions carefully before performing the procedures. Read and understand all warnings at the front of this manual.

4-13. FUEL SUPPLY CONTROL ASSEMBLY.

This task covers:

a. Inspect **b. Remove** **c. Repair**
d. Install

INITIAL SETUP:

Tools:

Tool Kit, General, Appendix B, Item 1
Tool Kit, No. 1 Common, Appendix B, Sect. III, Item 3

Materials/Parts:

Solvent, Dry Cleaning (Item 14, Appendix F)
Sealer, 3M (Item 13, Appendix F)
Rag, Wiping (Item 15, Appendix F)
Tags, (Item 17, Appendix F)
General Safety Requirements

WARNING

Drycleaning solvent is potentially dangerous. Avoid repeated or prolonged breathing of vapors and skin contact with liquid. DO not use near open flame, arcing equipment, or other ignition sources. Use in well ventilated places.

Equipment Condition:

Water heater not in operation and cooled down.
Power disconnected.

INSPECT

Inspect Fuel Supply Control Assembly for loose fitting components, corrosion, leaks, and evidence of physical damage.

REMOVE

Remove Fuel Supply Control Assembly as follows:

a. At control box (1), tag and disconnect two black wires (2) from terminal board (3). Remove nut (4) from conduit clamp (5). Remove elbow (6), from bottom of control box (1).

b. To remove the Fuel Supply Control Assembly (7) disconnect fuel lines (8 and 9), disconnect conduit (10), remove two screws (11) and two washers (12). Remove assembly (7) by pulling fuel solenoid wires out of the conduit (10).

c. To remove fuel line (8) from burner head (13), unscrew fuel line from adapter (14).

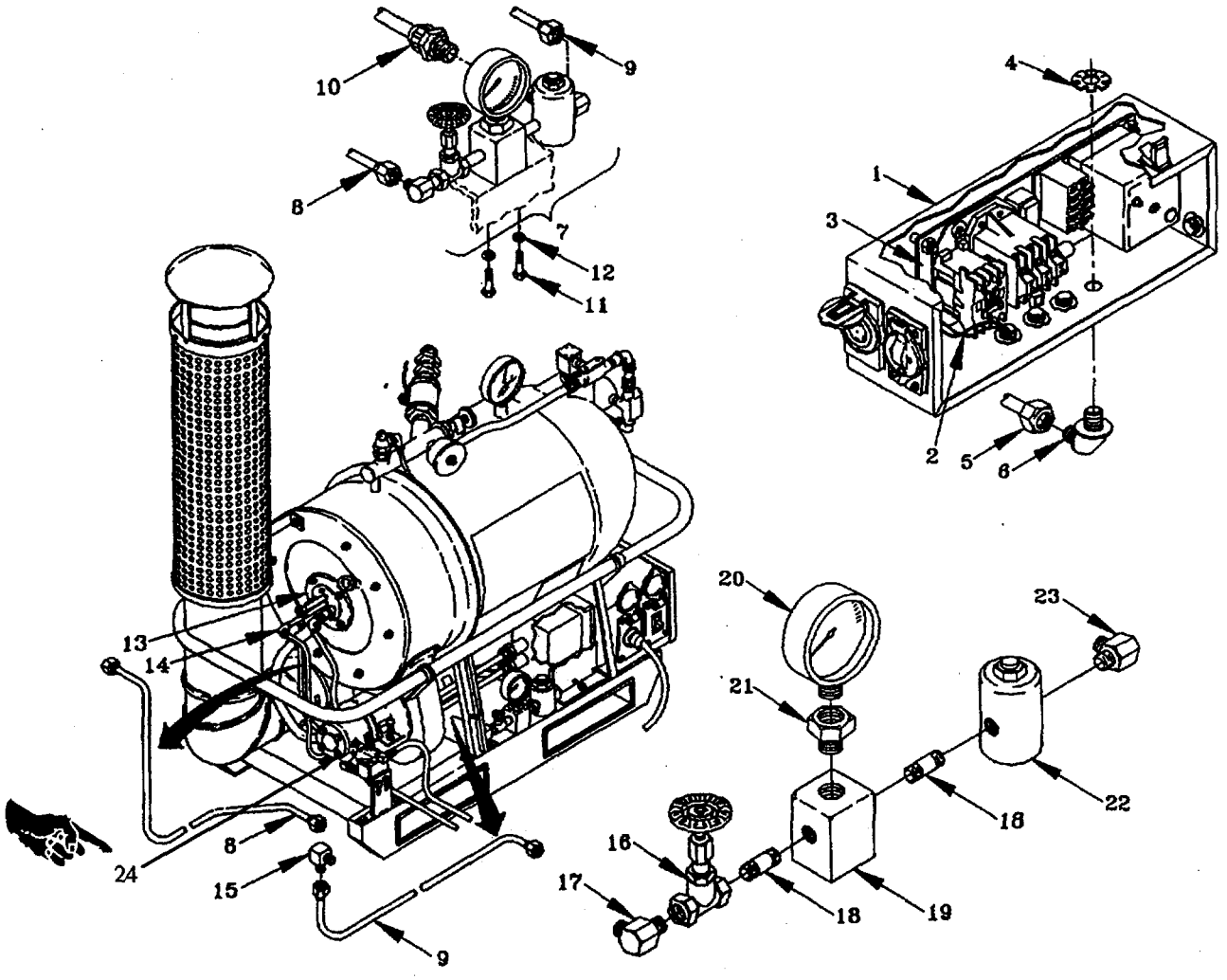
d. To remove fuel line (9) and elbow fitting (15), from fuel pump (24), unscrewfuel line.

e. To remove control valve (16), unscrew elbow (17) and valve from nipple (18).

f To remove fuel line tee (19), unscrew two nipples (18).

g. To remove gage (20), unscrew gage from snubber (21).

h. To remove solenoid valve (22), unscrew elbow (23) and unscrew nipple (18).



4-13. FUEL SUPPLY CONTROL ASSEMBLY. (CONT)

REPAIR

Repair Fuel Supply Control Assembly by replacing any defectve components.

INSTALL

a. Clean all components and fittings with solvent.

NOTE

Apply sealer when joining pipes and fittings.

b. Install two nipples (18) and snubber (21) in fuel line tee (19) by turning components clockwise.

c. Install gage (20) into snubber (21) by turning clockwise.

d. Install control valve (16) onto nipple (18) by turning clockwise.

e. Install elbow (17) onto control valve (16) by turning clockwise.

f. Install solenoid valve (22) onto nipple (18) by turning clockwise.

g. Install elbow (23) into solenoid valve (22).

h. Insert fuel solenoid valve wires into conduit (10) and install fuel supply control assembly (7) to water heater skid using two screws (11) and two washers (12). Tighten screws.

i. Connect conduit (10) to solenoid valve (22).

j. Connect fuel line (9) to elbow fitting (15), and other end to elbow (23) on fuel supply control assembly (7).

k. Connect fuel line (8) to adapter (14) and elbow (17) on fuel supply control assembly (7). Tighten all couplings.

l. Replace elbow (6) at bottom of control box (1). Secure with nut (4) to conduit clamps (5).

m. At control box, reconnect black wires (2) to terminal board (3).

n. Perform assembly procedures (paragraph 2-9), preparation for use (paragraph 2-10) and start up procedures (paragraph 2-11) to ensure normal operation of the water heater.

4-14. BURNER HEAD ASSEMBLY.

This task covers:

a. Inspect **b. Remove**
c. Repair **d. Install**

INITIAL SETUP:

Tools:

Tool set, General (Appendix B, Item 1)

Materials/Parts:

Soap, Liquid (Appendix F, Item 20)
Solvent, Dry Cleaning (Appendix F, Item 14)
Rag, Wiping (Appendix F, Item 15)
Washers, Lock MS35333-40
Gasket, Spark Plug 6-1-6242
Gasket, Peep Sight 6-1-6244

WARNING

Do not work on live circuits. Contact with the high voltage present in the water heater can cause severe injuries or death.

Equipment Condition:

Water heater shut off, cooled down, and power disconnected.

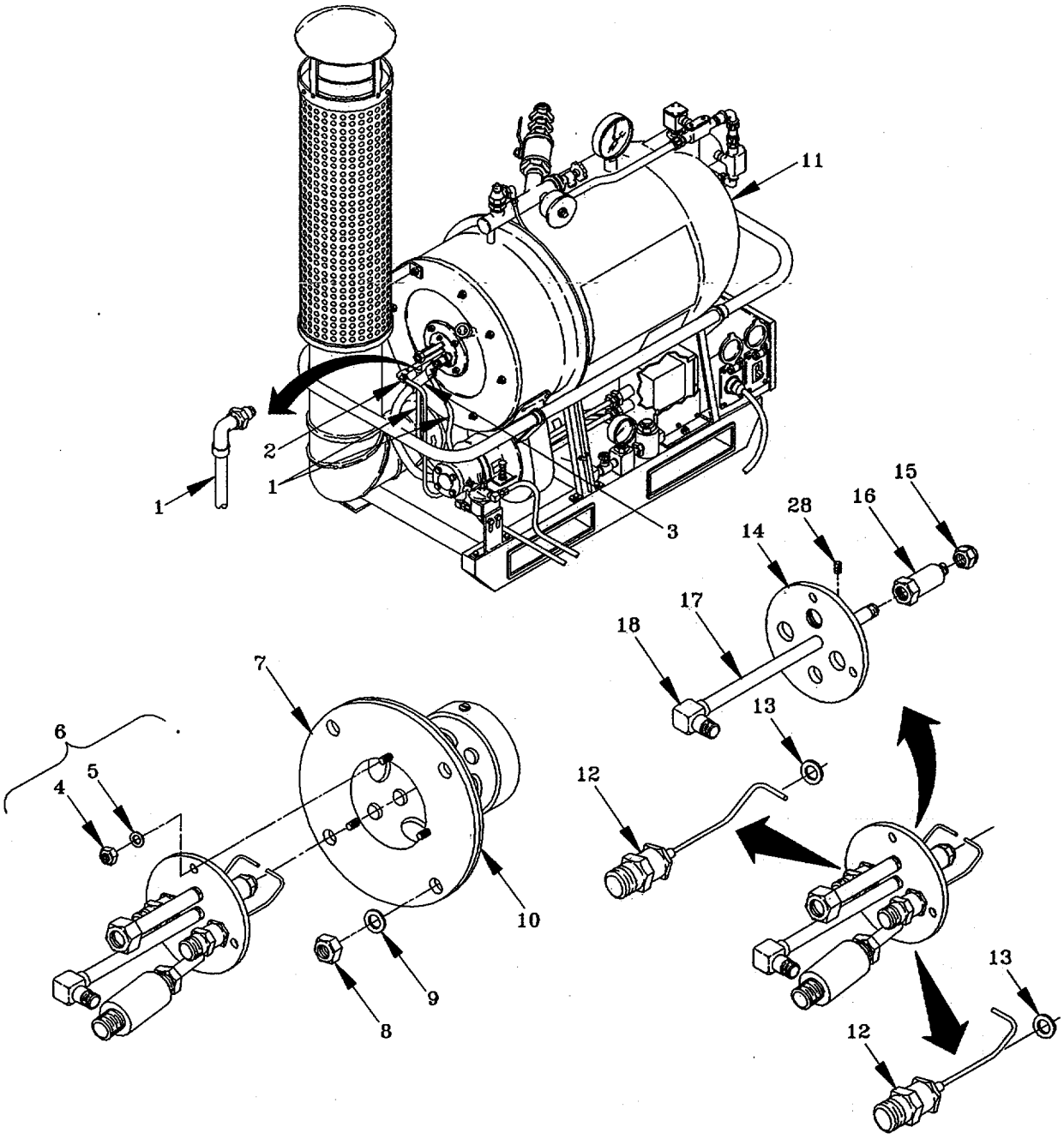
INSPECT

Inspect Burner Head Assembly for loose fitting components or corrosion, leaks, and evidence of physical damage.

REMOVE

a. Disconnect two ignition cable assemblies (1) and fuel line (2).

4-14. BURNER HEAD ASSEMBLY. (CONT)



CAUTION

The scanner is a sensitive device. Rough handling can damage the scanner and result in possible failure of the flame safeguard control.

b. Disconnect scanner (3).

c. Remove three nuts (4) and three washers (5). Remove nozzle and electrode assembly (6) from burner tube (7).

d. Inspect inside of burner tube (7) for excessive damage.

e. Remove four nuts (8) and four washers (9). Remove burner tube (7) and gasket (10) from water heater (11).

f. Unscrew and remove nozzle (15) and adapter (16) attached to nipple (17).

g. Unscrew and remove spark plugs (12) with gaskets (13) from nozzle and electrode holder (14).

NOTE

Mark position of nipple with holder before removing to ensure proper position during installation.

h. Remove nipple (17) by loosening set screws (28). Remove elbow (18) from nipple.

i. Unscrew and remove ignition sight tube (19 through 22) from holder (14).

CAUTION

Do not drop peep site. Glass may break.

j. Unscrew and remove peep sight cap (19) from nipple (20).

k. Remove peep site glass (21) and two peep sight gaskets (22). Separate gaskets from glass.

l. Unscrew and remove close nipple (23) from coupling (24).

m. Unscrew and remove coupling (24) from bushing (25).

n. Unscrew and remove bushing (25) from scanner tube (27).

4-14. BURNER HEAD ASSEMBLY. (CONT)

o. Loosen setscrew (26) securing scanner tube (27) to holder (14) and slip tube from holder.

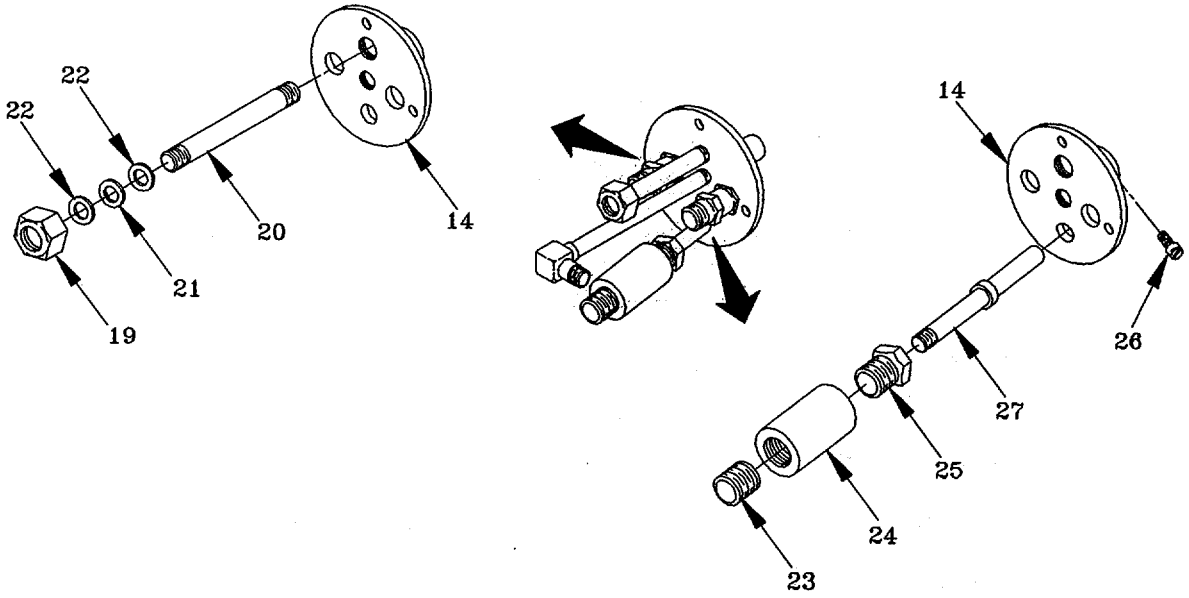
REPAIR

a. Repair Burner Head Assembly by replacing any defective components. Inspect holder (14) for breaks, cracks or damaged threads. Inspect spark plug for burned spots and cracks or breaks in insulation. Inspect nozzle (15) for cracks, clogs, excessive wear or carbon deposits. Inspect adapter (16), nipple (17) and elbow (18) for damaged threads. Inspect sight tube (19 through 22) for damaged threads, breaks or cracks in sight glass (21) and gaskets (22). Inspect close nipple (23), coupling (24), bushing (25), scanner tube (27), nozzle electrode holder (14) and set screws (26) for damaged threads. Inspect for clogged or obstructed tube.

b. Wash spark plug (12) with soapy water, rinse in clean water and dry thoroughly.

CAUTION

Use extreme care when cleaning nozzle to avoid damaging orifice tip. Do not force wire or any metallic object through the nozzle orifice.



c. Soak nozzle (15) and adapter (16) in solvent. Dry all parts thoroughly.

d. Wash sight glass (21) in soapy water, rinse in clean water and dry thoroughly.

e. Wash scanner tube (27) in solvent to remove deposits in tube and dry thoroughly.

INSTALL

a. Screw close nipple (23) and bushing (25) into coupling (24) by turning clockwise.

b. Screw scanner tube (27) into bushing (25). Insert scanner tube (27) into holder (14) and tighten set screws (26).

c. Assemble two gaskets (22) and peep sight glass (21) and insert into peep sight cap (19), then screw in nipple (20).

d. Install nipple (20) in holder (14) by turning clockwise.

e. Install elbow (18) on nipple (17) and screw into holder (14) and tighten set screws (28).

NOTE

Spark plugs are designated left handed and right handed. Be sure to install spark plug in correct position.

f. Place gasket (13) over electrode and install spark plug (12). Repeat procedure for other spark plug.

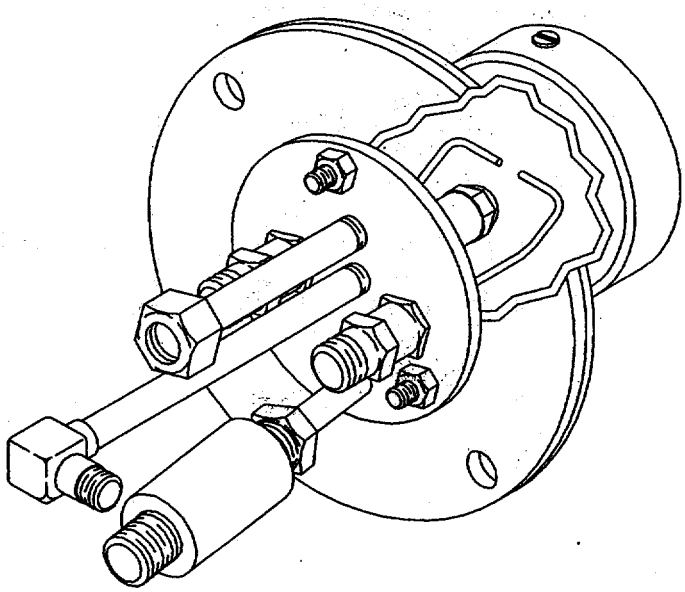
g. Screw nozzle adapter (16) to end of nipple (17) and install nozzle (15) onto nozzle adapter (16).

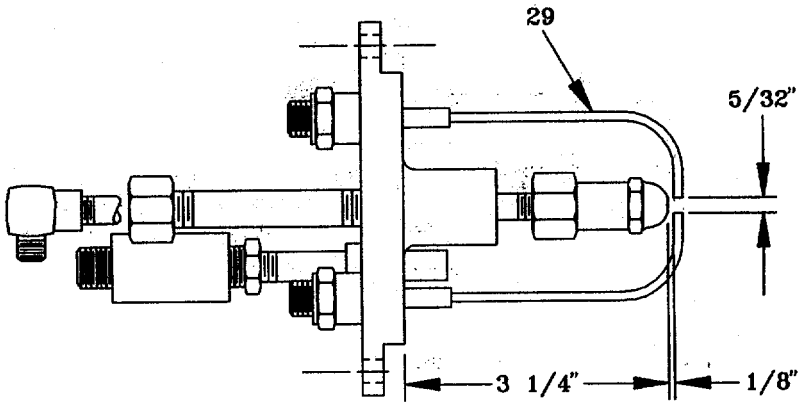
h. Bend spark plug electrodes (29) until spark gap is 5/32 inch (4mm) and electrodes are located 1/8 inch (13mm) outward and 1/2 inch (13mm) upward from hole in burner nozzle. See figure on page 4-26.

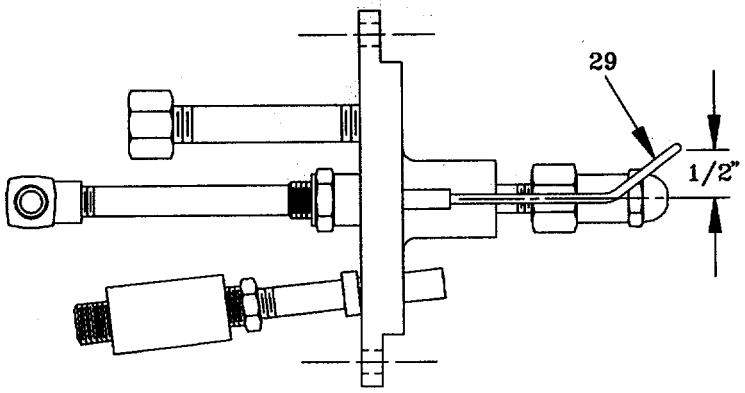
i. Install burner tube (7) and gasket (10) in water heater (11) using four washers (9) and nuts (8). Tighten nuts.

j. Install nozzle and electrode assembly (6) in burner tube (7) using three washers (5) and three nuts (4). Tighten nuts.

14-14. BURNER HEAD ASSEMBLY. (CONT)







CAUTION

The scanner is a sensitive device. Rough handling can damage the scanner and result in possible failure of the flame safeguard control. Do not overtighten when installing.

k. Inspect scanner (3) for dirt and foreign matter. Clean with a soft cloth if necessary. If scanner is broken or damaged, notify direct support maintenance.

1. Connect scanner (3) to nipple (23) and hand tighten only.

m. Connect two ignition cable assemblies (1) to two spark plugs (12).

n. Connect fuel line coupling (2) to elbow (18).

NOTE

FOLLOW-ON MAINTENANCE
Connect power source and test.

4-15. SMOKESTACK AND GUARD ASSEMBLY (M-80)/EXHAUST DUCT (M-85)

This task covers:
a. Inspect **b. Remove** **c. Install**

INITIAL SETUP:

Tools:

Tool set, General (Appendix B, Item 1)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Washer, Lock MS35338-44

Equipment Condition:

Water heater shut off, cooled down and electrical power disconnected.

INSPECT

M-80

a. Inspect Smokestack and Guard Assembly for physical damage, corrosion, and rust. Check flue support bracket and elbow for security.

M-85

b. Inspect exhaust duct for rips and tears.

REMOVE

WARNING

Prior to starting any work on the Smokestack or Exhaust Duct, allow the water heater to cool. Failure to do so may result in serious injury.

(M-80)

a. Grasp guard assembly (1) and lift upward to clear smokestack (2).

b. Separate two sections of smokestack (2).

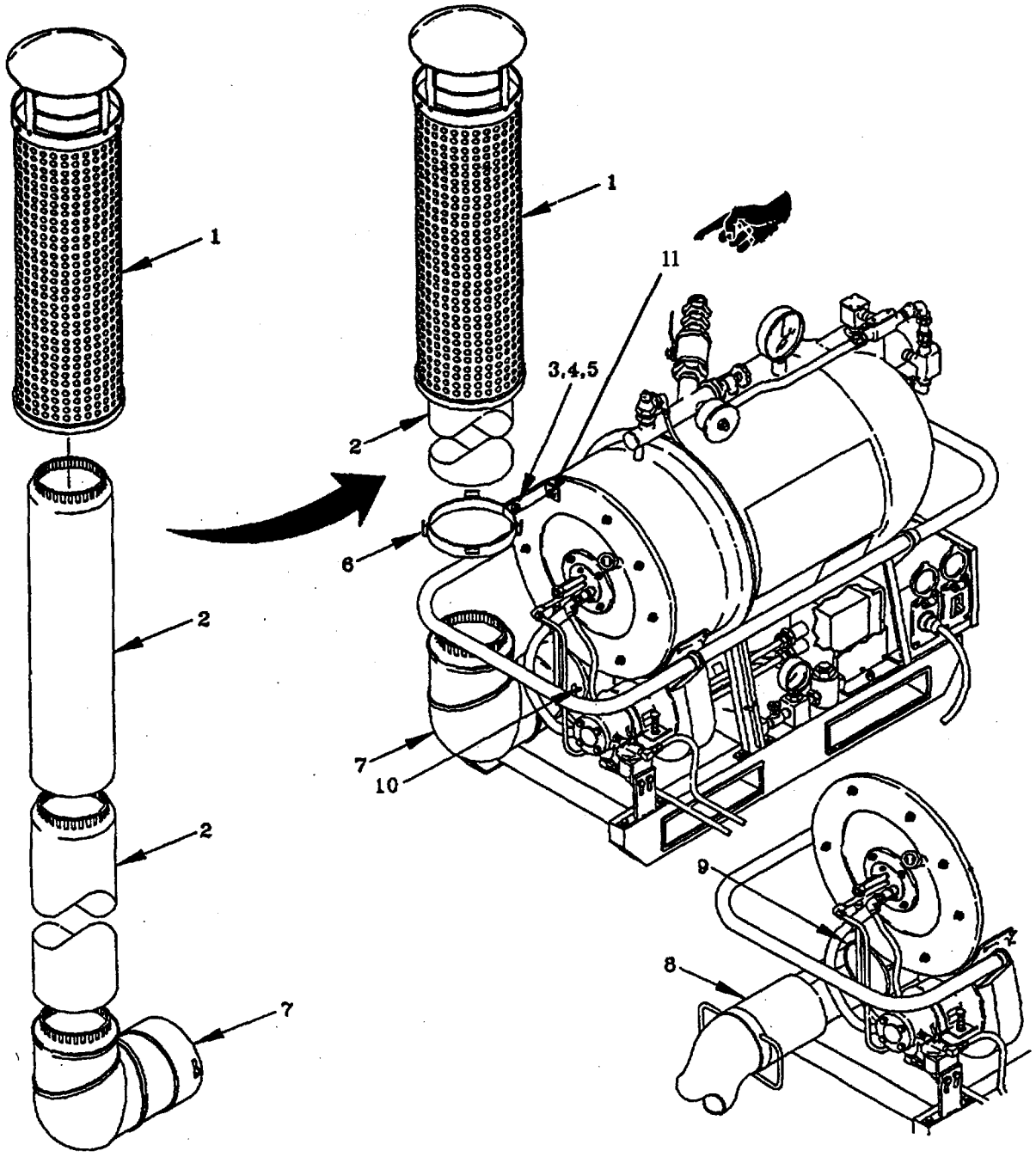
c. Remove nut (3), screw (4) and washer (5) on flue support (6) and remove smokestack (2).

d. Twist elbow (7) to left and pull out to remove.

(M-85)

e. Disconnect exhaust duct (8) from exhaust collar (9).

f. Unscrew nut (11) and remove flue support (6).



4-15. SMOKESTACK AND GUARD ASSEMBLY (M-80)/EXHAUST DUCT (M-85) (CONT)

INSTALL

(M-80)

a. Place elbow (7) over two mounting studs (10) and turn to right until secure.

b. Insert smokestack (2) through flue support bracket (6) and over elbow (7).

c. Install screw (3), nut (4),and washer (5) to flue support (6).i

d. Install upper length of smokestack (2) to lower length.

e. Slide guard assembly (1) over smokestack (2).

(M-85)

f. Install new exhaust duct (8) to exhaust collar (9).

4-16. IGNITION TRANSFORMER ASSEMBLY.

This task covers:

a. Inspect **b. Remove**
c. Test **d. Install**

INITIAL SETUP:

Tools:

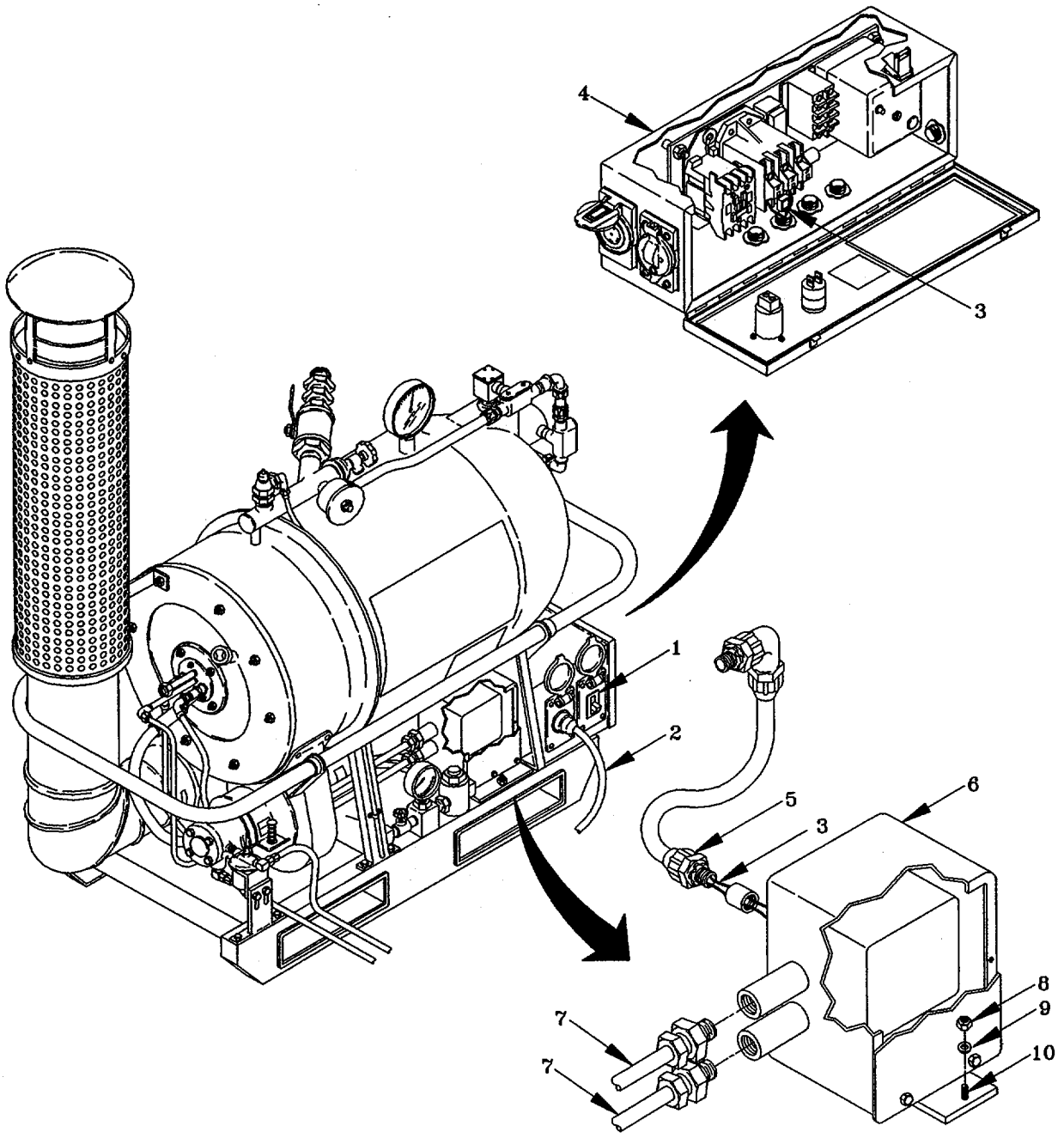
Tool Set, General (Appendix B, Item 1)
Multimeter

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Tags, (Item 17, Appendix F)

Equipment Condition:

Water heater shut off and electrical power disconnected.


4
3
1
2
6
5
3
8
9
10
7
7

4-16. IGNITION TRANSFORMER ASSEMBLY. (CONT)

INSPECT

Inspect transformer assembly for physical damage or corrosion to the transformer housing or cable connectors.

REMOVE

WARNING

Lethal voltage is present when the water heater is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

a. Turn off power switch (1) and disconnect power cable (2).

b. Disconnect two ignition cables (7) from transformer box (6).

c. Remove six screws (8). Remove cover (9).

d. Disconnect and tag two black ignition wires (3) in transformer box (6).

e. Remove two screws holding transformer into box.

f. Remove transformer from box.

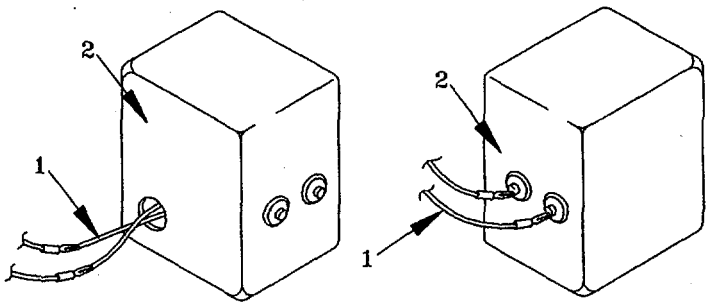
TEST

WARNING

Do not work on live circuits. Contact with the high voltage present in the water heater can cause severe injuries or death. Make certain power is disconnected from the water heater before performing the following procedures.

Resistance Specifications

	Pri Ohms	Sec Ohms
110V	2-7	15-50
208V	1-5	15-50



a. Using a multimeter check resistance between the two primary wires (1). Resistance should be approximately 2-7 ohms. A reading of 0 or infinity indicates a defective transformer.

b. Check resistance between one primary wire (1) and transformer housing (2). Resistance should be infinity (indicating an open circuit). Any reading, other than infinity, indicates a defective transformer.

c. Repeat steps a. and b. on secondary side. Resistance should be higher.

d. If test indicates defective transformer, replace it.

INSTALL

a. Install transformer (6) into box. Secure with two screws.

b. Reconnect two black wires (3) from control box to transformer leads.

c. Reconnect ignition cables (7) into secondary side of transformer.

d. Reinstall cover (9) with six screws (8).

4-17. ELECTRICAL COMPONENTS

This task covers:

a. Inspect **b. Test**
c. Remove **d. Install**

INITIAL SETUP:

Tools:

Tool set, General (Item 1, Appendix B)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Tags (Item 17, Appendix)

Equipment Condition:

Water heater shut off and electrical power disconnected.

INSPECT

Inspect the conduits, electrical fittings and wiring for damage, rust, corrosion or exposed electrical wires. Replace faulty components.

WARNING

Lethal voltage is present when the water heater is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

TEST

a. Going thru both thermostats, rotate shaft on operating control clockwise until a click is heard. Perform continuity test with a multimeter. Zero ohms should be read. Counterclockwise should read infinity.

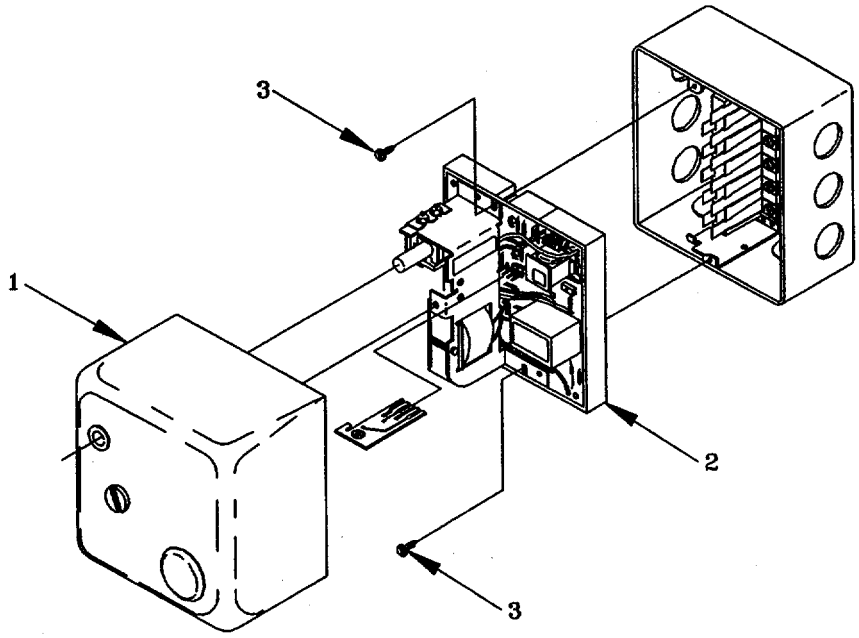
b. If a click was heard, remove cover from conduit box. If a click was not heard, replace switch.

c. Disconnect red and orange wires.

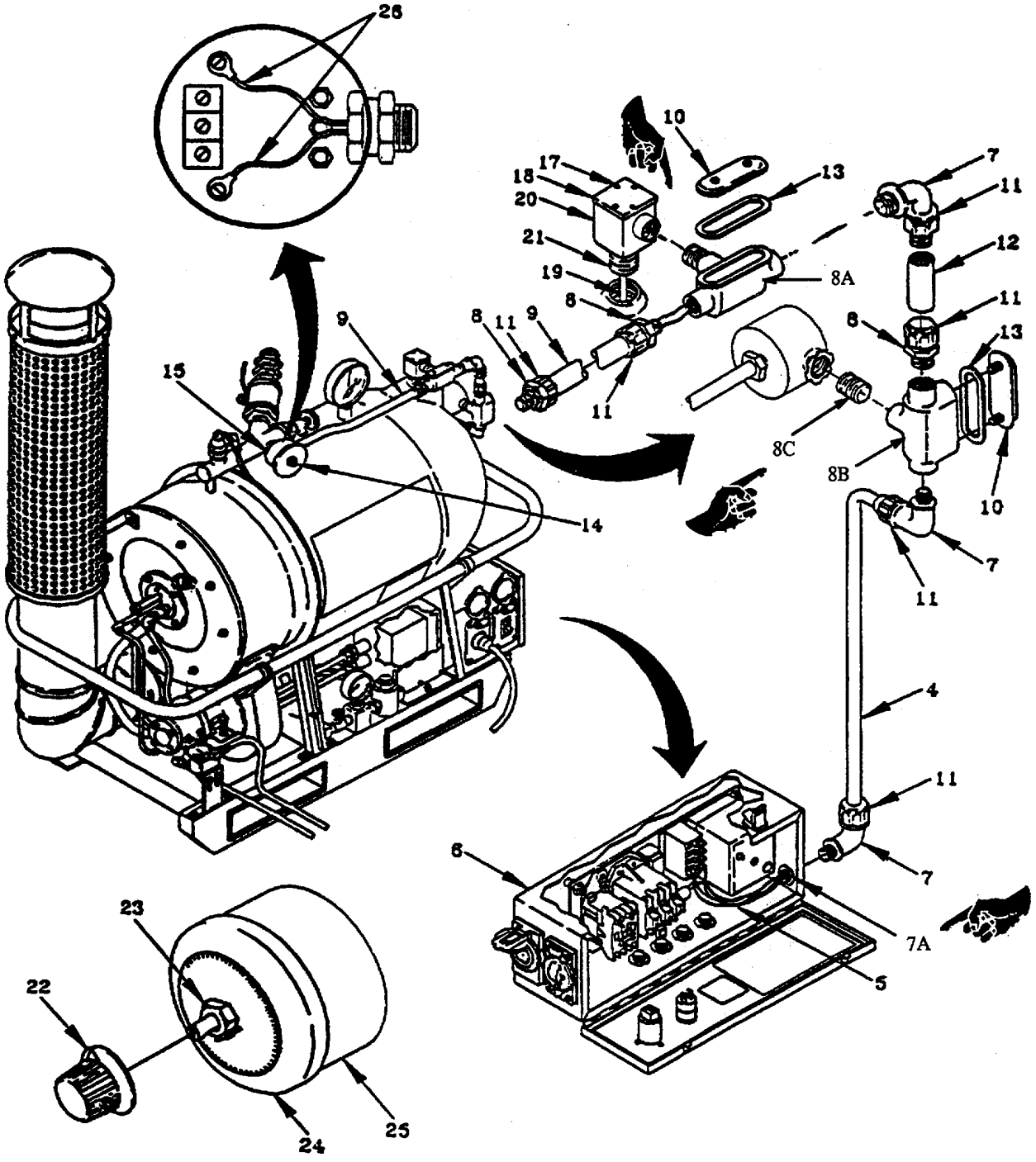
d. Perform continuity check on red wire from operating control thermostat. Perform continuity check on orange wire from high limit switch.

e. If correct readings do not register, leave one lead on red, place other lead on common terminal of high limit switch.

f. Rotate shaft on operating control clockwise until click is heard. Reading should be zero ohms. Counterclockwise should read infinity. If these readings do not register, replace the operating control. If readings do register, replace the high limit control.



