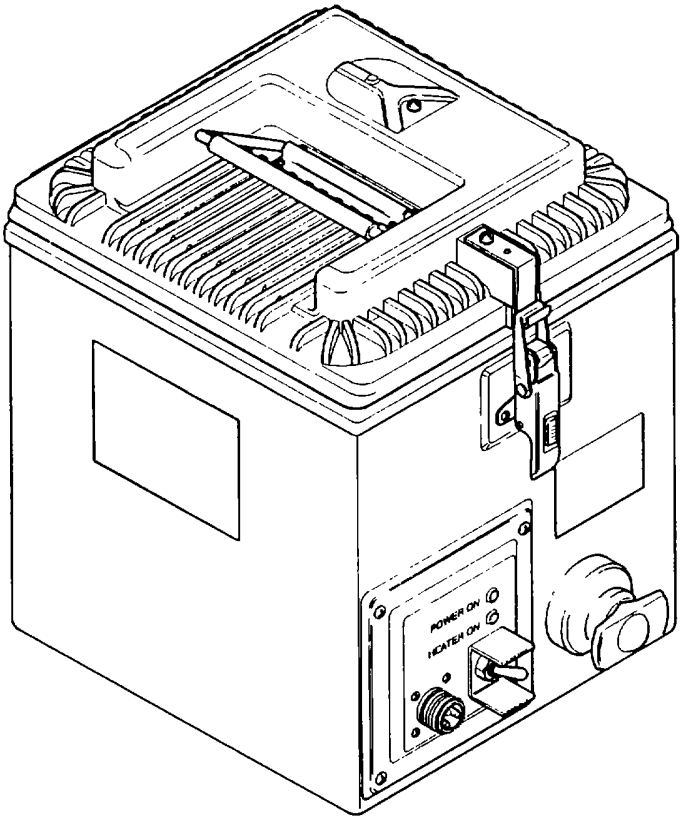
TECHNICAL MANUAL

OPERATOR'S AND UNIT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FOR HEATER, WATER AND RATION (HWR) NSN 7310-01-387-1305



H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y

2 2 J A N U A R Y 1 9 9 6

WARNING

- FIRST AID. Never work on the HWR unless there is another person present who is competent in administering first aid. The absence of first aid can result in serious personal injury or even death. Refer to FM 21-11 (First Aid for Soldiers) for appropriate first aid instructions.

- ELECTRIC SHOCK. Do not be misled by the term "low-voltage". Whenever possible turn off and disconnect the HWR power supply before performing any work. Potentials as low as 30 V dc can cause severe electric shock or death under adverse conditions.

- HEALTH HAZARD. Use the HWR to HEAT water only or to HEAT unopened prepackaged food and water. Using the HWR to prepare, boil, fry or cook food can be a hazard to health.

- HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 190°F (88°C) and can reach higher temperatures under abnormal conditions. Always use gloves or other hand protection as necessary. Unprotected exposure to high temperatures can cause serious burn injuries.

- OVERPRESSURE. Do not open the cover if the pressure relief valve is making a "hissing" noise or venting steam. Set the LO/OFF/HI switch to OFF, wait until the noise or steam has stopped then open the cover with extreme care using gloves or other hand protection as necessary. Failure to comply can result in serious burn injuries.

- HYGIENE WATER. Always cool heated water by adding sufficient cold potable water before using for hygiene purposes. Heated water can cause serious burn injuries.

- HEATED WATER. When dispensing heated water, always use a suitable vessel and avoid contact with the tap spigot which will be extremely hot. Failure to comply can result in serious burn injuries.

- WATER SPILLAGE. Always ensure that the cover is properly closed and latched before operating the HWR or at any time that the host vehicle is mobile. Failure to secure the cover can result in the accidental spillage of water.

- OVERFILLING (1). When heating water only, do not fill the outer container above the one gallon level. Overfilling can result in the accidental spillage of heated water.

- OVERFILLING (2). When heating water and unopened rations, do not fill the outer container above the 40 fluid ounce level. Overfilling can result in the accidental spillage of heated water.

- WATER/FOOD CONTAMINATION (1). Only use the inner container for carrying, holding and heating clean potable water or heating unopened rations. Using the inner container for any other purpose (e.g., personal hygiene) can result in contamination of water or food.

- WATER/FOOD CONTAMINATION (2). Always ensure that the inner container and cover are clean before fitting them to the HWR. Dirt or other debris will result in the contamination of water or food.

- NON-POTABLE/DIRTY WATER (1). Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operations) when filling the outer container. Non-potable or dirty water can cause contamination of water or food.

- NON-POTABLE/DIRTY WATER (2). Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operation) when cleaning the HWR. Non-potable or dirty water can cause contamination of water or food.

TECHNICAL MANUAL
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 22 JANUARY 1996

OPERATOR'S AND UNIT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FOR HEATER, WATER AND RATION (HWR) NSN 7310-01-387-1305

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.

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HOW TO USE THIS MANUAL

Depending upon the particular requirement, the information contained in this manual can be accessed by using any one of the following three methods:

a. Front Cover Index. Use the front cover index and corresponding page locator "bleeds" to access the required chapter or appendix. The first page of each chapter contains an index which provides a listing of the chapter contents. The first section or paragraph in each appendix provides a description of the purpose and contents of the appendix.

b. List of Contents. Use the Table of Contents to obtain the page number associated with the required chapter, section or appendix.

c. Index. Use the Index to obtain the alphabetical location of the subject matter of interest.

The following brief descriptions of the major divisions of the manual are provided as a general guide to where information can be found:

Chapter 1 - Introduction.

This chapter provides general information and gives a brief description of the HWR and its purpose.

Chapter 2 - Operating Instructions.

This chapter describes the operators controls and indicators, operator's PMCS and operation of the HWR under usual/unusual conditions.

Chapter 3 - Operator Maintenance Instructions.

This chapter contains the lubrication instructions, troubleshooting procedures and maintenance procedures which can be performed by operating personnel.

Chapter 4 - Unit Maintenance Instructions.

This chapter contains the repair, service upon receipt, check procedures, unit PMCS, troubleshooting procedures, maintenance procedures and preparation for storage or shipment which can be performed by unit maintenance personnel.

Appendix A - References.

This appendix lists the Forms, Field Manuals, Technical Manuals, Army Regulations, Department of the Army Pamphlets and Miscellaneous publications referenced in this manual.

Appendix B - Maintenance Allocation Chart (MAC).

This appendix includes the maintenance allocation chart which designates overall authority and responsibility for the performance of maintenance functions on end items or components.

Appendix C - Repair Parts and Special Tools List (RPSTL).

This appendix illustrates and lists the authorized replacement parts for the HWR.

HOW TO USE THIS MANUAL (Continued)

Appendix D	-	Components of End Items (COEI) and Basic Issue Items (Bll) Lists. This appendix illustrates and lists the COEI and BII for the HWR.
Appendix E	-	Expendable and Durable Items List. This appendix lists items which are used to operate and maintain the HWR.
Appendix F	-	Operators Lubrication Instructions. This appendix contains the statement "Lubrication Not Required".
Glossary	-	Defines abbreviations and unusual terms found in this manual and not listed in AR 310-25 (Dictionary of United States Army Terms).
Index	-	Alphabetically lists the names and paragraph numbers of subjects found in this manual.
Metric Conversion Chart	-	Printed on the inside of the rear cover. All measurements in this manual are given in U.S. standard units with the equivalent metric units in parentheses.

CHAPTER 1

INTRODUCTION

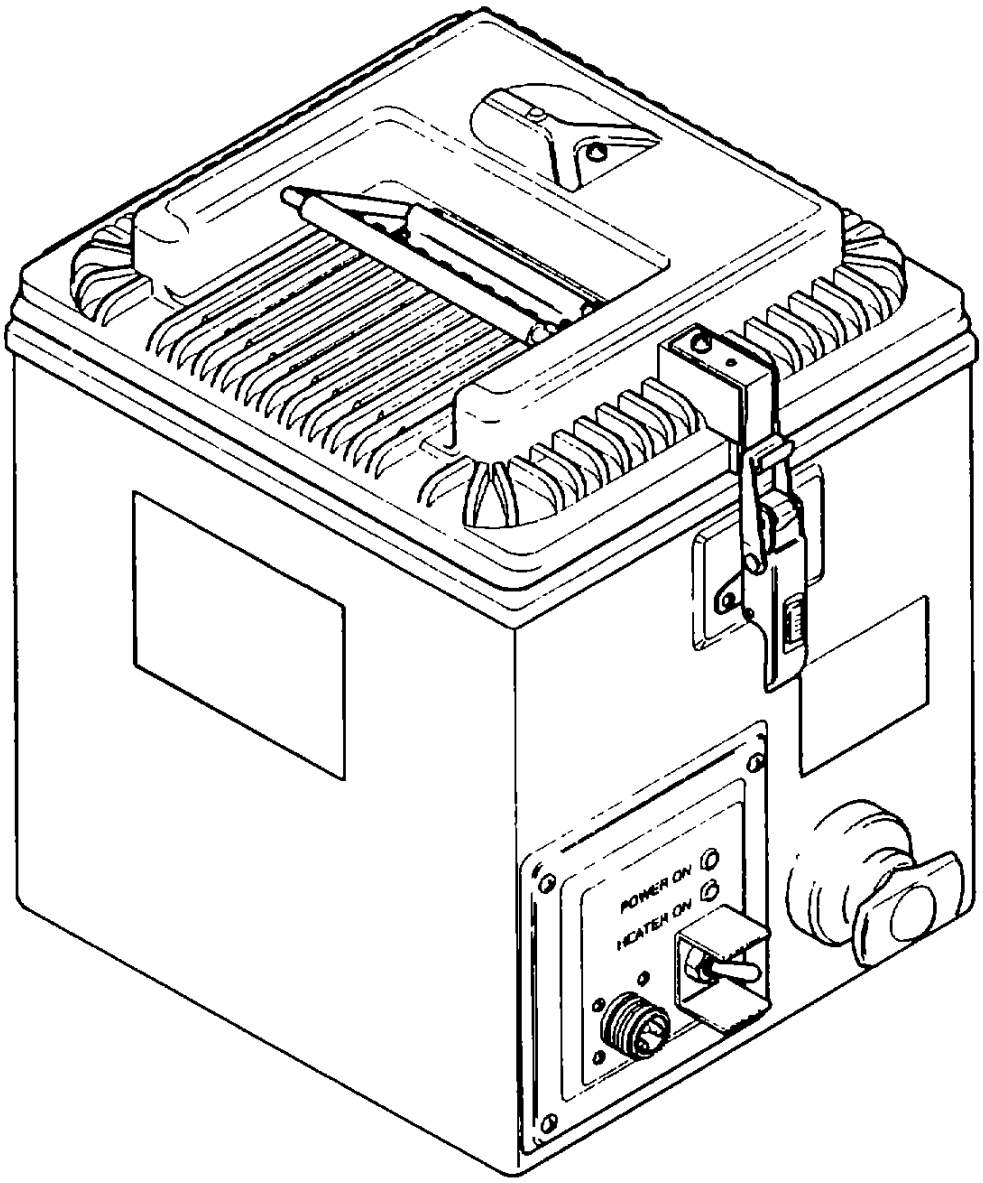


Figure 1-0. Heater, Water and Ration (HWR)

Section I. GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. Operator's and Unit Maintenance Manual including Repair Parts and Special Tools List.

b. Model Number and Equipment Name. Heater, Water and Ration (HWR).

c. Purpose of Equipment.

(1) The HWR provides a mounted potable water and prepackaged rations heating facility for the crew of any military vehicle which has a 22 - 28 V dc (24 V dc nominal) electrical system. Operation is possible at any time (including full battle conditions) in any climate while stationary or mobile.

(2) When used for water only the HWR can heat up to one gallon of potable water for beverages, hygiene or medical purposes.

(3) When used for rations the HWR can heat up to five unopened MRE entrees together with 40 fluid ounces of potable water.

(4) With the cover closed and locked the HWR can keep the contents hot for as long as operationally required.

1-2. MAINTENANCE FORMS AND PROCEDURES

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 (The Army Maintenance Management System (TAMMS)) as contained in the Maintenance Management Update.

1-3. SAFETY, CARE AND HANDLING

a. For artificial respiration procedures, refer to FM 21-11 (First Aid for Soldiers).

b. The HWR uses a power supply of 22 - 28 V dc (24 V dc nominal). Ensure that the power supply is turned off whenever the HWR is not being operated. Use extreme care if it is necessary to perform troubleshooting or maintenance procedures with the power supply connected.

c. The maximum temperature within the HWR will be 160°F (71°C) or 190°F (88°C) during normal operation and can reach 205°F (96°C) during overheat conditions before automatic shutdown occurs. Take care to avoid burns if the cover is opened immediately after the HWR has been in operation and be aware that internal heat can be retained for long periods when the cover is kept closed.

d. Use standard hand tools when tightening bolts, nuts and screws and only tighten with sufficient torque to ensure that the associated part is held firmly in position.

e. Ensure that the latch hook is properly engaged with the flat center part of the fold-down wire handle before using the cover to remove the inner container and its contents from the HWR.

f. To avoid accidental damage or contamination, ensure that the cover and inner container are placed in a safe, clean location when removed from the HWR.

1-4. CORROSION PREVENTION AND CONTROL (CPC)

a. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is therefore important that any corrosion problem with this equipment is reported so that it can be corrected and improvements made to prevent the problem on future equipments.

b. While corrosion is typically associated with the 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 caused by a corrosion problem.

c. If a corrosion problem is identified it can be reported using SF 368 (Product Quality Deficiency Report). The use of keywords such as "corrosion", "rust", "deterioration" or "cracking" will ensure that the information is identified as a CPC problem.

d. The completed form should be submitted to the address specified in DA PAM 738-750 (The Army Maintenance Management System (TAMMS)).

1-5. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For appropriate instructions, refer to TM 750-244-3 (Procedure for Destruction of Equipment to Prevent Enemy Use).

1-6. PREPARATION FOR STORAGE OR SHIPMENT

Preparation of the HWR for storage or shipment is covered in Chapter 4, Section VI.

1-7. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your HWR 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 a SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

1-8. WARRANTY INFORMATION

The HWR is warranted for 12 months. The warranty starts on the date entered in Block 23, DA Form 2408-9 in the logbook. Report all defects in material and workmanship to your supervisor who will take the appropriate action.

1-9. COMMON NAME/OFFICIAL NOMENCLATURE CROSS-REFERENCE LIST

A cross-reference between the common names used throughout this manual and the official nomenclature is provided in the following listing:

COMMON NAME	OFFICIAL NOMENCLATURE
Connector Plug	Connector, Plug, Electrical
Connector Receptacle	Connector, Receptacle, Electrical
Control Panel	Control Panel Assembly
Cover	Cover Assembly
Heater	Heater Assembly
HEATER ON lamp	LED, Yellow
HWR	Heater, Water and Ration (HWR)
Inner Container	Container Assembly, Inner

1-9. COMMON NAME/OFFICIAL NOMENCLATURE CROSS-REFERENCE LIST (Continued)

COMMON NAME	OFFICIAL NOMENCLATURE
Latch	Latch Assembly
LO/OFF/HI Switch	Toggle Switch Assembly
Main Case	Main Case Assembly
Outer Container	Container Assembly, Outer
Overheat Sensor	Thermistor Assembly
PCB	PCB Assembly
Power Cable	Cable Assembly, Power, Electrical
POWER ON Lamp	LED, Green
Tap	Tap Assembly

1-10. LIST OF ABBREVIATIONS

Refer to Section I of the Glossary for an alphabetical list of the abbreviations used in this manual and their exact meaning.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-11. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

a. Characteristics.

(1) Operates in any military vehicle with a 22 - 28 V dc (24 V dc nominal) power supply.

(2) Switch-selected low (LO) heating range of 150 -160°F (66 - 71°C).

(3) Switch-selected high (HI) heating range of 180 -190°F (82 - 88°C).

(4) Switch-selected OFF setting.

(5) Automatic protection against power supply reverse polarity connection and overvoltage surges.

(6) Automatic shutdown protection against power supply undervoltage condition.

(7) Automatic shutdown protection against overheat and "boil-dry" conditions.

(8) Non-spill operation under all conditions of service.

b. Capabilities.

(1) Heats up to one gallon of potable water.

(2) Heats up to five MRE entrees, or equivalent unopened prepackaged food, and 40 fluid ounces of potable water.

(3) Keeps contents hot for extended periods of time when the cover is closed and latched.

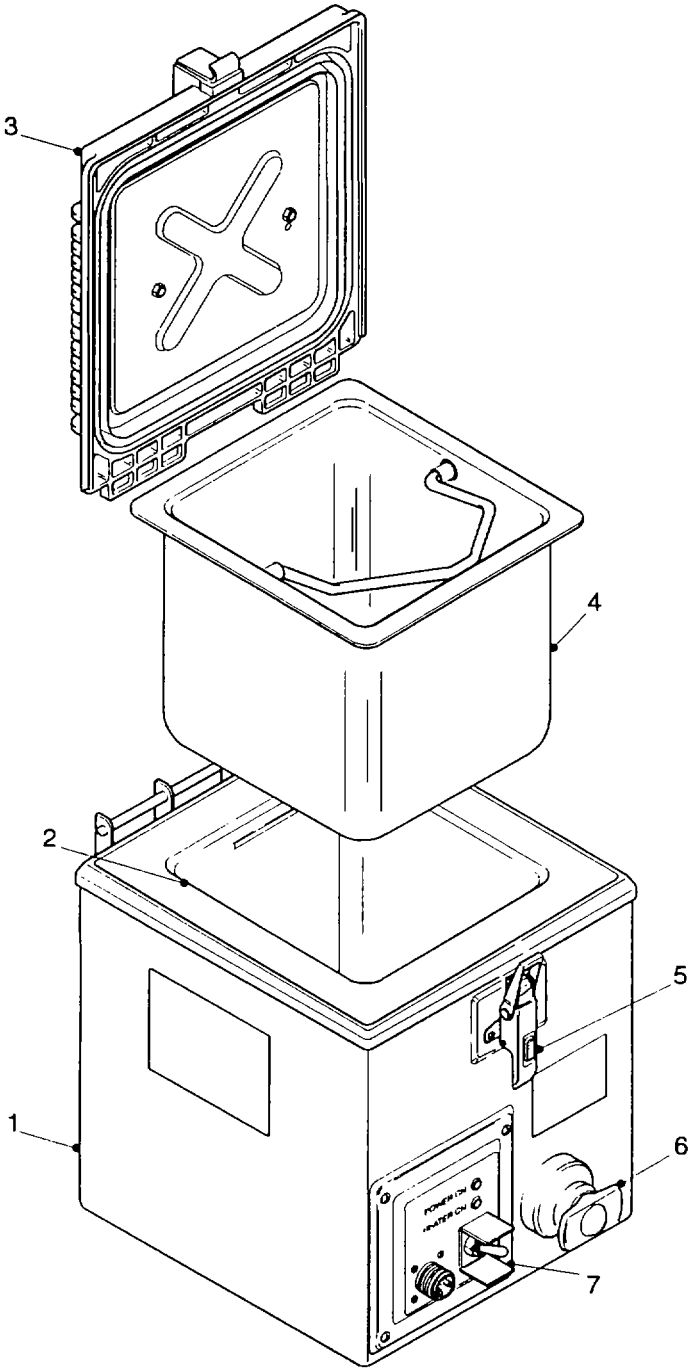
c. Features.

(1) Visual indication of power and heating status.

(2) Dual-action pressure/vacuum relief facility for safe operation.

(3) Insulated for reduced heat loss and the safety of personnel.

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



1 MAIN CASE. This is a stainless steel open-box structure which acts as the outermost housing insulated by preformed fiber blocks. Three stainless steel 5/16 inch fixing studs enable secure installation in the host vehicle. The top edge is fitted with a preformed flexible rubber seal which engages with a matching seal on the cover to form a steam/watertight joint when the latter is closed and latched. The bottom of the case is closed by a welded base plate which has four preformed "feet" for mounting.

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued)

2 OUTER CONTAINER. This is a food-quality seamless stainless steel vessel which is capable of holding up to one gallon of potable water (inner container removed) or 40 fluid ounces of potable water (inner container in place). An integral heater is externally attached to the bottom surface and water can be drained-off by means of a dispensing outlet which operates in conjunction with the tap.

3 COVER. This is a molded plastic cookware structure with internal air cavities acting as heat barriers and fitted with a removable pressure/vacuum relief valve. The rear edge locates with a hinge pivot bar on the main case and the front edge carries a metal hook which engages with the latch. The bottom edge is fitted with a preformed flexible rubber seal which engages with a matching seal on the main case to form a steam/watertight joint when closed and latched. When removed the cover allows user access to the inner and outer containers and also acts as a suitable lifting device for the inner container.

4 INNER CONTAINER. This is a food-quality seamless stainless steel vessel which is capable of holding up to five unopened MRE entrees or equivalent unopened prepackaged food. The container locates within the outer container and has a fold-down wire handle to facilitate lifting either by hand or by means of the metal hook on the cover. The handle can easily be removed for cleaning or sanitizing purposes.

5 LATCH. This is a quick-release toggle clip which, in conjunction with the hook on the cover, holds the cover securely in position under all conditions. The latch mechanism self-locks in the "fully-down" position and will release only after upward pressure is applied to a slide-action unlocking button.

6 TAP. This is a spring-loaded, pull-to-operate valve which allows water to be drained from the outer container and dispensed via a spigot. Protection of the operator against accidental burning is provided by a heatproof plastic shroud.

7 CONTROL PANEL. This provides for the connection of the power supply and carries the operator electrical controls and indicators. The panel is sealed to the main case by a flat silicone rubber gasket and is easily removable for repair at Unit level.

1-13. EQUIPMENT DATA

a. Physical Data.

Height (closed, handle up)	12.5 inch (318 mm).
Height (closed, handle down)	10.5 inch (267 mm).
Height (cover fully open)	19.0 inch (483 mm).
Width	8.5 inch (216 mm).
Depth	11.5 inch (292 mm).
Weight	17 lbs (7.7 kg).

b. Fixtures/Fittings.

Power connector	3-pin shrouded plug.
LO/OFF/HI switch	3-position DPDT toggle switch with center-off position.
POWER ON lamp	Green LED.
HEATER ON lamp	Yellow LED.
Latch (main case + cover)	Self-locking quick-release toggle clip + hook.
Lifting handle (cover)	Fold-down heatproof grip.
Tap	Spring-loaded pull-to-operate water valve.
Pressure/vacuum relief	Dual-action air valve preset at 0.3 psi (20.7 Mb).

1-13. EQUIPMENT DATA (Continued)

c. Electrical Data

Supply voltage	22 - 28 V dc (24 V dc nominal).
Supply current	15 A (maximum).
Power consumption	300 W (nominal).
Heater type	Resistive element affixed to the underside of the outer container.
Heater resistance	1.6 ohm (nominal at ambient temperature with power off).
Heater control	On/off switching determined by LO and HI temperature sensors using thermal feedback.
Heater safety cutout	"Boil-dry" temperature sensor operating at 490°F (255°C). Non-repairable thermal fuse operating at 374°F (190°C).

d. Performance Data.

Heating (water only)	Temperature of one gallon of water will be raised by 100°F (56°C) in one hour (max) at an ambient temperature of 70°F (21°C) using HI switch setting.
Heating (rations + water)	Temperature of up to five MRE entrees and 40 fluid ounces of water will be raised to between 150°F (66°C) and 160°F (71°C) at an ambient temperature of 70°F (21°C) using HI switch setting.
Heat retention	Better than 45% of selected heating range at three hours after HWR is turned off with the cover closed and latched.
Heating range (LO)	150 - 160°F (66 - 71°C).
Heating range (HI)	180 - 190°F (82 - 88°C).
Automatic shutdown	Power supply voltage less than 22 V dc. Internal temperature greater than 205°F (96°C). "Boil-dry" condition detected.
Overvoltage Protection	Power supply voltage greater than 39 V dc.

e. Environmental Data.

Temperature (operating)	Between -25 and 140°F (-32 and 60°C).
Temperature (storage)	Between -60 and 160°F (-51 and 71°C).
Humidity (storage)	Between 10 and 90%.

Section III. PRINCIPLES OF OPERATION

1-14. HWR FUNCTIONAL DESCRIPTION

a. PL1. Electrical connector which accepts the 22 - 28 V dc power supply via a suitable power cable (not part of the HWR) from the host vehicle electrical system.

b. Input Circuit. Electronic network which protects against reverse polarity connection of the power supply and overvoltage surges in excess 39 V dc.

c. 16 V Power Supply. Provides a stabilized supply of +16 V dc to power the electronic circuits.

d. Low Voltage Detector. Electronic circuit which monitors the power supply and activates the heater off latch if the voltage level falls below 22 V dc.

