TM 10-5430-244-10

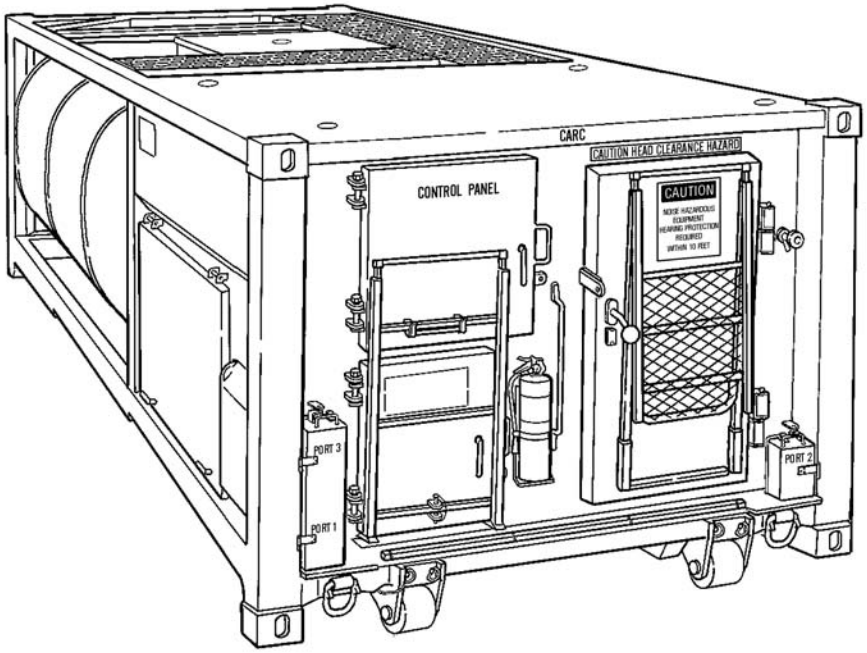
TECHNICAL MANUAL

OPERATOR'S MANUAL

FOR

LOAD HANDLING SYSTEM (LHS) COMPATIBLE WATER TANK RACK (Hippo)

Model No. M105
P/N 106A0020 LIN: T32629
NSN 5430-01-487-7760 (EIC:ZLJ)



HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 2007

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within this technical manual.

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.

CHEMICAL - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EAR PROTECTION - headphones over ears show that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.

WARNING

CARBON MONOXIDE (EXHAUST GASES) CAN KILL!

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from severe exposure.
- Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when engine of Hippo is operated.

1. Because engine is operated in an enclosed area, ensure that all exhaust tunnels are not leaking.
2. ALWAYS ventilate during engine operation. During engine compartment occupancy, both the main access door and engine access door MUST be open and secured with their safety braces.
3. DO NOT use the engine compartment as a shelter.
4. DO NOT enter the engine compartment if the CO monitor activates.
5. BE ALERT for exhaust poisoning symptoms. They are:
   - Headache
   - Dizziness
   - Sleepiness
   - Loss of muscular control
6. If you see another person with exhaust poisoning symptoms:
   - Remove person from area.
   - Expose to fresh air.
   - Keep person warm.
   - DO NOT permit physical exercise.
   - Administer cardiopulmonary resuscitation (CPR), if necessary.
   - Notify a medic.
7. BE AWARE. The field protective mask for nuclear-biological-chemical (NBC) protection WILL NOT protect you from carbon monoxide poisoning.

The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!

WARNING

CONFINED SPACE ENTRY PERMIT

A confined space entry permit is required before entering the water tank. No one is to enter the tank without a permit, the required training, and necessary personal protective equipment. Failure to follow this warning may result in injury or death to personnel.

WARNING

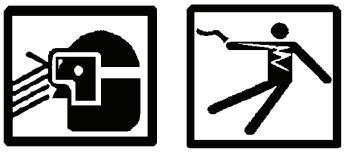
ACCESS DOORS

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

WARNING

AIR TRANSPORT

Fuel tank must be drained by Unit Maintenance prior to air transport. Failure to comply could result in injury to personnel or damage to equipment.



WARNING

BATTERIES

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel.

a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

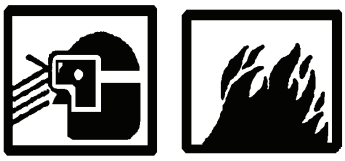
b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.

c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

WARNING

CHEMICAL SUBSTANCES



- Inhalation of calcium hypochlorite causes irritation to eyes, nose, mouth, throat, and lungs. It may also cause burns to respiratory tract, which can result in shortness of breath, wheezing, choking, chest pain, and lung failure.
- Calcium hypochlorite should be stored in its original container with the lid sealed in a cool, dry, well-ventilated place. It should be kept away from heat, sparks, flames, direct sunlight, and other sources of heat, including lighted tobacco products. Failure to comply could result in injury or death to personnel and/or damage to equipment.

WARNING

CLEANING HIPPO TANK

The Hippo must be inspected, cleaned, and sanitized on a regular basis. Failure to conduct a routine cleaning and disinfecting of equipment will increase the potential for the spread of infectious diseases. Servicing personnel must wear a mask and protective overgarments before beginning cleaning procedures. Follow the cleaning and disinfecting guidelines in TB MED 577. Unprotected personnel may experience serious side effects if residual biological substances are present. Failure to comply may result in injury or death to personnel and/or damage to equipment.

WARNING

DISPOSING OF MATERIALS

When servicing this equipment, performing maintenance, or disposing of materials such as lubricants, battery acids or batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulator guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845.

WARNING

DISTRIBUTION OF WATER

- Relieve pressure before disconnecting hose by closing Valve A or Valve B and opening fill port on fill station. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.
- Relieve pressure before disconnecting hoses by closing Valve A or Valve B and opening nozzle. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.
- DO NOT stand in the path of the water when draining water from the Hippo. Injury to personnel could result from the force of the water.

WARNING

ELECTRICAL SHOCK

Ensure Hippo is grounded to prevent electrical shock. Hippo must be grounded at all times during operation, whether on the ground or mounted on the prime mover (when the prime mover is stopped). Failure to follow this warning may result in injury or death to personnel.

WARNING

ENGINE

- Before engine is started, always make sure that no personnel are in the danger area (moving parts on engine or machinery). Ensure that all safety guards are in place. Ensure that area is clear from loose parts. Never use any spray starting aids. Failure to comply may result in injury or death to personnel.
- Engine must be stopped before performing any maintenance. Failure to comply may result in injury to personnel and damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.
- The engine must be shut down and cooled off before accessing the GFCI box from inside rear enclosure. Failure to comply may result in injury to personnel.
- Engine surfaces may become hot while engine is running. Failure to keep clear of hot engine may result in injury to personnel.

WARNING

FILLING TANK

- When using an auxiliary pump to fill the Hippo through the 4-in. fill port on the top of the unit, the operator MUST loosen the manhole cover latches prior to filling. 4-in. fill port cap should never be removed without first depressurizing tank. Failure to do so could create a hazardous situation with pressure buildup inside the tank. The vents will not be able to relieve the pressure buildup and could create a dangerous situation, causing injury to personnel or damage to equipment.
- If bottom filling tank with an auxiliary pump rated greater than 125 gpm (473 lpm), ensure manhole cover is loosened/opened to prevent pressure buildup inside tank. Failure to comply may result in damage to equipment and possible injury to personnel.
- When moving the prime mover into position, be sure that the ground is stable enough to support the weight of the fully loaded vehicle and that the surrounding terrain is passable. When stopped, always chock the wheels before filling the tank. Personnel working at the water loading site must avoid placing themselves in a position where equipment malfunction or sudden equipment movement would injure them. Failure to follow these warnings could result in injury or death to personnel and/or damage to equipment.
- When prime mover is stopped, always chock the wheels before filling the tank. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.
- When filling tank, ensure that a hissing or whistling noise is coming from the vents on top of the tank. If vents are clogged, stop pumping. Pressure can build up, causing injury or death to personnel.

WARNING

FIRE EXTINGUISHER

- Fire extinguisher contents are under pressure. Do not puncture, incinerate, or discharge into another person's face.
- DO NOT store at high temperatures above 120°F (49°C).
- Keep away from small children.
- Avoid inhaling the extinguishing agent. Avoid inhaling smoke and fumes. All fires release toxic substances that are harmful. DO NOT remain in a closed area after use. Evacuate the area immediately and ventilate thoroughly before reentering.
- Although extinguishing agents are nontoxic when properly used, contact with them may cause irritation to eyes, nose, and throat and other allergic symptoms.
- Failure to comply with the above warnings could result in injury or death to personnel or damage to equipment.

WARNING

FUEL HANDLING

- DO NOT smoke or permit any open flame in area of Hippo while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage.
- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel, or damage to vehicle.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.
- Ensure a fire extinguisher is accessible during refueling. Failure to comply may result in injury or death to personnel.

WARNING

HANDRAIL

- DO NOT lean on the handrail. The handrail is not load bearing. Failure to follow this warning may result in injury or death to personnel.
- There is a pinch hazard when deploying or stowing the handrail. Use caution and wear protective gloves. Failure to follow this warning may result in injury to personnel.

WARNING

HEARING PROTECTION

When engine is running during normal operations, all personnel within 10 ft. of the Hippo pump operator position are required to wear Army-approved hearing protection devices (HPDs). Failure to comply may result in hearing loss.

WARNING

HOT COMPONENTS

- Engine housing components and accessories may be extremely hot when engine is running or has been running recently. Use caution when working around engine unit. Failure to comply may result in injury to personnel.
- Ensure engine oil is cool before servicing engine. Failure to comply may result in injury to personnel.

WARNING

LADDER DEPLOYMENT

- Be certain that ladder is correctly secured onto the ladder support bracket using safety chains. Failure to follow this warning may result in injury to personnel or damage to equipment.
- The deployment of the ladder to check or perform battery maintenance is designed to be utilized only when the Hippo is on the ground. UNDER NO CIRCUMSTANCE SHOULD THE BATTERY MAINTENANCE BE PERFORMED WHEN THE HIPPO IS ON THE PRIME MOVER. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.

WARNING

MANHOLE

Manhole cover does not lock open. Injury may occur if manhole cover accidentally closes on personnel.

WARNING

NBC EXPOSURE

- If NBC exposure is suspected, personnel wearing protective equipment must handle all air filter media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.
- Refer to FM 3-5, *NBC Decontamination*.

To order this NBC decal use:

National Stock Number (NSN) - 7690-01-114-3702
Part Number (PN) - 12296626
Commercial and Government Entity Code (CAGEC) - 19207

WARNING

OPERATION IN EXTREME COLD

- Wear arctic clothing when housing temperatures fall and remain below 30°F (-1°C). Cold stress preventive measures in FM 31-70 should be applied when housing temperatures fall and remain below 30°F (-1°C). Failure to comply may result in serious injury or death to personnel.
- DO NOT touch extremely cold metal. Bare skin may freeze to cold metal. Failure to comply may result in injury to personnel.
- Wear gloves when operating or handling metallic equipment that is wet or ice covered. Failure to comply may result in injury to personnel.
- Exercise caution when working on the catwalk where snow or ice exists. Failure to comply may result in injury to personnel.

WARNING

OPERATION IN EXTREME HEAT/HIGH HUMIDITY

- When mission requires the system or unit operator and crew to remain stationary at an area or location in outside temperatures above 90°F (32°C), operator and crew must observe proper safety precautions to prevent heat stress injury. Refer to FM 21-10, *Field Hygiene and Sanitation*, and FM 4-25.11, *First Aid for Soldiers,* for proper precautions and preventive measures. Failure to comply may result in injury or death to personnel.
- Exercise caution when working where there are wet surfaces. Equipment may become slippery. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.


WARNING

SOLVENT CLEANING COMPOUND


Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to follow this warning may cause injury or death to personnel.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

Original 29 January 2007

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 34 AND TOTAL NUMBER OF WORK PACKAGES IS 22 CONSISTING OF THE FOLLOWING:

Page/WP No.	***Change No.**
Cover/(Back Blank)	0
a to i/(j Blank)	0
A/(B Blank)	0
i to iv	0
WP 0001 00 to 0022 00	0
Index-1 to Index-4	0
DA Form 2028 Sample	0
DA Form 2028 (three copies)	0

*Zero in this column indicates pages or work package.

TECHNICAL MANUAL
TM 10-5430-244-10

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., 29 January 2007

OPERATOR'S MANUAL

FOR

LOAD HANDLING SYSTEM (LHS) COMPATIBLE WATER TANK RACK (HIPPO)

Model No. M105

P/N 106A0020 LIN: T32629

NSN 5430-01-487-7760 (EIC:ZLJ)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is https://aeps.ria.army.mil. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or e-mail your letter or DA Form 2028 direct to: AMSTA-LC-LMIT/TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The E-mail address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

TABLE OF CONTENTS

Table of Contents - Continued

HOW TO USE THIS MANUAL

NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

INTRODUCTION

1. This revised manual is designed to help you operate the Hippo and to perform operator troubleshooting and maintenance on the equipment.
2. This manual is written in work package format:
    a. Chapters divide the manual into major categories of information (e.g., *Introductory Information, Equipment Description, and Theory of Operation, Operator Instructions, Troubleshooting Procedures, Maintenance Instructions,* and *Supporting Information*).
    b. Each Chapter is divided into work packages, which are identified by a 6-digit number (e.g., 0001 00, 0002 00, etc.) located on the upper right-hand corner of each page. The work package page number (e.g., 0001 00-1, 0001 00-2, etc.) is located centered at the bottom of each page.
    c. If a Change Package is issued to this manual, added work packages will use the 5^{th} and 6^{th} digits of their number to indicate new material. For instance, work packages inserted between WP 0001 00 and WP 0002 00 will be numbered WP 0001 01, WP 0001 02, etc.
3. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing operator troubleshooting or maintenance on the machine.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in the publication.
    a. The *Table of Contents* also provides *Reporting Errors and Recommending Improvements* information and DA Form 2028 addresses for the submittal of corrections to this manual.
    b. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical *Index* at the back of the manual.
3. Chapter 1, *General Information, Equipment Description,* and *Theory of Operation*, provides general information on the manual and the equipment.
4. Chapter 2, *Operator Instructions*, explains and illustrates all operator controls and indicators and contains a *Location and Description of Decal and Data Plates*. It also describes how to perform all operating procedures for the Hippo: *Operation Under Usual Conditions* and *Operation Under Unusual Conditions*.
5. Chapter 3 covers all *Troubleshooting Procedures*. WP 0014 00 contains a *Troubleshooting Symptom Index*. If the Hippo malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
6. Chapter 4 covers *Maintenance Instructions*. Major areas covered are *Preventive Maintenance Checks and Services (PMCS)* and operator level maintenance tasks.
7. Chapter 5 includes *Supporting Information: References, Components of End Item (COEI) and Basic Issue Items (BII) Lists, Additional Authorization List (AAL),* and *Expendable and Durable Items List*.

FEATURES OF THIS MANUAL

1. WARNINGs, CAUTIONs, NOTEs, subject headings, and other important information are highlighted in **BOLD** print as a visual aid.

WARNING

A WARNING indicates a hazard that may result in injury or death to personnel.

CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

NOTE

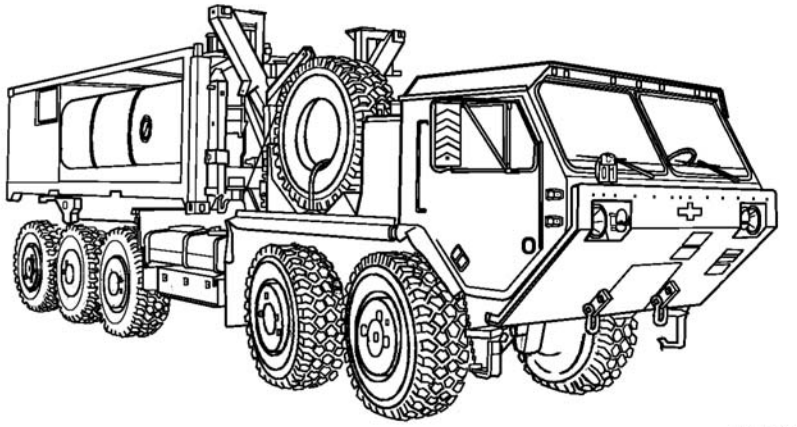
A NOTE is a statement containing information that will make the procedures easier to perform.

2. Statements and words of particular interest may be printed in CAPITAL LETTERS to create emphasis.
3. Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.
   a. If you are told: “Service batteries (WP 0017 00),” go to WP 0017 00 in this manual for instructions on this service.
   b. If you are told: “For complete information on servicing batteries, refer to TM 9-6140-200-14,” go to the *References* work package (WP 0019 00) for complete information.
4. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.
5. Technical instructions include metric units as well as standard units. For your reference, a *Metric Conversion Chart* is located on the inside back cover of the manual.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

SCOPE

1. **Type of Manual.** This manual is for use in operating and performing operator maintenance on the Load Handling System (LHS) Compatible Water Tank Rack (Hippo).
2. **Model Number and Equipment Name.** M105 Load Handling System (LHS) Compatible Water Tank Rack (Hippo).
3. **Purpose of Equipment.** To provide the ability to transport, store, and distribute potable water (both unit and supply point distribution) using the HEMTT-LHS truck (M1120), PLS truck (M1074, M1075), and PLS trailer (M1076) with the HEMTT-LHS truck and PLS truck (M1074, M1075) as the primary movers.
4. **Special Inclusions.** For operation and maintenance of the basic HEMTT-LHS truck (M1120), refer to TM 9-2320-304-Series; TM 9-2320-364-Series for the PLS truck (M1074, M1075); and TM 9-2320-385-Series for the PLS Trailer (M1076).