4-17. ELECTRICAL COMPONENTS (CONT)



REMOVE

a. Remove flame control cover (1) and circuit board (2) by removing two screws (3).

b. To remove rigid conduit (4), tag and disconnect wires (5) in control box (6) and remove nut (7A) from connectors (7). Remove rigid conduit (4) from control box (6).

c. To remove lower conduit, remove inspection plate (10), and gasket (13) to disconnect wires. Remove lower conduit, loosen nuts (11) and slide conduit (4) out.

d. To remove upper conduit (9), loosen nuts (11) on connectors (8) at both ends of conduit (9). Loosen screws, remove cover (14) and remove leads (26) from high limit switch (15). Unscrew nuts securing conduit to limit switch. Remove high limit switch (15) and slide conduit (9) out.

e. To remove short conduit (12), remove inspection plate (10) and gasket (13) from tee (8A) and remove wires. Loosen nuts (11) on connectors at both ends of conduit Remove ground cone (8) from tee (8B).

f. Remove knob (22), nut (23), and cover (24) from operating control (25).

g. Disconnect wires from common and normally open terminal.

h. Loosen four screws (17) and remove cover (18) from electrode holder (20).

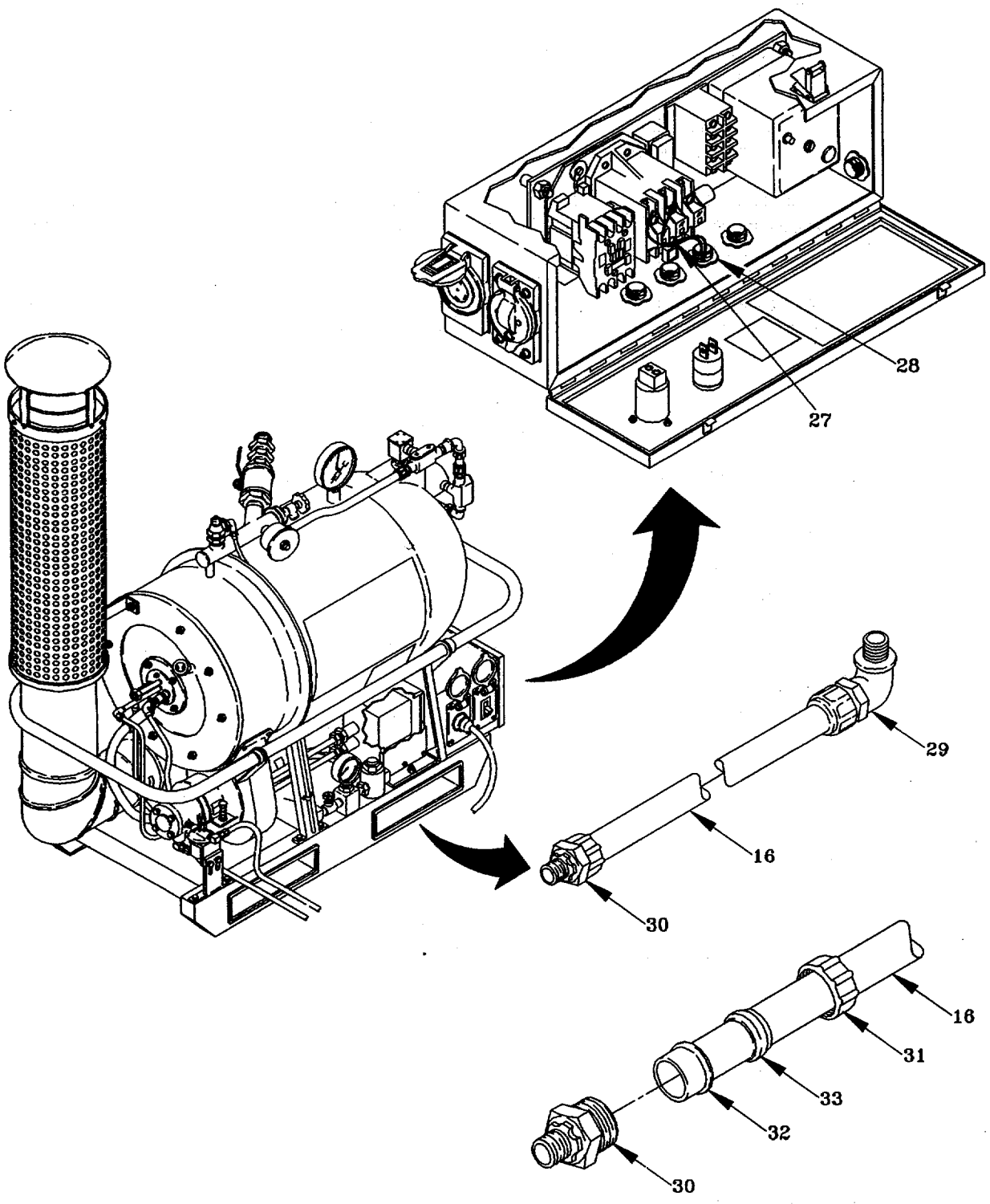
i. Disconnect lead from terminal. Unscrew electrode holder (20) from tank. Remove electrode holder (20) from electrode (19). Remove nipple (21) from electrode holder (20).

j. Unscrew tee (8B) from nipple (8C) and remove operating control (25) from tank.

k. To remove flexible conduit (16), tag and disconnect wires (27). Remove nut (28) and push connector (29) out. See figure on page 4-38.

l. Unscrew connector (30) at other end of conduit and pull wires through.

4-17. ELECTRICAL COMPONENTS (CONT)



m. To remove connector (30) from flexible conduit (16), unscrew nut (31) from connector (30) and disengage conduit.

n. Remove ground cone (32) from conduit (16). Slip nylon ring (33) and nut (31) from conduit.

INSTALL

a. Feed new wires into conduit.

b. Install nut (31) and nylon ring (33) onto conduit (16) and screw ground cone (32) into conduit. Screw nut (31) onto connector (30).

c. Screw connector (30) onto appropriate component

d. Install connector (29) onto control box securing it with nut (28).

e. Reconnect leads (27) as tagged.

f. Install operating control switch (25) onto water tank.

g. Install bushing onto limit switch (15), secure with nut (11). Install tee (8A) onto bushing.

h. Insert electrode (19) into electrode holder (20).

i. Install bushing (21) into electrode holder (20). Install electrode holder (20) into tank.

j. Connect blue wire to electrode (19).

k. Feed wire thru nipple (21).

l. Install connector (7) to tee (8B).

m. Feed blue wire thru connector (7). Install short conduit (12) with two nuts (11) and grounding cone (8) over wire onto connector (7).

n. Feed blue wire onto tee (8B). Splice blue wires. Replace inspection plate (10) and gasket (13).

o. Screw short conduit (12) onto tee (8B).

p. Install red leads onto operating temperature control (25), common and normally open.

4-17. ELECTRICAL COMPONENTS (CONT)

q. Splice red lead from common to red lead at lower conduit (4) injunction box. Secure with wire nuts.

r. Run other red lead out thru both tees and the short conduit (12).

s. Run orange lead out thru both tees and short conduit (12). Run red and orange leads thru upper conduit (9).

t. Install upper conduit (9) to tee (8A). Install short conduit (12) onto connector (7). Install nut (11) onto lower end of short conduit. Replace inspection plate (10) and gasket (13).

u. Install high limit switch (15).

v. Connect wires red, common, orange, normally open. Install upper conduit (9) to high limit switch (15) and secure with nut (11).

w. Replace cover and nut (14) on high limit switch (15).

x. Install cover (18) on electrode holder (20). Secure with four screws (17).

y. Install cover (24) on operating temperature control switch (25). Secure with nut (23) and replace knob (22). Tighten setscrew on knob (22).

z. Install rigid conduit (4) with wires (5) to both connectors (7) and tee (8B).

| aa. Secure lower conduit by installing connector (7) into control box (6) and tighten nut (7A). Install wires (5) into control box.

ab. Remount circuit board (2) and flame control cover (1) by installing two screws (3).

4-18. IGNITION CABLE ASSEMBLIES.

This task covers:

a. Remove **b. Install**

INITIAL SETUP:

Tools:

Tool Set, General (Appendix B, Item 1)

Materials/Parts:

Rags, Wiping (Appendix F, Item 15)

Equipment Condition:

Water heater shut off and cooled down. Power switch off and power cable disconnected.

REMOVE

Remove the ignition cable assemblies as follows:

WARNING

Lethal voltage is present when the water heater is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

a. Loosen connector (1) on ignition cable (2) and disengage cable.

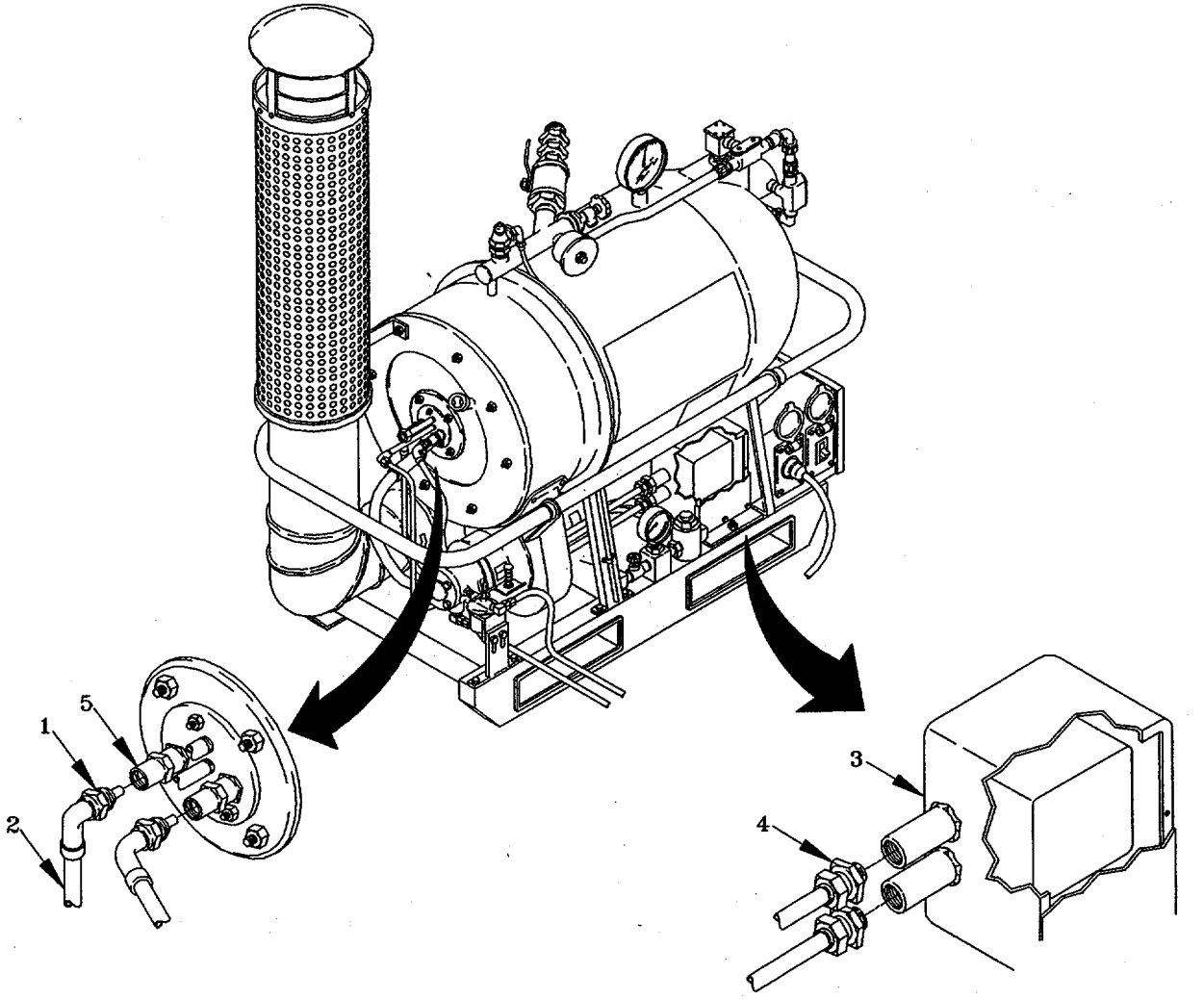
b. At transformer box (3), loosen adapter (4), let cable turn to prevent twisting, and disengage cable.

c. Replace ignition cables if leads on either end appear damaged.

INSTALL

a. Connect adapter (4) to transformer box (3), let the cable (2) turn with the adapter.

4-18. IGNITION CABLE ASSEMBLIES (CONT)



b. Feed cable (2) under water heater and connect connector (1) to spark plug (5).

c. Tighten cable connectors.

FOLLOW-ON MAINT.

Connect power cable and turn power on.

4-19. FUEL FILTER ASSEMBLIES (M-80) AND (M-85).

This task covers:

a. Remove **b. Repair** **c. Install**

INITIAL SETUP:

Tools:

Tool Set, General (Appendix B, Item 1)

Materials/Parts:

Rags, Wiping (Appendix F, Item 15)
Packing Kit
Washer, Lock MS 35333-39
Washer, Lock MS 35333-40
Washer, Flat MS 27183-10

Equipment Condition:

Water heater shut off and cooled down.
Power switch off and power cable disconnected.

REMOVE

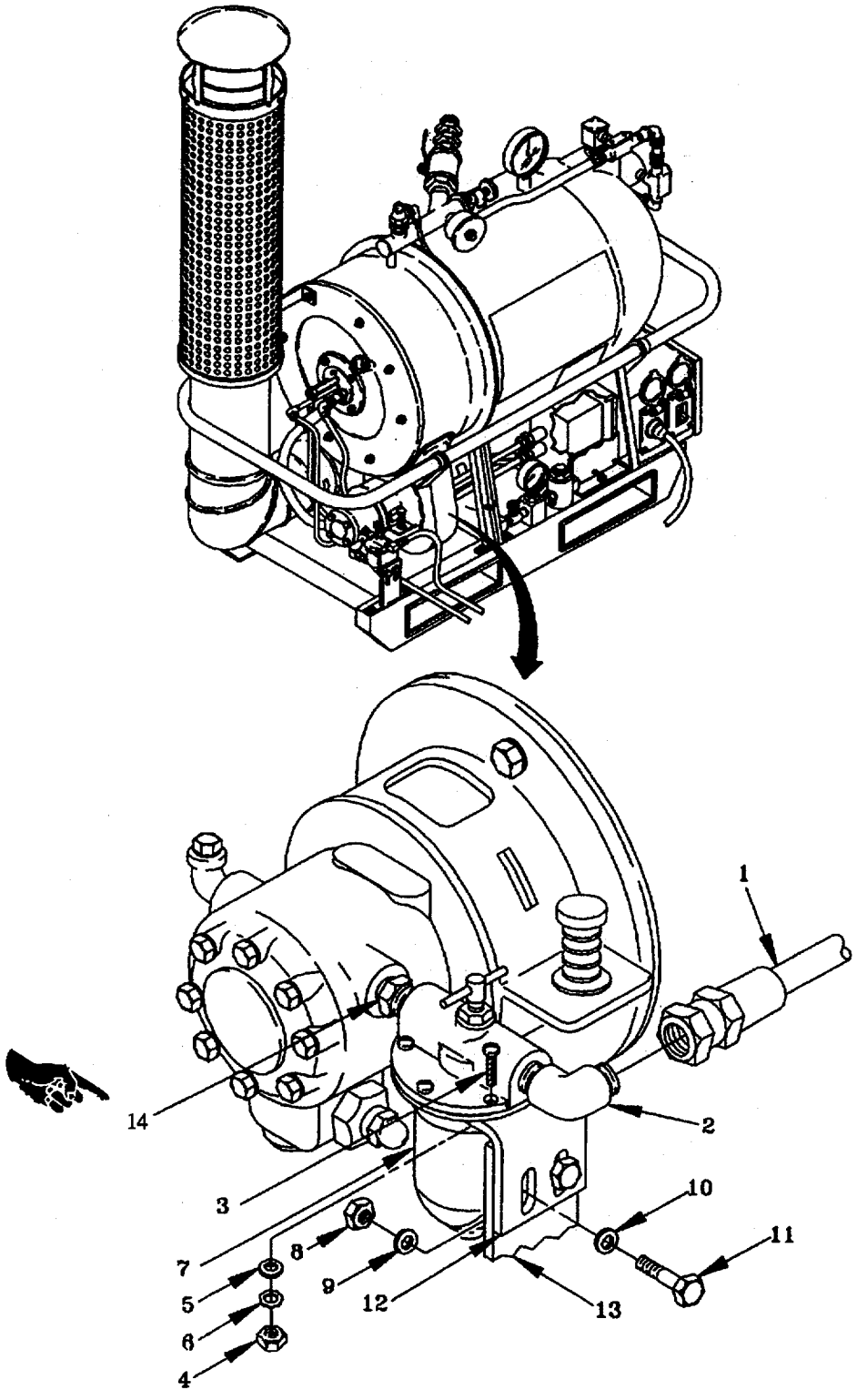
Remove the fuel filter assembly (M-80) as follows:

WARNING

Exposed fuel and fuel vapor can ignite or explode resulting in severe injury or death. Observe proper safety precautions when servicing fuel system. Ensure water heater is cooled down before servicing fuel system.

a. Disconnect fuel supply line (1) from elbow (2), elevate hose to allow fuel to drain into container. Rest hose on container.

4-19. FUEL FILTER ASSEMBLIES (M-80) AND (M-85). (CONT)



b. Remove elbow (2).

c. Remove two capscrews (3), two nuts (4), two flat washers (5), and two star washers (6).

d. Lower rivet on air band to lowest position to clear fuel filter (7).

e. Remove two nuts (8), lockwashers (9), screws (11), flat washers (10), and brace (12) from mounting bracket (13).

f. Unscrew fuel filter (7) from nipple (14).

Remove the fuel filter assembly (M-85) as follows:

g. Disconnect hoses (1) from nipples (2).

h. Remove two nuts (8), lockwashers (9), screws (11), flat washers (10), and brace (12) from mounting bracket (13).

i. Remove nipples (2) from fuel filter (7).

REPAIR

a. Remove two nuts (4), lockwashers (5), screws (3), flat washers (6), and brace (12), from fuel filter head (14).

b. Remove four screws (15) securing plate (16), filter bowl (17), and gasket (18), from fuel filter head (14).

WARNING

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated areas. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 100-138°F (38-59°C). If you become dizzy while using cleaning solvent, get fresh air and medical aid immediately. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

c. Clean all parts in dry cleaning solvent.

4-19. FUEL FILTER ASSEMBLIES (M-80) AND (M-85). (CONT)

d. Install new gasket (18), filter bowl (17), securing plate (16) and secure to fuel filter head (14) with four screws (15).

e. Install brace (12) on fuel filter (7) and secure with two screws (3), lockwasher (5), flatwasher (6), and nuts (4).

INSTALL

Install fuel filter assembly (M-80) as follows:

a. Join filter (7) to nipple (14) and turn clockwise until tight.

b. Install fuel filter brace (12) to mounting bracket (13) using two screws (11), two lockwashers (9), two flat washers (10) and two nuts (8).

c. Install elbow (2).

d. Install two capscrews (3), two nuts (4), two lockwashers (5) and two flatwashers (6). Connect fuel line (1) to elbow (2).

Install fuel filter assembly (M-85) as follows:

NOTE

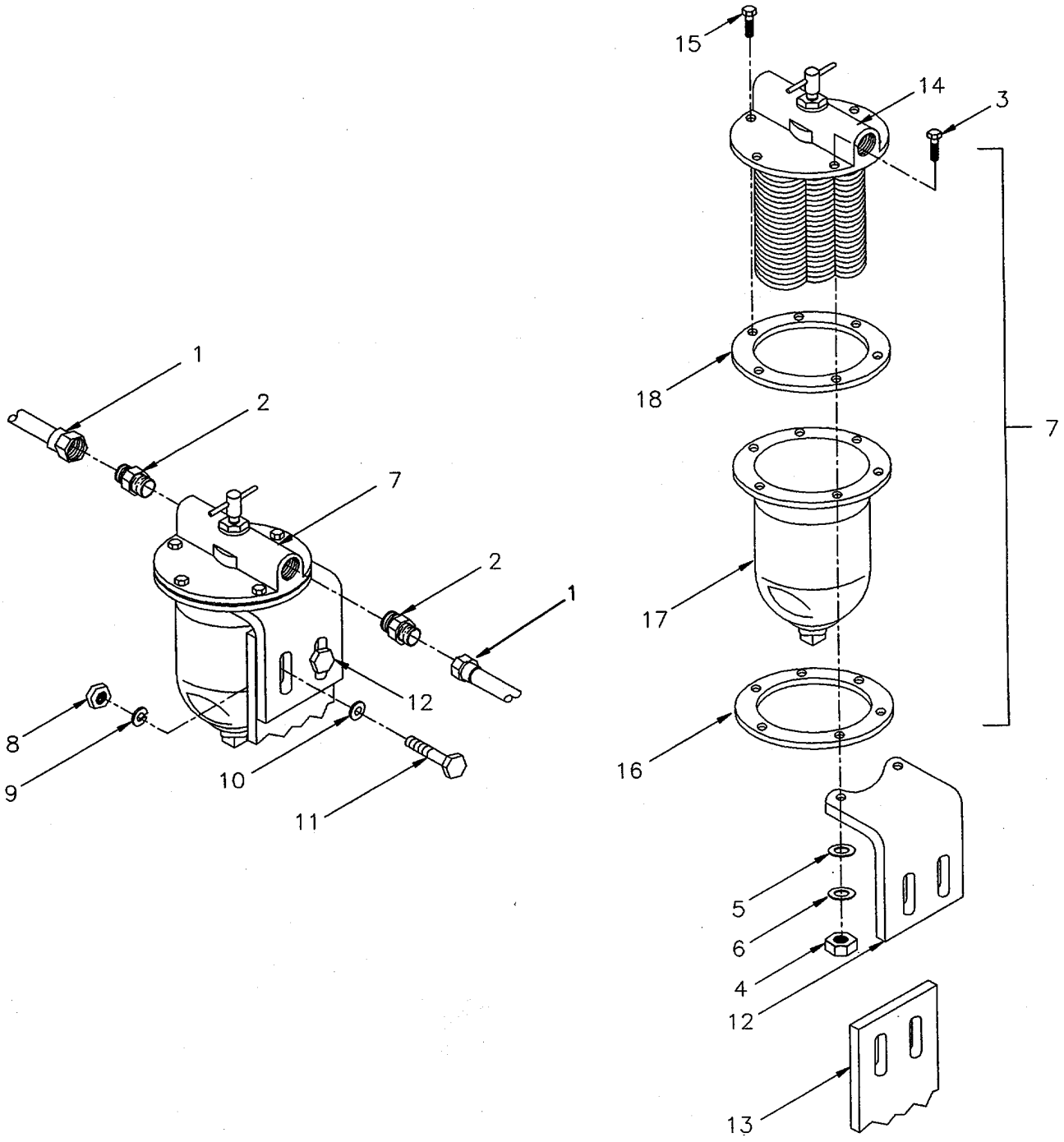
If bowl and gasket were replaced, ensure there are no fuel leaks.

a. Install nipples (2) in filter (7). Inlet side takes large nipple and outlet side takes small nipple.

b. Position fuel filter (7) on fuel filter brace (12) and secure with two screws (3), flat washers (5), lockwashers (6) and nuts (4).

c. Install fuel filter brace (12) to mounting bracket (13) using two screws (11), two lockwashers (9), two flat washers (10) and two nuts (8).

d. Connect hoses (1) to nipples (2).


15
14
3
18
7
17
16
5
6
4
12
13
1
2
7
2
1
12
8
9
10
11

4-20. FUEL PUMP ASSEMBLIES

This task covers:

a. Service **b. Inspect** **c. Adjust**

INITIAL SETUP:

Tools:

Tool Set, General (Appendix B, Item 1)

Materials/Parts:

Rags, Wiping (Appendix F, Item 15)
Soap (Appendix F, Item 20)

WARNING

Disconnect Power

Equipment Condition:

Water heater shut off and cooled down.
Power limit switch off and power cable disconnected.

SERVICE

Service the fuel pump by removing dirt and clogs from the fuel strainer as follows:

a. Remove eight screws (1) from fuel pump (2).

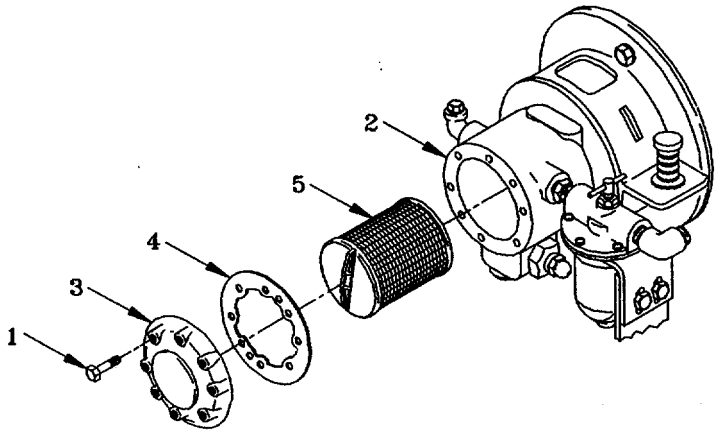
b. Remove cover (3) and gasket (4) from fuel pump (2).

c. Grasp strainer (5) by handle and pull strainer out.

d. Clean or unclog strainer (5) as necessary.

e. Push strainer (5) into fuel pump (2).

f. Place gasket (4) and cover (3) on fuel pump (2) and install eight screws (1).



INSPECT

Inspect the fuel pump for damage to housing. Check for damaged threads on fuel filter and elbow connections.

ADJUST (For M-85 Water heater only)

a. With water heater operating, fully open air shutter.

b. Adjust fuel pressure for the following elevations:

ELEV.(ft.)	PRESS. (Psi)
0-2500	125
2500-4000	115
over 4000	100

4-21. WATER VESSEL AND SKID ASSEMBLIES

This task covers:

a. Inspect **b. Repair.**

INITIAL SETUP:

Tools:

Tool set, General (Item 1, Appendix B)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Primer (Item 12, Appendix F)
Paint (Item 11, Appendix F)
Soap (Appendix F, Item 20)

WARNING

Disconnect power.

Equipment Condition:

Water heater shut off and cooled down.
Power switch off and power cable disconnected.

INSPECT

Inspect the water vessel and skid assemblies as described in paragraph a through c. Notify direct support maintenance if any welds are broken or other damage that can not be corrected by cleaning, painting or tightening of bolts.

a. Inspect smoke box cover gasket (1) for breaks, burns or damage.

4-21. WATER VESSEL AND SKID ASSEMBLIES. (CONT)

b. Inspect water vessel for dents, breaks, cracks or leaks. Check weld spots for breaks.

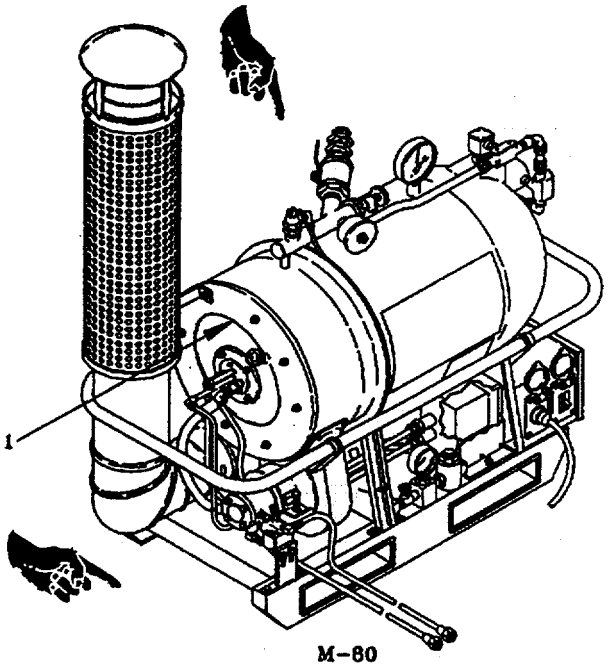
REPAIR

NOTE

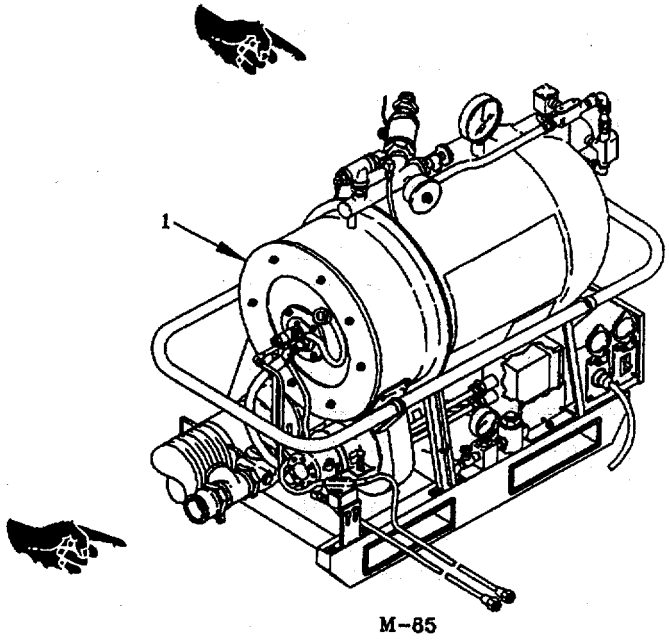
Do not paint hose fittings, glass or decals.

a. Repair the water vessel and skid assembly by first priming exposed surfaces with primer. Then apply one coat of paint per FED-STD-595.

b. Tighten mounting bolts on skid assembly if necessary.



M-80



M-85

4-22. UPPER AND LOWER MANIFOLD ASSEMBLY

This task covers:

a. Inspect
b. Remove
c. Repair
d. Install

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)
Tool Set, Common No. 1 (Item 3, Appendix B)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Sealer (Item 13, Appendix F)

WARNING

Disconnect power.

Equipment Condition:

Water heater shut off and cooled down.
Power switch off and power cable disconnected.

INSPECT

Inspect the upper and lower manifold assemblies for leaks, corrosion, damage, or loose components.

REMOVE

Remove faulty manifold assembly components as follows:

WARNING

Hot water under pressure is present in the water heater. Do not attempt to work on the plumbing until the water heater is cooled down

a. (M-80) Unscrew coupling (1) from bushing (2).

b. Unscrew bushing (2) and valve (3) from upper manifold (10).

c. Unscrew vent valve (4) and coupling (5) from upper manifold (10).

d. Unscrew overflow tube fitting (6) and clamp (12) from elbow (7). Remove overflow tube (13).

4-22. UPPER AND LOWER MANIFOLD ASSEMBLY (CONT)

e. (M-80) Unscrew elbow (7) from relief valve (8).

f. (M-80) Unscrew relief valve (8) from bushing (9).

g. (M-85) Unscrew connector (14) from elbow (15).

h. (M-85) Unscrew elbow (15) from bushing (16).

i. (M-85) Unscrew relief valve (8) from tee (17).

j. (M-85) Unscrew tee (17) from bushing (9).

k. Unscrew bushing (9) from manifold (10).

l. (M-80) Unscrew coupling (11) from lower manifold (18).

m. (M-85) Unscrew coupling (11) from tee (19).

REPAIR

Repair the manifold assemblies by removing rust or corrosion and tightening components to eliminate leaks. Replace any components that cannot be repaired.

INSTALL

NOTE

Before installing fittings, coat threads with sealer.

a. Install bushing (9) into upper manifold (10).

b. (M-80) Install relief valve (8) into bushing (9).

c. (M-80) Install elbow (7) into relief valve (8).

d. (M-85) Install tee (17) into bushing (9).

e. (M-85) Install relief valve (8) into tee (17).

f. (M-85) Install bushing (16) and elbow (15) onto tee (17).

g. (M-85) Install connector (14) onto elbow (15).

h. Install overflow tube (13) by attaching fitting (6) to elbow (7) and install clamp (12).

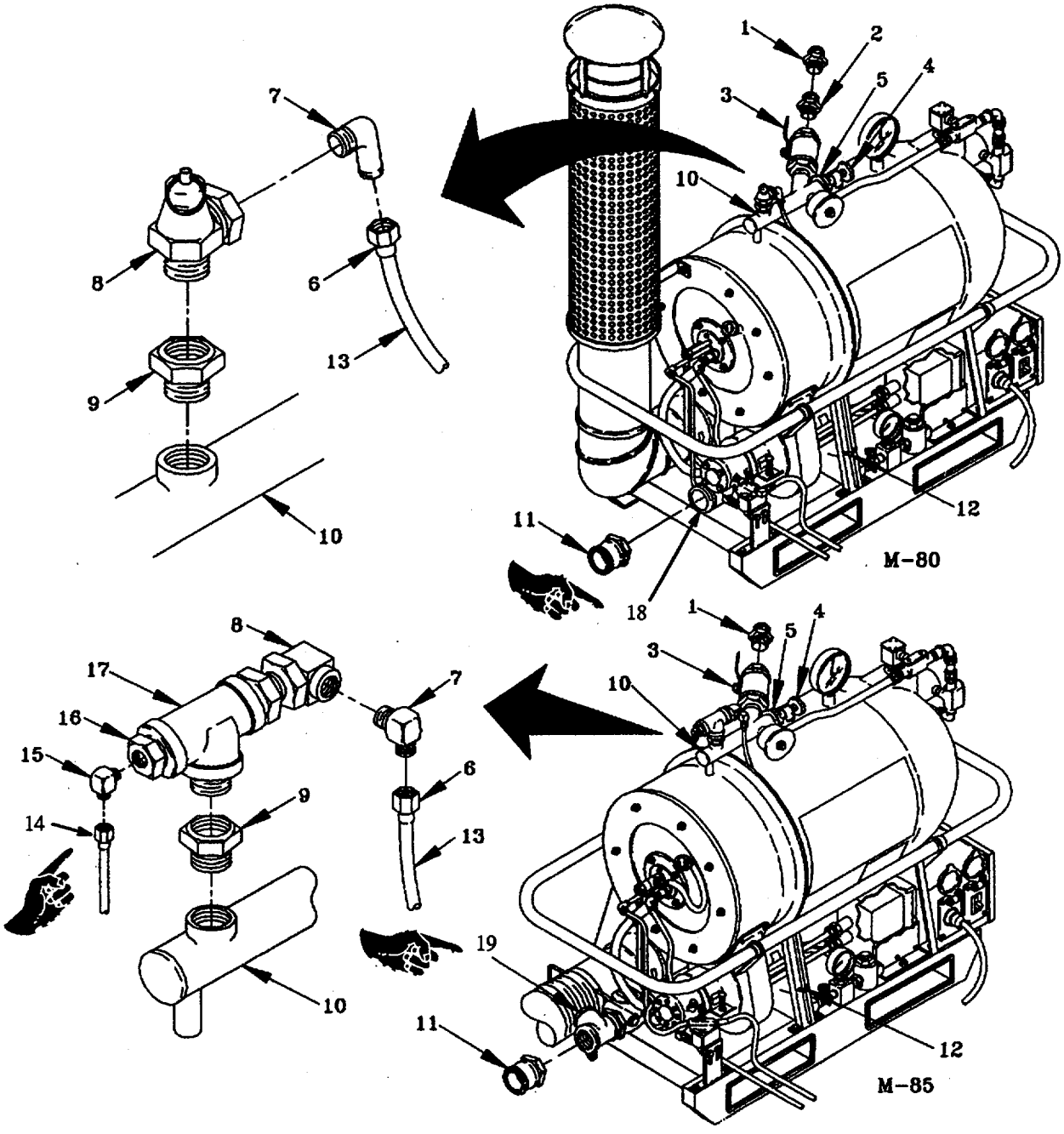
i. Install coupling (5) onto upper manifold (10) and vent valve (4) into coupling (5).

j. Install valve (3) into upper manifold (10).

k. Install bushing (2) into valve (3) and coupling (1) onto bushing (2).

l. (M-80) Install coupling (11) into lower manifold (18).

m. (M-85) Install coupling (11) onto tee (19).



4-23. DRUM FILL ADAPTER ASSEMBLY, TYPE II.

This task covers:

a. Disassembly **b. Inspect** **c. Assembly**

INITIAL SETUP:

Tools:
Tool Set, General (Item 1, Appendix B)

Materials/Parts:
Rag, Wiping (Item 15, Appendix F)
Sealer (Item 13, Appendix F)

Equipment Condition:
Adapter assembly not in use.

DISASSEMBLY

a. Remove extension adapter (1) from pipe connector (2) by turning counterclockwise.

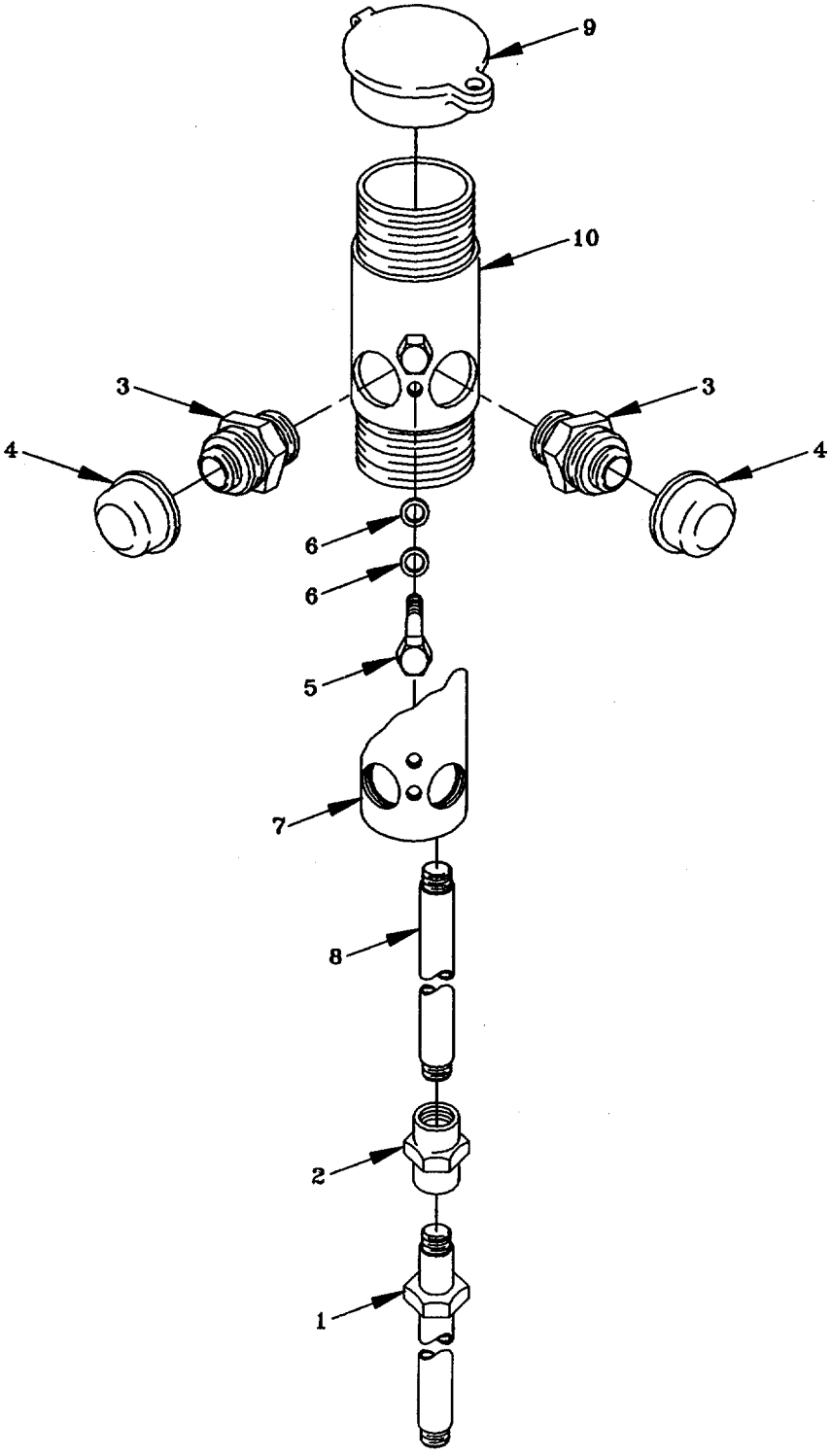
b. Remove pipe connector (2) from pipe (8).

c. Remove two male connectors (3) by turning counterclockwise and remove caps (4) or fuel lines from connectors.

d. Remove two screws (5), four washers (6), block (7) and adapter pipe (8).

e. Remove adapter pipe (8) from block (7) by turning counterclockwise.

f. Remove cover (9) from nipple (10) by turning counterclockwise.