1-14. HWR FUNCTIONAL DESCRIPTION (Continued)

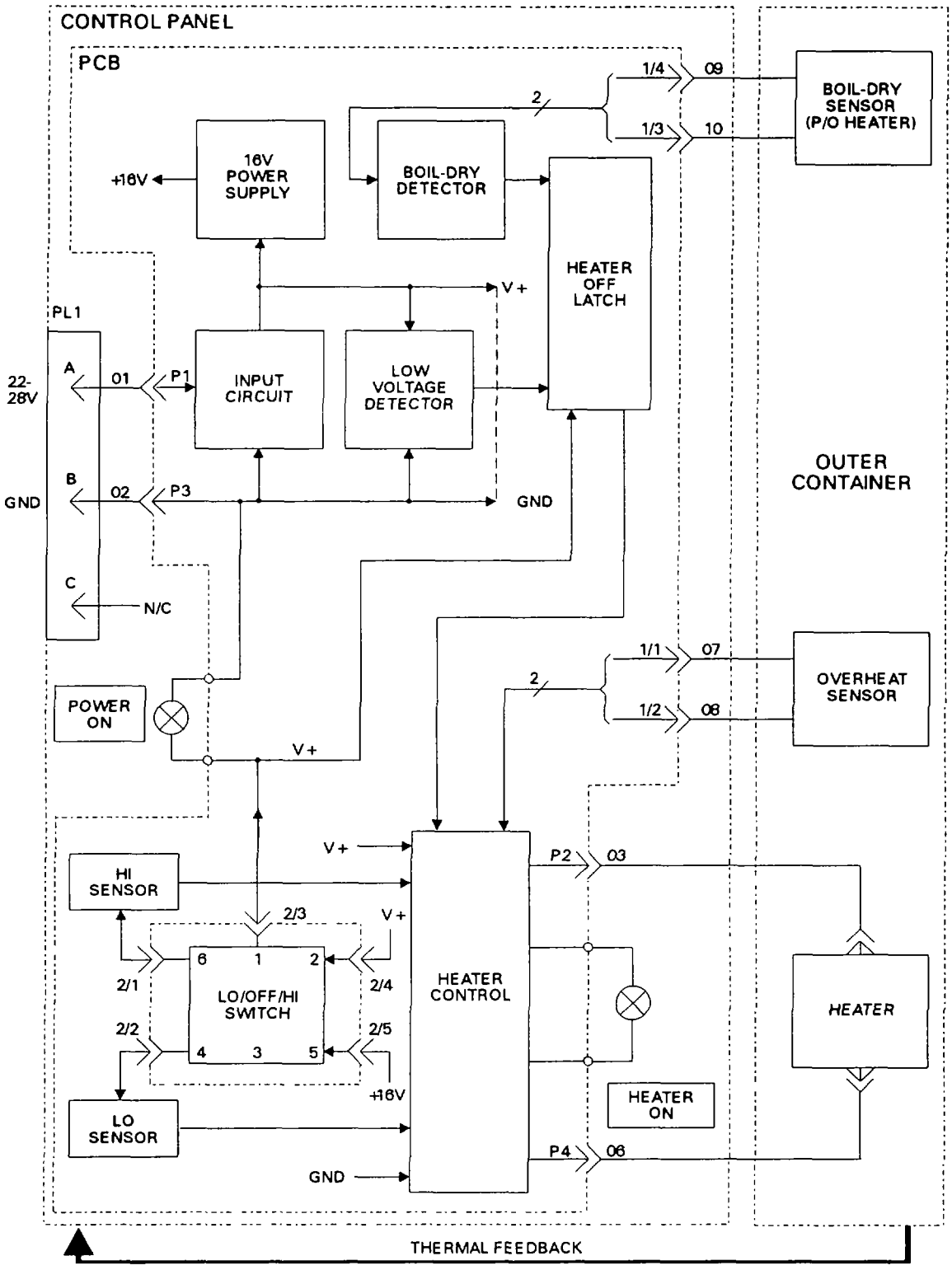


Figure 1-1. HWR Block Schematic Diagram

1-14. HWR FUNCTIONAL DESCRIPITION (Continued)

e. Boil-dry Sensor. Temperature-dependent network which directly monitors the heater temperature and outputs a corresponding signal to the boil-dry detector. The sensor is mechanically a part of the heater.

f. Boil-dry Detector. Monitors the output from the boil-dry sensor and activates the heater off latch when the signal represents a heater temperature of 490°F (255°C).

g. Heater Off Latch. Electronic circuit which is enabled by the V+ supply when the LO/OFF/HI switch is set to LO or HI. In operation the circuit is latched "off" to disable the heater control circuit and thereby prevent heating operation if the power supply is less than 22 V dc or if the internal temperature is greater than 205°F (96°C).

NOTE

If the circuit has been latched in the "off" condition it will need to be "unlatched" by first setting the LO/OFF/HI switch to OFF (to remove the V+ supply) then reselecting the LO or HI heating range as required.

h. POWER ON Lamp. Green LED which lights to provide visual indication that the power supply is turned on when the LOIOFF/HI switch is set to the LO or HI position.

i. LO Sensor. Temperature-dependent network which provides a control input to the heater control circuit when selected via the LO position of the LO/OFF/HI switch. The sensor measures thermal feedback from the outer container and thereby maintains the internal temperature within the LO heating range.

j. HI Sensor. Temperature-dependent network which provides a control input to the heater control circuit when selected via the HI position of the LO/OFF/HI switch. The sensor measures thermal feedback from the outer container and thereby maintains the internal temperature within the HI heating range.

k. LO/OFFIHI Switch. Operator-controlled 3-position toggle switch with a center OFF position. Selects a heating range of 150-160°F (66 - 71°C) when set to the LO position or a heating range of 180 -190°F (82 - 88°C) when set to the HI position. If the power supply is turned on, the switch also lights the POWER ON lamp and enables the heater off latch when set to the LO or HI position.

I. Heater Control. Electronic circuit which normally provides on/off relay switching of the heater in response to the control input received from the LO or HI sensor via the LO/OFF/HI switch (i.e., acts as a thermal servo). The circuit can also be disabled by the heater off latch or the overheat sensor in order to prevent heating operation under abnormal conditions.

m. HEATER ON Lamp. Yellow LED which lights to provide visual indication that power is being applied to the heater.

n. Heater. Comprises a 28 V, 15 A heating element which supplies conductive heat to the outer container when power is applied from the heater control circuit. The heater is protected by a non-repairable thermal fuse which operates at a temperature of 374°F (190°C).

o. Overheat Sensor. Temperature-dependent network which monitors conductive heat from the outer container and disables the heater control circuit if the temperature rises above a level of 205°F (96°C). The action is delayed for a short period of time (approximately 20 seconds) in order to prevent spurious operation.

CHAPTER 2

OPERATING INSTRUCTIONS

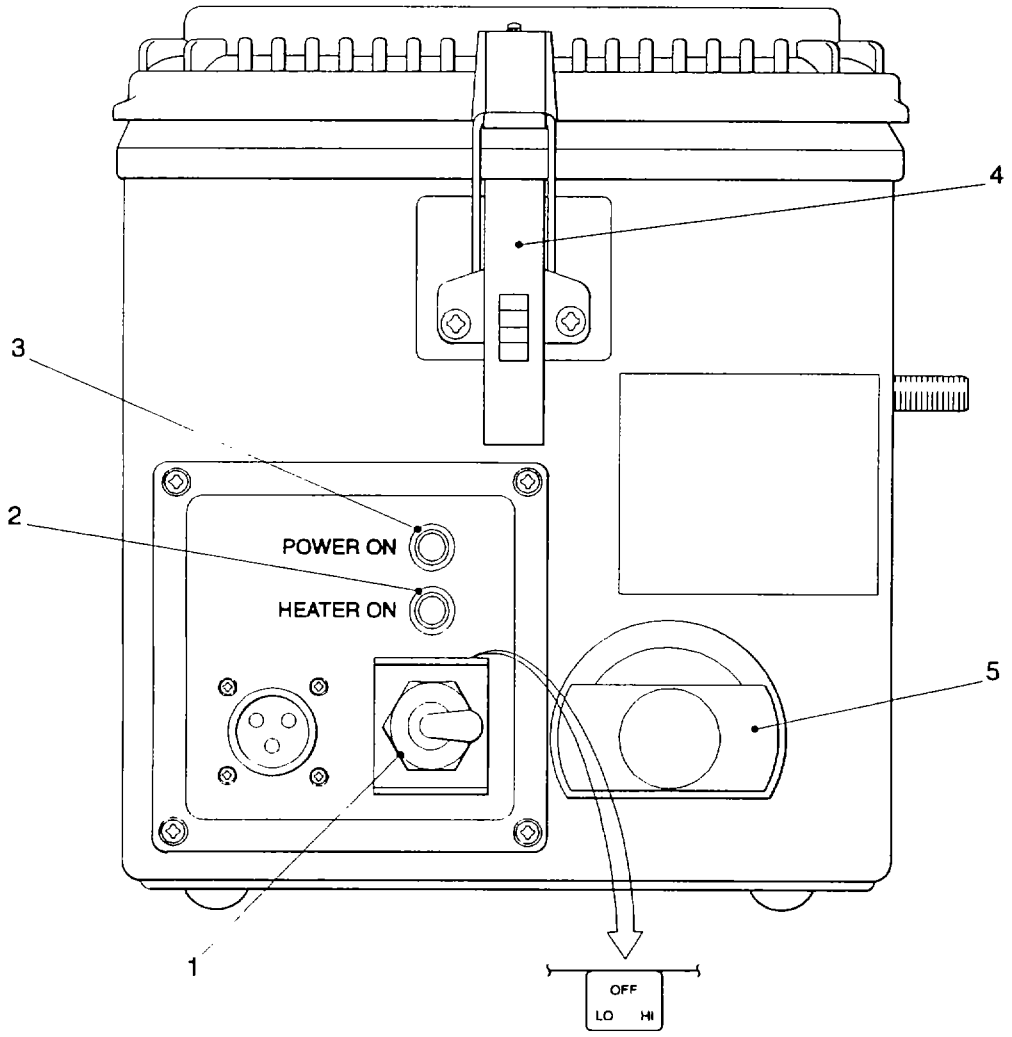
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL

The HWR has been designed for installation in a variety of military vehicles and for operation under a wide range of conditions. Operating personnel should be aware of any peculiarities or operational limitations which are applicable to their particular installation.

2-2. OPERATOR'S CONTROLS AND INDICATORS

The operator's controls and indicators are all located on the front of the HWR.



1 **LO/OFF/HI** switch (3-position)
Selects heating range of 150 -160°F (66 - 71°C) when set to the LO position.
Deselects heating when set to the center OFF position.
Selects heating range of 180 -190°F (82 - 88°C) when set to the HI position.

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

2 HEATER ON lamp
Indicates heating cycle status.
Lights when power is being applied to the heater.
Goes off when the selected temperature is reached.

3 POWER ON lamp
Indicates power supply status and setting of the LO/OFF/HI switch.
Lights when power supply is present and LO/OFF/HI switch is set to either LO or HI position.
Goes off when power supply is not present or LO/OFF/HI switch is set to the OFF position.

4 LATCH
Quick-release toggle clip with self-lock closing and manual unlocking action.
Secures cover in place to maintain steam/watertight seal with the main case.
Latch bridle engages with the latch hook on the front edge of the cover.

5 TAP
Spring-loaded pull-to-operate action.
Protective shroud prevents accidental hand contact with steam or heated water.
Allows water to be drained-off from the outer container.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-3. GENERAL

Preventive Maintenance Checks and Services (PMCS) provide systematic care, inspection and servicing of the HWR to keep it in good condition and help to prevent malfunctions.

The responsibilities associated with operation of the HWR are as described in the following subparagraphs:

a. Perform the PMCS procedures each time that the HWR is operated. Always perform the procedures in the same order so that a routine is established which allows any malfunction(s) to be quickly identified.

b. Perform the BEFORE (B) PMCS immediately prior to operating the HWR. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

c. Perform the DURING (D) PMCS by monitoring the operation of the HWR. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

d. Perform AFTER (A) PMCS immediately after operating the HWR. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

e. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any malfunction(s) which are identified before, during or after operation and cannot be corrected. DO NOT record any malfunction(s) which have already been identified and corrected.

f. Be prepared to assist with higher level maintenance tasks when requested.

2-4. PMCS PROCEDURES

The Preventive Maintenance Checks and Services given in Table 2-1 list the inspections and care required to keep the HWR in good operating condition.

2-4. PMCS PROCEDURES (Continued)

The following subparagraphs describe the column entries in Table 2-1:

a. The "ITEM No." column indicates the consecutive numerical order assigned to the procedures. The item numbers are also used when recording the results of PMCS on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

b. The "INTERVAL" column indicates when a check or service should be performed.

c. The "LOCATION, ITEM TO CHECK/SERVICE" column identifies the part which is to be checked or serviced.

d. The "PROCEDURE" column contains appropriate instructions for the performance of each check or service.

e. The "NOT FULLY MISSION CAPABLE IF" column describes the conditions under which the HWR is not mission capable and why it cannot be used.

f. Refer to Chapter 3, Section II, Operator's Troubleshooting Procedures if the HWR does not perform as stated.

g. If a fault is identified and cannot be corrected, write out a DA Form 2404 IMMEDIATELY and report it to Unit level maintenance.

h. The following general checks should be performed as necessary:

(1) **Sanitizing**. When the HWR is stored for long periods, the HWR should be cleaned and sanitized before use. Refer to chapter 3, section III for cleaning and sanitizing procedures.

(2) **Cleanliness**. Remove any accumulated dirt, grease, oil or debris on external surfaces. Refer to Chapter 3, Section III for cleaning and sanitizing procedures.

(3) **Corrosion**. Report corrosion problems in accordance with the instructions given in Chapter 1, Section I, Paragraph 1-4.

(4) **Screws and Nuts**. Check for looseness and missing, bent or broken condition. Report any defects to Unit level maintenance.

(5) **Power Cable Connector Plug**. Check for proper fit of the connector plug and for signs of physical damage to the connector plug or power cable. Tighten connector plug to hand tightness if it is loose. Report any damage to Unit level maintenance.

2-5. CLEANING AGENTS

a. Cleaning Internal Metal Parts. Use hand dishwashing compound or food service disinfectant as authorized by Appendix E, Section II, Item 3.

b. Cleaning External Metal Parts. Use hand dishwashing compound as authorized by Appendix E, Section II, Item 3.

c. Cleaning Rubber and Soft Plastic Parts. Use hand dishwashing compound as authorized by Appendix E, Section II, Item 3.

TABLE 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
1	Before	Cover	a. Inspect for loose/missing parts and physical damage.	Parts such as screws are loose/missing or damage will prevent safe usage.
			b. Check cover seal is properly fitted and not distorted (open cover, Paragraph 2-9).	Cover seal is badly fitted or loose and leakage of steam or water is possible.
			c. Inspect for dirt, grease, oil or food debris.	
			d. Inspect for signs of corrosion (Paragraph 1-4).	
2	Before	Inner Container	a. Check inner container is present and can be easily lifted out of the outer container.	Container is missing. Fold-down wire lifting handle is missing or broken.
			b. Inspect for physical damage such as holes or large dents.	Container has damage preventing safe usage.
			c. Inspect for dirt, grease, oil or food debris.	
			d. Inspect for signs of corrosion (Paragraph 1-4).	
3	Before	Outer Container	a. Inspect for physical damage such as holes or large dents.	Container has damage preventing safe usage.
			b. Inspect for dirt, grease, oil or food debris.	
			c. Inspect for signs of corrosion (Paragraph 1-4).	
4	Before	Main Case	a. Inspect for loose/missing parts and physical damage.	Parts such as screws are loose/missing or damage will prevent safe usage.
			b. Check case seal is properly fitted and not distorted.	Case seal is badly fitted or loose and leakage of steam or water is possible.

TABLE 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (Continued)

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable if:
			c. Inspect for dirt, grease, oil or food debris.	
			d. Inspect for signs of corrosion (Paragraph 1-4).	
5	Before	Latch	a. Check latch is secured to the main case and has no missing or broken parts.	Latch has loose or missing screws. Any part is broken, loose or missing.
			b. Check lock and unlock operation is correct.	Latch will not lock and/or unlock.
6	Before	Tap	a. Check tap is secured to the main case and has no missing or broken parts.	Tap has loose or missing screws. Any part is broken, loose or missing.
			b. Check tap can be easily operated over its full range with no binding.	Tap does not move freely or is jammed in one position.
7	Before	Control Panel	a. Check control panel is secured to the main case and has no missing or broken parts.	Control panel has loose or missing screws. Any part is loose or missing.
			b. Check power cable connector plug is properly connected to the connector receptacle.	Power cable connecting plug cannot be connected or connection is unsafe.
			c. Check LO/OFF/HI switch is securely held in position and operates with a firm, positive action.	LO/OFF/HI switch is loose or its operation is not satisfactory.
8	During	Main Case	Check for leakage of water indicated by damp or discolored patches on the case seal.	Leakage of water is observed.
9	During	Tap	Check for leakage of water after each operation	Leakage of water is observed.
10	After	Cover	Inspect for dirt, grease, oil or food debris.	

TABLE 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (Continued)

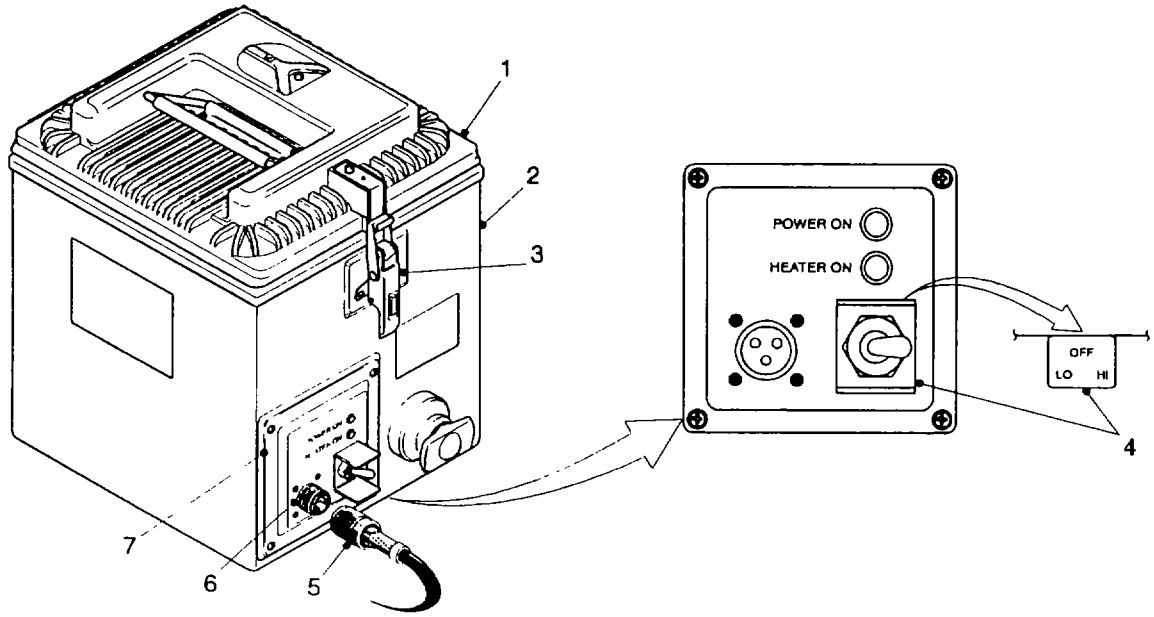
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
11	After	Inner Container	a. Check food has been removed.	
			b. Inspect for dirt, grease, oil or food debris.	
12	After	Outer Container	a. Check water has been removed.	
			b. Inspect for dirt, grease, oil or food debris.	
13	After	Main Case	a. Inspect for dirt, grease, oil or food debris.	
			b. Check inner container is present.	Inner container is missing.
			c. Check cover is installed and the latch is closed and locked.	Cover will not fit or latch will not close and lock.

Section III. OPERATION UNDER USUAL CONDITIONS

2-6. GENERAL

The instructions in this section are for personnel who operate the HWR. Refer to the appropriate technical manual(s) for information relating to the power supply arrangements for the HWR in particular types of host vehicle.

2-7. ASSEMBLY AND PREPARATION FOR USE



a. Assembly.

(1) Verify that the HWR is securely fitted.

(2) Verify that the cover (1) is correctly positioned on top of the main case (2).

(3) Verify that the latch (3) is closed and locked in position.

b. Preparation for Use.

NOTE

The HWR requires a power supply of 22 - 28 V dc (24 V dc nominal) capable of providing a maximum load current of 15 A.

(1) Connect power cable connector plug (5) to connector receptacle (6) on the control panel (7).

(2) Set LO/OFF/HI switch (4) on the control panel (7) to OFF.

(3) Turn on the vehicle power supply.

2-8. INITIAL CHECKS

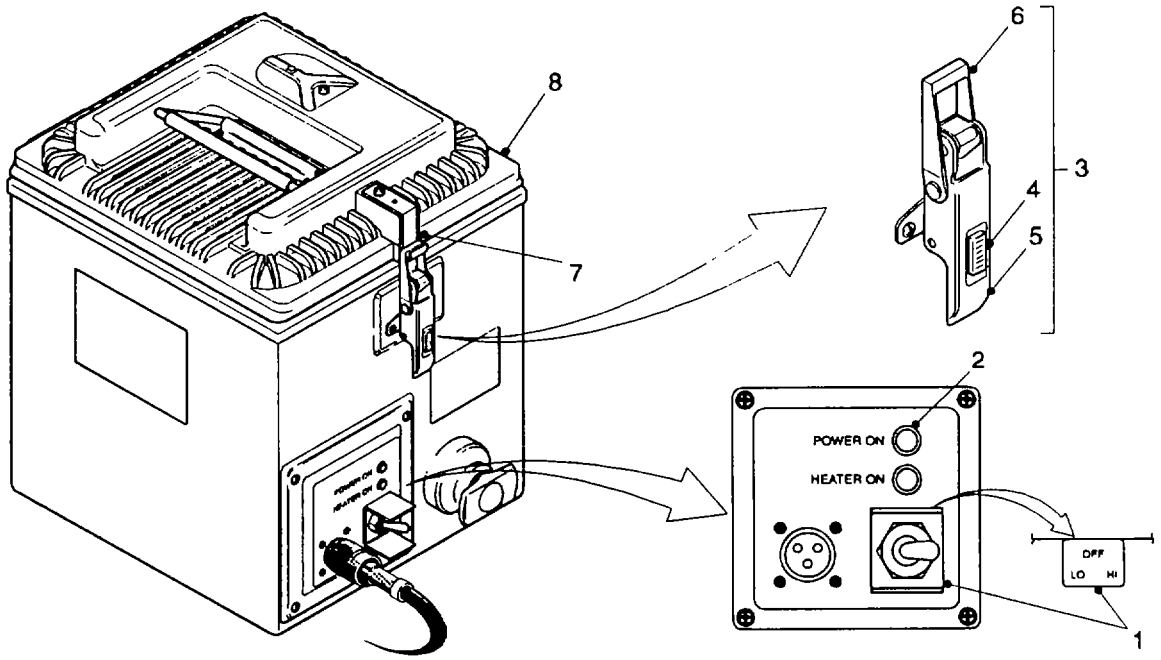
Before operating the HWR, perform the BEFORE (B) Preventive Maintenance Checks and Services (PMCS) given in Table 2-1. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

2-9. OPERATING PROCEDURES

WARNING

- HEALTH HAZARD. Use the HWR to HEAT water only or to HEAT unopened prepackaged food and water. Using the HWR to prepare, boil, fry or cook food can result in a hazard to health.
- WATER/FOOD CONTAMINATION (1). Only use the inner container for carrying/holding clean potable water or heating rations. Using the inner container for any other purpose (e.g., personal hygiene) can result in the contamination of water or food.

a. Heating Water. To heat water, perform the following steps in the order given:

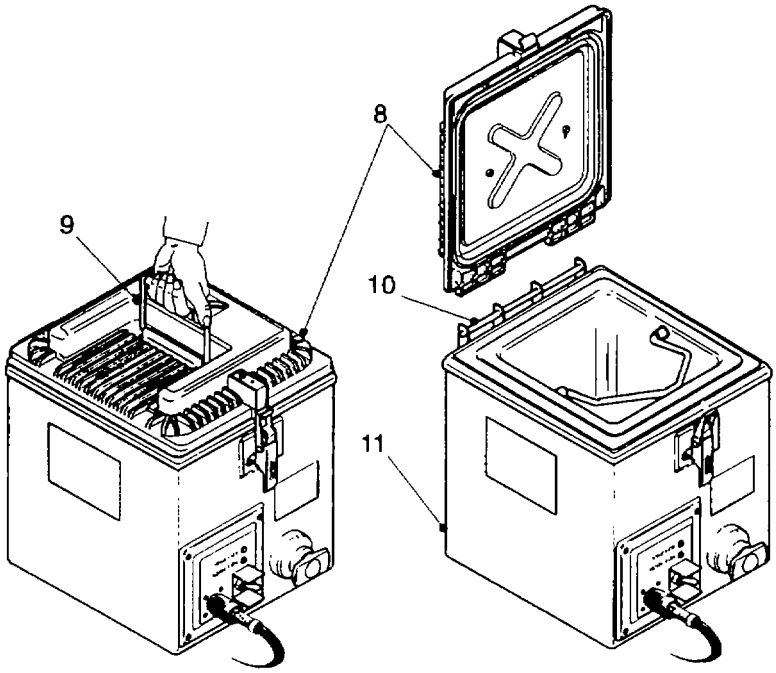


(1) Ensure that the LO/OFF/HI switch (1) is set to OFF and verify that the POWER ON lamp (2) is off.

(2) Unfasten the latch (3) by first pushing the spring-loaded unlocking catch (4) upwards with the thumb then pulling the operating lever (5) outwards while holding the unlocking catch in the "fully-up" position.

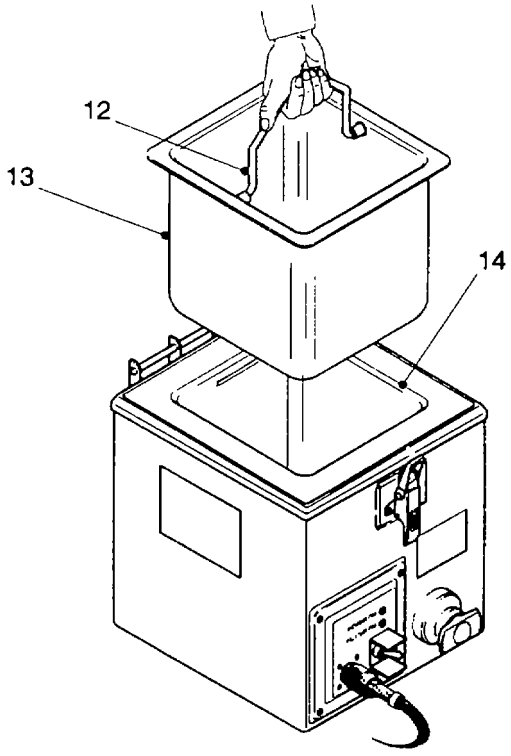
(3) Disengage the latch bridle (6) from the latch hook (7) located on the front edge of the cover (8).