HIPPO M105 ON HEMTT-PLS, TYPICAL

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment will be those prescribed by DA PAM 750-8 *Functional Users Manual for The Army Maintenance Management System* (TAMMS), or AR 700-138, *Army Logistics Readiness and Sustainability.*

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRS)

If your vehicle needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. The preferred method for submitting a Quality Deficiency Report (QDR) is through the Army Electronic Product Support (AEPS) website under the Electronic Deficiency Reporting System (EDRS). The web address is: https://aeps.ria.army.mil. This is a secured site, requiring a password that can be applied for on the front page of the website. If the above method is not available to you, put it on an SF 368, Product Quality Deficiency Report (PQDR), and mail it to us at: Department of the Army, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/PQDR MS 267, 6501 E. 11 Mile Road, Warren, MI 48397-5000. We'll send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

1. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion or deterioration problem(s) be reported so corrections and/or improvements can be made to future items.

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

3. If a corrosion problem is identified, it should be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as corrosion, rust deterioration, or cracking will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 750-8, *Functional Users Manual for the Army Maintenance Management System (TAMMS)*.

OZONE DEPLETING SUBSTANCES (ODS)

The continued use of ODS has been prohibited by Executive Order 12856 of 3 August 1993.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-6.

PREPARATION FOR STORAGE OR SHIPMENT

This section contains requirements and procedures for administrative storage of equipment that is issued to and in use by Army activities worldwide.

The requirements specified herein are necessary to maintain equipment in administrative storage in such a way as to achieve the maximum readiness condition.

Equipment that is placed in administrative storage should be capable of being readied to perform its mission within one 24-hour period, or as otherwise may be prescribed by the approving authority. Before equipment is placed in administrative storage, a Preventive Maintenance Checks and Services (PMCS) should be completed and deficiencies corrected.

Report equipment in administrative storage as prescribed for all reportable equipment.

Perform inspections, maintenance services, and lubrication as specified herein.

Records and reports to be maintained for equipment in administrative storage are those prescribed by DA PAM 750-8 for equipment in use.

A 10% variance is acceptable on time used to determine the required maintenance actions.

Accomplishment of applicable PMCS, as mentioned throughout this chapter, will be on a semiannual basis.

DEFINITION OF ADMINISTRATIVE STORAGE

The placement of equipment in administrative storage can be for short periods of time when a shortage of maintenance efforts exists. Items should be ready for use within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

1. **Storage Site.**
   a. Select the best available site for administrative storage. Separate stored equipment from equipment in use. Conspicuously mark the area "Administrative Storage."
   b. Covered space is preferred.
   c. Open sites should be improved hardstand, if available. Unimproved sites should be firm, well drained, and free of vegetation.
2. **Storage Plan.**
   a. Store equipment so as to provide maximum protection from the elements and to provide access for inspection, maintenance, and exercising. Anticipate removal or deployment problems and take suitable precautions.
   b. Take into consideration environmental conditions, such as extreme heat or cold, high humidity, blowing sand, dust, or loose debris, soft ground, mud, heavy snows, or any combination thereof, and take adequate precautions.
   c. Establish a fire plan and provide for adequate fire fighting equipment and personnel.
3. **Maintenance Services and Inspections.**
   a. **Maintenance Services.** Prior to storage, perform the next scheduled PMCS.
   b. **Inspection.** Inspect and approve the equipment prior to storage. Do not place non-mission-capable equipment in storage.
4. **Corrections of Shortcomings and Deficiencies.** Correct all shortcomings and deficiencies prior to storage or obtain a deferment from the approving authority.
5. **Lubrication.** Lubricate equipment in accordance with WP 0015 00.

GENERAL CLEANING AND DISINFECTING, PAINTING, AND PRESERVATION

WARNING

- The Hippo must be inspected, cleaned, and sanitized on a regular basis. Failure to conduct a routine cleaning and disinfecting of equipment will increase the potential for the spread of infectious diseases. Servicing personnel must wear a mask and protective overgarments before beginning cleaning procedures. Follow the cleaning and disinfecting guidelines in TB MED 577. Unprotected personnel may experience serious side effects if residual biological substances are present. Failure to comply may result in injury or death to personnel and/or damage to equipment.
- A confined space entry permit is required before entering the water tank. No one is to enter the tank without a permit, the required training, and necessary personal protective equipment. Failure to follow this warning may result in injury or death to personnel.

CAUTION

- DO NOT direct water under pressure against unsealed electrical systems of any exterior opening. Failure to follow this caution may result in damage to equipment.
- DO NOT use a vapor degreasing substance. Failure to follow this caution may result in damage to equipment.

a. **Cleaning and Disinfecting.** Refer to TB MED 577, Chapters 6 and 7, for complete instructions and guidelines on how to properly clean and disinfect the water tank.
   (1) New Equipment. The water tank will be cleaned and sanitized prior to initial use. Once the water tank has been designated for use with potable water, it will not be contaminated with any nonpotable water or fuel.
   (2) Routine Cleaning. The water tank will be cleaned, inspected, and sanitized on a quarterly basis.

GENERAL CLEANING AND DISINFECTING, PAINTING, AND PRESERVATION - CONTINUED

(3) Field Cleaning. During field exercises, clean the water tank as needed. Make sure the water tank is completely sealed to prevent dirt, leaves, windblown dust, and other contaminants from entering the water tank. Manhole covers, spigot box covers, and filling ports should be kept closed, and dust caps should be attached to dispensing valves when water is not being drawn from the water tank.

WARNING

Be careful not to paint the two stainless steel grounding studs (one located on the forward end of the unit near the end of the main beam, and one located on the lower longitudinal beam just forward of the enclosure on the curb [right] side of the unit). Failure to follow this warning may result in injury or death to personnel.

(a) *Painting*. Remove rust and damaged paint by scraping, wire brushing, sanding, or buffing. Sand to a smooth finish and spot paint as necessary (refer to TB 43-0209).

(b) *Preservation*. After cleaning and drying, immediately coat unpainted metal surfaces with oil or grease as appropriate.

(c) *Weatherproofing*. Sunlight, heat, moisture (humidity), and dirt tend to accelerate deterioration. Close and secure all openings except those required for venting and draining. Seal openings to prevent the entry of rain, snow, or dust. Insert desiccant when complete seal is required. Position equipment, and provide blocking or framing, to allow for ventilation and water drainage.

SHIPPING/STORAGE CONFIGURATION

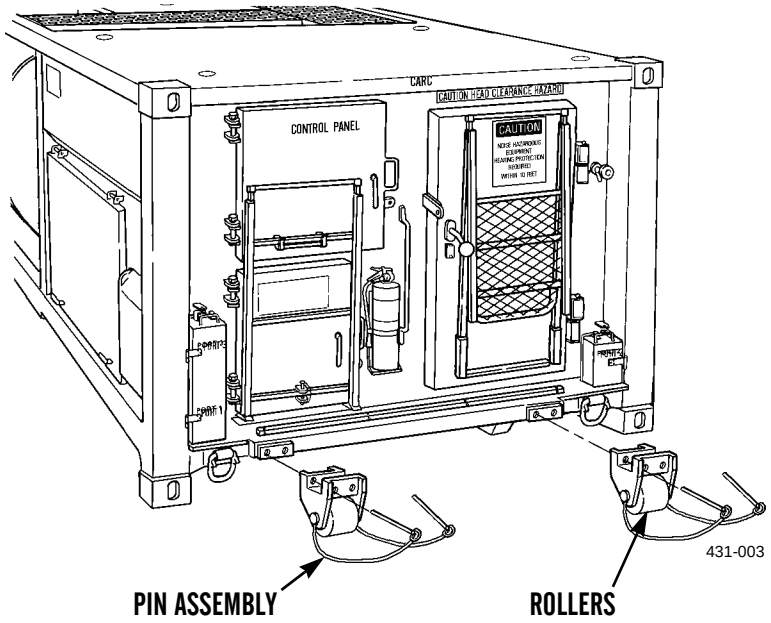
1. **Prepare for Shipping or Storage.**

a. **Removing and Storing Rollers.**

NOTE

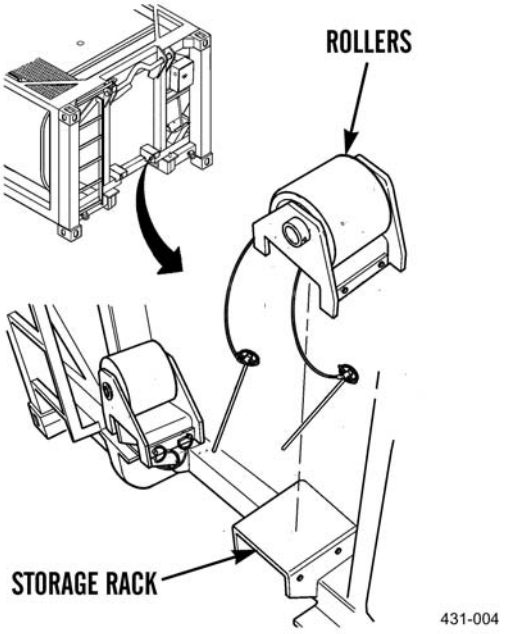
The cradle rollers can ONLY be removed and replaced when the unit is mounted on the prime mover. With the unit mounted on the prime mover, the cradle rollers would bear no weight from the unit.

(1) Removing Rollers. Remove locking pin assembly and rollers from rear of Hippo.



SHIPPING/STORAGE CONFIGURATION - CONTINUED

(2) Storing Rollers. Store rollers on storage rack located on the front of the Hippo.



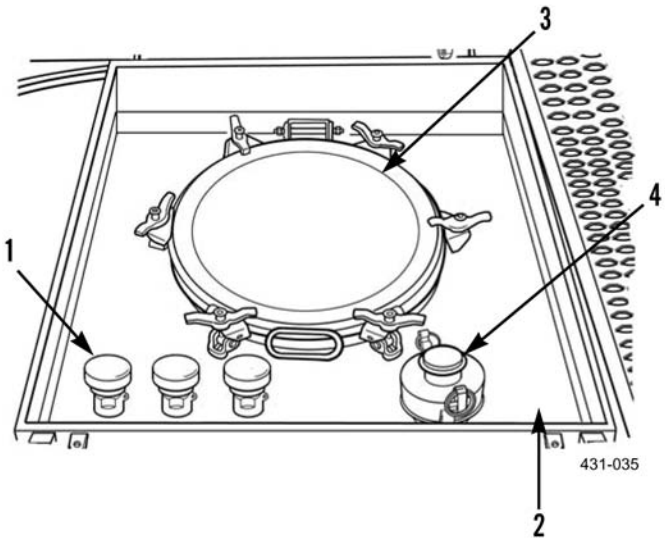
b. Remove the container from the prime mover.
c. Secure all BII in the BII box (WP 0020 00).
d. Remove the fire extinguisher from the outside bracket and secure the fire extinguisher in the inside bracket.
e. Ensure that all switches are in the OFF position and engage EMERGENCY STOP button (WP 0004 00).
f. Close and secure all doors and hatches with plastic ties or suitable locks.
g. Cover exhaust and intake vents with covers.

2. **Preparation for Fixed Wing Air Transport (Full Hippo).**

WARNING

Fuel tank must be drained by unit maintenance prior to air transport. Failure to comply could result in injury to personnel or damage to equipment.

a. Remove three pressure relief valves (1) from manhole spill box (2).
b. Apply sealant (Item 12, WP 0022 00) to seals of three BII air transportability plugs and install in pressure relief valve openings using BII socket head key.
c. Remove the roller assemblies from rear of Hippo and stow in stowage brackets located on the front of Hippo.
d. Ensure Hippo is in a level position.
e. Open the manhole cover (3) and remove the 4-inch fill port cap (4).



SHIPPING/STORAGE CONFIGURATION - CONTINUED

NOTE

- If the onboard pump or auxiliary pump is used to fill the Hippo, one person must operate the controls and a second person must monitor the fill level from atop the Hippo.
- If the onboard pump or auxiliary pump is used to fill the Hippo, it will be necessary to engage the LEVEL OVERRIDE switch (WP 0004 00) to disable the automatic shutdown.

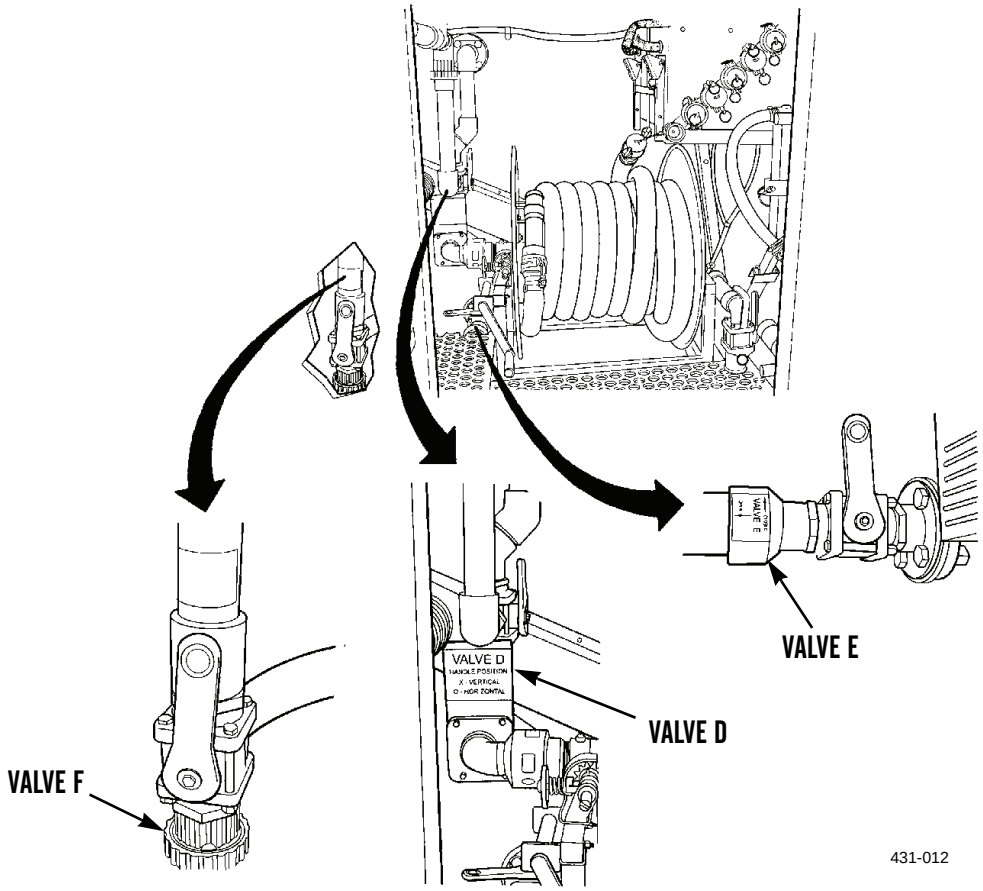
f. Fill the Hippo until the fill level is 1/2 in. to 3/4 in. below the bottom of the manhole ring (WP 0008 00).

g. Close and secure manhole cover (3) and replace the 4-in. fill port cap (4).

NOTE

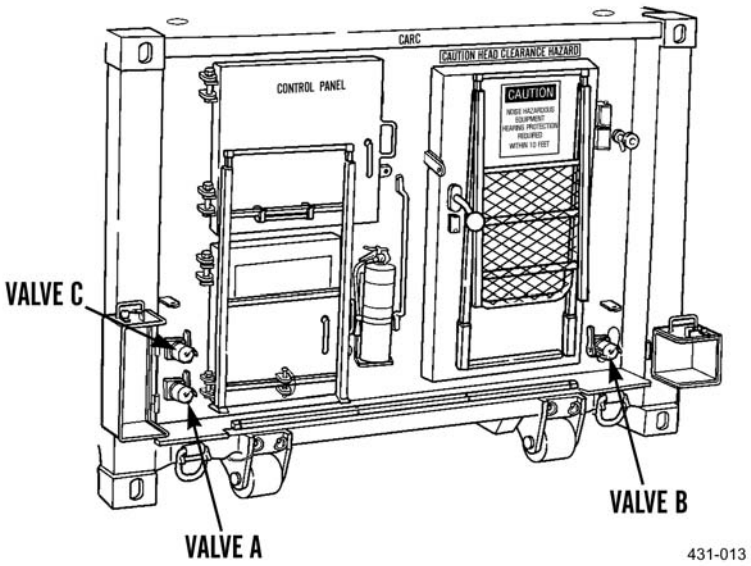
If filling is done through top fill port and Valve E has remained closed, the plumbing system should be free of water and draining will not be necessary.

h. Close Valve E and Valve D and drain the water from the plumbing system by opening Valve A, Valve B, and Valve F (WP 0008 00).



SHIPPING/STORAGE CONFIGURATION - CONTINUED

i. Close Valve A, Valve B, Valve C, and Valve F (WP 0008 00).



j. Ensure the EMERGENCY STOP button and ENGINE RUN switch are in the OFF position (WP 0004 00).

k. Ensure all BII and COEI are properly secured (WP 0020 00).

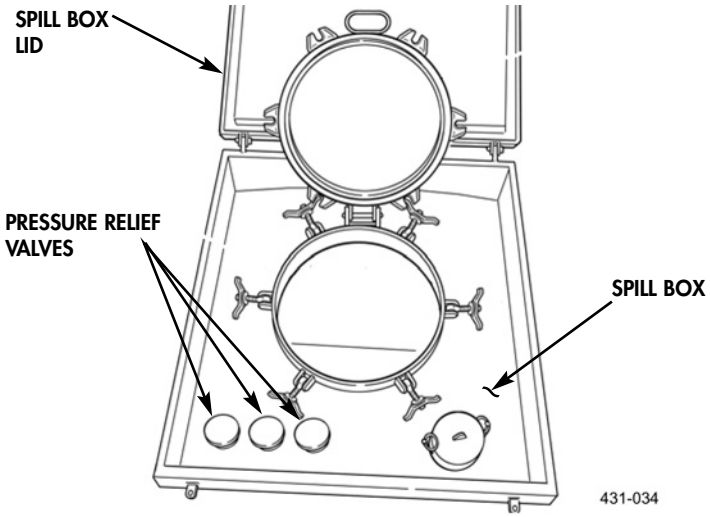
l. Notify Unit Maintenance to drain fuel tank.