9
10
3
3
4
4
6
6
5
7
8
2
1

4-23. DRUM FILL ADAPTER ASSEMBLY, TYPE II. (CONT)

INSPECT

Repair by replacing defective parts.

NOTE

Use sealer on pipe threads before installation.

ASSEMBLY

a. Attach cover (9) to nipple (10) by turning clockwise.

b. Attach double male pipe to supply side.

c. Install adapter pipe (8) in block (7) by turning clockwise.

d. Install block (7) and adapter pipe (8) in nipple (10) using two screws (5) and four washers (6).

e. Install pipe connector (2) on adapter pipe (8) and install extension adapter (1) on pipe connector (2).

f. Install two male connectors (3) in nipple (10) by turning dockwise. Replace fuel lines or caps (4).

SECTION VI. PREPARATION FOR STORAGE AND SHIPMANT

4-24. SPECIAL INSTRUCTIONS FOR ADMINISTRATIVE STORAGE

Placement of equipment in administrative storage should be for short periods of time 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.

Before placing the equipment in administrative 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.

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.

a. Inspection. In addition to the unit PMCS procedures, inspect the water heater for dirt, oil, corrosion, missing items and any signs of damage.

b. Draining and dismantling. Drain water from heater as described in paragraph 2-13. Dismantle the water heater as described in paragraph 2-15.

c. Cleaning and drying. Clean and dry the water heater in accordance with procedures described in paragraph 2-5 and TM 38-230-1.

d. Seal openings. Seal all openings on the water heater and fuel hoses with pressure sensitive tape (Item 18, Appendix F).

4-25. LONG TERM STORAGE AND SHIPMENT

Perform procedures outlined in paragraph 4-20 SERVICE a. through f. and correct all deficiencies determined during PMCS.

a. Painting. Repaint all surfaces where necessary by first priming with primer (Item 12, Appendix F) then painting with paint (Item 11, Appendix F). Apply a medium grade protective lubricating oil (Item 10, Appendix F) to exposed, polished, ground metal surface susceptible to corrosion or not otherwise protected.

b. Packaging. Package the water heater as follows:

(1) Open all valves and drain cocks.

(2) Connect fuel supply and return lines to the oil filter and fuel pump, respectively. Coil the lines beneath the heater and connect the ends to the fuel line holder.

(3) Fill the burner pump with P-10, grade 10 or grade 30 preservative (MIL-P-116).

(4) Treat all remaining interior surfaces with P-10, grade 10 or grade 30 preservative applied by fogging, spraying or completely filling and draining.

(5) Seal openings on the air shutter, smoke stack, manifold, and electric motor with barrier material (Item 19, Appendix F) and tape (Item 18, Appendix F) or with tape only.

(6) Place barrier material over gages, sight glasses and dials and secure with tape.

(7) Thread the drum adapter extension into the 1/4 inch return port. Hand tighten.

c. Packing. Pack the water heater in its original shipping crate, or construct a crate in accordance with class 2, grade A, style 7, type 3 load of PPP-B-621.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I.

REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

5-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization-and Equipment applicable to your unit.

5-2. SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT.

No special tools, TMDE, or support equipment are required for the water heater.

5-3. REPAIR PARTS.

Required repair parts are listed and illustrated in the Repair Parts and Special Tools List (Appendix C).

SECTION II. TROUBLESHOOTING

5-4. TROUBLESHOOTING PROCEDURES.

See Tables 3-1 and 4-2 for operator and unit troubleshooting procedures.

SECTION III. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

5-5. GENERAL CLEANING INSTRUCTIONS.

WARNING

Dry cleaning solvent, P-D-680 (Item 14, Appendix F) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

CAUTION

- Do not immerse oil soaked bearings or sealed bearings in cleaning solvent. Damage may occur to bearings.
- Exercise care when handling machined and polished surfaces to avoid nicks and other damage.
- Do not immerse more than one metal machined part in solvent at a time, unless parts are separated or protected from contacting each other.

a. Metal Parts

(1) Prior to removal or disassembly of components, remove oil or dirt with cleaning solvent (Item 14, Appendix F), or steam clean.

(2) Use cleaning solvent (Item 14, Appendix F) to clean parts such as housing and hand-packaged bearings.

(3) Clean bearings with solvent moistened cloth.

(4) Use brushes to clean irregularly shaped surfaces. Use wooden pegs to clean posts and orifices. Use a lint free cloth (Item 15, Appendix F) to wipe parts clean.

b. Electrical Components.

WARNING

Dry cleaning solvent, P-D-680 (Item 14, Appendix F) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well-ventilated area.

(1) Prior to removal or disassembly of electrical components, clean exterior by scraping off excess oil and dirt. Wipe with a clean lint free cloth (Item 15, Appendix F) dampened with cleaning solvent (Item 14, Appendix F).

WARNING

Safety glasses must be used when cleaning parts with compressed air. Failure to do so may result in injury to eyes.

CAUTION

Do not immerse oil soaked bearings or sealed bearings in cleaning solvent. Damage may occur to bearings.

(2) Clean armatures, coils, and solenoids with compressed air and wipe clean with lint-free cloth (Item 15, Appendix F) dampened in cleaning solvent (Item 14, Appendix F).

(3) Wipe electrical terminals with a clean, lint-free cloth (Item 15, Appendix F) dampened with cleaning solvent (Item 14, Appendix F). Use a soldering iron to clean solder from terminals and connectors.

c. Gaskets, Seals and O-Rings

(1) Clean all old gasket particles from mating surfaces.

(2) Discard and replace all gaskets, seals, O-rings, and flat washers.

5-6. GENERAL INSPECTION INSTRUCTIONS.

a. General. Perform an inspection of all parts as soon as possible after cleaning. Instructions for specific inspection procedures are included throughout the maintenance procedures for specific components.

b. Visual Inspection. Visually inspect all machined and polished areas. Use a strong light to shine across polished surfaces to inspect for scoring, cracks, breaks, or excessive wear.

c. Electrical Parts.

(1) Visually inspect wiring for frayed edges or damaged insulation.

(2) Inspect all electrical parts such as solenoids, with power applied to observe actual operation.

5-7. GENERAL REPAIR INSTRUCTIONS.

a. General. Repair the water vessel, skid, and base assembly by removing only the components necessary to make the repair. The flame safeguard control and wiring, control box assembly, and ignition transformer are tested or repaired while installed on the water heater. All other components of the water heater needing repair are removed from the heater at the unit maintenance level. Repair these components, make the necessary tests to ensure proper performance and return the components to supply for further use.

b. Thread Repair. Use the proper size tapping tool to repair tapped holes. Discard and replace all components that have defective threads.

CAUTION

Do not press on outer race of bearings when installing on shafts.

c. Press Fit Parts.

(1) Bearings may require the use of a pneumatic or hand-operated arbor press.

(2) Preheat all press-fit parts before reassembly. If necessary, use a lubricant to reduce abrasive action.

5-8. BLOWER ASSEMBLY

This task covers:

a. Remove **b. Inspect** **c. Install**

INITIAL SETUP:

Tools:
Tool Set, General (Item 1, Appendix B)

Materials/Parts:
Rags, Wiping (Item 15, Appendix F)
Washers, Star
Gaskets
Seals
O-Rings
Pump, Fuel
Tags, (Item 17, Appendix F)

Equipment Condition:
Water heater shut off and cooled down.
Power switch off and power cable disconnected.

REMOVE

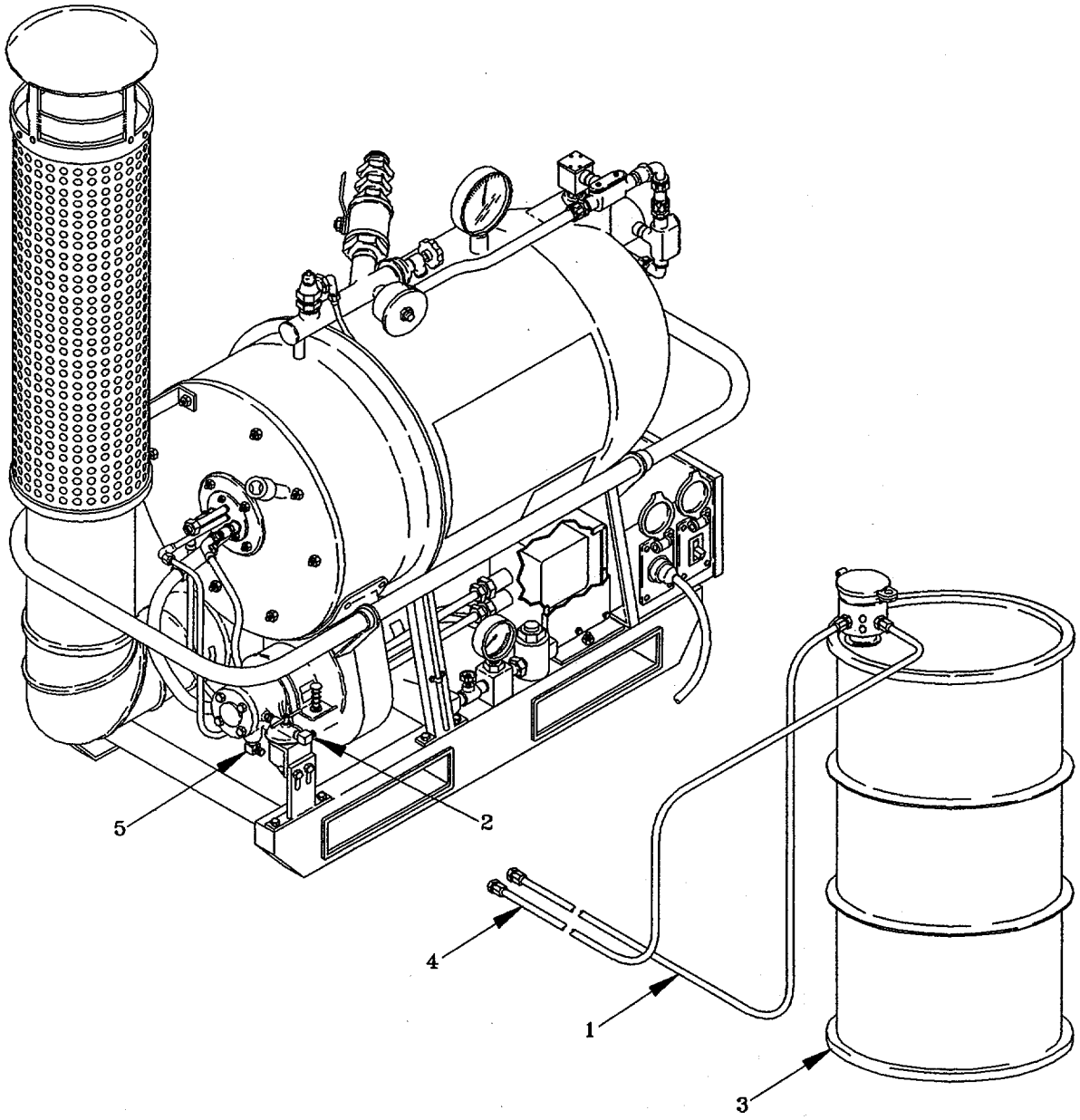
Remove the blower assembly as follows:

WARNING

- Lethal voltage is present when the water heater is connected to power source. Disconnect from power source before inspecting or repairing any electrical component. Be careful not to touch electrical connections. Electrical shock and/or death may result from failure to heed this warning.

- Exposed fuel and fuel vapor can ignite or explode resulting in severe injury or death. Observe proper safety precautions when servicing blower assembly. Ensure water heater is cooled down before servicing blower assembly.

5-8. BLOWER ASSEMBLY. (CONT)



a. Disconnect fuel supply hose (1) from elbow (2), elevate hose to allow fuel to drain back into container (3) and then rest hose on container.

b. Disconnect fuel return hose (4) from elbow (5), elevate hose to allow fuel to drain back into container (3) and then rest hose on container.

c. Remove two nuts (6), two lock washers (7), two flat washers (8), and two screws (9) from fuel filter pump bracket (10).

d. Disconnect fuel line (11) from fuel pump to solenoid valve (12).

e. Disconnect elbow (13) from fuel pump.

f. On backside of blower assembly, unscrew one screw (14) and remove cover plate with gasket (15).

g. Tag and disconnect wires (16) and remove nut (17). Push connector (18) down, disconnecting' it from junction box (19).

h. Remove two capscrews (20) and lockwashers (21) securing handle assembly (22) to blower housing (23)

i. Remove six hex head screws (24) and lockwashers (25) holding blower housing (23) to water vessel (26).

j. Remove blower housing (23) with motor (27) attached from water vessel (26).

k. Separate gasket (28) from blower housing (23).

INSPECT

a. Inspect blower assembly for damage or indication of burns around the blower motor.

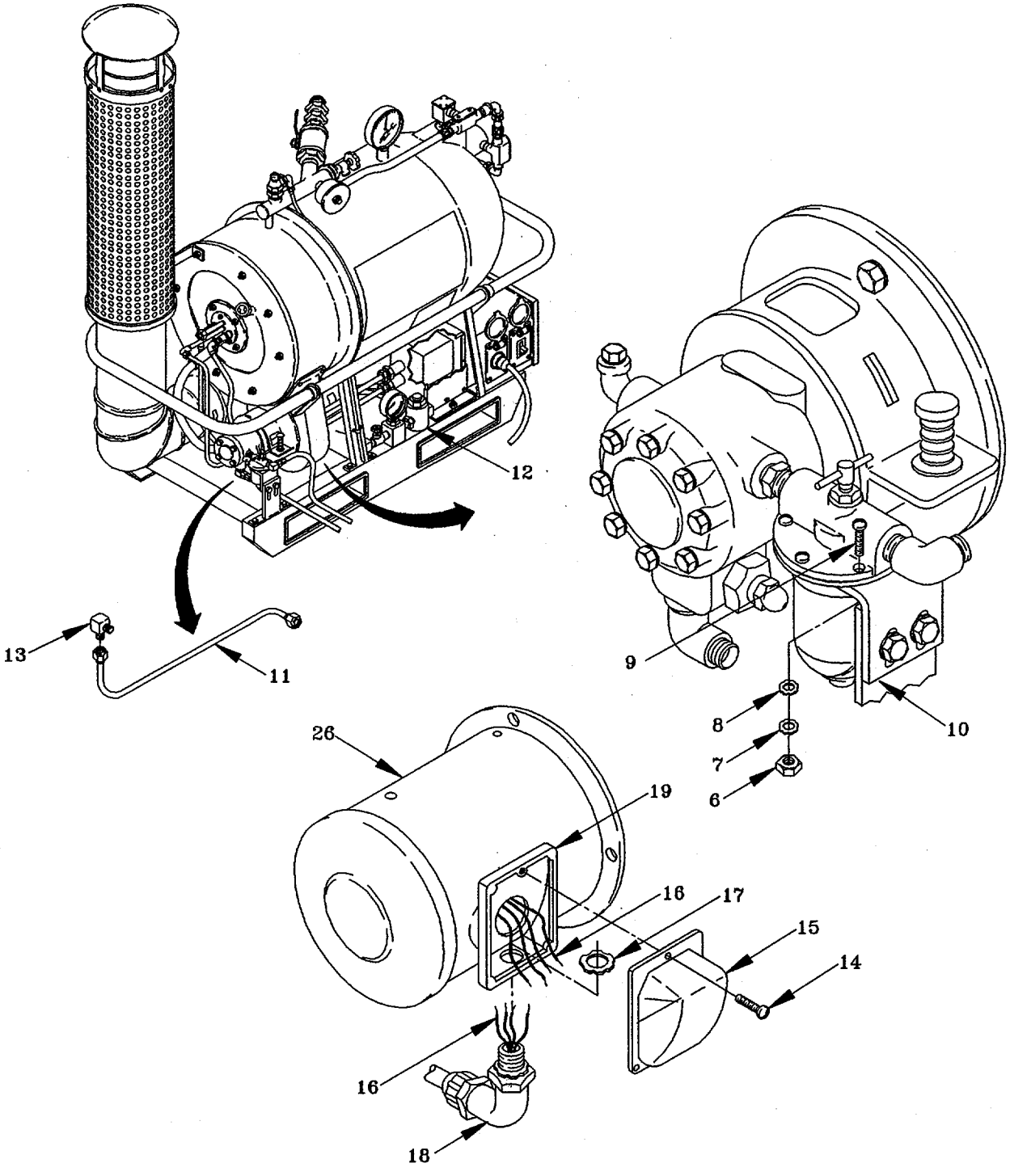
b. Check for free movement of the blower.

c. Replace any faulty components.

INSTALLATION

a. Place gasket (28) on blower assembly (23). Set blower assembly on water vessel (26). Secure handle assembly (22) to blower housing (23) using two capscrews (20) and lockwashers (21).

5-8. BLOWER ASSEMBLY. (CONT)



b. On back side of blower assembly, insert conduit connector (18) into junction box (19) and secure with nut (17).

c. Connect tagged wires (16), install cover plate (15) using one screw (14).

d. Mount blower housing (23) in position and secure with six hex head screws (24) and lock washers (25).

e. Connect elbow (13) to fuel pump.

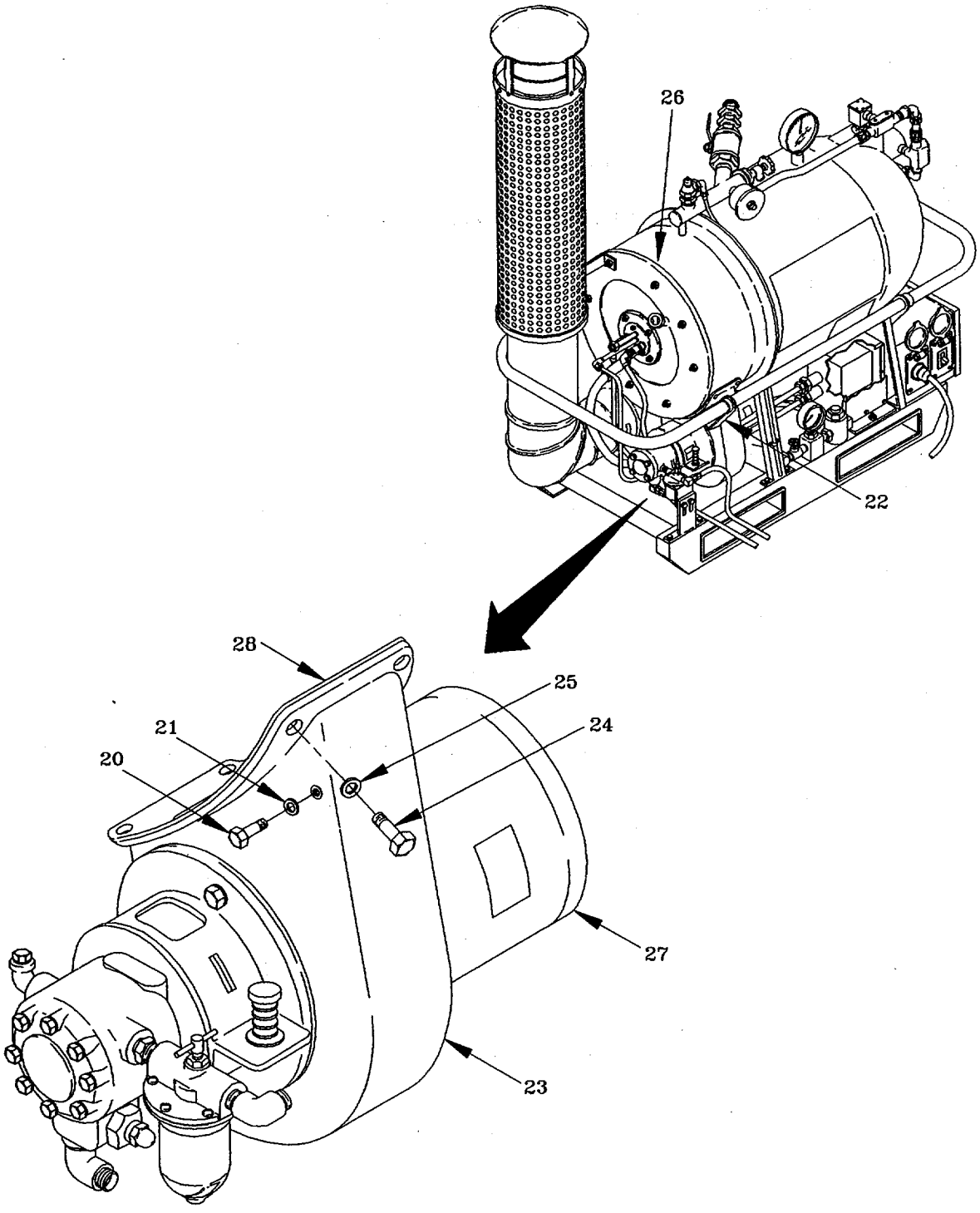
f. Secure handle assembly (22) to blower housing (23) using two capscrews (20) and lock washers (21).

g. Connect fuel line (11) from solenoid valve (12) to elbow (13).

h. Install two screws (9), two flat washers (8), two lock washers (7) and two nuts (6).

i. Connect fuel return hose (4) to elbow (5) and connect fuel line (1) to elbow (2).

5-8. BLOWER ASSEMBLY. (CONT)



5-9. BLOWER AND FUEL PUMP MOTOR

This task covers:

a.	**Remove**	**c.**	**Repair**
b.	**Inspect**	**d.**	**Install**

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)
Lubricating Oil, OE30 (Item 10, Appendix F)
Solvent, P-D-680 (Item 14, Appendix F)
Lock Washers

Equipment Condition:

Water heater shut off and cooled down.
Power switch off and power cable disconnected.

REMOVE

Remove faulty blower and fuel pump motor as follows:

a. Remove blower assembly from water heater as described in paragraph 5-8 a. through k.

b. Remove four capscrews (1), and four lockwashers (2).

c. Loosen setscrew (3) on coupling half (4) from shaft (5).

d. Slide motor (6) out of housing (7). Rubber insert (8) may come out with coupling half (4) attached to shaft (5), stay with coupling half (4) attached to pump or it may fall out.

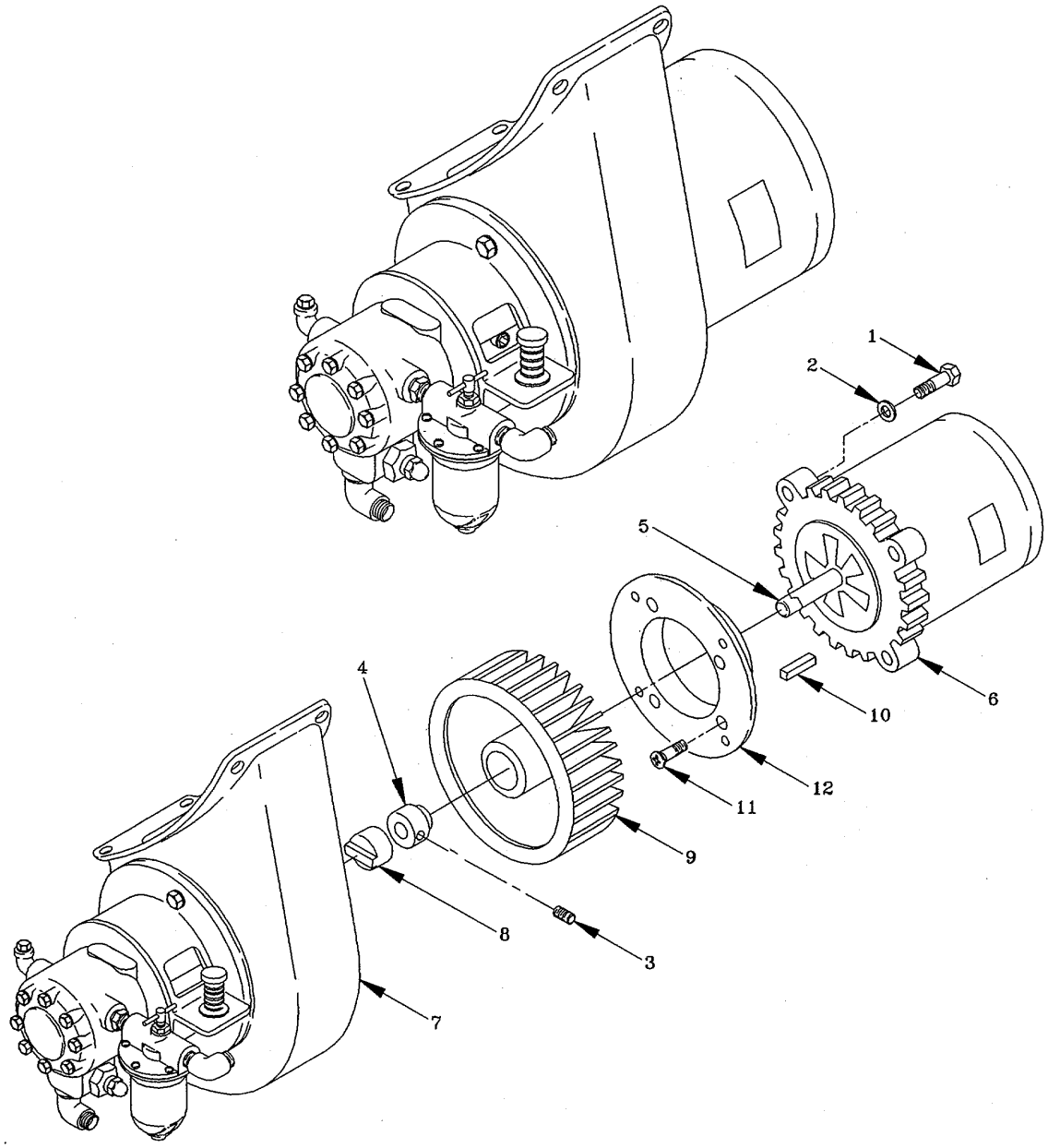
e. Carefully pry blower wheel (9) from shaft (5). Lift key (10) from blower shaft.

f. Remove four machine screws (11) securing mounting plate (12) to motor (6) and remove plate.

INSPECT

Inspect for burrs, nicks, burned or broken wires.

5-9. BLOWER AND FUEL PUMP MOTOR. (CONT)



REPAIR

a. Mark (1) motor housing (2) and end plates (3) for ease in reassembly.

b. Remove four bolts (4) holding end plates (3) to housing (2).

c. Remove bearings (5) from motor (6). Clean all parts except bearings with a clean dry cloth. Clean bearings with a clean, lint free cloth moistened in light engine oil.

d. Inspect for broken, cracked or burned motor (6) and bent shaft (7), bent fins (8), end plate (9), and damaged wiring. If any of these items are damaged, replace motor.

e. If bearings (5) are rough or excessively worn, replace bearings.

f. Install bearings (5) onto motor (6). Install end plates (9) into motor housing (2) in alignment with mark (1) on motor housing.

g. Secure using four bolts (4).

INSTALL

a. To install blower and fuel pump motor, set mounting plate (12) in place on motor (5) and secure with four machine screws (11).

b. Insert key (10) on shaft (8) and press blower wheel (9) on

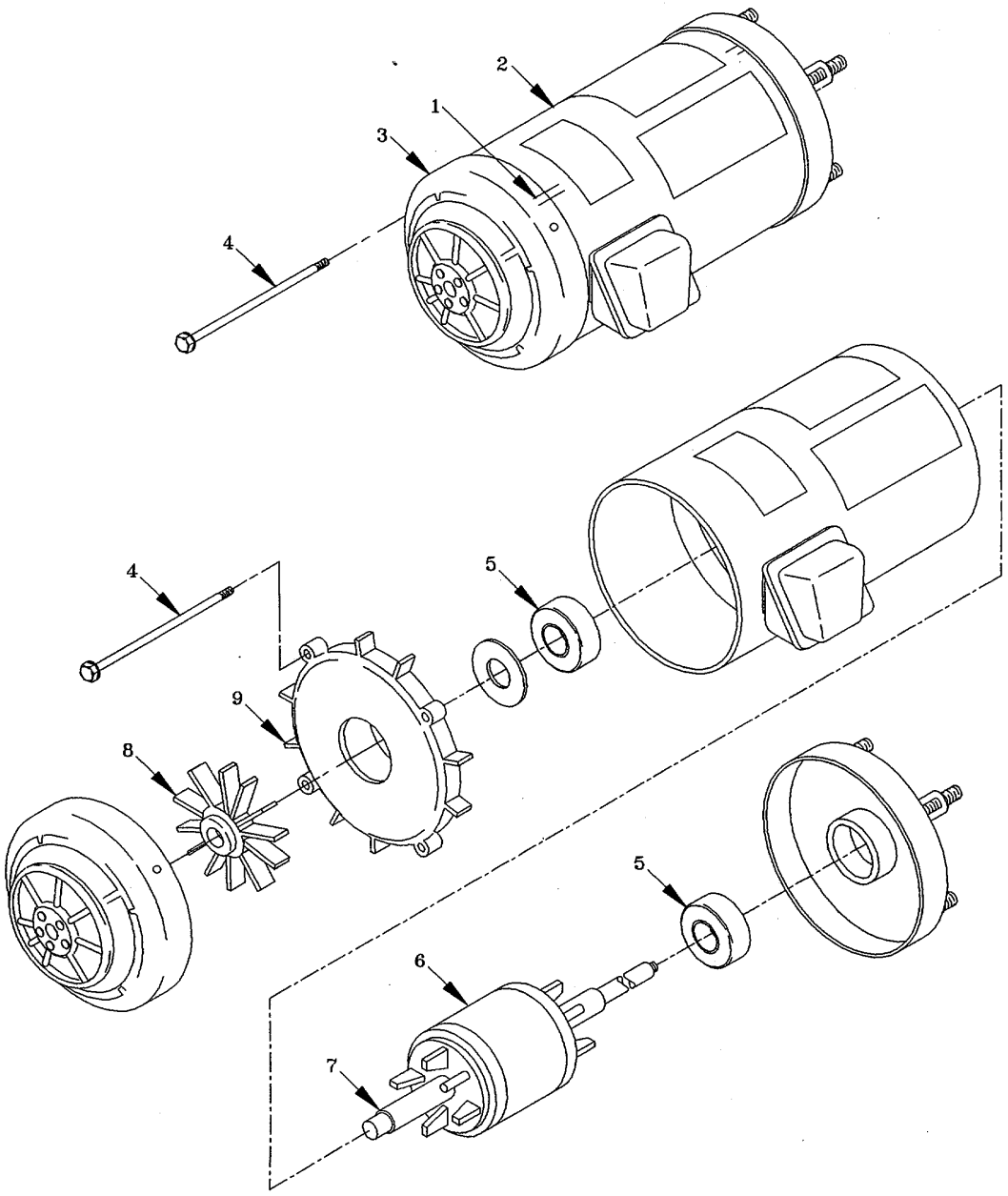
c. Tighten setscrew on blower wheel (9).

d. Install coupling (7) with insert (1) on shaft (8) and tighten setscrew (2).

e. Set motor (5) in place on blower assembly (6) and secure with four capscrews (3) and four lockwashers (4).

f. Install blower assembly to water heater as in paragraph 5-8.

5-9. BLOWER AND FUEL PUMP MOTOR. (CONT)



5-10. FUEL PUMP ASSEMBLIES

This task covers:

a. Remove **c. Repair**
b. Inspect **d. Install**

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)
Shop Equipment, Electrical, Repair (Item 2, Appendix B)

Materials/Parts:

Rag, Wiping (Item 15, Appendix F)
Solvent P-D-680 (Item 14, Appendix F)
Gaskets
Seals
MIL-S-7916 (Item 21, Appendix F)

Equipment Condition:

Fuel filter removed from water heater. See paragraph 4-19.

REMOVE

M-80

a. Remove two hex head screws (1) and two lockwashers (2) securing fuel pump (3) to shutter assembly (4).

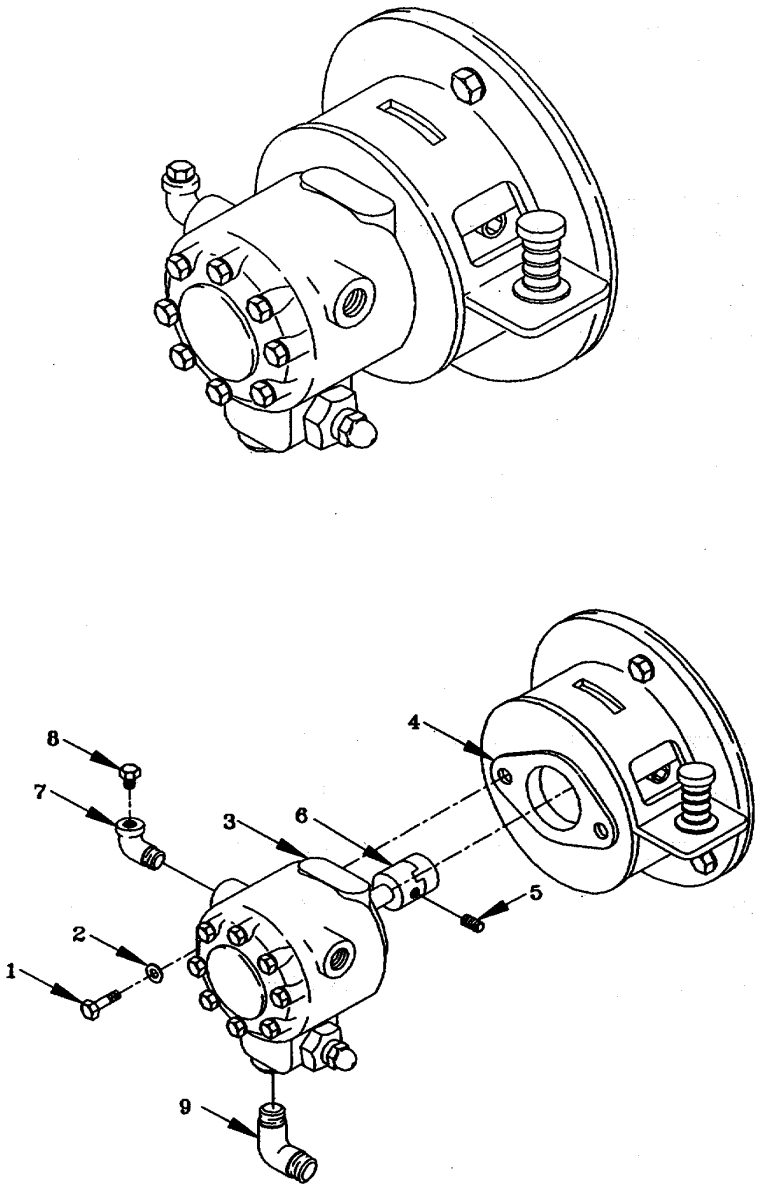
b. Loosen setsrews (5) on coupling (6) and remove fuel pump (3).

c. Remove elbow (7), plug (8), and elbow (9) from fuel pump (3).

d. Remove pipe plugs from replacement pump and install on defective pump to protect it from dirt and foreign matter.

e. Install bypass plug for proper operation with two pipe system.

5-10. FUEL PUMP ASSEMBLIES. (CONT)



M-85

a. Disconnect hose (10) from elbow (11).

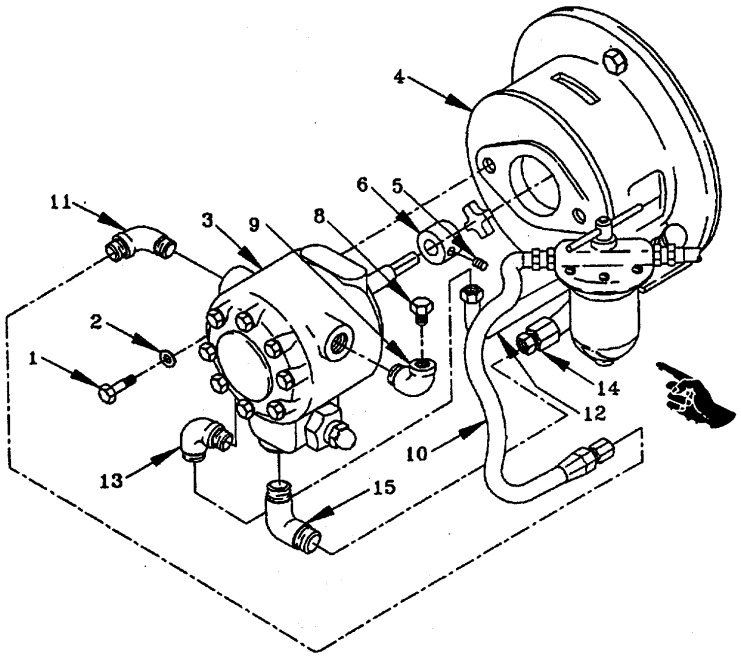
b. Disconnect fuel line (12) from elbow (13).

c. Disconnect hose (14) from elbow (15).

d. Loosen setscrew (5) on coupling (6).

e. Remove two screws (1), lockwashers (2), and fuel pump (3) from shutter assembly (4).

f. Remove elbows (11), (15), and (13) from fuel pump (3).



5-10. FUEL PUMP ASSEMBLIES. (CONT)

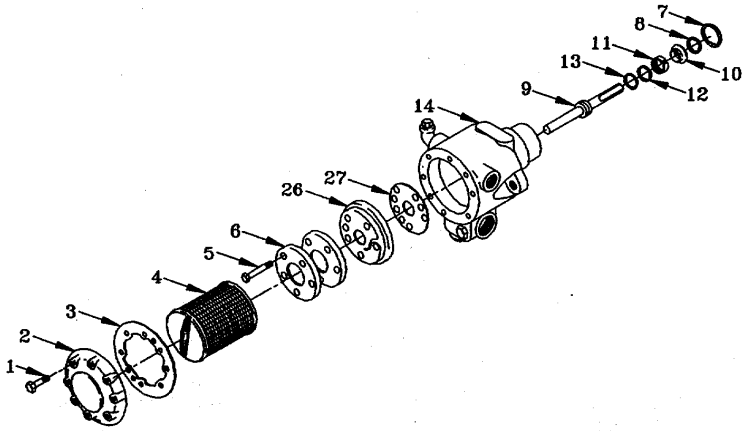
INSPECT

Inspect for burred, nicked, broken, scratched or excessively worn parts. Replace defective parts.

REPAIR

a. Remove eight screws (1) and remove cover (2) and cover gasket (3) from fuel pump body (14).

b. Grasp strainer (4) by handle and pull strainer out.



c. Unscrew five gear setscrews (5) and remove end plate assembly (6).

d. Use snap ring pliers to remove retaining ring (7) and O-ring (8) and press shaft assembly (9) out of body.

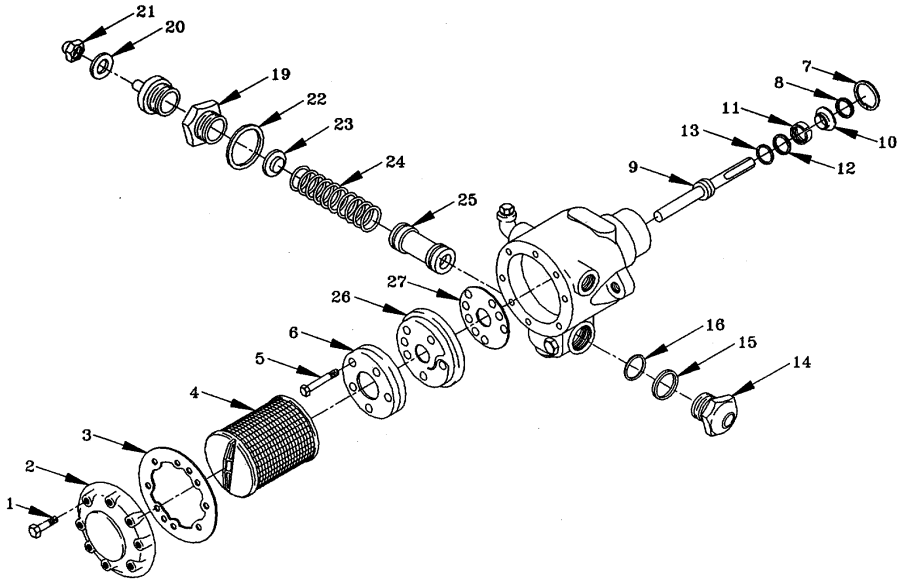
e. Remove stationary face seal (10), seal (11), washer (12) and O-ring (13).

f. Remove nozzle plug assembly (14) and gasket (15).

g. Remove sleeve retaining ring (16).

h. Remove end plug assembly (19, 20, 21) and gasket (22).

i. Remove spring seat (23), piston spring (24), and piston assembly (25).


