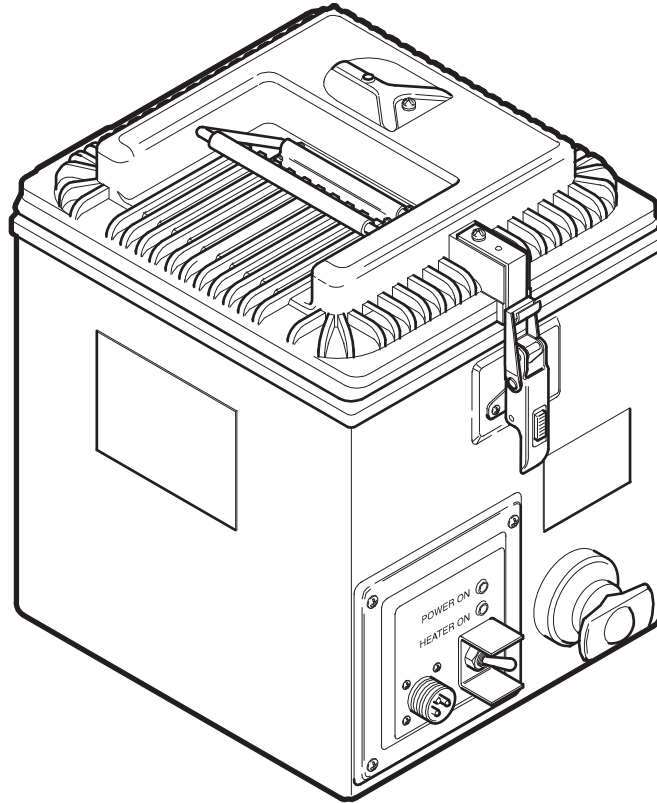


INSTRUCTION MANUAL M6831

OPERATOR'S & UNIT MAINTENANCE MANUAL FOR HEATER, WATER AND RATION (HWR) RAK 15/2



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**OPERATOR'S AND UNIT MAINTENANCE MANUAL
FOR HEATER, WATER AND RATION (HWR)
RAK 15/2**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any error or if you know a way to improve the procedures, please let us know. Mail your letter, Recommended Changes to Publications direct to: **Cole-Parmer Ltd.** Beacon Road, Stone, Staffordshire ST15 0SA, United Kingdom.

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CHAPTER DESCRIPTIONS

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 operator's controls and indicators, operator's PMCS and operation of the HWR under usual / unusual conditioned.
- 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 and receipt, check procedures, unit PMCS, troubleshooting procedures, maintenance and preparation for storage and shipment which can be performed by unit maintenance personnel.
- APPENDIX A** - **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 B** - **Repair Parts.**

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

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.
- **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 pre-packaged 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 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 lid 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 scalds and burn injuries.
- **HEATED WATER.** When dispensing heated water, always use a suitable vessel and avoid contact with the tap spigot which might 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 the host vehicle is mobile. Failure to secure the cover lid can result in 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 fluid 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 lid 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 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 when cleaning the HWR. Non-potable or dirty water can cause contamination of water or food.

INSTALLATION REQUIREMENTS.

To meet EMC criteria, the RAK15 product should be installed using the three mounting studs to secure the unit via the mounting cradle to the vehicle chassis (Negative ground).

NOTE

RAK units **do not** have internal over-current protection and so protection must be provided externally before or during installation.

When installed within a vehicle for example, this could be achieved using the vehicles internal fuse box and a designated power socket for the RAK.

Alternatively, a fuse could be integrated into the cable harness between the vehicle and the RAK.

The RAK15 draws a nominal current of approximately 15 amps; over-current protection should be rated appropriately so that adequate protection is achieved *without* causing nuisance tripping during normal operation.

CHAPTER 1

INTRODUCTION

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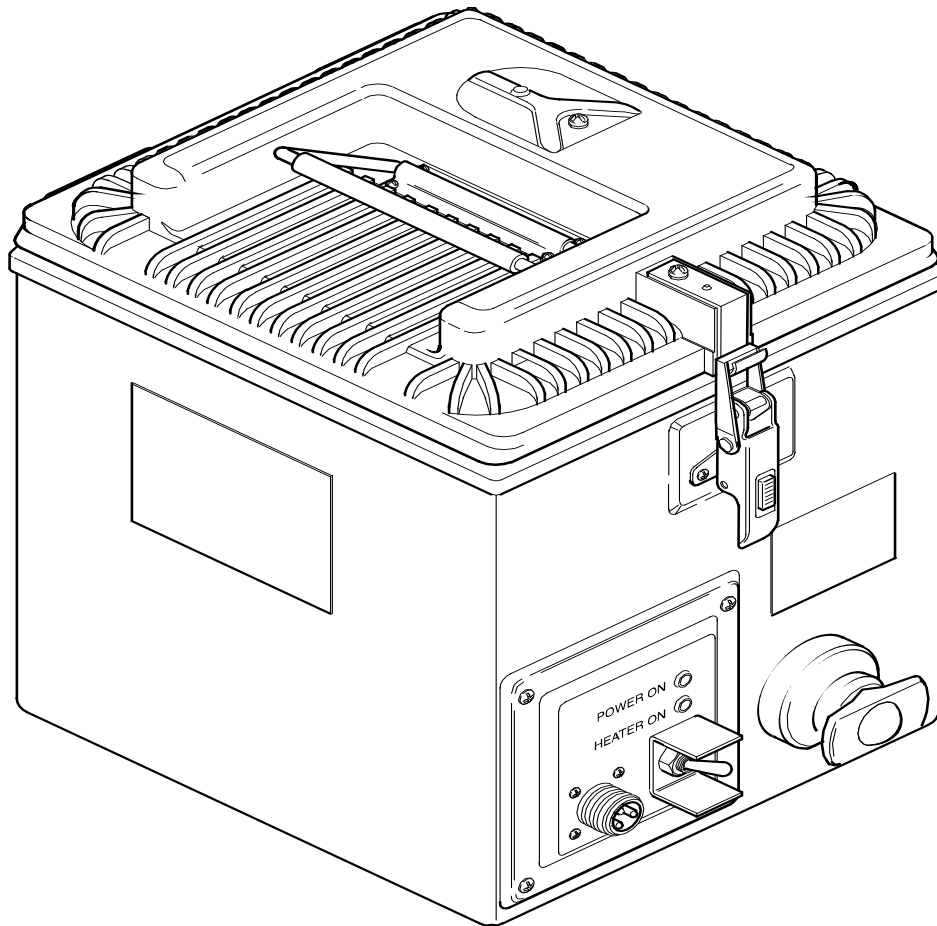


Figure 1-0 Heater, Water and Ration (HWR)

Section I. GENERAL INFORMATION

1-1. SCOPE

- a. Type of Manual. Operators and Unit Maintenance Manual.
- b. Model Number and Equipment Name. RAK15/2. Heater, Water and Ration (HWR).
- c. Purpose of Equipment.

(1) The HWR provides a mounted potable water and pre-packaged 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 pre-cooked meals together with 1.18 liters 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. SAFETY, CARE AND HANDLING

a. 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.

b. The maximum temperature within the HWR will be 71 °C or 88 °C during normal operation and can reach 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.

c. 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.

d. 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.

e. 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.

1-3. PREPARATION FOR STORAGE OR SHIPMENT

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

1-4. 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
HWR	Heater, Water and Ration (HWR)
Main Case	Main Case Assembly
Latch	Latch Assembly
Control Panel	Control Panel Assembly
PCB	PCB Assembly
LO/OFF/HI Switch	Toggle Switch Assembly
POWER ON Lamp	LED, Green
HEATER ON Lamp	LED, Yellow
Tap	Tap Assembly
Outer Container	Container Assembly, Outer
Heater	Heater Assembly
Overheat Sensor	Thermistor Assembly
Inner Container	Container Assembly, Inner
Cover	Cover Assembly

1-5. 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

1-6. 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 66 - 71 °C.
- (3) Switch-selected high (HI) heating range of 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 under voltage condition.
- (7) Automatic shutdown protection against overheating and "boil-dry" conditions.
- (8) Non-spill operation under all conditions of service.

NOTE

RAK units **do not** have internal over-current protection and so protection must be provided externally before or during installation.

When installed within a vehicle for example, this could be achieved using the vehicles internal fuse box and a designated power socket for the RAK.

Alternatively, a fuse could be integrated into the cable harness between the vehicle and the RAK.

The RAK15 draws a nominal current of approximately 15 amps; over-current protection should be rated appropriately so that adequate protection is achieved *without* causing nuisance tripping during normal operation.

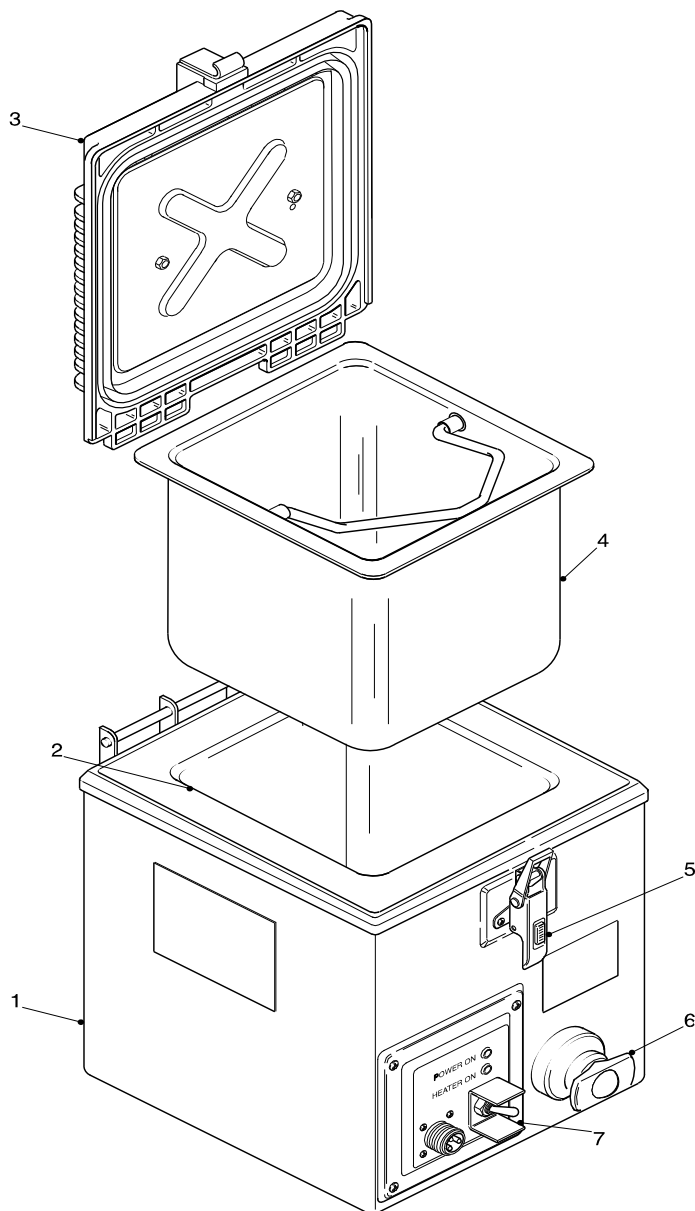
b. Capabilities.

- (1) Heats up to one gallon of potable water.
- (2) Heats up to five pre-cooked meals, or equivalent unopened pre-packaged food, and 1.18 litres 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.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



1 MAIN CASE. Stainless steel open-box structure which acts as the outermost housing insulated by preformed fiber blocks. Three stainless steel 5/16 inch fixing studs (with appropriate fixings) enable secure installation in the host vehicle. The top edge is fitted with a shaped 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.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Continued)

2 OUTER CONTAINER. Food-quality seamless stainless steel vessel which is capable of holding up to one gallon of potable water (inner container removed) or 1.18 litres 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. Moulded plastic cookware 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 shaped 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. Food-quality seamless stainless steel vessel which is capable of holding up to five unopened MRE entrees or equivalent unopened pre-packaged 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. 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. 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. 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.

1-7. EQUIPMENT DATA

a. Physical Data.

Height (closed, handle up)	318 mm.
Height (closed, handle down)	267 mm.
Height (cover fully open)	483 mm.
Width	216 mm.
Depth	292 mm.
Weight	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 pre-set at 0.3 psi (20.7 mb).

1-7. EQUIPMENT DATA (Continued)

c. Electrical Data

Supply voltage	22 - 28 V dc (24 V dc nominal).
Supply current.....	10 A (min)/15 A (max).
Power consumption	300 W (nominal).
Heater type	Resistive element affixed to the underside of the outer container.
Heater resistance.....	1.6 Ohm (nominal, power off and at ambient temperature). On/off switching determined by LO and HI temperature sensors using thermal feedback.
Heater safety cut-out	"Boil-dry" temperature sensor operating at 172 °C. Non-repairable thermal fuse operating at 175 °C.

NOTE

RAK units **do not** have internal over-current protection and so protection must be provided externally before or during installation.

When installed within a vehicle for example, this could be achieved using the vehicles internal fuse box and a designated power socket for the RAK.

Alternatively, a fuse could be integrated into the cable harness between the vehicle and the RAK.

The RAK15 draws a nominal current of approximately 15 amps; over-current protection should be rated appropriately so that adequate protection is achieved *without* causing nuisance tripping during normal operation.

d. Performance Data.

Heating (water only)	Temperature of one gallon of water will be raised by 56 °C in one hour (max) at an ambient temperature of 21°C using HI switch setting.
Heating (rations + water).....	Temperature of up to five pre-cooked meals and 1.18 litres of water will be raised to between 66 °C and 71 °C at an ambient temperature of 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)	66 - 71 °C.
Heating range (HI).....	82 - 88 °C.
Automatic shutdown.....	Power supply voltage less than 22 V dc. Internal temperature greater than 96 °C. "Boil-dry" condition detected.
Overvoltage Protection	Power supply voltage greater than 39 V dc.

e. Environmental Data.

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

Section III. PRINCIPLES OF OPERATION

1-8. 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.

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 172 °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 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 selecting 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 LO/OFF/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.

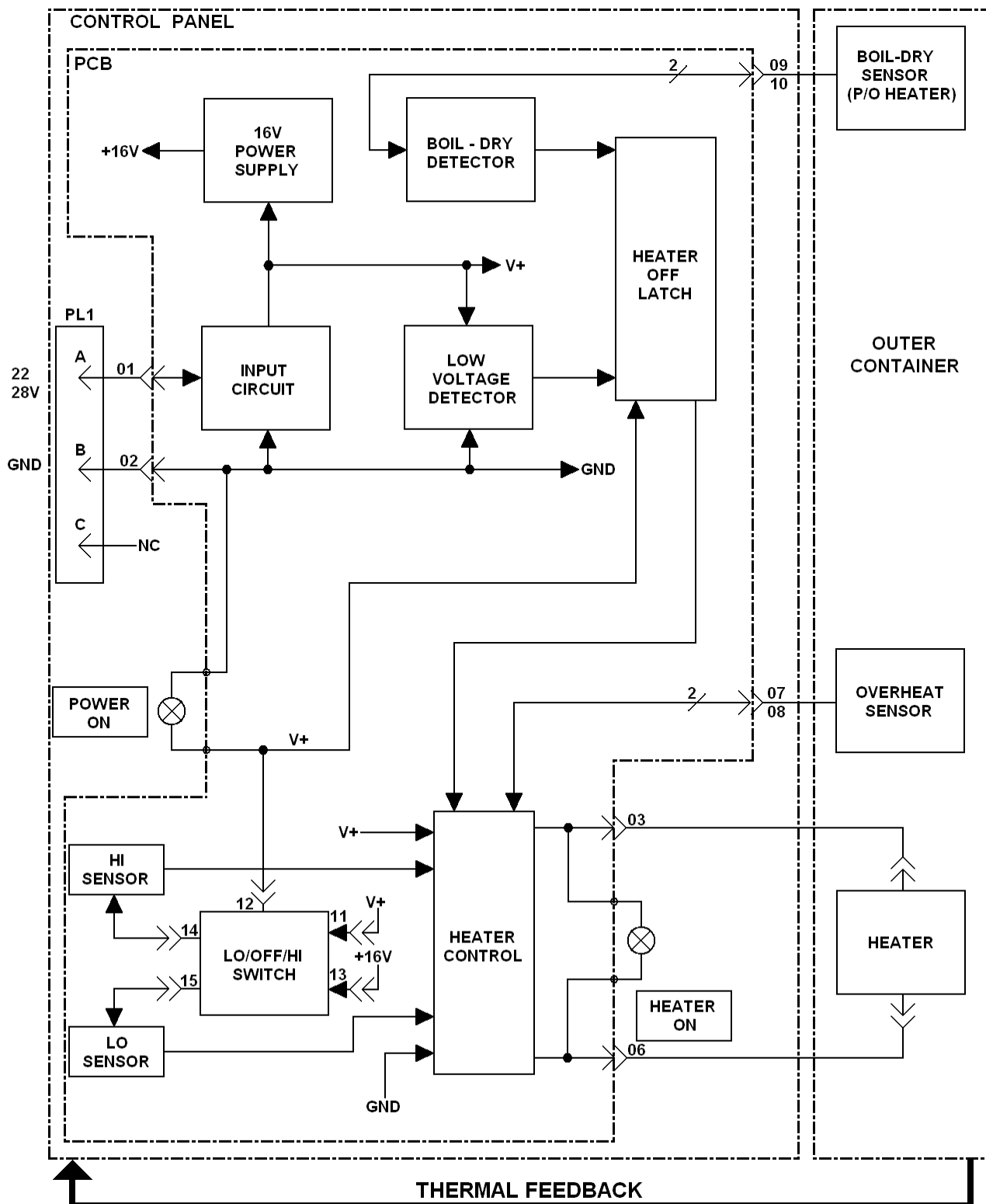
k. LO/OFF/HI Switch. Operator-controlled 3-position toggle switch with a center OFF position. Selects a heating range of 66 - 71 °C when set to the LO position or a heating range of 82 - 88 °C when set to the HI position. If the power supply is turned on, the switch also lights the POWER ON lamp and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

l. 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, 15A 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 175 °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 96 °C. This action is delayed by approximately one minute in order to avoid spurious operation.