3. **Placing Hippo Back In Service After Fixed Wing Air Transport (Full)**

a. Fill fuel tank. Refer to WP 0005 00.

b. Using BII socket head key, remove three BII air transportability plugs from manhole spill box and remove sealant from seals.

c. Install three pressure relief valves on manhole spill box.



d. Remove two roller assemblies from storage rack and install on Hippo frame. Refer to WP 0001 00.

SHIPPING/STORAGE CONFIGURATION - CONTINUED

4. **Preparation for Highway, Rail, or Fixed Wing Air Transport (Empty)**.
   a. Remove the ground rod and secure it to the floor inside the enclosure.
   b. Remove the spare fuel tank strap and place it inside the BII Box.

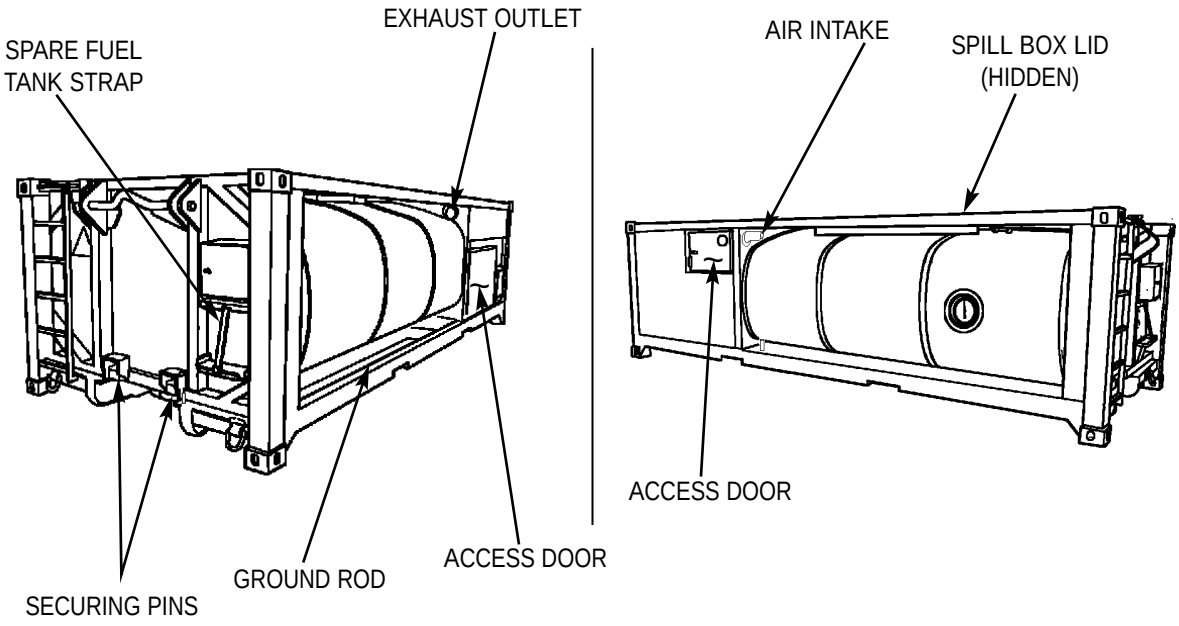
WARNING

DO NOT ship the Hippo by fixed wing air transport with a partial water load. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

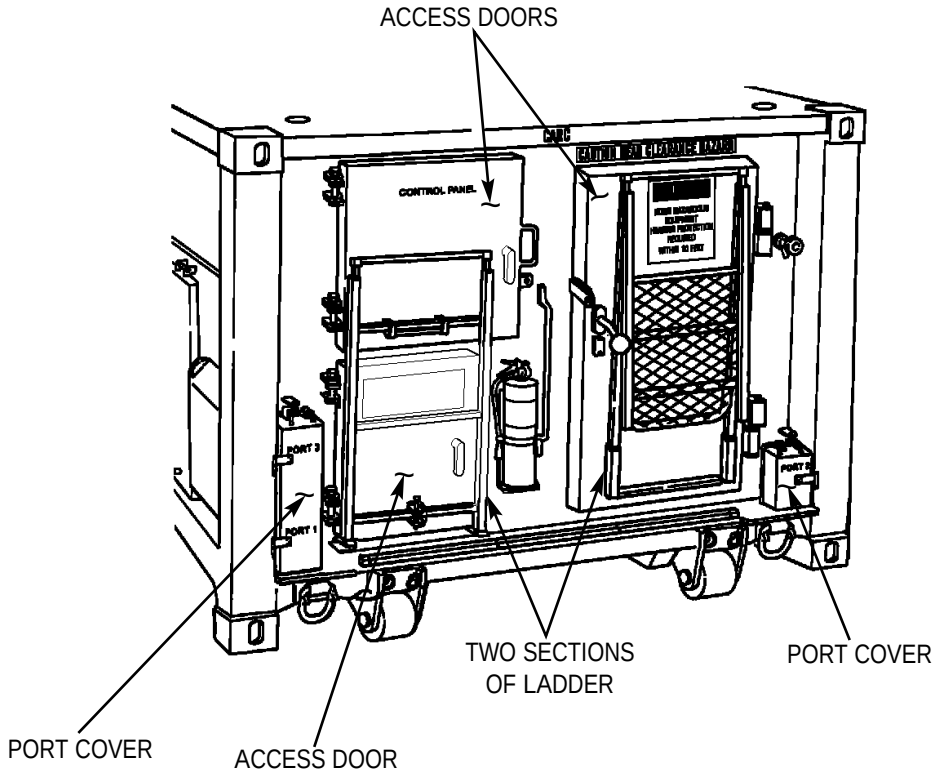
NOTE

The Hippo can be shipped by highway or rail with a full or partial water load. If this is the case, proceed to step d.

   c. Be sure the entire unit has been completely drained (WP 0009 00).
   d. Completely drain the fuel tank.
   e. With tiedown straps or other suitable device, secure all doors, port covers, and spill box lid.
   f. Using tiedown straps or other suitable device, secure the two sections of the ladder stowed on the rear of the unit.
   g. Verify that the securing pins are installed and locked which hold the roller assemblies in place on the front of the unit.
   h. Place a canvas bag or other suitable cover over the exhaust outlet and secure.
   i. Place a canvas bag or other suitable cover over the air intake and secure.



SHIPPING/STORAGE CONFIGURATION - CONTINUED



5. **Placing Hippo Back In Service after Highway, Rail, or Fixed Wing Air Transport (Empty)**
   a. Remove canvas bag or cover from air intake.
   b. Remove canvas bag or cover from exhaust outlet.
   c. Install both roller assemblies on Hippo frame. Refer to WP 0001 00.
   d. Remove and discard tiedown straps from upper and lower ladder sections stowed on rear of Hippo.
   e. Remove and discard tiedown straps form all access doors, port covers, and spill box lid.
   f. Fill fuel tank. Refer to WP 0005 00.
   g. Fill water tank as required. Refer to WP 0008 00.
   h. Install fuel tank strap, located in BII toolbox, on spare fuel tank stowage bracket.
   i. Install grounding rod in stowage position on left longitudinal beam. Refer to WP 0006 00.

REMOVAL OF EQUIPMENT FROM ADMINISTRATIVE STORAGE

1. **Activation**. Restore the equipment to normal operating condition by performing the Preventive Maintenance Checks and Services in accordance with the instructions contained in WP 0016 00.
2. **Servicing**. Resume the maintenance service schedule in effect at the commencement of storage or service the equipment before the scheduled dates in order to produce a staggered maintenance workload.

PREPARATION OF EQUIPMENT FOR SHIPMENT

1. Refer to FM 55-21 for additional instructions on processing, storage, and shipment of material.
2. Equipment that has been removed from storage for shipment does not have to be reprocessed if they will reach their destination within the administrative storage period. Reprocess only if inspection reveals any corrosion or if any anticipated in-transit weather conditions make it necessary.
3. When a piece of equipment is received and has already been processed for domestic shipment, as indicated on DD Form 1397, it does not have to be reprocessed for storage unless corrosion and deterioration are found during the inspection upon receipt. List on SF Form 364 all discrepancies found because of poor preservation packaging, packing, marking, handling, loading, storage, or excessive preservation. Repairs that cannot be handled by the receiving unit must have tags attached listing the needed repairs. A report of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

1. Preparation For Shipment and Storage (CONUS Packaging Instructions)

NOTE

- This procedure applies to CONUS and OCONUS shipments.
- All equipment must me clean, serviced, and in good operating condition prior to processing equipment for shipment and storage.
- Ensure roller assemblies are removed and stowed, and Hippo is positioned on a level surface prior to processing.

a. Clean Hippo and all ancillary equipment. Refer to WP 0001 00.

b. Perform scheduled PMCS as required. Refer to WP 0015 00 and WP 0016 00.

c. Remove both rollers assemblies and pack them in a weather-resistant fiberboard container. Secure container in rear compartment with straps. Refer to WP 0001 00.

d. Place Hippo TM 10-5430-244-10, Form DD250 or DD1149, and all records in protective cover, and stow these documents in document holder located inside main access door.

e. Spot paint with Chemical Agent Resistant Coating (CARC) paint or apply grade 1 preservative to all bare metal.

f. Stow fire extinguisher inside rear compartment. Refer to WP 0006 00.

g. Remove grounding rod form external stowage brackets and secure to floor inside Hippo rear compartment with tie straps.

NOTE

- Level A processing allows for outside storage for a period of 2 years in any worldwide environment without any exercising or maintenance.
- Level B processing allows for controlled humidity storage for a period not to exceed 2 years and processing for shipment and temporary outside storage not to exceed 90 days without any exercising or maintenance.

h. Notify unit maintenance to stencil the following information on a 23 in. x 16.5 in (58 cm x 42 cm) piece of exterior grade plywood in 0.5 in. (13 mm) high black ink letters:
   1) Level of protection (Level A and/or Level B) and date processed
   2) Gross weight, cube, and outside dimensions
   3) Contractor’s name or depot symbol and mailing address
   4) If applicable, overseas address marking.

i. Notify unit maintenance to apply water resistant varnish to stenciled plywood shipping plate, drill a 0.375 in. (9.5 mm) through each corner, and fasten shipping plate to ladder on front of Hippo with tie straps.

j. Notify unit maintenance to grease hose reel at all four lube points if Hippo has exceeded 50 hours of operation since last scheduled unit level PMCS.

PREPARATION OF EQUIPMENT FOR SHIPMENT - CONTINUED

k. Remove batteries from battery tray. Refer to WP 0017 00. Using brush, clean battery cables, battery box, clamps, supports, and retainers with a 0.5 lb (0.23 kg) to 1 gal (3.8 l) solution of sodium bicarbonate and water. Notify unit maintenance to fully charge batteries, and then install batteries on battery box. Refer to WP 0017 00.

l. Apply preservative to front and side grounding studs. Refer to WP 0006 00.

m. Apply TALC to all exposed rubber on exterior and interior of Hippo including electrical connector covers.

n. Notify unit maintenance to remove belt guard and apply preservative to engine shaft and bolt heads located on engine bell housing.

o. Seal openings on 240 V generator with tape.

p. Cover vent in battery access door with tape.

q. Apply preservative to all hinge points and latches.

r. Secure all access doors all access doors, port covers, and spill box lid with padlocks. Refer to WP 0021 00.

NOTE

Perform step r below for Level A processing.

s. Notify unit maintenance to drain and fill engine crankcase with grade PE 30-1 oil.

NOTE

Perform step s below for Level B processing.

t. Notify unit maintenance to drain and fill engine crankcase with SAE 15W/40.

NOTE

Raising front of hippo with HEMTT 12 to 18 in. (30 cm to 46 cm) will accelerate draining process.

u. Completely drain water from tank, pumping system, and hoses. Refer to WP 0009 00.

v. Loosen pump belt tension by placing pump offline. Refer to WP 0010 00.

w. Notify unit maintenance to relieve belt tension on generator.

x. Notify unit maintenance to completely drain fuel tank. After draining, close drain valve by turning valve counterclockwise.

y. Disconnect and drain fuel from fuel feed and return lines. Connect fuel feed and return lines.

z. Add 0.5 gal (1.9 l) of diesel fuel with proper amount of additive to fuel tank, and run engine for 4 minutes to ensure circulation of additive through engine. Refer to WP 0005 00.

NOTE

Engine shall be cooled to 100 F (38 C) prior to combustion chamber preservation. Flushing or purging of mixture will not be required when activating Hippo.

aa. Add 0.5 gal (1.9 l) 1:4 ratio mixture of kerosene and conservation oil to fuel tank, and run engine for 4 minutes to coat combustion chamber with preservative. Refer to WP 0005 00.

bb. Apply a coating of oil to filler cap, filler neck, and chain.

cc. Using atomizer spray bottle, add 3 oz (85 g) of preservative oil to crankcase through oil filler cap opening.

dd. Seal all openings to engine interior including dipstick shroud and oil filler cap with tape.

ee. Using atomizer spray bottle, add 2 oz (57 g) of preservative oil to exterior exhaust opening.

ff. Clean air cleaner assembly and install new filter element. Seal air intake opening with tape.

gg. For rail transportability guidance and other shipping requirements refer to STANAG 2832, DOD 4500.32, and AR 70-47. Refer to WP 0019 00.

PREPARATION OF EQUIPMENT FOR SHIPMENT – CONTINUED

2. Placing Hippo Back In Service After Shipment And Storage (Deprocessing Procedures)

a. Remove and discard tape from engine air filter and exhaust openings, oil filter cap, oil dipstick, and engine interior.

b. Check engine fuel feed line and fuel return line connections.

c. Using clean cloth and solvent, clean oil from fuel filter cap. Refer to WP 0022 00, items 10 and 2.

d. Tighten generator and pump drive belts. Notify unit maintenance. Return pump to on-line condition and secure toggle clamp with lock pin. Refer to WP 0010 00.

e. Check system voltage display (located on control panel) for voltage level of batteries. If voltage is low, run engine or notify unit maintenance to charge batteries. Refer to WP 0004 00.

f. Remove and discard tape from battery door vent and vents on generator.

g. Remove belt guard, and clean residual preservative oil from engine main driveshaft using clean cloth and solvent. Install belt guard. Notify unit maintenance. Refer to WP 0022 00, items 10 and 2.

h. Using clean cloth and solvent, clean preservative from front grounding stud and curb (right) side grounding stud. Refer to WP 0006 00 and WP 0022 00, items 10 and 2.

i. Retrieve fiberboard container from inside enclosure, remove strap, roller assemblies, and roller assembly retaining pins, and install roller assemblies on unit. Refer to WP 0001 00.

j. Remove grounding rod from enclosure, and install grounding rod on left longitudinal beam of Hippo frame. Refer to WP 0006 00.

k. Change preservative engine oil after 10 to 15 hours of operation. Refer to WP 0015 00.

l. Prior to starting engine, ensure pump is either off-line or properly primed with water. Refer to WP 0010 00 or WP 0006 00.

WARRANTY INFORMATION

The LHS Compatible Water Tank Rack (Hippo) is covered by a warranty. All U.S. Army Hippo customers requiring warranty assistance will initiate direct contact through respective unit Warranty Coordinators (WARCOs). WARCOs will submit all warranty claims for nonconsumable items greater than $100.00, to the Point of Contact (POC) identified below.
Request all claims be submitted both electronically and telephonically.

Hippo warranty coverage applies to the following end item:
M105 Compatible Water Tank Rack (Hippo) 5430-01-487-7760

The Hippo warranty period of performance provides complete bumper-to-bumper coverage for a period of 13 months. The warranty start date begins upon the acceptance and signing for the Hippo at the contractor’s facility.

MIL-MAR Century Corp.
Dayton, Ohio
Program Manager
937-275-4860 Comm.
937-275-4904 Fax

LIST OF ABBREVIATIONS/ACRONYMS

NOTE

Refer to ASME Y14.38-1999 for standard abbreviations.