21
20
19
22
23
24
25
26
27
6
5
4
3
2
1
7
8
11
13
9
10
12
16
15
14

5-10. FUEL PUMP ASSEMBLIES. (CONT)

j. Press port housing (26) from body (14) and remove port housing gasket (27).

WARNING

Dry cleaning solvent, P-D-680 (Item 14, Appendix F) is potentially dangerous. Avoid repeated and prolonged breathing of vapors and skin contact with liquid. Do not use near open flame, arcing equipment, or other ignition sources. Use in well ventilated area.

k. Clean all parts in solvent.

INSTALL

M-80

a. Install port housing gasket (27) and port housing (26) by pressing in place.

b. Inset sleeve retaining spring (16), gasket (15) and nozzle plug assembly (14).

c. Install piston assembly (25), piston spring (24), spring seat (23), gasket (22), and end plug assembly (19, 20, 21).

d. Install O-ring (13), washer (12), seal (11), and stationary face seal (10).

e. Press shaft assembly (9) into body and install O-ring (8) and retaining ring (7) onto shaft assembly (9). Install end plate (6) and secure with five screws (5).

g. Push strainer (4) into pump.

h. Assemble gasket (3) and cover (2) and secure to pump body with eight screws (1).

i. Install elbow (9), plug (12) and elbow (10) on fuel pump (5).

j. Install coupling (1) onto shaft of fuel pump (5) and secure with setscrew (2).

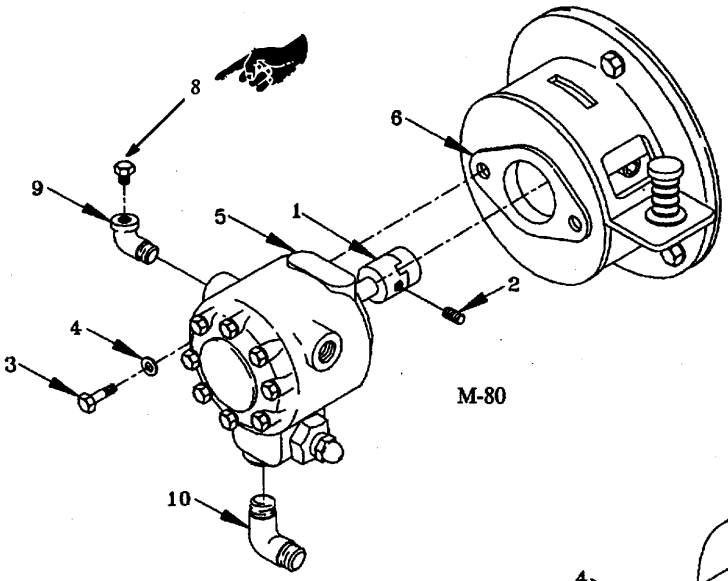
k. Install plug (8) into elbow (9).

l. Set fuel pump (5) in place on shutter assembly (6) and secure with two hex head screws (3) and two lockwashers (4).

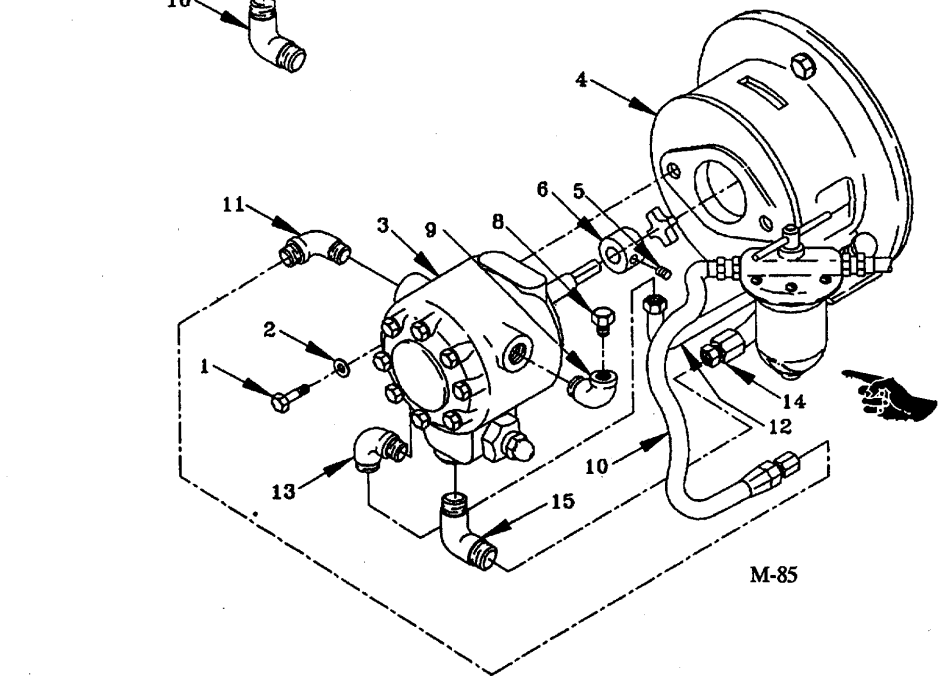
m. Install fuel filter bracket as described in paragraph 4-19.

n. Connect fuel lines as described in paragraph 420 t.

o. Prime pump and check for leaks.



M-80



M-85

5-10. FUELPUMPASSEMBLIES. (CONT)

M-85

a. Install elbows (11), (13), and (15) on fuel pump (3).

b. Install plug (8) in elbow (9) and install elbow in fuel pump (3).

c. Install fuel pump (3) on shutter assembly (4) and secure with two lockwashers (2) and screws (1).

d. Install coupling (6) on shaft of fuel pump (3) and tighten with setscrew (5).

e. Connect hose (10) to elbow (11).

f. Connect hose (12) to elbow (13).

g. Connect hose (14) to elbow (15).

h. Prime pump and check for leaks.

FOLLOW-ON MAINTENANCE

Install filter, see para 4-19.

5-11. AIR SHUTTER ASSEMBLY

This task covers:

a. Remove **c. Install**
b. Repair

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)

Materials/Parts:

Rags, Wiping (Item 15, Appendix F)

Equipment Condition:

Water heater shut off and cooled down.
Power switch oaf and power cable disconnected.
Fuel lines disconnected.

REMOVE

a. Remove fuel pump and filter assembly as described in paragraphs 4-19 and 5-10.

b. Remove three capscrews (1), three washers (2), and remove air shutter assembly (3) from blower (4).

c. Remove cotter pin (5), two washers (6), spring (7), rivet (8), and remove air band (9), from the air shutter (10).

REPAIR

Repair faulty components by replacement.

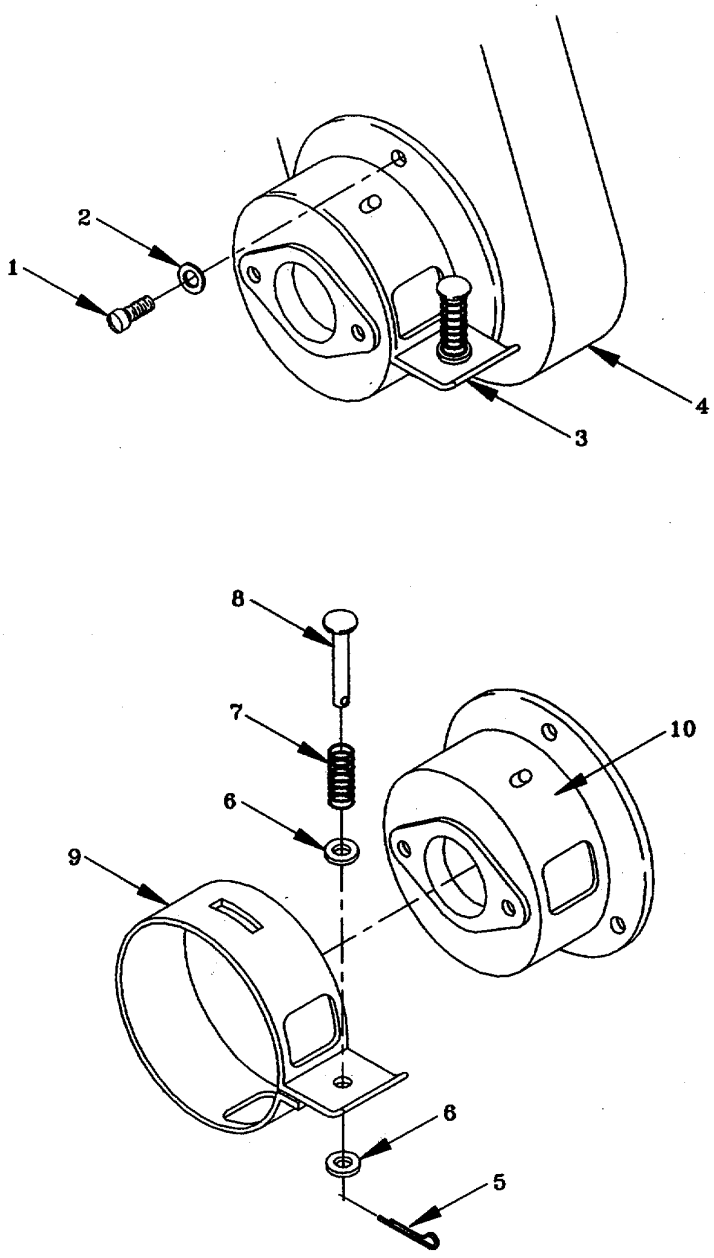
INSTALL

a. Place air band (9) over shutter (10) and secure with rivet (8), spring (7), two washers (6) and cotter pin (5).

b. Position air shutter assembly (3) on blower housing (4) and secure with three capscrews (1) and three washers (2).

c. Install fuel pump and filter assembly as described in paragraphs 4-19 and 5-10.

5-11. AIR SHUTTER ASSEMBLY. (CONT)



5-12. WATER VESSEL AND SKID ASSEMBLY

This task covers:

a. Remove **c. Install**
b. Repair

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)
Tool Set, Common No. 1 (Item 3, Appendix B)

Materials/Parts:

Compound, Cleaning (Item 1, Appendix F)
Primer (Item 12, Appendix F)
Paint (Item 11, Appendix F)
Rag, Wiping (Item 15, Appendix F)
Solder, SN60 (Item 16, Appendix F)
Gasket, Blower
Washer, Lock
Gasket, Burner
Washer, Flat
Gasket, Smoke

Equipment Condition:

Water heater shut off and cooled down.
Power disconnected.

REMOVE

The welded water vessel or skid assembly may sustain damage during shipment and handling. Minor dents and scratches can be repaired by cleaning and coating the affected area with paint. A ruptured vessel, broken leg or bent skid can be repaired by welding. More severe damage may require replacement of the vessel. When making repairs, remove only those assemblies or parts necessary to gain access to the damaged components.

a. Remove the following assemblies as applicable:

(1) Smokestack assembly as described in paragraph 4-15.

(2) Fuel supply control assembly as described in paragraph 4-13.

(3) Burner head assembly as described in paragraph 4-14.

(4) Transformer box as described in paragraph 4-16.

(5) Conduit, electrical fittings and wiring as described in paragraph 4-17.

(6) Temperature high limit and operation limit controls as described in paragraph 4-17.

(7) Upper and lower manifold assemblies as described in paragraph 4-22.

5-12. WATER VESSEL AND SKID ASSEMBLY. (CONT)

(8) Instructional, identification and warning plates as necessary.

(9) Ignition cables as described in paragraph 4-18.

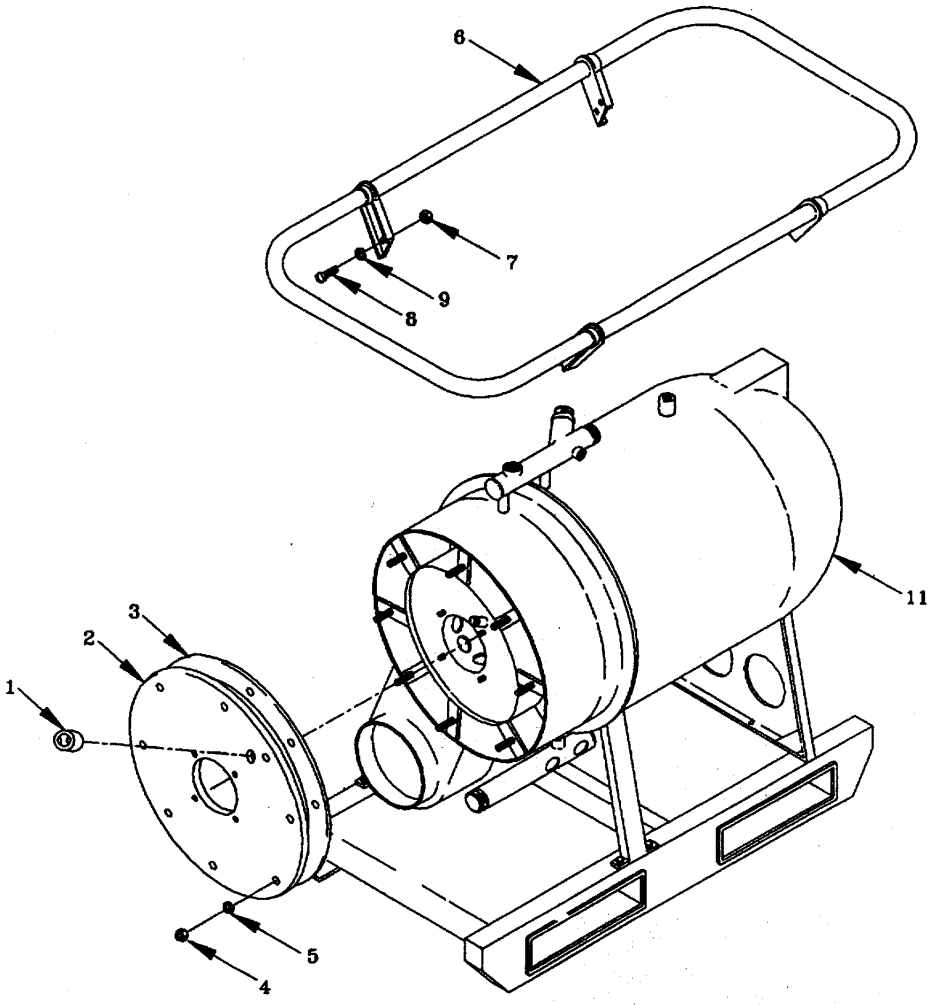
(10) Blower assembly as described in paragraph 5-8.

(11) UV scanner as described in paragraph 5-13.

(12) Low water probe assembly as described in paragraph 4-17.

(13) Control box assembly as described in paragraph 5-14.

(14) Smokestack and guard assembly as described in paragraph 4-15.



b. Remove sight assembly cap (1).

c. Remove smoke box cover (2) and smoke box cover gasket (3) by removing eight nuts (4) and eight washers (5).

d. Remove water heater handle (6) by removing four nuts (7), eight screws (8), and four washers (9). Lift handle up.

e. Remove drain cock (10) from water vessel (11).

f. Remove water vessel (11) from skid (12) by removing seven nuts (13), seven washers (14) and seven screws (15).

g. Remove fuel line holder (16) by removing two screws (17).

REPAIR

a. Make needed repairs or replace vessel or skid as necessary.

b. Weld the following components made of steel in accordance with MIL-W-52574 Type I:

Water vessel	Drum fill adapter extension
Blower duct	Handle
Burner tube	Flue support
Filter mounting bracket	Fuel line holder
Transformer mounting plate	Smoke pipe elbow assembly
Control box and cover	Smoke pipe cap and guard

c. Weld the skid assembly, made of aluminum, in accordance with MIL-W45206 Class B.

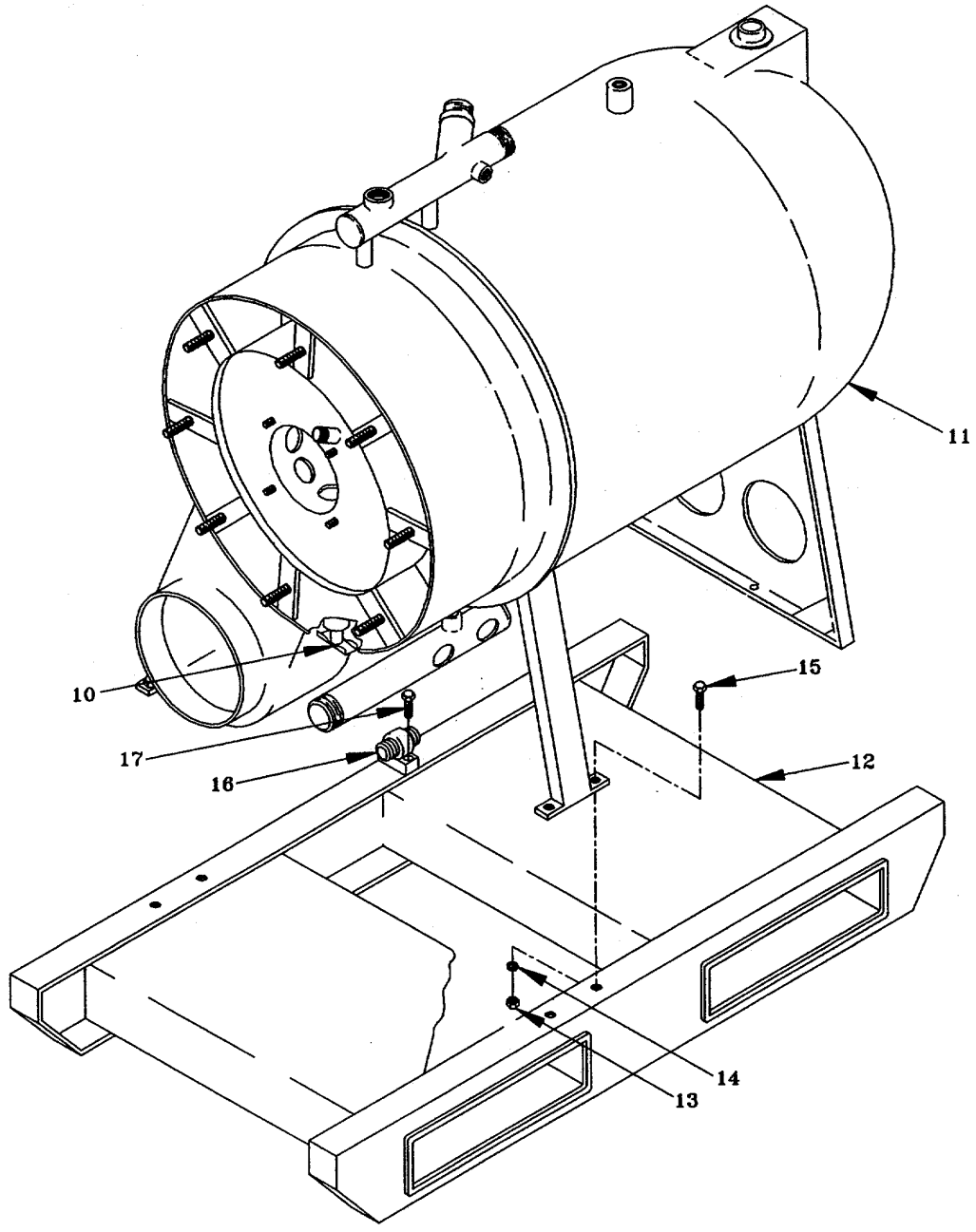
d. After welding, clean all exposed metal surfaces using cleaning compound. Then apply a coat of primer (Item 12, Appendix F) and a finish coat of enamel paint (Item 11, Appendix F).

INSTALL

a. Install fuel line holder (16) and secure with two screws (17).

b. Attach water vessel (11) to skid (12) using seven screws (15), seven washers (14) and seven nuts (13).

5-12. WATER VESSEL AND SKID ASSEMBLY. (CONT)



c. Install drain cock (10) by inserting in water vessel (11) and turning clockwise.

d. Install water heater handle (6) on water vessel (11) and secure with eight screws (8), four washers (9) and four nuts (7).

e. Install smoke box cover (2) and smoke box cover gasket (3) and secure with eight washers (5) and eight nuts (4).

f. Install sight assembly cap (1) on sight tube.

g. Install the following assemblies as applicable:

(1) Control box assembly as described in paragraph 5-14.

(2) Low water probe assembly as described in paragraph 4-17.

(3) UV scanner as described in paragraph 5-13.

(4) Blower assembly as described in paragraph 5-8.

(5) Ignition cables as described in paragraph-4-18.

(6) Instructional, identification and warning plates as necessary.

(7) Upper and lower manifold assemblies as described in paragraph 4-22.

(8) Temperature high limit and operation limit controls as described in paragraph 4-17.

(9) Conduit, electrical fittings and wiring as described in paragraph 4-17.

(10) Ignition transformer as described in paragraph 4-16.

(11) Burner head assembly as described in paragraph 4-14.

(12) Fuel supply control assembly as described in paragraph 4-13.

(13) Smokestack assembly as described in paragraph 4-15.

5-13. UV SCANNER AND FLAME SAFEGUARD CONTROL.

This task covers:

a. Test **c. Install**
b. Remove

INITIAL SETUP:

Tools:

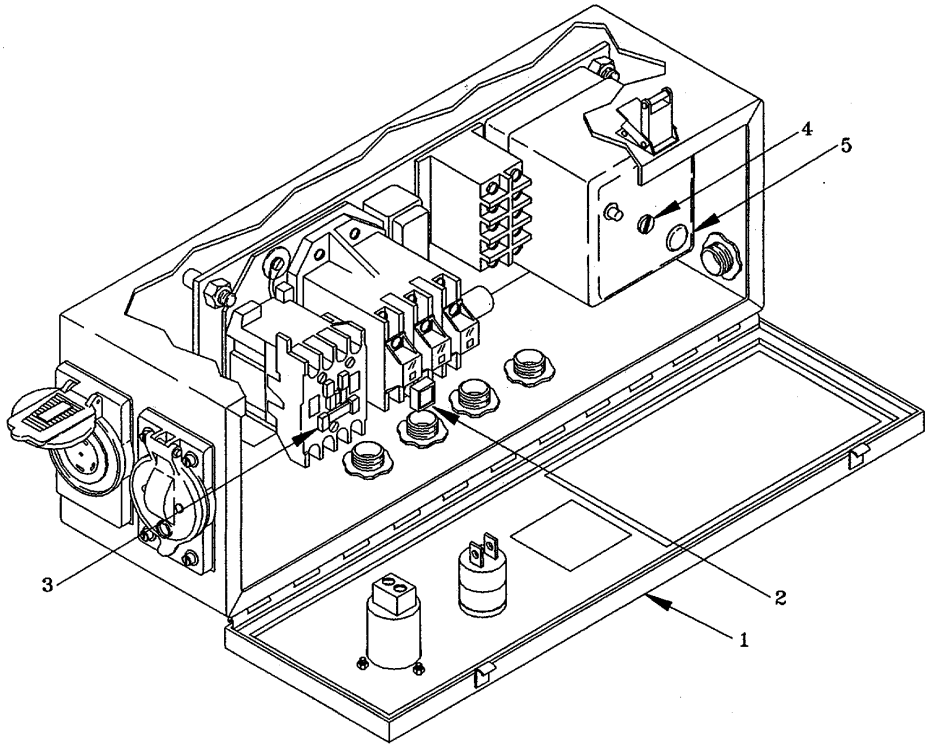
Shop Equipment, Electrical, Repair (Item 2, Appendix B)

Materials/Parts:

Rag, Wiping (Item 15, Appendix F)
Tags, (Item 17, Appendix F)

Equipment Condition:

Water heater set up for operation.
Power turned off.



TEST

a. Turn on water heater fuel and power.

b. Wait approximately 20 seconds. If audible alarm sounds, go to step i. If blower motor does not come on and ignition does not occur, proceed to next step.

c. Open control box lid (1) and check motor contactors (2). If contactors are tripped, reset contactors and check for normal operation. If contactors continue to trip, test motor contactor operation as described in step d. If contactors are not tripped, proceed to step e.

CAUTION

Ensure that power is off before making continuity check. Damage to test equipment could result.

NOTE

Isolate any electrical components before starting continuity check.

d. Using the multimeter, check continuity from input terminals to output terminals on motor contactor solenoid (3). Meter should indicate an open circuit at each set of terminals. Push up on motor contactor solenoid. Meter should indicate continuity at each set of terminals. Check continuity of relay coil. Multimeter should indicate low resistance. If it registers infinity or 0 ohms, replace contactor.

e. Loosen screw (4) on cover (5) and remove cover (5) from flame safeguard control (6) exposing control.

5-13. UV SCANNER AND FLAME SAFEGUARD CONTROL. (CONT)

WARNINGS

- Remove all jewelry before working on the water heater. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock and death.

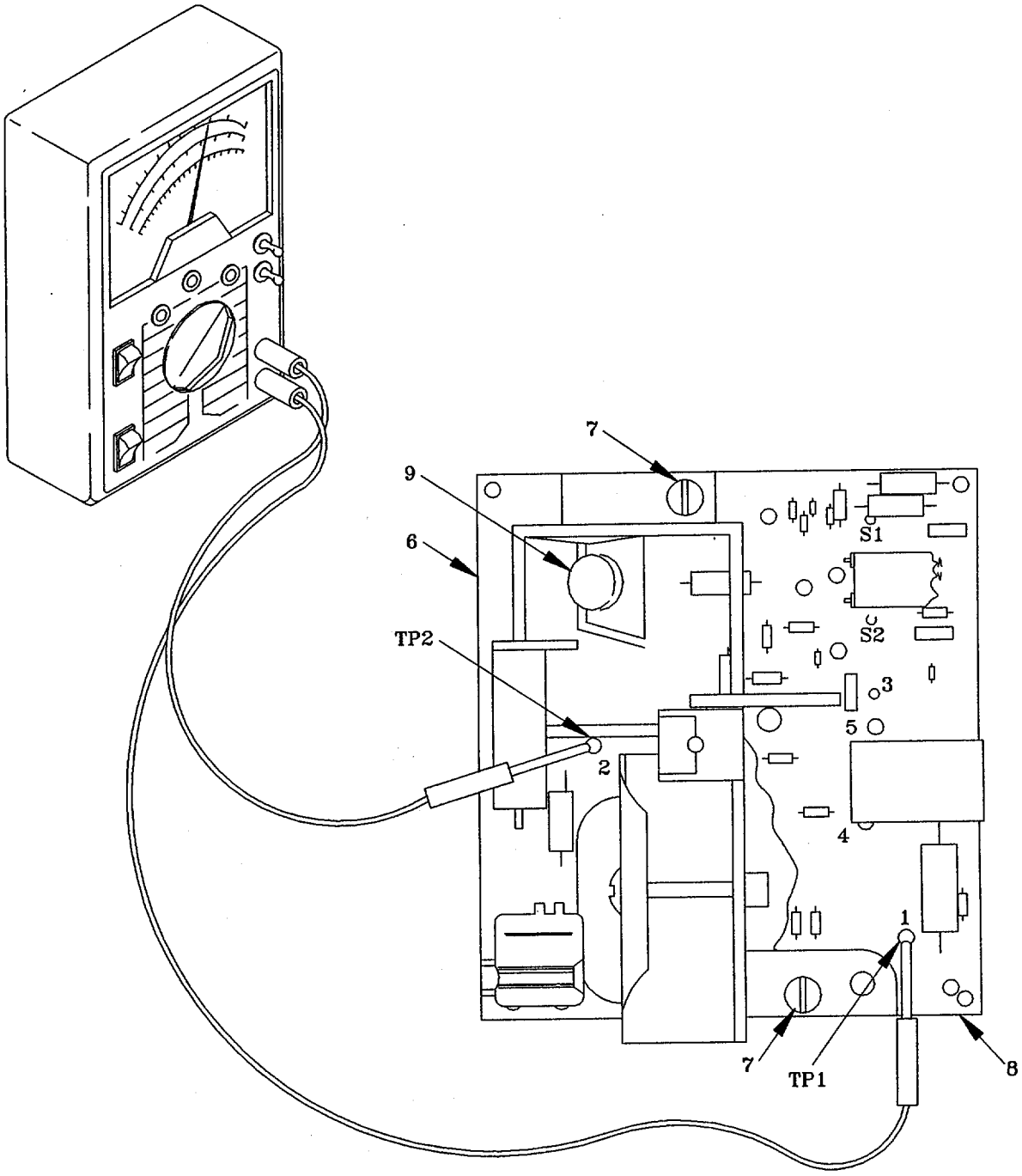
- Use extreme caution when performing the following test with power on. Electrical current can cause severe injury or death.

f. Set power switch to on and check for 120 Vac at test points (TP) 1 and 2 with multimeter. If voltage is not normal, test power switch and power source as described in step h. If voltage is normal, proceed to next step.

g. Turn off power switch and remove two screws (7) and flame safeguard control (6).

h. Turn on power switch and check for 120 Vac on terminals #2 and #7 of base terminal board (8). If voltage is not normal, disconnect power source and replace power switch as described in paragraph 5-14. If voltage at terminals 2 and 7 is normal, proceed to the next step.

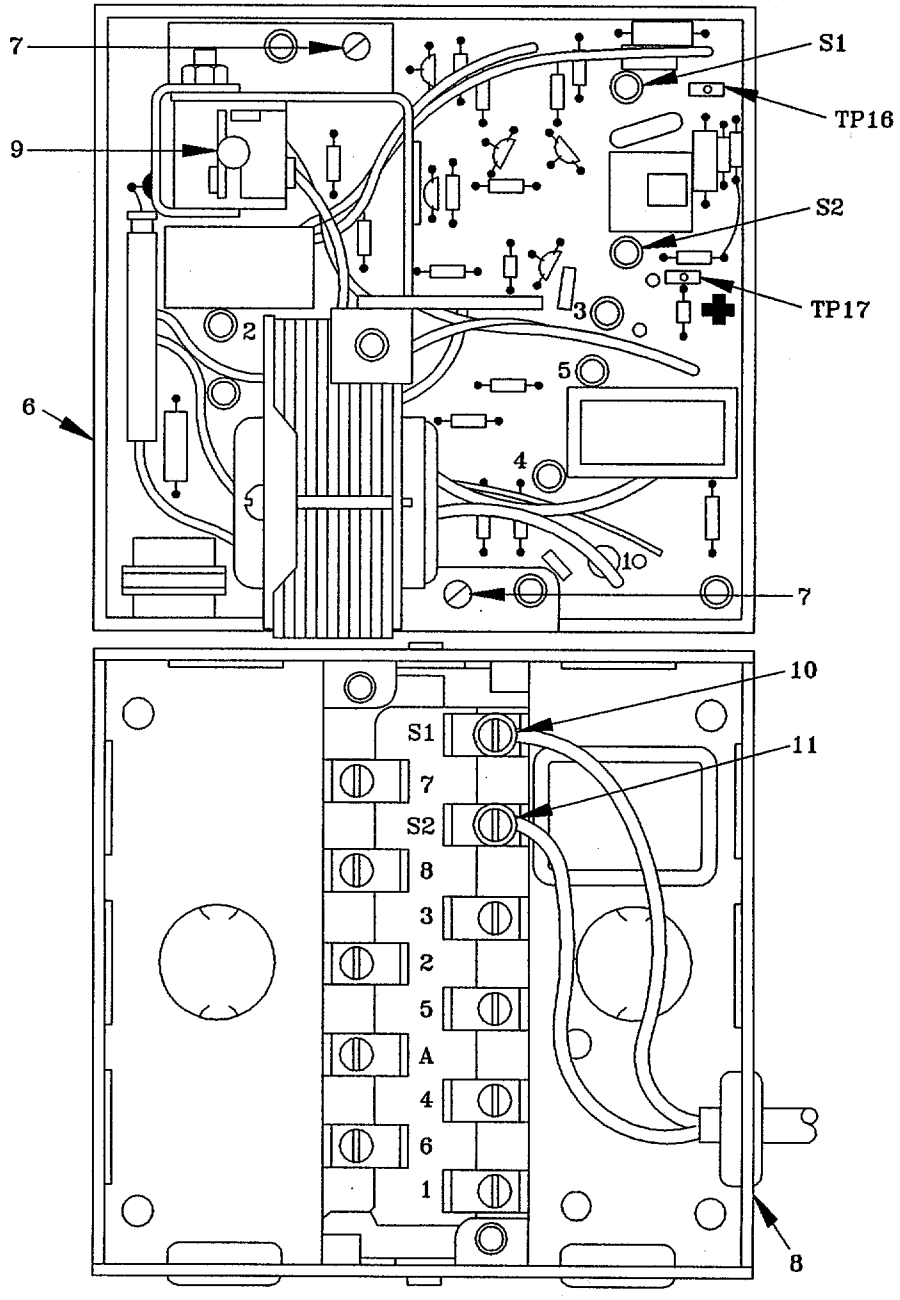
i. Turn off power switch and install replacement flame safeguard control (6). Setnew control in place and tighten two screws (7).


7
9
6
TP2
S1
S2
3
5
2
4
1
7
TP1
8

5-13. UV SCANNER AND FLAME SAFEGUARD CONTROL. (CONT)

NOTE

If the buzzer sounds, an ignition failure is indicated.



j. Unit maintenance has determined that ignition takes place momentarily but system shuts down immediately after ignition. With multimeter set for dc operation, press reset button (9), check voltage at test points (16, black) and (17, red). If voltage is not 4 to 6 V dc, replace the UV scanner as described in Remove steps.

k. Unit maintenance has determined that ignition does not occur after pressing reset pushbutton but buzzer sounds. With multimeter set for ac operation, check for 120 Vac at test points #2 and #3 after pressing reset button (9). If voltage is 0, replace the flame safeguard control (6).

REMOVE

a. Loosen two screws (7) and flame safeguard control (6).

b. Tag and disconnect two wires (10) and (11) from terminal S1 and S2 on base terminal board (8).

c. Disconnect UV scanner (12) at burner head assembly (13) and remove conduit nut (14). Pull UV scanner and wires from the conduit (15).

INSTALL

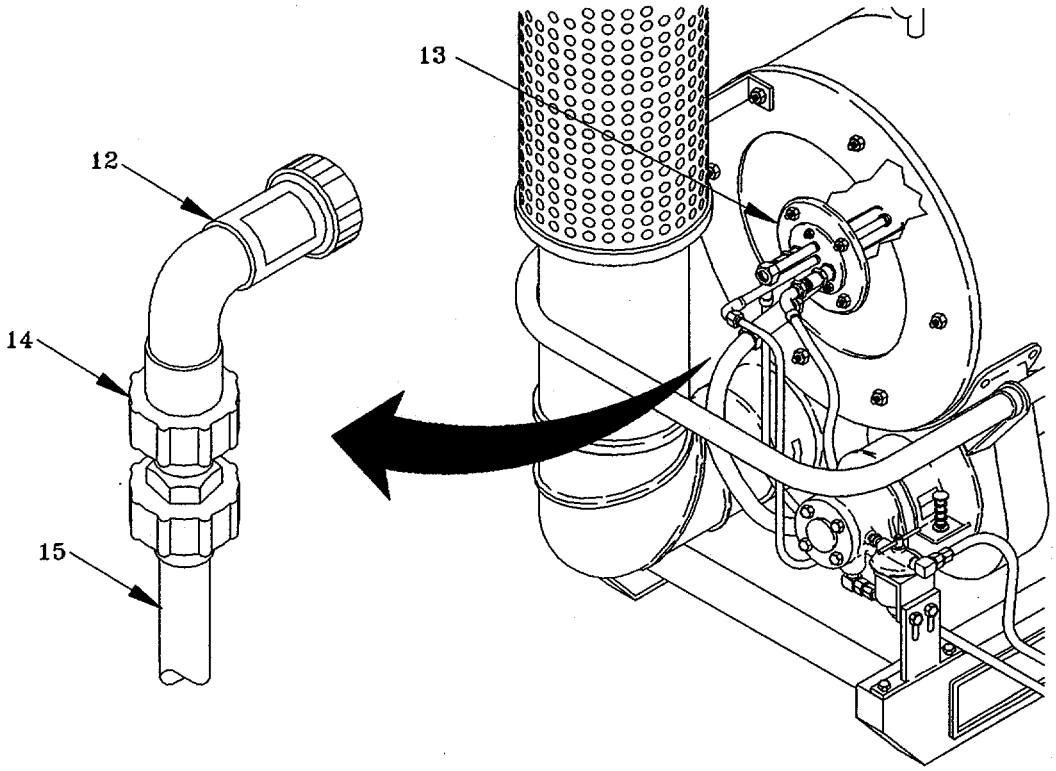
a. To install the UV scanner (12), insert UV scanner wires (10) and (11) into conduit (15). Screw conduit nut (14) to UV scanner (12) until connection is tight.

b. Screw UV scanner (12) to scanner tube at burner head (13). Connect two wires (10) and (11) to terminals S1 and S2 on base terminal board (8).

c. Install flame safeguard control (6) and secure with two screws (7).

d. Close lid (1) on control box and turn off power switch.

5-13. UV SCANNER AND FLAME SAFEGUARD CONTROL. (CONT)



5-14. CONTROL BOX ASSEMBLY

This task covers:

a. Inspect **b. Test** **c. Remove**
d. Install

INITIAL SETUP:

Tools:

Tool Set, General (Item 1, Appendix B)

Materials/Parts:

Rag, Wiping (Item 15, Appendix F)
Tag, (Item 17, Appendix F)
Washer, Flat MS27183-10

Equipment Condition:

Water heater shut off and pooled down.
Power disconnected.

General Safety:

WARNING

Do not work on live circuits. Contact with the high voltage present in the water heater can cause severe injuries or death. Make certain power is disconnected from the water heater before performing the following procedures.

INSPECT

Open control box cover and inspect components and wires for damage, burns and frayed insulation. Replace defective parts or wires as necessary.

NOTE

It may be necessary to remove receptacle from control box to contact rear output pins.

5-14. CONTROL BOX ASSEMBLY. (CONT)

TEST

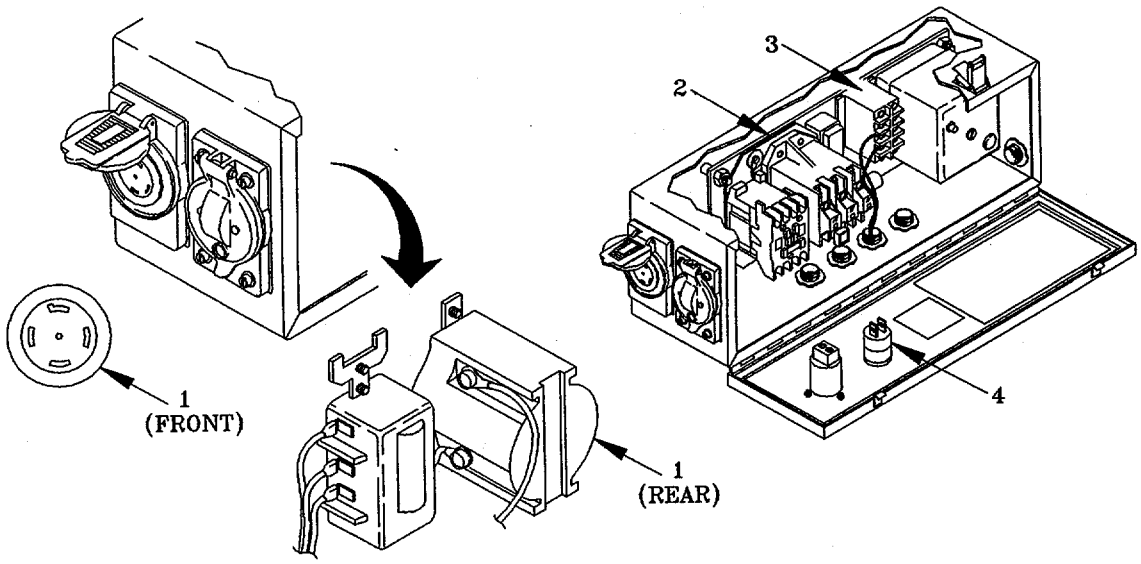
a. Use multimeter on low ohms scale and check continuity from the front of receptacle (1) to rear output of each pin. Replace receptacle as described in removal a. through c. if no continuity is indicated on any pin.