Block Schematic

CHAPTER 2

OPERATING INSTRUCTIONS

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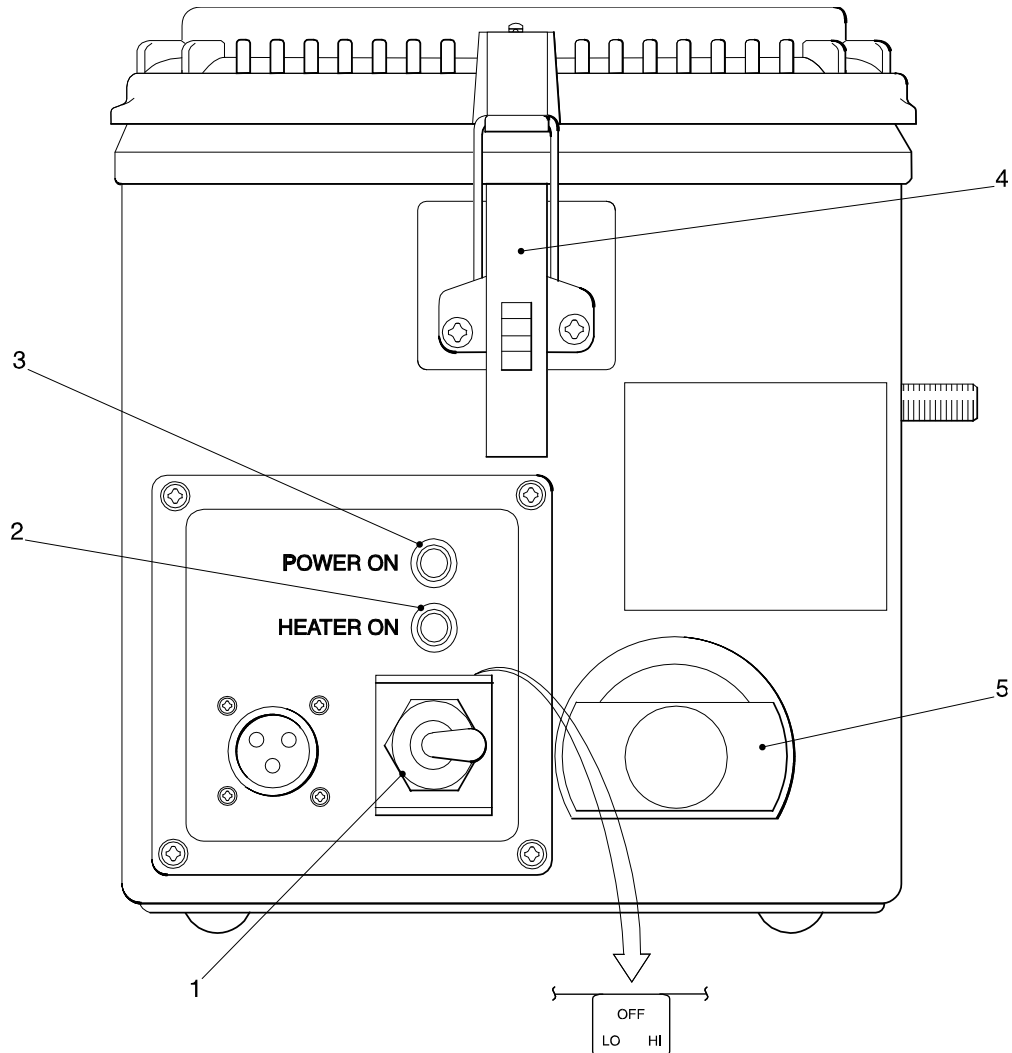
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

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 66 - 71 °C when set to the LO position.

Deselects heating when set to the centre OFF position.

Selects heating range of 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. Perform WEEKLY (W) PMCS at a regular time once a week.
- f. Perform MONTHLY (M) PMCS at a regular time once a month.

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.

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.
- 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.
- h. The following general checks should be performed as necessary:
 - (1) **Sanitizing.** When the HWR is stored for long periods, the HWR should be cleared 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) **Bolts, Nuts and Screws.** Check for looseness and missing, bent or broken condition.
 - (4) **Power Cable/Connector.** Check for proper fit of the connector and for signs of physical damage to the connector or cable. Tighten connector to hand tightness if it loose.

2-5. CLEANING AGENTS

- a. Cleaning Internal Metal Parts. Use hand dishwashing compound or food service disinfectant.
- b. Cleaning External Metal Parts. Use hand dishwashing compound.
- c. Cleaning Rubber and Soft Plastic Parts. Use hand dishwashing compound.

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

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

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

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
5	Before	Latch	<p>a. Check latch is secured to the main case and has no missing or broken parts.</p> <p>b. Check lock and unlock operation is correct.</p>	<p>Latch has loose or missing screws. Any part is broken, loose or missing.</p> <p>Latch will not lock and/or unlock.</p>
6	Before	Tap	<p>a. Check tap is secured to the main case and has no missing or broken parts.</p> <p>b. Check tap can be easily operated over its full range with no binding.</p>	<p>Tap has loose or missing screws. Any part is broken, loose or missing.</p> <p>Tap does not move freely or is jammed in one position.</p>
7	Before	Control Panel	<p>a. Check control panel is secured to the main case and has no missing or broken parts.</p> <p>b. Check power cable connector is properly connected to the power connector.</p> <p>c. Check LO/OFF/HI switch is securely held in position and operates with a firm, positive action.</p>	<p>Control panel has loose or missing screws. Any part is loose or missing.</p> <p>Power cable connecting plug cannot be connected or connection is unsafe.</p> <p>LO/OFF/HI switch is loose or its operation is not satisfactory.</p>
8	During	Main Case	Check for leakage of water indicated by damp or discoloured patches on the cover 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)**

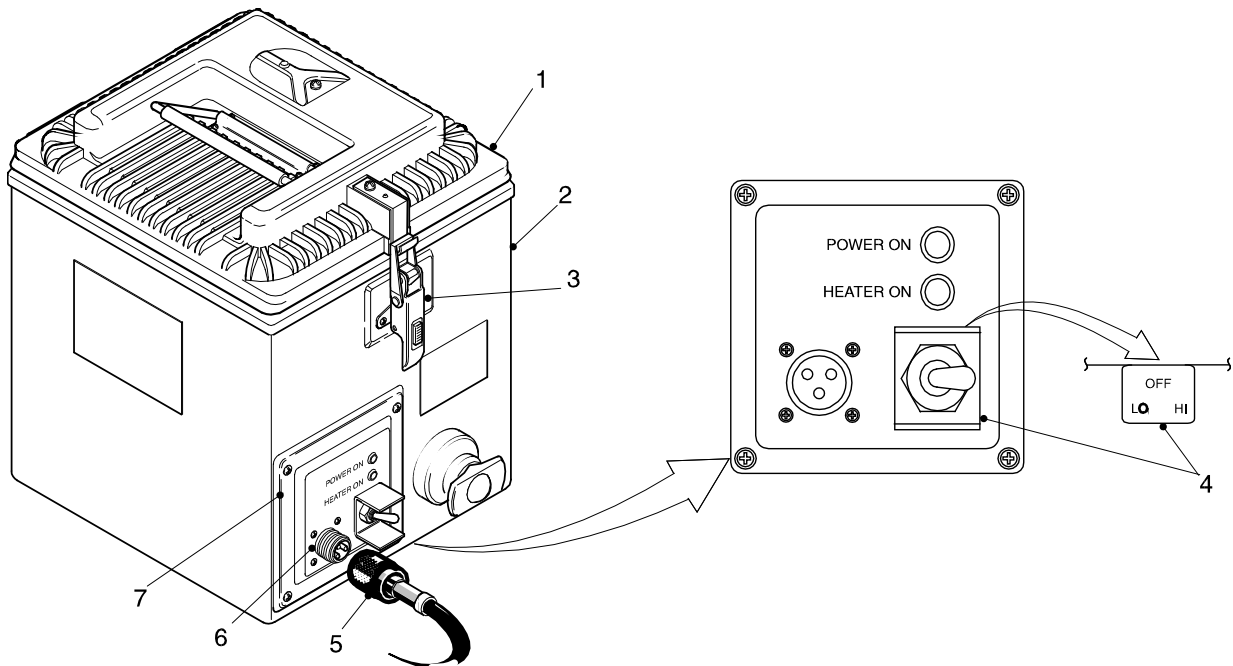
Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
11	After	Inner Container	<p>a. Check food has been removed.</p> <p>b. Inspect for dirt, grease, oil or food debris.</p>	
12	After	Outer Container	<p>a. Check water has been removed.</p> <p>b. Inspect for dirt,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

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 supply cable (5) to power connector (6) on the control panel (7).
- (2) Set LO/OFF/HI switch (4) on the control panel (7) to OFF.
- (3) Turn on the power supply.

NOTE

RAK units **do not** have internal over-current protection and so protection must be provided externally before or during installation.

When installed within a vehicle for example, this could be achieved using the vehicles internal fuse box and a designated power socket for the RAK.

Alternatively, a fuse could be integrated into the cable harness between the vehicle and the RAK.

The RAK15 draws a nominal current of approximately 15 amps; over-current protection should be rated appropriately so that adequate protection is achieved *without* causing nuisance tripping during normal operation.

2-8. INITIAL CHECKS

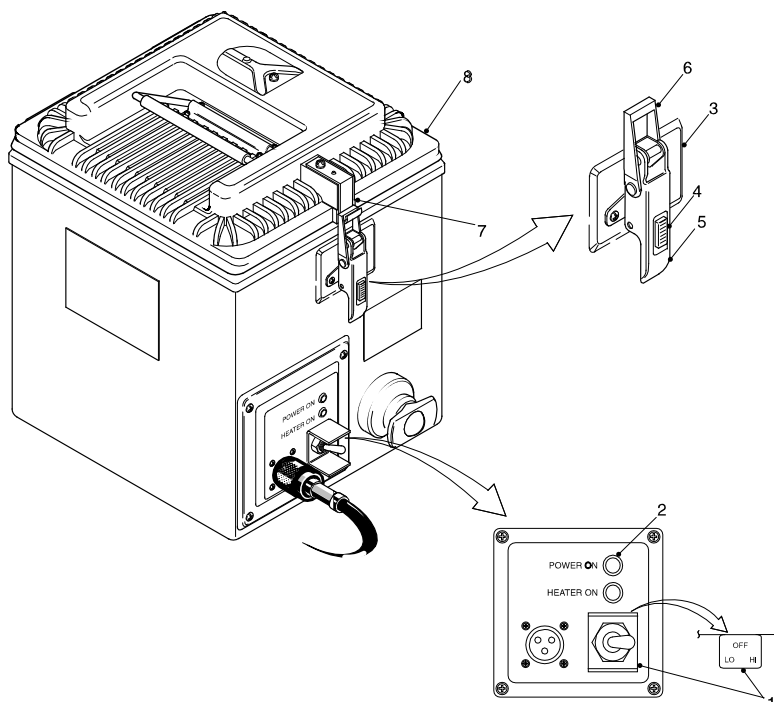
Before operating the HWR, perform the BEFORE (B) Preventive Maintenance Checks and Services (PMCS) given in Table 2-1. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

2-9. OPERATING PROCEDURES

WARNING

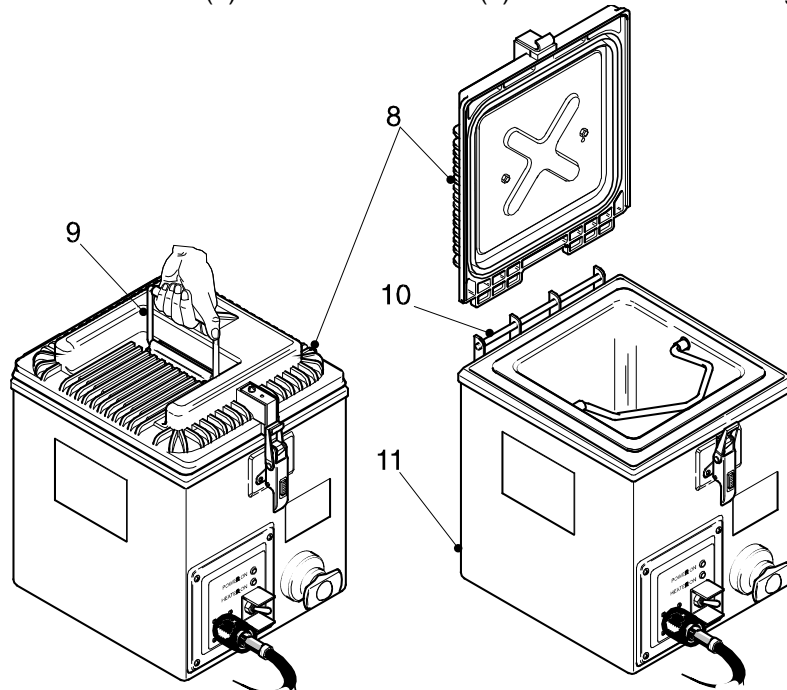
- **HEALTH HAZARD.** Use the HWR to HEAT water only or to HEAT unopened pre-packaged food and water. Using the HWR to prepare, boil, fry or cook food can result in a hazard to health.
- **WATER/FOOD CONTAMINATION.** Only use the inner container for carrying/holding clean potable water or heating rations. 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:

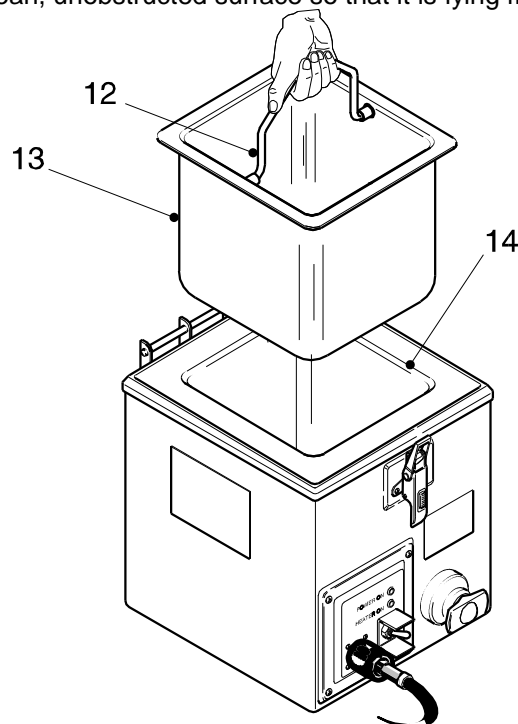


OPERATING PROCEDURES (Continued)

- (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).

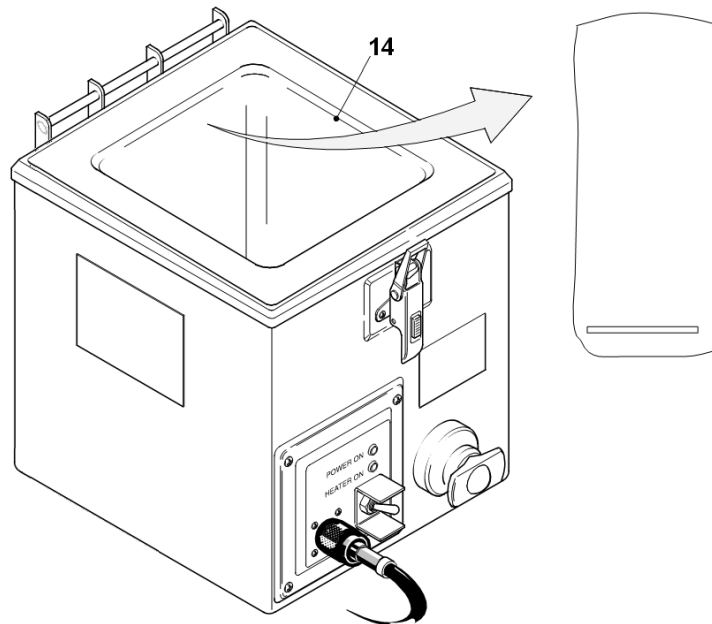


- (4) Using the fold-down heatproof handle (9), carefully open the cover (8) and disengage it from the hinge pivot bar (10) located along the top rear edge of the main case (11).
- (5) Place the cover (8) on a clean, unobstructed surface so that it is lying flat in a safe position.



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

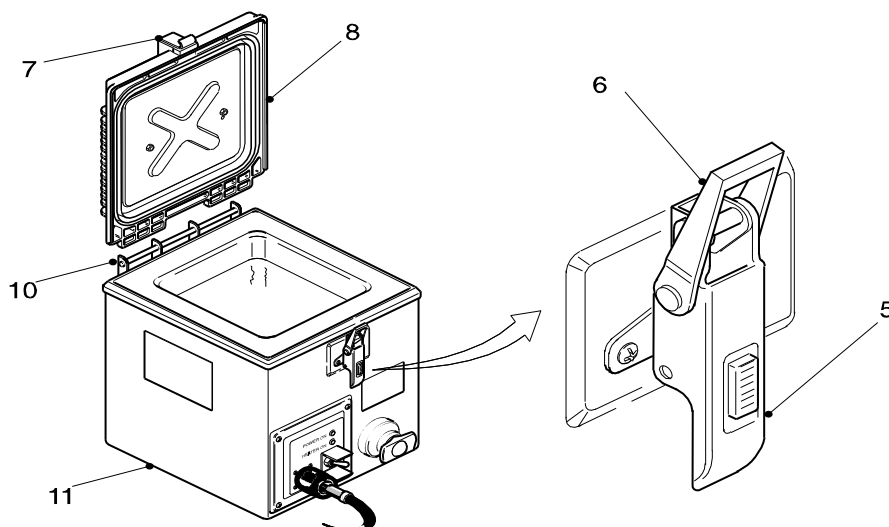
- **NON-POTABLE/DIRTY WATER.** Only use clean, potable water when filling the outer container. Non-potable or dirty water can cause contamination of water or food.
- **OVERFILLING.** When heating water only, do not fill the outer container above the one gallon level. Overfilling can result in the accidental 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.