ABBREVIATION/ACRONYMS	DEFINITION
AAL	Additional Authorization List
AEPS	Army Electronic Product Support
BII	Basic Issue Items
C	Celsius
CAGEC	Commercial and Government Entity Code
CFR	Code of Federal Regulations
Class	Classification
cm	Centimeter
CO	Commanding Officer
CPC	Corrosion Prevention and Control
COEI	Components of End Item
DA	Department of the Army
EDRS	Electronic Deficiency Reporting System
EIR	Equipment Improvement Recommendation
F	Fahrenheit
ft	foot
GAA	Grease, Automotive and Artillery
gal	Gallon
gpm	Gallons per minute
HEMTT	Heavy Expanded Mobility Tactical Truck
hp	Horsepower
HPD	Hearing Protection Devices
in	Inch
JTA	Joint Table of Allowances
kg	Kilogram
L	Liter
lb	Pound
LED	Light Emitting Diode
LHS	Load Handling System
Lpm	Liters Per Minute
m	Meter
mm	Millimeter
MTOE	Modified Table of Organization and Equipment
NBC	Nuclear, Biological, and Chemical
NCO	Non-Commissioned Officer
NSN	National Stock Number
ODS	Ozone Depleting Substances
PLS	Palletized Load System
PMCS	Preventive Maintenance Checks and Services

LIST OF ABBREVIATIONS/ACRONYMS - CONTINUED

ABBREVIATION/ACRONYMS	DEFINITION
P/N	Part Number
PPM	Parts Per Million
PQDR	Product Quality Deficiency Report
PVC	Poly Vinyl Chloride
Qty Recom	Quantity Recommended
Qty Rqr	Quantity Required
ROD	Report of Discrepancy
rpm	Revolutions Per Minute
RPSTL	Repair Parts and Special Tools List
TAMMS	The Army Maintenance Management System
TB	Technical Bulletin
TDA	Table of Distribution and Allowances
TM	Technical Manual
U/M	Unit of Measure
V	Volts
V dc	Volts Direct Current
WP	Work Package

END OF WORK PACKAGE

EQUIPMENT DESCRIPTION AND DATA 0002 00

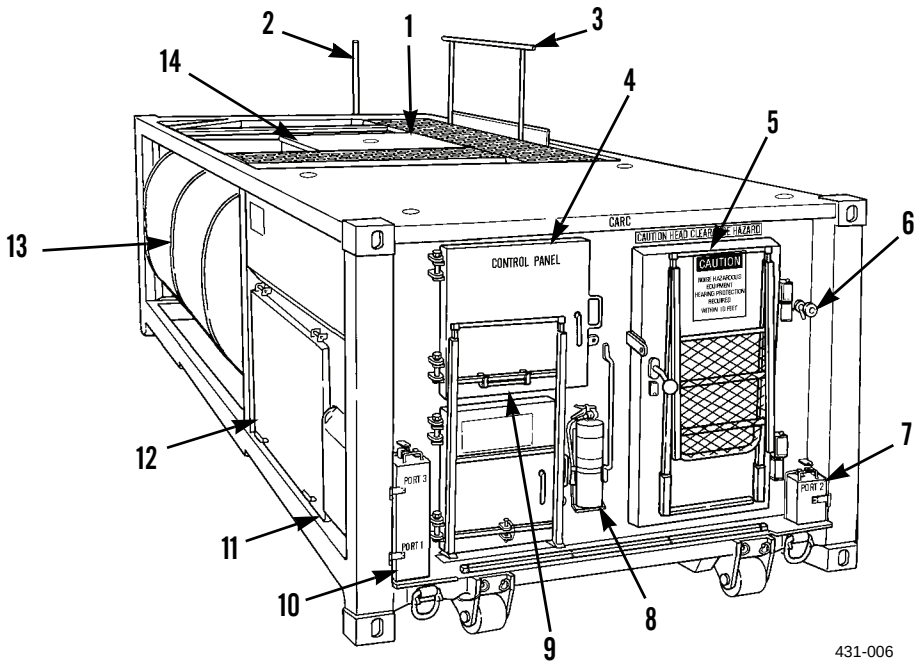
EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

1. **Characteristics.**
   a. The Hippo is a mobile hardwall system used to perform bulk and retail potable water distribution and storage. The Hippo consists of a 2,000-gal. (7,571 L) capacity water tank rack with pump, filling station, 70-ft (23.5 m) hose reel, and bulk suction and discharge hoses. It is fully functional whether mounted or dismounted, and is mobile when it is full, partially full, or empty.
   b. It is compatible with the use of Heavy Equipment Mobility Tactical Truck (HEMTT), Load Handling System (LHS) truck (M1120), the Palletized Load System (PLS) truck (M1074, M1075), and PLS trailer (M1076).
   c. The Hippo is conformed dimensionally to the requirements of ISO 668 as a 1CX 20-ft (6.1 m) container. It is designed to be lifted from the four top corner fittings and four bottom corner fittings. Hippo can also be lifted with a forklift and meets the stacking requirements of ISO 1496-3.
2. **Capabilities.**
   a. The purpose of the Hippo is to provide the means to store and transport potable water to unit and supply distribution points. The Hippo can be loaded through the top or bottom fill opening. This work package explains how components of the Hippo and its filling station work. This work package provides a functional description of the Hippo and the filling station operations.
   b. This work package locates and describes the controls and indicators of the Hippo. It is important to learn the location and function of all controls and indicators before attempting to operate the equipment.
   c. The unit has the ability to store and distribute potable water (both unit and supply point distribution), and is capable of being transported by highway, rail, marine, and air mode worldwide without disassembly.
   d. The unit is equipped with a filling station capable of filling 5-gal. (18.9 L) water cans or individual canteens. The filling station is capable of discharging water either by gravity or utilization of the on-board pump system.
3. **Features.**
   a. LHS/PLS compatible rack
   b. 2000-gal. (7,571 L) tank
   c. Centrifugal pump
   d. Filling station

EQUIPMENT DESCRIPTION AND DATA - CONTINUED 0002 00

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

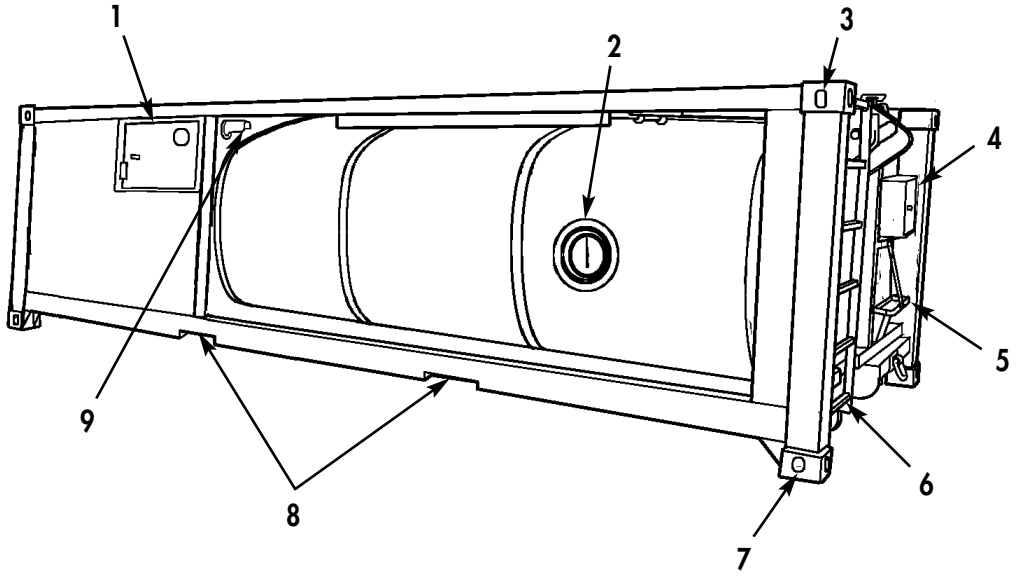
1. **Rear/Roadside View.**



KEY	COMPONENT	DESCRIPTION
1	Transverse Catwalk	Grid platform to provide top access to tank manhole.
2	Foldable Handhold	Provides a point of contact to the top platform.
3	Foldable Hand Rail	Provides a hand rail on the platform.
4	Control Panel Cover	Provides access to unit control panel to operate the system.
5	Main Access Door	Provides access to interior components in the housing.
6	Sampling Port	Provides access to obtain water samples.
7	Dispensing Port 2	Provides hookup option for water distribution.
8	Fire Extinguisher	Fire extinguisher and stowage (when being transported, fire extinguisher is stowed inside).
9	Ladder Assembly/Stowage	Stowage for ladder assembly.
10	Dispensing Port 1 and Suction Port 3	Provides hookup options for water refill or discharge distribution. Port 3 is the suction port, which is used to fill the Hippo using the on-board pump.
11	Fuel Tank	Six-liter capacity fuel tank.
12	Engine Access Door	Provides access to the engine assembly for maintenance and removal of the system.
13	Tank	Cylinder tank with a capacity of 2,000 gal. (7,571 L) of potable water that can be distributed through discharge ports with the unit sitting on level ground, utilizing gravity flow or on-board pump system. The tank consists of an inner shell, heating blankets, and an outer shell, secured by tank banding straps.
14	Spill Box Lid	Provides protective cover for tank manhole and spill box.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED

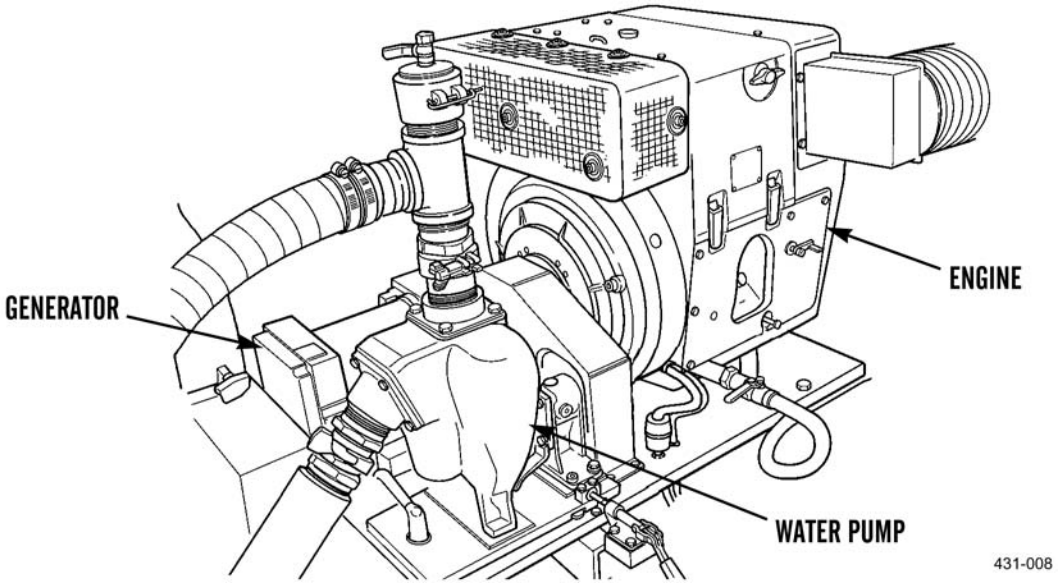
2. **Front/Curbside View**.



KEY	COMPONENT	DESCRIPTION
1	Battery Access Door	Provides access to the batteries.
2	Water Level Gauge	Displays water level viewable through the level indicator located on the side of the tank.
3	Corner Lift/Fitting Pockets	Provides access to sling load or containerized load method.
4	Stowage Box	Provides stowage for water chemical mixture.
5	Fuel Can Bracket	Provides stowage for 5-gal. (18.9 L) fuel can.
6	Front Unit Access Ladder	Welded ladder at the front of the unit to provide access onto the top platform and manhole.
7	Tiedown	Capable of restraining the components during all modes of transport.
8	Forklift Pockets	Provides for removal of the unit when the tank is empty.
9	Air-Intake Funnel	Allows clean air to enter the engine compartment to assist in cooling the engine.

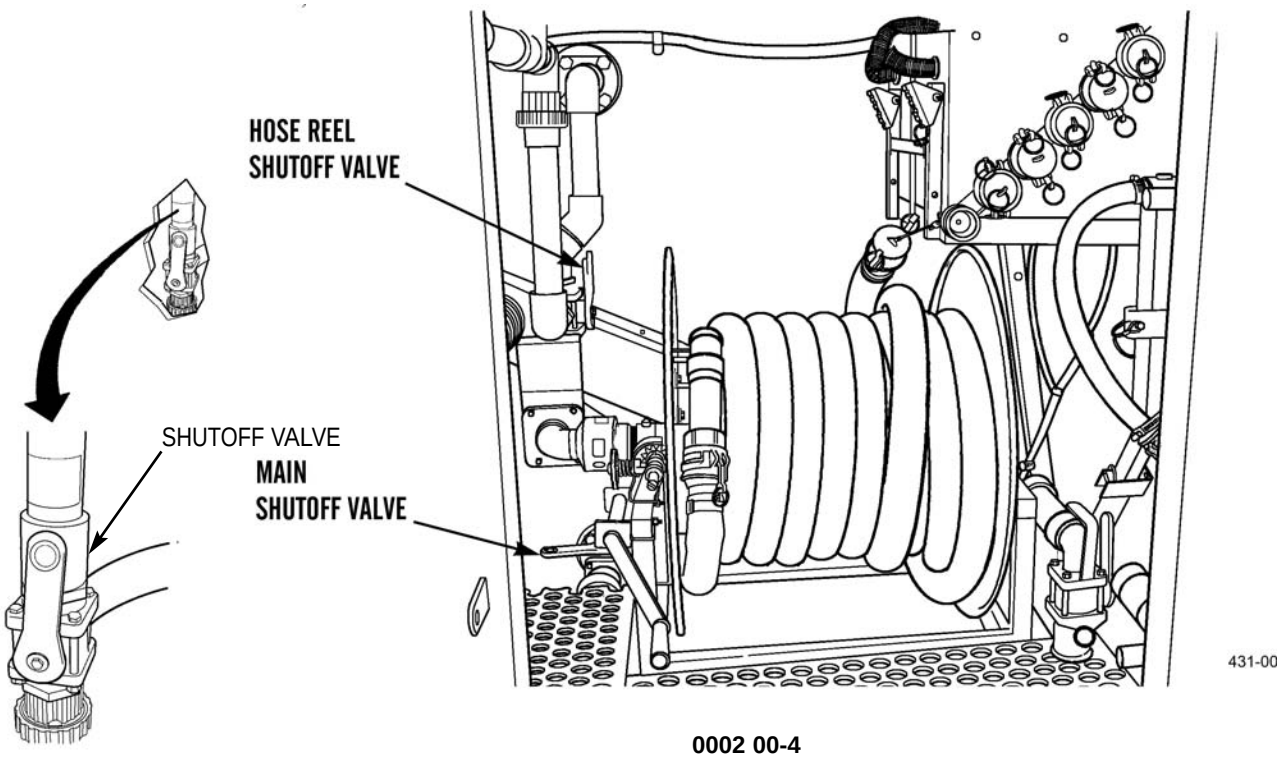
ENGINE ASSEMBLY

The engine assembly consists of a three-unit assembly mounted onto a metal plate. The unit consists of 1D81C HATZ™ Engine, Flomax 8™ 125 gpm Centrifugal Water Pump, and ER2CZ Series Power Generator (240 kW @ 3,600 rpm) 50 Hz - 13 hp 3,600 rpm - 230 V.



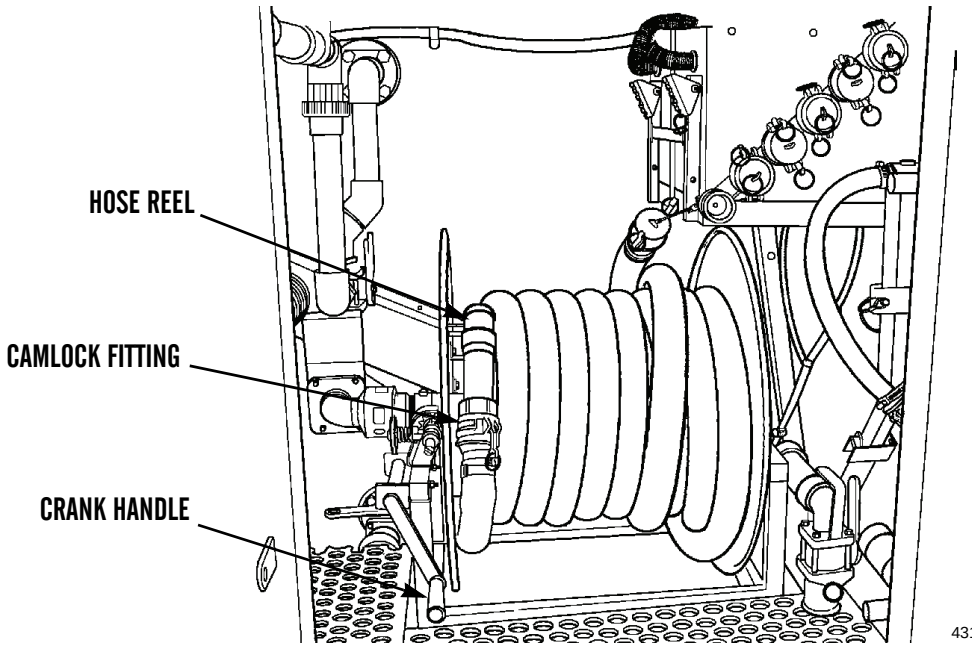
PLUMBING SYSTEM

The plumbing system is designed to supply water to the water pump and hose reel for distribution of water. The system is also designed for gravity flow distribution when the on-board pump is not operational or required. The system is distributed to the three ports and the sampling port. There are three shutoff valves on the system. The main shutoff valve is located at the flooring unit; the hose reel shutoff valve is located above the hose reel on the return line. There is an additional shutoff valve (not pictured) located on the return line.



HOSE REEL

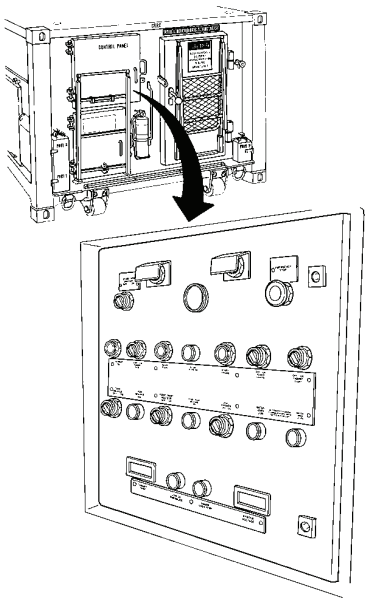
The hose reel is equipped with a 2-in. (50.8 mm) manual retractable hose, capable of dispensing potable water to unit water trailers and other water containers. It is equipped with three hose segments of the following lengths: 35 ft, 20 ft, and 15 ft (10.7 m, 6.1 m, and 4.6 m). All hoses are equipped with a 2-in. (50.8 mm) cam-lock fitting (a male on one end and a female on the other end).



431-009

CONTROL PANEL

The control panel provides access to all necessary operational functions for the operator to perform distribution operations.