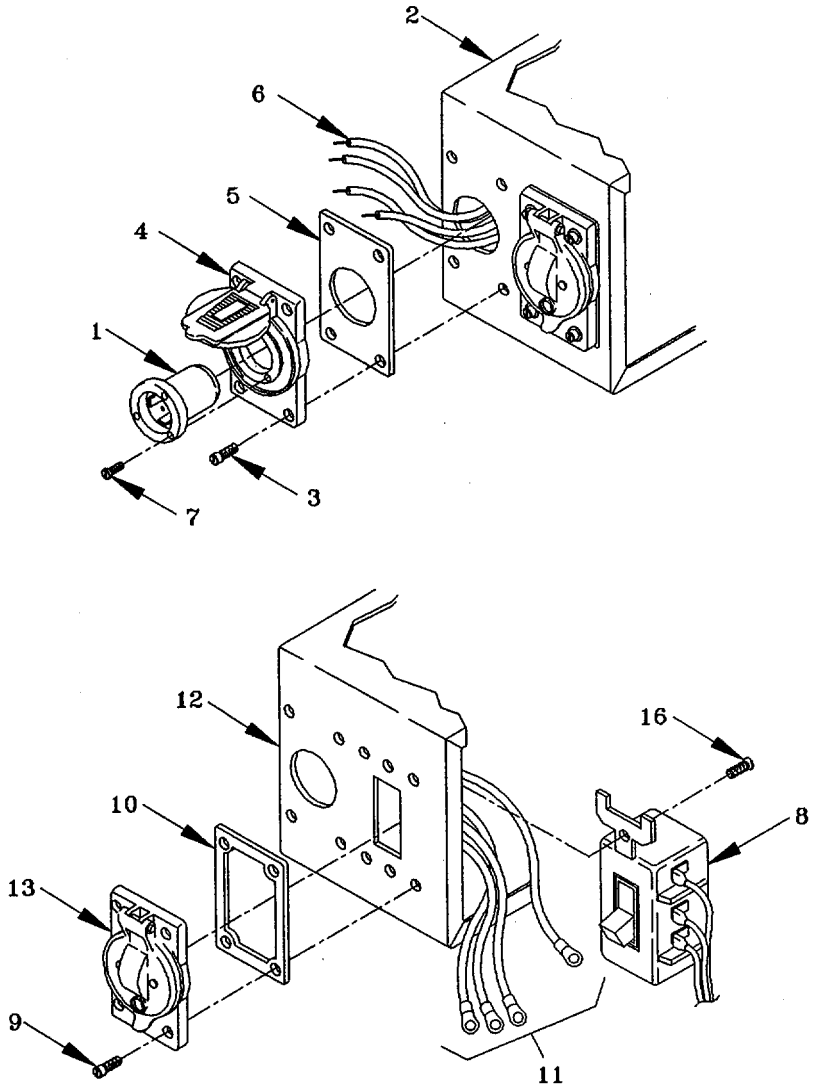
NOTE

Two different power switches may be found. One (old style) incorporates overload heaters, the other (new style) does not.

b. Check overload heaters for damage. If overload heaters are damaged, replace an old style switch with a new style switch.

c. Set power switch to off. With multimeter on high ohms scale, measure from receptacle (1) to input terminals of the motor contactor (2). The meter should indicate an open circuit.




2
6
5
4
1
7
3
12
16
10
8
13
9
11

5-14. CONTROL BOX ASSEMBLY (CONT)

d. Set power switch (8) to on. With multimeter on low ohms scale, repeat measurements in paragraph c. The meter should indicate continuity for points connected by same color wire.

e. Replace power switch (8) as described in removal d. through f., and installation 1. and m., if defective.

f. With multimeter on high ohms scale, measure from the three input terminals to the three corresponding output terminals of motor contactor (2). Meter should indicate an open circuit.

g. With multimeter on low ohms scale, push in motor contactor solenoid, and repeat measurements in f. Meter should indicate continuity.

h. Replace defective motor contactor (2) as described in removal h. and i.; and installation h. and i.

i. Tag and disconnect wires from terminals 1 and 2 of low water relay (3).

j. With multimeter on high ohms scale measure between terminals 1 and 2. Meter should indicate an open circuit.

k. With multimeter on high ohms scale measure between terminal 2 and chassis ground. Meter should indicate an open circuit.

l. If meter indicates continuity during i., j., or k. above replace low water relay (3) as described in removal g. and install j.

m. Reconnect tagged wires to terminals 1 and 2 of low water relay (3). Remove tags.

n. Tag and disconnect wires from terminals 9 and 10 of low water relay (3).

o. Conduct measurements on terminals 9 and 10 as described in paragraphs j., and k., for terminals 1 and 2. Meter should indicate continuity. If continuity is not indicated, replace low water relay as described in removal. g. and install j.

p. Turn temperature control to zero. With multimeter on high ohms scale measure between terminals 7 and 8 of low water relay (3). Meter should indicate an open circuit. If continuity is indicated, replace low water relay as described in removal g. and install j.

NOTE

Turn power on before testing.

q. Test function of alarm (4) by closing the fuel shut off valve on the water heater to simulate a low fuel and loss of flame condition. If alarm does not function, disconnect power and replace buzzer as described in removal paragraphs k. or 1. and installation e. or f.

M-85

r. Test the K-2 initiate relay (6-1-9976/6-1-8786) by checking for continuity between pin 2 and 7. Meter should indicate low resistance.

s. Check for closed contacts between terminals 5 and 8, and 1 and 4. Meter should show 0 ohms.

t. Check for open contacts between terminals 5,6 and 8, and 1 and 3. Meter should read infinity.

u. Replace relay if these readings are not obtained.

5-14. CONTROL BOX ASSEMBLY (CONT)

v. Test the K-1 post purge relay (641-9974/6-1-9973) by checking for continuity between pins 2 and 5, and 6 and 10. Meter should indicate continuity.

w. Check for closed contacts between terminals 1 and 4, and 8 and 11. Meter should indicate 0 ohms.

x. Check for open contacts between terminals 1 and 3, and 9 and 11. Meter should indicate infinity.

y. Replace relays if other readings are obtained.

REMOVE

a. Remove receptacle (1) from control box (2), by removing four screws (3), cover plate (4) and gasket (5) with receptacle (1).

b. Tag and disconnect five wires (6) connected to the rear of the receptacle (1).

c. Remove three screws (7) from under the cover plate (4).

NOTE

Two different power switches may be found. One (old style) incorporates overload heaters, the other (new style) does not.

d. Remove the power switch (8) by removing two screws (9) and remove gasket (10).

e. Turn load power switch (8) over.

f. Tag all wires (11). Remove six screws (16), wires, and power switch (8) from control box (12).

g. Tag wires connected to low water relay (14). Remove eight screws (15) securing wire lugs to terminals. Loosen three screws (16) and raise up and remove low water relay from circuit box (17).

h. Tag and disconnect wires from motor contactor (18). Remove two bottom screws (19) and washers (20) and loosen top screw. Remove motor contactor from control box (17).

i. Remove six screws (21) and remove three contactor heaters (22).

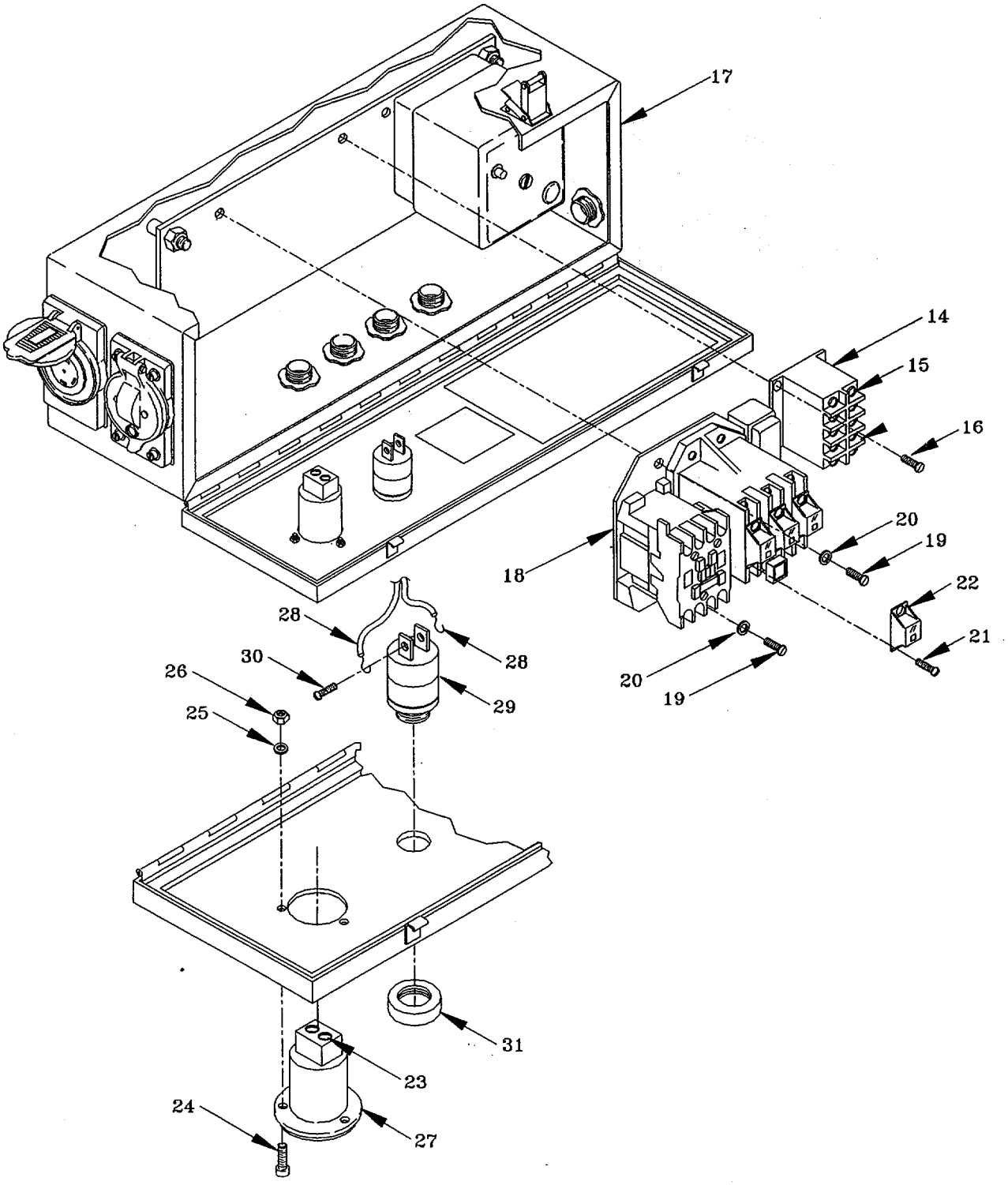
j. Tag and disconnect two terminal lugs (23). Remove three screws (24) washers (25), nuts (26) and hour meter (27) from front of control box (17).

k. For M-85 only, tag two wires (28) on buzzer (29). Loosen two screws (30) and disconnect wires. Remove cap (31) and buzzer (29) from front of control box (17).

l. For M-80 only, tag and disconnect two wires (32) from buzzer (33). Remove two screws (34), and buzzer (33) from control box (17).

m. Tag and disconnect all wires from panel-mounted component(s).

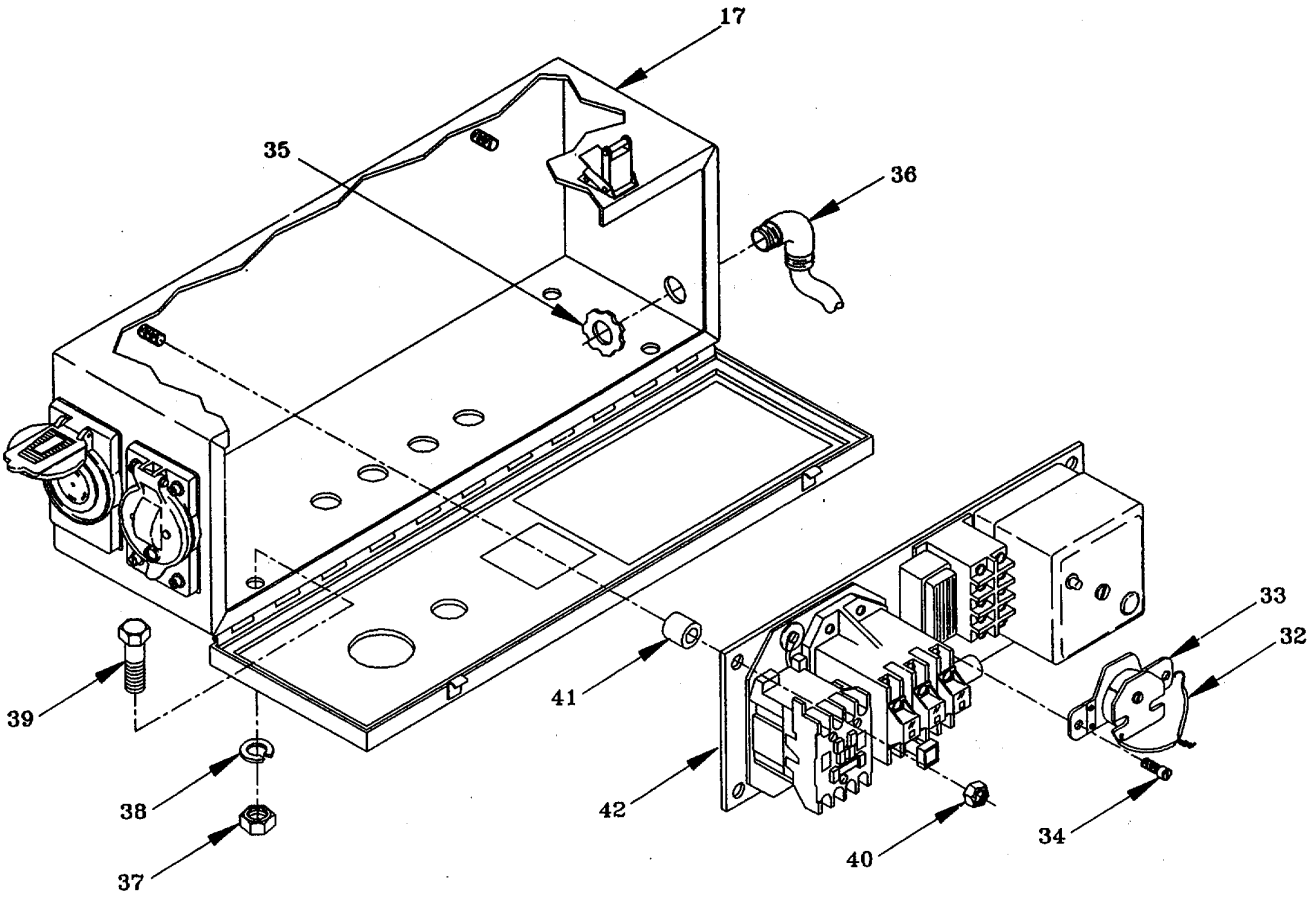
5-14. CONTROL BOX ASSEMBLY (CONT)



n. Remove conduit locknuts (35) (six on M-85 and five on M-80) and conduit fitting (36) from control box (17).

o. Remove four nuts (37), lockwasher (38), screws (39), and control box (17) from skid assembly.

p. Remove four nuts (40), spacers (41), and mounting panel (42), from control box (17).



5-14. CONTROL BOX ASSEMBLY (CONT)

INSTALL

a. Install mounting panel (42), four spacers (41), and four nuts (40) to control box (17).

b. Install control box (17), four screws (39), lockwashers (38), and nuts (37) on slid assembly.

c. Install six conduit fittings (M-85), or five conduit locknuts (M-80), (35) in control box (17).

d. Connect all wires to panel mounted components. Remove tags.

e. For M-85, install buzzer (29) and cap (31) on control box (17). Connect and secure two wires (28) with two screws (30).

f. For M-80, install leads (32) to buzzer (33). Secure with two screws (34).

g. Install hour meter (2X, three screws (24), washers (25) and nuts (26) on control box (17).

h. Install three contactor heaters (22) and secure with six screws (21).

i. Install motor contactor (18) and three screws (19) and washers (20) on control box, reconnect leads as tagged.

j. For M-80, install low water relay (14) and tighten three screws (16). Connect wire lugs to terminals with eight screws (15). Remove tags. For M-85, plug in new relay.

k. Connect wires (11) to power switch (8) and secure with six screws (16). Remove tags.

NOTE

Two different power switches may be found. One (old style) incorporates overload heaters, the other (new style) does not.

l. Install power switch (8) with two screws (16) on control box (17).

m. Position gasket (10) and cover plate (13) in place and secure with four screws (9).

n. Install cover plate (4) and gasket (5) and secure withfour screws (3).

o. Install receptacle by connecting four wires (6) to rear of receptacle (1). Remove tags.

p. Insert receptacle (1) through cover plate (4) inside control box (2) and secure with three screws (7) under receptacle cap.

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals, military specifications, standards and miscellaneous publications referenced in this manual.

A-2. FORMS

Report of Item Discrepancy	SF 364
Product Quality Deficiency Report	SF 368
Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Uncorrected Fault Record	DA Form 2408-14
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Equipment Log Assembly (Records)	DA Form 2408-5

A-3. FIELD MANUALS

Northern Operations	FM 31-71
First Aid for Soldiers	FM 21-11

A-4. TECHNICAL MANUALS

Packaging of Material, Preservation	TM 38-230-1
Welding: Theory and Application	TM 9-237
Operator's Manual for Welding Theory and Application	TM 9-450
Administrative Storage of Equipment	TM 740-90-1
Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)	TM 750-244-3
Warranty Program for Laundry Unit, Trailer Mtd, Model M-85-100	TB 10-3510-220-24

A-5. MISCELLANEOUS PUBLICATIONS

The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Functional User's Manual for the Army Maintenance Management System Aviation (TAMMS-A)	DA Pam 738-751
Army Logistics Readiness and Sustainability	AR 700-138

A-6. MILITARY SPECIFICATIONS AND STANDARDS

Color, Marking, and Camouflage Patterns Used on Military Equipment	TB 43-0147
Fuels, Lubricants, Oils, and Waxes	C9 100IL
Dry Cleaning Solvent	FED Spec P-D-680
Primer Coat Paint (Aluminum)	TT-P-636 or MIL-C-5541
Primer Coat Paint (Steel)	TT-P-636 or TT-C-490
Primer Coat Enamel Paint (Metal) Color Forest Green (color code 34079)	MIL-E-52798
Standard for Applying Finish Coat	FED STD 595
Finish Coat Enamel Paint (Wood) Olive Drab No. 24803	TT-E-529, Class A, Color
Welding, Aluminum	MIL-W-45206A
Welding, Steel	MIL-W-52574 (ME), Type I

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

SECTION I. INTRODUCTION

B-1. The Army Maintenance System MAC

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

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be 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 are 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.

B-2. Maintenance Functions. (CONT)

c. Service. Operations required periodically to keep an item in proper operating condition: i.e., 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. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

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

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of equipment or a 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 3rd position code of the SMR code.

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

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

k. Rebuild. Consists of those service/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel 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.

[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 (i.e., 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. (CONT)

b. Column 2, Component/Assembly. Column 2 contains the item M 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.)

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 varies 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
L .....Specialized Repair Activity (SRA)[5]
H.....General support maintenance
D.....Depot maintenance

[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-3. Explanation of Columns in the MAC, Section II. (CONT)

e. Column 5, Tools and Test Equipment. Column 5 specifies, by number, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Numbers are keyed to tools and test equipment in Section III.

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.

B-4. Explanation of Columns in Tool and Test Equipment Requirements, Section III.

a. Column 1, Reference Code. The tool and test equipment reference code corresponds 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 tools or test equipment.

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, Manufacturer's Part Number. The manufacturer's part number, model number, or type number.

B-5. Explanation of Columns in Remarks, Section IV.

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

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

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS & TEST EQUIPT	(6) REMARKS
			C	O	F	H	D		
00	Heater Assembly	Service							
		Inspect							
		Remove							
		Clean							
		Test							
		Repair							
		Install							
		Adjust							
01	Fuel Supply Control Components	Inspect	0.2	0.2				1	
		Remove		0.3					
		Repair		0.6					
		Install		0.4					
02	Burner Head Assembly	Inspect		0.3				1	
		Remove		0.3					
		Repair		1.5					
		Install		0.4					
03	Smokestack and Guard Assembly, M-80/Exhaust Duct M-85	Inspect	0.1	0.1				1	
		Remove		0.1					
		Install		0.1					
04	Ignition Transformer Assembly	Inspect		0.1					
		Test		0.5				1,2	
		Remove		0.5					
		Install		0.5					
05	Electrical Components	Inspect		0.3					
		Remove		0.3				1	
		Test		0.2					
		Install		0.4					
		Adjust	0.1						
		Replace		0.5					
06	Ignition Cable Assembly	Inspect	0.1						
		Remove		0.2				1	
		Install		0.3					

Section II. MAINTENANCE ALLOCATION CHART (CONT)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & TEST EQUIPT	(6) REMARKS
			C	O	F	H	D		
07	Blower Assembly	Inspect	0.1	0.1	.1				
		Service	0.2						
		Remove			0.5				
		Adjust	0.2						
		Repair		1.5	3.0				
		Install			1.5				
0701	Blower and Fuel Pump Motor	Inspect			0.2				
		Remove			0.5				
		Repair			2.0				
		Install			0.5				
0702	Fuel Filter Assembly	Service	0.1						
		Remove		0.2				1	
		Install		0.3					
0703	Fuel Pump Assembly	Service		0.1				1	
		Inspect		0.3					
		Adjust		0.2					
		Remove			0.4				
		Repair			1.0				
		Install			0.4				
0704	Air Shutter Assembly	Inspect	0.1					1	
		Remove			0.2				
		Install			0.3				
		Adjust	0.1						
		Repair			1.0				
08	Water Vessel and Skid Assembly	Inspect		0.1				3	
		Remove			0.2				
		Repair	0.2	1.0	1.5				
		Install			1.0				
0801	Upper and Lower Manifold Assembly	Inspect		0.1				1	
		Remove		0.2					
		Repair		0.2					
		Install		0.2					
09	UV Scanner and Flame Safeguard Control	Inspect		0.2				1	
		Test			0.4				
		Remove			0.5				
		Install			0.5				

Section II. MAINTENANCE ALLOCATION CHART (CONT)									
(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & TEST EQUIPT	(6) REMARKS
			C	O	F	H	D		
10	Electric Control Box Assembly	Inspect Test Remove Repair Install			0.3 0.9 0.7 1.5 0.8			1,2	
11	Drum Fill Adapter Assembly Type II	Inspect Disassemble Repair Assemble		0.2 0.3 0.3 0.2				1	

Section III. TOOL AND TEST EQUIPMENT LIST				
(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NSN	(5) TOOL NO
1	O, F	Tool Set, General Mechanic's: Automotive	5180-00-177-7033	
2	F	Shop, Equipment, Electrical Repair		
3	O	Tool Set, #1 Common	4910-00-754-0654	

Section IV. REMARKS	
REFERENCE CODE	REMARKS

APPENDIX C
OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

1. SCOPE. This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of unit, direct support and general support maintenance of the Air Conditioner. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

2. GENERAL. In addition to this section, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. This list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed in item name sequence. Repair parts kits are listed separately in functional groups in Section II. Repair parts for repairable special tools are also listed in this section. Items listed are shown in the associated illustration(s)/figure(s).

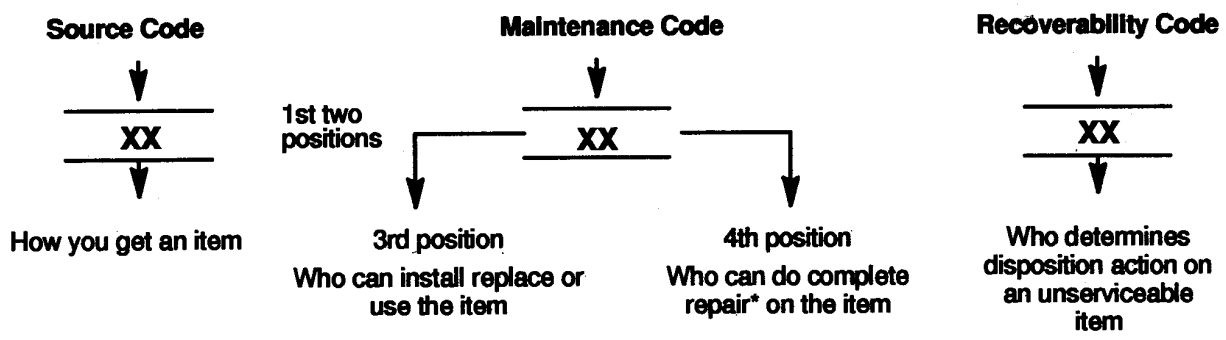
b. Section III. Special Tools List. A list of special tools, special TMDE, and other special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USABLE ON CODE column) for the performance of maintenance.

c. Section IV. Cross-Reference Index. A list, in National Item Identification Number (NIIN) sequence, of all national stock numbered items appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers. are cross referenced to each illustration figure and item number appearance. The figure and item number index lists figure and item numbers in alphanumeric sequence and cross references NSN, CAGEC and part number.

3. EXPLANATION OF COLUMNS (SECTIONS II AND III).

a. ITEM NO. (Column (1)). Indicates the number used to identify items called out in the illustration.

b. SMR Code (Column (2)). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:



* Complete Rear: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1). Source Code. The source code tells you how you get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow.

Code.	Explanation
PA PB PC** PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category indicated by the code entered in the 3rd position of the SMR code. **NOTE : Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance category indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied.
MO (Made at org AVUM level) MF (Made at DS/AVUM level) MH (Made at GS level) ML (Made at Specialized Repair Activity (SRA)) MD (Made at Depot)	Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION and USABLE ON CODE (UOC) column and listed in the Bulk Material group of the repair parts list in the RPSTL. If the item is authorized to you by the 3rd position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.
AO (Assembled by org AVUM Level) AF (Assembled by DS/AVUM Level) AH (Assembled by GS Category) AL (Assembled by SRA) AD (Assembled by Depot)	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position code of the SMR code, authorizes you to replace the item, but the source code indicates the items are assembled at a higher level, order the item from the higher level of maintenance.

Code	Explanation
XA	Do not requisition an "XA"-coded item. Order its next higher assembly. (Also, refer to the NOTE below.)
XB	If an "XB" item is not available from salvage, order it using the CAGEC and part number given.
XC	Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.
XD	Item is not stocked. Order an "XD"-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

(2). Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a). The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to the following levels of maintenance.

Maintenance Code	Application/Explanation
C	Crew or operator maintenance done within unit/AVUM maintenance.
O	Unit level VAVUM maintenance can remove, replace, and use the item.
F	Direct support/AVIM maintenance can remove, replace, and use the item.
H	General support maintenance can remove, replace, and use the item.
L	Specialized repair activity can remove, replace, and use the item.
D	Depot can remove, replace, and use the item.

(b). The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions). This position will contain one of the following maintenance codes.

NOTE

Some limited repair may be done on an item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

Maintenance Code	Application/Explanation
O	Unit VAVUM is the lowest level that can do complete repair of the item.
F	Direct support VAVIM is the lowest level that can do complete repair of the item.
H	General Support is the lowest level that can do complete repair of the item.
L	Specialized repair activity is the lowest level that can do complete repair of the item.
D	Depot is the lowest level that can do complete repair of the item.
Z	Nonreparable. No repair is authorized.
B	No repair is authorized. No parts or special tools are authorized for the maintenance of a "B" coded item. However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

(3). Recoverability. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability

Codes	Application/Explanation
Z	Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3rd position of SMR Code.
O	Reparable item. When not economically reparable, condemn and dispose of the item at unit or AVUM level.
F	Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or AVIM level.
H	Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	Reparable item. Condemnation and disposal not authorized below specialized repair activity (SRA).
A	Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. CAGEC (Column (3)). The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

d. PART NUMBER (Column (4)). Indicates the primary number used by the manufacturer, (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the number listed.

e. DESCRIPTION AND USABLE ON CODE (UOC) (Column (5). This column includes the following information:

(1). The Federal item name and, when required, a minimum description to identify the item.
(2). Part numbers of bulk materials are referenced in this column in the line entry for the item to be manufactured/fabricated.
(3). The statement “END OF FIGURE" appears just below the last item description in Column (5) for a given figure in both Section II and Section III.

f. QTY (Column (6)). The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column instead of a quantity indicates that the quantity is variable and may vary from application to application.

4. EXPLANATION OF INDEX FORMAT AND COLUMNS (SECTION IV).

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1). STOCK NUMBER Column. This column lists the NSN in national item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN, i.e.

NSN
5305-01-574-1467
NIIN

When using this column to locate an item, ignore the first four digits of the NSN. Use the complete NSN (13 digits) when requisitioning items by stock number.

(2). FIG. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and Section III.

(3). ITEM Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed in ascending alphanumeric sequence (i. e., vertical arrangement of letter and number combinations which place the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9, and each following letter or digit in like order).

(1). CAGEC Column. The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

(2). PART NUMBER Column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

(3). STOCK NUMBER Column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and CAGEC columns to the left.

(4). FIG. Column. This column lists the number of the figure where the item is identified/located in Section II and Section III.

(5). ITEM Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

c. FIGURE AND ITEM NUMBER INDEX.

(1). FIG. Column. This column lists the number of the figure where the item is identified/located in Section II and Section Ill.

(2). ITEM Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

(3). STOCK NUMBER Column. This column lists the NSN for the item.

(4). CAGEC Column. The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

(5). PART NUMBER Column. Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

5. SPECIAL INFORMATION.

a. USABLE ON CODE. The usable on code appears in the lower left comer of the Description column heading. Usable on codes are shown as "UOC:." in the Description Column justified left) on the last line of the applicable item description/nomenclature. Uncoded items are applicable to all models. Identification of the usable on codes used in this RPSTL are:

Code	Used On
FHQ	Model M80
FHR	Model M85

b. FABRICATION INSTRUCTIONS. Bulk materials required to manufacture items are listed in the Bulk Material Functional Group of this RPSTL. Part numbers for bulk materials are also referenced in the description column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in Appendix G.

c. ASSEMBLY INSTRUCTIONS. INDEX NUMBERS. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number/Part Number Index and the bulk material list in Section II.

6. HOW TO LOCATE REPAIR PARTS.

a. When National Stock Numbers or Part Numbers are NOT Known.

(1). First. Using the table of contents, determine the assembly or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2). Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3). Third. Identify the item on the figure and use the Figure and Item Number Index to find the NSN.

b. When National Stock Number or Part Number is Known

(1). First. Using the of National Stock Number and Part Number Indexes find the pertinent National Stock Number or Part Number. The NSN index is in National Item Identification Number (NIIN) sequence (see paragraph 4.a.). The part numbers in the Part Number index are listed in ascending alphanumeric sequence (see paragraph 4.b.). Both indexes cross-reference you to the illustration/figure and item number of the item you are looking for.

(2). Second. Turn to the figure and item number, verify that the item is the one you are looking for, then locate the item number in the repair parts list for the figure.

7. ABBREVIATIONS. Abbreviations used in this manual are listed in MIL-STD-12.

SECTION II. REPAIR PARTS LIST

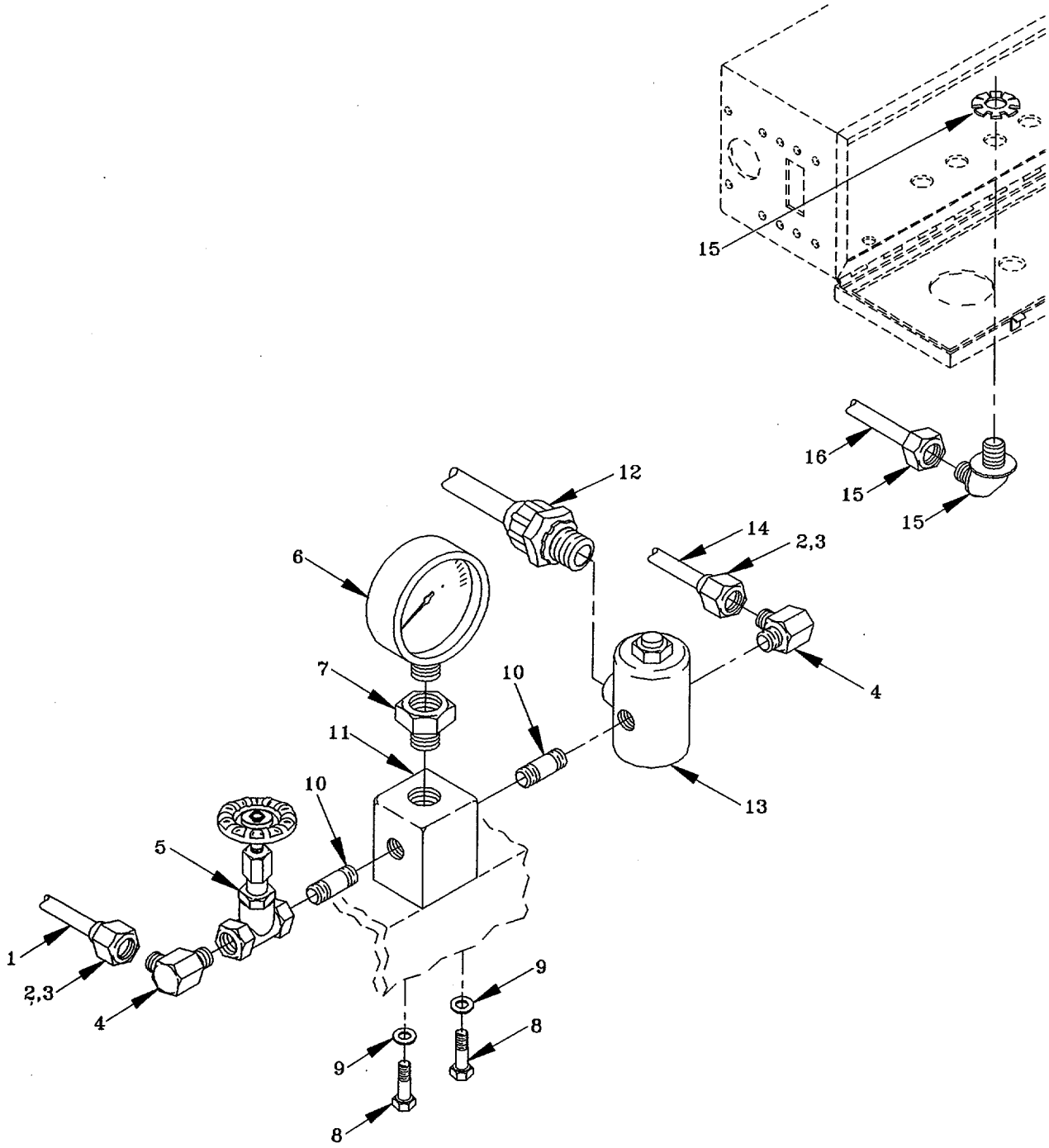


FIGURE C-1. FUEL SUPPLY CONTROL COMPONENTS

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 01 FUEL SUPPLY CONTROL COMPONENTS	
				FIG. C-1 FUEL SUPPLY CONTROL COMPONENTS	
1	PBOZZ	81337	6-1-7494	LINE, FUEL. SOLENOID TO BURNER	1
2	XDOZZ	96906	MS51531-B5Z	NUT	4
3	XDOZZ	96906	MS20819-5	SLEEVE, FLARED, TUBE	4
4	XDOZZ	96906	MS51504-A5Z	ELBOW.PIPE TO TUBE	2
5	XDOZZ	81337	6-1-8115	VALVE, GLOBE	1
6	PBOZZ	61349	500LM	GAGE, PRESSURE	1
7	XDOZZ	99752	25BE	SNUBBER. MIL-D-2940, TYPE2, CLASS1, COMPA, 1/4NPT.	1
8	XDOZZ	96906	MS90725-6	SCREW, CAP, HEXAGON H	2
9	XDOZZ	96906	MS35333-40	WASHER, LOCK	2
10	XDOZZ	96906	MS51953-6	NIPPLE, PIPE	2
11	XDOZZ	81337	6-1-6257	TEE, FUEL LINE	1
12	XDOZZ	81337	6-1-8110	CONNECTOR, STR TIGHT. UL514, 1/8	1
13	PBOZZ	81978	71215SN1KNOONOC111P3	VALVE, SOLENOID	1
14	XDOZZ	81337	6-1-6200-55	TUBING, COPPER. SOLENOID TO PUMP	1
15	XDOZZ	81337	6-1-6200-33	CONNECTOR, LIQ TIGHT. UL514, 90DEGX118	5
16	XDOZZ	81337	6-1-6200-52	CONDUIT, FLEX	1
				END OF FIGURE	

SECTION II. REPAIR PARTS LIST

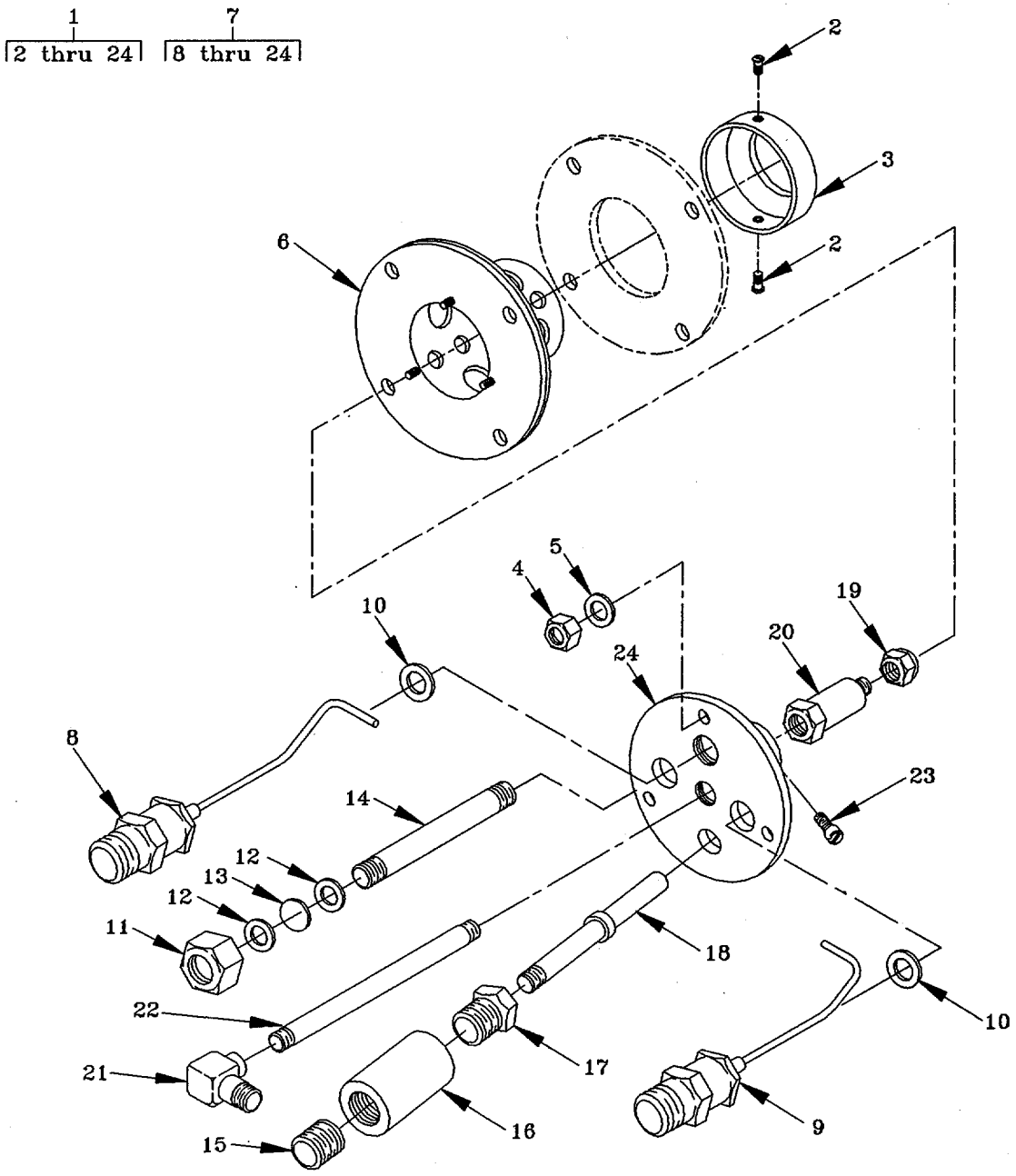


FIGURE C-2. BURNER HEAD ASSE1MBLY (SHEET 1 OF 2, MODEL M80)