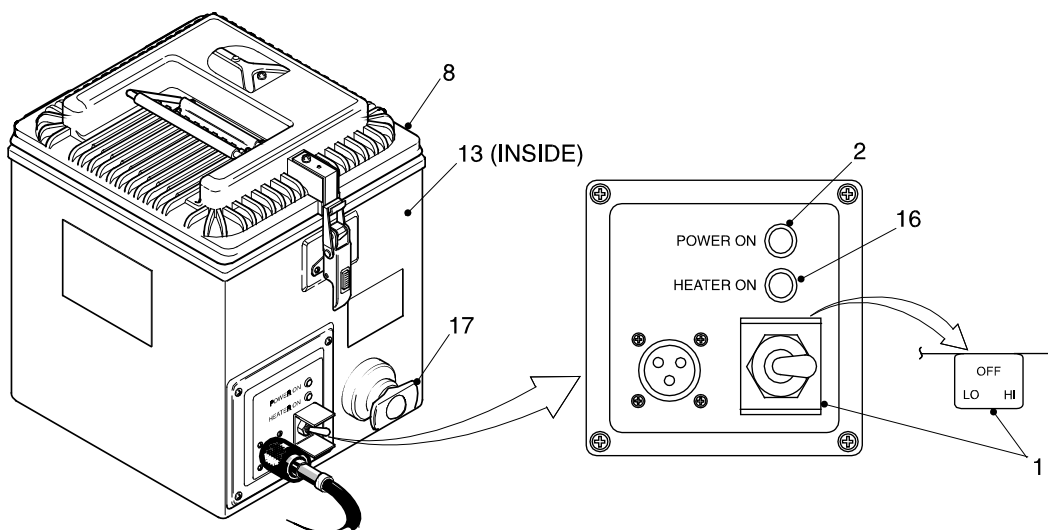
OPERATING PROCEDURES (Continued)



- (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 operation 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.

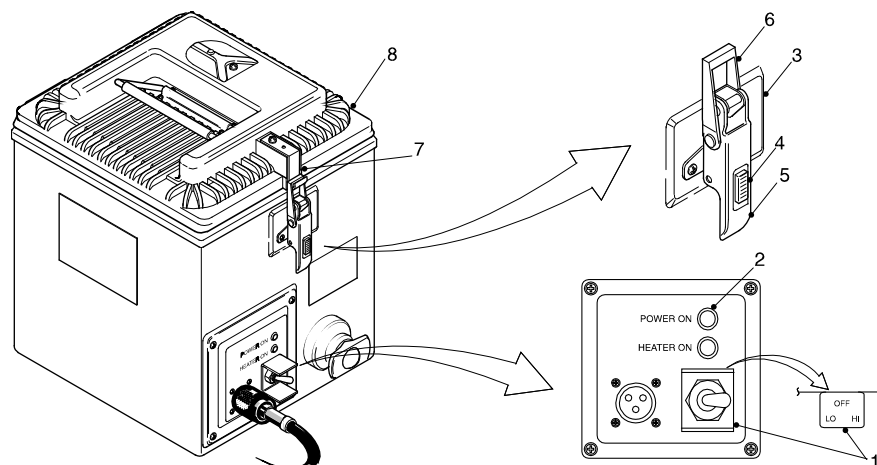
WARNING

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.

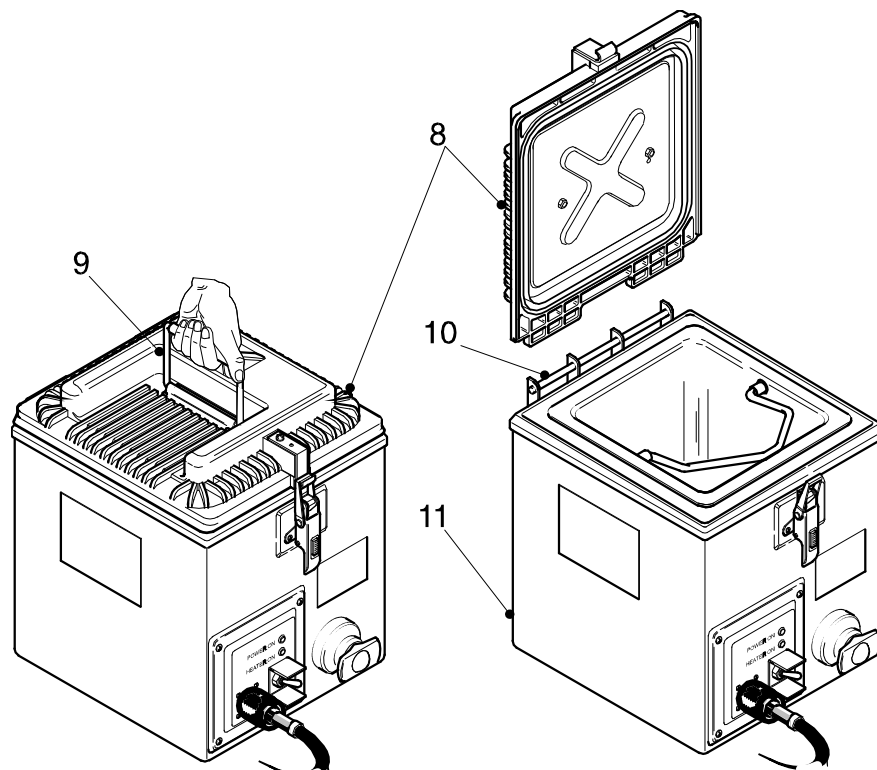
- (15) Fit the inner container (13) and the cover (8).
- (16) Fit cover (8) as described in steps (8) and (9).

OPERATING PROCEDURES (Continued)

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

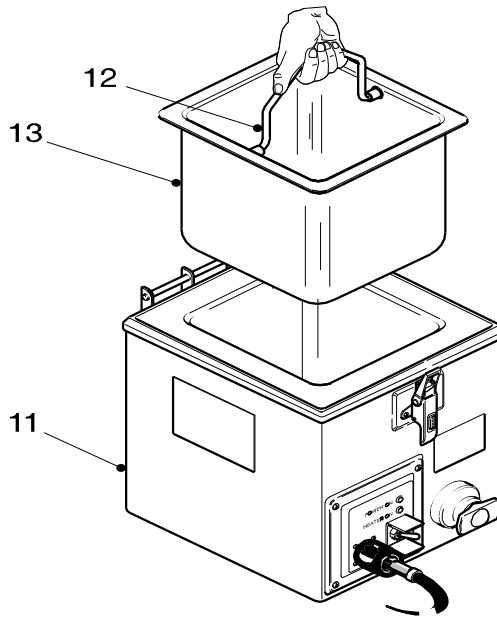


- (1) Ensure that the LO/OFF/HI switch (1) is set to OFF and verify that the POWER ON lamp (2) is off.
- (2) Unfasten the latch (3) by first pushing the spring-loaded unlocking catch (4) upwards with the thumb then pulling the operating lever (5) outwards while holding the unlocking catch (4) in the "fully-up" position.
- (3) Disengage the latch bridle (6) from the latch hook (7) located on the front edge of the cover (8).

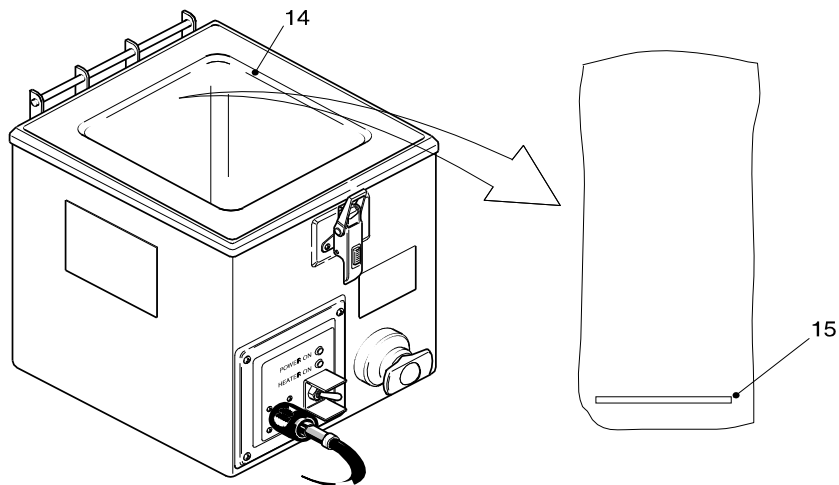


2-9. OPERATING PROCEDURES (Continued)

- (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 lying 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.

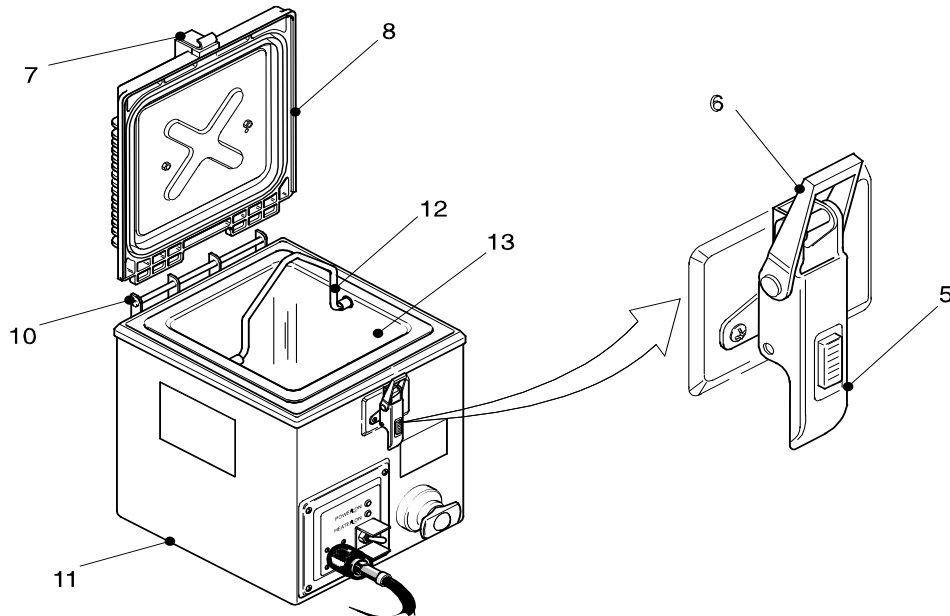


OPERATING PROCEDURES (Continued)

WARNING

- **NON-POTABLE/DIRTY WATER.** Only use clean, potable water 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 1.18 liters level. Overfilling can result in the accidental spillage of heated water.

- (7) Fill the outer container (14) with clean, potable water up to the 1.18 liters level line (15) which is the lower embossed mark on the rear wall.



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

WARNING

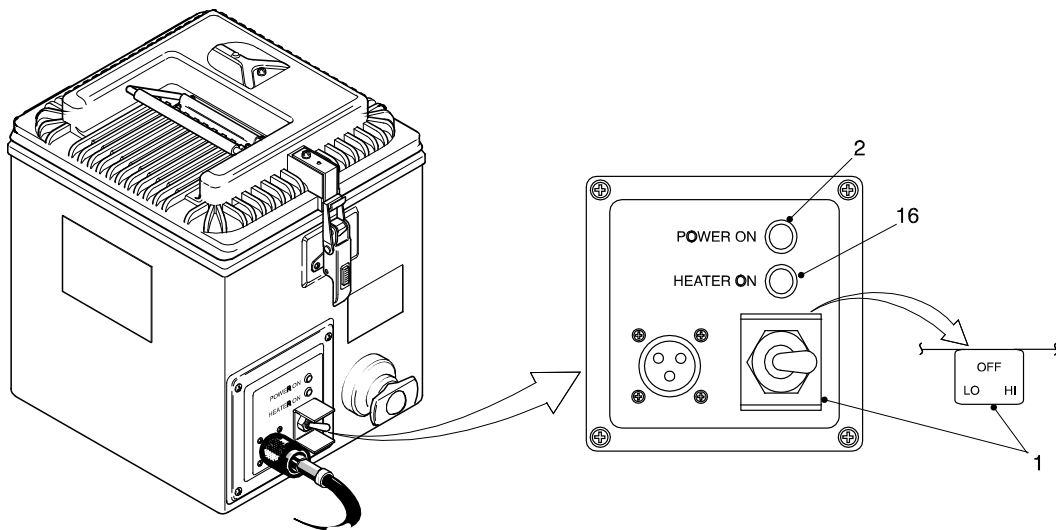
WATER/FOOD CONTAMINATION (2). Ensure that the inner container and cover are clean before fitting them to the HWR. Dirt or debris will result in contamination of water or food.

- (9) Using the folding wire handle (12), fit 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.

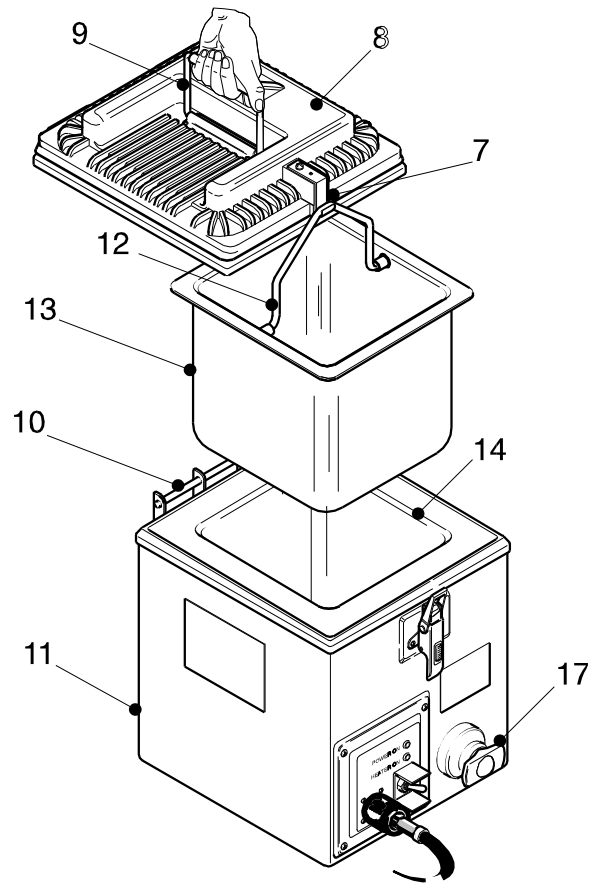
- (12) Set the LO/OFF/HI switch (1) to HI and verify that the POWER ON lamp (2) and HEATER ON lamp (16) are both on.
- (13) Water (and rations) has been heated to the selected temperature when the HEATER ON lamp (16) goes off again.

NOTE

When the water has heated, the rations may still require heating and a longer warm up 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 are not required, repeat steps (1) thru (3).

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 and then open the cover with extreme care using gloves or other hand protection as necessary. Failure to comply can result in serious burn injuries.
- **HIGH TEMPERATURES.** Be aware that normal operating temperatures within the HWR are up to 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.

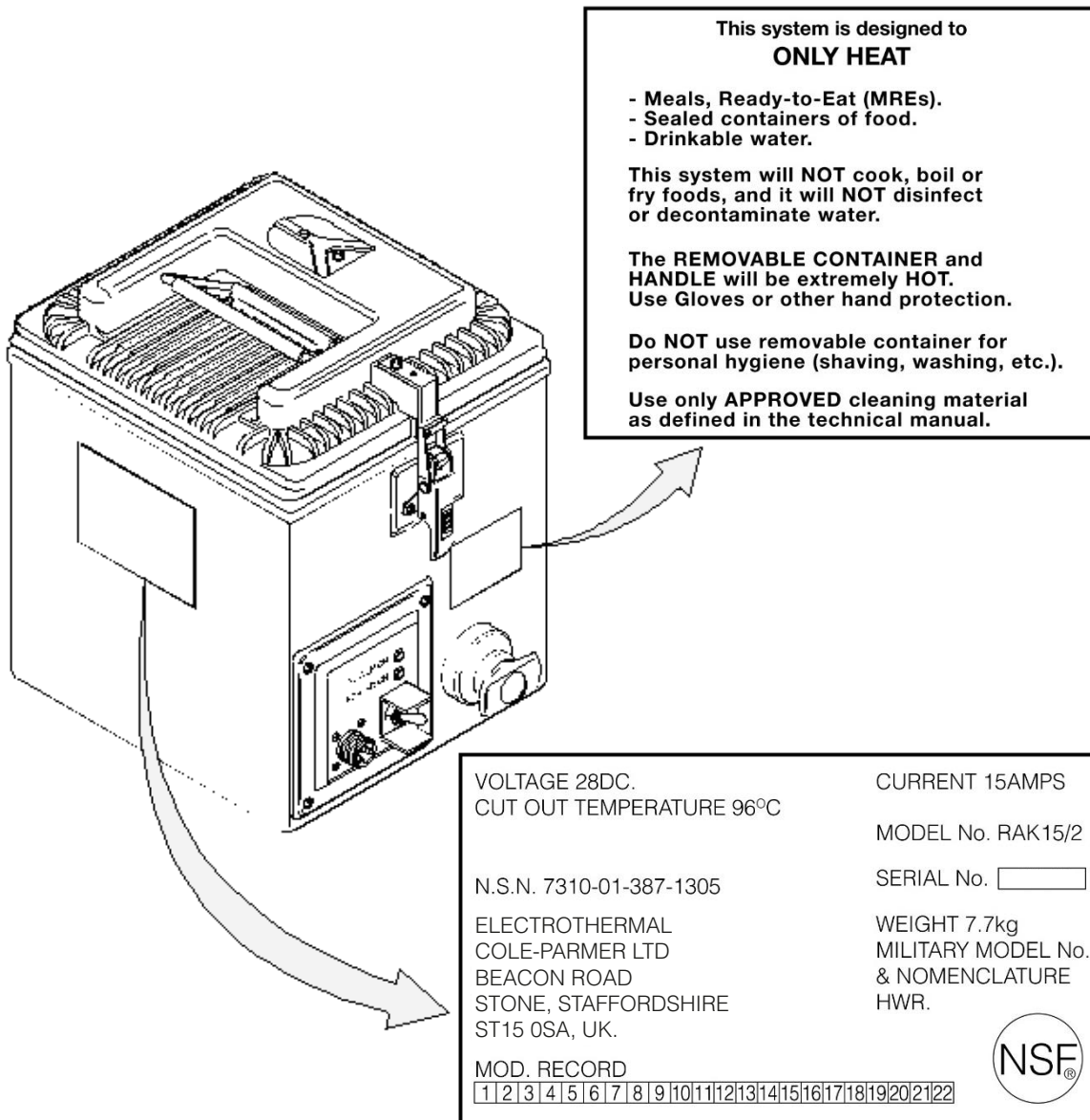
- (15) Using the fold-down heatproof handle (9), carefully open the cover (8) and disengage it from the hinge pivot bar (10) located along the top rear edge of the main case (11).
- (16) Holding the cover (8) by means of the fold-down heatproof handle (9), engage the latch hook (7) with the flat center 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 is located as illustrated.