431-010

EQUIPMENT DATA

TANK RACK

Tank Capacity (usable)	2,000 gal. (7,571 L)
NSN	5430-01-487-7760
Part Number	106A0020
Model Number	M105
Length	20 ft (6.1 m)
Width	8 ft (2.4 m)
Height	5 ft 8 in. (1.7 m)
Weight, Empty	9,060 lb (4,114 kg)
Weight, Full	25,942 lb (11,778 kg)

PUMP

Water Pump (low pressure, centrifugal) 45 lb (1,436 cu. in.)	Flowmax 8™, 125 gpm (473 Lpm)
Drive	Flexible coupling to engine

HOSE REEL

Hose Reel	Manual crank
Hose Size	70 ft (23.5 m), 2 in. (50.8 mm) diameter hose, consisting of a 35 ft (10.7 m), 20 ft (6.1 m), and 15 ft (4.6 m) hose

ENGINE

Engine Type	HATZ™ 1D81C-9243
Model	1D81C
Horsepower	13 hp
Cylinder	1
Fuel Type	JP 8
Fuel Tank Capacity	1.6 gal. (6.1 L)/3 hr of operation

GENERATOR

Generator Type	ER2CZ Series Power 50 Hz-3,600 rpm - 230 V
Model	ER2CZ
Drive	Flexible coupling to engine

FIRE EXTINGUISHER

Fire Extinguisher Type	A, B, C
Size	10 lb
Quantity	1 each

END OF WORK PACKAGE

THEORY OF OPERATION 0003 00

PRINCIPLES OF OPERATION

Electrical power is provided to the module by on-board systems. Water distribution is accomplished through the hose reel, filling station, or water transfer valve.

INTRODUCTION

The Hippo provides the Army with a mobile hardwall water tanker to perform bulk and retail potable water distribution and lessens the need for special purpose trailers. The Hippo is also designed to match water distribution capabilities with current heavy trailer vehicle mobility.

The Hippo contains five functional systems. They are the engine, pump, valves, hose reel, and control panel.

OPERATIONAL FEATURES OF COMPONENTS

1. **Engine**. The engine, which powers the pump, is mounted within the housing unit. It receives its fuel from a 1.6-gal. (6-L) fuel tank mounted outside the housing between the frame and the engine access door. Control of the engine is by the control panel as described below.
2. **Pump**. The pump is coupled directly to the engine. The purpose of the pump is to pump water out of or into the tank.
3. **Valves**. There are three port control valves and three main valves within the housing that control the flow of water for all operations.
4. **Control Panel**. The control panel controls the starting and stopping of the engine. It also monitors and activates the tank and housing heating devices and the high and low water indicators. The control panel is permanently mounted on the outside of the housing.
5. **Filling Station**. The filling station is designed with two 5-gal. (18.9 L) refill stations and three individual canteen stations. It is capable of being set up on almost any terrain and can also be functional with the Hippo still mounted on its primary mover. The filling station is used with Port 1 or 2 only and will not be used connected to the hose reel.

FOR TRANSPORTER OPERATION AND FUNCTIONS REFER TO:

TM 9-2320-304-10 for the Heavy Equipment Mobility Tactical Truck (HEMTT) Load Handling System (LHS) truck (M1120).
TM 9-2320-364-10 for the Palletized Load System (PLS) truck (M1074, M1075).
TM 9-2330-385-10 for the PLS trailer (M1076).

END OF WORK PACKAGE

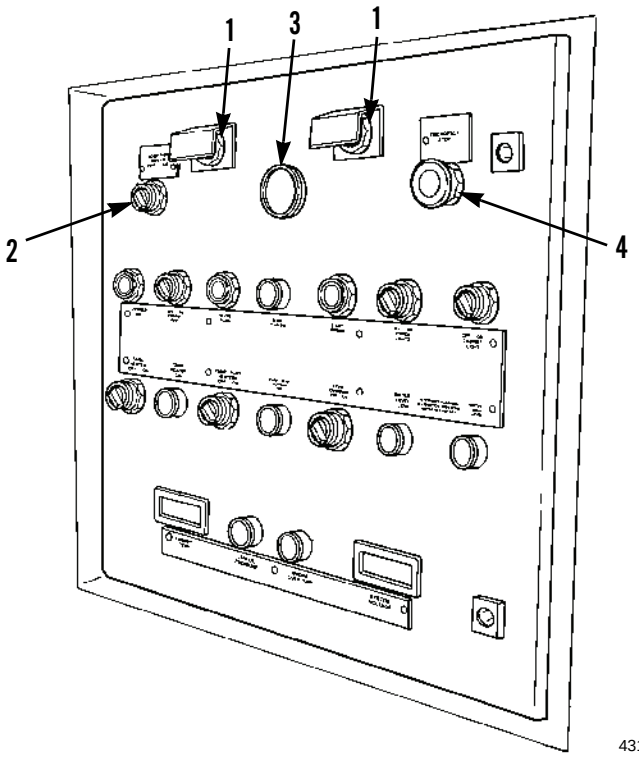
CHAPTER 2
OPERATOR INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS 0004 00

GENERAL

For the location and a basic description of the controls and indicators of the Hippo, locate the desired component by matching its description callout with the corresponding illustration callout.

CONTROL PANEL

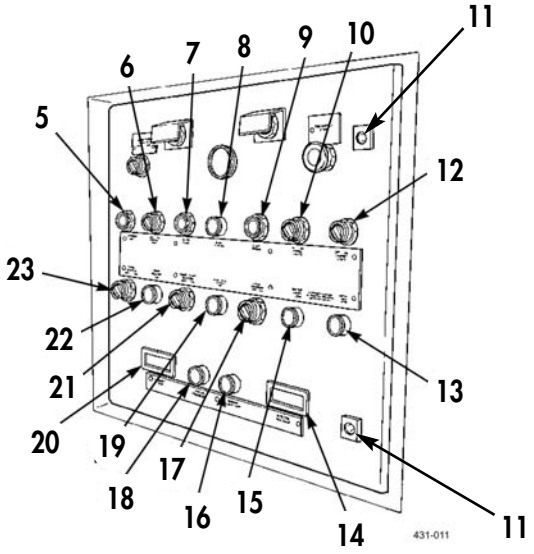


KEY	CONTROL OR INDICATOR	FUNCTION
1	Panel Lights	Enables the operation of the control panel during limited visibility.
2	BLACKOUT SWITCH	To put the system in the blackout mode turn the BLACKOUT SWITCH to the ON position. When the BLACKOUT SWITCH is in the ON position, the cabinet light will go out and the panel lights will dim.
3	Hour Meter	Monitors the engine running time.
4	EMERGENCY STOP Button	Enables the operator to immediately shut down the system in an emergency situation.

CONTROL PANEL - CONTINUED

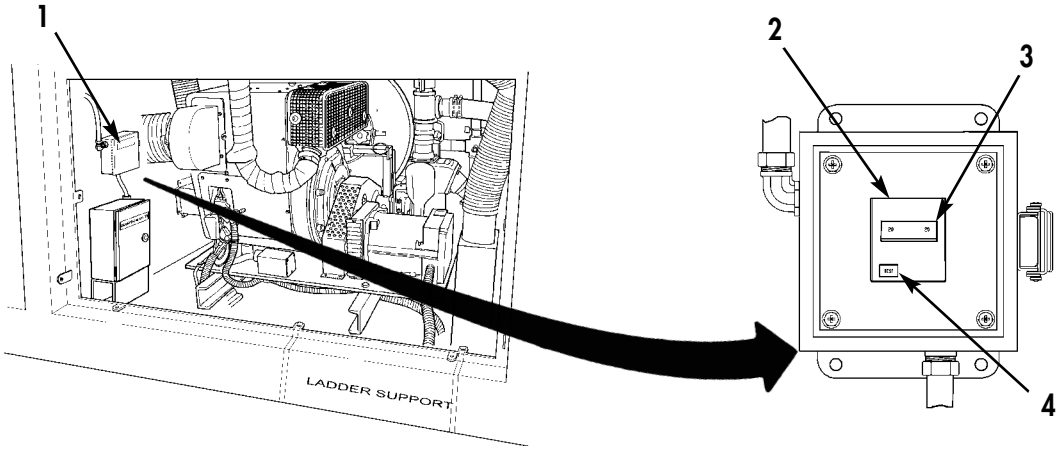
KEY	CONTROL OR INDICATOR	FUNCTION
5	POWER ON Button	Enables the operator to provide power to all controls other than the engine.
6	ENGINE RUN Switch	Place ENGINE RUN switch in the ON position before pushing the START ENGINE button.
7	GLOW PLUG Button	The glow plug heats intake air during cold start operations. The switch must be held down until the glow plug light indicator goes out, showing the engine is ready for operation. In cold start operation, glow plugs must always be used before starting engine (refer to WP 0011 00 for cold weather starting).
8	GLOW PLUG ON Indicator	Serves as a visual indicator to the operator that the glow plug has been activated for cold weather start-up operations.
9	START ENGINE Button	Enables the operator to start the on-board engine.
10	PANEL LIGHTS Switch	Enables the operator to turn the panel lights ON and OFF.
11	CONTROL PANEL Locks	The control panel can be opened by inserting the BII control panel key in each lock and turning it to the left to unlock and to the right to lock control panel.
12	CABINET LIGHT Switch	Enables the operator to turn the florescent cabinet light ON and OFF.
13	WATER HIGH LEVEL Indicator	Serves as a visual indicator to the operator that the WATER HIGH LEVEL sensor has indicated high level fill. When this occurs, the engine will shut down immediately.
14	SYSTEM VOLTAGE Monitor	With the power ON, the SYSTEM VOLTAGE gauge serves as a visual indicator of the current system voltage.
15	WATER LOW LEVEL Indicator	Serves as a visual indicator to the operator that the WATER LOW LEVEL sensor has indicated low water level has been reached. When this occurs, the engine will shut down immediately.
16	ENGINE OVER TEMP Indicator	Serves as a visual indicator to the operator that a high engine temperature has been reached. When this occurs, the engine will shut down immediately.
17	LEVEL OVERRIDE Switch	Enables the operator to override the high level and low level cut-offs in the system. When the LEVEL OVERRIDE switch is in the ON position, the system will not automatically shut down when full or empty.
18	LOW OIL PRESSURE Indicator	Serves as a visual indicator to the operator that low oil pressure has been reached. When this occurs, the engine will shut down immediately.
19	PUMP/PORT HEATERS ON Indicator	Serves as a visual indicator to the operator that the PUMP/PORT HEATER heat trace has become energized and is drawing current.
20	CABINET TEMP Monitor	Continuously monitors and displays the current cabinet temperature.
21	PUMP/PORT HEATERS Switch	Enables the operator to turn the heat trace, which is wrapped around Valve B and several feet of adjacent pipe, ON and OFF.
22	TANK HEATER ON Indicator	Serves as a visual indicator to the operator that the TANK HEATERS have become energized and are drawing current.
23	TANK HEATER Switch	Enables the operator to turn the heater under the tank ON and OFF. When placed in the ON position the TANK HEATER light will indicate whether the heaters have become energized.

CONTROL PANEL - CONTINUED



GROUND FAULT CIRCUIT INTERRUPTER (GFCI)

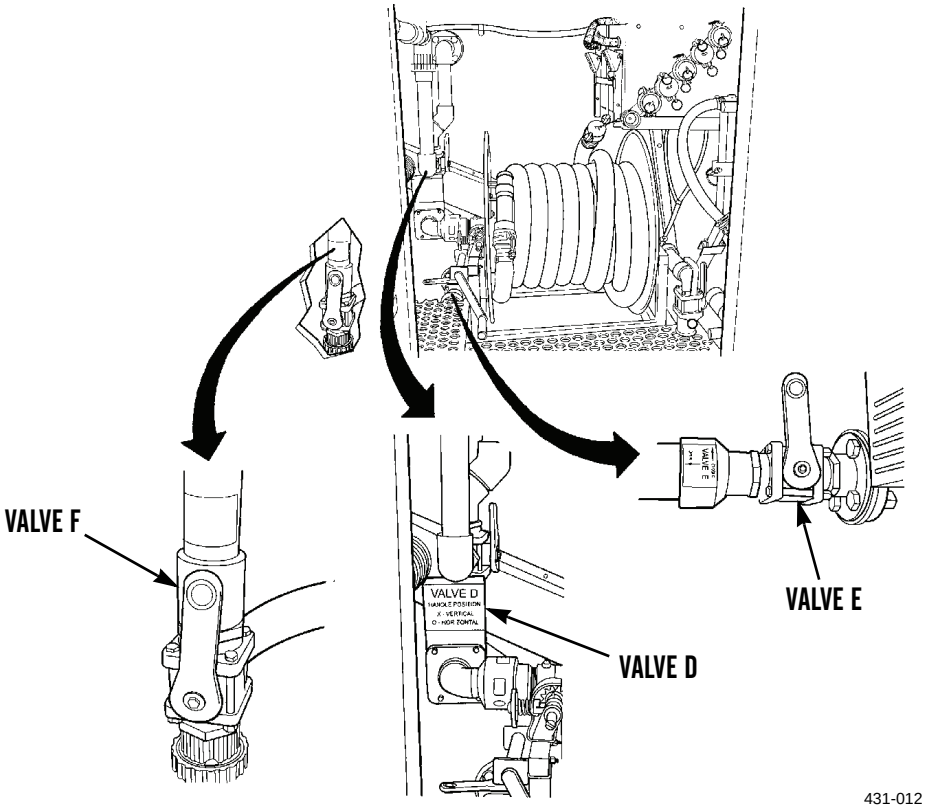
GFCI box contains a GFCI, 5mA sensitive personnel protection device which protects against electrical shock hazards.



KEY	CONTROL OR INDICATOR	FUNCTION
1	GFCI BOX door and latch	Enables operator to access GFCI TEST button and reset switch bar. To open door release latch.
2	GFCI	Protects personnel against electrical shocks.
3	GFCI reset switch bar	Enables operator to reset the GFCI when it is automatically or manually tripped. Reset GFCI by moving switch bar down until it clicks, then move switch bar all the way up to top position.
4	GFCI TEST button	Enables operator to test GFCI function. Depressing white GFCI test button will immediately snap switch bar to lower position and interrupt power to circuit.

PORT/MAIN VALVES

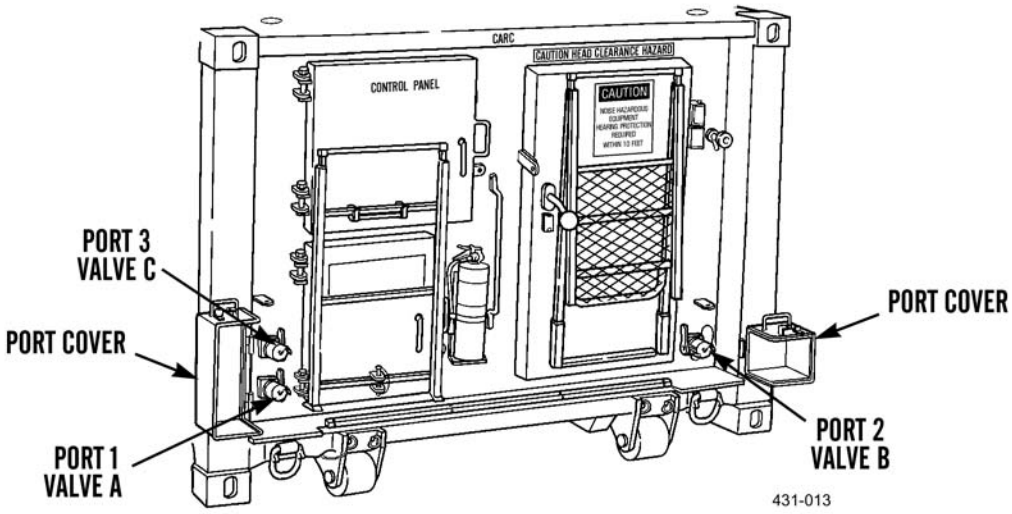
There are three port control valves, Valve A, Valve B, Valve C and three main valves, Valve E, Valve D, and Valve F, that control the flow and distribution of water for all operations.



PORT/MAIN VALVES - CONTINUED

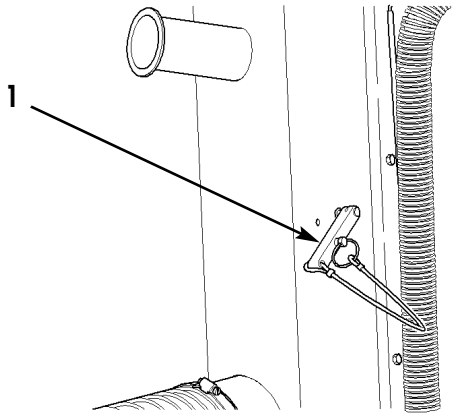
Port covers are used to prevent dirt and debris from entering the port area and prevents damage to the port when not in use. To open the port cover (Models 1-5): Locate the latch on the port cover. Lift up on the latch handle and turn the latch handle counterclockwise to unlock the latch. Lift the port cover up and secure it, using the safety chain provided. To open the port cover (Models 6 & up): Locate the latch on the port cover. Turn the latch counterclockwise to unlock the latch. Swing the port cover to the side.

1. **Port Control Valve C**. The suction valve is located on Port 3. The valve is closed when the handle is up, and open when the handle is parallel with the valve.
2. **Port Control Valves A & B**. The discharge A valve is located on Port 1 and discharge Valve B is located on Port 2. The valve is closed when the handle is up, and open when the handle is parallel with the valve.