2-9. OPERATING PROCEDURES (Continued)



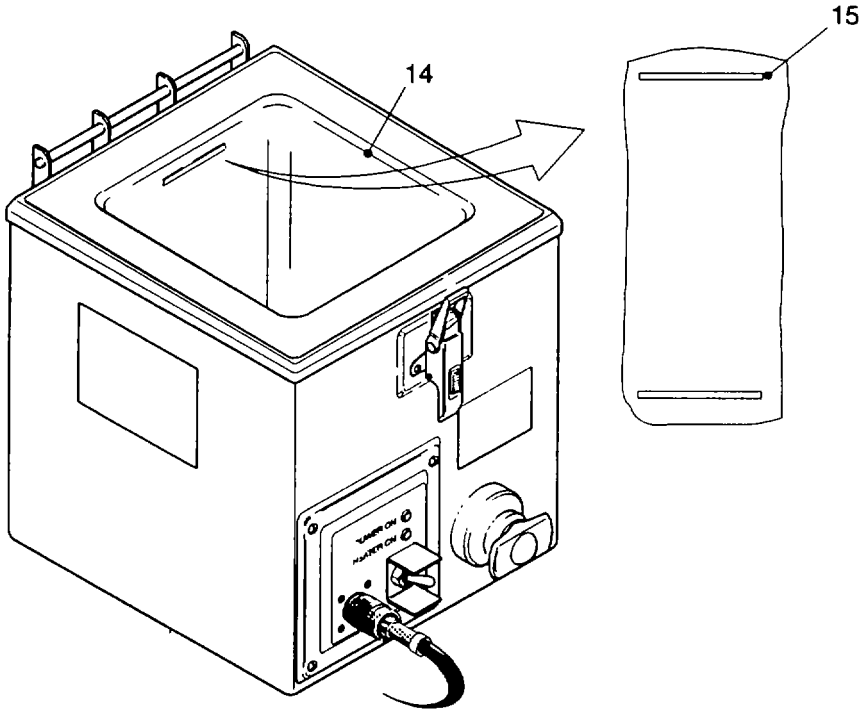
(4) Using the fold-down heatproof handle (9), carefully open the cover (8) and disengage it from the hinge pivot bar (10) located along the top rear edge of the main case (11).

(5) Place the cover (8) on a clean, unobstructed surface so that it is laying flat in a safe position.



2-9. OPERATING PROCEDURES (Continued)

(6) Using the fold-down wire handle (12), lift the inner container (13) out of the outer container (14) and place on a clean, unobstructed surface so that it is standing upright in a safe position.



WARNING

- **NON-POTABLE/DIRTY WATER (1).** Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operations) when filling the outer container. Non-potable or dirty water can cause contamination of water or food.

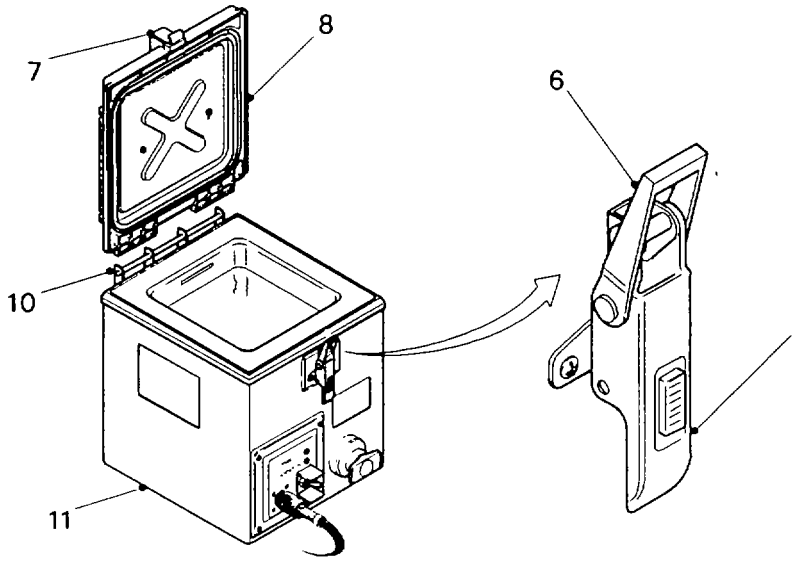
- **OVERFILLING (1).** When heating water only, do not fill the outer container above the one gallon level. Overfilling can result in the accidental spillage of heated water.

CAUTION

BLOCKAGE OF TAP. Only use the outer container for heating water. Preparing beverages or soups in the outer container can result in the tap becoming blocked with solid residue.

(7) Fill the outer container (14) with clean, potable water up to the one gallon level line (15) which is the upper embossed mark on the rear wall.

2-9. OPERATING PROCEDURES (Continued)

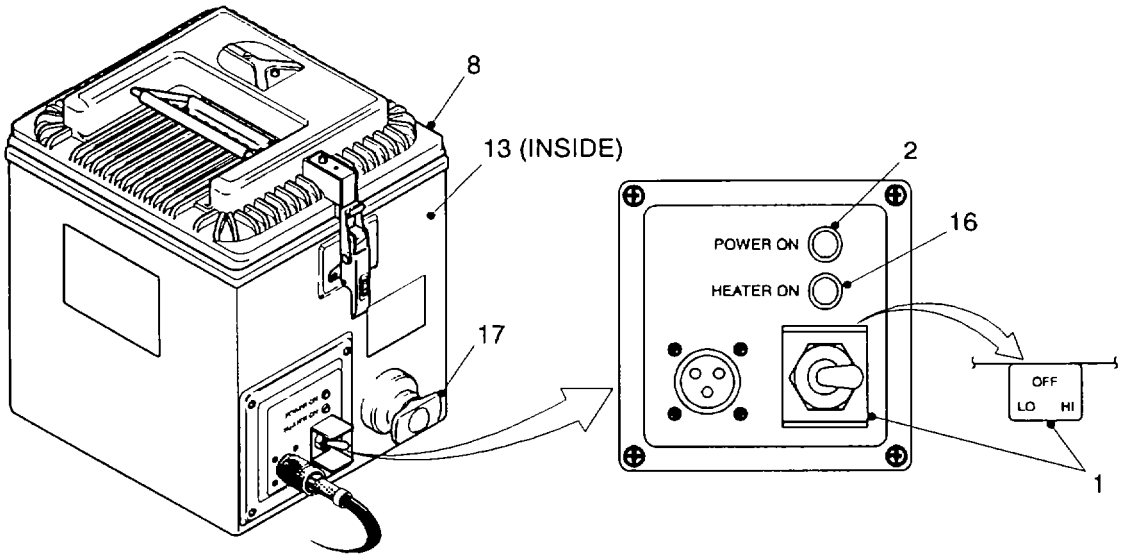


(8) Position the cover (8) on the hinge pivot bar (10) then carefully lower into position making sure that it is properly aligned with the top of the main case (11).

(9) With the cover (8) in place, engage the latch bridle (6) with the latch hook (7) then push the operating lever (5) to the "fully-down" position and verify that it is locked by attempting to pull it outwards.

NOTE

The latch self-locking mechanism engages automatically with an audible "click" when the operating lever is in the "fully-down" position.



2-9. OPERATING PROCEDURES (Continued)

WARNING

WATER SPILLAGE. Always ensure that the cover is properly closed and latched before operating the HWR or at any time that the host vehicle is mobile. Failure to secure the cover can result in the accidental spillage of heated water.

CAUTION

OVERHEATING. To avoid overheating, do not operate without water in the outer container. Overheating can result in the HWR becoming non-operational.

(10) Set the LO/OFF/HI switch (1) to HI and verify that the POWER ON lamp (2) and HEATER ON lamp (16) are both on.

(11) Water has been heated to the selected temperature when the HEATER ON lamp (16) goes off again.

WARNING

- HEATED WATER. When dispensing heated water, always use a suitable vessel and avoid contact with the tap spigot which will be extremely hot. Failure to comply can result in serious burn injuries.

- HYGIENE WATER. Always cool heated water by adding sufficient cold potable water before using for hygiene purposes. Heated water can cause serious burn injuries.

(12) Set the LO/OFF/HI switch (1) to OFF and dispense heated water as required by operating the pull-action tap (17).

NOTE

If a continuous supply of heated water is needed, leave the LO/OFF/HI switch set to LO or HI. The water will then be thermostatically maintained at the selected temperature for as long as required.

(13) If further heating of water is not required, set the LO/OFF/HI switch (1) to OFF and verify that the POWER ON lamp (2) is off.

(14) Using the tap (17), drain-off any remaining water and dispose of in accordance with applicable instructions.

WARNING

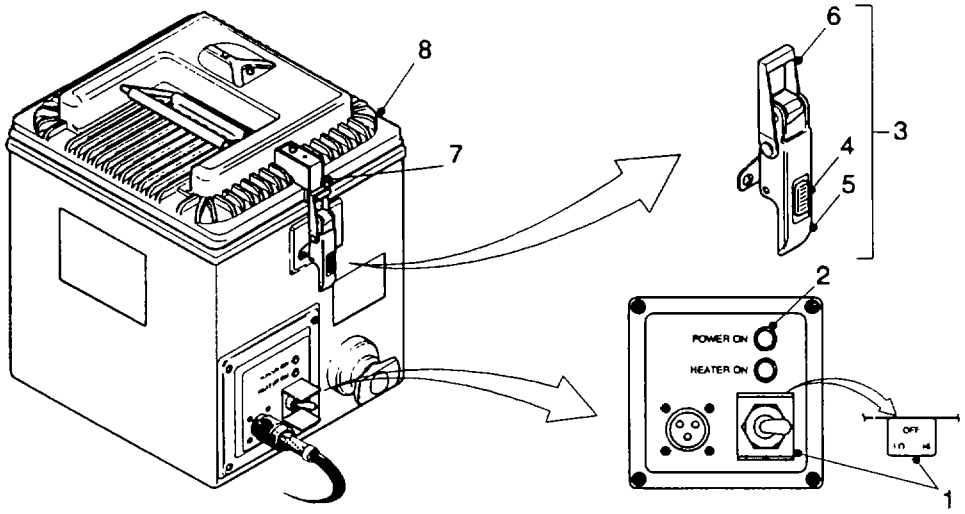
WATER/FOOD CONTAMINATION (2). Always ensure that the inner container and cover are clean before fitting them to the HWR. Dirt or other debris will result in the contamination of water or food.

(15) Install the inner container (13).

(16) Install the cover (8) as described in steps (8) and (9).

2-9. OPERATING PROCEDURES (Continued)

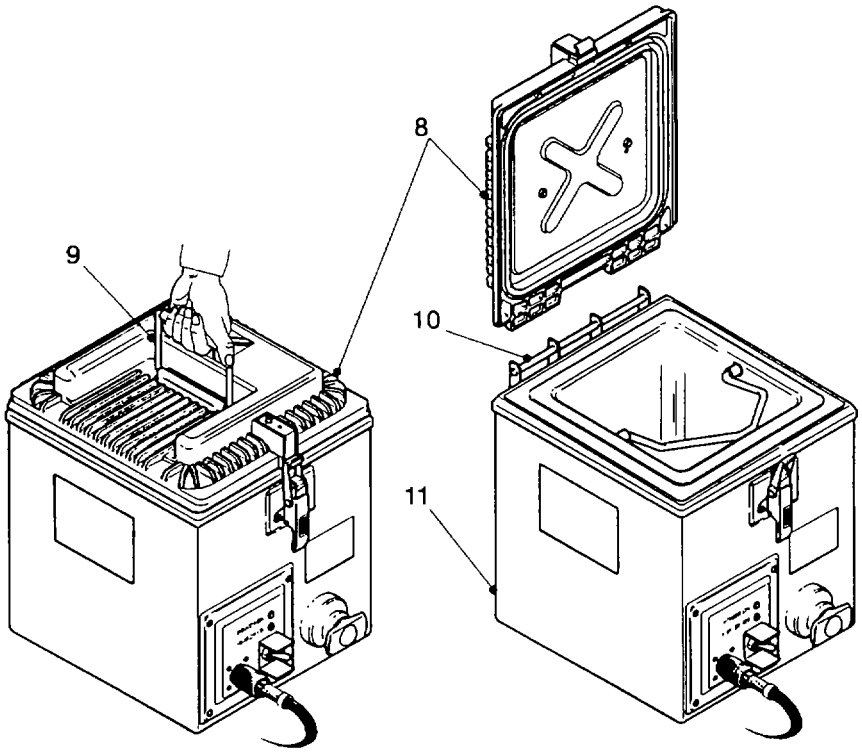
b. Heating Rations. To heat rations, perform the following steps in the order given:



(1) Ensure that the LO/OFF/HI switch (1) is set to OFF and verify that the POWER ON lamp (2) is off.

(2) Unfasten the latch (3) by first pushing the spring-loaded unlocking catch (4) upwards with the thumb then pulling the operating lever (5) outwards while holding the unlocking catch (4) in the "fully-up" position.

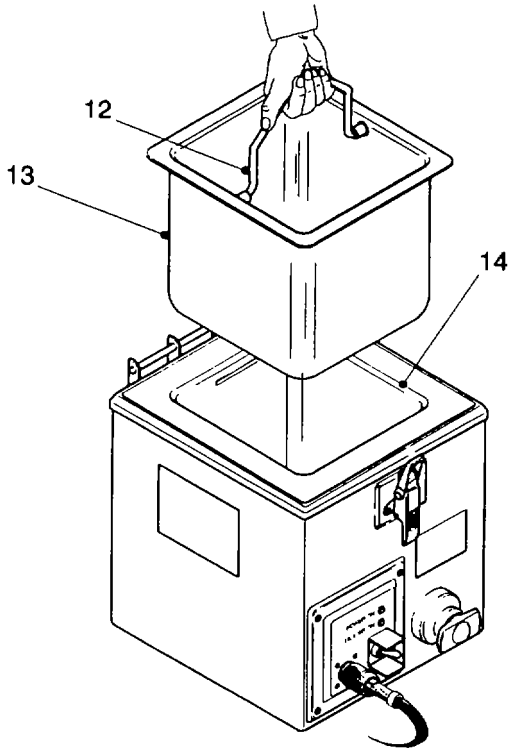
(3) Disengage the latch bridle (6) from the latch hook (7) located on the front edge of the cover (8).



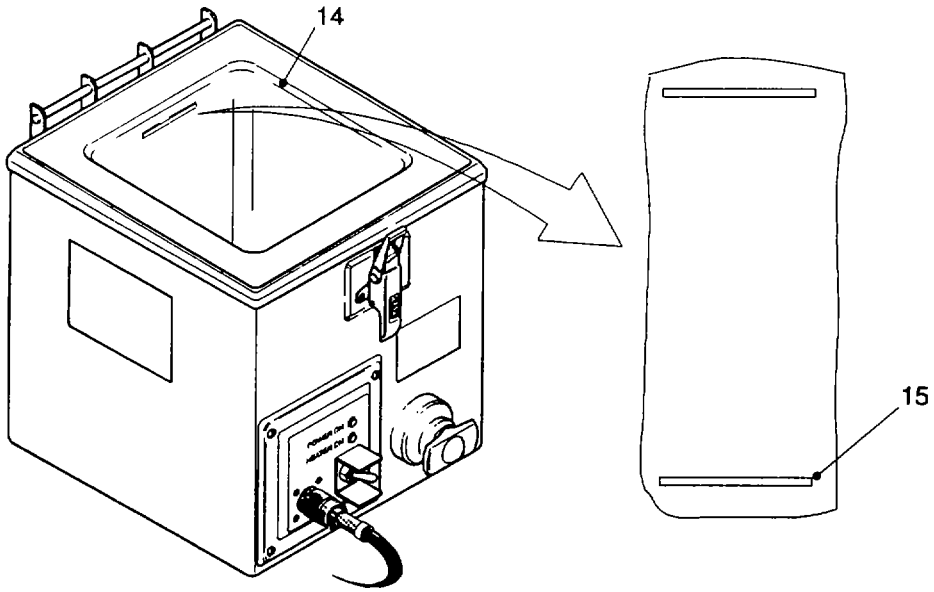
2-9. OPERATING PROCEDURES (Continued)

(4) Using the fold-down heatproof handle (9), carefully open the cover (8) and disengage it from the hinge pivot bar (10) located along the top rear edge of the main case (11).

(5) Place the cover (8) on a clean, unobstructed surface so that it is laying flat in a safe position.



(6) Using the fold-down wire handle (12), lift the inner container (13) out of the outer container (14) and place on a clean, unobstructed surface so that it is standing upright in a safe position.



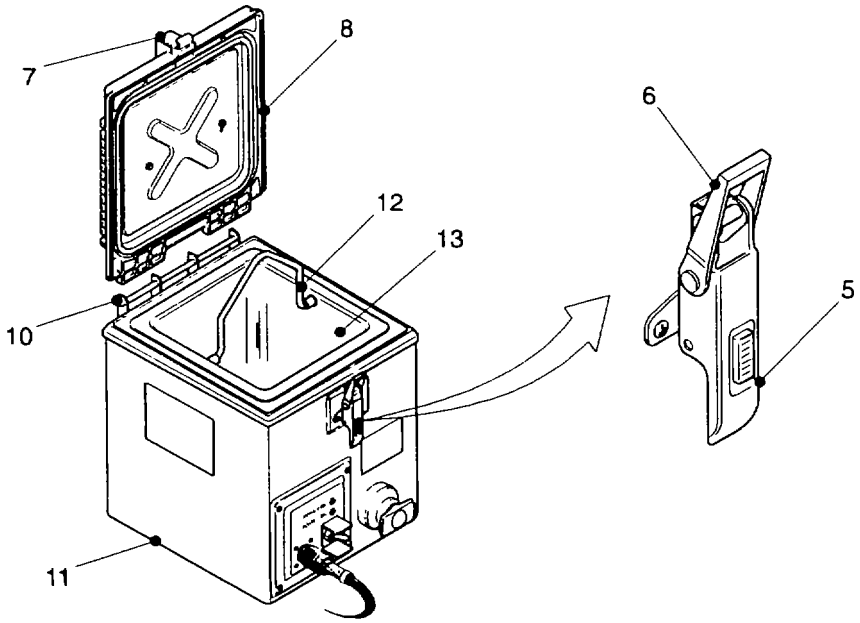
2-9. OPERATING PROCEDURES (Continued)

WARNING

- NON-POTABLE/DIRTY WATER (1). Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operations) when filling the outer container. Non-potable or dirty water can cause contamination of water or food.

- OVERFILLING (2). When heating water and rations, do not fill the outer container above the 40 fluid ounce level. Overfilling can result in the accidental spillage of heated water.

(7) Fill the outer container (14) with clean, potable water up to the 40 fluid ounce level line (15) which is the lower embossed mark on the rear wall.



(8) Place up to five unopened MRE entrees or other unopened prepackaged food in the inner container (13) and add sufficient clean, potable water to just cover the rations.

WARNING

WATER/FOOD CONTAMINATION (2). Ensure that the inner container and cover are clean before fitting them to the HWR. Dirt or debris will result in contamination of water or food.

(9) Using the folding wire handle (12), install the inner container (13) into the main case (11) and ensure that it is properly positioned.

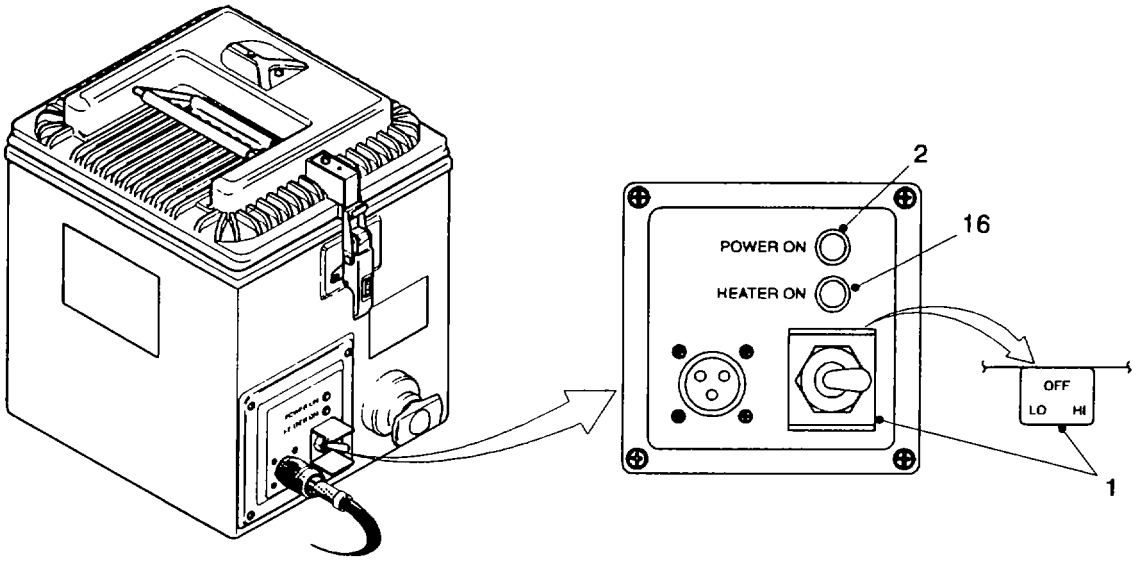
(10) Position the cover (8) on the hinge pivot bar (10) then carefully lower into position making sure that it is properly aligned with the top of the main case (11).

(11) With the cover (8) in place, re-engage the latch bridle (6) with the latch hook (7) then push the operating lever (5) to the "fully-down" position and verify that it is locked by attempting to pull it outwards.

2-9 OPERATING PROCEDURES (Continued)

NOTE

The latch self-locking mechanism engages automatically with an audible "click" when the operating lever is in the "fully-down" position.



WARNING

WATER SPILLAGE. Always ensure that the cover is properly closed and latched before operating the HWR or at any time that the host vehicle is mobile. Failure to secure the cover can result in the accidental spillage of water.

CAUTION

OVERHEATING. To avoid overheating, do not operate the HWR without water in the outer container. Overheating can result in the HWR becoming non-operational.

(12) Set the LO/OFF/HI switch (1) to HI and verify that the POWER ON lamp (2) and HEATER ON lamp (16) are both on.

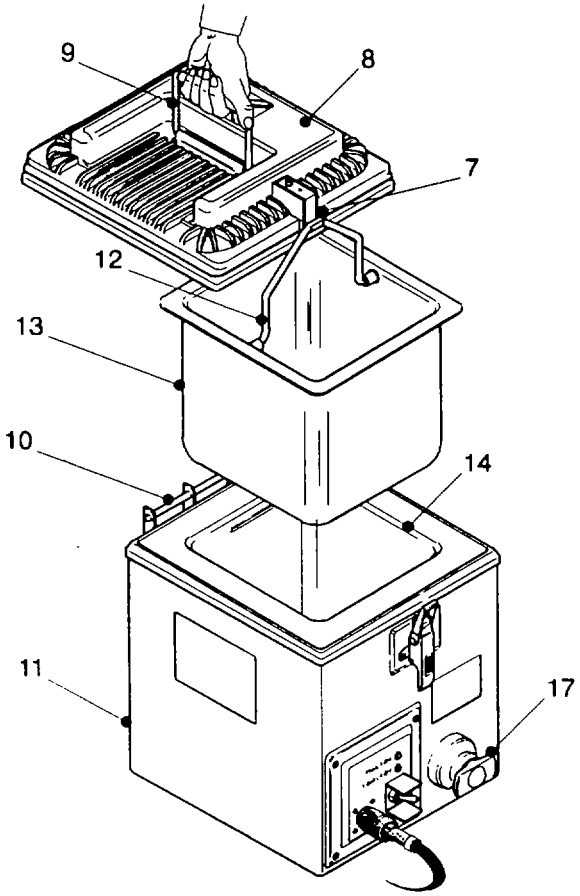
(13) Water (and rations) have been heated to the selected temperature when the HEATER ON lamp (16) goes off again.

NOTE

When the water has heated, the rations may still require heating and a longer warmup time should therefore be allowed. Leave the LO/OFF/HI switch set to LO or HI for as long as is needed, the water will be thermostatically maintained at the selected temperature and the rations will continue to be heated.

(14) If further heating of rations is not required, set the LO/OFF/HI switch (1) to OFF and verify that the POWER ON lamp (2) is off.

2-9. OPERATING PROCEDURES (Continued)



WARNING

- OVERPRESSURE. Do not open the cover if the pressure relief valve is making a "hissing" noise or venting steam. Set the LO/OFF/HI switch to OFF, wait until the noise or steam has stopped then open the cover with extreme care using gloves or other hand protection as necessary. Failure to comply can result in serious bum injuries.

- HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 190°F (88°C) and can reach higher temperatures under abnormal conditions. Always use gloves or other hand protection as necessary. Unprotected exposure to high temperatures can cause serious burn injuries.

(15) Using the fold-down heatproof handle (9), carefully open the cover (8) and disengage it from the hinge pivot bar (10) located along the top rear edge of the main case (11).

(16) Holding the cover (8) by means of the fold-down heatproof handle (9), engage the latch hook (7) with the flat center part of the folding wire handle (12) on the inner container (13).

(17) Carefully lift out the inner container (13) together with its contents and place on a clean, unobstructed surface so that it is standing upright in a safe position.