**This system is designed to
ONLY HEAT**

- Meals, Ready-to-Eat (MREs).
- Sealed containers of food.
- Drinkable water.

This system will NOT cook, boil or fry foods, and it will NOT disinfect or decontaminate water.

The REMOVABLE CONTAINER and HANDLE will be extremely HOT. Use Gloves or other hand protection.

Do NOT use removable container for personal hygiene (shaving, washing, etc.).

Use only APPROVED cleaning material as defined in the technical manual.

VOLTAGE 28DC.	CURRENT 15AMPS
CUT OUT TEMPERATURE 96°C	MODEL No. RAK15/2
N.S.N. 7310-01-387-1305	SERIAL No. <input type="text"/>
ELECTROTHERMAL	WEIGHT 7.7kg
COLE-PARMER LTD	MILITARY MODEL No.
BEACON ROAD	& NOMENCLATURE
STONE, STAFFORDSHIRE	HWR.
ST15 0SA, UK.	
MOD. RECORD	
<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/> 16 <input type="checkbox"/> 17 <input type="checkbox"/> 18 <input type="checkbox"/> 19 <input type="checkbox"/> 20 <input type="checkbox"/> 21 <input type="checkbox"/> 22	

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 °C.
- b. Operation in Extreme Heat. There are no special instructions/precautions for operating the HWR in temperatures as high as 60 °C.
- c. Operation in High Humidity. There are no special instructions/precautions for operating the HWR in humidity greater than $94 \pm 4\%$ at a temperature of 60 °C.

2-13. EMERGENCY PROCEDURES

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

- a. The draw current (up to 15 A) will degrade the host vehicle electrical system.
- b. Power usage is restricted for operational reasons.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

	Page
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3-1 General	40
3-2 Troubleshooting Instructions	40
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Section I. OPERATOR'S TROUBLESHOOTING PROCEDURES

3-1. GENERAL

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

3-2. 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 severe electric shock or death under adverse conditions.

HIGH TEMPERATURES. Be aware that normal operating temperatures within the HWR are up to 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.

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.

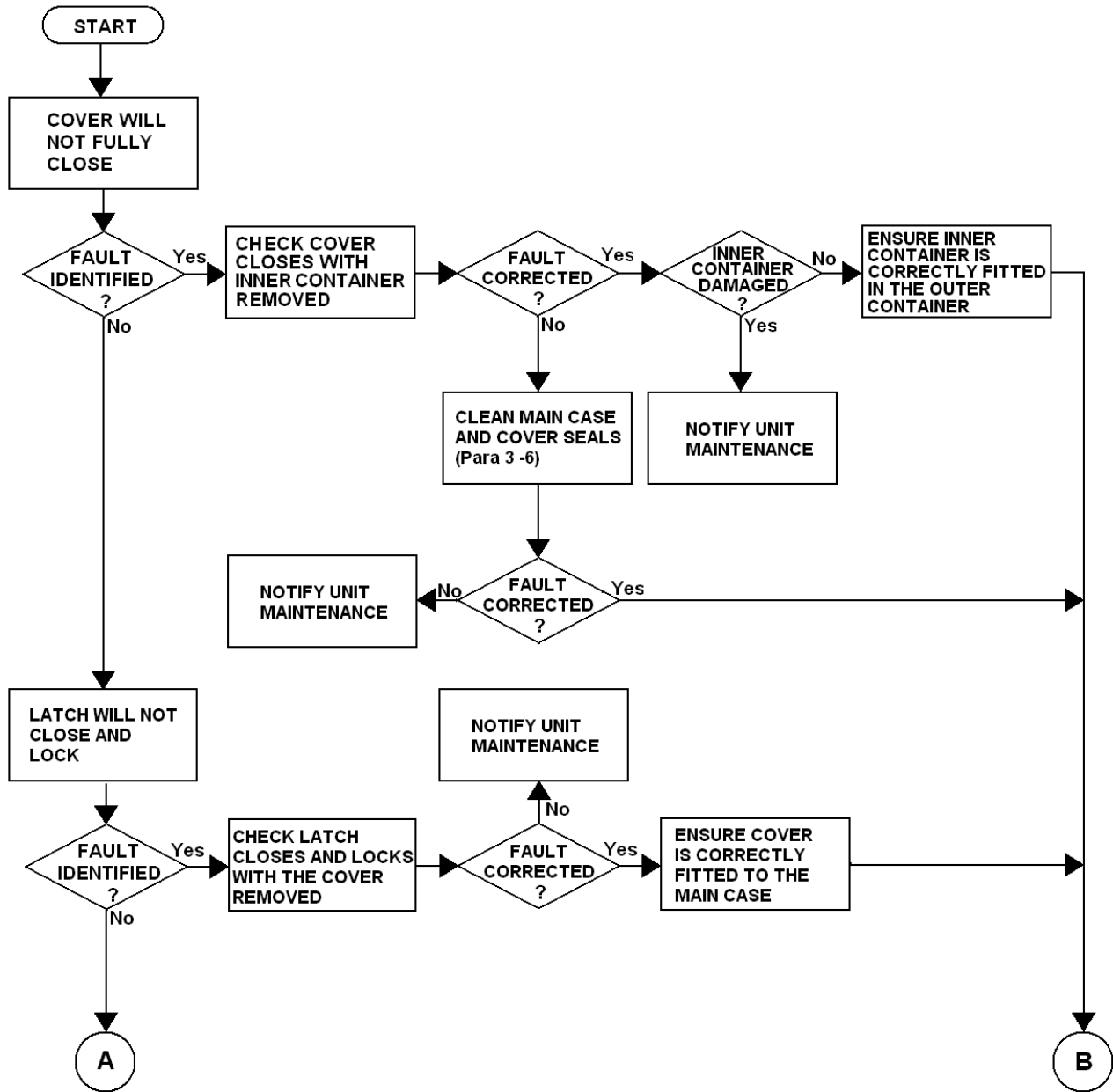
NOTE

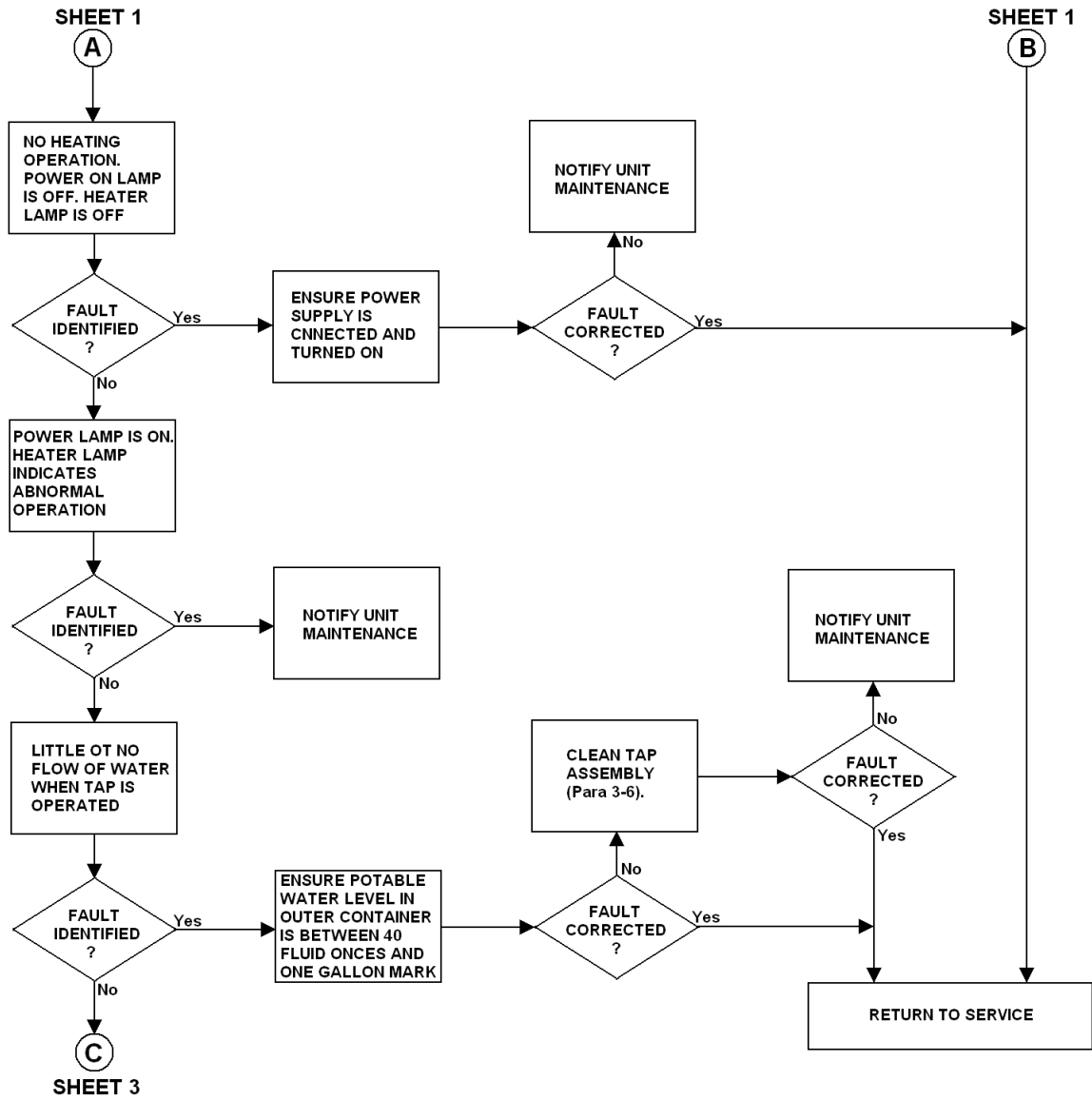
RAK units **do not** have internal over-current protection and so protection must be provided externally before or during installation.

When installed within a vehicle for example, this could be achieved using the vehicles internal fuse box and a designated power socket for the RAK.

Alternatively, a fuse could be integrated into the cable harness between the vehicle and the RAK.

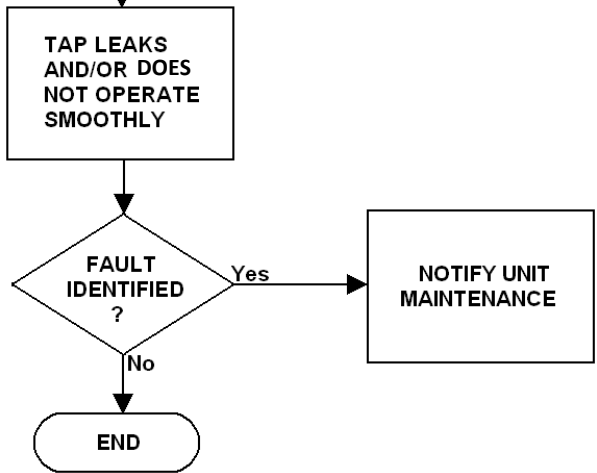
The RAK15 draws a nominal current of approximately 15 amps; over-current protection should be rated appropriately so that adequate protection is achieved *without* causing nuisance tripping during normal operation.





SHEET 2

C



Section II. OPERATOR'S MAINTENANCE PROCEDURES

3-3. 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 A:

- 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.

3-4. INSPECTION

Perform inspection of the HWR as described in Chapter 2, Section II, Preventive Maintenance Checks and Services (PMCS).

3-5. 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).

WARNING

NON-POTABLE/DIRTY WATER. Only use clean, potable 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 ingress of water to the control panel can result in the HWR becoming non-operational.
- CLEANING MATERIALS. Only use the authorized cleaning materials. Materials such as metal scouring pads can cause damage to the surface finish.
- DISHWASHING COMPOUND. Discard hand dishwashing compound/ heated water solution in accordance with the disposal instructions.

NOTE

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

a. Preliminary/Final Procedures.

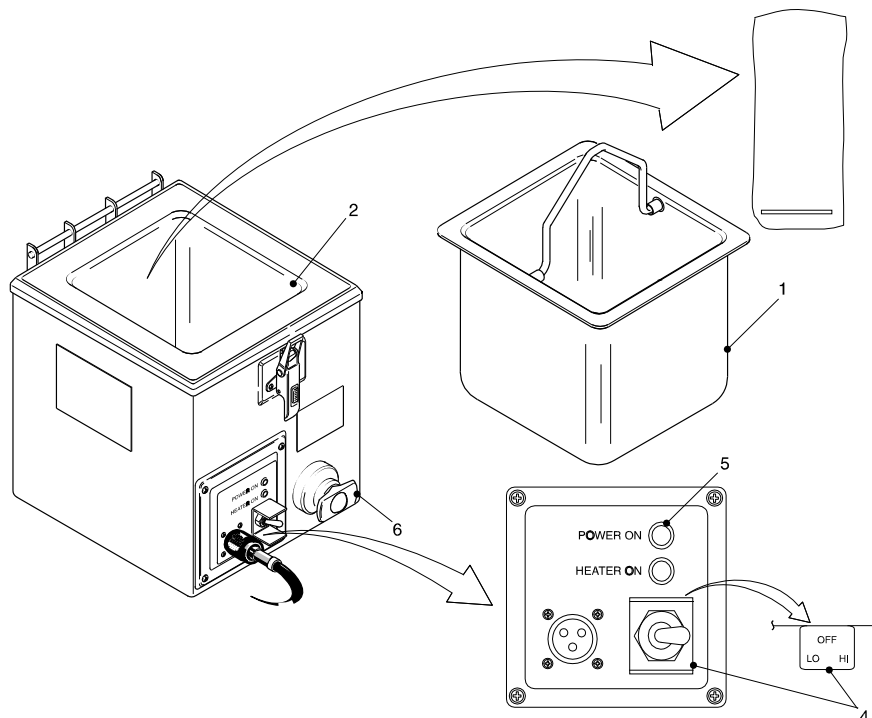
- (1) To prepare the HWR for cleaning, perform steps (1) thru (6) of Subparagraph 2-10a in Chapter 2.

3-5. CLEANING (Continued)

(2) To return the HWR to normal service, perform the following steps:

- a. Fit the inner container and the cover.
- b. Ensure that the cover is properly closed and latched.

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 necessary for cleaning purposes, the fold-down wire handle can be removed from the inner container before performing step (2).

- (2) Remove any loose food from the inner container (1) and outer container (2) by pre-scraping.
- (3) Fill the outer container (2) with clean, potable water up to the one gallon level line (3) embossed mark on the rear wall.
- (4) Set the LO/OFF/HI switch (4) to OFF and verify that the POWER ON lamp (5) is on.
- (5) When the POWER ON lamp (5) goes off again (ie, water is at selected temperature), set the LO/OFF/HI switch (4) to OFF.
- (6) Using the pull-action tap (6), half-fill the inner container (1) with heated water from the outer container (2).

3-5. CLEANING (Continued)

- (7) Using a field mess spoon, add two spoonful's of hand dishwashing compound 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.