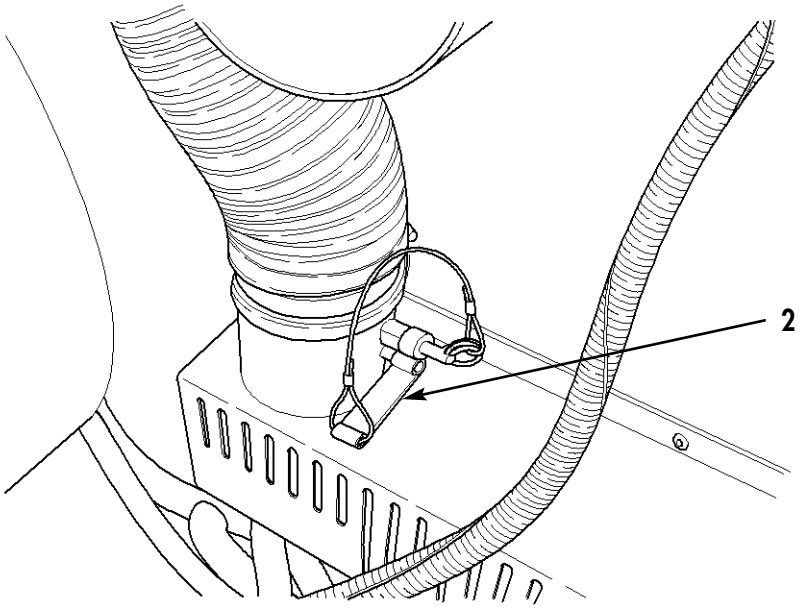
HEATER PLENUM DAMPER VALVES

1. Open the valve (1) on the exhaust tunnel. This allows heat to travel to the two heater plenums. Refer to WP 0010 00 for cold weather startup operation.

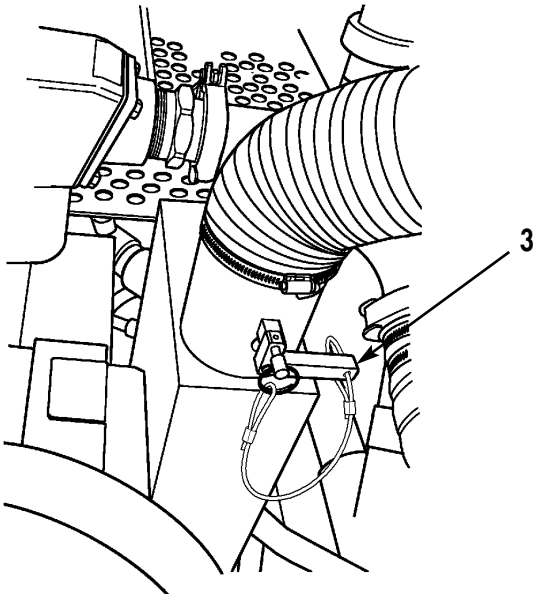


HEATER PLENUM DAMPER VALVES - CONTINUED

2. Open the valve (2) located on plenum A which is mounted on the back wall of the enclosure.



3. Open the valve (3) located on plenum B which is located between the pump and the rear wall.

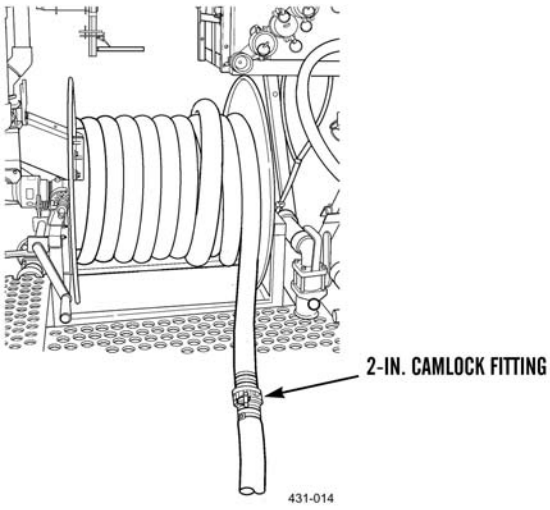


HOSE REEL

CAUTION

Do not use hose reel with filling station. Failure to comply may result in damage to equipment.

The Hippo is equipped with a 2-in. (50.8 mm) manual retractable hose, capable of dispensing potable water to unit water trailers and other water containers. The hose reel is equipped with three hose segments of the following lengths: 35 ft (10.7 m), 20 ft (6.1 m), and 15 ft (4.6 m). All hoses are equipped with a 2-in. (50.8 mm) cam-lock fitting (a male on one end and a female on the other end).

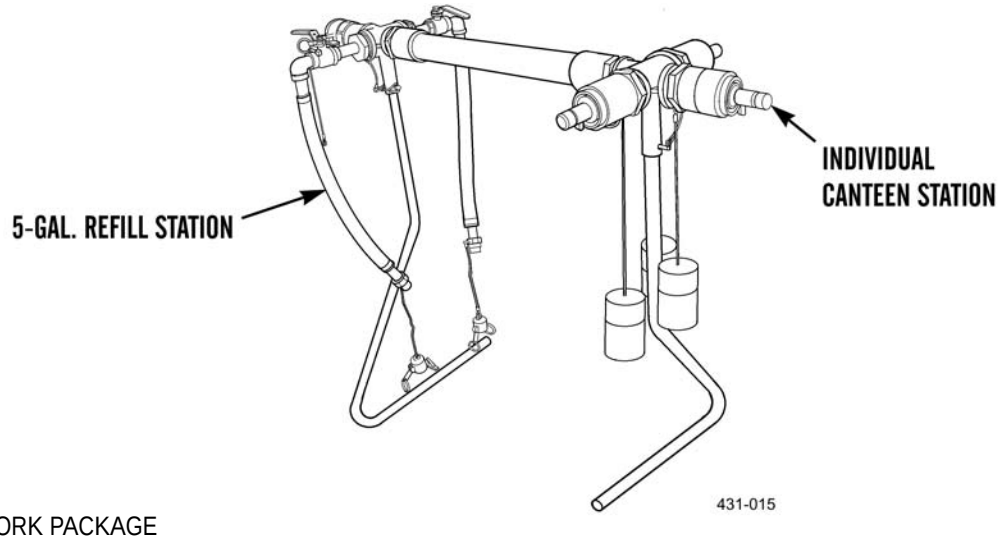


FILLING STATION

CAUTION

Do not use hose reel with filling station. Failure to comply may result in damage to equipment.

The filling station is designed with two 5-gal. (18.9 L) refill stations and three individual canteen stations. It is capable of being set up on level terrain and can be functional with the Hippo still mounted on its prime mover. The filling station is used with Port 1 or 2 only and will not be used connected to the hose reel.



END OF WORK PACKAGE

PERFORMING OPERATOR TASKS WITH THE HIPPO ATOP THE PRIME MOVER

NOTE

With the exception of servicing the batteries, all operator tasks can be performed with the Hippo atop the prime mover.

To perform operator tasks when the Hippo is atop the prime mover, deploy the ladder located on the rear of the Hippo. Refer to next section.

ASSEMBLY/DISASSEMBLY OF THE LADDER TO ACCESS THE REAR OF THE HIPPO AND TO REFUEL

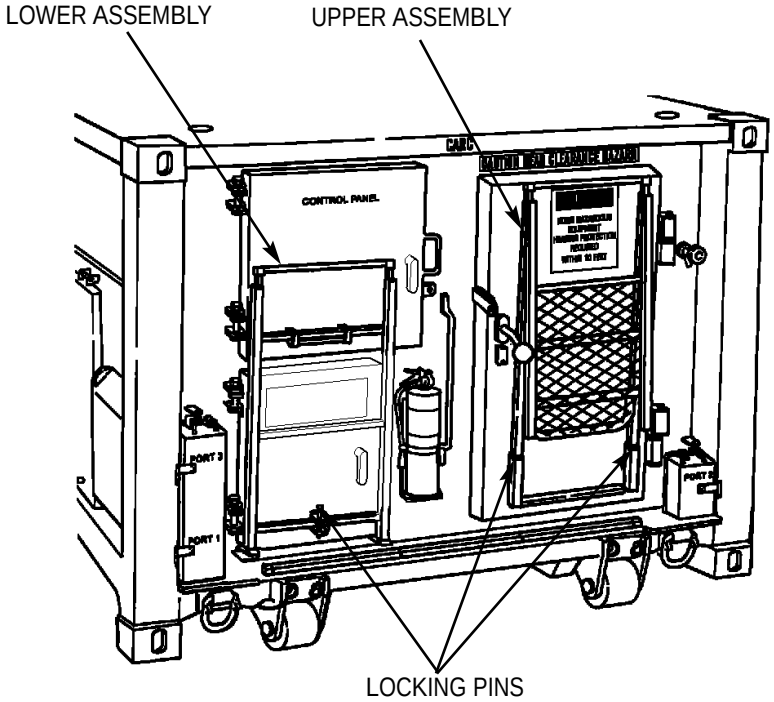
WARNING

There is a pinch hazard when deploying or stowing the ladder. Use caution and wear protective gloves. Failure to follow this warning may result in injury to personnel.

NOTE

- The deployment of the ladder is designed to be utilized to provide access to the control panel and the interior components in the housing for fill and distribution operations or to refill the fuel tank when the Hippo is mounted onto the primary mover, and to access the battery compartment when the Hippo is on the ground.
- The ladder is comprised of three parts: upper assembly and two different lower assemblies.

1. The upper assembly is mounted onto the main access door and is secured with two locking pins.
2. One longer lower assembly is mounted onto the control panel access door and is secured onto a bracket and locked with a locking pin.



ASSEMBLY/DISASSEMBLY OF THE LADDER TO ACCESS THE REAR OF THE HIPPO AND TO REFUEL - CONTINUED

WARNING

When moving the prime mover into position, be sure that the ground is stable enough to support the weight of the fully loaded vehicle and that the surrounding terrain is passable. When stopped, always chock the wheels before filling the tank. Personnel working at the water loading site must avoid placing themselves in a position where equipment malfunction or sudden equipment movement would injure them. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.

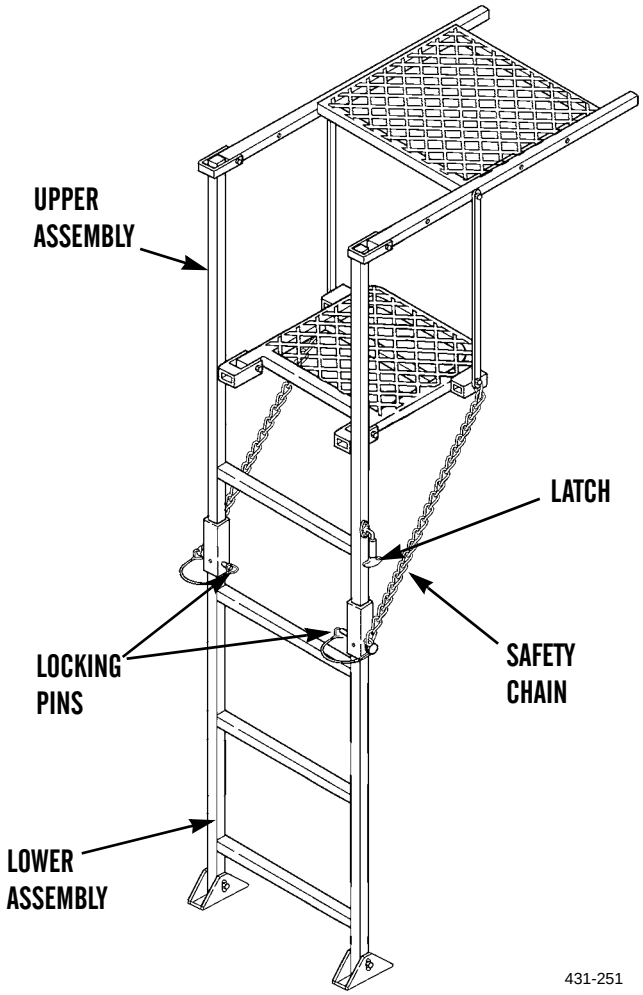
CAUTION

Place ladder in a location that would prevent the lower assembly from being damaged.

NOTE

This assembly is designed so that one person can assemble the ladder without assistance.

3. Release locking pin on the lower assembly and, as you pull out, lift the lower assembly up, clearing the lip of the bracket, then pull down on the lower assembly.
4. Release the two locking pins on the upper assembly, push up to free the lower locks, and then pull down.
5. Placing the upper assembly onto the ground, attach the lower assembly with the upper assembly until the pinholes are aligned.
6. Slide the locking pins from the upper assembly thru the last link on the safety chain.
7. Secure the two assemblies with the two locking pins.
8. Release the latches (one on each side) and extend the platform.

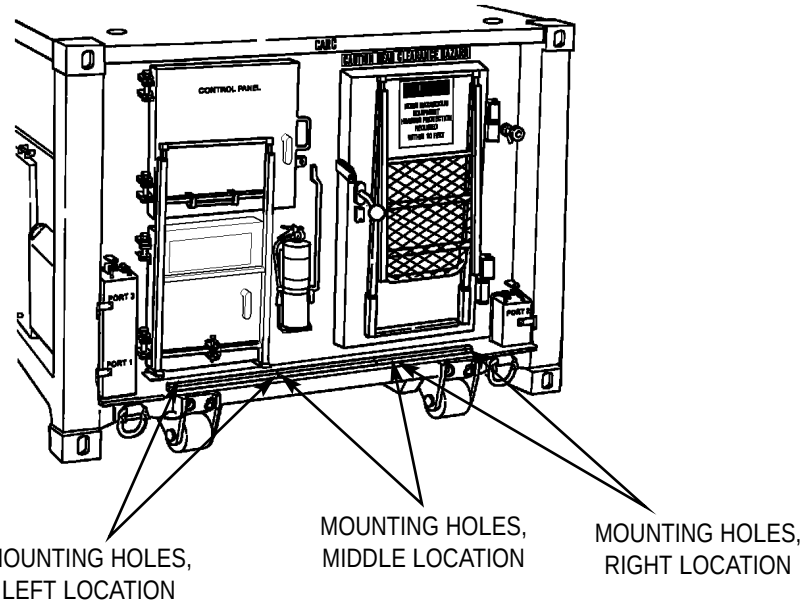


DEPLOYMENT OF THE LADDER TO ACCESS THE REAR OF THE HIPPO

9. The ladder is now ready to deploy to the rear of the Hippo or for refueling the Hippo.
10. To disassemble and stow the ladder reverse the above steps.

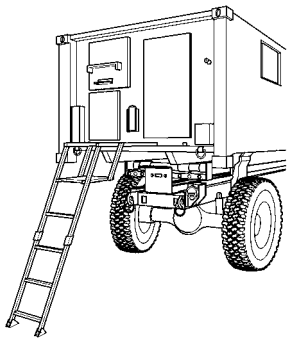
NOTE

The ladder can be deployed at three different locations at the rear of the Hippo.

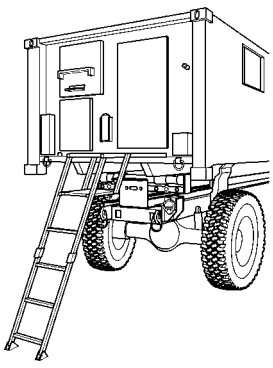


1. Position the assembled ladder at the rear of the unit.
2. Release the platform latches (one on each side). Extend the platform upwards and lean it against the unit.
3. Locate the ladder mounting holes to be used.
4. Position the ladder to align with the mounting holes.
5. Guide the platform nipples onto the mounting holes to secure the ladder.

LEFT LOCATION



MIDDLE LOCATION



RIGHT LOCATION

DEPLOYMENT OF THE LADDER TO ACCESS THE REAR OF THE HIPPO - CONTINUED

6. Adjust ladder so the top of the platform is level. Adjust the length of the safety chain so the ladder does not accidentally kickout too far.

WARNING

Before accessing the rear of the Hippo be certain that ladder is correctly secured onto the ladder support bracket. Failure to follow this warning may result in injury to personnel or damage to equipment.

7. Reverse the sequence to recover the ladder.

DEPLOYMENT OF THE LADDER TO REFUEL THE HIPPO

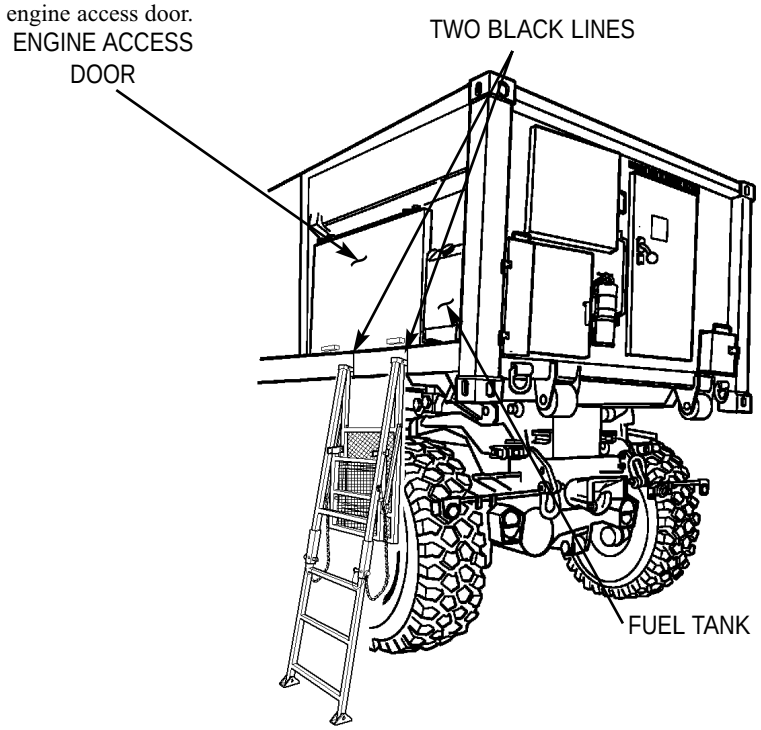
WARNING

Ensure a fire extinguisher is accessible during refueling. Failure to comply may result in injury or death to personnel.

NOTE

The deployment of the ladder to add fuel to the Hippo is designed to be utilized when the Hippo is located on the primary mover or PLS. The preferred method is with the unit on the ground.