SECTION II. REPAIR PARTS LIST

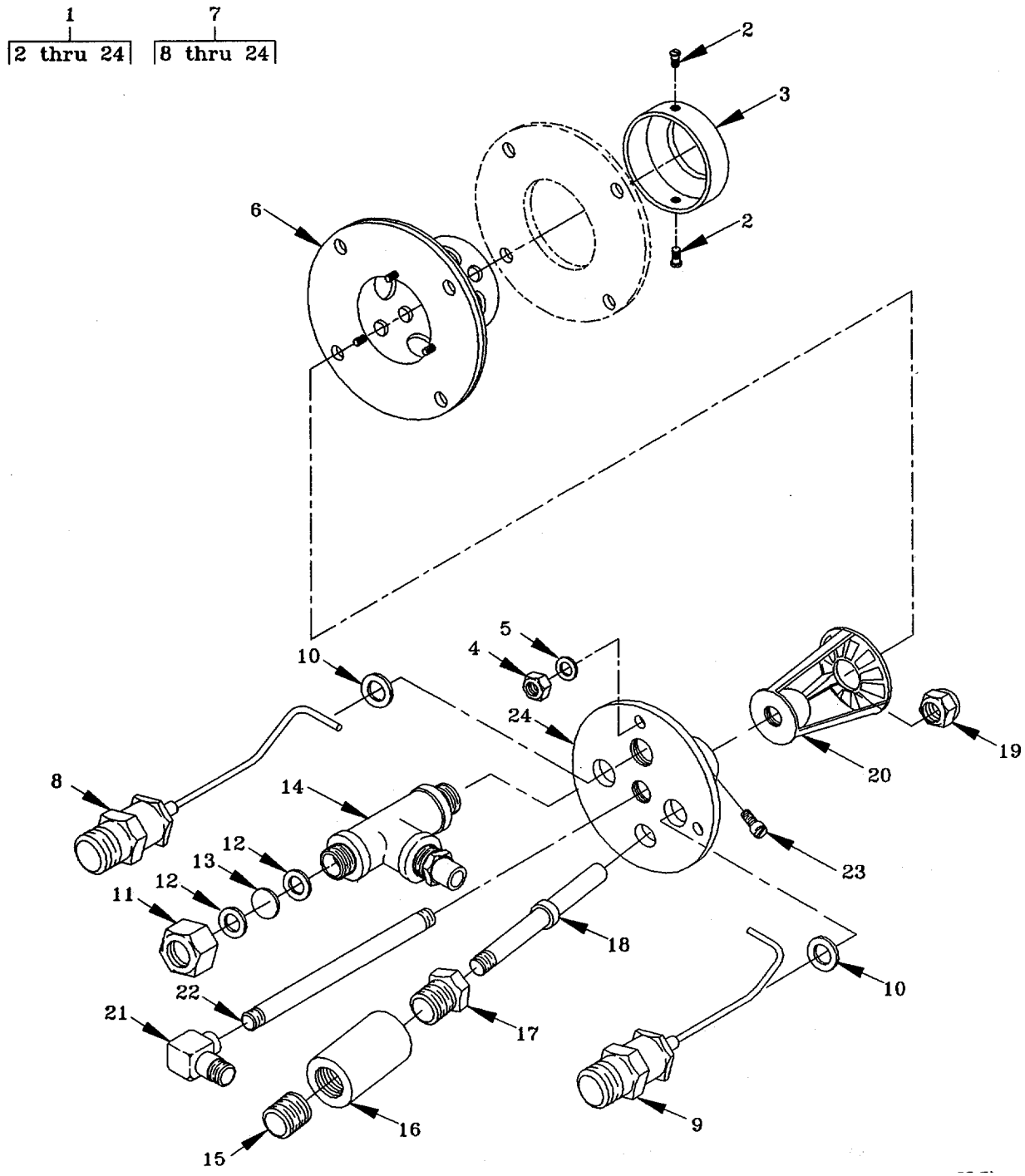


FIGURE C-2. BURNER HEAD ASSEMBLY (SHEET 2 OF 2, MODEL M85)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 02 BURNER HEAD ASSEMBLY	
				FIG. C-2 BURNER HEAD ASSEMBLY	
1	XDOOO	81337	6-1-6236	HEAD ASSY,BURNER	1
2	XDOZZ	96906	MS35275-259	SCREW,MACHINE	2
3	XDOZZ	81337	6-1-6247	NOSE,AIR	1
4	XDOZZ	96906	MS51967-2	NUT,PLAIN,HX	3
5	XDOZZ	96906	MS35333-40	WASHER,LOCK	3
6	XDOZZ	81337	6-1-6237	TUBE,BURNER	1
7	XDOOO	81337	6-1-6238	NOZZLE AND ELECTROD	1
8	PAOZZ	81337	6-1-6240-1	IGNITER,SPARK,FUEL	1
9	PAOZZ	81337	6-1-6240-2	IGNITER,SPARK,FUEL	1
10	PAOZZ	11583	M674	GASKET	2
11	XDOZZ	81337	6-1-6242	CAP,PEEP SIGHT	1
12	XDOZZ	81337	6-1-6244	GASKET,PEEP SIGHT	2
13	XDOZZ	81337	6-1-6243	WINDOW,OBSERVATION	1
14	XDOZZ	81337	6-1-6241	TUBE,IGNITION,SIGHT	1
				UOC:FHQ	
14	XDOZZ	81337	6-2-2461	TEE, ASSEMBLY	1
				UOC:FHR	
15	XDOZZ	96906	MS51953-73	NIPPLE,PIPE	1
16	XDOZZ	96906	MS14304-2C08	COUPLING,PIPE	1
17	XDOZZ	81337	6-1-6238-14	BUSHING,PIPE WW-P-471,TYB,CLD, FINISH C,SIZE A	1
18	XDOZZ	81337	6-1-6245	TUBE,SCANNER	
19	XDOZZ	81337	6-1-8043	NOZZLE,OIL BURNER,P	1
20	XDOZZ	81337	6-1-8042	ADAPTER,NOZZLE,OIL	1
				UOC:FHQ	
20	XDOZZ	81337	6-2-2462	FLAMELOCK, MODIFIED	1
				UOC:FHR	
21	XDOZZ	96906	MS51506A5Z	ELBOW,STREET	1
22	XDOZZ	96906	MS51953-17	NIPPLE,PIPE	1
23	XDOZZ	96906	MS51963-47	SETSCREW	4
24	XDOZZ	81337	6-1-6239	HOLDER, NOZ AND ELCT	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

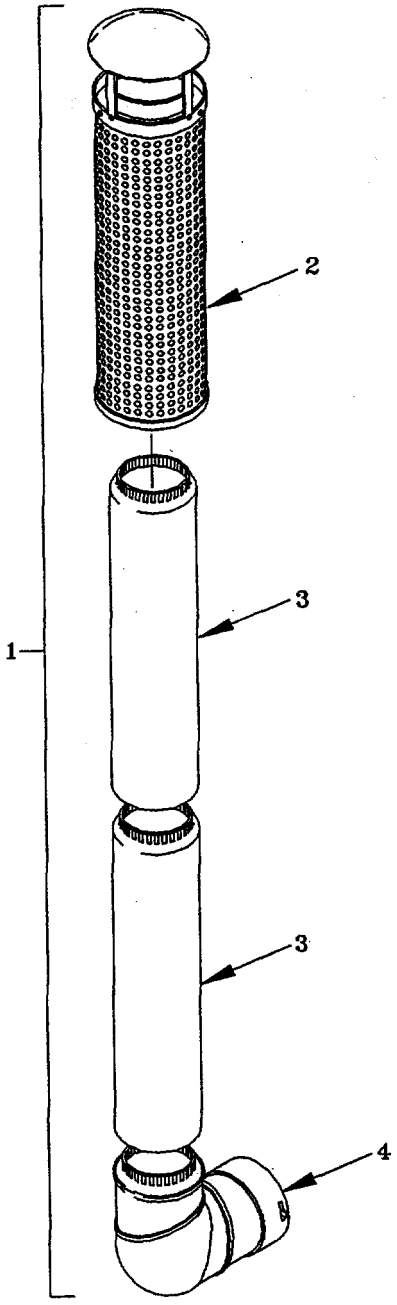


FIGURE C-3. SMOKESTACK AND GUARD ASSEMBLY (MODEL M80)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 03 SMOKESTACK AND GUARD ASSEMBLY (MODEL M80)	
				FIG. C-3 SMOKESTACK AND GUARD ASSEMBLY (MODEL M80)	
1	XDOOO	81334	6-1-8259	GUARD ASSEMBLY ..... UOC:FHQ	1
2	XDOZZ	81337	6-1-8264	CAP,FLUE..... UOC:FHQ	1
3	XDOZZ	81337	6-1-8263	PIPE,AIR CONDITIONI ..... UOC:FHQ	2
4	XDOZZ	81337	6-1-8260	ELBOW,AIR CONDITION ..... UOC:FHQ	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

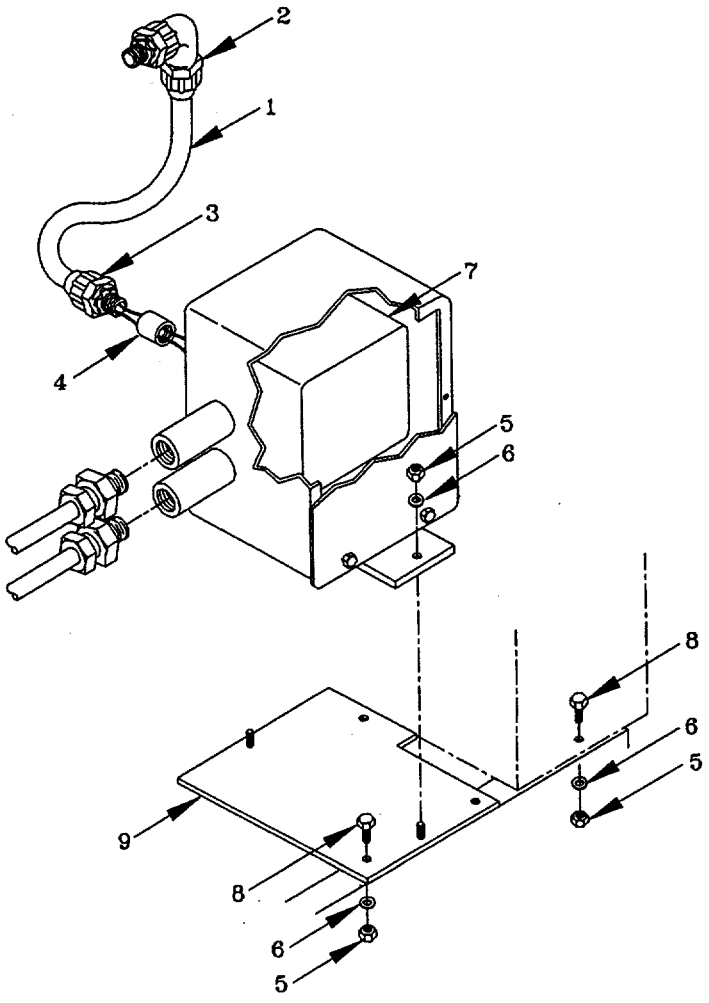


FIGURE C-4. IGNITION TRANSFORMER ASSEMBLY

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 04 IGNITION TRANSFORMER ASSEMBLY	
				FIG. C-4 IGNITION TRANSFORMER ASSEMBLY	
1	XDOZZ	77628	P504	HOSE	1
2	XDOZZ	81349	MIL-C-13909C TYP E 1 GRADE B	CONDUIT, FLEXIBLE	1
3	XDOZZ	81337	6-1-9336	COUPLING, PIPE	1
4	XDOZZ	59730	5351	BOX CONNECTOR,ELECT	1
5	XDOZZ	96906	MS35649-2252	NUT,PLAIN,HEXAGON	9
6	XDOZZ	96906	MS35333-40	WASHER,LOCK	9
7	PAOZZ	81337	6-1-8100	TRANSFORMER,POWER	1
8	XDOZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	7
9	XDOZZ	81337	6-1-6258	PLATE,TRANSFORMER	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

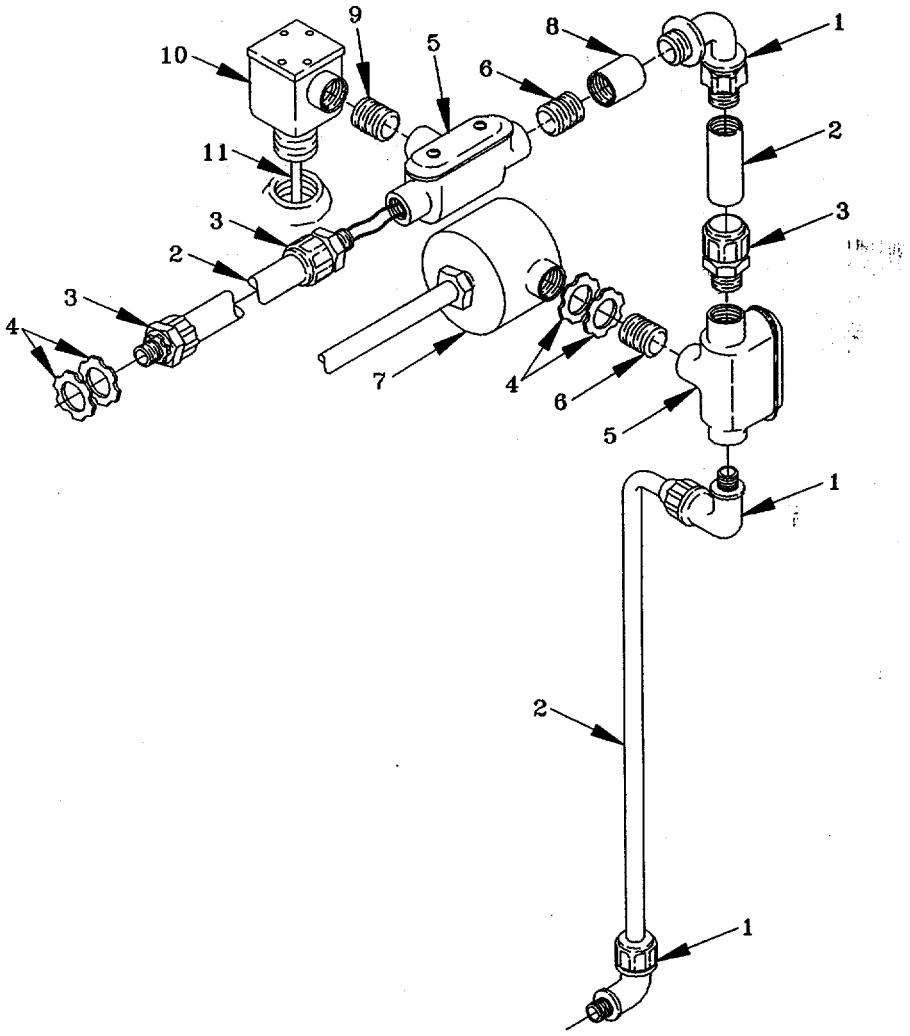


FIGURE C-5. ELECTRICAL COMPONENTS

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 05 ELECTRICAL COMPONENTS	
				FIG. C-5 ELECTRICAL COMPONENTS	
1	XDOZZ	81337	6-1-6200-29	CONNECTOR,BOX W-F-408,TY1,CL2,KINK M,STYLE 2	3
2	XDOZZ	81337	6-1-6200-28	CONDUIT,THIN WALL	3
3	XDOZZ	81337	6-1-6200-30	CONNECTOR,BOX,ELEC W-F-408,TY1,CL2, KINDLSTYL,E2	3
4	XDOZZ	81337	6-1-6200-31	LOCKNUT,CND,O.50 W-F-408,TY3,CL1, KIND P,1/2.	4
5	XDOZZ	81337	6-1-6200-32	TEE,.50X.50X.50 W-C-586,TY1,DESIGN 1,STYLE T	2
6	XDOZZ	96906	MS51953-75	NIPPLE,PIPE	2
7	PBOZZ	81337	6-1-8101	CONTROL,TEMPERATURE	1
8	XDOZZ	81337	6-1-8094	COUPLING, HALF	1
9	XDOZZ	81337	6-1-8122	NIPPLE,CHASE, 0.50	1
10	PBOZZ	81337	6-1-8102	HOLDER,ELECTRODE	1
11	PBOZZ	81337	6-1-8103	ELECTRODE	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

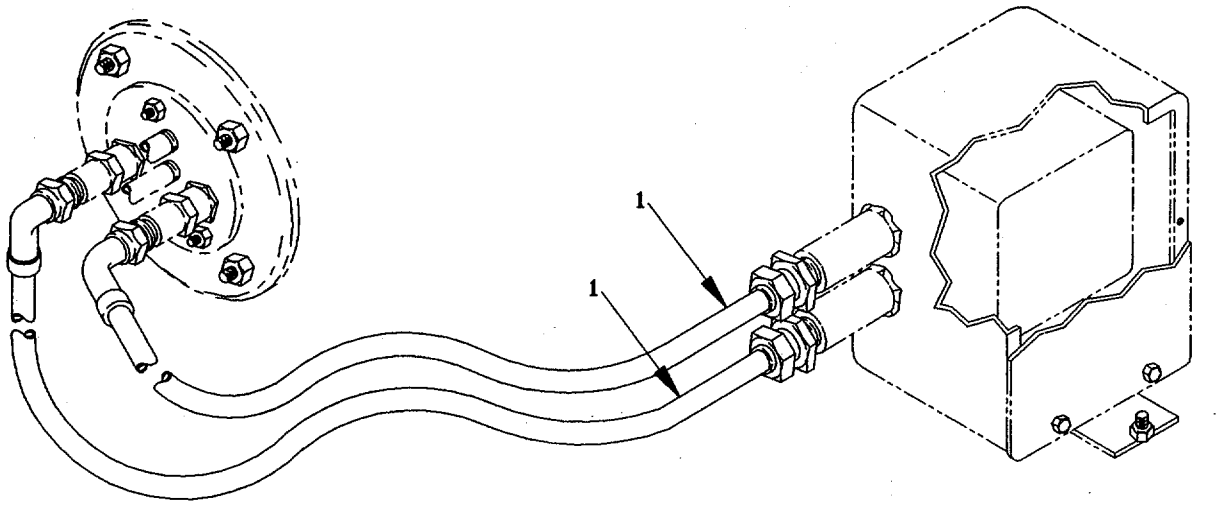


FIGURE C-6. IGNITION CABLE ASSEMBLY

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 06 IGNITION CABLE ASSEMBLY	
				FIG. C-6 IGNITION CABLE ASSEMBLY	
1	PBOZZ	81337	6-1-6263	CABLE,POWER,ELECTRI	2

END OF FIGURE

SECTION II. REPAIR PARTS LIST

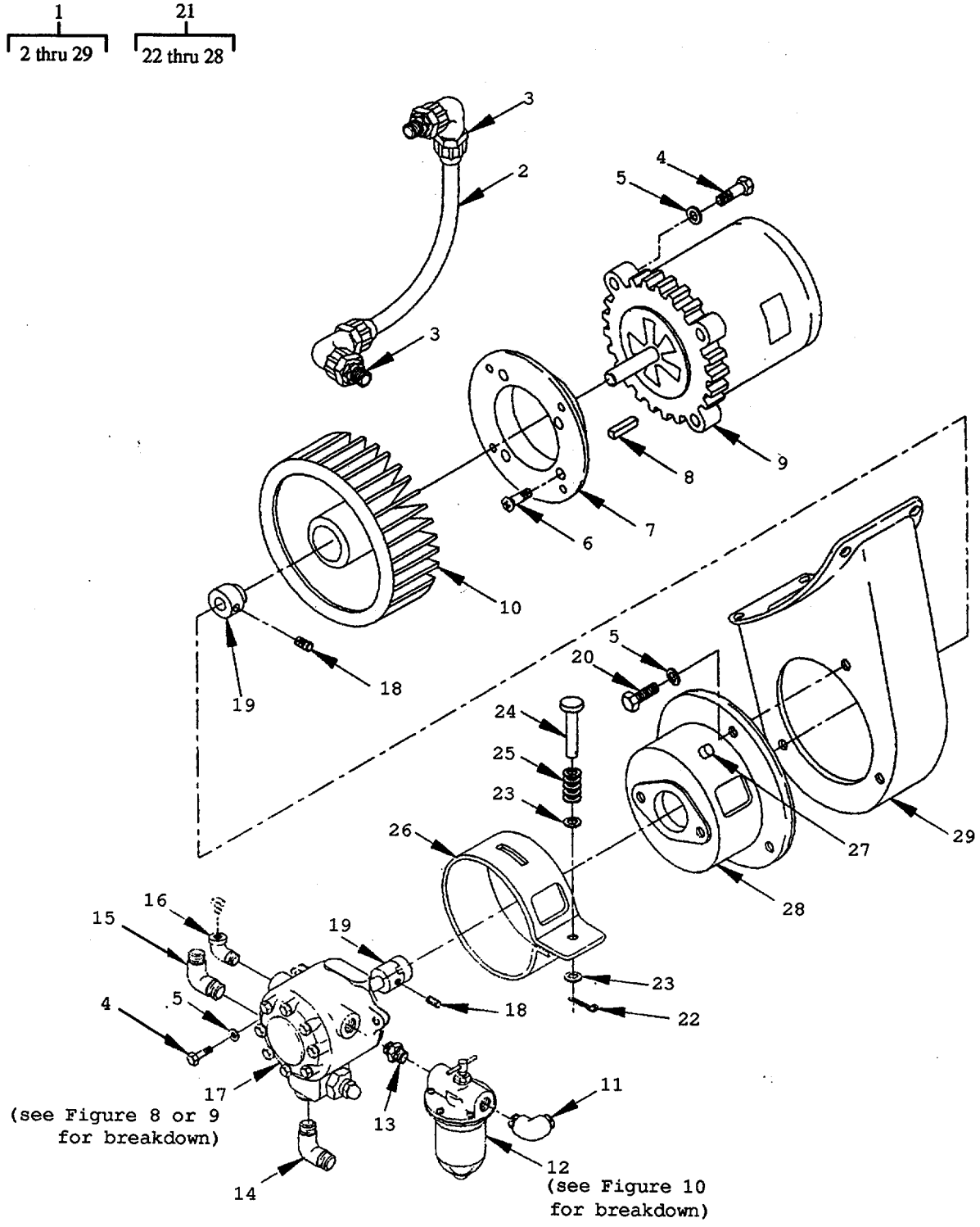


FIGURE C-7. BLOWER ASSEMBLY

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 07 BLOWER ASSEMBLY	
				FIG. C-7 BLOWER ASSEMBLY	
1	XDOFF	81337	6-1-6225-101	BLOWER ASSEMBLY	1
2	XDOZZ	81337	6-1-6225-14	CONDUIT, FLEX	1
3	XAFZZ	59730	5331	BOX CONNECTOR,ELECT	2
4	XDFZZ	96906	MS90725-60	SCREW,CAP,HEXAGON H	6
5	XDFZZ	96906	MS35333-42	WASHER,LOCK	9
6	XDFZZ	96906	MS35190-321	SCREW,MACHINE	4
7	XDFZZ	81337	6-1-6227	PLATE.,MOTOR MTG	1
8	XDFZZ	81337	6-1-6234	KEY,MOTOR	1
9	XDFZZ	03510	5K33FN311U	MOTOR,ELECTRIC	1
10	XDFZZ	95933	631-200S	WHEEL,BLOWER	1
11	XDOZZ	96906	MS20822-8D	ELBOW UOC:FHQ	1
12	XDOOO	81337	6-1-8040	FILTER,FLUID SEE FIGURE 10 FOR BREAKDOWN	1
13	XDOZZ	81337	6-1-8097	REDUCER,PIPE UOC:FHQ	1
14	XDOZZ	96906	MS51504-B8-4Z	ELBOW,TUBE	1
15	XDOZZ	96906	MS20822-5D	ELBOW,PIPE TO TUBE	1
16	XDOZZ	81337	6-1-8095	ELBOW,STREET	1
17	PBFFF	1Y370	H3BA-100	PUMP,ROTARY SEE FIGURE 9 FOR BREAKDOWN UOC:FHR	1
17	PBFFF	1Y370	J3BA-178P	PUMP,ROTARY SEE FIGURE 8 FOR BREAKDOWN UOC:FHQ	1
18	XDFZZ	96906	MS51963-64	SETSCREW	2
19	XDFZZ	81337	6-1-8038	COUPLING,SHAFT,FLEX	2
20	XDFZZ	96906	MS90725-61	SCREW,CAP,HEX HD	3
21	XDFFF	81337	6-1-6228	SHUTTER	1
22	XDFZZ	96906	MS9245-25	PIN,COTTER	1
23	XDFZZ	96906	MS15795-910	WASHER,FLAT	2
24	XDFZZ	81337	6-1-6232	RIVET,AIR BAND	3
25	XDFZZ	81337	6-1-6233	SPRING	1
26	XDFZZ	81337	6-1-6230	BAND,AIR	1
27	XDFZZ	81337	6-1-6231	PIN,STOP	1
28	XDFZZ	81337	6-1-6229	BRACKET,FUEL PUMP	1
29	XDFZZ	81337	6-1-6226	HOUSING,BLOWER	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

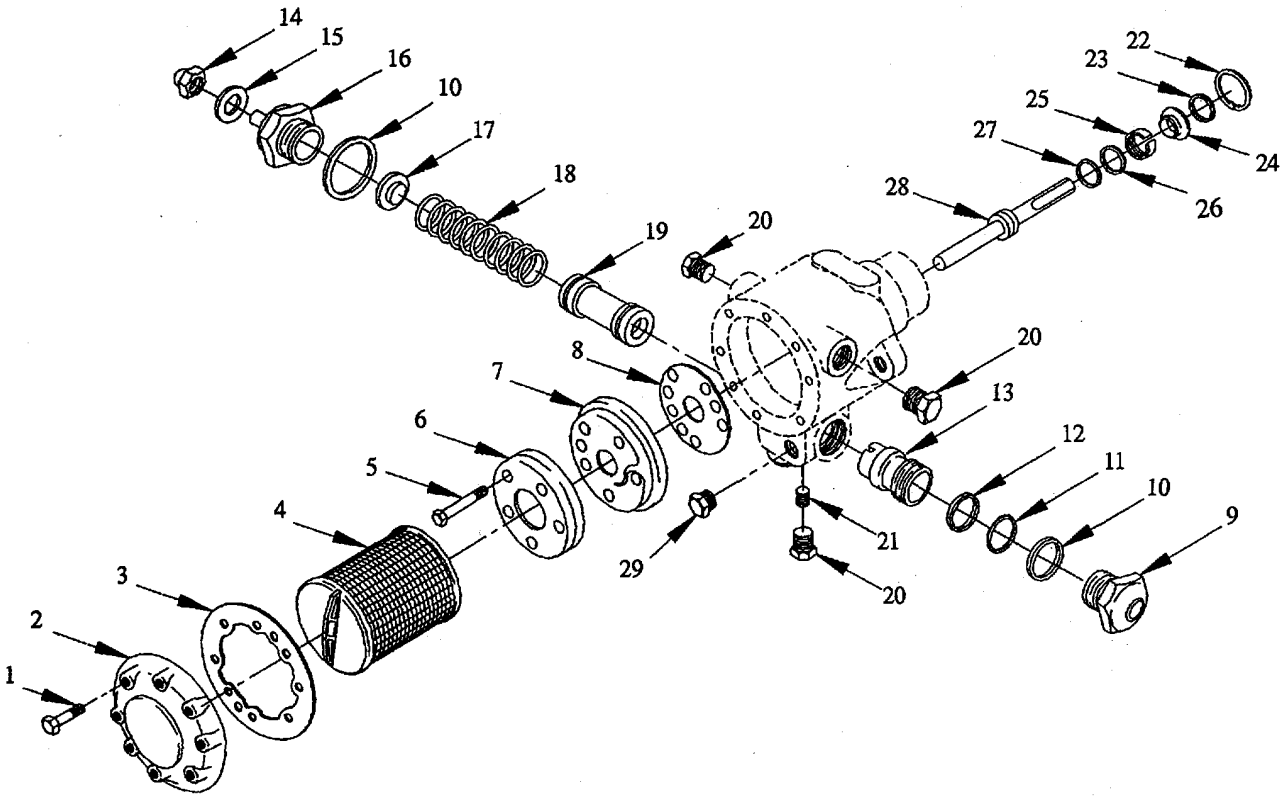


FIGURE C-8. FUEL PUMP ASSEMBLY (MODEL M80)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 07 BLOWER ASSEMBLY	
				FIG. C-8 FUEL PUMP ASSEMBLY (MODEL M80)	
1	XDFZZ	1Y370	111401	SCREW,COVER UOC:FHQ	8
2	XDFZZ	1Y370	131596	COVER UOC:FHQ	1
3	PBFZZ	1Y370	110441	GASKET UOC:FHQ	1
4	PBFZZ	1Y370	131622	STRAINER ELEMENT UOC:FHQ	1
5	XDFZZ	1Y370	104671	SCREW,GEARSET UOC:FHQ	5
6	XDFZZ	1Y370	124027	PLATE ASSEMB1Y,END UOC:FHQ	1
7	XDFZZ	1Y370	117531	HOUSING,PORT UOC:FHQ	1
8	PBFZZ	1Y370	113331	GASKET UOC:FHQ	1
9	XDFZZ	1Y370	114227	PLUG ASSEMB1Y UOC:FHQ	1
10	PBFZZ	1Y370	100901	GASKET UDC:FHQ	2
11	XDFZZ	1Y370	121732	SLEEVE,RETAINER UOC:FHQ	1
12	PBFZZ	1Y370	25815	WASHER,FLAT UOC:FHQ	1
13	XDFZZ	1Y370	121222	SLEEVE,PISTON UOC:FHQ	1
14	PBFZZ	1Y370	100241	NUT,PLAIN,CAP UOC:FHQ	1
15	PBFZZ	1Y370	100371	GASKET UOC:FHQ	1
16	XDFZZ	1Y370	103379	PLUG ASSEMB1YPEND UOC:FHQ	1
17	XDFZZ	1Y370	100931	SEAT,SPRING UOC:FHQ	1
18	XDFZZ	1Y370	728335	SPRING,HELICAL UOC:FHQ	1
19	XBFZZ	1Y370	116106	PISTON ASSEMB1Y UOC:FHQ	1
20	XDFZZ	1Y370	3759231	PLUG,PIPE,HEX HD UOC:FHQ	3
21	XDFZZ	1Y370	24800	PLUGBYPASS UOC:FHQ	1
22	XDFZZ	1Y370	51017	RING,RETAINING UOC:FHQ	1
23	PBFZZ	1Y370	125132	PACKING,PREFORMED UOC:FHQ	1
24	XDFZZ	1Y370	129772	SEAL	1

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
25	XDFZZ	1Y370	129792	UOC:FHQ SEAL	1
26	XDFZZ	1Y370	129521	UOC:FHQ WASHER	1
27	PBFZZ	1Y370	125122	UOC:FHQ PACKING,PREFORMED	1
28	XDFZZ	1Y370	117667	UOC:FHQ SHAFT ASSEMB1Y	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

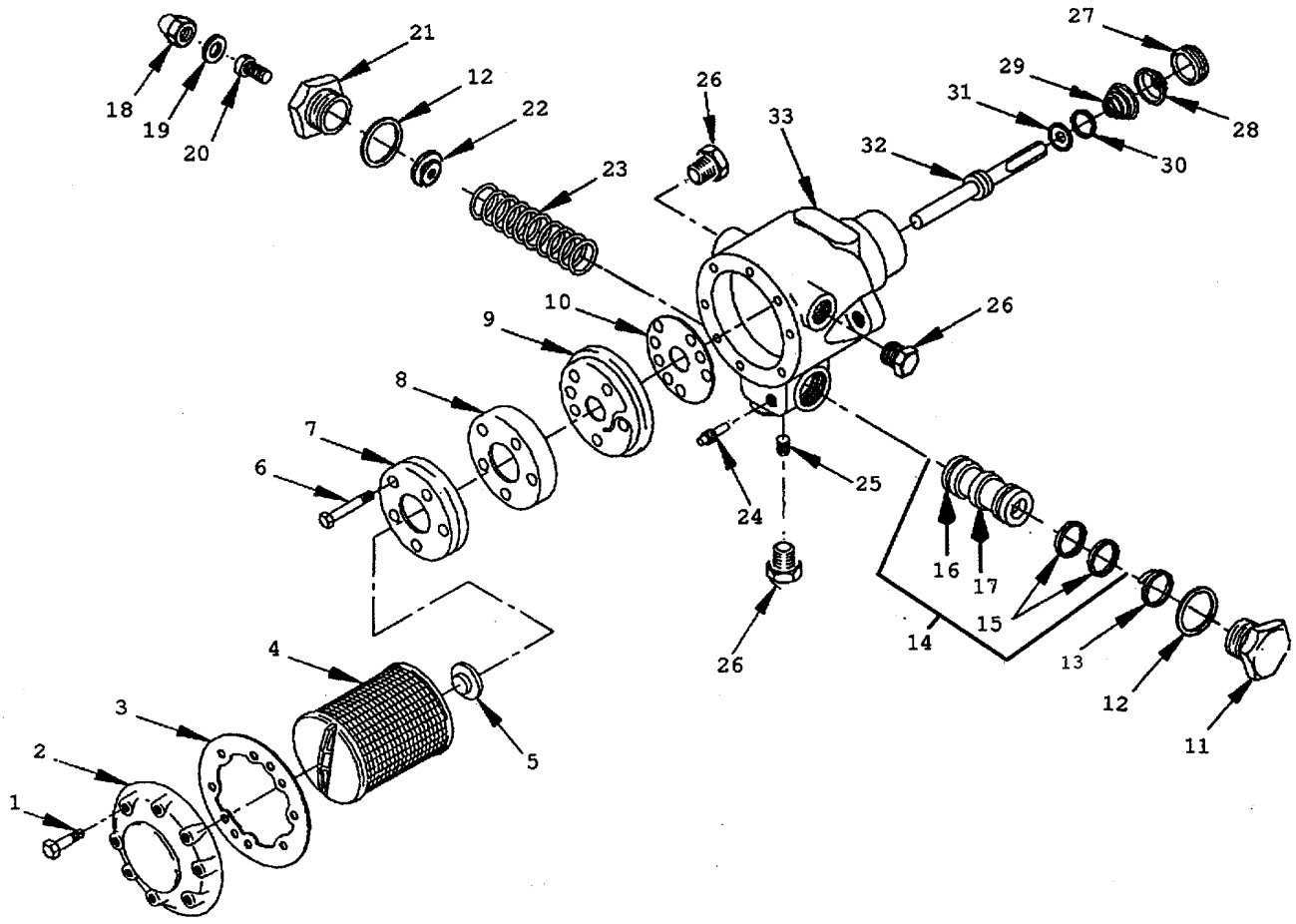


FIGURE C-9. FUEL PUMP ASSEMBLY (MODEL M85)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIG. C-9 FUEL PUMP ASSEMBLY (MODEL M85)	
1	XDFZZ	1Y370	111401	SCREW UOC: FHR	8
2	XDFZZ	1Y370	120353	COVER,ACS UOC:FHR	1
3	PCFZZ	1Y370	110441	GASKET UOC:FHR	1
4	PBFZZ	1Y370	131129	FILTER ELEMENT,FLUI UOC: FHR	1
5	XDFZZ	1Y370	122822	DIAPHRAGM,STEAM CLE UOC:FHR	1
6	XDFZZ	1Y370	134122	SCREW UOC: FHR	5
7	XDFZZ	1Y370	134137	PLATE ASSY, END UOC:FHR	1
8	XDFZZ	1Y370	128527	SPACER,PLATE ASSY UOC:FHR	1
9	XDFZZ	1Y370	128283	HOUSING,PORT UOC:FHR	1
10	XDOZZ	1Y370	113331	GASKET UOC:FHR	1
11	XDFZZ	1Y370	109777	PLUG UOC: FHR	1
12	XDFZZ	1Y370	100901	GASKET UOC:FHR	2
13	XDFZZ	1Y370	121732	SLEEVE,RETAINER UOC:FHR	1
14	XDFZZ	1Y370	991096	PISTON/SLEEVE ASSY UOC:FHR	1
15	XAFZZ	1Y370	25815	WASHER,FLAT UOC:FHR	2
16	XAFZZ	1Y370	128403	PISTON UOC: FHR	1
17	XAFZZ	1Y370	128433	CYLINDER,SLEEVE UOC: FHR	1
18	XDFZZ	1Y370	100241	NUT,PLAIN,CAP UOC: FHR	1
19	XDFZZ	1Y370	100371	GASKET UOC:FHR	1
20	XDFZZ	1Y370	101001	SCREW UOC:FHR	1
21	XDFZZ	1Y370	103379	PLUG ASSY,END P UOC: FHR	1
22	XDFZZ	1Y370	100931	SEAT,HELICAL COMPRE UOC:FHR	1
23	XDFZZ	1Y370	101641	SPRING, HELICAL UOC: FHR	1
24	XDFZZ	1Y370	3759231	VALVE,BLDR PMP	1

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				UOC:FHR	
25	XDFZZ	1Y370	24800	PLUG,MACH THD	1
				UOC:FHR	
26	XDFZZ	1Y370	3729241	PLUG,PIPE	3
				UOC:FHR	
27	XDFZZ	1Y370	100031	PACKING NUT	1
				UOC:FHR	
28	XDFZZ	1Y370	100291	WASHER,SHOULDERED A	1
				UOC:FHR	
29	XDFZZ	1Y370	100301	SPRING,HLCPS	1
				UOC:FHR	
30	XDFZZ	1Y370	100319	PACKING,PREFORMED	1
				UOC:FHR	
31	XDFZZ	1Y370	101861	SHIM	1
				UOC:FHR	
32	XDFZZ	1Y370	109026	SHAFT ASSY	1
				UOC:FHR	
33	XAFZZ	1Y370	170070	CASING	1
				UOC:FHR	