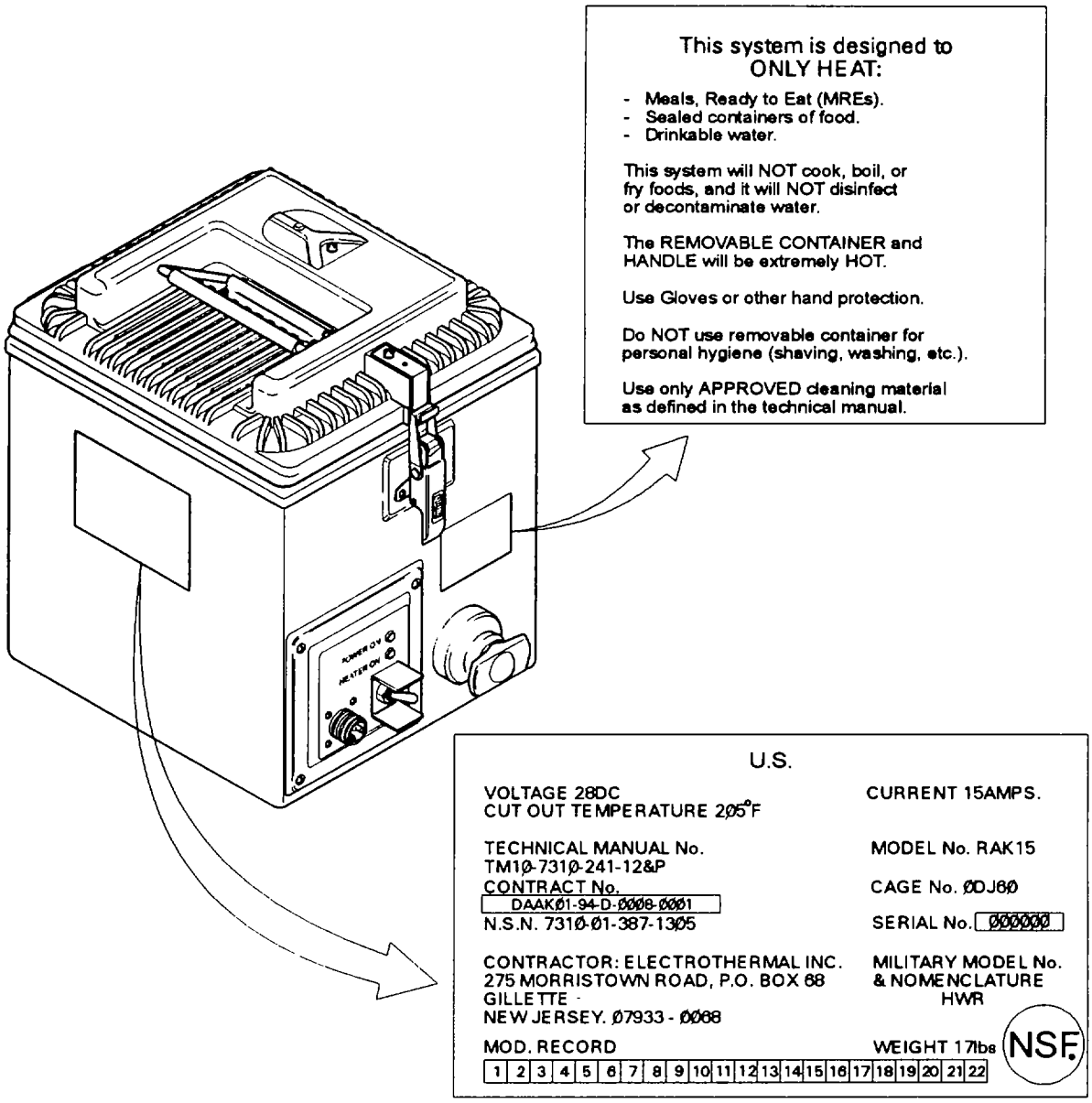
2-9. OPERATING PROCEDURES (Continued)

(18) Any heated water remaining in the outer container (14) can be dispensed by operating the pull-action tap (17).

(19) If further operation is not required, perform step (1) and then steps (9) thru (11).

2-10. DECALS AND INSTRUCTION PLATES

The HWR carries a Data Name Plate and an Instruction Plate which are located as illustrated.



Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-11. GENERAL

This section contains special instructions/precautions for operating the HWR under unusual environment/weather conditions and procedures for operating the HWR under emergency conditions.

2-12. UNUSUAL ENVIRONMENT/WEATHER

The HWR is designed to operate over a wide range of operational and climatic conditions within the protection of a vehicle. However, the following extreme conditions may require procedures which ensure that safe and efficient operation of the HWR can be maintained:

a. Operation in Extreme Cold. There are no special instructions/precautions for operating the HWR in temperatures as low as -40°F (-40°C).

b. Operation in Extreme Heat. There are no special instructions/precautions for operating the HWR in temperatures as high 140°F (60°C).

c. Operation in High Humidity. There are no special instructions/precautions for operating the HWR in humidity greater than 94 ± 4% at a temperature of 140°F (60°C).

2-13. EMERGENCY PROCEDURES

The HWR should not be operated when either, or both, of the following conditions are present:

a. The load current (up to 15 A) will degrade the host vehicle electrical system.

b. Power usage is restricted for operational reasons.

2-14. NUCLEAR, BIOLOGICAL AND CHEMICAL (NBC) DECONTAMINATION PROCEDURES

Refer to the appropriate host vehicle manual(s) for the NBC decontamination instructions (if any) which are applicable to the HWR.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S LUBRICATION INSTRUCTIONS

3-1. LUBRICATION INSTRUCTIONS

Lubrication Not Required

Section II. OPERATOR'S TROUBLESHOOTING PROCEDURES

3-2. GENERAL

Operator troubleshooting is based on malfunctions or failures observed during operator PMCS or operational use of the HWR.

3-3. TROUBLESHOOTING INSTRUCTIONS

WARNING

ELECTRIC SHOCK. Do not be misled by the term "low voltage". Whenever possible turn off and disconnect the HWR power supply before performing any work. Potentials as low as 30 V dc can cause severe electric shock or death under adverse conditions.

HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 190°F (88°C) and can reach higher temperatures under abnormal conditions. Always use gloves or other hand protection as necessary. Unprotected exposure to high temperatures can cause serious burn injuries.

FIRST AID. Never work on the HWR unless there is another person present who is competent in administering first aid. The absence of first aid can result in serious personal injury or even death. Refer to FM 21-11 (First Aid for Soldiers) for appropriate first aid instructions.

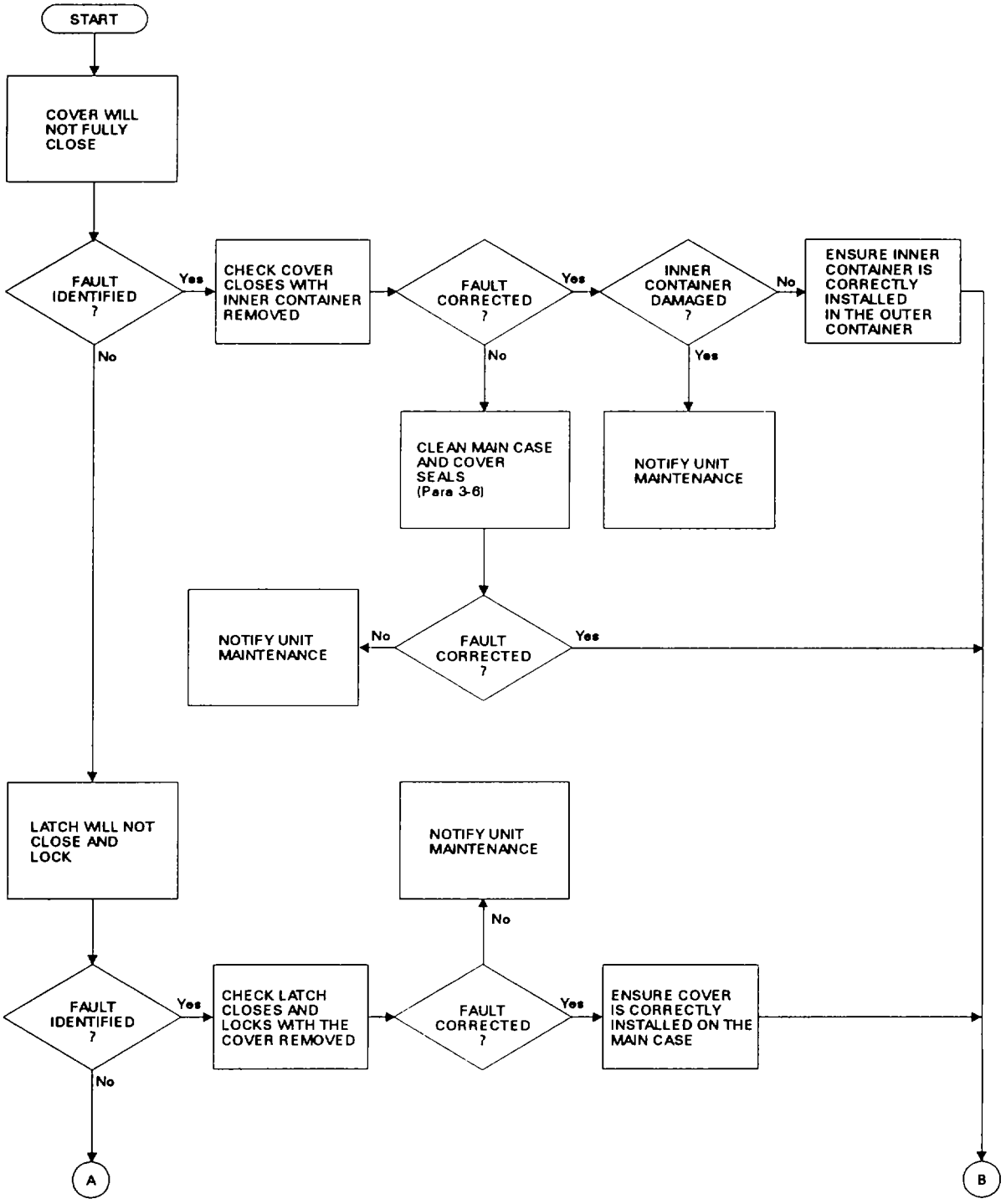
CAUTION

DISASSEMBLY. Do not attempt disassembly beyond that which is necessary for operator troubleshooting and maintenance. Unauthorized disassembly can result in the HWR becoming non-operational.

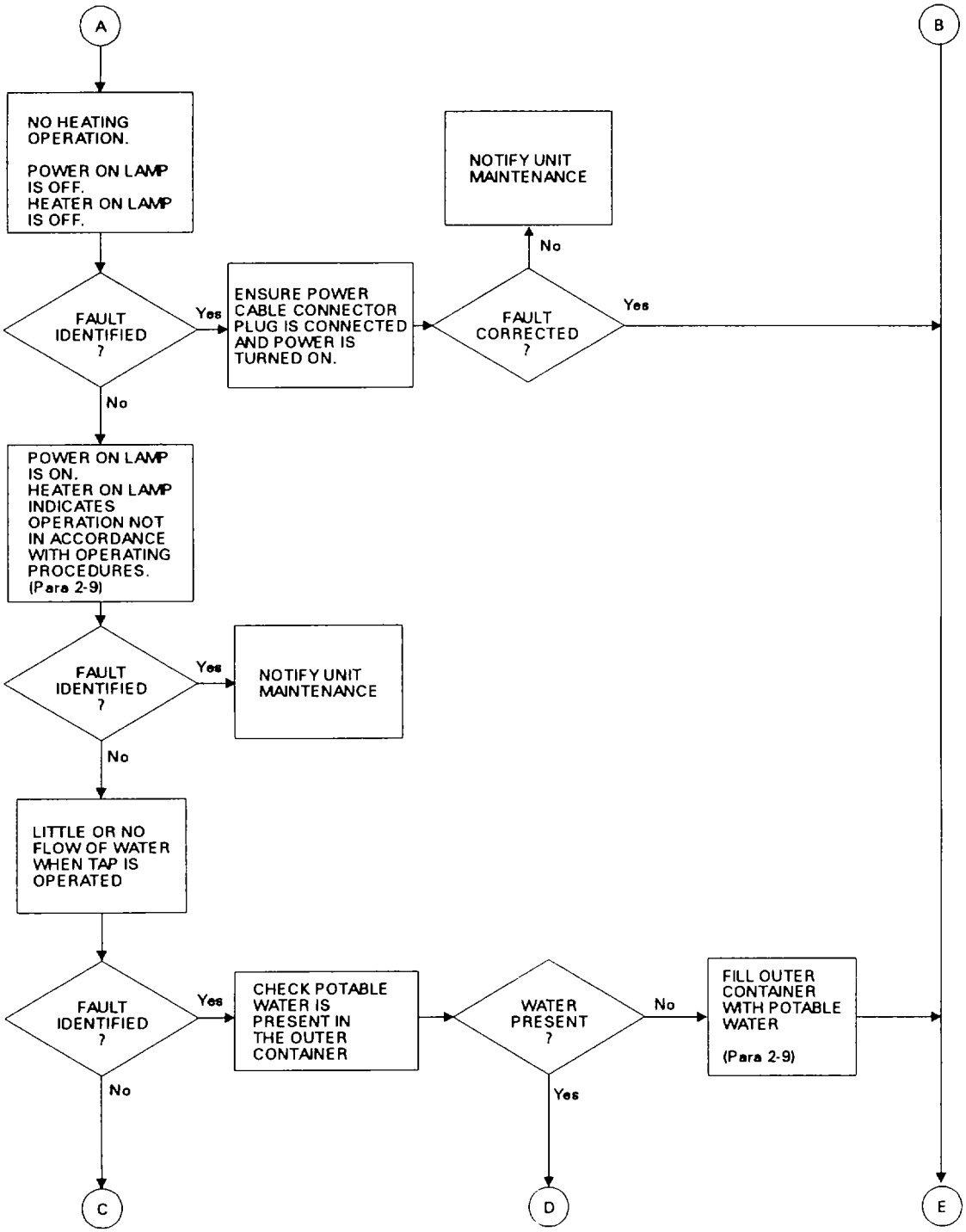
This troubleshooting flowchart describes typical malfunctions which are most likely to occur when operating the HWR. To use the flowchart, commence at the START function and check each set of fault conditions against the observed malfunction. When the matching fault conditions are identified, rectify the malfunction by following the corrective action instructions in the order in which they appear.

The flowchart cannot contain all the malfunctions that may occur or all the corrective actions needed to rectify a particular malfunction. If a particular malfunction cannot be identified, or is not cleared by the corrective actions, notify Unit maintenance.

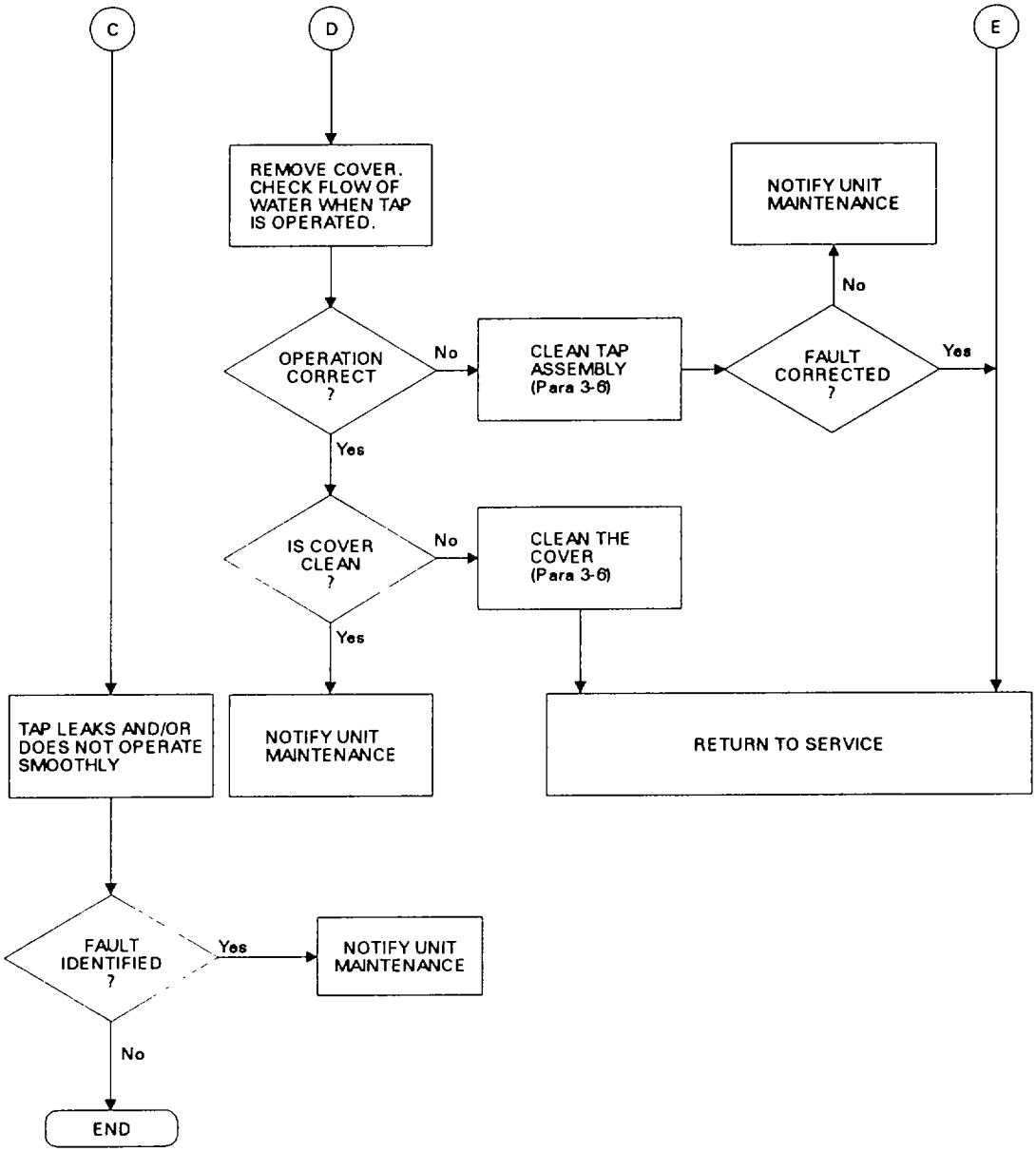
3-3. TROUBLESHOOTING INSTRUCTIONS (Continued)



3-3. TROUBLESHOOTING INSTRUCTIONS (Continued)



3-3. TROUBLESHOOTING INSTRUCTIONS (Continued)



Section III. OPERATOR'S MAINTENANCE PROCEDURES

3-4. GENERAL

Corrective maintenance by the operator is limited to the following procedures as authorized by the "Inspect" and "Service" functions of the MAC in Appendix B:

a. Inspection. Visual checks for correct installation, physical damage and loose or missing parts.

b. Cleaning. Cleaning of internal and external parts using hand dishwashing compound.

c. Sanitizing. Sanitizing of internal parts using food service disinfectant.

3-5. INSPECTION

Perform inspection of the HWR as described in Chapter 2, Section II, Preventive Maintenance Checks and Services (PMCS). Report defects on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

3-6. CLEANING

Cleaning of the HWR should be performed when required by the procedures described in Chapter 2, Section II, Preventive Maintenance Checks and Services (PMCS). Wipe the HWR cover, inner/outer containers and main case with a dry cleaning cloth (Appendix E, Section II, Item 2) after every use.

The HWR should be cleaned and sanitized weekly or more frequently if food stains appear.

WARNING

NON-POTABLE/DIRTY WATER (2). Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operations) when cleaning the HWR. Non-potable or dirty water can cause contamination of water or food.

CAUTION

- IMMERSION IN WATER. Do not immerse the HWR in water. The seeping of water to the control panel can result in the HWR becoming non-operational.
- CLEANING MATERIALS. Only use the authorized cleaning materials listed in Section II of Appendix E. Materials such as metal scouring pads can cause damage to the surface finish.
- DISHWASHING COMPOUND. Discard heated hand dishwashing compound solution in accordance with the disposal instructions in FM 21-10 (Field Hygiene and Sanitation).

NOTE

When the HWR is mounted in the host vehicle it is not necessary to disconnect the power supply when performing the cleaning procedures.

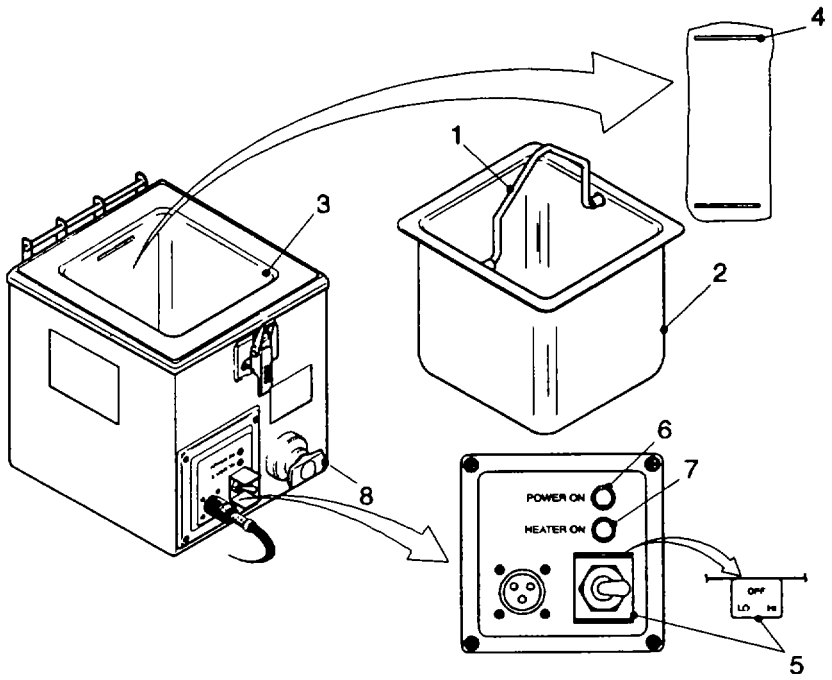
3-6. CLEANING (Continued)

a. Preliminary/Final Procedures.

(1) To prepare the HWR for cleaning, perform steps (1) thru (6) of Subparagraph 2-9a.

(2) To return the HWR to normal service, perform steps (9) thru (11) of Subparagraph 2-9b.

b. Cleaning the Inner/Outer Containers and Tap. Perform the following procedural steps in the given order:



(1) Prepare the HWR for cleaning in accordance with step (1) of Subparagraph 3-6a.

NOTE

If required, the fold-down wire handle (1) can be removed from the inner container (2) by squeezing the vertical arms towards the center until both ends are clear of the bearing sockets.

(2) Remove any loose food from the inner container (2) and outer container (3) by pre-scraping.

(3) Fill the outer container (3) with clean, potable water up to the one gallon level line (4) embossed on the rear wall.

(4) Set the LO/OFF/HI switch (5) to LO and verify that the POWER ON lamp (6) and HEATER ON lamp (7) are both on.

(5) When the HEATER ON lamp (7) goes off again (i.e., water is at selected temperature), set the LO/OFF/HI switch (5) to OFF and verify that the POWER ON lamp (6) is off.

(6) Using the pull-action tap (8), half-fill the inner container (2) with heated water from the outer container (3).

3-6. CLEANING (Continued)

(7) Using a field mess spoon (Appendix E, Section II, Item 6), add one ounce (i.e., two spoonfuls) of hand dishwashing compound (Appendix E, Section II, Item 3) to both containers and stir vigorously to produce suds.

NOTE

In step (8), retain the wash water if the cover (Subparagraph 3.6c) and/or the main case (Subparagraph 3.6d) are to be cleaned.

(8) Clean the pull-action tap (8) by draining-off one canteen cupful of the outer container (3) wash water and discard if not required.

(9) Using a scrub brush (Appendix E, Section II, Item 1) or a scouring pad (Appendix E, Section II, Item 5), scrub both containers until they are free of any persistent food residue and/or discoloration.

(10) Discard the contents of both containers.

(11) Half-fill the outer container (3) with clean, potable water and rinse off all traces of hand dishwashing compound.

(12) Flush the pull-action tap (8) by draining-off the outer container (3) rinse water into a receptacle of suitable capacity and discard.

(13) Rinse the inner container (2) with clean, potable water to remove all traces of hand dishwashing compound.

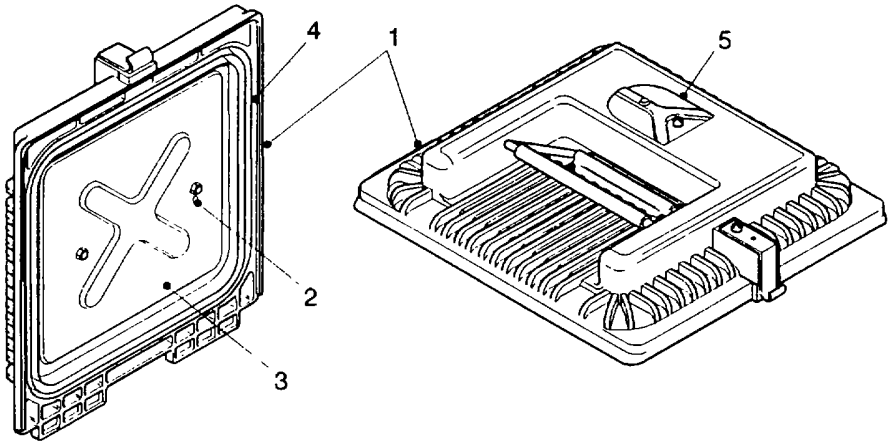
(14) Allow both containers to air dry.

NOTE

To clean the cover perform the procedure in Subparagraph 3-6c or to clean the main case perform the procedure in Subparagraph 3-6d. Otherwise proceed to step (15).

(15) Return the HWR to normal service in accordance with step (2) of Subparagraph 3-6a.

c. Cleaning the Cover. Perform the following procedural steps in the given order:



3-6. CLEANING (Continued)

(1) To prevent the seeping of liquid into the interior of the cover (1), block-off the small steam hole (2) in the seal retaining plate (3) using an easily removable means (e.g., tapered wooden peg of suitable size).

(2) Remove any loose food from the seal retaining plate (3) and cover seal (4) by pre-scraping.