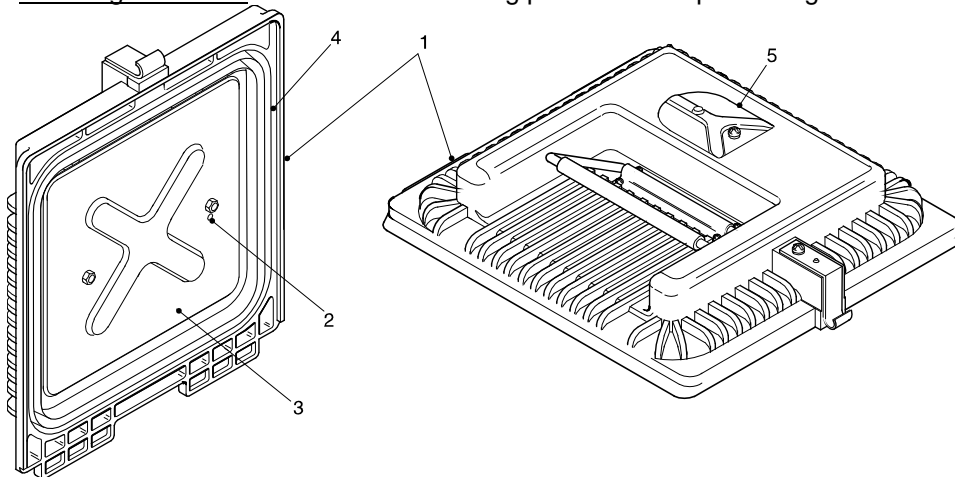
- (8) Clean the pull-action tap (6) by draining-off one canteen cupful of the outer container (2) wash water and discard.
- (9) Using a scrub brush or a scouring pad, scrub both containers until they are free of any persistent food residue and/or discoloration.
- (10) Discard the contents of both containers.
- (11) Half-fill the outer container (2) with clean, potable water and rinse off all traces of hand dishwashing compound.
- (12) Flush the pull-action tap (6) by draining-off the outer container (2) rinse water into a receptacle of suitable capacity and discard.
- (13) Rinse the inner container (1) in 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:



3-5. CLEANING (Continued)

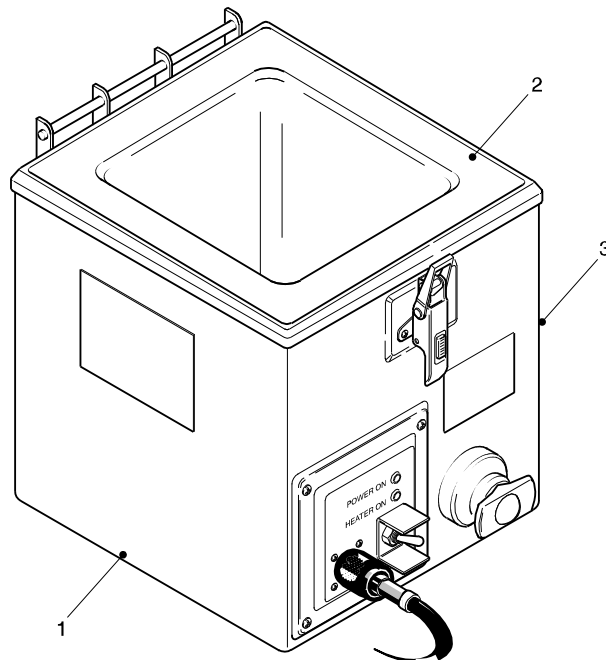
- (1) To prevent the ingress of liquid into the interior of the cover (1), block-off the small steam hole (2) in the seal retaining plate (3) using an easily removable means (e.g. tapered wooden peg of suitable size).
- (2) Remove any loose food from the seal retaining plate (3) and cover seal (4) by pre-scraping.
- (3) Using a scrub brush or a scouring pad, 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 hand washing compound/heated water 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) in 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.

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



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 which has been soaked in a hand dishwashing compound/heated water solution.
- (3) Wipe the case seal (2) with a damp cleaning cloth to remove all traces of hand dishwashing compound.
- (4) Clean the main case (1) using a cleaning cloth and the hand dishwashing compound/heated water solution retained in step (8) of Subparagraph 3-6b taking care to avoid splashing the control panel (3).
- (5) Rinse the main case (1) in 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.

3-6. SANITIZING

Sanitizing of the HWR should be performed quarterly and when required by the procedures described in Chapter 2, Section II, Preventive Maintenance Checks and Services (PMCS).

WARNING

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

CAUTION

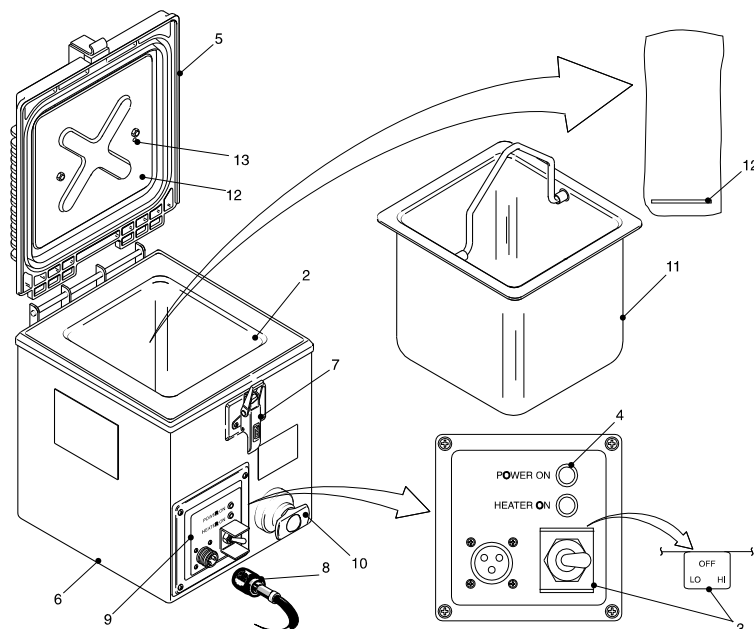
- **IMMERSION IN WATER.** Do not immerse the HWR in water. The ingress of water to the control panel can result in the HWR becoming non-operational.
- **CLEANING MATERIALS.** Only use the authorized cleaning materials. Materials such as metal scouring pads can cause damage to the surface finish.
- **FOOD SERVICE DISINFECTANT.** Discard food service disinfectant/heated water solution in accordance with the disposal instructions.

3-6. SANITIZING (Continued)

a. Preliminary/Final Procedures.

- (1) To prepare the HWR for sanitizing, perform steps (1) thru (6) of Subparagraph 2-10a in Chapter 2.
- (2) To return the HWR to normal service, perform the following steps:
 - a. Fit the inner container and the cover.
 - b. Ensure that the cover is properly closed and latched.

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 mark on the rear wall.
- (3) Set the LO/OFF/HI switch (3) to OFF and verify that the POWER ON lamp (4) is on.
- (4) When the POWER ON lamp (4) goes off again (i.e. water is at selected temperature), set the LO/OFF/HI switch (3) to OFF.
- (5) Fit the cover (5) onto the main case (6) ensuring that it is properly closed and secured by the latch (7).
- (6) Turn off the power supply then disconnect the power supply cable (8) from the control panel (9).
- (7) Remove the HWR from the host vehicle, place upright in a suitable work location then unlatch and remove the cover (5).

SANITIZING (Continued)

- (8) Using a field mess spoon, add one spoonful of food service disinfectant 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 (10) and discard.
- (10) Using the pull-action tap (10), drain-off the food service disinfectant/heated water solution into the inner container (11) until the level in the outer container (1) falls to the 1.18 liters line (12) embossed on the rear wall.
- (11) Fit the inner container (11) into the main case (6) taking care to not spill the food service disinfectant/heated water solution.
- (12) To prevent the ingress of liquid into the interior of the cover (5), block-off the small steam hole (13) in the seal retaining plate (14) using an easily removable means (e.g. tapered wooden peg of suitable size).
- (13) Fit the cover (5) onto the main case (6) ensuring that it is properly closed and secured by the latch (7).
- (14) Temporarily invert the HWR to allow the food service disinfectant/heated water 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 (5) then remove the inner container (11) and discard the food service disinfectant/heated water solution.
- (16) Using the pull-action tap (7), drain-off the food service disinfectant/heated water 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 (10) by draining-off the outer container (1) rinse water into a receptacle of suitable capacity and discard.
- (19) Rinse the inner container (11) in clean, potable water to remove all traces of food service disinfectant.
- (20) Allow the cover (5) and both containers to air dry.
- (21) On the cover (5), unblock the small steam hole (13) in the seal retaining plate (14).
- (22) Fit the HWR in the host vehicle, connect the power supply cable (8) to the control panel (9) 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

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Section I. REPAIR PARTS; TOOLS; MEASUREMENT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT

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

- a. Tool Kit, General Mechanics.

4-2. SPECIAL TOOLS, TMDE.

- a. List of Special Tools. No special tools are required.
- b. List of Test, Measurement and Diagnostic Equipment.
 - (1) Multimeter.

4-3. REPAIR PARTS

Repair parts are listed and illustrated in Appendix B 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 as follows:

- a. Inspect for damage incurred during shipment. If the HWR has been damaged, report the damage.
- b. Check against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions.

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 sub-paragraphs:

4-7. GENERAL (Continued)

- 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.
- b. Perform the PMCS procedures at a regular time within the stated periods.
- c. Comply with all applicable WARNINGS, CAUTIONS and NOTES.

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.
- 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 V, Unit Troubleshooting Procedures if the HWR does not perform as stated.
- g. If a malfunction is identified and cannot be corrected, report it to the supervisor.
- h. The following general checks should be performed as necessary:
 - (1) **Bolts, Nuts and Screws.** Check for looseness, missing, bent or broken condition. Tighten or replace as required.
 - (2) **Power Cable/Connector.** Check for proper fit of the connector and for signs of physical damage to the connector or cable. Tighten connector to hand tightness if loose.

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

Item No.	Interval	Location	Procedure	Not Fully Mission Capable if:
		Item to Check/Service		
1	Monthly		a. Test operation of pressure relief valve.	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 (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 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.

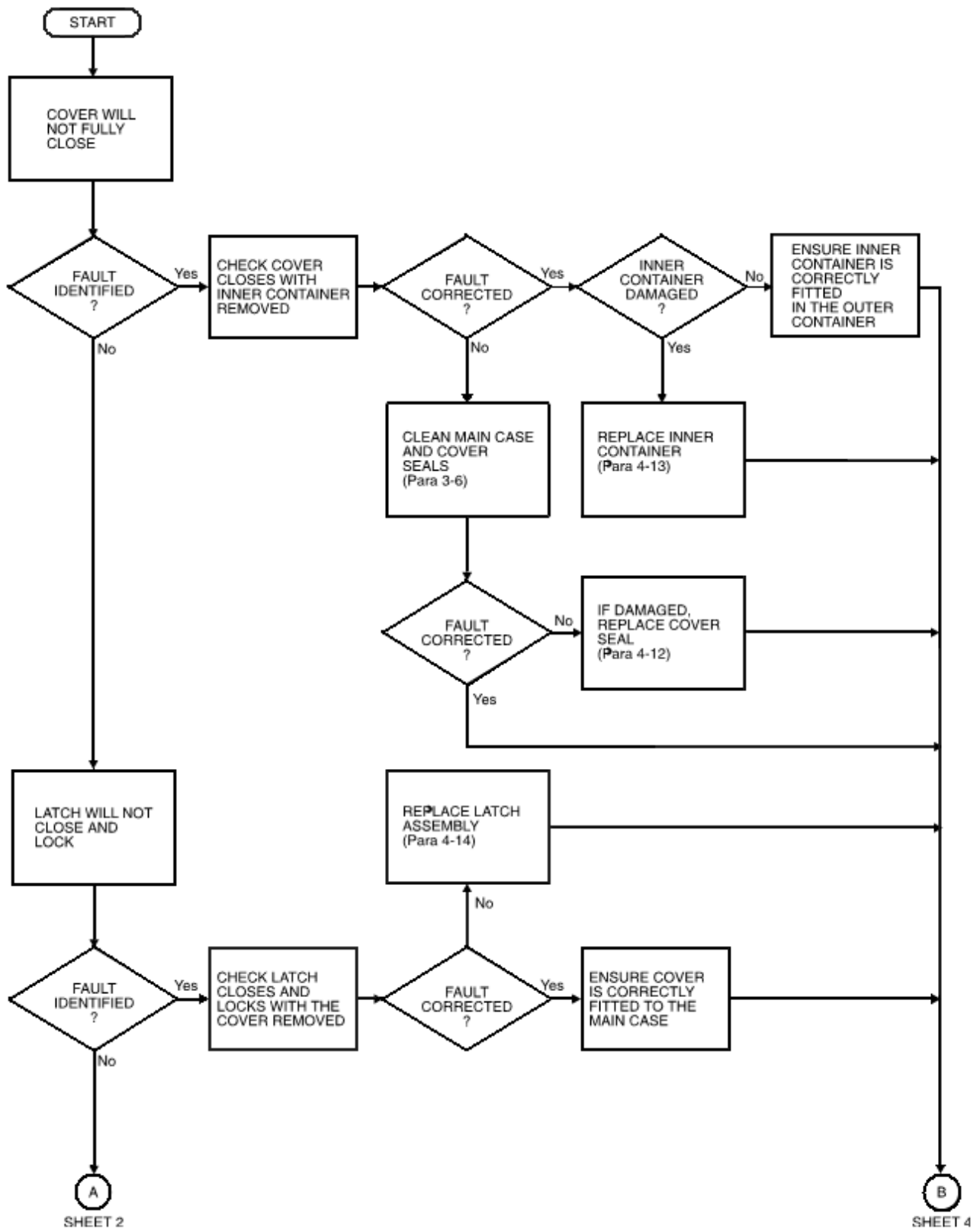
CAUTION

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.

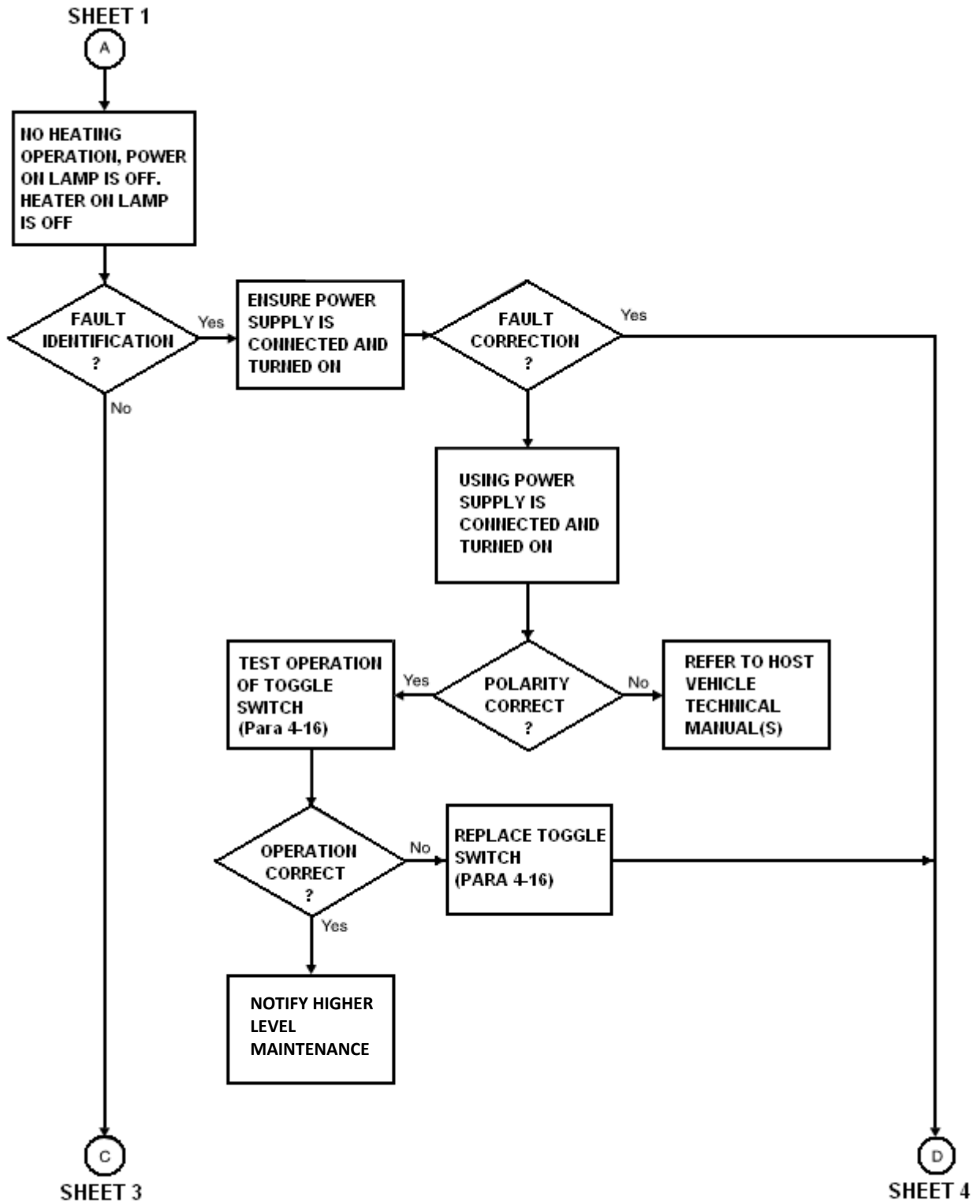
This troubleshooting flowchart describes typical malfunctions which are most likely to occur when operating the HWR. To use the flowchart, commence at the START function and check each set of fault conditions against the observed malfunction. When matching fault conditions are identified, rectify the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

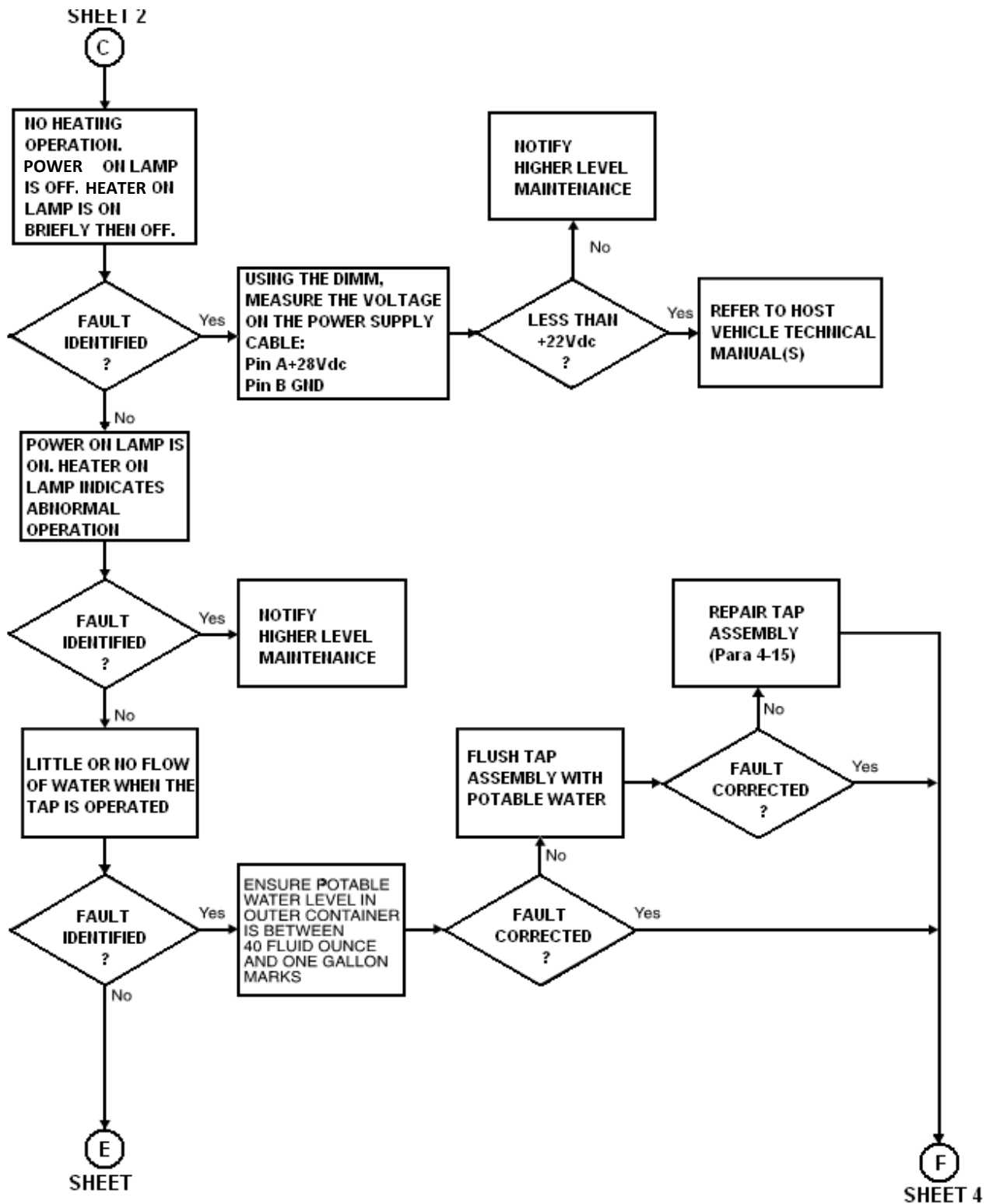
4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)