END OF FIGURE

SECTION II. REPAIR PARTS LIST

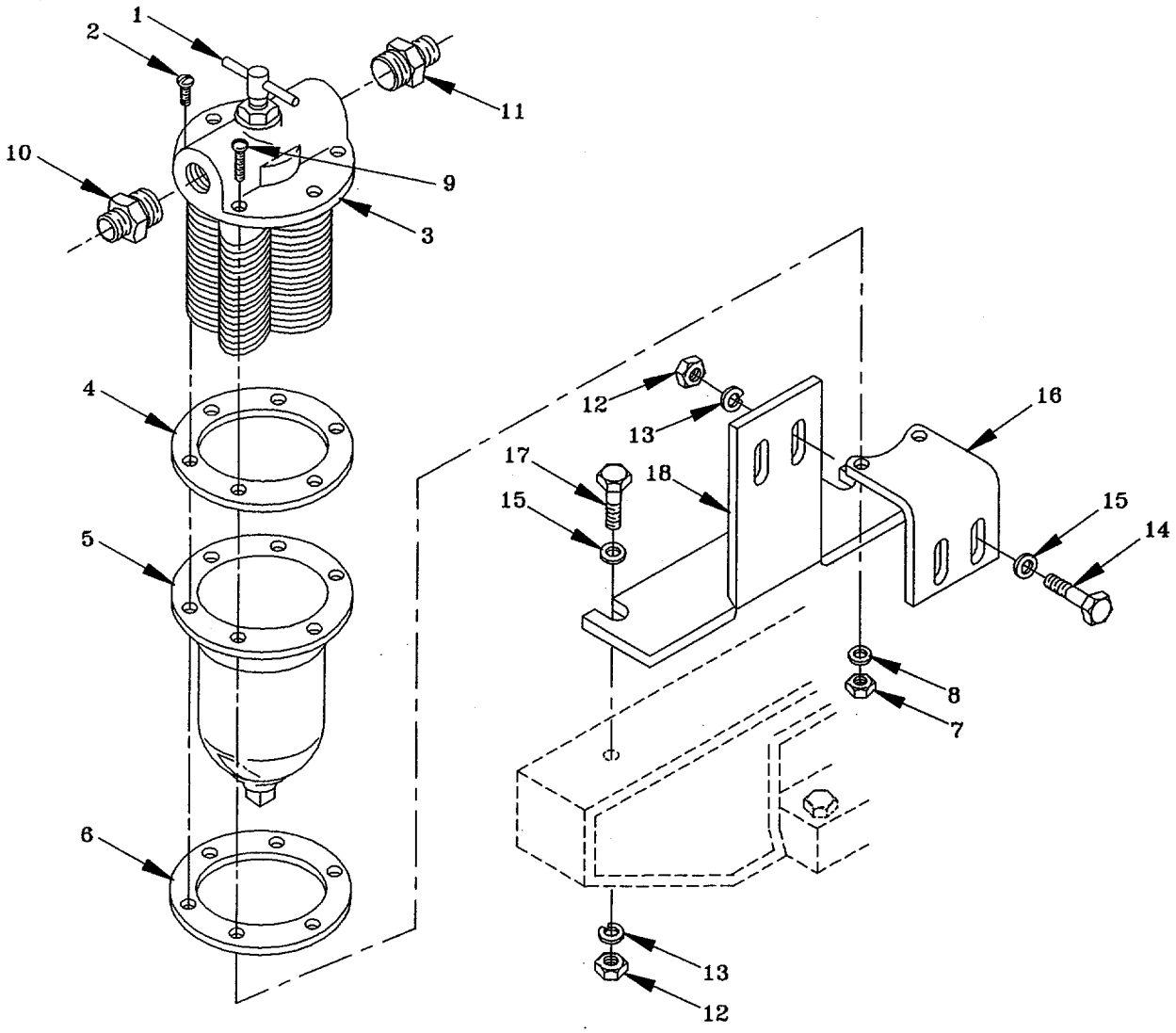


FIGURE C-10. FUEL FILTER ASSEMBLY

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 07 BLOWER ASSEMBLY	
				FIG. C-10 FUEL FILTER ASSEMBLY	
1	PAOZZ	15472	98801-01	PARTS KIT,FLUID PRE	1
2	XDOZZ	96906	MS35206-265	SCREW,MACHINE	4
3	XDOZZ	15472	12705-01-20-0035	HEAD AND CARTRIDGE	1
4	PBOZZ	15472	32845-31	GASKET	1
5	XDOZZ	15472	22342-00	SUMP,FILTER	1
6	XDOZZ	15472	28329-o0	RING,REINFORCING	1
7	XDOZZ	96906	MS35649-202	NUT,PLAIN, HEXAGON	2
8	XDOZZ	96906	MS35333-39	WASHER,LOCK	2
9	XDOZZ	96906	MS51849-78	SCREW,CAP,HX HD	2
10	XDOZZ	96906	MS51500-B8S	ADAPTER,STR	1
11	XDOZZ	01276	2021-6-4C	CONNECTOR,MALE	1
12	XDOZZ	96906	MS35649-2252	NUT ,PLAIN,HEXAGON	4
13	XDOZZ	96906	MS35333-40	WASHEROLOCK	4
14	XDOZZ	80204	B1821BHO25ClOON	SCREW,CAP,HEXAGON H	2
15	XDOZZ	96906	MS27183-10	WASHER,FLAT	4
16	XDOZZ	81337	6-1-6256	BRACKET,MTG	1
17	XDOZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	2
18	XDOZZ	81337	6-1-6255	BRACKET,MTG	1

END OF FIGURE

Section II. REPAIR PARTS LIST

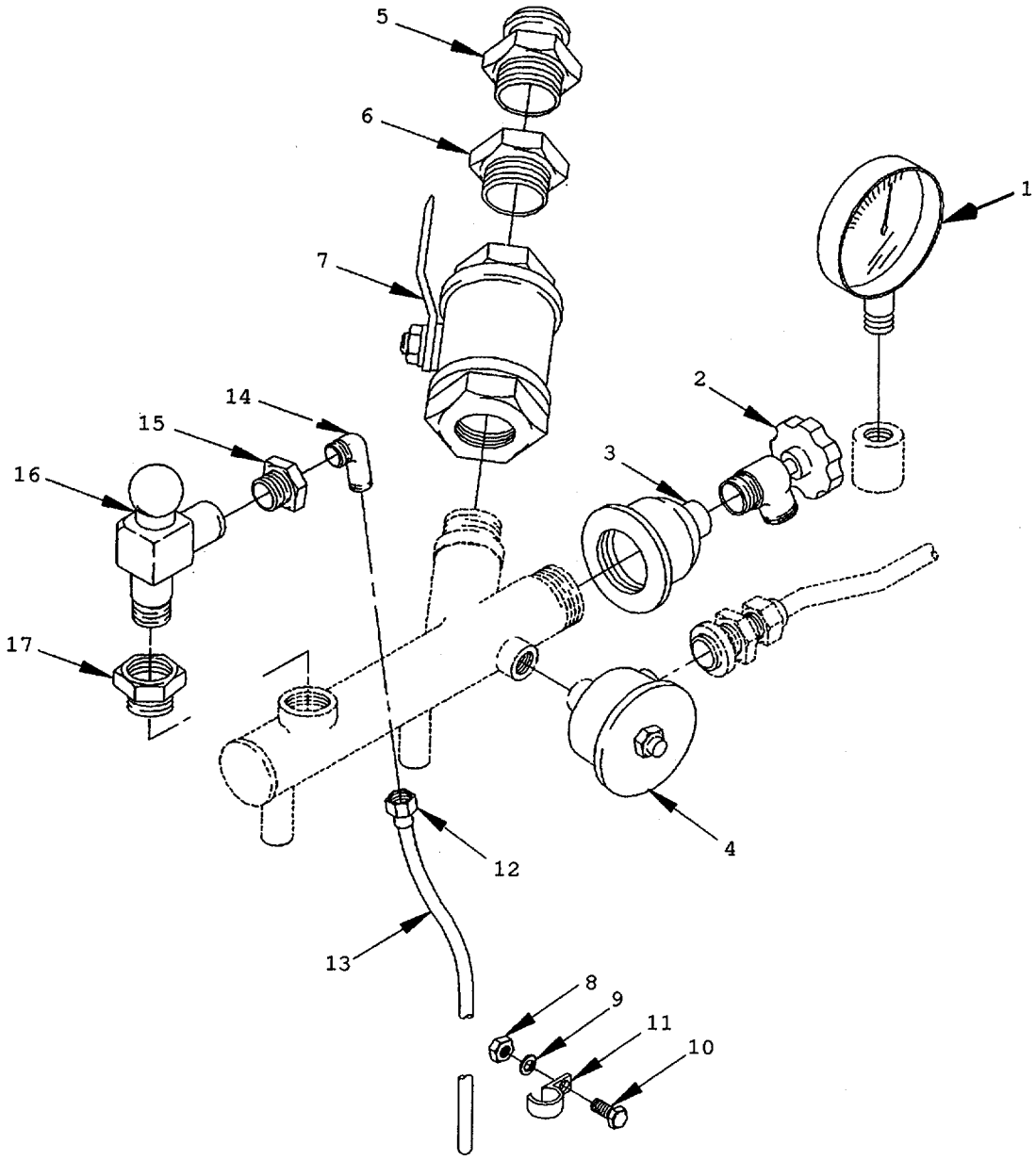


FIGURE C-11. PRESSURE RELIEF VALVE AND THERMOSTAT ASSEMBLY (SHEET 1 OF 2, MODEL M80)

SECTION II. REPAIR PARTS LIST

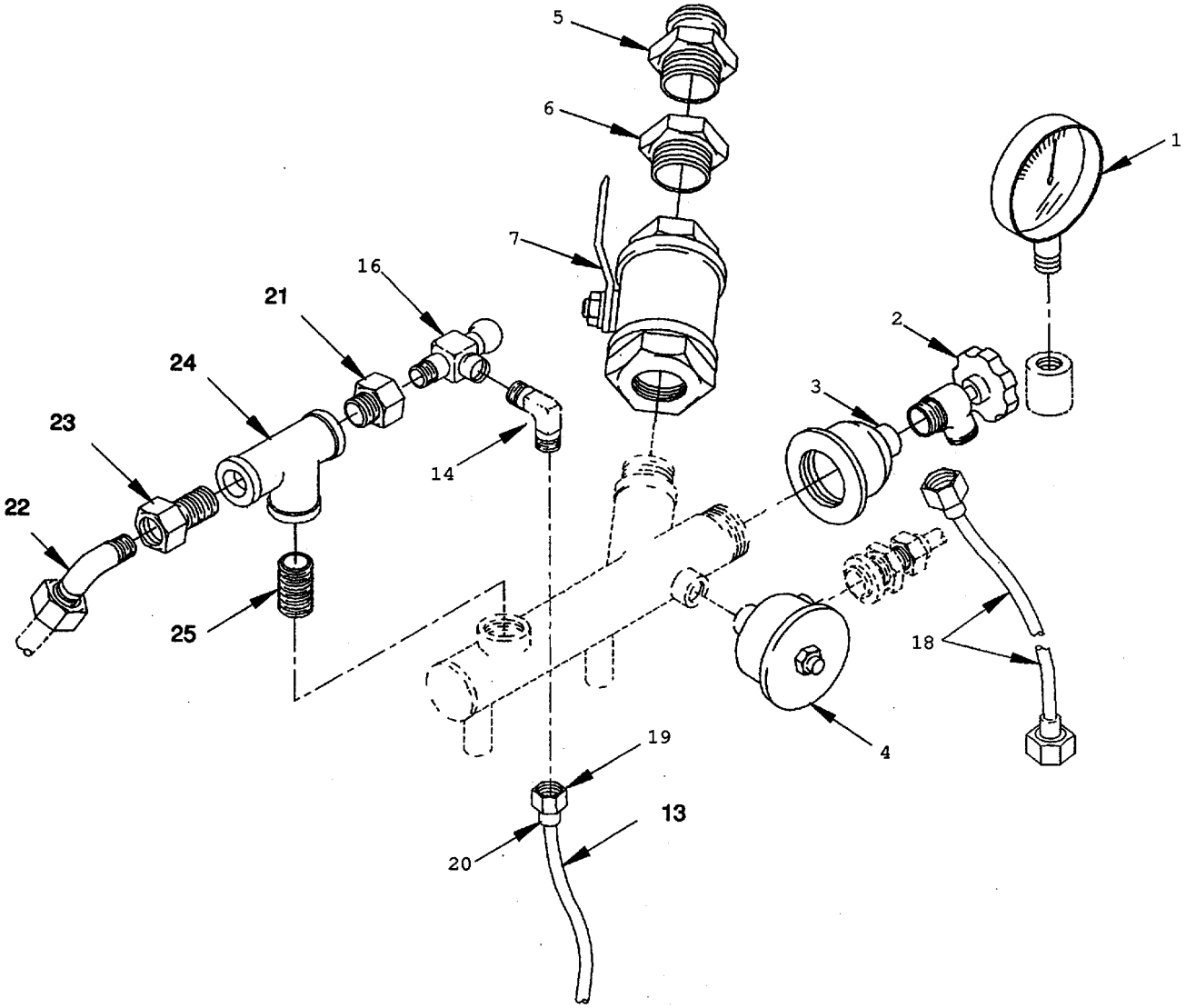


FIGURE C-11. PRESSURE RELIEF VALVE AND THERMOSTAT ASSEMBLY (SHEET 2 OF 2, MODEL M85)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 08 WATER VESSEL AND SKID ASSEMBLY	
				FIG. C-11 PRESSURE RELIEF VALVE AND THERMOSTAT ASSEMBLY	
1	PBOZZ	61349	147869-T1050	THERMOMETER,SELF-IN	1
2	XDOZZ	81337	6-1-8117	DRAINCOCK, .50 IPS	1
3	XDOZZ	81337	6-1-8104	COUPLING, REDUCER	1
4	PBOZZ	81337	6-1-8121	SWITCH,THERMOSTATIC	1
5	XDOZZ	96906	MS27022-5	COUPLINC- HALF,QUICK	1
6	XDOZZ	96906	MS51847-19	BUSHING, OUTSIDE	1
7	XDOZZ	81337	6-1-6200-44	VALVE,BALL,1.50MPT' WW-V-35,TY2,CLA, STYLE 1,1-1/2NPT	1
8	XDOZZ	96906	MS35649-202	NUT,PLAIN, HEXAGON UOC:FHQ	1
9	XDOZZ	96906	MS35333-40	WASHER,LOCK UOC:FHQ	1
10	XDFZZ	96906	MS35275-243	SCREW,MACHINE UOC:FHQ	1
11	XDOZZ	96906	MS21333-69	CLAMP,LOOP UOC:FHQ	1
12	XDOZZ	96906	MS39166-5L	NUT, TUBE COUPLING UOC:FHQ	1
13	XDOZZ	19207	12260274	TUBING,STEEL	1
14	XDOZZ	81343	SAE J 514 (070202)	ELBOW,MALE SAE J514 90DEG,3/8TUBEX1/2NPT	
15	XDOZZ	78468	5120	CONNECTOR, PLUG UOC:FHQ	1
16	PBOZZ	81337	6-1-8118	VALVE,RELIEF, PRESSU	1
17	XDFZZ	81337	6-1-9336	COUPLING,PIPE UOC:FHQ	1
18	XDOZZ	81337	6-1-9912-15	HOSE ASSY,W/BRASS COUPLINGS UOC:FHR	1
19	XDOZZ	96906	MS51531-B6	NUT,TUBE COUPLING UOC:FHR	1
20	XDOZZ	96906	MS51533-B6	SLEEVE UOC:FHR	1
21	XDOZZ	81337	6-1-9337	BUSHING,PIPE UOC:FHR	1
22	XDOZZ	81337	6-1-9912-21	CONNECTOR,MALE,BRS SAE J512,5/16 TUBEX1/4 NPTF UOC:FHR	1
23	XDOZZ	81337	6-1-9912-20	BUSHING,STEEL,ZINC ANSI B16.14,1X1/4,,TY2 UOC:FHR	1
24	XDOZZ	81337	6-1-9912-19	TEE,STEEL,ZINC WW-P-521,1IN UOC:FHR	1
25	XDOZZ	96906	MS51953-121	NIPPLE,PIPE UOC:FHR	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

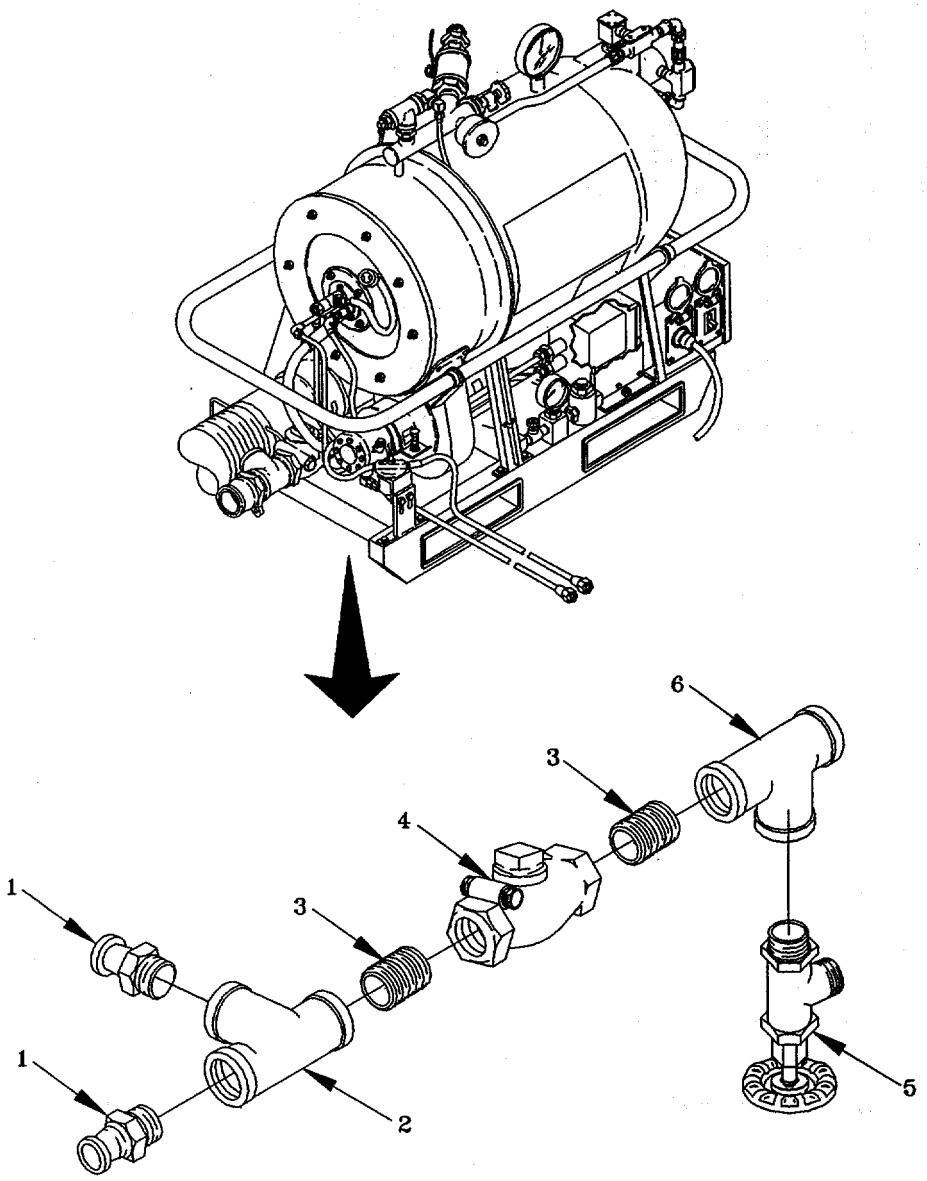


FIGURE C-12. SWING CHECK AND DRAIN VALVES (Model M85)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 08 WATER VESSEL AND SKID ASSEMBLY	
				FIG. C-12 SWING CHECK AND DRAIN VALVES	
1	XDOZZ	96906	MS27022-9	COUPLING HALF,QUICK. ..... UOC:FHR	2
2	XDOZZ	81337	6-1-9912-10	TEE,PIPE ..... UOC:FHR	1
3	XDOZZ	96906	MS51953-169	NIPPLE,PIPE ..... UOC:FHR	2
4	XDOZZ	76364	509	VALVE,CHECK,SWING ..... UOC:FHR	1
5	XDOZZ	81337	6-1-9917	VALVE,DRAIN..... UOC:FHR	1
6	XDOZZ	81337	6-1-9912-3	TEE,STEEL,ZINC CDT WW-P-521,TY2,1- ..... 1/2Xl-1/2X3/4IPS..... UOC:FHR	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

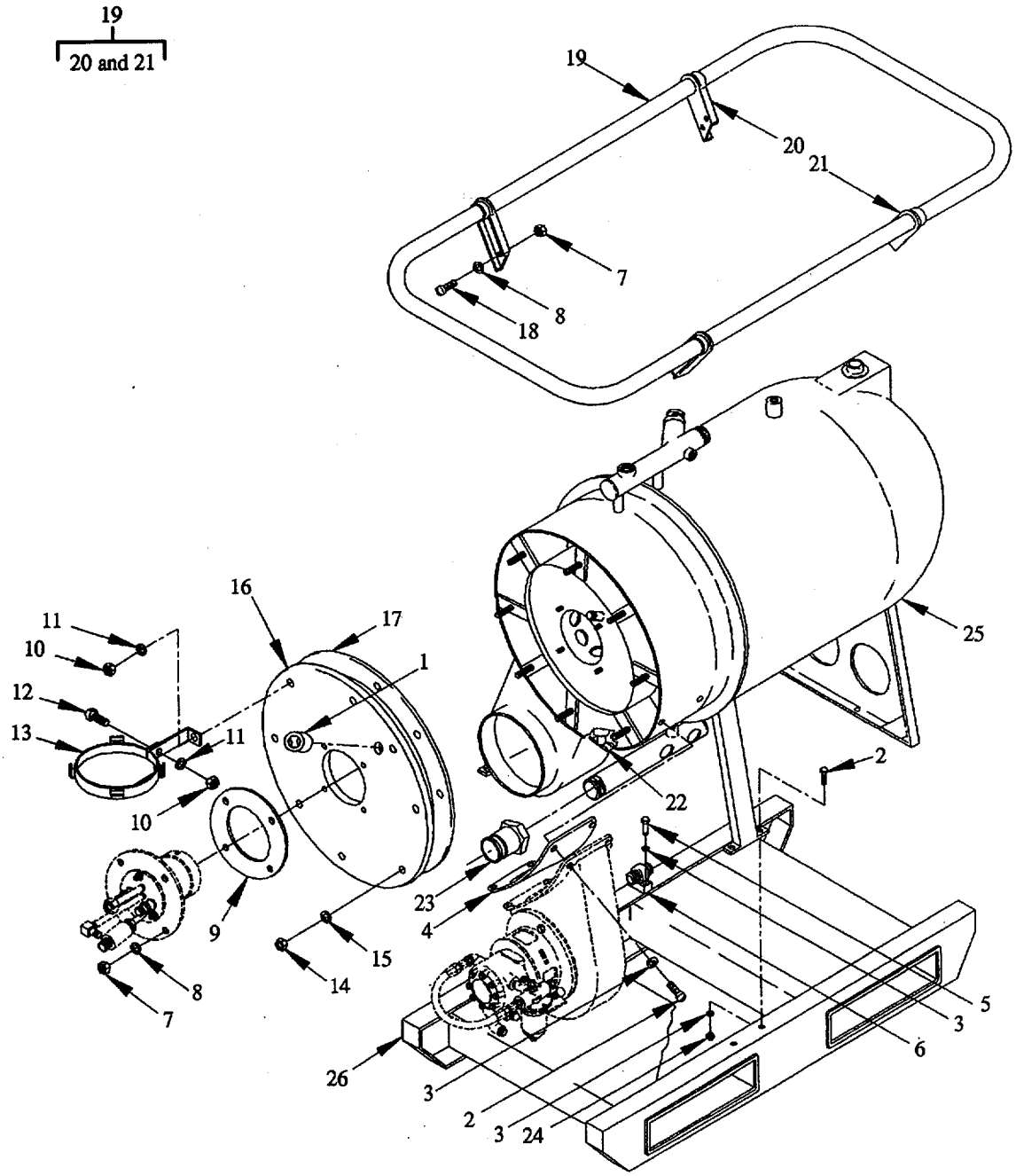


FIGURE C-13. WATER VESSEL-SKID AND HANDLE ASSEMBLY

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 08 WATER VESSEL AND SKID ASSEMBLY	
				FIG. C-13 WATER VESSEL SKID AND HANDLE ASSEMBLY	
1	PAOZZ	81337	6-1-6248	INDICATOR,SIGHT,LIQ	1
2	XDOZZ	96906	MS90725-60	SCREW,CAP,HEXAGON H	12
3	XDOZZ	96906	MS35333-42	WASHER,LOCK	14
4	XDOZZ	81337	6-1-6235	GASKET	1
5	XDOZZ	96906	MS90725-8	SCREW,CAP,HEXAGON H	2
6	XDOZZ	81337	6-1-6262	HOLDER,FUEL LINE	1
7	XDOZZ	96906	MS35649-2252	NUT,PLAIN,HEXAGON	12
8	XDOZZ	96906	MS35333-40	WASHER,LOCK	8
9	XDOZZ	81337	6-1-6260	GASKET	1
10	XDOZZ	96906	MS51967-2	NUT, HEX	2
11	XDOZZ	96906	MS35338-44	WASHER,LOCK	2
12	XDOZZ	96906	MS35206-283	SCREW, MACHINE UOC:FHQ	1
13	XDOOZ	81337	6-1-6261	BRACKET ,MOUNTING UOC:FHQ	1
14	XDOZZ	96906	MS51922-1	NUT,SELF-LOCKING,HE	8
15	XDOZZ	96906	MS27183-10	WASHER,FLAT	8
16	XDOZZ	81337	6-1-6224	COVER,SMOKE BOX	1
17	XDOZZ	81337	6-1-6223	GASKET	1
18	XDOZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	8
19	XDOZZ	81337	6-1-6259	HANDLE ASSY	1
20	XDFZZ	81337	6-1-8071-1	BRACKET	2
21	XDFZZ	81337	6-1-8071-2	BRACKET	2
22	XDOZZ	96906	MS35782-3	COCK,DRAIN	1
23	XDOZZ	96906	MS27020-9	COUPLING HALF,QUICK UOC:FHQ	1
24	XDOZZ	96906	MS35649-2382	NUT,PLAIN, HEXAGON	8
25	PDFFH	81337	6-1-6202	HEATER,WATER,LIQUID	1
26	XDOZZ	81337	6-1-6201	SKID ASSY	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

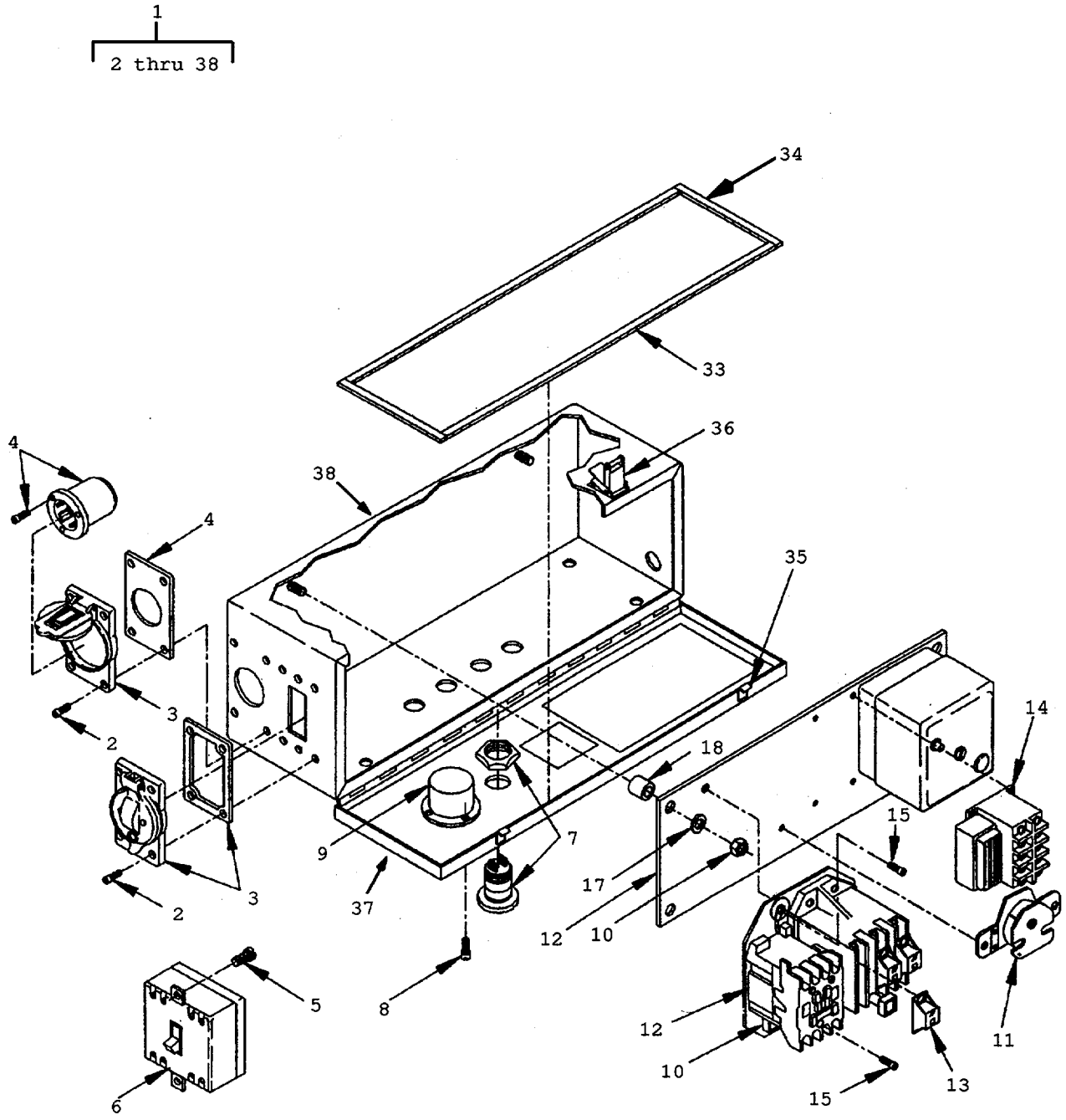


FIGURE C-14. ELECTRIC CONTROL BOX ASSEMBLY (SHEET 1 OF 2)

SECTION II. REPAIR PARTS LIST

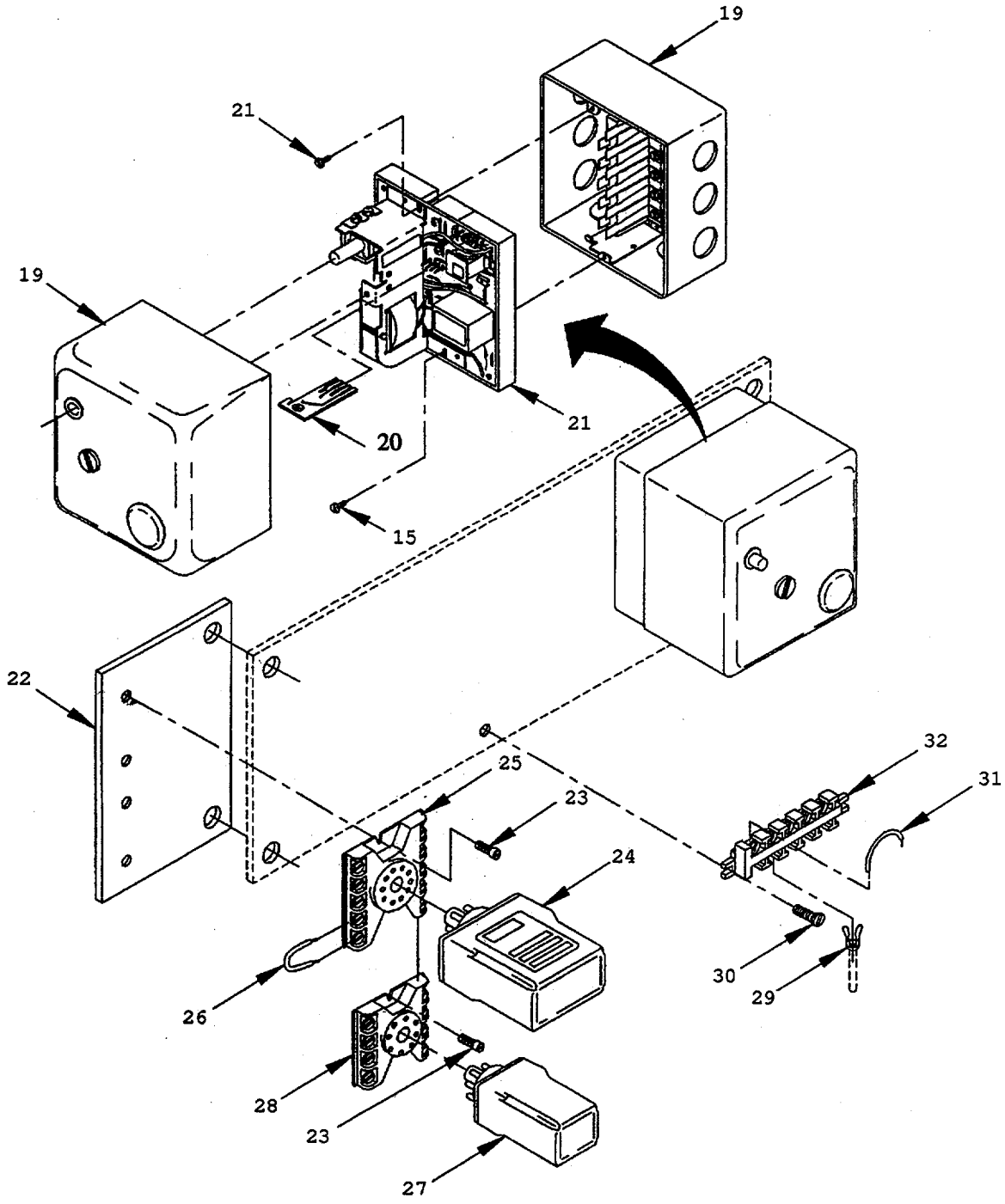


FIGURE C-14. ELECTRIC CONTROL BOX ASSEMBLY (SHEET 2 OF 2)

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 10 ELECTRIC CONTROL BOX ASSEMBLY	
				FIG. C-14 ELECTRIC CONTROL BOX ASSEMBLY	
1	PBFFF	81337	6-1-9972	BOX ASSY,CONTROL UOC:FHR	1
1	XDFFF	81337	6-1-6250	BOX ASSY,CONTROL UOC:FHQ	1
2	XDFZZ	96906	MS35275-231	SCREW,MACHINE	8
3	PAFZZ	74545	7420	COVER,CONDUIT OUTLE	1
4	PAFZZ	81348	WC596/139-1	CONNECTOR,RECEPTACL	1
5	XDFZZ	96906	MS35275-231	SCREW,MACHINE	2
6	XDFZZ	04009	78100UD	CIRCUIT BREAKER SUB	1
7	XDFZZ	90201	SC110	BUZZER UOC:FHR	1
8	XDFZZ	96906	MS35275-215	SCREW,MACHINE	3
9	PBFZZ	81349	M3791/2-005	METER,TIME TOTALIZI	1
10	XDFZZ	81349	LPO1LLO4	TERMINAL,LUG	1
11	PAFZZ	81337	6-1-8059	BUZZER	1
12	PAFZZ	01121	509-TOD/W-39	STARTER,MOTOR	1
13	PAFZZ	01121	W-39	ELEMENT,HEATER	8
14	PAFZZ	79198	1D1EO	RELAY,ELECTROMAGNET	1
15	XDFZZ	96906	MS35275-243	SCREW,MACHINE	32
16	XDFZZ	96906	MS35649-2252	NUT,PLAIN,HEXAGON	4
17	XDFZZ	96906	MS27183-10	WASHER,FLAT	4
18	XDFZZ	81337	6-1-6254	SPACER	4
19	XDFZZ	98317	613060	TERMINAL,BOX	1
20	XDOZZ	72144	MT710	PROGRAM TIME CARD	1
21	PAFZZ	72144	UVM-2	CONTROL,FLAME SAFEG	1
22	XDFZZ	81337	6-1-6253	PANEL,MTG	1
23	XDFZZ	96906	MS51958-45	SCREW,MACHINE UOC:FHR	8
24	PBFZZ	94696	W211ACPSRX-7	RELAY,SOLID STATE UOC:FHR	1
25	XDFZZ	77342	27E122	SOCKET,PLUG-IN UOC:FHR	1
26	PBFZZ	72962	10	TERMINAL, JUMPER UOC:FHR	1
27	PBOZZ	04071	R350016-3	RELAY,ELECTROMAGNET UOC:FHR	1
28	XDFZZ	12300	27E123	SOCKET,PLUG-IN WW-P-521,TY2,1-1/2XI-1/2X3/4IPS UOC:FHR	1
29	XDFZZ	09922	BA14EL6M	TERMINAL, LUG	21
30	XDFZZ	96906	MS35275-246	SCREW,MACHINE	6
31	XDFZZ	89020	70	CONTACT, ASSEMBLY	1
32	XDFZZ	81349	M55164/2-38TB6	BLOCK,TERMINAL	6
33	XDFZZ	81337	6-1-8067-1	GASKET	2
34	XDFZZ	81337	6-1-8067-2	GASKET	2
35	XDFZZ	90598	TR3347-2	STRIKE	2

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
36	XDFZZ	81337	6-1-6251-3	CATCH, PULL-DOWN.....	2
37	XDFZZ	81337	6-1-6252	COVER,CONTROL BOX.....	1
38	XDFZZ	81337	6-1-6251	BOX,CONTROL	1

END OF FIGURE

SECTION II. REPAIR PARTS LIST

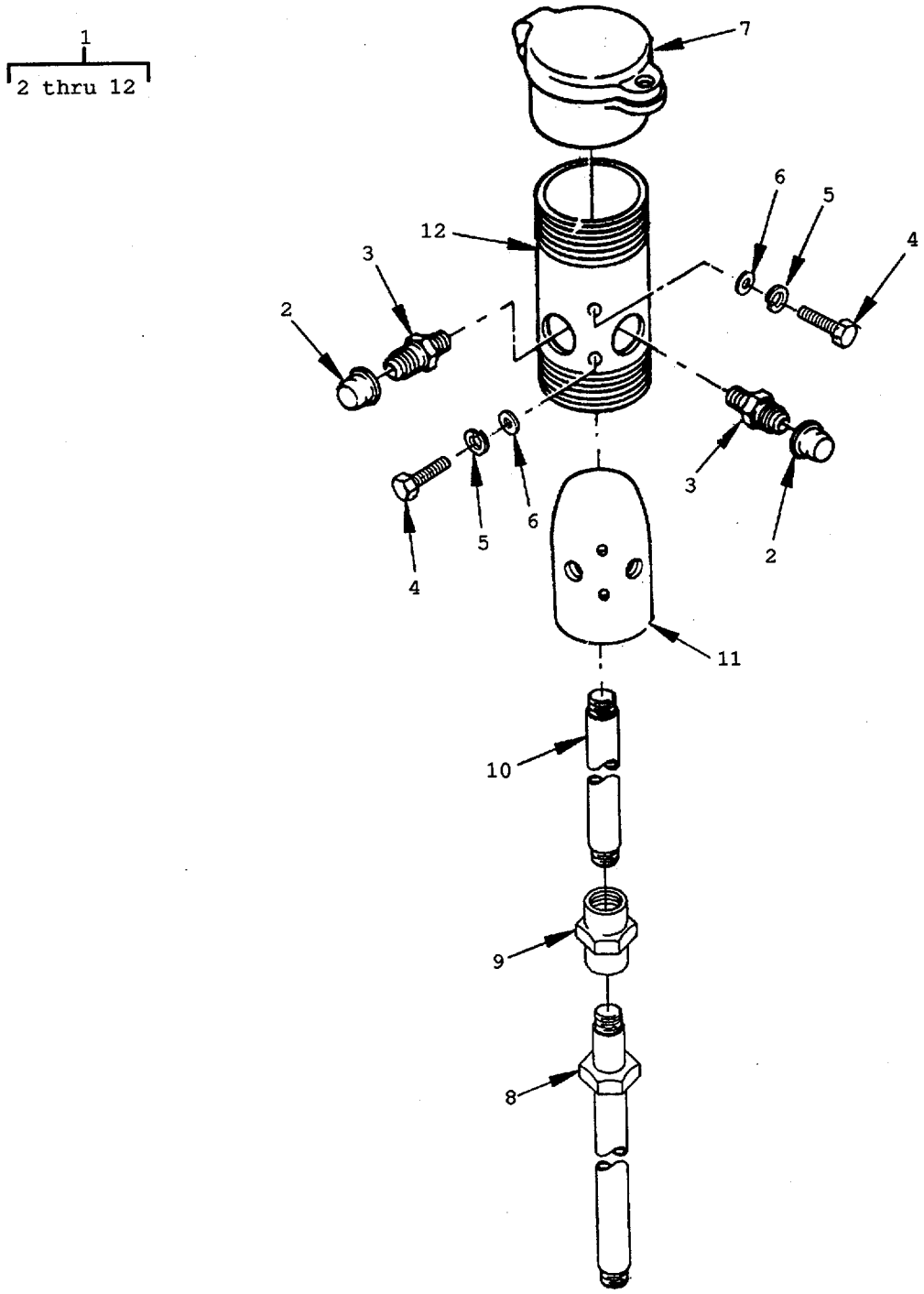


FIGURE C-15. DRUM FILL ADAPTER ASSEMBLY, TYPE II

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 11 DRUM FILL ADAPTER ASSEMBLY, TYPE II	
				FIG. C-15 DRUM FILL ADAPTER ASSEMBLY, TYPE II	
1	XDOOO	81337	6-1-8285	ADAPTER ASSEMBLY	1
2	XDOZZ	81349	M5501/3-R8	CAP,DUST,PROT,DRUM	2
3	XDOZZ	88044	AN816-7B	ADAPTER,STRAIGHT,PI	2
4	XDOZZ	96906	MS90725-6	SCREW,CAP,HEXAGON H	2
5	XDOZZ	96906	MS35338-44	WASHER,LOCK	2
6	XDOZZ	96906	MS27183-9	WASHER.FLAT	2
7	XDOZZ	81337	6-1-8288	FILL BOX,HNG TYPE	1
8	XDOZZ	81337	6-1-8281	EXTENSION ASSY,DRUM	1
9	XDOZZ	81349	J926 (140138)	COUPLING, PIPE	1
10	XDOZZ	81337	6-1-8279	PIPE,ADAPTER,DRUM	1
11	XDOZZ	81337	6-1-8287	BLOCK	1
12	XDOZZ	81337	6-1-8286	NIPPLE,MACH	1
				END OF FIGURE	