(3) Using a scrub brush (Appendix E, Section II, Item 1) or a scouring pad (Appendix E, Section II, Item 5), scrub the seal retaining plate (3) until it is free of any persistent food residue and/or discoloration.

(4) Wash the cover (1) with the heated hand dishwashing compound solution retained in step (8) of Subparagraph 3-6b taking care to avoid splashing or immersing the pressure relief valve (5).

(5) Rinse the cover (1) with clean, potable water to remove all traces of hand dishwashing compound taking care to avoid splashing or immersing the pressure relief valve (5).

(6) Allow cover (1) to air dry.

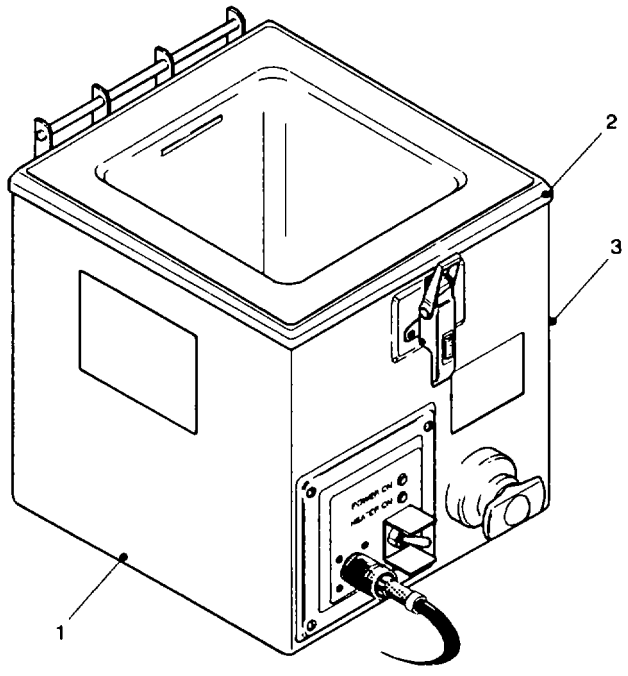
(7) On the cover (1), unblock the small steam hole (2) in the seal retaining plate (3).

NOTE

To clean the main case perform the procedure in Subparagraph 3-6d. Otherwise proceed to step (8).

(8) Return the HWR to normal service in accordance with step (2) of Subparagraph 3-6a.

d. Cleaning the Main Case. Perform the following procedural steps in the given order:



3-6. CLEANING (Continued)

(1) Remove any loose food from the main case (1) and case seal (2) by pre-scraping.

(2) Wipe the case seal (2) with a cleaning cloth (Appendix E, Section II, Item 2) which has been soaked in the heated hand dishwashing compound solution retained in step (8) of Subparagraph 3-6b.

(3) Wipe the case seal (2) with a damp cleaning cloth (Appendix E, Section II, Item 2) to remove all traces of hand dishwashing compound.

(4) Clean the main case (1) using a cleaning cloth (Appendix E, Section II, Item 2) and the heated hand dishwashing compound solution retained in step (8) of Subparagraph 3-6b taking care to avoid splashing the control panel (3).

(5) Rinse the main case (1) with clean, potable water to remove all traces of hand dishwashing compound taking care to avoid splashing the control panel (3).

(6) Allow the main case (1) to air dry.

(7) Return the HWR to normal service in accordance with step (2) of Subparagraph 3-6a.

3-7. SANITIZING

Sanitizing of the HWR should be performed when required by the procedures described in Chapter 2, Section II, Preventive Maintenance Checks and Services (PMCS). The HWR should be cleaned and sanitized weekly or more frequently if food stains appear.

WARNING

NON-POTABLE/DIRTY WATER (2). Only use clean, potable water as defined in FM 10-52 (Water Supply in Theaters of Operations) when cleaning the HWR. Non-potable or dirty water can cause contamination of water or food.

CAUTION

- IMMERSION IN WATER. Do not immerse the HWR in water. The seeping of water to the control panel can result in the HWR becoming non-operational.
- CLEANING MATERIALS. Only use the authorized cleaning materials listed in Section II of Appendix E. Materials such as metal scouring pads can cause damage to the surface finish.
- FOOD SERVICE DISINFECTANT. Discard heated food service disinfectant solution in accordance with the disposal instructions in FM 21-10 (Field Hygiene and Sanitation).

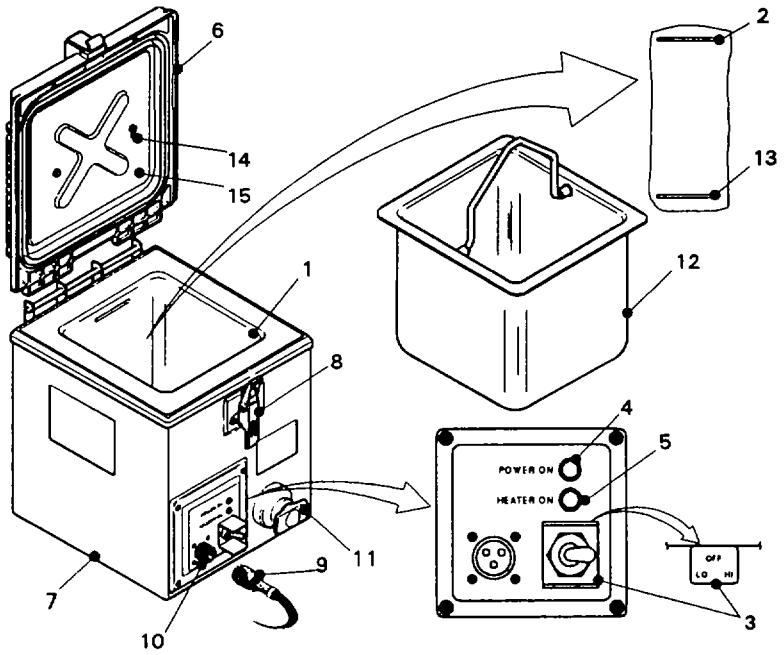
3-7. SANITIZING (Continued)

a. Preliminary/Final Procedures.

(1) To prepare the HWR for sanitizing, perform steps (1) thru (6) of Subparagraph 2-9a.

(2) To return the HWR to normal service, perform steps (9) thru (11) of Subparagraph 2-9b.

b. Sanitizing Procedure. Perform the following procedural steps in the given order:



(1) Prepare the HWR for sanitizing in accordance with step (1) of Subparagraph 3-7a.

(2) Fill the outer container (1) with clean, potable water up to the one gallon level line (2) embossed on the rear wall.

(3) Set the LO/OFF/HI switch (3) to LO and verify that the POWER ON lamp (4) and HEATER ON (5) are both on.

(4) When the HEATER ON lamp (5) goes off again (i.e., water is at selected temperature), set the LO/OFF/HI switch (3) to OFF and verify that the POWER ON lamp (4) is off.

(5) Fit the cover (6) onto the main case (7) ensuring that it is properly closed and secured by the latch (8).

(6) Tum off the power supply then disconnect the power cable connector plug (9) from the connector receptacle (10).

(7) Remove the HWR from the host vehicle, place upright in a suitable work location then unlatch and remove the cover (6).

3-7. SANITIZING (Continued)

(8) Using a field mess spoon (Appendix E, Section II, Item 6), add one spoonful of food service disinfectant (Appendix E, Section II, Item 4) to the heated water in the outer container (1) and stir thoroughly until fully dissolved.

(9) Wait five minutes then drain-off one canteen cupful of the food service disinfectant/heated water solution through the pull-action tap (11) and discard.

(10) Using the pull-action tap (11), drain-off the heated food service disinfectant solution into the inner container (12) until the level in the outer container (1) falls to the 40 fluid ounce level line (13) embossed on the rear wall.

(11) Install the inner container (12) into the main case (7) taking care to not spill the heated food service disinfectant solution.

(12) To prevent the seeping of liquid into the interior of the cover (6), block-off the small steam hole (14) in the seal retaining plate (15) using an easily removable means (e.g., tapered wooden peg of suitable size).

(13) Install the cover (6) onto the main case (7) ensuring that it is properly closed and secured by the latch (8).

(14) Temporarily invert the HWR to allow the heated food service disinfectant solution to reach all internal surfaces then return it to the upright position.

NOTE

Allow the HWR to stand upright for a minimum period of 20 minutes before proceeding to step (15).

(15) Unlatch and remove the cover (6) then remove the inner container (12) and discard the heated food service disinfectant solution.

(16) Using the pull-action tap (11), drain-off the heated food service disinfectant solution from the outer container (1).

(17) Half-fill the outer container (1) with clean, potable water and rinse off all traces of food service disinfectant.

(18) Flush the pull-action tap (11) by draining-off the outer container (1) rinse water into a receptacle of suitable capacity and discard.

(19) Rinse the inner container (12) with clean, potable water to remove all traces of food service disinfectant.

(20) Allow the cover (6) and both containers to air dry.

(21) On the cover (6), unblock the small steam hole (14) in the seal retaining plate (15).

(22) Install the HWR in the host vehicle, connect the power cable connecting plug (9) to the connector receptacle (10) then turn on the power supply.

(23) Return the HWR to normal service in accordance with step (2) of Subparagraph 3-7a.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

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

4-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) as applicable for your unit.

The following tool kits are required for maintenance of the HWR at Unit level:

a. Tool Kit, General Mechanics: Automotive.

b. Shop Equipment, Common, No 1.

4-2. SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

a. List of Special Tools. No special tools are required.

b. List of Test, Measurement and Diagnostic Equipment.

(1) Multimeter, Digital (Component of Shop Equipment, Common, No 1). (Appendix B Section III Item 2).

c. List of Support Equipment. No support equipment is required.

4-3. REPAIR PARTS

Repair parts are listed and illustrated in Appendix C of this manual.

Section II. SERVICE UPON RECEIPT

4-4. UNPACKING

The HWR is packaged in a cardboard container designed for shipment and handling. No unusual unpacking procedures are required but exercise care when removing the HWR from the container to prevent accidental damage. Keep the container (plus packing material) for future use.

4-5. CHECKING UNPACKED EQUIPMENT

After unpacking, check the HWR for damage, completeness and modifications as follows:

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

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

c. Check the modification status. If the HWR has been modified the Modification Work Order (MWO) number will appear near the nomenclature plate. Check to see if the MWO number (if any) and appropriate notations concerning the MWO have been entered in this manual. Current MWOs are listed in DA Pam 750-10.

4-6. INSTALLATION INSTRUCTIONS

Refer to the appropriate technical manual(s) for information on the installation kit which covers all the location, mounting and electrical connection requirements for the HWR in the host vehicle.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-7. GENERAL

Preventive Maintenance Checks and Services (PMCS) provide systematic care, inspection and servicing of the HWR to keep it in good condition and help to prevent malfunctions.

The responsibilities associated with PMCS of the HWR at Unit level are as described in the following subparagraphs:

a. Always perform the PMCS procedures in the same order so that a routine is established which allows any malfunction(s) to be quickly identified.

4-7. GENERAL (Continued)

b. Perform the PMCS procedures at a regular time within the stated periods.

c. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

d. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any malfunction(s) which are identified during PMCS and cannot be corrected. DO NOT record any malfunction(s) which have been identified and corrected.

e. Be prepared to assist with higher level maintenance tasks when requested.

4-8. PMCS PROCEDURES

The Preventive Maintenance Checks and Services given in Table 4-1 list the inspections and care required to keep the HWR in good operating condition.

The following subparagraphs describe the column entries in Table 4-1:

a. The "ITEM No." column indicates the consecutive numerical order assigned to the procedures. The item numbers are also used when recording the results of PMCS on DA Form 2404, Equipment Inspection and Maintenance Worksheet.

b. The "INTERVAL" column indicates when a check or service should be performed.

c. The "LOCATION, ITEM TO CHECK/SERVICE" column identifies the part which is to be checked or serviced.

d. The "PROCEDURE" column contains appropriate instructions for the performance of each check or service.

e. The "NOT FULLY MISSION CAPABLE IF" column describes the conditions under which the HWR is not mission capable and why it cannot be used.

f. Refer to Chapter 4, Section IV, Unit Troubleshooting Procedures if the HWR does not perform as stated.

g. If a malfunction is identified and cannot be corrected, write out a DA Form 2404 IMMEDIATELY and report it to the supervisor.

h. The following general checks should be performed as necessary:

(1) **Corrosion**. Report corrosion problems in accordance with the instructions given in Chapter 1, Section I, Paragraph 1-4.

(2) **Screws and Nuts**. Check for looseness, missing, bent or broken condition. Tighten or replace as required.

(3) **Power Cable Connector Plug**. Check for proper fit of the connector plug and for signs of physical damage to the connector plug or power cable. Tighten connector plug to hand tightness if loose.

TABLE 4-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
1	Monthly		a. Test Operational of pressure relief valve (Paragraph 4-12).	Pressure relief valve does not seat correctly

Section IV. UNIT TROUBLESHOOTING PROCEDURES

4-9. GENERAL

Unit troubleshooting is based on malfunctions or failures observed during operator PMCS (Chapter 2, Table 2-1), Unit PMCS (Table 4-1) or operational use of the HWR.

4-10. TROUBLESHOOTING INSTRUCTIONS

WARNING

ELECTRIC SHOCK. Do not be misled by the term "low-voltage". Whenever possible turn off and disconnect the HWR power supply before performing any work. Potentials as low as 30 V dc can cause severe electric shock or death under adverse conditions.

HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 190°F (88°C) and can reach higher temperatures under abnormal conditions. Use gloves or other hand protection as necessary. Unprotected exposure to high temperatures can cause serious burn injuries.

FIRST AID. Never work on the HWR unless there is another person present who is competent in administering first aid. The absence of first aid can result in serious personal injury or even death. Refer to FM 21-11 (First Aid for Soldiers) for appropriate first aid instructions.

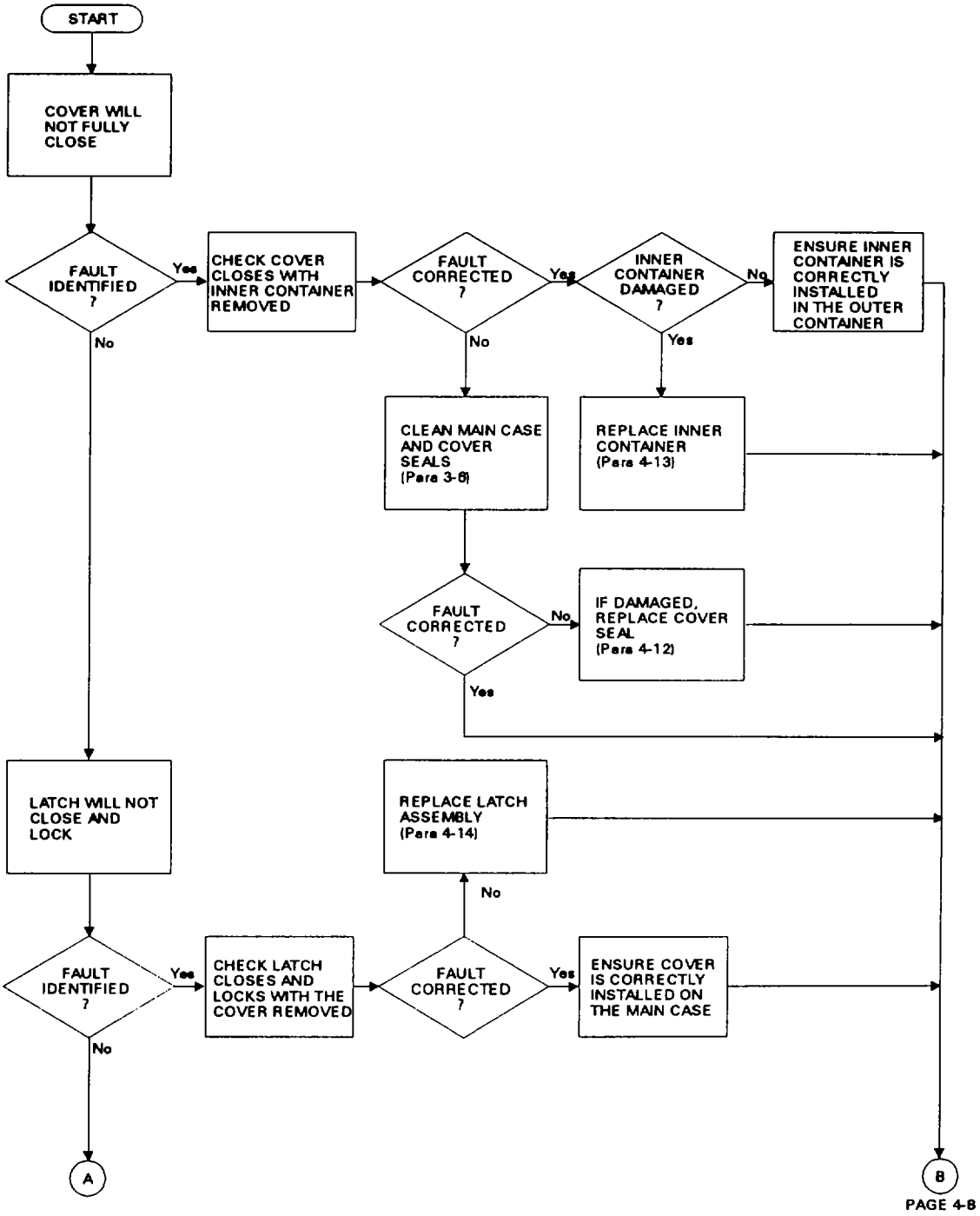
CAUTION

DISASSEMBLY. Do not attempt disassembly beyond that which is necessary for Unit troubleshooting and maintenance. Unauthorized disassembly can result in the HWR becoming non-operational.

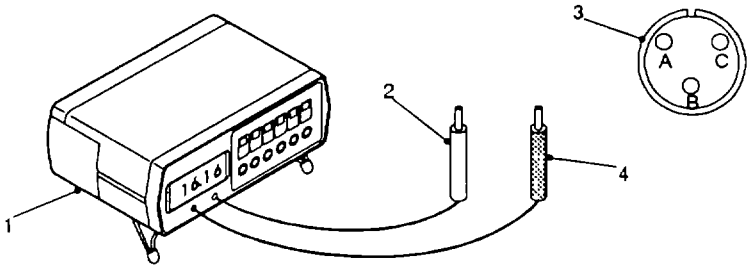
This troubleshooting flowchart describes typical malfunctions which are most likely to occur when operating the HWR. To use the flowchart, commence at the START function and check each set of fault conditions against the observed malfunction. When matching fault conditions are identified, rectify the malfunction by following the corrective action instructions in the order in which they appear.

The flowchart cannot contain all the malfunctions that may occur or all the corrective actions needed to rectify a particular malfunction. If a particular malfunction cannot be identified, or is not cleared by the corrective actions, notify your supervisor.

4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)



4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)



A

NO HEATING OPERATION.

POWER ON LAMP IS OFF.
HEATER ON LAMP IS OFF.

FAULT IDENTIFIED ?

Yes

ENSURE POWER CABLE CONNECTOR PLUG IS CONNECTED AND POWER IS TURNED ON.

FAULT CORRECTED ?

Yes

No

No

CHECK POWER SUPPLY POLARITY:

* DISCONNECT POWER CABLE CONNECTOR PLUG (3) FROM HWR CONNECTOR RECEPTACLE.
* SET MULTIMETER (1) TO READ DC VOLTS.
* CONNECT RED (+) TEST PROBE (2) TO A ON POWER CABLE CONNECTOR PLUG (3).
* CONNECT BLACK (-) TEST PROBE (4) TO B ON POWER CABLE CONNECTOR PLUG (3).
* VERIFY MULTIMETER READING IS A POSITIVE (+) VOLTAGE.

POLARITY CORRECT ?

Yes

CONNECT POWER CABLE CONNECTOR PLUG (3) TO HWR CONNECTOR RECEPTACLE

No

REFER TO HOST VEHICLE TECHNICAL MANUAL(S)

TEST OPERATION OF TOGGLE SWITCH (Para 4-16)

OPERATION CORRECT ?

No

RELACE TOGGLE SWITCH (Para 4-16)

Yes

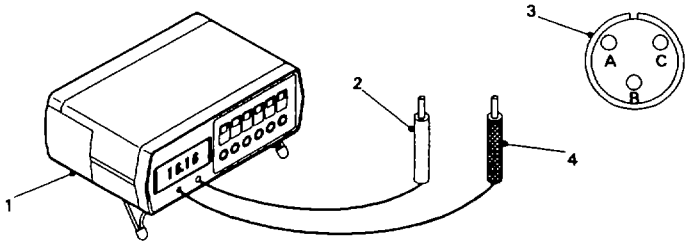
REPLACE HWR

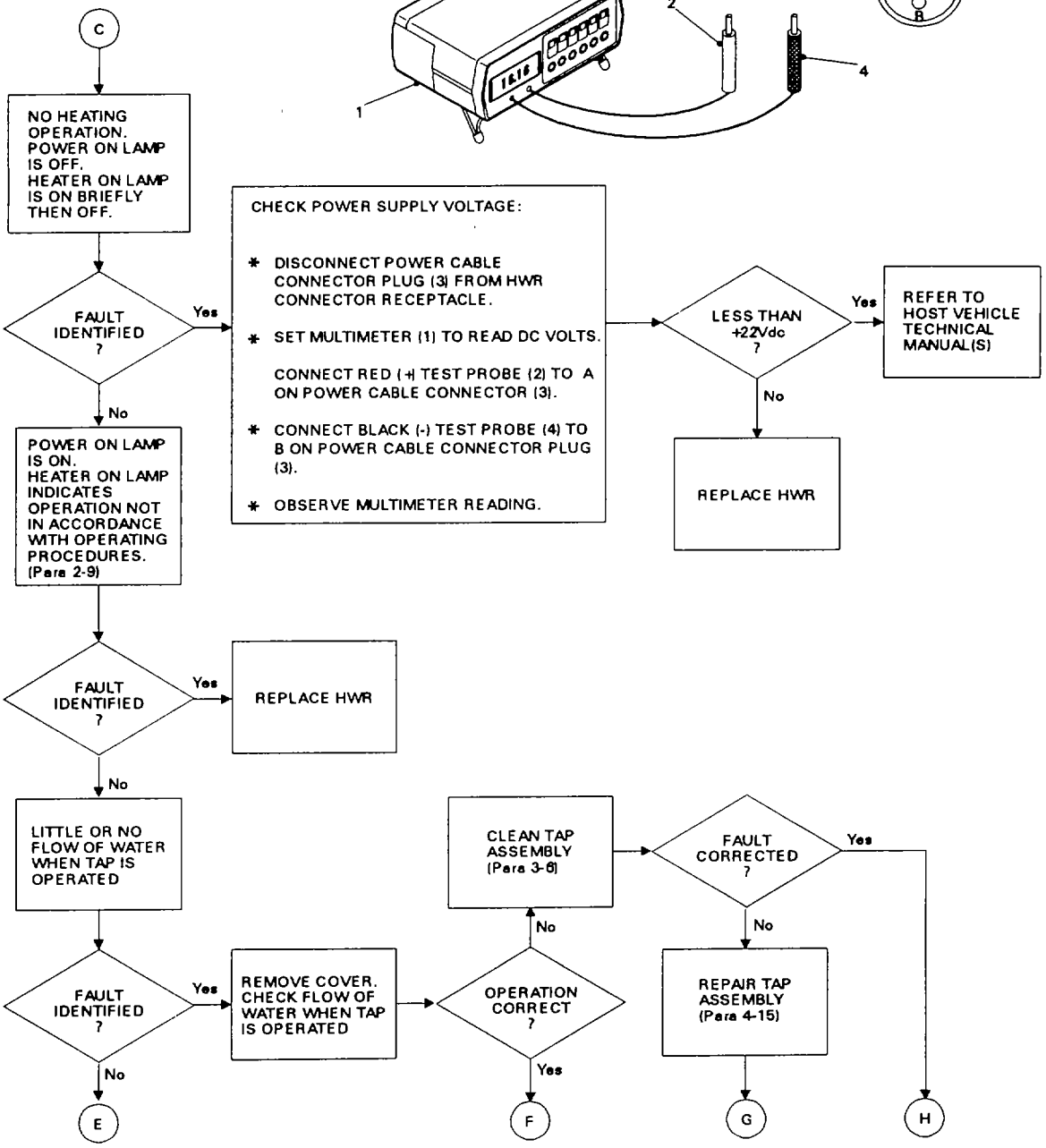
C

D

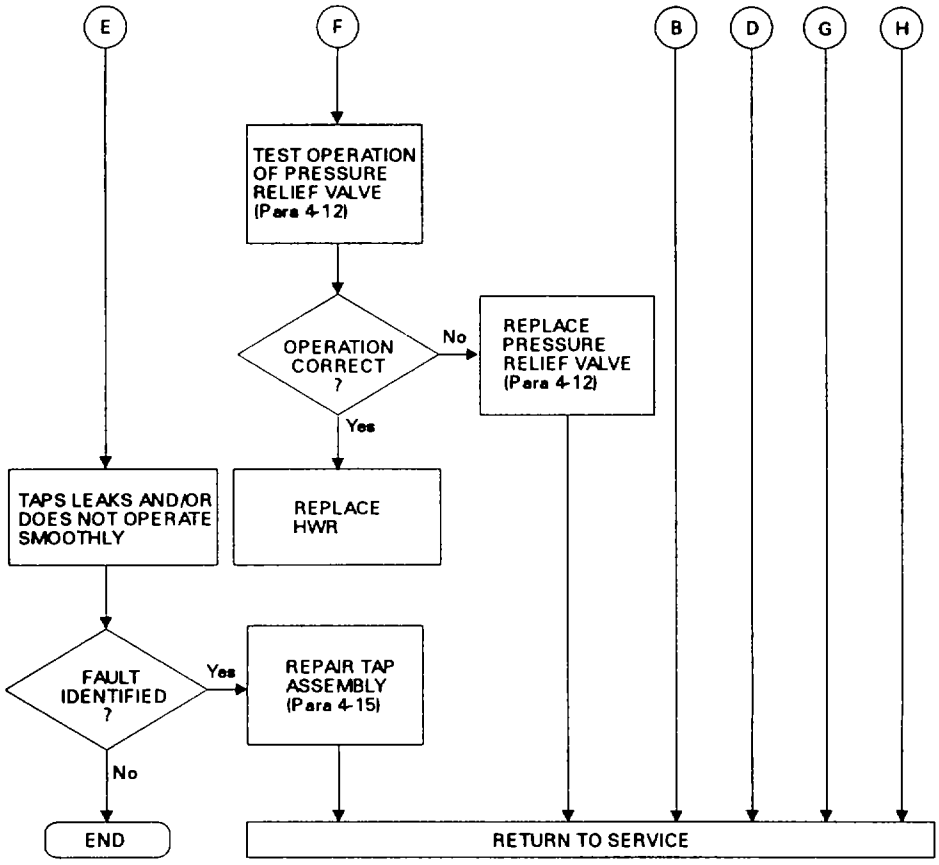
PAGE 4-8

4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)





4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)



Section V. UNIT MAINTENANCE PROCEDURES

4-11. GENERAL

This section contains unit maintenance procedures as authorized by the Maintenance Allocation Chart (MAC) provided in Appendix B. The maintenance procedures consist of step-by-step instructions and will be performed by one person unless otherwise indicated in the initial setup.