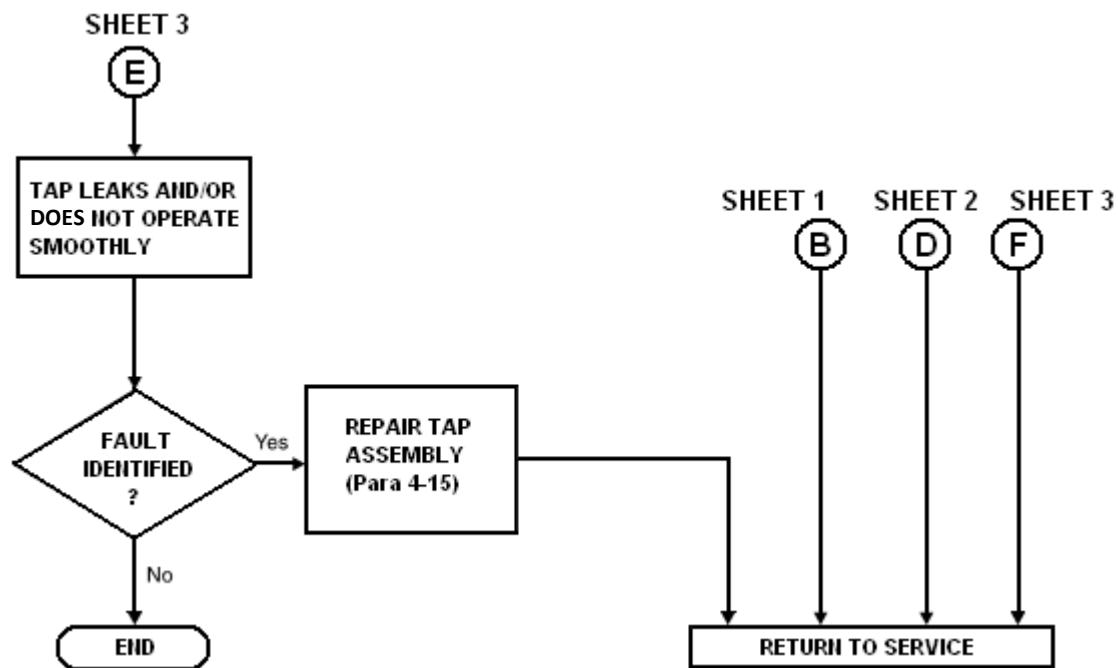
4-10. TROUBLESHOOTING INSTRUCTIONS (Continued)



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 A. 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 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.

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.

HWR Condition: Cover removed (Chapter 2, 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).

b. Installation of Cover Seal and Preformed Packing.

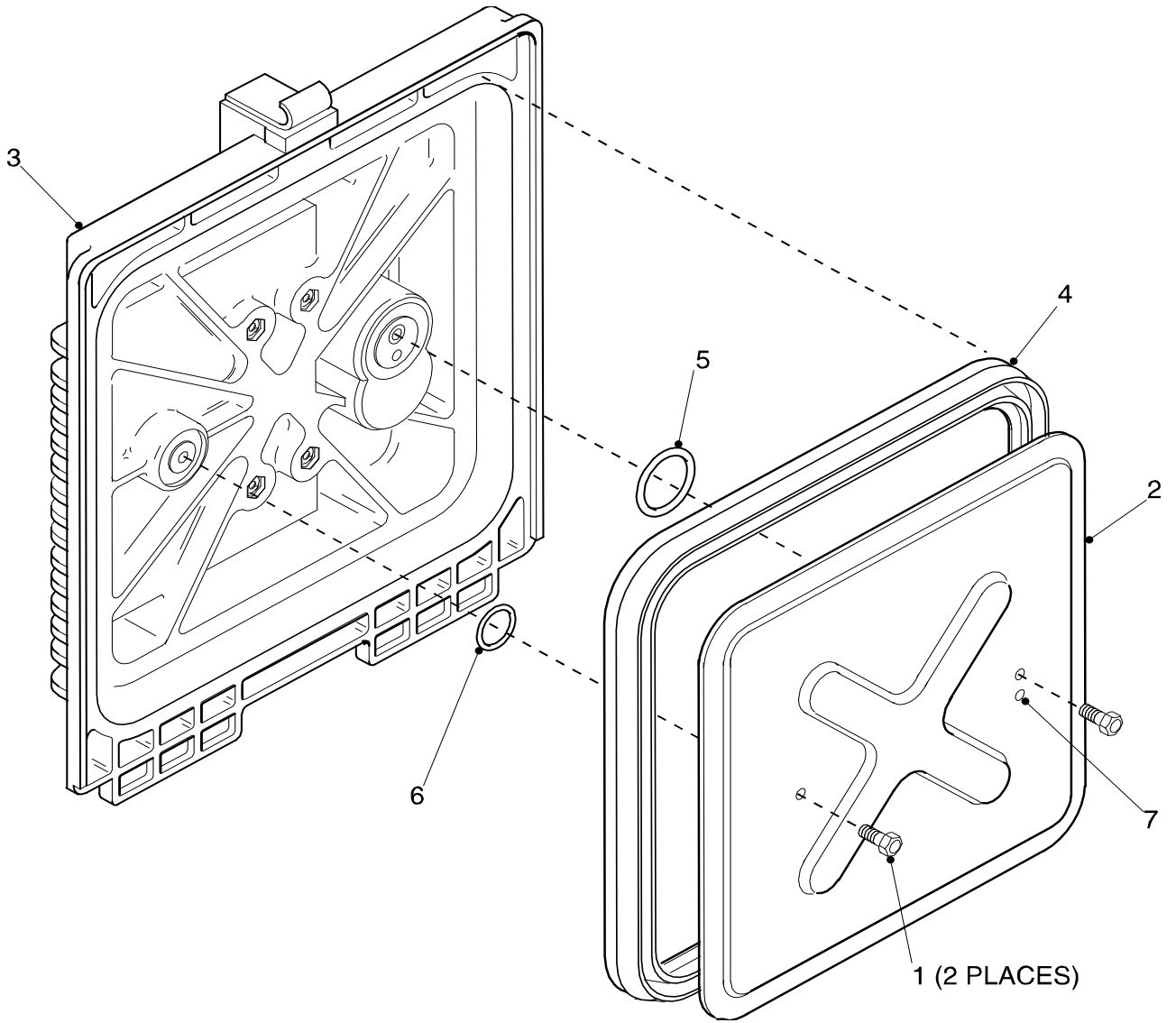
- (1) Install cover seal (4) by aligning it with the cover (3) and pressing firmly into position.
- (2) Install large preformed packing (5) in the cover (3) and ensures that it is correctly positioned.
- (3) Install small preformed packing (6) in the cover (3) and ensure that it is correctly positioned.
- (4) Install seal retaining plate (2) to the cover seal (4) with the small steam hole (7) located as shown.

CAUTION

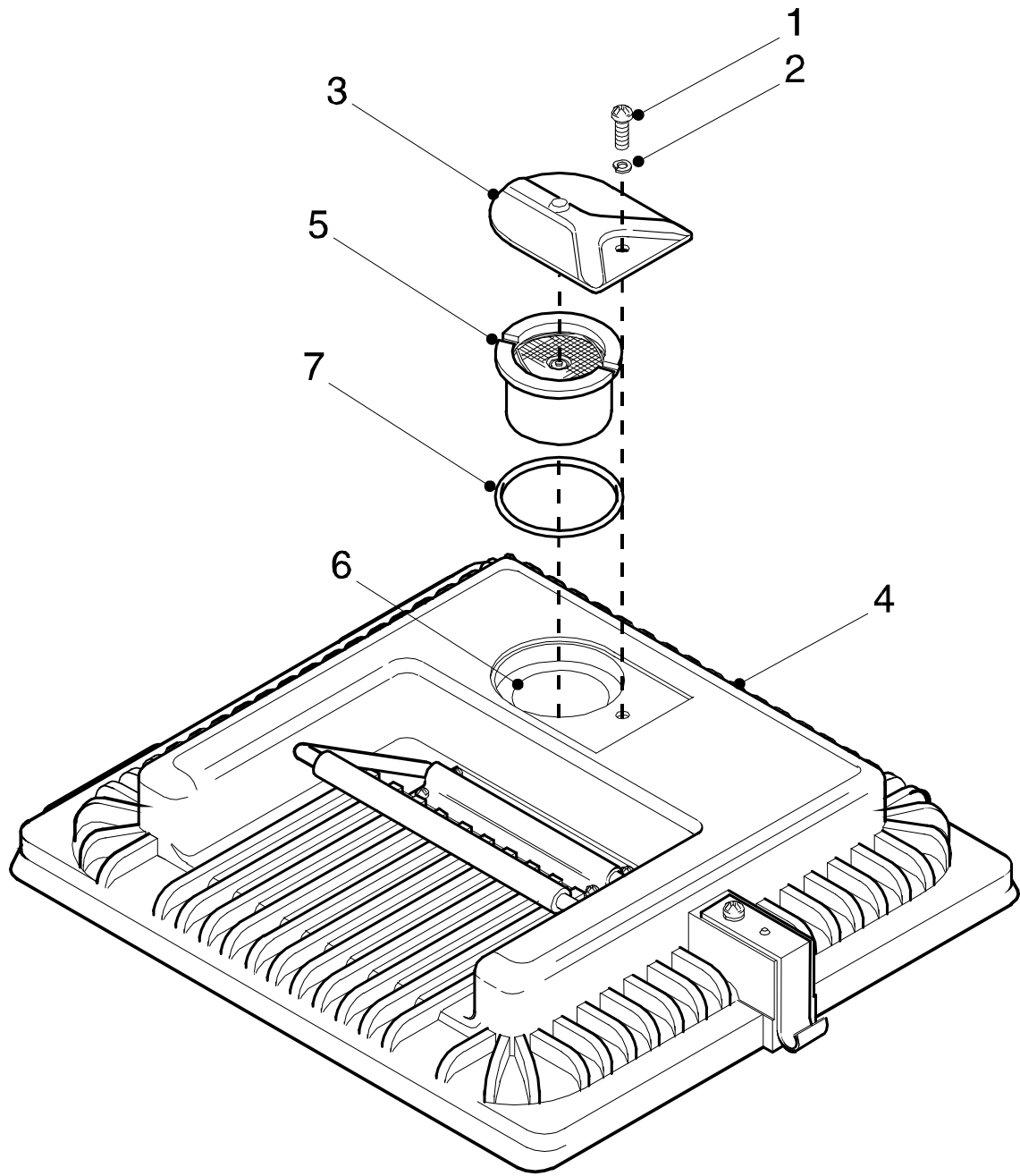
DAMAGE TO BOLTS. In step (5), use standard hand tools to fit the bolts (1) and only tighten with sufficient torque to ensure that the seal retaining plate (2) is held firmly in position. The application of excessive torque can result in damage to the bolts (1).

- (5) Ensure that both screw holes are correctly aligned then install and tighten the two screws (1).
- (6) Install cover (Chapter 2, Subparagraph 2-9a, steps (8) and (9)).

4-12. REPAIR OF COVER ASSEMBLY (Continued)



REPAIR OF COVER ASSEMBLY (Continued)



4-12. REPAIR OF COVER ASSEMBLY (Continued)

c. Removal of Pressure Relief Valve.

- (1) Remove and retain single fixing screw (1) with 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).
- (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) Lightly push valve head and stem in one direction then release and blow in the other direction to release.
- (2) Repeat step (1) but in the opposite direction.

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 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 fit 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 and tighten single screw (1) with lock washer (2).
- (6) Install cover (Chapter 2, Subparagraph 2-9a, steps (8) and (9)).

4-13. REPLACEMENT OF INNER CONTAINER

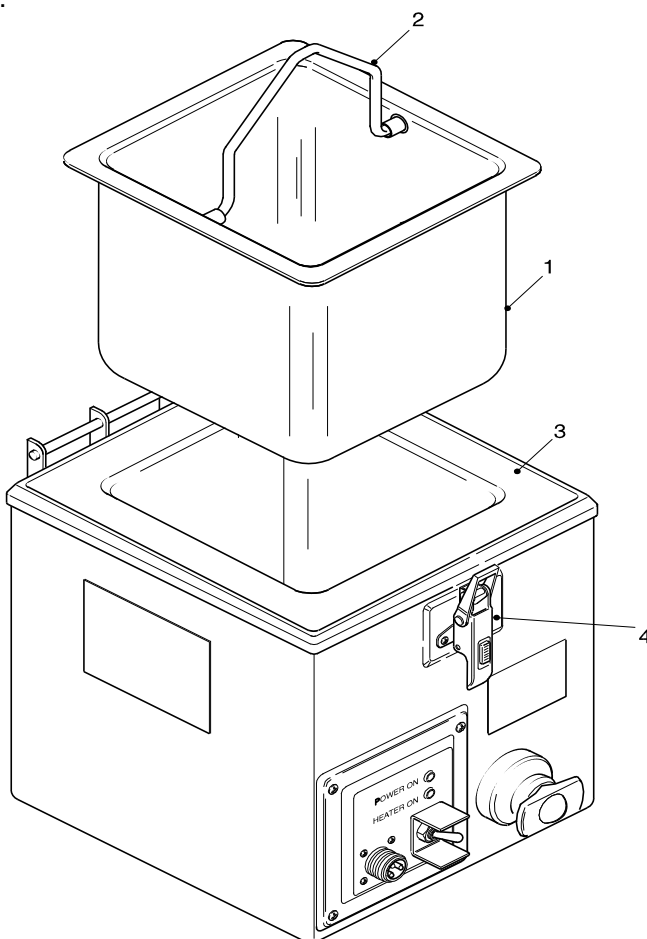
This task covers: a. Removal.
 b. Installation.

INITIAL SETUP

Tools: None.

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

- a. Removal. Remove inner container (1) using fold-down wire handle (2).
- b. Replacement.
 - (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 cover (Chapter 2, 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.
 - b. Installation.

INITIAL SETUP

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

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

a. Removal.

- (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 (5) to the main case (6).
- (4) Remove latch assembly (5).

b. Installation.

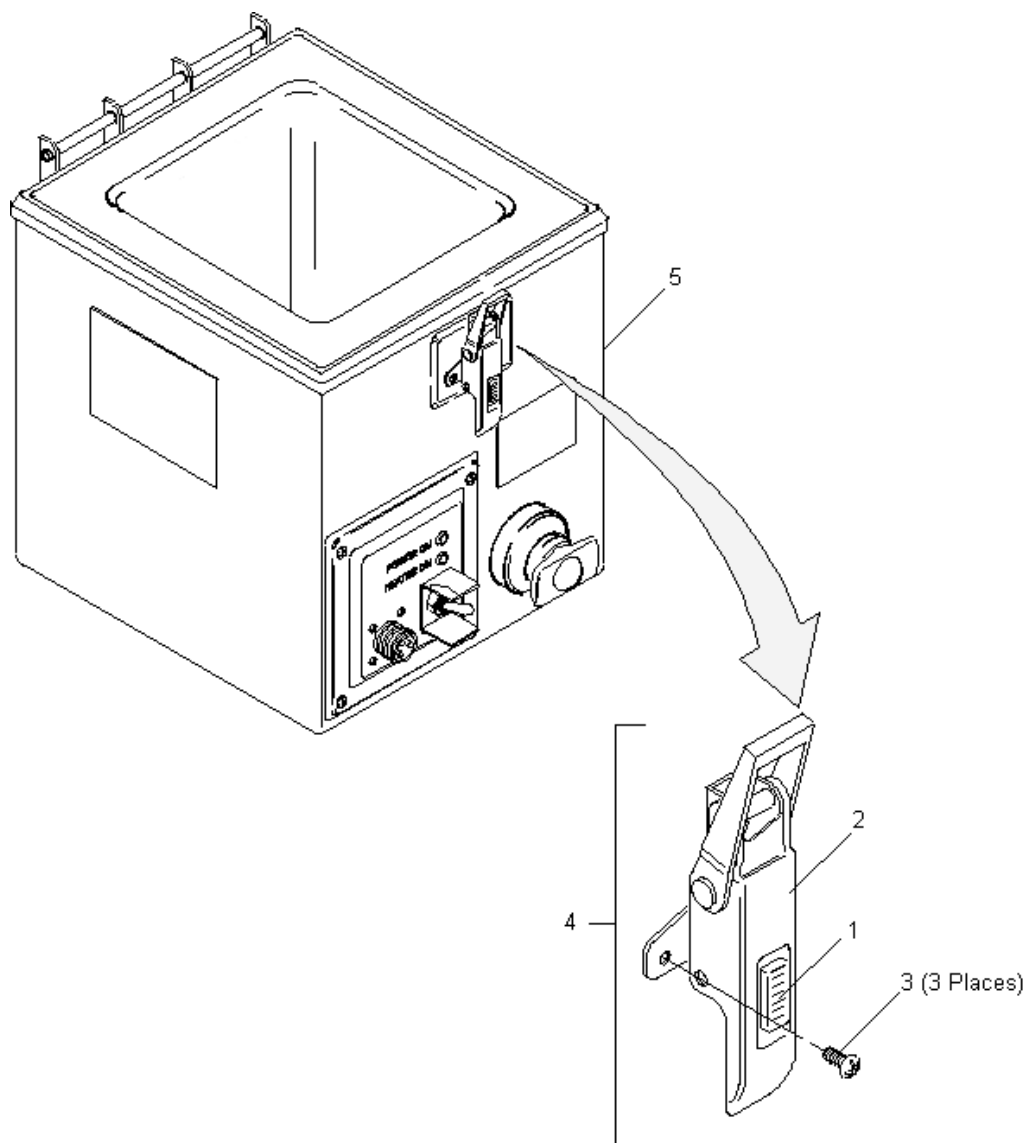
- (1) Rotate operating lever (2) upwards to its full extent and hold in position.
- (2) Locate latch assembly (5) on the main case (6) and position it such that the three mounting holes are correctly aligned.