CROSS-REFERENCE INDEXES
NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5310-00-037-4935	C-8	12			
5930-00-058-9344	C-11	4			
5330-00-218-0390	C-8	27			
5330-00-360-5303	C-10	4			
5330-00-375-1690	C-8	3			
	C-9	3			
5330-00-467-3553	C-2	10			
5330-00-472-6189	C-8	15			
5310-00-472-6204	C-8	14			
5330-00-527-7560	C-8	10			
5950-00-627-6753	C-4	7			
4330-00-690-0363	C-9	4			
4320-00-707-4851	C-7	17			
5330-00-718-6547	C-8	8			
5945-00-787-3068	C-14	27			
6685-00-831-2740	C-11	1			
6645-00-831-6826	C-14	9			
5975-00-840-5844	C-14	3			
5330-00-953-4407	C-8	23			
6110-01-013-6482	C-14	12			
5945-01-155-8680	C-14	14			
5977-01-161-6680	C-5	10			
4410-01-203-0998	C-13	25			
5935-01-213-0383	C-14	4			
4520-01-218-8575	C-2	8			
4820-01-218-8629	C-11	16			
6145-01-219-8696	C-6	1			
4520-01-227-1618	C-2	9			
4540-01-230-8586	C-14	21			
4520-01-237-8038	C-14	13			
4330-01-278-3614	C-10	1			
6680-01-306-2079	C-13	1			
6685-01-357-7533	C-5	7			
6350-01-373-7939	C-14	11			

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
88044	AN816-7B		C-15	3
09922	BA14EL6M		C-14	29
80204	B1821BH025C100N		C-10	14
1Y370	H3BA-100		C-7	17
1Y370	J3BA-178P	4320-00-707-4851	C-7	17
81349	J926 (140138)		C-15	9
81349	LP01L004		C-14	10
81349	MIL-C-13909C TYP E 1 GRADE B		C-4	2
96906	MS14304-2C08		C-2	16
96906	MS15795-910		C-7	23
96906	MS20819-5		C-1	3
96906	MS20822-5D		C-7	15
96906	MS20822-8D		C-7	11
96906	MS21333-69		C-11	11
96906	MS27020-9		C-13	23
96906	MS27022-5		C-11	5
96906	MS27022-9		C-12	1
96906	MS27183-10		C-10	15
			C-13	15
			C-14	17
96906	MS27183-9		C-15	6
96906	MS35190-321		C-7	6
96906	MS35206-265		C-10	2
96906	MS35206-283		C-13	12
96906	MS35275-215		C-.4	8
96906	MS35275-231		C-14	2
			C-14	5
96906	MS35275-243		C-11	10
			C-14	15
96906	MS35275-246		C-14	30
94696	MS35275-259		C-2	2
96906	MS35333-39		C-10	8
96906	MS35333-40		C-1	9
			C-2	5
			C-4	6
			C-10	13
			C-11	9
			C-13	8
96906	MS35333-42		C-7	5
			C-13	3
96906	MS35338-44		C-13	11
			C-15	5
96906	MS35649-202		C-10	7
			C-11	8
96906	MS35649-2252		C-4	5
			C-10	12
			C-13	7
			C-14	16
96906	MS35649-2382		C-13	24
96906	MS35782-3		C-13	22

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
96906	MS39166-5L		C-11	12
96906	MS51500-B8S		C-10	10
96906	MS51504-A5Z		C-1	4
96906	MS51504-B8-4Z		C-7	14
96906	MS51506A5Z		C-2	21
96906	MS51531-B5Z		C-1	2
96906	MS51531-B6		C-11	19
96906	MS51533-B6		C-11	20
96906	MS51847-19		C-11	6
96906	MS51849-78		C-10	9
96906	MS51922-1		C-13	14
96906	MS51953-121		C-11	25
96906	MS51953-169		C-12	3
96906	MS51953-17		C-2	22
96906	MS51953-6		C-1	10
96906	MS51953-73		C-2	15
96906	MS51953-75		C-5	6
96906	MS51958-45		C-14	23
96906	MS51963-47		C-2	23
96906	MS51963-64		C-7	18
96906	MS51967-2		C-2	4
			C-13	10
96906	MS90725-6		C-1	8
			C-4	8
			C-10	17
			C-13	18
			C-15	4
96906	MS90725-60		C-7	4
			C-13	2
96906	MS90725-61		C-7	20
96906	MS90725-8		C-13	5
96906	MS9245-25		C-7	22
72144	MT710		C-14	20
81349	M3791/2-005	6645-00-831-6826	C-14	9
81349	M5501/3-R8		C-15	2
81349	M55164/2-38TB6		C-14	32
11583	M674	5330-00-467-3553	C-2	10
77628	P504		C-4	1
04071	R350016-3	5945-00-787-3068	C-14	27
81343	SAE J 514 (07020 2)		C-11	14
90201	SC110		C-14	7
90598	TR3347-2		C-14	35
72144	UVM-2	4540-01-230-8586	C-14	21
01121	W-39	4520-01-237-8038	C-14	13
81348	WC596/139-1	5935-01-213-0383	C-14	4
94696	W211ACPSRX-7		C-14	24
79198	1D1E0	5945-01-155-8680	C-14	14
72962	10		C-14	26
1Y370	100031		C-9	27
1Y370	100241	5310-00-472-6204	C-8	14

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1Y370	100241		C-9	18
1Y370	100291		C-9	28
1Y370	100301		C-9	29
1Y370	100319		C-9	30
1Y370	100371	5330-00-472-6189	C-8	15
			C-9	19
1Y370	100901	5330-00-527-7560	C-8	10
			C-9	12
1Y370	100931		C-8	17
			C-9	22
1Y370	101001		C-9	20
1Y370	101641		C-9	23
1Y370	101861		C-9	31
1Y370	103379		C-8	16
			C-9	21
1Y370	104671		C-8	5
1Y370	109026		C-9	32
1Y370	109777		C-9	11
1Y370	110441	5330-00-375-1690	C-8	3
			C-9	3
1Y370	111401		C-8	1
			C-9	1
1Y370	113331	5330-00-718-6547	C-8	8
			C-9	10
1Y370	114227		C-8	9
1Y370	116106		C-8	19
1Y370	117531		C-8	7
1Y370	117667		C-8	28
1Y370	120353		C-9	2
1Y370	121222		C-8	13
1Y370	121732		C-8	11
			C-9	13
19207	12260274		C-11	13
1Y370	122822		C-9	5
1Y370	124027		C-8	6
1Y370	125122	5330-00-218-0390	C-8	27
1Y370	125132	5330-00-953-4407	C-8	23
15472	12705-01-20-0035		C-10	3
1Y370	128283		C-9	9
1Y370	128403		C-9	16
1Y370	128433		C-9	17
1Y370	128527		C-9	8
1Y370	129521		C-8	26
1Y370	129772		C-8	24
1Y370	129792		C-8	25
1Y370	131129	4330-00-690-0363	C-9	4
1Y370	131596		C-8	2
1Y370	131622		C-8	4
1Y370	134122		C-9	6
1Y370	134137		C-9	7
61349	147869-T1050	6685-00-831-2740	C-11	1

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1Y370	170070		C-9	33
01276	2021-6-4C		C-10	11
15472	22342-00		C-10	5
1Y370	24800		C-8	21
			C-9	25
99752	25BE		C-1	7
1Y370	25815	5310-00-037-4935	C-8	12
			C-9	15
77342	27E122		C-14	25
12300	27E123		C-14	28
15472	28329-00		C-10	6
15472	32845-31	5330-00-360-5303	C-10	4
1Y370	3729241		C-9	26
1Y370	3759231		C-8	20
			C-9	24
03510	5K33FN311U		C-7	9
61349	500LM		C-1	6
76364	509		C-12	4
01121	509-TOD/W-39	6110-01-013-6482	C-14	12
1Y370	51017		C-8	22
78468	5120		C-11	15
59730	5331		C-7	3
59730	5351		C-4	4
81337	6-1-6200-28		C-5	2
81337	6-1-6200-29		C-5	1
81337	6-1-6200-30		C-5	3
81337	6-1-6200-31		C-5	4
81337	6-1-6200-32		C-5	5
81337	6-1-6200-33		C-1	15
81337	6-1-6200-44		C-11	7
81337	6-1-6200-52		C-1	16
81337	6-1-6200-55		C-1	14
81337	6-1-6201		C-13	26
81337	6-1-6202	4410-01-203-0998	C-13	25
81337	6-1-6223		C-13	17
81337	6-1-6224		C-13	16
81337	6-1-6225-101		C-7	1
81337	6-1-6225-14		C-7	2
81337	6-1-6226		C-7	29
81337	6-1-6227		C-7	7
81337	6-1-6228		C-7	21
81337	6-1-6229		C-7	28
81337	6-1-6230		C-7	26
81337	6-1-6231		C-7	27
81337	6-1-6232		C-7	24
81337	6-1-6233		C-7	25
81337	6-1-6234		C-7	8
81337	6-1-6235		C-13	4
81337	6-1-6236		C-2	1
81337	6-1-6237		C-2	6
81337	6-1-6238		C-2	7

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
81337	6-1-6238-14		C-2	17
81337	6-1-6239		C-2	24
81337	6-1-6240-1	4520-01-218-8575	C-2	8
81337	6-1-6240-2	4520-01-227-1618	C-2	9
81337	6-1-6241		C-2	14
81337	6-1-6242		C-2	11
81337	6-1-6243		C-2	13
81337	6-1-6244		C-2	12
81337	6-1-6245		C-2	18
81337	6-1-6247		C-2	3
81337	6-1-6248	6680-01-306-2079	C-13	1
81337	6-1-6250		C-14	1
81337	6-1-6251		C14	38
81337	6-1-6251-3		C-14	36
81337	6-1-6252		C-14	37
81337	6-1-6253		C-14	22
81337	6-1-6254		C-14	18
81337	6-1-6255		C-10	18
81337	6-1-6256		C-10	16
81337	6-1-6257		C-1	11
81337	6-1-6258		C-4	9
81337	6-1-6259		C-13	19
81337	6-1-6260		C-13	9
81337	6-1-6261		C-13	13
81337	6-1-6262		C-13	6
81337	6-1-6263	6145-01-219-8696	C-6	1
81337	6-1-7494		C-1	1
81337	6-1-8038		C-7	19
81337	6-1-8040		C-7	12
81337	6-1-8042		C-2	20
81337	6-1-8043		C-2	19
81337	6-1-8059	6350-01-373-7939	C-14	11
81337	6-1-8067-1		C-14	33
81337	6-1-8067-2		C-14	34
81337	6-1-8071-1		C-13	20
81337	6-1-8071-2		C-13	21
81337	6-1-8094		C-5	8
81337	6-1-8095		C-7	16
81337	6-1-8097		C-7	13
81337	6-1-8100	5950-00-627-6753	C-4	7
81337	6-1-8101	6685-01-357-7533	C-5	7
81337	6-1-8102	5977-01-161-6680	C-5	10
81337	6-1-8103		C-5	11
81337	6-1-8104		C-11	3
81337	6-1-8110		C-1	12
81337	6-1-8115		C-1	5
81337	6-1-8117		C-11	2
81337	6-1-8118	4820-01-218-8629	C-11	16
81337	6-1-8121	5930-00-058-9344	C-11	4
81337	6-1-8122		C-5	9
81334	6-1-8259		C-3	1

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
81337	6-1-8260		C-3	4
81337	6-1-8263		C-3	3
81337	6-1-8264		C-3	2
81337	6-1-8279		C-15	10
81337	6-1-8281		C-15	8
81337	6-1-8285		C-15	1
81337	6-1-8286		C-15	12
81337	6-1-8287		C-15	11
81337	6-1-8288		C-15	7
81337	6-1-9336		C-4	3
			C-11	17
81337	6-1-9337		C-11	21
81337	6-1-9912-10		C-12	2
81337	6-1-9912-15		C-11	18
81337	6-1-9912-19		C-11	24
81337	6-1-9912-20		C-11	23
81337	6-1-9912-21		C-11	22
81337	6-1-9912-3		C-12	6
81337	6-1-9917		C-12	5
81337	6-1-9972		C-14	1
81337	6-2-2461		C-2	14
81337	6-2-2462		C-2	20
98317	613060		C-14	19
95933	631-200S		C-7	10
89020	70		C-14	31
81978	71215SN1KN00N0C1 11P3		C-1	13
1Y370	728335		C-8	18
74545	7420	5975-00-840-5844	C-14	3
04009	78100UD		C-14	6
15472	98801-01	4330-01-278-3614	C-10	1
1Y370	991096		C-9	14

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-1	1		81337	6-1-7494
C-1	2		96906	MS51531-B5Z
C-1	3		96906	MS20819-5
C-1	4		96906	MS51504-A5Z
C-1	5		81337	6-1-8115
C-1	6		61349	500LM
C-1	7		99752	25BE
C-1	8		96906	MS90725-6
C-1	9		96906	MS35333-40
C-1	10		96906	MS51953-6
C-1	11		81337	6-1-6257
C-1	12		81337	6-1-8110
C-1	13		81978	71215SN1KN00N0C1 11P3
C-1	14		81337	6-1-6200-55
C-1	15		81337	6-1-6200-33
C-1	16		81337	6-1-6200-52
C-2	1		81337	6-1-6236
C-2	2		96906	MS35275-259
C-2	3		81337	6-1-6247
C-2	4		96906	MS51967-2
C-2	5		96906	MS35333-40
C-2	6		81337	6-1-6237
C-2	7		81337	6-1-6238
C-2	8	4520-01-218-8575	81337	6-1-6240-1
C-2	9	4520-01-227-1618	81337	6-1-6240-2
C-2	10	5330-00-467-3553	11583	M674
C-2	11		81337	6-1-6242
C-2	12		81337	6-1-6244
C-2	13		81337	6-1-6243
C-2	14		81337	6-1-6241
C-2	14		81337	6-2-2461
C-2	15		96906	MS51953-73
C-2	16		96906	MS14304-2C08
C-2	17		81337	6-1-6238-14
C-2	18		81337	6-1-6245
C-2	19		81337	6-1-8043
C-2	20		81337	6-1-8042
C-2	20		81337	6-2-2462
C-2	21		96906	MS51506A5Z
C-2	22		96906	MS51953-17
C-2	23		96906	MS51963-47
C-2	24		81337	6-1-6239
C-3	1		81334	6-1-8259
C-3	2		81337	6-1-8264
C-3	3		81337	6-1-8263
C-3	4		81337	6-1-8260
C-4	1		77628	P504
C-4	2		81349	MIL-C-13909C TYP E 1 GRADE B
C-4	3		81337	6-1-9336

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-4	4		59730	5351
C-4	5		96906	MS35649-2252
C-4	6		96906	MS35333-40
C-4	7	5950-00-627-6753	81337	6-1-8100
C-4	8		96906	MS90725-6
C-4	9		81337	6-1-6258
C-5	1		81337	6-1-6200-29
C-5	2		81337	6-1-6200-28
C-5	3		81337	6-1-6200-30
C-5	4		81337	6-1-6200-31
C-5	5		81337	6-1-6200-32
C-5	6		96906	MS51953-75
C-5	7	6685-01-357-7533	81337	6-1-8101
C-5	8		81337	6-1-8094
C-5	9		81337	6-1-8122
C-5	10	5977-01-161-6680	81337	6-1-8102
C-5	11		81337	6-1-8103
C-6	1	6145-01-219-8696	81337	6-1-6263
C-7	1		81337	6-1-6225-101
C-7	2		81337	6-1-6225-14
C-7	3		59730	5331
C-7	4		96906	MS90725-60
C-7	5		96906	MS35333-42
C-7	6		96906	MS35190-321
C-7	7		81337	6-1-6227
C-7	8		81337	6-1-6234
C-7	9		03510	5K33FN311U
C-7	10		95933	631-200S
C-7	11		96906	MS20822-8D
C-7	12		81337	6-1-8040
C-7	13		81337	6-1-8097
C-7	14		96906	MS51504-B8-4Z
C-7	15		96906	MS20822-5D
C-7	16		81337	6-1-8095
C-7	17		1Y370	H3BA-100
C-7	17	4320-00-707-4851	1Y370	J3BA-178P
C-7	18		96906	MS51963-64
C-7	19		81337	6-1-8038
C-7	20		96906	MS90725-61
C-7	21		81337	6-1-6228
C-7	22		96906	MS9245-25
C-7	23		96906	MS15795-910
C-7	24		81337	6-1-6232
C-7	25		81337	6-1-6233
C-7	26		81337	6-1-6230
C-7	27		81337	6-1-6231
C-7	28		81337	6-1-6229
C-7	29		81337	6-1-6226
C-8	1		1Y370	111401
C-8	2		1Y370	131596
C-8	3	5330-00-375-1690	1Y370	110441

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-8	4		1Y370	131622
C-8	5		1Y370	104671
C-8	6		1Y370	124027
C-8	7		1Y370	117531
C-8	8	5330-00-718-6547	1Y370	113331
C-8	9		1Y370	114227
C-8	10	5330-00-527-7560	1Y370	100901
C-8	11		1Y370	121732
C-8	12	5310-00-037-4935	1Y370	25815
C-8	13		1Y370	121222
C-8	14	5310-00-472-6204	1Y370	100241
C-8	15	5330-00-472-6189	1Y370	100371
C-8	16		1Y370	103379
C-8	17		1Y370	100931
C-8	18		1Y370	728335
C-8	19		1Y370	116106
C-8	20		1Y370	3759231
C-8	21		1Y370	24800
C-8	22		1Y370	51017
C-8	23	5330-00-953-4407	1Y370	125132
C-8	24		1Y370	129772
C-8	25		1Y370	129792
C-8	26		1Y370	129521
C-8	27	5330-00-218-0390	1Y370	125122
C-8	28		1Y370	117667
C-9	1		1Y370	111401
C-9	2		1YS70	120353
C-9	3	5330-00-375-1690	1Y370	110441
C-9	4	4330-00-690-0363	1Y370	131129
C-9	5		1Y370	122822
C-9	6		1Y370	134122
C-9	7		1Y370	134137
C-9	8		1Y370	128527
C-9	9		1Y370	128283
C-9	10		1Y370	113331
C-9	11		1Y370	109777
C-9	12		1Y370	100901
C-9	13		1Y370	121732
C-9	14		1Y370	991096
C-9	15		1Y370	25815
C-9	16		1Y370	128403
C-9	17		1Y370	128433
C-9	18		1Y370	100241
C-9	19		1Y370	100371
C-9	20		1Y370	101001
C-9	21		1Y370	103379
C-9	22		1Y370	100931
C-9	23		1Y370	101641
C-9	24		1Y370	3759231
C-9	25		1Y370	24800
C-9	26		1Y370	3729241

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-9	27		1Y370	100031
C-9	28		1Y370	100291
C-9	29		1Y370	100301
C-9	30		1Y370	100319
C-9	31		1Y370	101861
C-9	32		1Y370	109026
C-9	33		1Y370	170070
C-10	1	4330-01-278-3614	15472	98801-01
C-10	2		96906	MS35206-265
C-10	3		15472	12705-01-20-0035
C-10	4	5330-00-360-5303	15472	32845-31
C-10	5		15472	22342-00
C-10	6		15472	28329-00
C-10	7		96906	MS35649-202
C-10	8		96906	MS35333-39
C-10	9		96906	MS51849-78
C-10	10		96906	MS51500-B8S
C-10	11		01276	2021-6-4C
C-10	12		96906	M535649-2252
C-10	13		96906	MS35333-40
C-10	14		80204	B1821BH025C100N
C-10	15		96906	MS27183-10
C-10	16		81337	6-1-6256
C-10	17		96906	MS90725-6
C-10	18		81337	6-1-6255
C-11	1	6685-00-831-2740	61349	147869-T1050
C-11	2		81337	6-1-8117
C-11	3		81337	6-1-8104
C-11	4	5930-00-058-9344	81337	6-1-8121
C-11	5		96906	MS27022-5
C-11	6		96906	MS51847-19
C-11	7		81337	6-1-6200-44
C-11	8		96906	MS35649-202
C-11	9		96906	MS35333-40
C-11	10		96906	MS35275-243
C-11	11		96906	MS21333-69
C-11	12		96906	MS39166-5L
C-11	13		19207	12260274
C-11	14		81343	SAE J 514 (07020 2)
C-11	15.		78468	5120
C-11	16	4820-01-218-8629	81337	6-1-8118
C-11	17		81337	6-1-9336
C-11	18		81337	6-1-9912-15
C-11	19		96906	MS51531-B6
C-11	20		96906	MS51533-B6
C-11	21		81337	6-1-9337
C-11	22		81337	6-1-9912-21
C-11	23		81337	6-1-9912-20
C-11	24		81337	6-1-9912-19
C-11	25		96906	MS51953-121

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-12	1		96906	MS27022-9
C-12	2		81337	6-1-9912-10
C-12 -	3		96906	MS51953-169
C-12	4		76364	509
C-12	5		81337	6-1-9917
C-12	6		81337	6-1-9912-3
C-13	1	6680-01-306-2079	81337	6-1-6248
C-13	2		96906	MS90725-60
C-13	3		96906	MS35333-42
C-13	4		81337	6-1-6235
C-13	5		96906	MS90725-8
C-13	6		81337	6-1-6262
C-]3	7		96906	MS35649-2252
C-13	8		96906	MS35333-40
C-13	9		81337	6-1-6260
C-13	10		96906	MS51967-2
C-13	11		96906	MS35338-44
C-13	12		96906	MS35206-283
C-13	13		81337	6-1-6261
C-13	14		96906	MS51922-1
C-13	15		96906	MS27183-10
C-13	16		81337	6-1-6224
C-13	17		81337	6-1-6223
C-13	18		96906	MS90725-6
C-13	19		81337	6-1-6259
C-13	20		81337	6-1-8071-1
C-13	21		81337	6-1-8071-2
C-13	22		96906	MS35782-3
C-13	23		96906	MS27020-9
C-13	24		96906	MS35649-2382
C-13	25	4410-01-203-0998	81337	6-1-6202
C-13	26		81337	6-1-6201
C-14	1		81337	6-1-6250
C-14	1		81337	6-1-9972
C-14	2		96906	MS35275-231
C-14	3	5975-00-840-5844	74545	7420
C-14	4	5935-01-213-0383	81348	WC596/139-1
C-14	5		96906	MS35275-231
C-14	6		04009	78100UD
C-14	7		90201	SC110
C-14	8		96906	MS35275-215
C-14	9	6645-00-831-6826	81349	M3791/2-005
C-14	10		81349	LP01L004
C-14	11	6350-01-373-7939	81337	6-1-8059
C-14	12	6110-01-013-6482	01121	509-TOD/W 39
C-14	13	4520-01-237-8038	01121	W-39
C-14	14	5945-01-155-8680	79198	1D1E0
C-14	15		96906	MS35275-243
C-14	16		96906	MS35649-2252
C-14	17		96906	MS27183-10
C-14	18		81337	6-1-6254

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-14	19		98317	613060
C-14	20		72144	MT710
C-14	21	4540-01-230-8586	72144	UVM-2
C-14	22		81337	6-1-6253
C-14	23		96906	MS51958-45
C-14	24		94696	W211ACPSRX-7
C-14	25		77342	27E122
C-14	26		72962	10
C-14	27	5945-00-787-3068	04071	R350016-3
C-14	28		12300	27E123
C-14	29		09922	BA14EL6M
C-14	30		96906	MS35275-246
C-14	31		89020	70
C-14	32		81349	M55164/2-38TB6
C-14	33		81337	6-1-8067-1
C-14	34		81337	6-1-8067-2
C-14	35		90598	TR3347-2
C-14	36		81337	6-1-6251-3
C-14	37		81337	6-1-6252
C-14	38		81337	6-1-6251
C-15	1		81337	6-1-8285
C-15	2		81349	M5501/3-R8
C-15	3		88044	AN816-7B
C-15	4		96906	MS90725-6
C-15	5		96906	MS35338-44
C-15	6		96906	MS27183-9
C-15	7		81337	6-1-8288
C-15	8		81337	6-1-8281
C-15	9		81349	J926 (140138)
C-15	10		81337	6-1-8279
C-15	11		81337	6-1-8287
C-15	12		81337	6-1-8286

APPENDIX D

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists components of end item and basic issue items for the water heater to help you inventory the items for safe and efficient operation of the equipment.

D-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 List. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the water heater. 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 shipment only when necessary. Illustrations are furnished to help you find and identify the items.

b. Section III, Basic Issue Items List. These essential items are required to place the water heater in operation, operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the water heater 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.

D-3. EXPLANATION OF COLUMNS.

a. Column (1), Illus Number, gives you the number of the item illustrated.

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

c. Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number. If the item you need is not the same for different

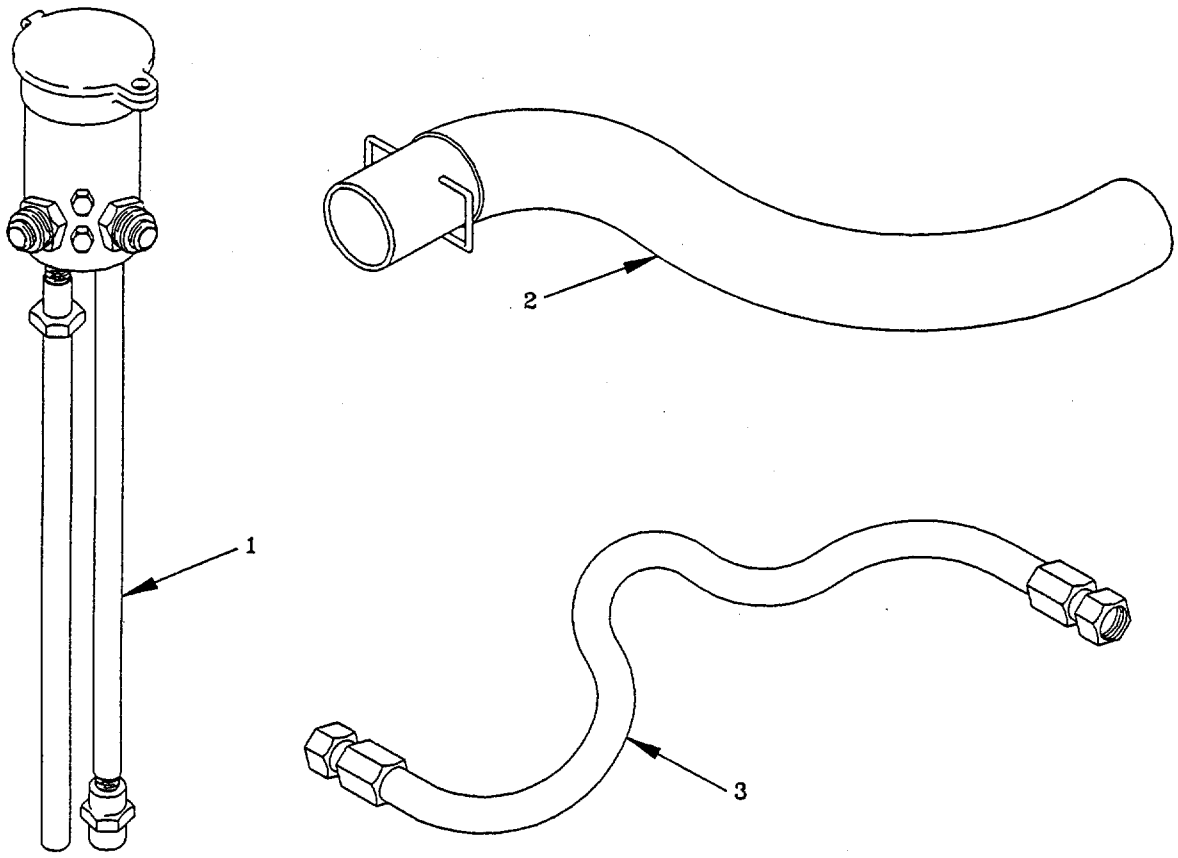
D-3. EXPLANATION OF COLUMNS. (CONT)

models of the equipment, a Usable On Code (UOC) will appear on the right side of the description column on the same line as the part number. These codes are identified below:

CODE	USED ON
FHQ	M-80
FHR	M-85

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

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



SECTION II.

COMPONENTS OF END ITEM				
(1) ILLUS/ NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, PART NUMBER AND UOC	(4) U/I	(5) QTY RQD
1	4510-01-214-9139	DRUM FILL ADAPTER ASSY, TYPE II (81337) 6-1-8285 FHQ/FHR	EA	1
2		DUCT, BURNER EXHAUST ASSY (81337) 6-2-2427 FHR	EA	2
3	4720-00-063-7222	HOSE, FUEL RETURN, 12 FOOT (96906) MS 28741-8-1440 FHQ/FHR	EA	2

SECTION III.

BASIC ISSUE ITEMS LIST				
(1) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, PART NUMBER AND UOC	(4) U/I	(5) QTY RQD
1	NONE	TM 10,52-259-13&P OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTNANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FOR HEATER WATER, LQUID FUEL	EA	1

APPENDIX E

ADDITIONAL AUTHORIZATION LIST (AAL)

Section I. INTRODUCTION

E-1. SCOPE.

This appendix lists additional items you are authorized for the support of the water heater.

E-2 GENERAL.

This list identifies items that do not have to accompany the water heater and that do not have to be turned in with it. The items are authorized to you by CTA, MTOE, TDA, or JTA.

E-3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identified as follows:

EQUIPMENT	USABLE-ON CODE
Heater, Water, Liquid Fuel, Type I M-80	FHQ
Heater, Water, Liquid Fuel, Type II M-85	FHR

SECTION II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) & (3) DESCRIPTION, PART NUMBER & CAGEC - USABLE ON, CODE	(4) U/m	(5) QTY RQD
5120-00-240-5328	Wrench, Open End, Adjustable 8 in. FHQ/FHR	EA	2

APPENDIX F

EXPENDABLE AND DURABLE ITEMS LIST

SECTION I. INTRODUCTION

F-1. SCOPE

This appendix lists expendable and durable items that you will need to operate and maintain the water heater. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except medical, class V, repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

F-2. EXPLANATION OF COLUMNS.

a. Column 1. Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g. "Use cleaning compound, item 5, Appendix D").

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

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

d. Column 4. Item name, description, Commercial and Government Entity Code (CAGEC), and part number. This provides the other information you need to identify the item.

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

Section II. EXPENDABLE AND DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item name, Description CAGEC, Part number	(5) U/M
1	O,F	6850-00-656-1292	COMPOUND, CLEANING MIL-C-10578 (Type I or II)	EA
2	O,F	8030-01-104-5392	COMPOUND, THREAD SEALING (05972)	EA
3	C		FUEL, AVGAS MIL-G-5572 (All Grades)	GAL
4	C	9140-00-286-5284	FUEL, DIESEL W-F-800 (DF-A, DF-1, DF-2)	GAL
5	C		FUEL, JET MIL-T-5624 (JP-4, JP-5)	GAL
	C	9130-01-207-7039	FUEL, MOGAS MIL-G-3056 (All Grades)	GAL
7	C		FUEL, OIL No. 1 or No. 2 Commercial G	GAL
8	C	9130-00-221-0680	GASOLINE, AUTOMOTIVE COMBAT 9 5 Gal Drum MIL-G-3056 (81349)	GAL
9	C,O	0150-00-985-7246	GREASE, SOFT MIL-G-23827	EA
10	C,O	9150-00-188-9858	LUBRICATING OIL, ENGINE, OE30 5 Gal. Pail	GAL
11	O,F	8010-01-229-9561	PAINT, GREEN 383 CARC MIL-C-53039 (81349)	EA

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item name, Description CAGEC, Part number	(5) U/M
12	O, F		PRIMER, PAINT EPOXY KIT MIL-P-53022	EA
13	O, F		SEALER, 3M MIL-M-22473D, GRADE AB	EA
14	C, O, F	6850-00-664-5683	SOLVENT, DRY CLEANING 1 QT CANS FED SPEC P-D-680	QT
15	C, O, F	8020-00-597-4761	RAG, WIPING	BAL
16	F	3439-00-043-3623	SOLDER, SN60, 1 LB ROLL QQ-S-571 (81348)	LB
17	O, F	9905-00-644-3167	TAGS, IDENTIFICATION 50EA MIL-T-12755 (58538)	LB
18	O	5970-00-644-3167	TAPE, A-A-2094 (58536)	RL
19	O		BARRIER MATERIAL	V
20	O		SOAP, LIQUID	GAL
21	O		GASKET SEALER SU8 8 OUNCES (53777)	OZ
			GASKET SEALER SU16 16 OUNCES (53777)	OZ
			GASKET SEALER SU32 32 OUNCES (53777)	OZ

APPENDIX G

ILLUSTRATED LIST OF MANUFACTURED ITEMS

G-1. INTRODUCTION.

a. This appendix contains complete instructions for making items authorized to be manufactured or fabricated at unit maintenance level.

b. 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.

c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

G-2. MANUFACTURED ITEMS PART NUMBER INDEX.
None Required

G-3. MANUFACTURED ITEMS ILLUSTRATIONS.
None required

APPENDIX H

TORQUE LIMITS

H-1. GENERAL. This appendix provides general torque limits for fasteners. Special torque values are indicated in the maintenance procedures for applicable components. The general torque values given in this appendix shall be used when specific torque values are not indicated in the maintenance procedures.

H-2. TORQUE LIMITS. Torque limits are listed in table H-1 for fasteners. Dry fasteners are defined as fasteners on which no lubricants are applied to the threads; wet fasteners are defined as fasteners on which specific graphite or moly-disulphide greases or other extreme-pressure lubricants are applied to the threads. Table H-2 lists minimum breakaway torque values for locknuts.

Bolt/screw size	Torque requirement in lb ft (N.m)			
	SAE grade 1 or 2	SAE grade 5	SAE grade 6 or 7	SAE grade 8
1/4-20 UNC	5 (7)	8 (11)	10 (14)	12 (16)
1/4-28 UNF	6 (8)	10 (14)	12 (16)	14 (19)
5/16-18 UNC	11 (15)	17 (23)	19 (26)	24 (33)
5/16-24 UNF	13 (18)	19 (26)	23 (31)	27 (37)
3/8-16 UNC	18 (24)	31 (42)	34 (46)	44 (60)
3/8-24 UNF	20 (27)	35 (47)	42 (57)	49 (66)
7/16-14 UNC	28 (38)	49 (66)	55 (75)	70 (95)
7/16-20 UNF	30 (41)	55 (75)	67 (91)	78 (106)
1/2-13 UNC	39 (53)	75 (102)	85 (115)	105 (142)
1/2-20 UNF	41 (56)	85 (115)	102 (138)	120 (163)
9/16-12 UNC	51 (69)	110 (149)	120 (163)	155 (210)
9/16-18 UNF	55 (75)	120 (163)	145 (197)	170 (231)
5/8-11 UNC	63 (85)	150 (203)	167 (226)	210 (285)
5/8-18 UNF	95 (129)	170 (231)	205 (278)	240 (325)
3/4-10 UNC	105 (142)	270 (366)	280 (380)	375 (509)
3/4-16 UNF	115 (156)	295 (400)	357 (484)	420 (570)
7/8-9 UNC	160 (217)	395 (536)	440 (597)	605 (820)
7/8-14 UNF	175 (237)	435 (590)	555 (753)	675 (915)
1-8 UNC	235 (319)	590 (800)	660 (895)	910 (1234)
1-14 UNF	250 (339)	660 (895)	825 (1119)	990 (1342)
1-1/8-7 UNC	350 (475)	800 (1085)	1000 (1356)	1280 (1736)
1-1/8-12 UNF	400 (542)	880 (1193)	1050 (1424)	1440 (1953)
1-1/4-7 UNC	500 (678)	1080 (1464)	1325 (1797	1820 (2468)
1-1/4-12 UNF	550 (746)	1125 (1526)	1500 (2034	2000 (2712)
1-3/8-6 UNC	660 (895)	1460 (1980)	1800 (2441	2380 (3227)
1-3/8-12 UNF	740 (1003)	1680 (2278)	1960 (2658	2720 (3688)
1-1/2-6 UNC	870 (1180)	1940 (2631)	2913 (3950	3160 (4285)
1-1/2-12 UNF	980 (1329)	2200 (2983)	3000 (4068	3560 (4827)

*Torque given is for clean, dry threads. Reduce torque by 10percent when engine oilis used as a lubricant.

Table H-2. Locknut Breakaway Torque Values

NOTE

To determine breakaway torque, thread locknut onto screw or bolt until at least two threads stick out. Locknut shall not make contact with a mating part. Stop the locknut. Torque necessary to begin turning locknut again is the breakaway torque. Do not reuse locknuts that do not meet minimum breakaway torque.

Thread size	Minimum breakaway torque lb-in.	(N.m.)
10-32	2.0	(0.23)
1/4-28	3.5	(0.40)
5/16-24	6.5	(0.73)
3/8-24	9.5	(1.07)
7/16-20	14.0	(1.58)
1/2-20	18.0	(2.03)
9/16-18	24.0	(2.71)
5/8-18	32.0	(3.62)
3/4-16	50.0	(5.65)
7/8-14	70.0	(7.91)
1-12	90.0	(10.17)
1-1/8-12	117.0	(13.22)
1-1/4-12	143.0	(16.16)

APPENDIX I

MANDATORY REPLACEMENT PARTS

I-1. INTRODUCTION.

This appendix lists all mandatory replacement parts specified in the maintenance procedures described in Chapters 3, 4, and 5.

MANDATORY REPLACEMENT PARTS

ITEM NUMBER	NOMENCLATURE	PART NUMBER
1	Gasket, Sparkplug	6-1-6246
2	Gasket	32845-31
3	Gasket, Cover	110441
4	Gasket, Smoke Box Cover	6-1-6223
5	Gasket, Port Housing	113331
6	Gasket, Burner Head	6-1-6260
7	Gasket	100901
8	Gasket, End Cap Nut	100371
9	Gasket	6-1-6252-2
10	Gasket, Blower	6-1-6235
11	Packing, Preformed	125122
12	Packing, Preformed	125132
13	Seal Stationary Face	129772
14	Seal	129792
15	Washer, Lock	MS35333-9
16	Washer, Lock	MS35333-39
17	Washers, Lock Internal Tooth 0.250	MS35333-40

MANDATORY REPLACEMENT PARTS - CONTINUED

ITEM NUMBER	NOMENCLATURE	PART NUMBER
18	Washers, Lock Internal	MS35333-42
19	Washer, Flat 0.281 ID X 0.625 OD X 0,065 THK	MS15795-910
20	Washer	129521
21	Washer, Flat	MS27183-9
22	Washer, Flat 0.281	MS27183-10

GLOSSARY

SECTION I. ABBREVIATIONS

Bx ..... Box

CPC ..... Corrosion Prevention Control

EA ..... Each

EIR ..... Equipment Improvement Recommendation

HZ ..... Hertz

Illus ..... Illustration

kPa ..... Kilopascal

MWO ..... Modification Work Order

NBC ..... Nuclear, Biological, Chemical

PSI ..... Pressure per square inch

Qty rq ..... Quantity required

U/M ..... Unit of measure

UOC ..... Usable on Code

SECTION II. DEFINITION OF UNUSUAL TERMS

Cubic Foot - Unit for measuring volume in cubic feet.

Hertz - Cycles per second of electrical current.

Torque - Force causing rotation.

ALPHABETICAL INDEX

Subject Page

A

B

C

D

E

F

G

I

L

M

N

O

P

Q

R

S

T

U

W

By Order of the Secretary of the Army:

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

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
05448

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25-E, block no. 6159, requirements for TM 10-4520-259-13&P.

*U.S. GOVERNMENT PRINTING OFFICE : 1996 0 - 404-648 (52259)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

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

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

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

The Metric System and Equivalents

Linear Measure

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

Weights

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

Liquid Measure

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

Square Measure

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

Cubic Measure

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

Approximate Conversion Factors

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

Temperature (Exact)

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

PIN: 071885-000