Read all WARNINGS, CAUTIONS, NOTES and instructions carefully before working on the HWR. Read and understand all the WARNINGS listed in the front of this manual.

WARNING

ELECTRIC SHOCK. Do not be misled by the term "low-voltage". Whenever possible turn off and disconnect the HWR power supply before performing any work. Potentials as low as 30 V dc can cause severe electric shock or death under adverse conditions.

HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 190°F (88°C) and can reach higher temperatures under abnormal conditions. Use gloves or other hand protection as necessary. Unprotected exposure to high temperatures can cause serious bum injuries.

FIRST AID. Never work on the HWR unless there is another person present who is competent in administering first aid. The absence of first aid can result in serious personal injury or even death. Refer to FM 21-11 (First Aid for Soldiers) for appropriate first aid instructions.

CAUTION

DISASSEMBLY. Do not attempt disassembly beyond that which is necessary for each maintenance task. Unauthorized disassembly can result in the HWR becoming non-operational.

WORK SURFACE. Always ensure that the work surface is clean and not obstructed. A dirty or unsafe surface can cause damage to the HWR.

4-12. REPAIR OF COVER ASSEMBLY

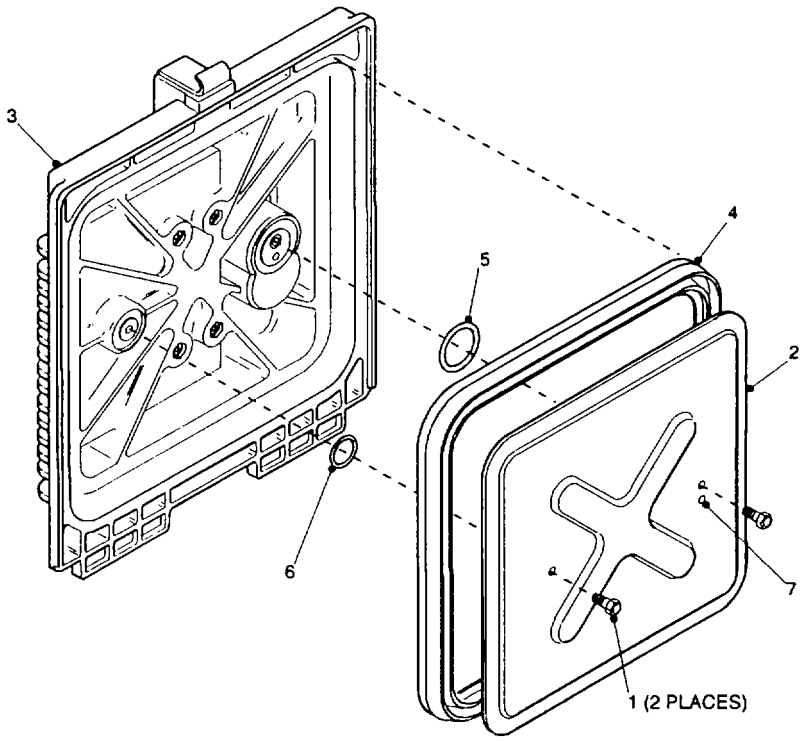
This task covers: a. Removal of cover seal and preformed packing.
b. Installation of cover seal and preformed packing.
c. Removal of pressure relief valve.
d. Test of pressure relief valve.
e. Installation of pressure relief valve.

INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive (Appendix B, Section III, Item 1).

Parts/Materials: Kit, Cover Seal, and Kit, Pressure Relief Valve.

HWR Condition: Cover removed (Subparagraph 2-9a, steps (1) thru (5)).



a. Removal of Cover Seal and Preformed Packing.

(1) Remove and retain two screws (1) securing the seal retaining plate (2) to the underside of the cover (3).

(2) Carefully lift the seal retaining plate (2) from its seating in the cover seal (4).

(3) Remove and retain the seal retaining plate (2).

(4) Remove and discard the cover seal (4).

(5) Remove and discard the large preformed packing (5).

(6) Remove and discard the small preformed packing (6).

4-12. REPAIR OF COVER ASSEMBLY (Continued)

b. Installation of Cover Seal and Preformed Packing.

(1) Install cover seal (4) by aligning it with the cover (3) and pressing firmly into position.

(2) Install large preformed packing (5) in the cover (3) and ensure that it is correctly positioned.

(3) Install small preformed packing (6) in the cover (3) and ensure that it is correctly positioned.

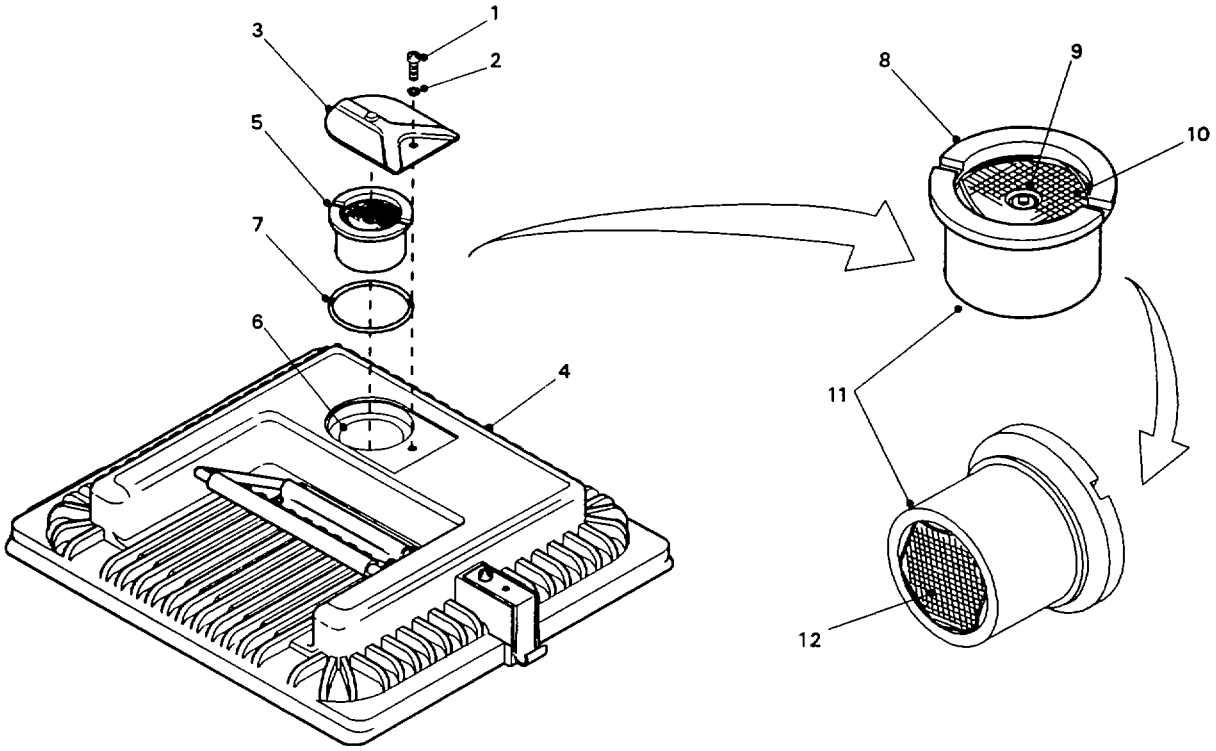
(4) Install seal retaining plate (2) to the cover seal (4) with the small steam hole (7) located as shown.

CAUTION

DAMAGE TO SCREWS. In step (5), use standard hand tools to install the screws (1) and only tighten with sufficient torque to ensure that the seal retaining plate (2) is held firmly in position. The application of excessive torque can result in damage to the screws (1).

(5) Ensure that both screw holes are correctly aligned then install and tighten the two screws (1).

(6) Install the cover (Subparagraph 2-9a, steps (8) and (9)).



c. Removal of Pressure Relief Valve.

(1) Remove and retain screw (1) and lock washer (2) securing the valve retaining plate (3) to the cover (4).

(2) Lift up valve retaining plate (3) from the cover (4) to gain access to the pressure relief valve (5).

4-12. REPAIR OF COVER ASSEMBLY (Continued)

(3) Carefully lift out pressure relief valve (5) from the valve recess (6).

(4) Remove and discard preformed packing (7) from the valve recess (6).

d. Testing of Pressure Relief Valve.

(1) Place pressure relief valve (5) on a clean, flat surface with the flange (8) uppermost and verify that the valve stem (9) is level with the inward gauze filter (10).

NOTE

In step (2) the valve stem (9) will also momentarily protrude beyond the level of the inward gauze filter (10).

(2) Using a suitable tool (e.g., ballpoint pen top), carefully depress the valve stem (9) to its full extent and verify that it moves freely with no binding of the internal spring.

(3) Release the valve stem (9) and verify that it returns to a position level with the inward gauze filter (1 0).

(4) Hand-hold the pressure relief valve (5) and place the base (11) firmly against the mouth.

(5) Blow sharply through the outward gauze filter (12) and verify that the valve operates with a clearly audible sound.

(6) Verify that the valve stem (9) has returned to a position level with the inward gauze filter (10).

e. Installation of Pressure Relief Valve.

(1) Check valve recess (6) is clean and the small steam hole at the bottom is not blocked.

(2) Install preformed packing (7) in the valve recess (6) and ensure that it is correctly positioned.

(3) Install pressure relief valve (5) in the valve recess (6) and rotate with downwards pressure to ensure that it is correctly positioned.

(4) Install valve retaining plate (3) in the cover (4) and ensure that it is correctly positioned.

CAUTION

DAMAGE TO SCREW. In step (5), use standard hand tools to install the screw (1) and only tighten with sufficient torque to ensure that the valve retaining plate (3) is held firmly in position. The application of excessive torque can result in damage to the screw (1).

(5) Ensure that the screw hole is correctly aligned then install lock washers (2) and install and tighten screws (1).

(6) Install the cover (Subparagraph 2-9a, steps (8) and (9)).

4-13. REPLACEMENT OF INNER CONTAINER ASSEMBLY

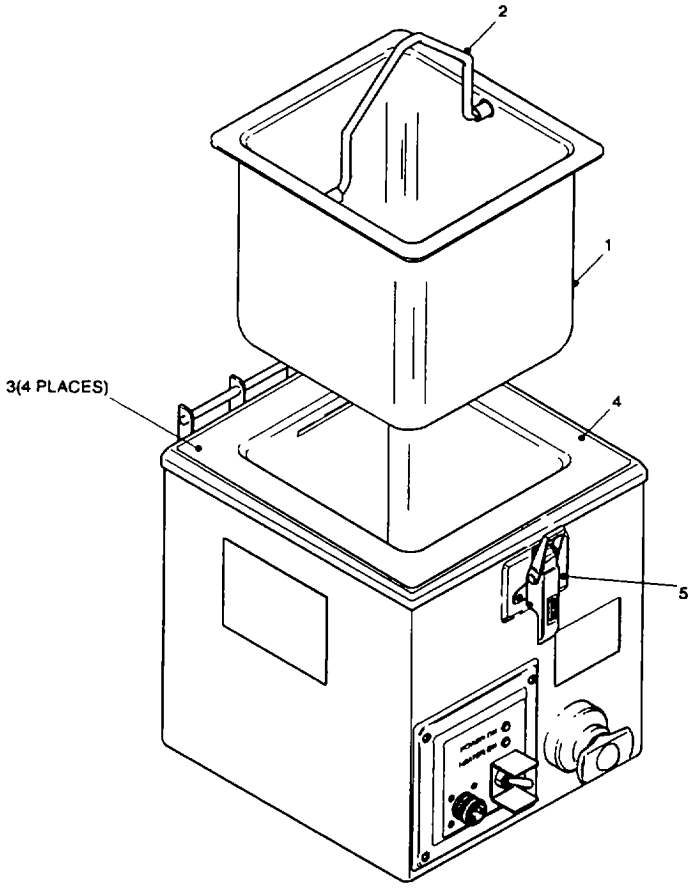
This task covers: a. Removal of inner container assembly.
b. Installation of inner container assembly.

INITIAL SETUP

Tools: None.

Parts/Materials: None.

HWR Condition: Cover removed (Subparagraph 2-9a, steps (1) thru (5)).



a. Removal of inner container assembly. Remove inner container (1) using fold-down wire handle (2).

b. Installation of inner container assembly.

(1) Install inner container (1) using fold-down wire handle (2) and check that it seats evenly on the four "pips" (3) embossed on the top flange of the outer container (4).

(2) Install the cover (Subparagraph 2-9a, steps (8) and (9)) and check that the latch (5) will close and lock.

4-14. REPLACEMENT OF LATCH ASSEMBLY

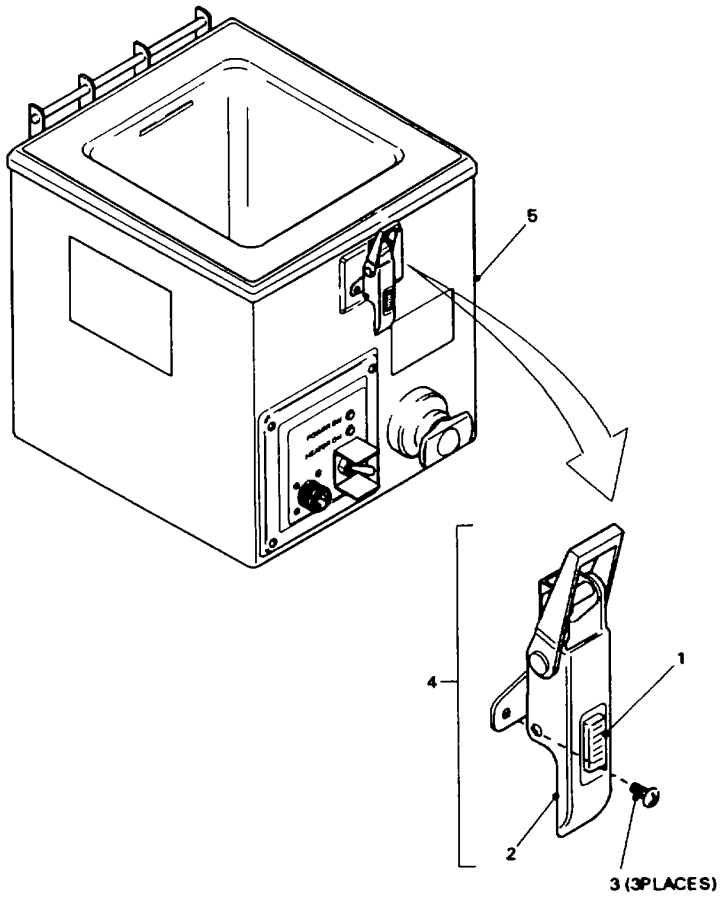
This task covers: a. Removal of latch assembly.
b. Installation of latch assembly.

INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive (Appendix B, Section III, Item 1).

Parts/Materials: None.

HWR Condition: Cover removed (Subparagraph 2-9a, steps (1) thru (5)).
Inner Container removed (Subparagraph 4-13a).



a. Removal of latch assembly.

(1) Operate unlocking catch (1) upwards to release the operating lever (2).

(2) Rotate operating lever (2) upwards to its full extent and hold in position.

(3) Remove and retain three mounting screws (3) securing latch assembly (4) to the main case (5).

(4) Remove latch assembly (4).

4-14. REPLACEMENT OF LATCH ASSEMBLY (Continued)

b. Installation of latch assembly.

(1) Rotate operating lever (2) upwards to its full extent and hold in position.

(2) Locate latch assembly (4) on the main case (5) and position it such that the three mounting holes are correctly aligned.

CAUTION

DAMAGE TO SCREWS. In step (3), use standard hand tools to install the mounting screws (3) and only tighten with sufficient torque to ensure that the latch assembly (4) is held firmly in position. The application of excessive torque can result in damage to the mounting screws (3).

(3) Install and tighten three mounting screws (3).

(4) Install the inner container (Subparagraph 4-13b, step (1)).

(5) Install the cover (Subparagraph 2-9a, steps (8) and (9)).

4-15. REPAIR OF TAP ASSEMBLY

This task covers:
a. Removal of valve preformed packing, valve spring, body gasket and body preformed packing.
b. Installation of valve preformed packing, valve spring, body gasket and body preformed packing.

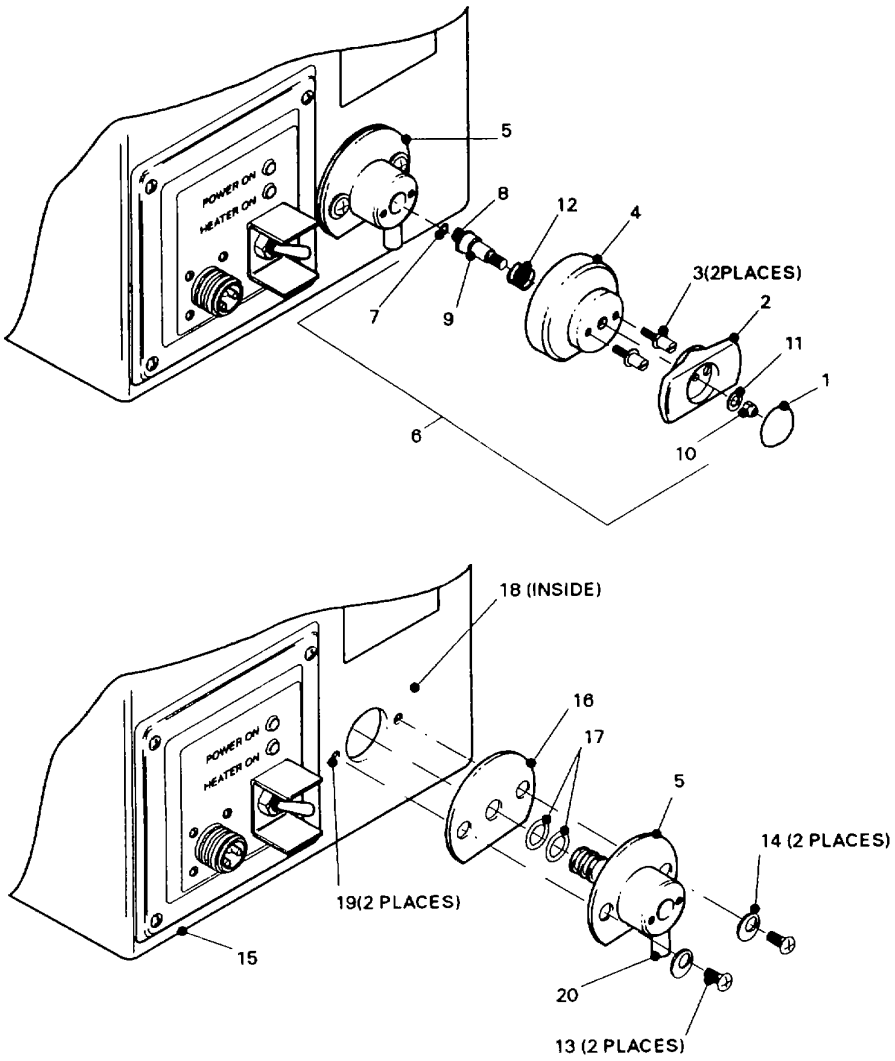
INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive (Appendix B, Section III, Item 1).

Parts/Materials: Kit, Tap Assembly.

HWR Condition: Cover removed (Subparagraph 2-9a, steps (1) thru (5)).
Inner Container removed (Subparagraph 4-13a).

4-15. REPAIR OF TAP ASSEMBLY (Continued)



a. Removal of valve preformed packing, valve spring, body gasket and body preformed packing.

(1) Using a flat tip screwdriver, remove the press-fit plastic cap (1) from center of the handle (2).

(2) Loosen two captive screws (3) securing the shroud (4) to the tap body (5).

(3) Withdraw the complete tap valve assembly (6) from the tap body (5).

(4) Remove and discard the valve preformed packing (7).

4-16. REPAIR OF TAP ASSEMBLY (Continued)

CAUTION

VALVE PARTS. Care should be taken when performing step (5) as the valve parts will be loose when the valve nut (10) is released from the threaded portion of the valve stem (9).

(5) Perform the following:

a. Insert a flat tip screwdriver into slot (8) to prevent the valve stem (9) from rotating.

b. Remove and retain valve nut (10) and washer (11).

c. Withdraw handle (2), shroud (4) and valve spring (12) from the valve stem (9).

d. Discard the valve spring (12).

(6) Remove and retain two screws (13) and special washers (14) securing the tap body (5) to the main case (15).

(7) Carefully withdraw tap body (5) and gasket (16) until free of the main case (15).

(8) Remove and discard the preformed packing (17).

(9) Remove and discard the gasket (16).

b. Installation of valve preformed packing, valve spring, body gasket and body preformed packing.

(1) Install gasket (16) and preformed packing (17) on the valve body (5).

(2) Install tap body (5) and gasket (16) by carefully pushing into the water outlet on the outer container (18) until even contact is made with the main case (15).

(3) Rotate tap body (5) and gasket (16) to the left or right as necessary to align with the two mounting holes (19) while ensuring that the spigot (20) is orientated as shown.

CAUTION

DAMAGE TO SCREWS. In step (4), use standard hand tools to install the screws (13) and only tighten with sufficient torque to ensure that the tap body (5) is held firmly in position. The application of excessive torque can result in damage to the screws (13).

(4) Install and tighten two screws (13) and special washers (14). Orient washers (14) to cover holes on tap body (5).

4-16. REPAIR OF TAP ASSEMBLY (Continued)

CAUTION

VALVE PARTS. Care should be taken when performing step (5) as the valve parts will be loose until the valve nut (10) is started on the threaded portion of the valve stem (9).

(5) Perform the following:

a. Install valve spring (12) and shroud (4) on the valve stem (9).

b. Install two mounting screws (3) and handle (2) on the shroud (4).

c. Install washer (11) and valve nut (10) on the valve stem (9).

d. Insert a flat tip screwdriver into slot (8) to prevent valve stem (9) from rotating.

e. Tighten valve nut (10).

(6) Check that the valve stem (9) can move freely over its full range with no binding of the valve spring (12).

(7) Install preformed packing (7) on the valve stem (9).

(8) Install the tap valve by carefully pushing it fully home into the tap body (5).

(9) Rotate the tap valve to the left or right as necessary to achieve correct positioning of the two mounting screws (3) with the tap body (5).

CAUTION

DAMAGE TO SCREWS. In step (10), use standard hand tools to install the screws (3) and only tighten with sufficient torque to ensure that the tap valve is held firmly in position. The application of excessive torque can result in damage to the screws (3).

(10) Tighten two mounting screws (3) securing shroud (4) to the tap body (5).

(11) Install press-fit plastic cap (1) in the center of the handle (2).

(12) Install the inner container (Subparagraph 4-13b, step (1)).

(13) Install the cover (Subparagraph 2-9a, steps (8) and (9)).