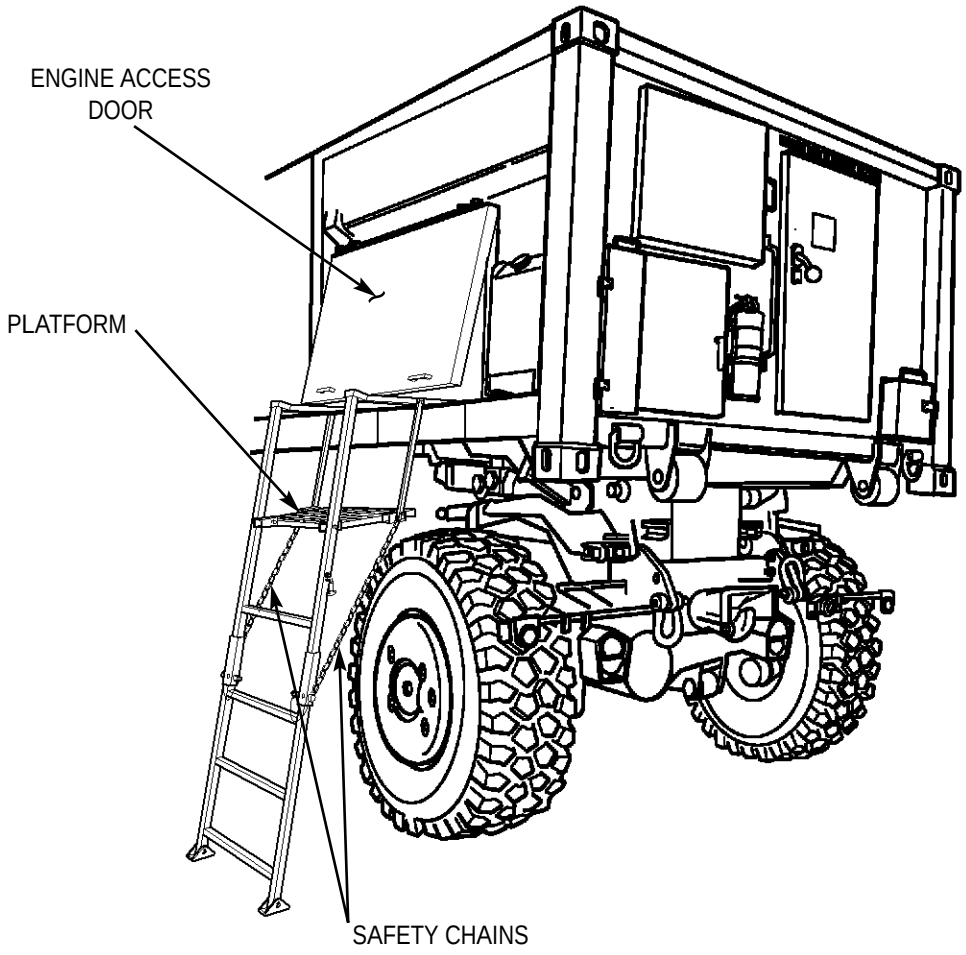
1. Unlatch the engine access door.



2. Position the ladder at the engine access door. Lean the top of the ladder against the frame aligned with reference mark.

DEPLOYMENT OF THE LADDER TO REFUEL THE HIPPO - CONTINUED 0005 00

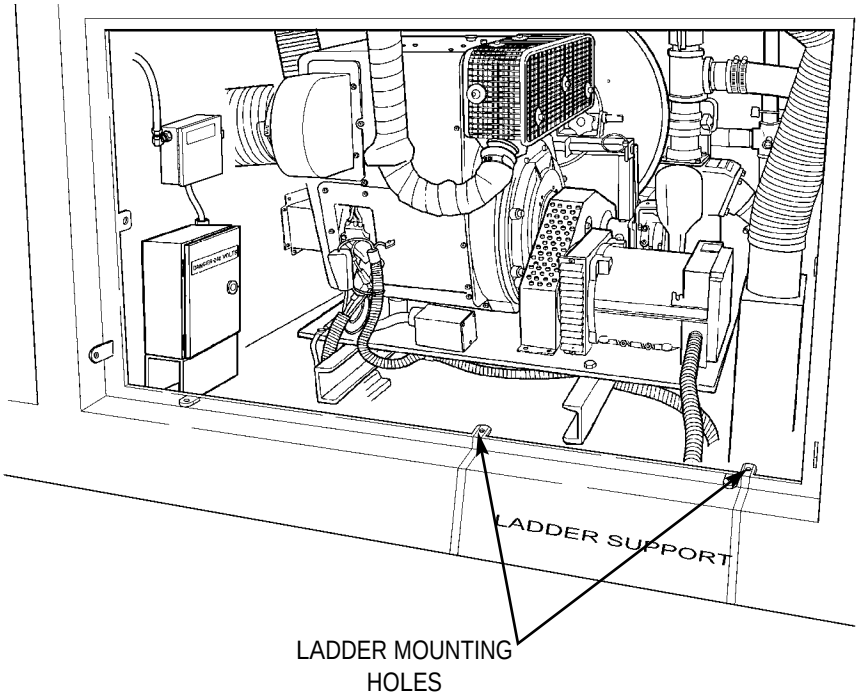
3. Release the platform latches (one on each side).
4. Hold the engine access door open slightly and extend the platform upwards.
5. Position the nipples of the ladder onto the ladder mounting holes.
6. Adjust the ladder so the platform is level. Adjust the length of two safety chains so the ladder does not accidentally kick out too far.



DEPLOYMENT OF THE LADDER TO REFUEL THE HIPPO - CONTINUED

WARNING

Be certain ladder is correctly positioned and secured onto the ladder mounting holes. Failure to follow this warning may result in injury to personnel or damage to equipment.



7. Retrieve the 5-gal. fuel can. Place the 5-gal. fuel can on the first platform of the ladder assembly. Ascend the ladder to the first platform of the ladder assembly.
8. Remove the fuel tank cap from the fuel tank and allow the cap to hang by the safety chain.
9. Grasp the 5-gal. fuel can with both hands and, while standing squarely on the ladder platform, commence filling of the Hippo fuel tank. When the fuel tank has been filled, place the 5-gal. fuel can on the platform and replace the fuel cap on the fuel tank.
10. Descend the ladder to the ground. From the ground, place the 5-gal. fuel can on the ground.
11. Hold engine access door slightly open and remove ladder assembly.
12. Fold ladder platform down and secure latch on both sides.
13. To disassemble ladder refer to assemble/disassemble ladder instructions at the beginning of this work package.

DEPLOYMENT OF LADDER TO CHECK BATTERIES

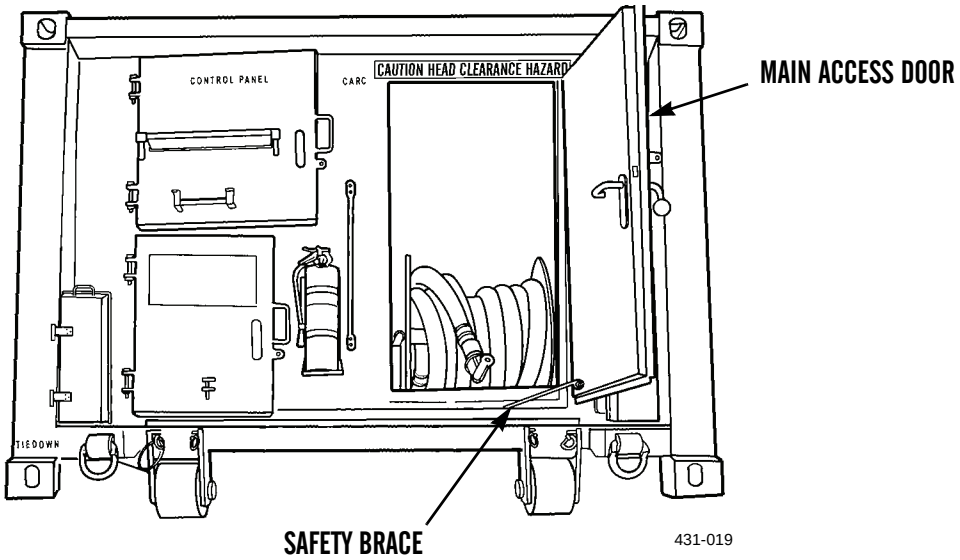
WARNING

- The deployment of the ladder to check or perform battery maintenance is designed to be utilized only then the Hippo is on the ground. UNDER NO CIRCUMSTANCES SHOULD THE BATTERY MAINTENANCE BE PERFORMED WHEN THE HIPPO IS ON THE PRIME MOVER. Failure to follow this warning could result in injury or death to personnel and.or damage to equipment.
- When any access door is open, the safety brace must be used to brace the access door. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

NOTE

The ladder is comprised of two parts for this operation: the upper assembly and the small lower assembly. The upper assembly is mounted onto the main access door and is secured with two locking pins. The small lower assembly is mounted inside the Hippo onto the rear of the battery box and is secured with two locking pins.

1. Open main access door and secure, using safety brace.



DEPLOYMENT OF LADDER TO CHECK BATTERIES - CONTINUED

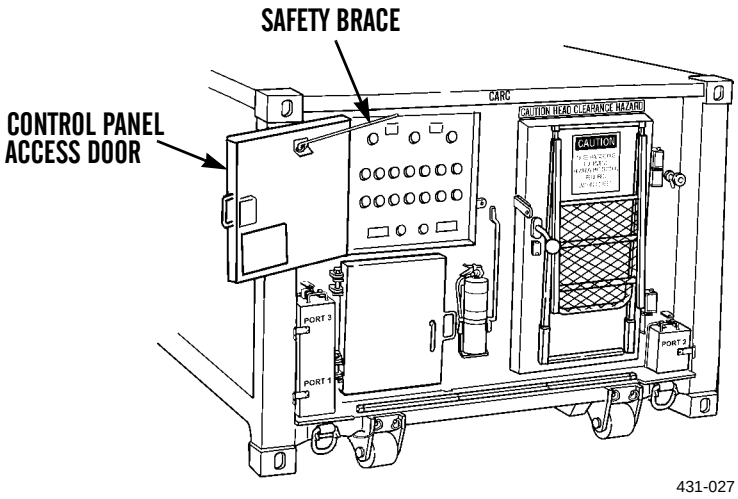
WARNING

- Then any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a pinch hazard when deploying or stowing the ladder. Use caution and wear protective gloves. Failure to follow this warning may result in injury to personnel.

NOTE

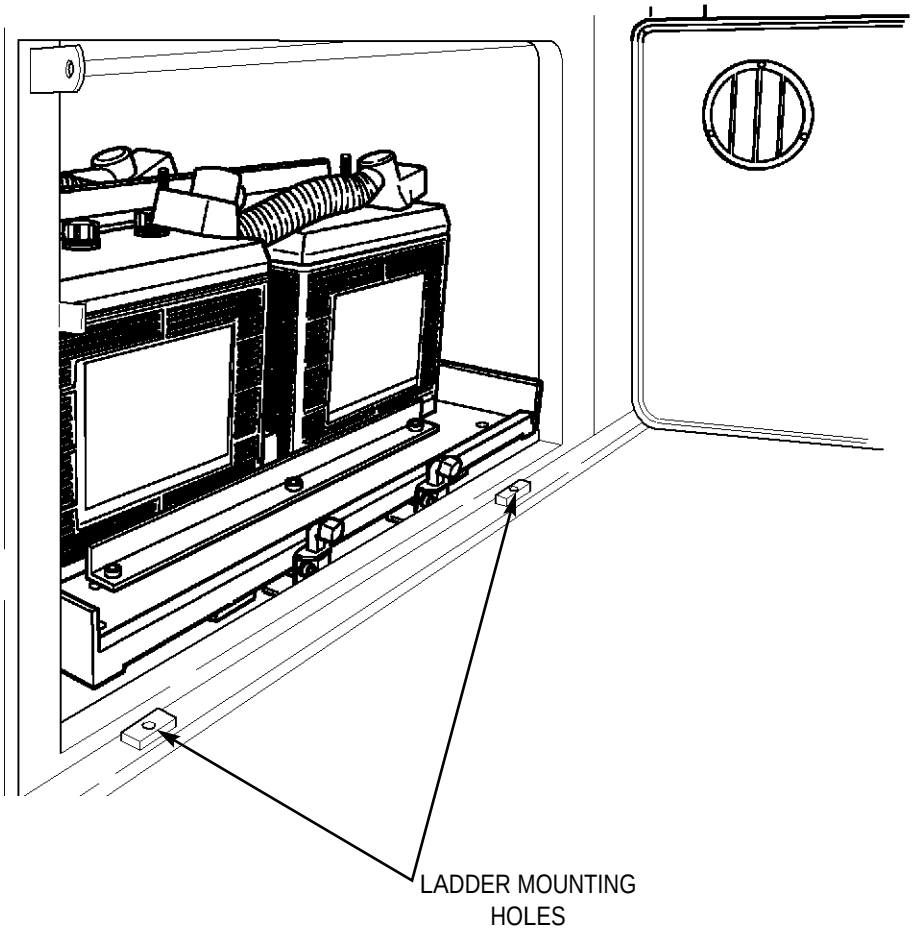
The assembly of the ladder is designed so that one person can assemble the ladder with assistance.

2. If lights are needed, open control panel (WP 0007 00) and secure door with safety brace. Push POWER button on. Turn CABINET LIGHT switch to ON position.



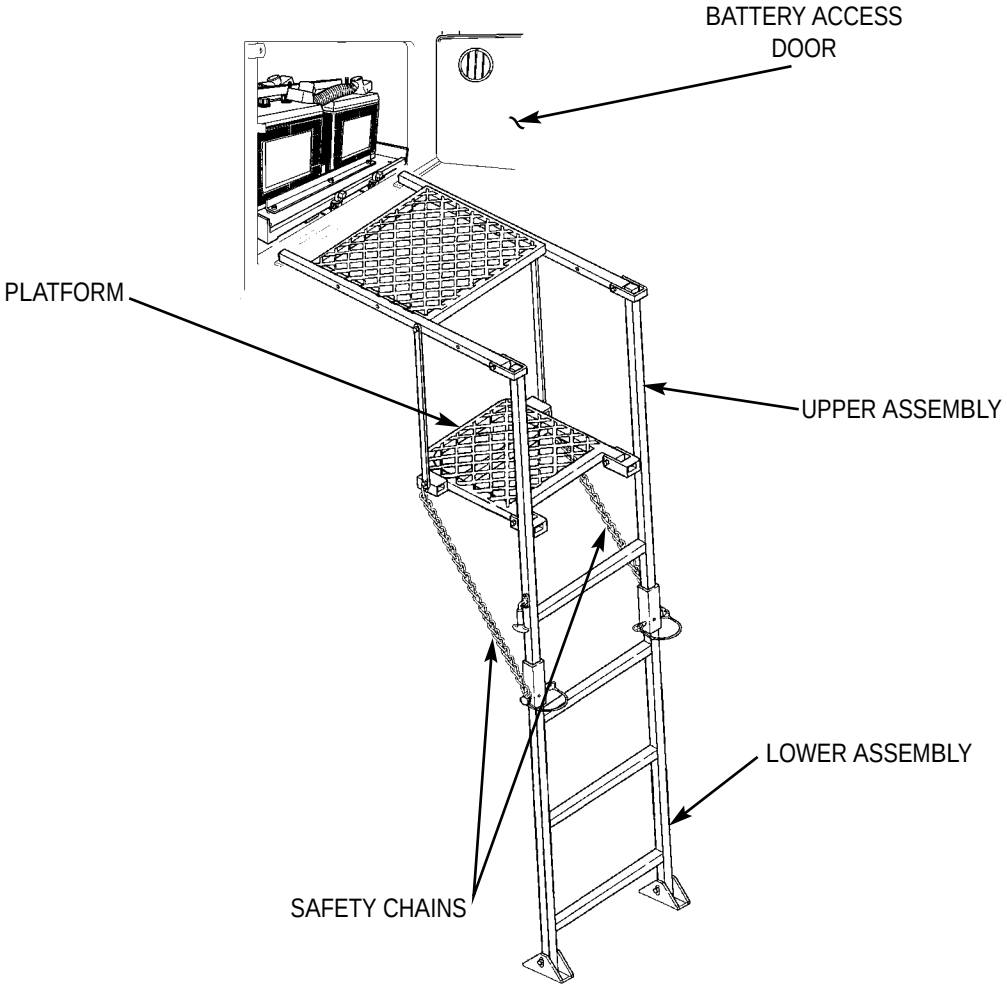
DEPLOYMENT OF LADDER TO CHECK BATTERIES - CONTINUED

3. Release the locking pins on the lower section of the ladder, mounted on the back side of the battery compartment, located in the interior of the unit, and remove from the inside of the Hippo.
4. Release the two locking pins on the upper assembly, push the upper assembly up to free the lower locks, and then pull down the upper assembly to remove from stowage rack.
5. Placing the upper assembly onto the ground, attach the lower assembly with the upper assembly until the pinholes are aligned.
6. Slide the locking pins from the upper assembly through the last link of safety chain.
7. Secure the two assemblies with the locking pins attached to the upper assembly.
8. Open and lock the batter compartment door.
9. Position the ladder at the battery box and extend the platform by pushing the platform upwards.
10. Locate the ladder mounting holes on the ladder support bracket and position the ladder with the nipples onto the ladder mounting holes to secure the ladder.



DEPLOYMENT OF LADDER TO CHECK BATTERIES - CONTINUED

11. Adjust ladder so the top of the platform is level. Adjust the length of two safety chains so the ladder will be secure in its position.



WARNING

Be certain the ladder is correctly secured onto the ladder support bracket. Failure to follow this warning may result in injury to personnel or damage to equipment.