CAUTION

DAMAGE TO SCREWS. In step (3), use standard hand tools to fit the screws (3) and only tighten with sufficient torque to ensure that the latch assembly (5) is held firmly in position. The application of excessive torque can result in damage to the screws (3).

- (3) Install and tighten three mounting screws (3).
- (4) Install inner container (Subparagraph 4-13b, step (1)).
- (5) Install cover (Chapter 2, Subparagraph 2-9a, steps (8) and (9)).

REPLACEMENT OF LATCH ASSEMBLY (Continued)



4-15. REPAIR OF TAP ASSEMBLY

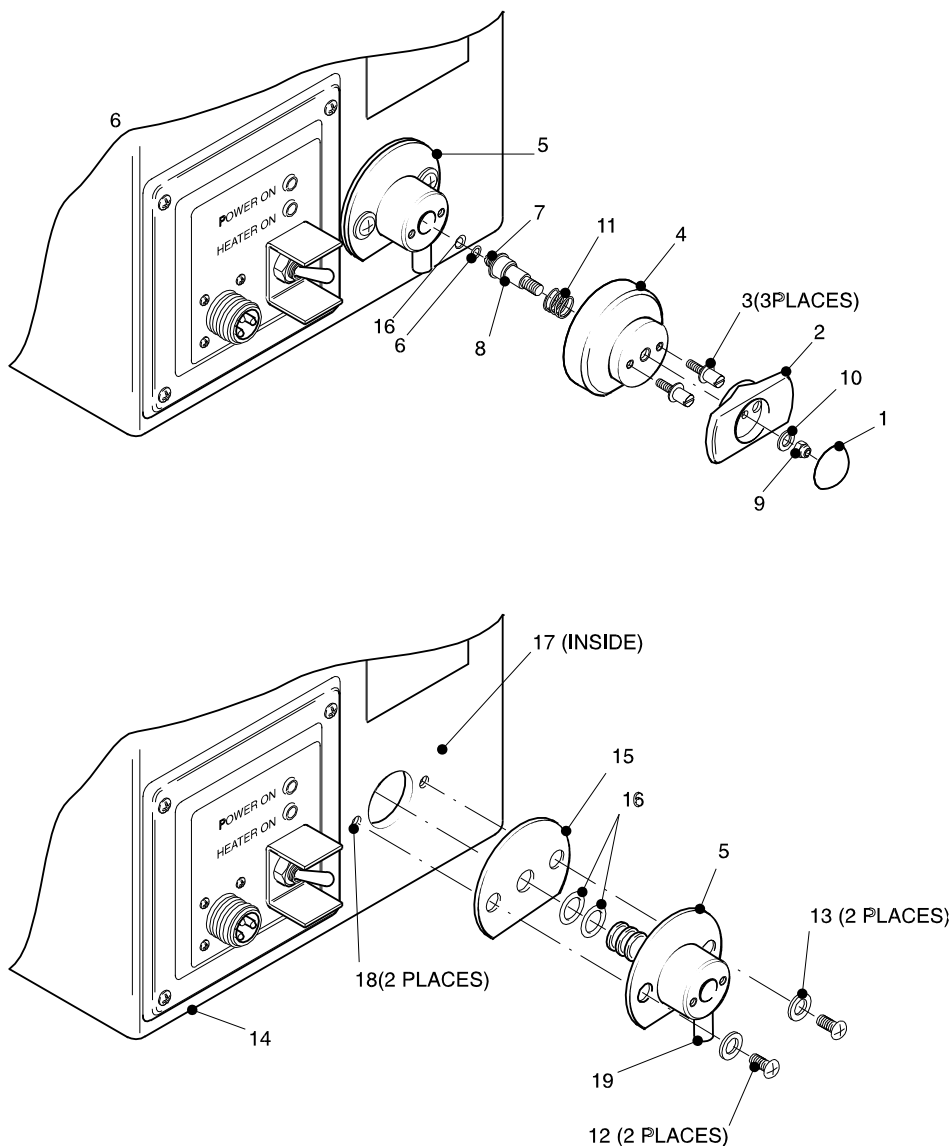
- This task covers:
- Removal of valve preformed packing, valve spring, body gasket and body preformed packing.
 - Installation of valve preformed packing, valve spring, body gasket and body preformed packing.

INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive.

Parts/Materials: Preform Tap Assembly.

HWR Condition: Cover removed (Chapter 2, 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 from the tap body (5).
- (4) Remove and discard valve preformed packings (6)(16).

CAUTION

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

- (5) Perform the following:
 - a. Insert a flat tip screwdriver into slot (7) to prevent the valve stem (8) from rotating.
 - b. Remove and retain valve nut (9) and washer (10).
 - c. Withdraw handle (2), shroud (4) and valve spring (11) from the valve stem (8).
 - d. Discard the valve spring (11).
- (6) Remove and retain two screws (12) and special washers (13) securing the tap body (5) to the main case (14).
- (7) Carefully withdraw tap body (5) and gasket (15) until free of the main case (14).
- (8) Remove and discard the gasket (15).
- (9) Remove and discard the preformed packing (16).

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

- (1) Install preformed packing (16) and gasket (15) on the valve body (5).
- (2) Install tap body (5) and gasket (15) by carefully pushing into the water outlet on the outer container (17) until even contact is made with the main case (14).
- (3) Rotate tap body (5) and gasket (15) to the left or right as necessary to align with the two mounting holes (18) while ensuring that the spigot (19) is orientated as shown.

CAUTION

DAMAGE TO SCREWS. In step (4), use standard hand tools to install the screws (12) 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 (12).

- (4) Install and tighten two screws (12) and special washers (13).

4-15. 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 (9) is started on the threaded portion of the valve stem (8):

- a. Install valve spring (11) and shroud (4) on the valve stem (8).
 - b. Install two mounting screws (3) and handle (2) on the shroud (4).
 - c. Install washer (10) and valve nut (9) on the valve stem (8).
 - d. Insert a flat tip screwdriver into slot (7) to prevent valve stem (8) from rotating.
 - e. Tighten valve nut (9) until the end of the valve stem (8) protrudes by one thread.
- (6) Check that the valve stem (8) can move freely over its full range with no binding of the valve spring (11).
- (7) Install preformed packings (6)(16) on the valve stem (8).
- (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 inner container (Subparagraph 4-13b, step (1)).
- (13) Install cover (Chapter 2, Subparagraph 2-9a, steps (8) and (9)).

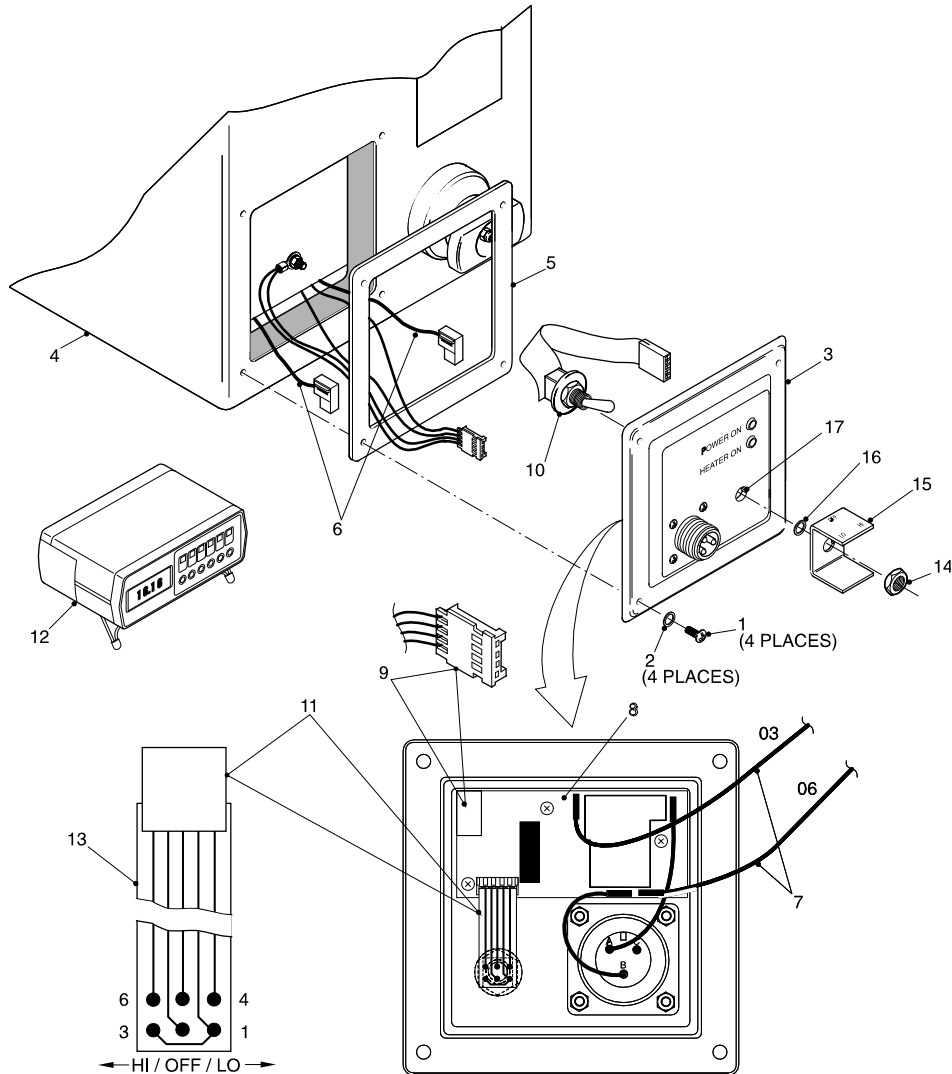
4-16. REPAIR OF CONTROL PANEL ASSEMBLY

- This task covers:
- Removal of control panel.
 - Test of toggle switch.
 - Removal of toggle switch.
 - Installation of toggle switch.
 - Installation of control panel.

INITIAL SETUP

Tools: Tool Kit, General Mechanics: Automotive.

HWR Condition: Power supply turned off. Power cable / connector disconnected.



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

a. Removal of Control Panel.

- (1) Support the control panel (1) by hand then loosen, in turn, four mounting screws (2) until it is detached from the main case (4).

NOTE

In step (2) the fixing screws will be retained in place by the gasket.

- (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 and P4 respectively on the PCB (7).
- (4) Disconnect overheat sensor/boil-dry sensor connector (8) from connector CONN 1 on the PCB (7).
- (5) Remove and retain the control panel (1) complete with gasket (5), fixing screws (2).

b. Test of Toggle Switch.

- (1) Operate switch (9) between the LO, OFF and HI positions and verify that the action is firm with positive stop in each position.
- (2) Disconnect switch connector (10) from connector CONN 2 on the PCB (7).

NOTE

In steps (3) and (4) "open-circuit" is taken to be a reading greater than 50 M and "continuity" is taken to be a reading less than 0.5 ohm.

- (3) Using the digital multimeter (12) set to read resistance, perform the following:
 - a. Set switch (10) to the OFF (center) position and check that an open-circuit reading is obtained between pins 1 & 2, pins 2 & 3, pins 4 & 5 and pins 5 & 6.
 - b. Set switch (10) to the LO (left) position and check that a continuity reading is obtained between pins 1 & 2 and pins 4 & 5. Check also that an open-circuit reading is obtained between pins 5 & 6.
 - c. Set switch (10) to the HI (right) position and check that a continuity reading is obtained between pins 1 & 2 and pins 5 & 6. Check also that an open-circuit reading is obtained between pins 4 & 5.
- (4) Using the digital multimeter (12) set to read resistance, check that a continuity reading is obtained for each track of the ribbon-cable (13) between the switch (10) and switch connector (11).

c. Removal of Toggle Switch.

- (1) Verify that switch connector (11) is disconnected from connector CONN 2 on the PCB (8).
- (2) Loosen lock nut (14) securing toggle switch (10) to the control panel (3).

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

- (3) Remove and retain the lock nut (14), switch guard (15) and switch gasket (14).
- (4) Withdraw toggle switch (10) from the rear of the control panel (1).

d. Installation of Toggle Switch.

- (1) Using the keyway (17) to ensure correct positioning, insert toggle switch (10) into the control panel (3) then fit switch gasket (16) and switch guard (15) in that order.

CAUTION

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

- (2) Install and tighten the lock nut (14).
- (3) Reconnect switch connector (11) to connector CONN 2 on the PCB (8).

e. Installation of Control Panel.

NOTE

Ensure that the control panel is complete with gasket, mounting screws and lock washers before installing.

- (1) Reconnect overheat sensor/boil-dry sensor connector (9) to connector CONN 1 on the PCB (8).
- (2) Reconnect 03 and 06 heater power supply wires (7) to connectors P2 and P4 respectively on the PCB (8).
- (3) Locate control panel (1) on the main case (4) and position such that the four mounting holes are correctly aligned.

CAUTION

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

- (4) Install and tighten four mounting screws (1).

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4-17. PREPARATION FOR STORAGE

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

4-18. 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

MAINTENANCE ALLOCATION CHART

SECTION I. INTRODUCTION

A-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 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.

A-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.

A-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 (i.e., DMWR). 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.

A-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.
- c. MAINTENANCE FUNCTION. This column lists the maintenance functions to be performed on the items listed in Column 2.
- d. TOOLS AND EQUIPMENT REFERENCE 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.
- e. 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.

A-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 REFERENCE CODE. This column contains numbers which coincide with the numbers used in Column 5 in the MAC. The numbers indicate the applicable tools and equipment required for performing the designated maintenance functions.
- b. NOMENCLATURE. This column lists the name and nomenclature of the tools and test equipment required to perform the maintenance functions.

Section II. MAINTENANCE ALLOCATION CHART

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

SECTION III. TOOLS AND TEST EQUIPMENT

TOOL & TEST EQUIP CODE	NOMENCLATURE	TOOL OR TEST EQUIP NUMBER
1	TOOL KIT, GENERAL MECHANICS: AUTOMOTIVE	

SECTION IV. REMARKS

REMARKS CODE	REMARKS
A	VISUAL INSPECTION.
B	REPAIR BY REPLACEMENT OF PARTS.
C	ELECTRICAL TEST.
D	MECHANICAL TEST.
E	CLEAN OR SANITIZE.

APPENDIX B

REPAIR PARTS

SECTION I. 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.