4-16. REPAIR OF CONTROL PANEL ASSEMBLY

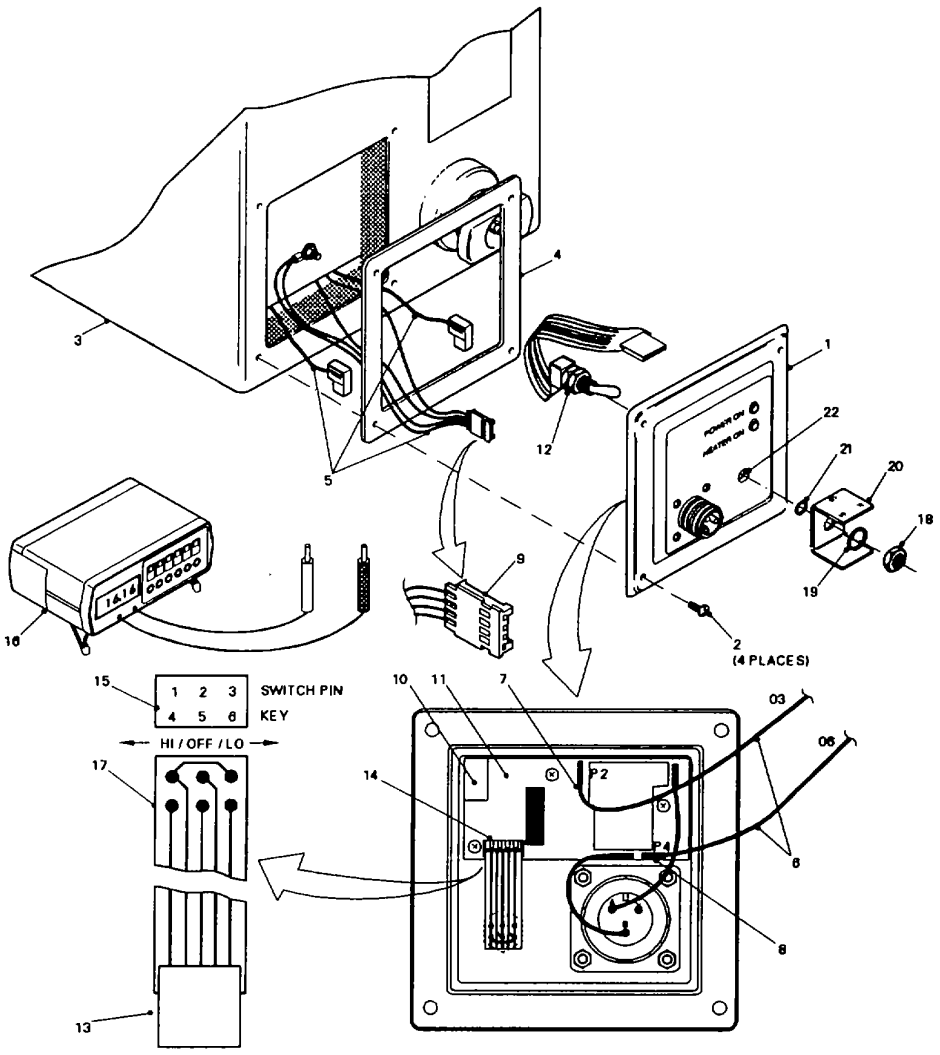
This task covers:
a. Removal of control panel.
b. Test of toggle switch.
c. Removal of toggle switch.
d. Installation of toggle switch.
e. Installation of control panel.

INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive (Appendix B, Section III, Item 1).
Shop Equipment, Common, No 1 (Appendix B, Section III, Item 2).

Parts/Materials: None.

HWR Condition: Vehicle power supply turned off.
Power cable connector plug disconnected.



4-16. REPAIR OF CONTROL PANEL ASSEMBLY (Continued)

a. Removal of Control Panel.

(1) Support the control panel (1) by hand and remove four mounting screws (2) until it is detached from the main case (3). The gasket (4) usually remains on the case.

(2) Withdraw control panel (1) to the full extent of the interconnect wiring (5).

(3) Disconnect 03 and 06 heater power supply wires (6) from connectors P2 (7) and P4 (8) on the PCB (11).

(4) Disconnect overheat sensor/boil-dry sensor connector (9) from connector CONN 1 (10) on the PCB (11).

(5) Remove and retain the control panel (1) complete with gasket (4) and mounting screws (2).

b. Test of Toggle Switch.

(1) Operate switch (12) between the LO, OFF and HI positions and verify that the action is firm with a positive stop in each position.

(2) Disconnect switch connector (13) from connector CONN 2 (14) on the PCB (11).

NOTE

In steps (3) and (4) "open-circuit" is taken to be a reading greater than 50 Mohm and "continuity" is taken to be a reading less than 0.5 ohm. A key (15) is provided for pin identification.

(3) Using the digital multimeter (16) set to read resistance, perform the following:

a. Set switch (12) to the OFF (center) position and check that an open-circuit reading is obtained between pins 1 & 2 (15), pins 2 & 3 (15), pins 4 & 5 (15) and pins 5 & 6 (15).

b. Set switch (12) to the LO (left) position and check that a continuity reading is obtained between pins 1 & 2 (15) and pins 4 & 5 (15). Check also that an open-circuit reading is obtained between pins 5 & 6 (15).

c. Set switch (12) to the HI (right) position and check that a continuity reading is obtained between pins 2 & 3 (15) and pins 5 & 6 (15). Check also that an open-circuit reading is obtained between pins 4 & 5 (15).

(4) Using the digital multimeter (16) set to read resistance, check that a continuity reading is obtained for each track of the ribbon-cable (17) between the switch (12) and switch connector (13).

c. Removal of Toggle Switch.

(1) Verify that switch connector (13) is disconnected from connector CONN 2 (14) on the PCB (11).

(2) Loosen lock nut (18) securing the switch (12) to the control panel (1).

(3) Remove and retain the lock nut (18), washer (19), switch guard (20) and switch gasket (21).

(4) Withdraw the toggle switch (12) from the rear of the control panel (1).

4-16. REPAIR OF CONTROL PANEL ASSEMBLY (Continued)

d. Installation of Toggle Switch.

(1) Using the keyway (22) to ensure correct positioning, insert toggle switch (12) into the control panel (1) then install switch gasket (21), switch guard (20) and washer (19) in that order.

CAUTION

DAMAGE TO LOCK NUT. In step (2), use standard hand tools to install the lock nut (18) and only tighten with sufficient torque to ensure that the switch (12) is held firmly in position. The application of excessive torque can result in damage to the threads on the switch (12) and/or the lock nut (18).

(2) Install and tighten the lock nut (18).

(3) Reconnect switch connector (13) to connector CONN 2 (14) on the PCB (11).

e. Installation of Control Panel.

NOTE

Ensure that the control panel (1) is complete with gasket (4), and mounting screws (2) before installing.

(1) Reconnect overheat sensor/boil-dry sensor connector (9) to connector CONN 1 (10) on the PCB (11).

(2) Reconnect 03 and 06 heater power supply wires (6) to connectors P2 (7) and P4 (8) respectively on the PCB (11).

(3) Locate control panel (1) on the main case (3) and position such that it is orientated as illustrated with the four mounting holes correctly aligned.

CAUTION

DAMAGE TO SCREWS. In step (4), use standard hand tools to install the screws (2) and only tighten with sufficient torque to ensure that the control panel (1) is held firmly in position. The application of excessive torque can result in damage to the screws (2).

(4) Install and tighten four mounting screws (2).

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4-17. SPECIAL INSTRUCTIONS FOR ADMINISTRATIVE STORAGE

a. 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 shall 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 (MWOs) should be applied.

c. 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.

4-18. PREPARATION FOR STORAGE

To prepare the HWR for storage, perform the inspection, cleaning and sanitizing procedures described in Chapter 3.

4-19. PREPARATION FOR SHIPMENT

Prepare the HWR for shipment by packing it into the original, or similar, packaging and container in which it was received.

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists the Forms, Field Manuals, Technical Manuals, Army Regulations, Department of the Army Pamphlets and Miscellaneous publications referenced in this manual.

A-2. FORMS

Recommended Changes to Publications ..... DA Form 2028
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404
Equipment Control Record ..... DA Form 2408-9
Report of Discrepancy ..... SF 364
Product Quality Deficiency Report ..... SF 368

A-3. FIELD MANUALS

Water Supply in Theaters of Operations ..... FM 10-52
Field Hygiene and Sanitation ..... FM 21-10
First Aid for Soldiers ..... FM 21-11

A-4. TECHNICAL MANUALS

Procedure for Destruction of Equipment to Prevent Enemy Use ..... TM 750-244-3

A-5. ARMY REGULATIONS

Dictionary of United States Army Terms ..... AR 310-25

A-6. DEPARTMENT OF THE ARMY PAMPHLETS

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30
US Army Equipment Index of MWOs ..... DA Pam 750-10
The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750

A-7. MISCELLANEOUS PUBLICATIONS

Expendable and Durable Items ..... CTA 50-970

APPENDIX B
MAINTENANCE ALLOCATION CHART

SECTION I. INTRODUCTION

B-1. SCOPE

This appendix is divided into four sections as follows:

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

b. Section II. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for 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 categories.

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

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

B-2. MAINTENANCE FUNCTIONS

Maintenance functions are limited to and defined as the following:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through visual examination.

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

c. Service. Operations required periodically to keep an item in proper operation condition, to clean, preserve, drain, paint or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

d. Adjust. To maintain within prescribed limits by bringing into proper or exact position or by setting operating characteristics to the 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 or diagnostic equipment used in precision measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

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 emplacement, sealing or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

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

B-2. MAINTENANCE FUNCTIONS (Continued)

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

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

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

B-3. MAINTENANCE ALLOCATION CHART

An explanation of the column entries is as follows:

a. GROUP NUMBER. This column lists group numbers (or functional group codes) the purpose of which is to identify components, assemblies, subassemblies and modules within the next higher assembly.

b. COMPONENT/ASSEMBLY. This column contains the name or nomenclature of components, assemblies, subassemblies and modules for which maintenance is authorized. Throwaway items such as lamps, tubes, resistors, modules, cards and like items are not considered repairable and therefore are not listed. However, a listing of such items in the repair parts and special tools lists (RPSTL) in Appendix C gives automatic authorization to replace such items at the lowest level of maintenance.

c. MAINTENANCE FUNCTION. This column lists the maintenance functions to be performed on the items listed in Column 2. When items are listed without maintenance functions it is solely for the purpose of having the group numbers in the MAC and RPSTL coincide.

d. MAINTENANCE LEVEL. This column specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels appropriate "worktime" figures will be shown for each level. The number of task-hours specified by the "worktime" figures will be shown for each level. The number of task-hours specified by the "worktime" 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, troubleshooting time and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in Column 3. The subcolumns of Column 4 are as follows:

UNIT	DIRECT SUPPORT	GENERAL SUPPORT	DEPOT
C = Operator/Crew	F = Direct Support	H = general Support	D = Depot
O = Organizational			

B3. MAINTENANCE ALLOCATION CHART (Continued)

e. TOOLS AND TEST EUIPMENT CODE. This column specifies (by a reference code number) the common tool sets, individual tools, special tools and the test and support equipment required to perform the designated maintenance function listed in Column 3. These reference code numbers are listed in Section III.

f. REMARKS CODE. This column contains an alphabetic code which identifies the remarks listed in Section IV. These remarks pertain to the item immediately adjacent to the particular code.

B-4. TOOLS AND TEST EQUIPMENT

The list of tools and test equipment for HWR is a supplement to the Maintenance Allocation Chart. All the common tools and special tools are listed as well as the test and support equipment required by the indicated maintenance level to perform its authorized maintenance functions.

An explanation of the column entries is as follows:

a. TOOL OR TEST EQUIPMENT CODE. This column contains numbers which coincide with the numbers used in Column 5 in the MAC. The numbers indicate the applicable tools and test equipment required for performing the designated maintenance functions.

b. MAINTENANCF LEVEL. This column contains the letter codes which indicate the maintenance category allocated to the specific tool or test equipment.

c. NOMENCLATURE. This column lists the name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. NATIONAL STOCK NUMBER. This column lists the National stock number of the specific tool or test equipment.

e. TOOL OR TEST EQUIPMENT NUMBER. This column lists the manufacturer's part number of the specified tool or test equipment.

B-5. REMARKS

An explanation of the column entries is as follows:

a. REMARKS CODE. This code refers to the appropriate item in the MAC.

b. REMARKS. This column provides the required explanatory information necessary to clarify items appearing in the MAC.

Section II. MAINTENANCE ALLOCATION CHART

GROUP No.	COMPONENT/ ASSEMBLY	MAINT FUNCTION	MAINTENANCE LEVEL					TOOLS & TEST EQUIP CODE	REMARKS CODE
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
00	HEATER, WATER AND RATION (HWR)								
01	COVER ASSEMBLY	INSPECT	0.1						A
		SERVICE	1.0						E
		REPAIR		0.3				1	B
0101	PRESSURE RELIEF VALVE	TEST		0.1					D
		REPLACE		0.2				1	
02	INNER CONTAINER ASSEMBLY	INSPECT	0.1						A
		SERVICE	1.0						E
		REPLACE		0.1					
03	MAIN CASE ASSEMBLY	INSPECT	0.1						A
		SERVICE	1.0						E
0301	LATCH ASSEMBLY	INSPECT	0.1						A
		REPLACE		0.2				1	
0302	TAP ASSEMBLY	INSPECT	0.1						A
		SERVICE	1.0						E
		REPAIR		0.3				1	B
0303	CONTROL PANEL ASSEMBLY	REPAIR		0.3				1	B
030301	TOGGLE SWITCH ASSEMBLY	TEST		0.3				2	C
		REPLACE		0.3				1	

SECTION III. TOOLS AND TEST EQUIPMENT

TOOL OR TEST EQUIP CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL OR TEST EQUIP NUMBER
1	0	TOOL KIT, GENERAL MECHANICS: AUTOMOTIVE	5180-00-177-7033	
2	0	SHOP EQUIPMENT, COMMON, No 1	4910-00-7540654	

SECTION IV. REMARKS

REMARKS CODE	REMARKS
A	VISUAL INSPECTION.
B	REPAIR BY REPLACEMENT OF PARTS.
C	ELECTRICAL TEST.
D	MECHANICAL TEST.
E	CLEAN AND SANITIZE. (Note, service time includes heating of water in HWR.)

APPENDIX C

REPAIR PARTS AND SPECIAL TOOLS LIST

SECTION I. INTRODUCTION

C-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 the performance of operator/unit maintenance of the HWR. It authorizes the requisitioning, issue and disposition of spares, repair parts and special tools as indicated by the Source, Maintenance and Recoverability (SMR) codes.

C-2. GENERAL

In addition to Section I 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. The 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.

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 Column 5) for the performance of maintenance.

c. Section IV. Cross-Reference Indexes. A list, in National Item Identification Number (NIIN) sequence, of all National stock numbered items appearing in the listings followed by a list of alphanumeric sequence of all part numbers appearing in the listing. 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 number in alphanumeric sequence and cross-references the NSN, CAGEC and part number.

C-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-digit code containing supply/requisitioning information, maintenance category authorization criteria and disposition instructions as shown in the following breakdown:

Source Code		Maintenance Code	Recoverability Code
XX	X	X	X
1st and 2nd positions	3rd position	4th position	5th position
How to get an item.	Who can install, replace or use the item.	Who can do complete repair* on the item.	Who determined disposition action on an unserviceable item.

*Complete Repair: 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.

C-3. EXPLANATION OF COLUMNS (Sections II and III) (Continued)

(1) Source Code. The source code describes how to get an item needed for maintenance, repair or overhaul of an end item/equipment. Explanations of the source codes are as follows:

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)	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 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 code entered in the 3rd position of the SMR code, but the source code indicates that it is made at a higher level, order the item from the higher level of maintenance.
MF	(Made at DS/AVUM Level)	
MH	(Made at GS Level)	
ML	(Made at Specialized Repair Activity (SRA))	
MD	(Made at Depot)	
AO	(Assembled by org/AVUM Level)	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 code entered in the 3rd position of the SMR code authorizes you to replace the item but the source code indicates that the item is assembled at a higher level, order the item from the higher level of maintenance
AF	(Assembled by DS/AVIM Level)	
AH	(Assembled by GS Category)	
AL	(Assembled by SRA)	
AD	(Assembled by Depot)	
XA	Do not requisition an "XA"-coded item. Order its next higher assembly. (See NOTE).	
XB	If an "XB"-coded item is not available from salvage, order it using the CAGEC and part number given.	
XC	Installation drawing, diagram, instruction sheet or 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 the requirements of AR 700-42.

C-3. EXPLANATION OF COLUMNS (Sections II and III) (Continued)

(2) Maintenance Code. The maintenance code describes the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the 3rd and 4th positions of the SMR Code as follows:

(a) The maintenance code entered in the 3rd position describes the lowest maintenance level authorized to remove, replace and use an item. The maintenance code entered in the 3rd position will indicate authorization to one of the following levels of maintenance:

Code	Application/Explanation
C	Crew or operator maintenance done within organizational or aviation unit maintenance.
O	Organizational or aviation unit category can remove, replace and use the item.
F	Direct support or aviation intermediate level can remove, replace and use the item.
H	General support level can remove, replace and use the item.
L	Specialized repair activity can remove, replace and use the item.
D	Depot level can remove, replace and use the item.

(b) The maintenance code entered in the 4th position indicates whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (ie. perform all authorized repair functions). Some limited repair may be done on the item at a lower level of maintenance if authorized by the Maintenance Allocation Chart (MAC) and SMR codes. The 4th position will contain one of the following maintenance codes:

Code	Application/Explanation
O	Organizational or aviation unit is the lowest level that can do complete repair of the item.
F	Direct support or aviation intermediate 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	Non-repairable. 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.

C-3. EXPLANATION OF COLUMNS (Sections II and III) (Continued)

(3) Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the 5th position of the SMR code as follows:

Code	Application Explanation
Z	Non-repairable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the 3rd position of the SMR code.
O	Repairable item. When not economically repairable, condemn and dispose of the item at organizational or aviation unit level.
F	Repairable item. When not economically repairable, condemn and dispose of the item at direct support or aviation intermediate level.
H	Repairable item. When not economically repairable, condemn and dispose of the item at general support level.
D	Repairable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	Repairable item. Condemnation and disposal not authorized below specified repair activity.
A	Item requires special handling or condemnation procedures because of specific reasons (eg, precious metal content, high dollar value, critical material or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. CAGEC (Column 3). The Contractor and Government Entity Code (CAGEC) is a 5-digit numeric code which is used to identify the manufacturer, distributor or Government agency etc, 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 an NSN is used to requisition an item, the item received may have a different part number from the part ordered.

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) The physical security classification of the item is indicated by the parenthetical entry, eg, Phy Sec C1 (C)-Confidential, Phy Sec C1 (S)-Secret, Phy Sec C1 (T)-Top Secret.

(3) Items that are included in kits and sets are listed below the name of the kit or set.

(4) Spare/repair parts that make up an assembled item are listed immediately following the assembled item line entry.

C-3. EXPLANATION OF COLUMNS (Sections II and III) (Continued)

(5) Part numbers for bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC).

(7) The usable on code, when applicable (Paragraph 5, Special Information).

(8) In the Special Tools List section, the basis of issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE and other special support equipment. When density of equipments supported exceeds density spread indicated in the basis of issue, the total authorization is increased proportionately.

f. QTY (Column 6). The QTY (quantity per figure) indicates the quantity of the item used in the breakdown shown on the illustration figure which is prepared for a functional group, subfunctional group or an assembly. A "V' appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

C-4. EXPLANATION OF COLUMNS (Section IV)

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN. When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) FIG. 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. 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 by part number in ascending alphanumeric sequence (ie., vertical arrangement of letter and number combination which places 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. The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code used to identify the manufacturer, distributor or Government agency etc, that supplies the item.

(2) PART NUMBER. 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. 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. This column lists the number of the figure where the item is identified/located in Sections II and III.

(5) ITEM. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

C4. EXPLANATION OF COLUMNS (Section IV) (Continued)

c. FIGURE AND ITEM NUMBER INDEX.

(1) FIG. This column lists the number of the figure where the item is located and identified in Sections II and III.

(2) ITEM. This column lists the number assigned to the item as it appears in the figure referenced in Column 1.

(3) STOCK NUMBER. This column lists the NSN for the item.

(4) CAGEC. The Commercial and Government Entity Code (CAGEC) is a 5-digit alphanumeric code used to identify the manufacturer, distributor or Government agency etc, that supplies the item.

(5) PART NUMBER. This 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.

C-5. SPECIAL INFORMATION

Not applicable to the HWR.

C-6. HOW TO LOCATE REPAIR PARTS

a. When National Stock Number or Part Number is Not Known.

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups and the 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 National Stock Number or the Part Number Index, find the pertinent National Stock Number or Part Number. The NSN index is in National Item Identification Number (NIIN) sequence and the part numbers in the Part Number Index are listed in ascending alphanumeric sequence. Both indexes cross reference you to the illustration/figure and item number of the item.

(2) Second. Turn to the figure and item number, verify that the item is the one required then locate the item number in the repair parts list for the figure.

C-7. ABBREVIATIONS

Refer to Section I of the Glossary for an alphabetical list of the abbreviations used in this manual and their exact meaning.

SECTION II. REPAIR PARTS LIST

This section illustrates and lists the spares and repair parts authorized for the performance of maintenance.

The parts are contained in functional groups in ascending numerical order with the parts in each group listed in figure item number sequence.

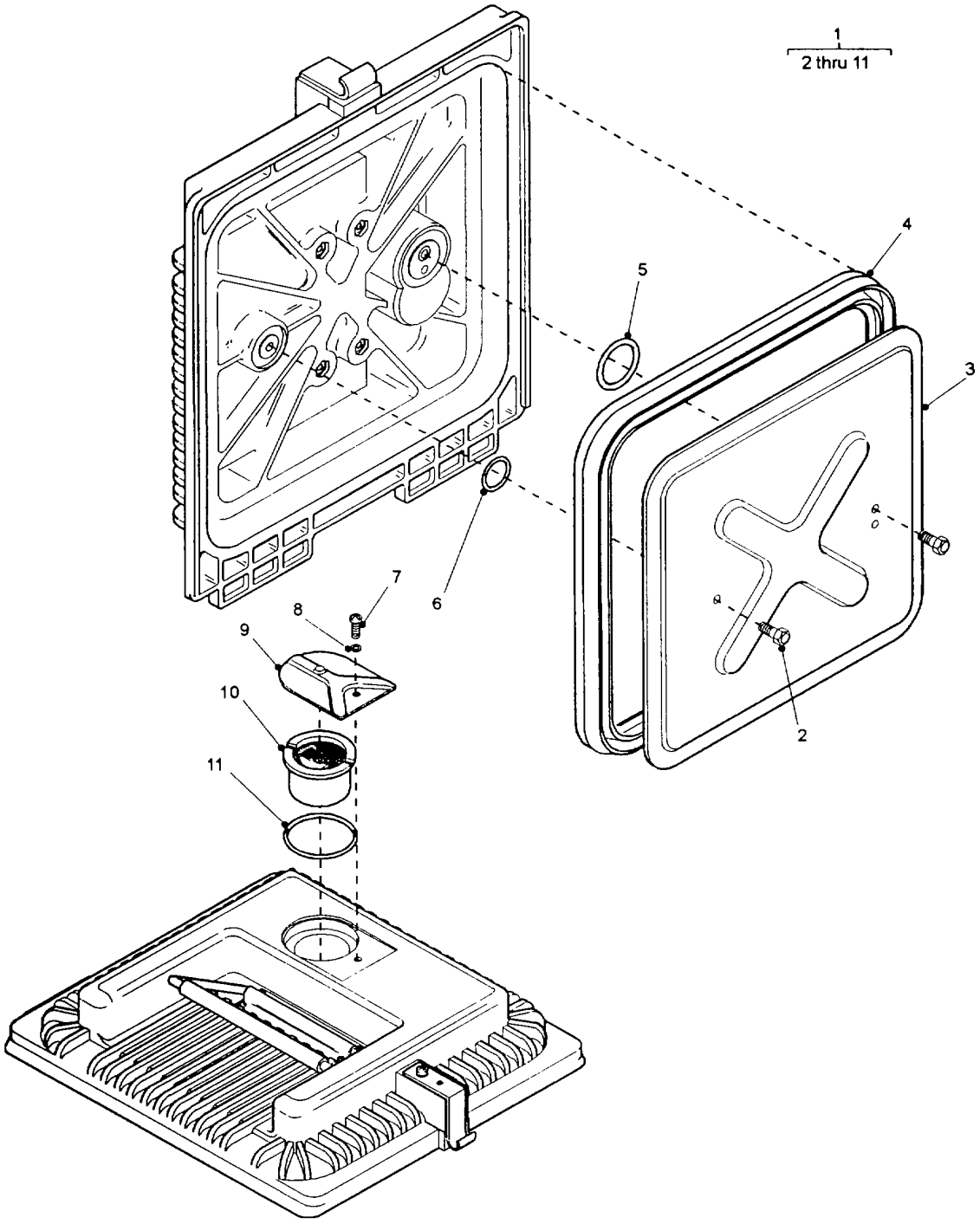


Figure C-1. Cover Assembly

(1) ITEM No .	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 01: Cover Assembly FIG. C-1 Cover assembly	
1	XDOOO	ODJ60	AZ137603	Cover Assembly	1
2	XDOZZ	ODJ60	SM0440807	• Screw, Seal Retaining Plate M4 x 8mm Ig Hex Hd St/Stl.....	2
3	XDOZZ	ODJ60	AZ137628	• Plate, Seal Retaining.....	1
4	KFOZZ	ODJ60	AZ137625	• Seal, Cover..... (Part of Kit, P/N AZ1376128)	1
5	KFOZZ	ODJ60	M6833	• Packing, Preformed, Large ..... (Part of Kit, P/N AZ1 376128)	1
6	KFOZZ	ODJ60	M6832	• Packing, Preformed, Small..... (Part of Kit, P/N AZ1376128)	1
7	XDOZZ	ODJ60	SM1140807	• Screw, Plate, Valve Retaining M4 x 8mm Ig Pan Hd Cross..... Tip St/Stl	1
8	XDOZZ	ODJ60	WM804	Washer, Special M4 Spring St/Stl.....	1
9	XDOZZ	ODJ60	AZ1376127	• Plate, Valve Retaining	1
10	KFOZZ	ODJ60	AZ1376120	• Valve, Pressure Relief..... (Part of Kit, P/N AZ1376141)	1
11	KFOZZ	ODJ60	M6836	• Packing, Preformed ..... (Part of Kit, P/N AZ1376141)	1
	PAOZZ	ODJ60	AZ1376128	Kit, Cover Seal ..... Seal (1) C-1-4 Packing, Large (1) C-1-5 Packing, Small (1) C-1-6	1
	PAOZZ	ODJ60	AZ1376141	Kit, Pressure Relief Valve..... Valve (1) C-1-10 Packing (1) C-1-11	1