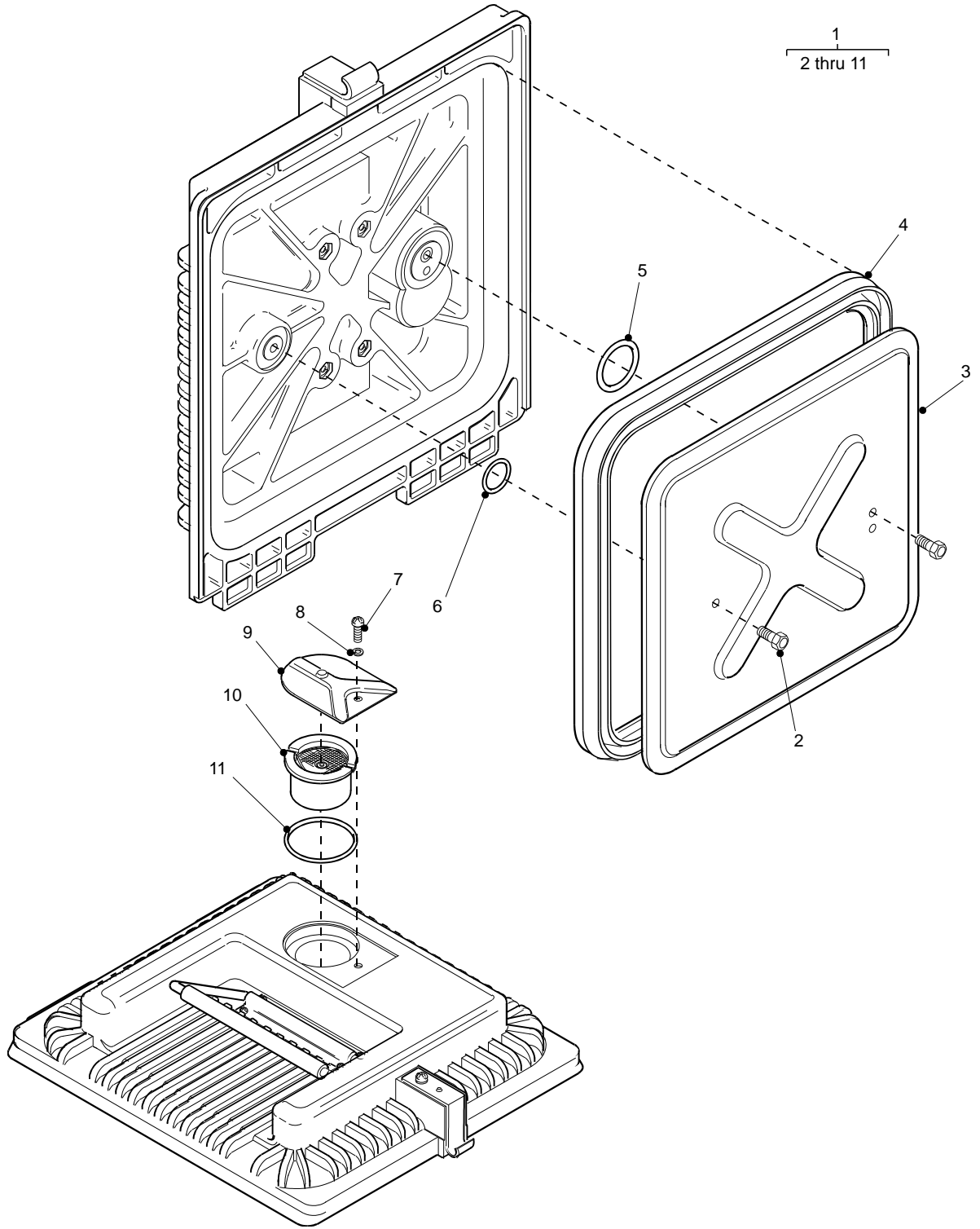


Figure B-1. Cover Assembly (AZ137603)

(1) ITEM No.	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
1	AZ137603	GROUP 01: Cover Assembly FIG. B-1 Cover Assembly Cover Assembly	1
2		<ul style="list-style-type: none"> • Screw, Seal Retaining Plate M4 x 8mm lg Hex Hd S/St 	2
3		<ul style="list-style-type: none"> • Plate, Seal Retaining 	1
4		<ul style="list-style-type: none"> • Seal, Cover 	1
5		<ul style="list-style-type: none"> • Packing, Preformed, Large 20.29 ID x 2.62 Section..... 	1
6		<ul style="list-style-type: none"> • Packing, Preformed, Small 13.95 ID x 2.62 Section.... 	1
7		<ul style="list-style-type: none"> • Screw, Plate, Valve Retaining M4 x 8mm lg Pan Hd Ph S/St 	1
8		<ul style="list-style-type: none"> • Washer, Special M4 Spring St/Stl..... 	1
9		<ul style="list-style-type: none"> • Plate, Valve Retaining 	1
10		<ul style="list-style-type: none"> • Valve, Pressure Relief 	1
11		<ul style="list-style-type: none"> • Packing, Preformed 34.0 ID x 2.00 Section..... 	1

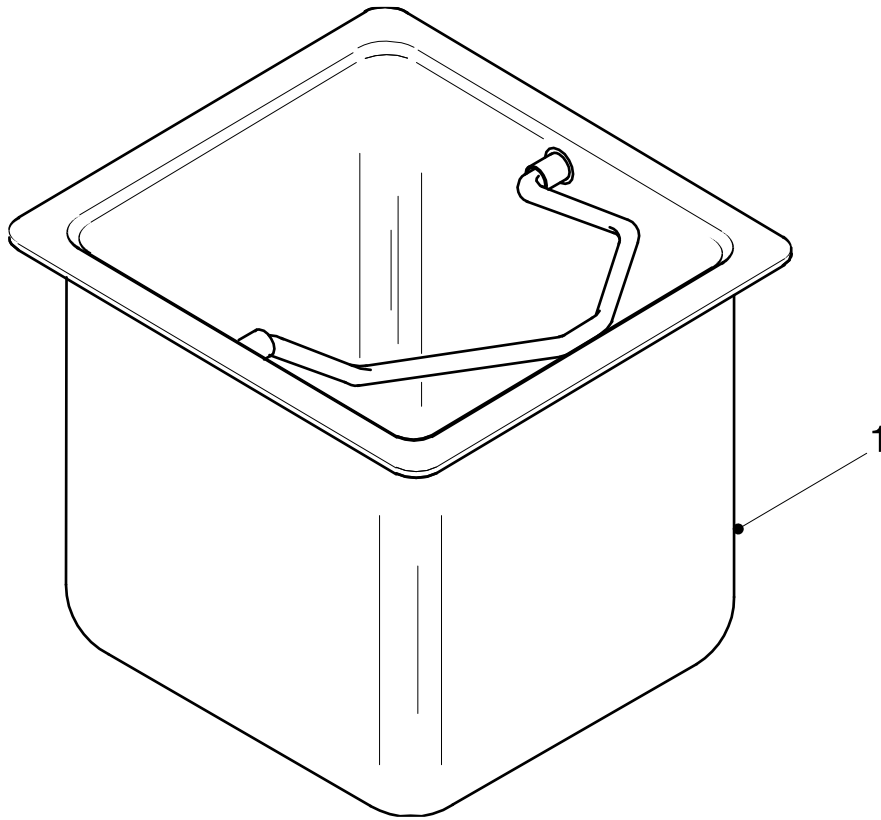


Figure B-2. Container Assembly, Inner (AZ137605)

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

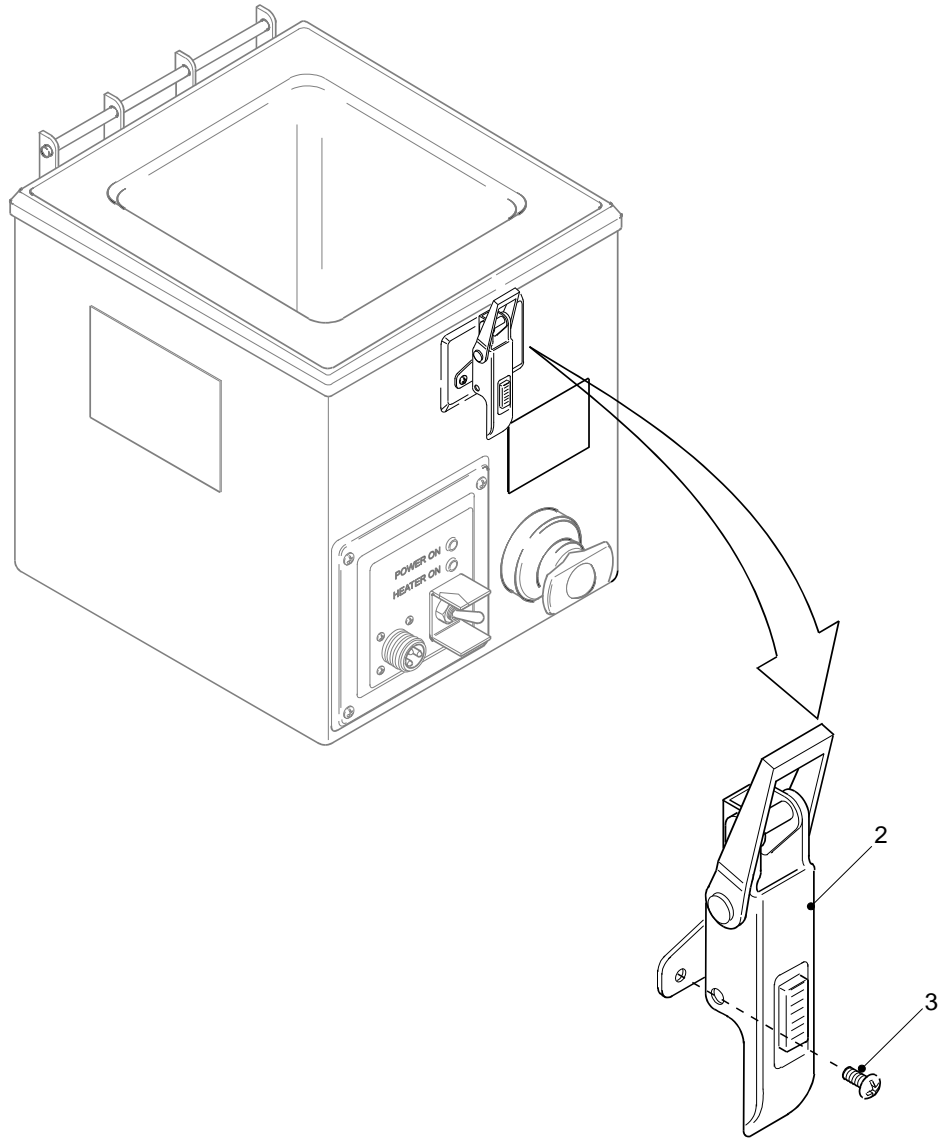
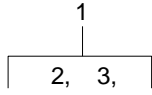


Figure B-3. Latch Assembly (AZM6633)

(1) ITEM No.	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
1 2 3	AZM6633	GROUP 03: Main Case Assembly FIG. B-3 Latch Assembly • Latch Assembly..... •• Latch..... •• Screw, Machine M4 x 12 lg Pan Hd Ph S/St.....	1 1 3

1
2 thru 15

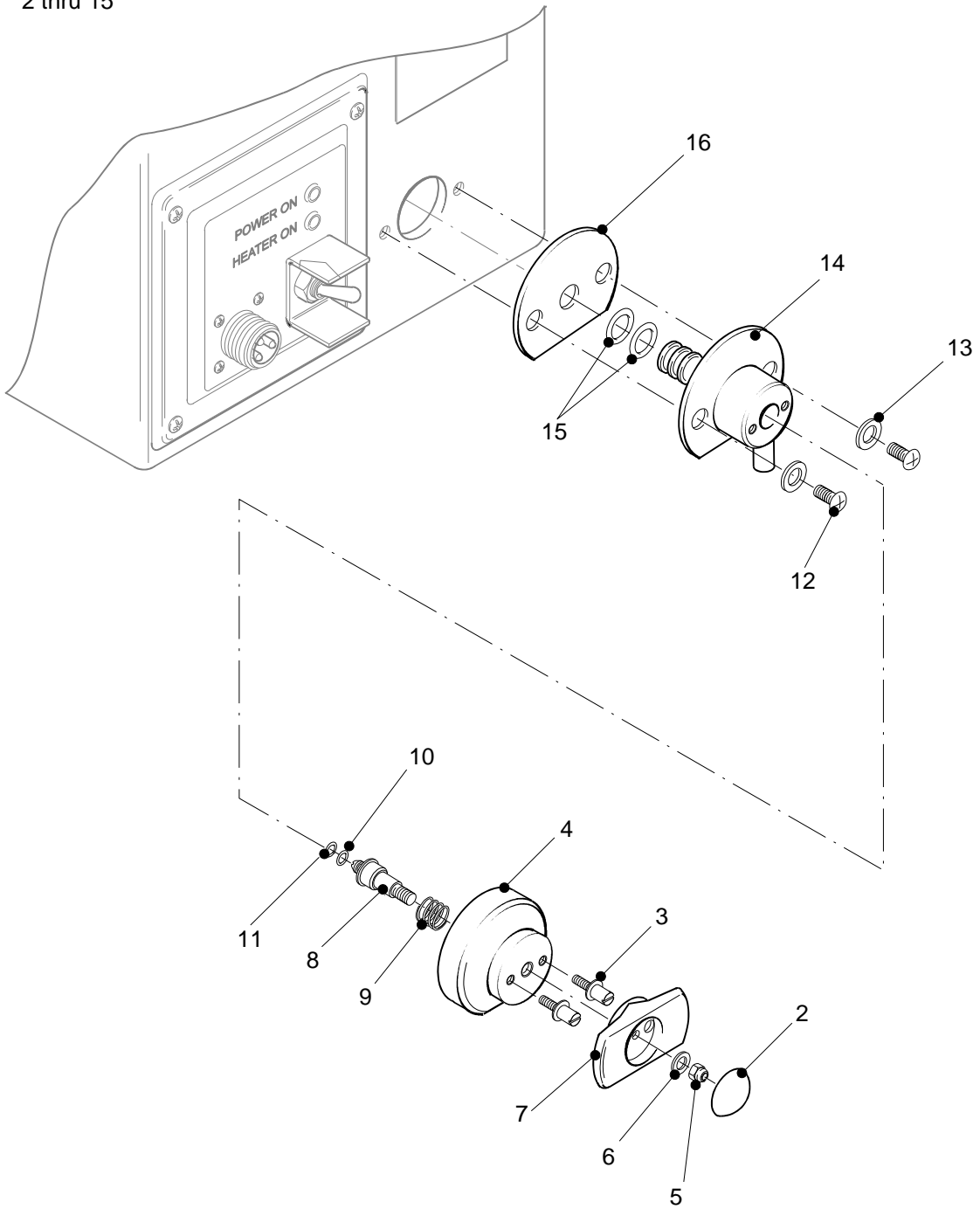


Figure B-4. Tap Assembly (AZ1376137)

(1) ITEM No.	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
		GROUP 03: Main Case Assembly FIG. B-4 Tap Assembly	
1	AZ1376137	• Tap Assembly	1
2		•• Press-fit Plastic cap.....	1
3		•• Screw, Captive	2
4		•• Shroud.....	1
5		•• Nut M5 Aerotight St/Stl.....	1
6		•• Washer M5 Plain St/Stl.....	1
7		•• Handle.....	1
8		•• Valve Stem	1
9		•• Spring, Valve	1
10		•• Packing, Preformed 5.23 ID x 2.62 Section.....	1
11		•• Packing, Preformed 7.60 ID x 2.62 Section.....	1
12		•• Screw, Tap Body M4 x 12 lg Pan Hd Ph St/Stl..	2
13		•• Washer, Special	2
14		•• Tap Body.....	1
15		•• Packing, Preformed 9.25 ID x 1.78 Section.....	2
16		•• Gasket	1

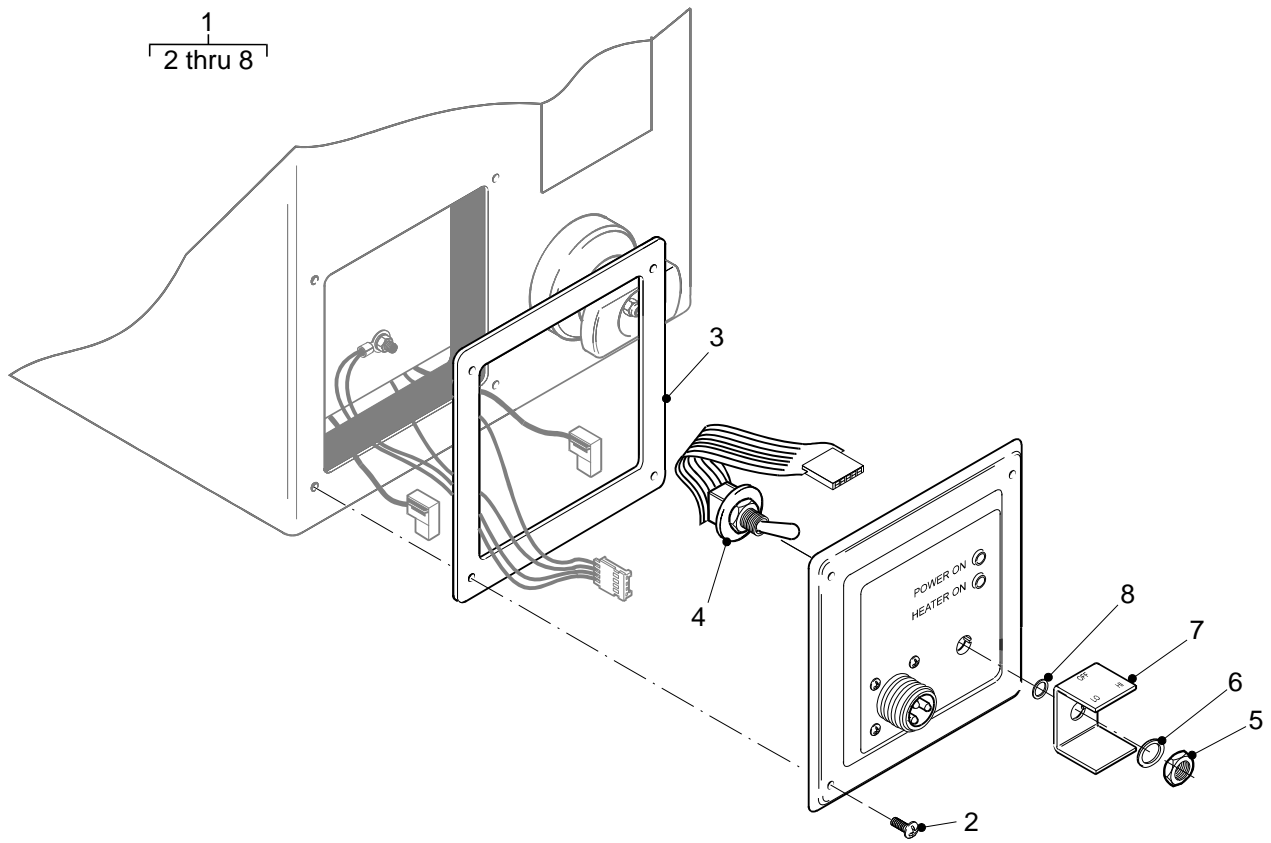


Figure B-5. Control Panel Assembly (AZ137608)

(1) ITEM No.	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODE (UOC)	(6) QTY
1 2 3 4 5 6 7 8	AZ137608	GROUP 03: Main Case Assembly FIG. B-5 Control Panel Assembly • Control Panel Assembly • Screw, Machine M4 x 12 lg Pan Hd Ph St/Stl..... • • Gasket • • Toggle Switch Assembly • • • Nut, Switch Guard • • • Washer, Switch Guard..... • • Switch Guard • • Packing, Preformed 12 ID x 1.6 Section.....	1 4 1 1 2 1 1 1



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