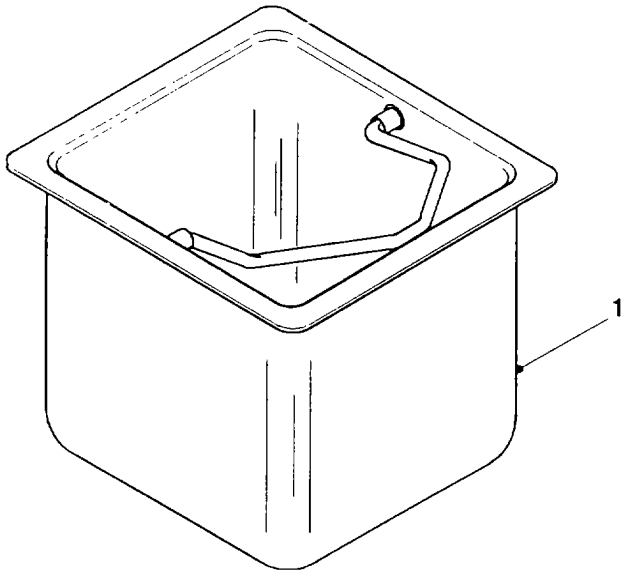


Figure C-2. Inner Container Assembly

(1) ITEM No .	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 02: Inner Container Assembly FIG. C-2 Inner Container Assembly	
1	XDOZZ	ODJ60	AZ137605	Container Assembly, Inner.....	1

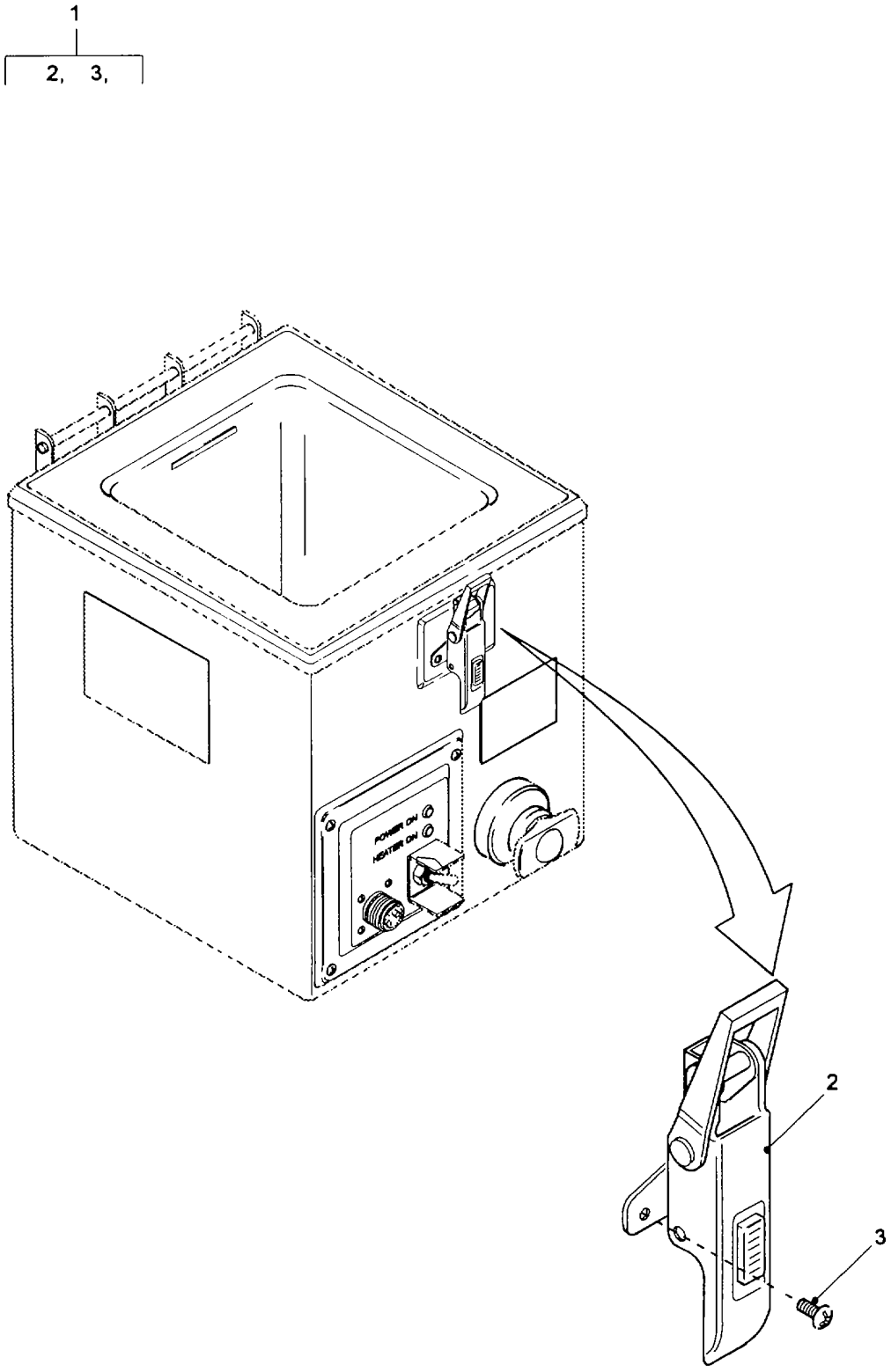


Figure C-3. Latch Assembly

(1) ITEM No .	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
				GROUP 03: Main Case Assembly FIG. C-3 Latch Assembly	
1	XDO2Z	ODJ60	AZM6633	• Latch Assembly	1
2	XAOZZ	ODJ60	M6633	•• Latch.....	1
3	XAOZZ	ODJ60	SM1141007	•• Screw, Machine M4 x 10 lg Pan Hd Cross Tip St/Stl	3

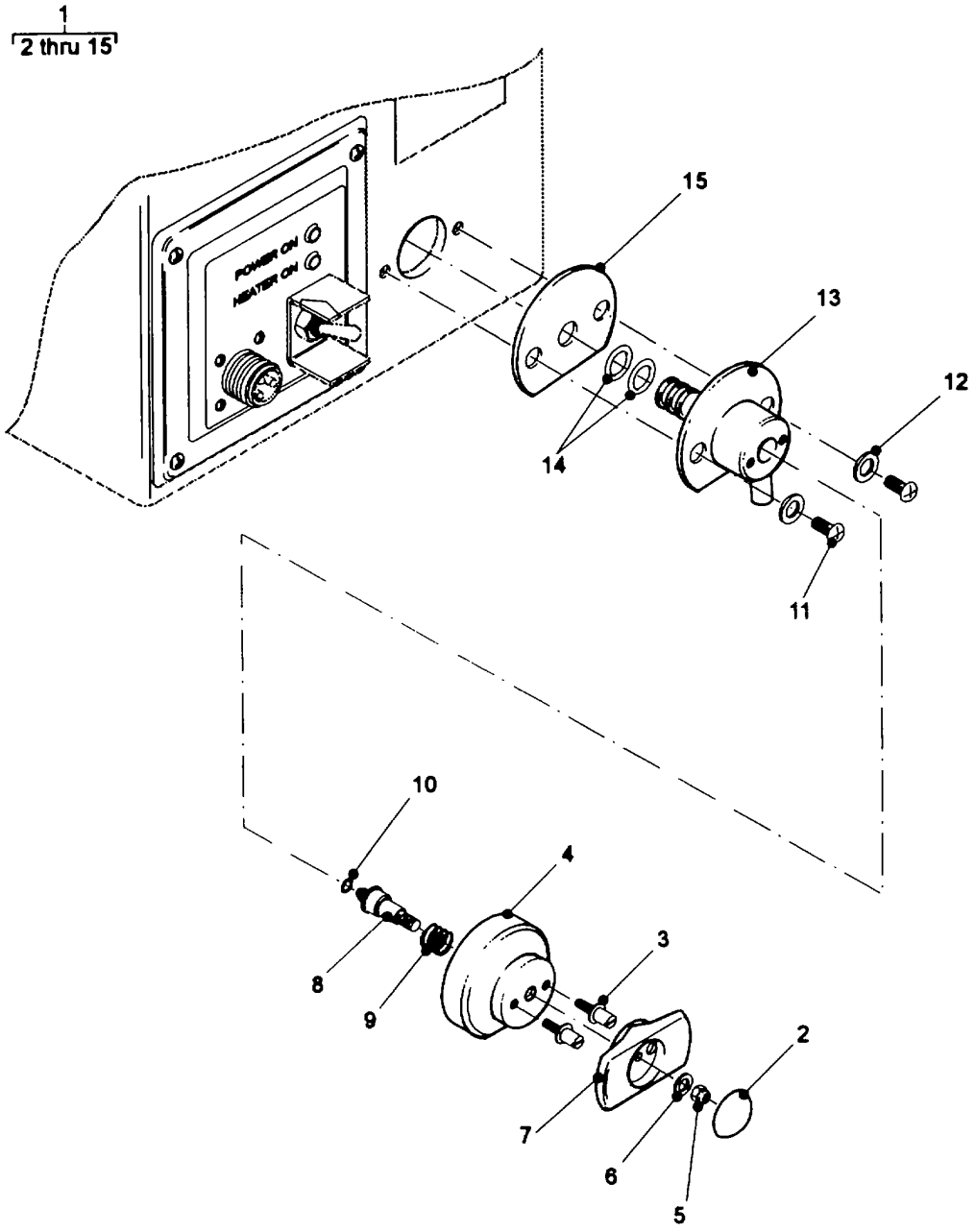


Figure C-4. Tap Assembly

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 03: Main Case Assembly FIG. C-4 Tap Assembly	
1	XAOOO	0DJ60	AZ1376137	• Tap Assembly	1
2	XAOZZ	0DJ60	AZ1376136	•• Press-fit Plastic cap	1
3	XAOZZ	0DJ60	AZ1376109	•• Screw, Captive	2
4	XAOZZ	0DJ60	AZ137696	•• Shroud	1
5	XAOZZ	0DJ60	M5270	•• Nut MS Aerotight St/Stl	1
6	XAOZZ	0DJ60	WM705	•• Washer Ms Plain St/Stl	1
7	XAOZZ	0DJ60	AZ137694	•• Handle	1
8	XAOZZ	0DJ60	AZ137650	•• Valve Stem	1
9	KFOZZ	0DJ60	M6644	•• Spring, Valve (Part of Kit, P/N AZ1376129)	1
10	KFOZZ	0DJ60	M6661	•• Packing, Preformed (Part of Kit, P/N AZ1376129)	1
11	XAOZZ	0DJ60	SM1141207	•• Screw, Tap Body M4 x 12 Ig Pan Hd Cross Tip St/Stl	2
12	XAOZZ	0DJ60	AZ1376116	•• Washer, Special	2
13	XAOZZ	0DJ60	AZ137692	•• Tap Body	1
14	KFOZZ	0DJ60	M6664	•• Packing, Preformed (Part of Kit, P/N AZ1376129)	2
15	KFOZZ	0DJ60	AZ1376121	•• Gasket (Part of Kit, P/N AZ1376129)	1
	PAOZZ	0DJ60	AZ1376129	Kit, Tap Assembly Spring (1) C-4-9 Packing (1) C-4-10 Packing (2) C-4-14 Gasket (1) C-4-15	1

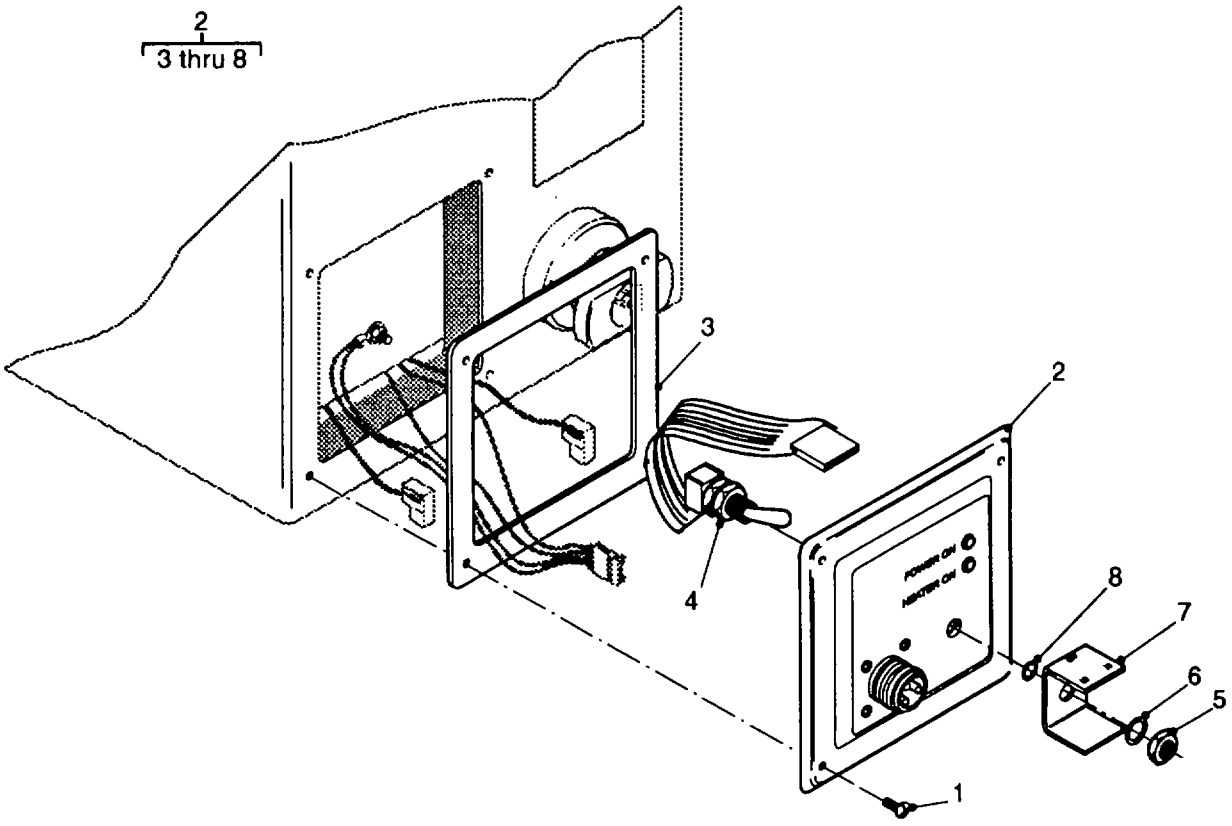


Figure C-5. Control Panel Assembly

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 03: Main Case Assembly FIG. C-5 Control Panel Assembly	
1	XDOZZ	0DJ60	SM1141007	• Screw, Machine M4 x 10 lg Pan Hd Cross Tip St/Stl	4
2	XAOOO	0DJ60	AZ137608	• Control Panel Assembly	1
3	XDOZZ	0DJ60	AZ137643	• • Gasket	1
4	PAOZZ	0DJ60	AZ1376130	• • Toggle Switch Assembly	1
5	XAOZZ	0DJ60	M7010	• • • Nut, Switch Guard	2
6	XAOZZ	0DJ60	M7011	• • • Washer, Switch Guard	1
7	KFOZZ	0DJ60	AZ137632	• • Switch Guard (Part of Kit, P/N AZ1376111)	1
8	KFOZZ	0DJ60	M6792	• • Packing, Preformed (Part of Kit, P/N AZ1376111)	1
	XDOZZ	0DJ60	AZ1376111	Kit, Switch Guard Guard (1) C-5-7 Packing (1) C-5-8	1

SECTION III. SPECIAL TOOLS LIST

(Not Applicable)

SECTION IV. CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
	C-1	1			
	C-1	2			
	C-1	3			
	C-1	4			
	C-1	5			
	C-1	6			
	C-1	7			
	C-1	8			
	C-1	9			
	C-1	10			
	C-1	11			
	C-2	1			
	C-3	1			
	C-3	2			
	C-3	3			
	C-4	1			
	C-4	2			
	C-4	3			
	C-4	4			
	C-4	5			
	C-4	6			
	C-4	7			
	C-4	8			
	C-4	9			
	C-4	10			
	C-4	11			
	C-4	12			
	C-4	13			
	C-4	14			
	C-4	15			
	C-5	1			
	C-5	2			
	C-5	3			
	C-5	4			
	C-5	5			
	C-5	6			
	C-5	7			
	C-5	8			

SECTION IV. CROSS-REFERENCE INDEXES (Continued)

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
0DJ60	AZ137603		C-1	1
0DJ60	AZ137605		C-2	1
0DJ60	AZ137608		C-5	2
0DJ60	AZ137625		C-1	4
0DJ60	AZ137628		C-1	3
0DJ60	AZ137632		C-5	7
0DJ60	AZ137643		C-5	3
0DJ60	AZ137650		C-4	8
0DJ60	AZ137692		C-4	13
0DJ60	AZ137694		C-4	7
0DJ60	AZ137696		C-4	4
0DJ60	AZ1376109		C-4	3
0DJ60	AZ1376116		C-4	12
0DJ60	AZ1376120		C-1	10
0DJ60	AZ1376121		C-4	15
0DJ60	AZ1376127		C-1	9
0DJ60	AZ1376130		C-5	4
0DJ60	AZ1376136		C-4	2
0DJ60	AZ1376137		C-4	1
0DJ60	AZM6633		C-3	1
0DJ60	M5270		C-4	5
0DJ60	M6644		C-4	9
0DJ60	M6661		C-4	10
0DJ60	M6663		C-3	2
0DJ60	M6664		C-4	14
0DJ60	M6792		C-5	8
0DJ60	M6832		C-1	6
0DJ60	M6833		C-1	5
0DJ60	M6836		C-1	11
0DJ60	M7010		C-5	5
0DJ60	M7011		C-5	6
0DJ60	SM0440807		C-1	2
0DJ60	SM1140807		C-1	7
0DJ60	SM1141007		C-3	3
0DJ60	SM1141007		C-5	1
0DJ60	SM1141207		C-4	11
0DJ60	WM705		C-4	6
0DJ60	WM804		C-1	8

SECTION IV. CROSS-REFERENCE INDEXES (Continued)

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
C-1	1		0DJ60	AZ137603
C-1	2		0DJ60	SM0440807
C-1	3		0DJ60	AZ137628
C-1	4		0DJ60	AZ137625
C-1	5		0DJ60	M6833
C-1	6		0DJ60	M6832
C-1	7		0DJ60	SM1140807
C-1	8		0DJ60	WM804
C-1	9		0DJ60	AZ1376127
C-1	10		0DJ60	AZ1376120
C-1	11		0DJ60	M6836
C-2	1		0DJ60	AZ137605
C-3	1		0DJ60	AZM6633
C-3	2		0DJ60	M6663
C-3	3		0DJ60	SM1141007
C-4	1		0DJ60	AZ1376137
C-4	2		0DJ60	AZ1376136
C-4	3		0DJ60	AZ1376109
C-4	4		0DJ60	AZ137696
C-4	5		0DJ60	M5270
C-4	6		0DJ60	WM705
C-4	7		0DJ60	AZ137694
C-4	8		0DJ60	AZ137650
C-4	9		0DJ60	M6644
C-4	10		0DJ60	M6661
C-4	11		0DJ60	SM1141207
C-4	12		0DJ60	AZ1376116
C-4	13		0DJ60	AZ137692
C-4	14		0DJ60	M6664
C-4	15		0DJ60	AZ1376121
C-5	1		0DJ60	SM1141007
C-5	2		0DJ60	AZ137608
C-5	3		0DJ60	AZ137643
C-5	4		0DJ60	AZ1376130
C-5	5		0DJ60	M7010
C-5	6		0DJ60	M7011
C-5	7		0DJ60	AZ137632
C-5	8		0DJ60	M6792

APPENDIX D

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

SECTION I. INTRODUCTION

D-1. SCOPE

This appendix lists components of the end item and basic issue items for the HWR 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. This listing is for information purposes only and is not authority to requisition replacements. These items are part of the HWR. 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. These essential items are required to place the HWR in operation, to operate it and to perform emergency repairs. Although shipped separately packaged, the BII must be with the HWR during operation and whenever it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

D-3. EXPLANATION OF COLUMNS (Sections II and III)

An explanation of the column entries in Sections II and III is as follows:

a. ILLUSTRATION NUMBER (ILLUST No.). This column indicates the number of the illustration in which the item is shown.

b. NATIONAL STOCK NUMBER. This column indicates the National Stock Number (NSN) assigned to the item and used to request or requisition the item.

c. DESCRIPTION. CAGEC AND PART NUMBER. This column contains the Federal item name and, if required, a description to identify and locate the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parenthesis followed by the part number.

d. USABLE ON CODE (UOC). This column contains a 3-digit code which identifies the different model types on which the item is used. Uncoded items are applicable to all models.

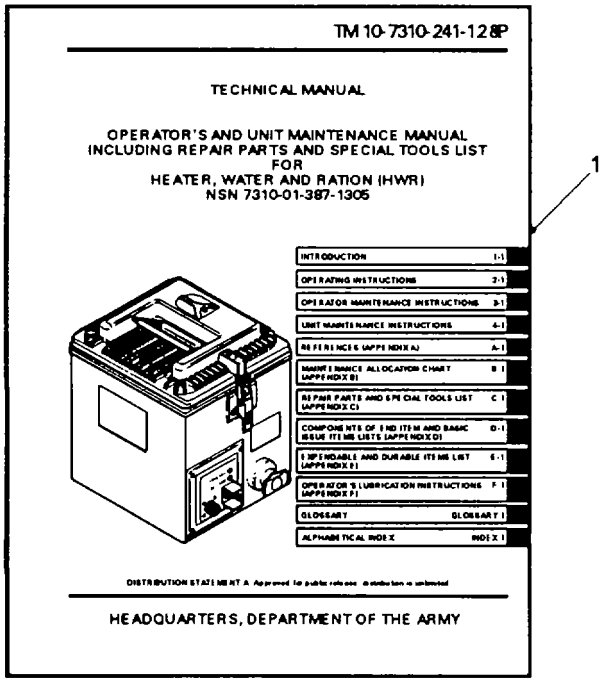
e. UNIT OF MEASURE (U/M). This column indicates the measure used in performing the operation/maintenance function and is expressed by a 2-character alphabetical abbreviation (eg, EA, IN, PR).

f. QUANTITY (QTY). This column indicates the quantity of the item authorized to be used with/on the HWR.

SECTION II. COMPONENTS OF END ITEM

ILLUST No	NATIONAL STOCK NUMBER	DESCRIPTION, CAGEC AND PART NUMBER	U/M	QTY

SECTION III. BASIC ISSUE ITEMS



ILLUST No	NATIONAL STOCK NUMBER	DESCRIPTION, CAGEC AND PART NUMBER	U/M	QTY
1		Operator's and Unit Maintenance Manual including Repair Parts and Special Tools List TM 10-7310-241-12&P		1

APPENDIX E

EXPENDABLE AND DURABLE ITEMS LIST

SECTION I. INTRODUCTION

E-1. SCOPE

This appendix contains the Expendable and Durable Items List (EDIL) which identifies the requirements for maintaining the HWR. This listing is for information purposes only and is not authority to requisition the listed items. These items are authorized by CTA 50-970 (Expendable and Durable Items) except for Medical, Class V, Repair Parts and Heraldic.

E-2. EXPLANATION OF COLUMNS (Section II)

An explanation of the column entries in Section II is as follows:

a. ITEM NUMBER. This column indicates the number assigned to the entry in the listing for referencing when required.

b. LEVEL. This column indicates the lowest level of maintenance that requires the listed item.

C - Operator/Crew Maintenance

O - Organizational Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. NATIONAL STOCK NUMBER. This column indicates the National Stock Number (NSN) assigned to the item and used to request or requisition the item.

d. ITEM NAME, DESCRIPTION. CAGEC, PART NUMBER. This column contains the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parenthesis followed by the part number.

e. UNIT OF MEASURE (U/M). This column indicates the measure used in performing the operation/ maintenance function and is expressed by a 2-character alphabetical abbreviation (eg, EA, IN, PR). If the Unit of Measure (U/M) differs from the Unit of Issue (U/I) as shown in the Army Master Data File (AMDF) then the lowest Unit of Issue (U/I) that will satisfy the requirements should be requisitioned.

SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	U/M
1	C	7920-00-324-2746	Brush, Scrub (80244) H-B-00555 CL2	EA
2	C	7920-00-401-8034	Cloth, Cleaning (80244) A-A-162 TY1CL1	EA
3	C	7930-00-281-4731	Dishwashing Compound, Hand (58536) A-A-5	OZ
4	C	6840-00-810-6396	Disinfectant, Food Service (81349) MIL-D-11309	OZ
5	C	7920-00-753-5242	Pad, Scouring (83421) 7920-00-753-5242	EA
6	C	7340-00-243-5390	Spoon, Field Mess (81349) MIL-F-284	EA

APPENDIX F

OPERATOR'S LUBRICATION INSTRUCTIONS

(Lubrication Not Required)

GLOSSARY

Section I. ABBREVIATIONS

Following is an alphabetical listing of the abbreviations used in this manual. The exact word or phrase is identified for each abbreviation.

A	Ampere
AMDF	Army Master Data File
BOI	Basis of Issue
C	Celsius (degree)
CAGEC	Contractor and Government Entity Code
cm	Centimeter
COEI	Component of End Item
dc	Direct Current
EDIL	Expendable and Durable Items List
EIC	End Item Code
EIR	Equipment Improvement Recommendations
F	Fahrenheit (degree)
HWR	Heater, Water and Ration
kg	Kilogram
MAC	Maintenance Allocation Chart
mb	Millibar
mm	Millimeter
MTOE	Modified Table of Organization and Equipment
MWO	Modification Work Order
NIIN	National Item Identification Number (last 9 digits of the NSN)
NSN	National Stock Number
PMCS	Preventive Maintenance Checks and Services
psi	Pounds per Square Inch
RPSTL	Repair Parts and Special Tools List
SMR	Source, Maintenance and Recoverability
SRA	Specialized Repair Activity
TMDE	Test, Measurement and Diagnostic Equipment
TOE	Table of Organization and Equipment
U/I	Unit of Issue
U/M	Unit of Measure
UOC	Usable on Code
V	Voltage

Section II. DEFINITION OF UNUSUAL TERMS

(Not Applicable)

INDEX

Page

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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 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 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: 074437-000