12. To return the ladder to storage position, perform deployment steps in reverse.

DEPLOYMENT OF FILLING STATION

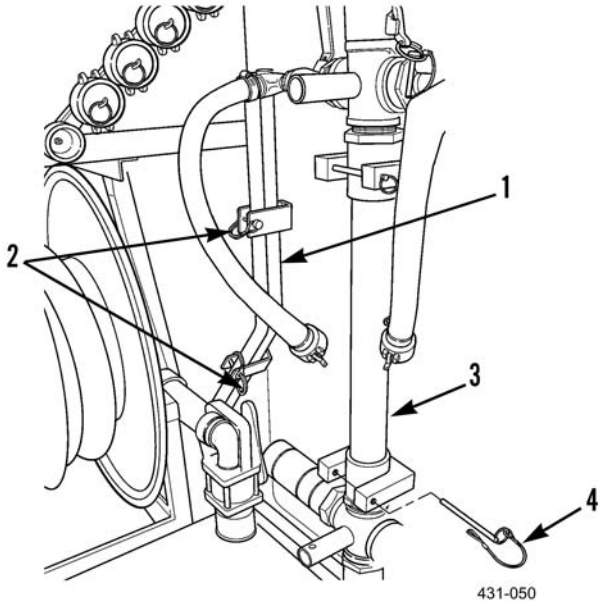
CAUTION

Do not use hose reel with filling station. Failure to comply may result in damage to equipment.

NOTE

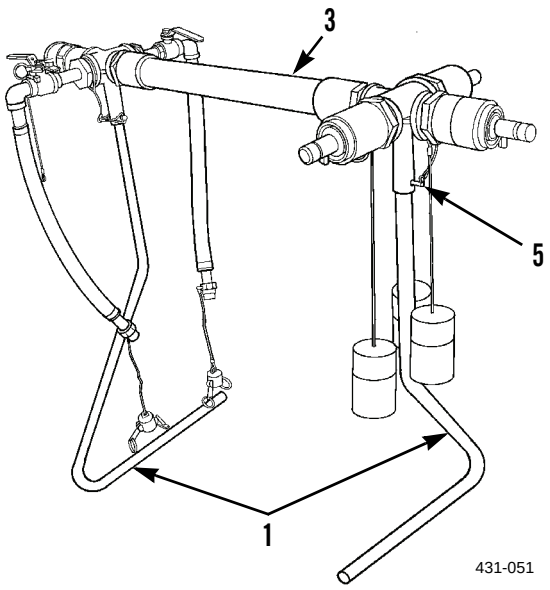
- The filling station is designed with a 5-gal. refill station and individual canteen station. It is capable of being set up on any terrain and it can also function with the Hippo still mounted onto its prime mover.
- The filling station can be set up utilizing either discharge port A or B. Stowed within the Hippo, the center component of the filling station is located on the right side, mounted onto the wall panel of the interior of the housing or shelter. The two supporting legs are mounted onto the right wall panel, directly next to the filling station.

1. Locate the two supporting legs (1) for the filling station and release the pins (2) from the mounting bracket.
2. Locate the center component of the filling station (3) and release the pins (4) from the mounting bracket. Push the release button on the head of the pin to release lock.



DEPLOYMENT OF FILLING STATION - CONTINUED

3. Identify the desired ground to set up the filling station.
4. Insert supporting legs (1) into center component slot (3), align the holes on the legs and the center component of the filling station, and insert the locking pins (5) to secure them together.



5. Reverse steps 1 thru 4 to disassemble. Be sure to properly place the capped valve end down on the floor.

FUEL TANK REFILLING ATOP PRIME MOVER

Refer to “Deployment of the Ladder to Refuel the Hippo” earlier in this work package.

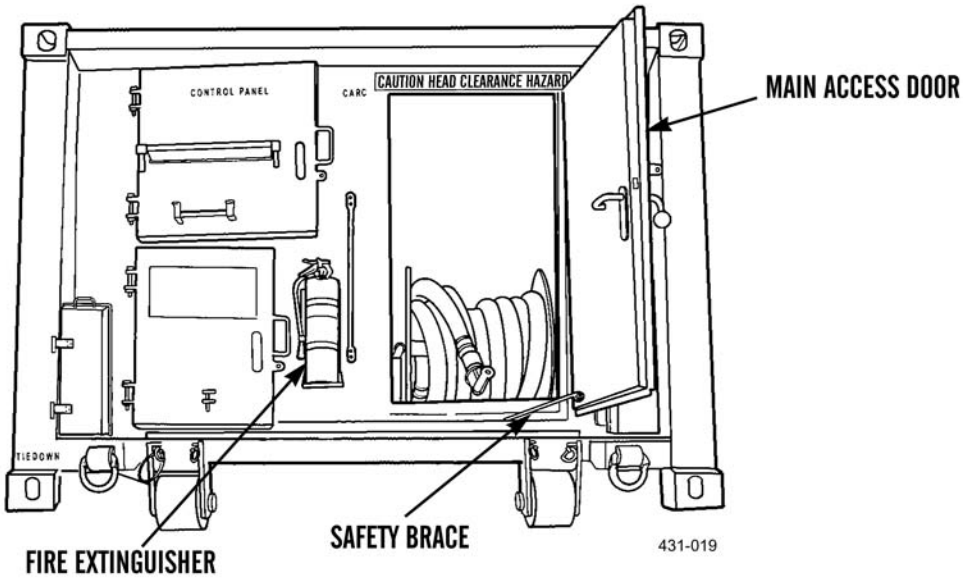
FUEL TANK REFILLING WHEN THE HIPPO IS ON THE GROUND 0005 00

WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard.
- Ensure a fire extinguisher is accessible during refueling. Failure to comply may result in injury or death to personnel.

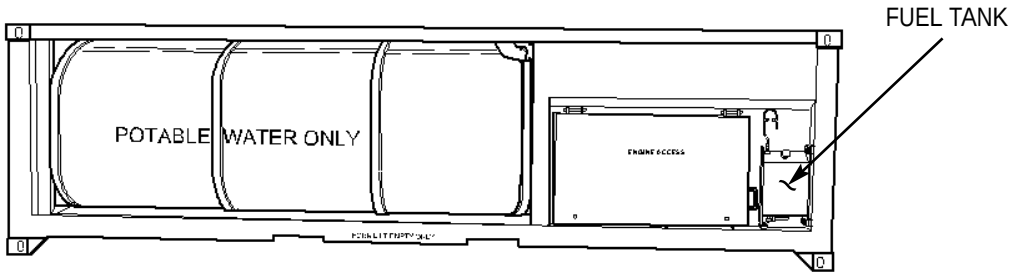
During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

1. Open the main access door and brace the main access door open using the safety brace.



FUEL TANK REFILLING WHEN THE HIPPO IS ON THE GROUND - CONTINUED

2. Remove the fire extinguisher and place it in the mounting bracket on the outside of the Hippo.
3. Retrieve the 5 gal. fuel can from the front of the Hippo.
4. Remove the cap from the fuel tank and allow the cap to hang by the safety chain.



5. Grasp the 5 gal. fuel can with both hands and commence filling of the Hippo fuel tank. When the fuel tank has been filled, place the 5 gal. fuel can on the ground and replace the fuel cap on the fuel tank.
6. Secure the 5 gal. fuel can in the mounting bracket on the front of the Hippo.
7. Return the fire extinguisher from the outside mounting bracket to the inside mounting bracket.
8. Securely close the main access door.
9. Return the ladder to its stowage configuration.

END OF WORK PACKAGE

INITIAL CHECKS

NOTE

Perform the WEEKLY PMCS as well as the BEFORE OPERATION PMCS if you are the assigned operator and have not operated the equipment since the last weekly inspection or if you are operating the unit for the first time.

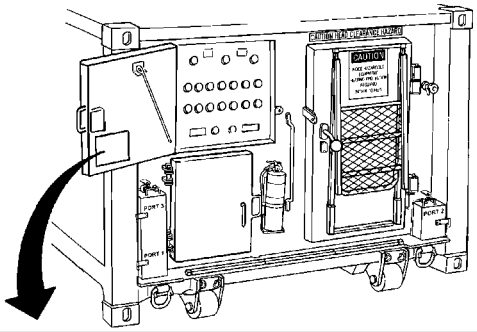
Perform the BEFORE OPERATION Preventive Maintenance Checks and Services (PMCS) found in WP 0016 00 before performing the following procedures. These checks and services will determine that the Hippo is ready for use.

OPERATING PROCEDURES

The following paragraphs provide operating procedures for the Hippo. Read and understand all operating instructions before attempting to operate this equipment.

VALVE POSITION CHART

The Valve Position Chart is located on the interior of the control panel access door. This chart identifies each valve that controls the flow and distribution of water. It provides instructions for which position (opened or closed) each valve must be in to achieve the various functions of the Hippo.



VALVE POSITION CHART

	VALVE A	VALVE B	VALVE C	VALVE D	VALVE E	VALVE F	ENGINE
Top Fill Port	X	X	X	X	X	X	OFF
Gravity Discharge-Port 1	O	X	X	X	O	O	OFF
Gravity Discharge-Port 2	X	O	X	X	O	O	OFF
Bulk Discharge With Pump-Port 1	O	X	X	X	O	X	ON
Bulk Discharge With Pump-Port 2	X	O	X	X	O	X	ON
Bottom Fill-Aux Pump-Port 3	X	X	O	X	X	O	OFF
Fill With Onboard Pump-Port 3	X	X	O	X	X	O	ON
Filling Station-Port 1	O	X	X	X	O	O	ON OR OFF
Filling Station-Port 2	X	O	X	X	O	O	ON OR OFF
Hose Reel Discharge	X	X	X	O	O	O	ON
Sampling/Discharge-Spigots 4	X	X	X	X	O	O	ON
Recirculation Mode	X	X	X	X	O	O	ON
Aux Pump Operation-Port 1	O	X	X	X	O	X	OFF
Aux Pump Operation-Port 2	X	O	X	X	O	X	OFF
Emergency On Board Pump Operation	O	X	O	X	X	X	ON
Bulk Discharge & Hose Reel	O	X	X	O	O	O	ON
Bulk Discharge & Filling Station	O	O	X	X	O	O	ON
Hose Reel Discharge & Fill Station Port A or B	O	X	X	O	O	O	ON
Plumbing Maintenance or Leakage	O	O	O	X	X	X	OFF
Drain Tank and System	O	O	O	O	O	O	OFF
WARNING- DO NOT USE FILL STATION ATTACHED TO HOSE REEL - EQUIPMENT DAMAGE MAY RESULT							
-LEGEND-							
O-VALVE OPEN							
X-VALVE CLOSED							

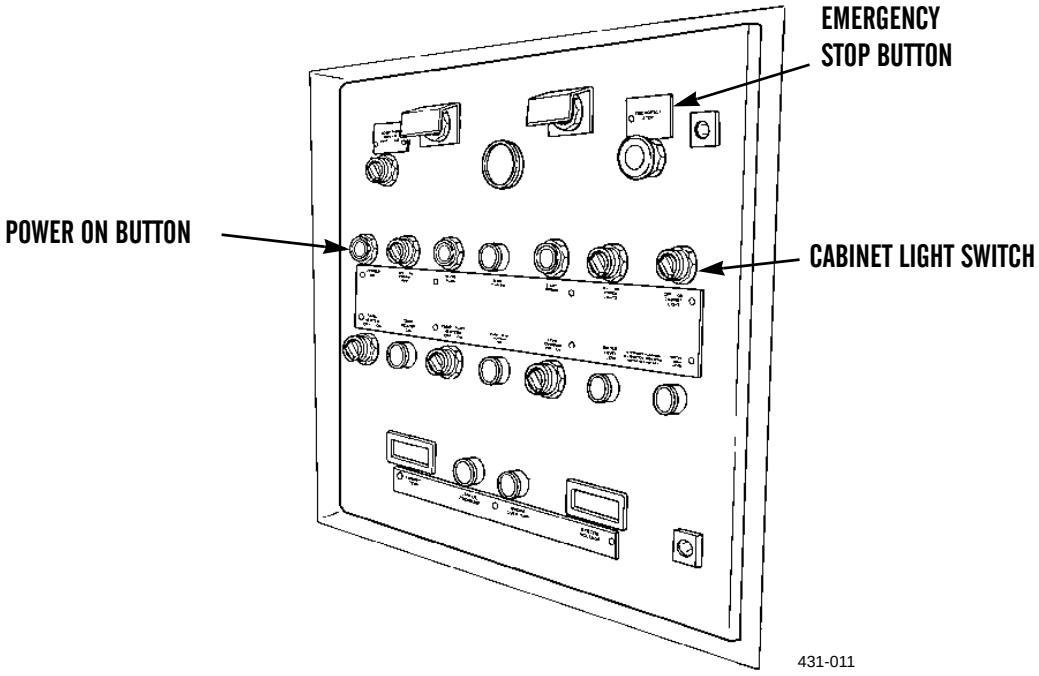
MIL-MAR CENTURY CORP.

PRIMING PUMP WITH AUXILIARY WATER SOURCE

NOTE

Refer to Valve Position Chart in this work package for valve location and operation.

1. Pull out EMERGENCY STOP button, push POWER ON button, and turn CABINET LIGHT switch to ON.



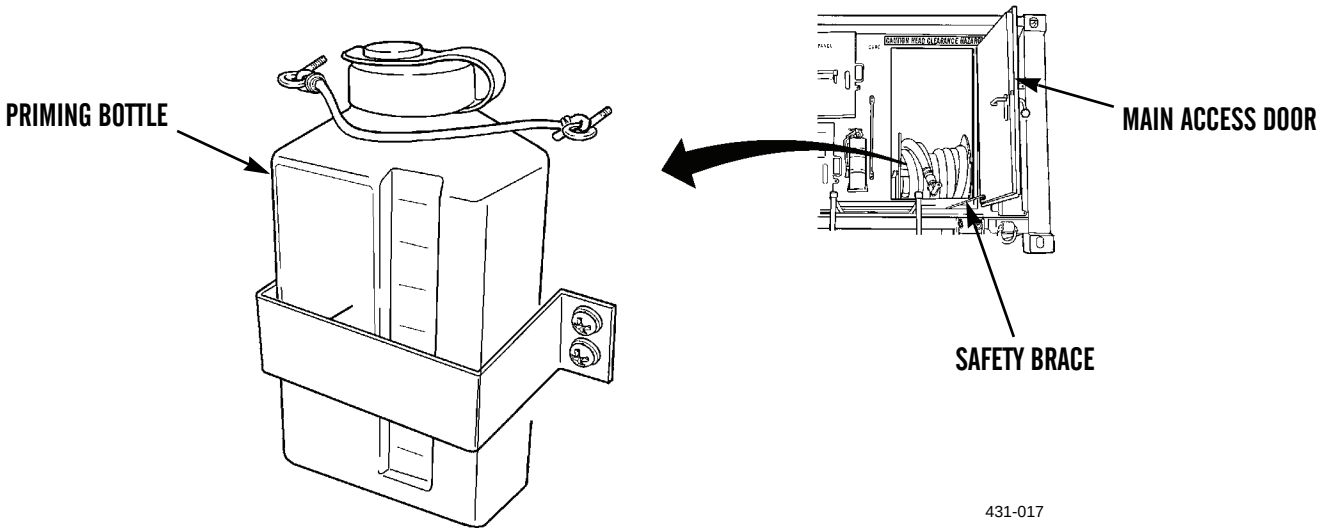
WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

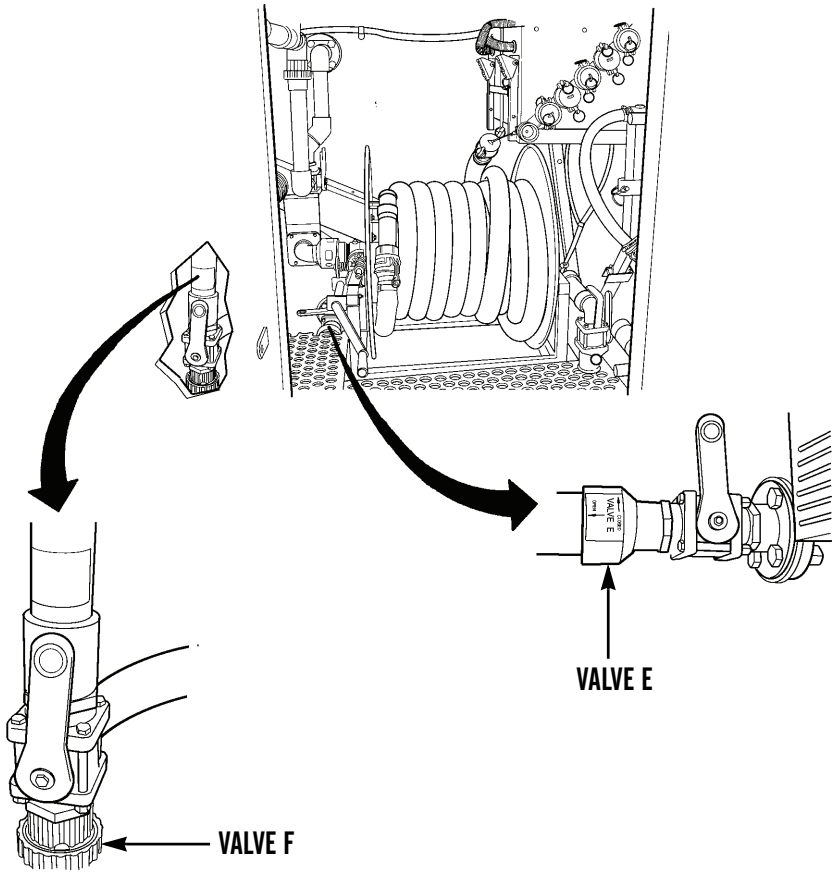
2. Open main access door and brace the main access door using the safety brace.
3. Enter Hippo through main access door and remove priming bottle located on the interior right side of the cabinet.
4. Fill the priming bottle from an uncontaminated water source.
5. Close valve E and open valve F.

OPERATION UNDER USUAL CONDITIONS - CONTINUED **0006 00**

PRIMING PUMP WITH AUXILIARY WATER SOURCE - CONTINUED



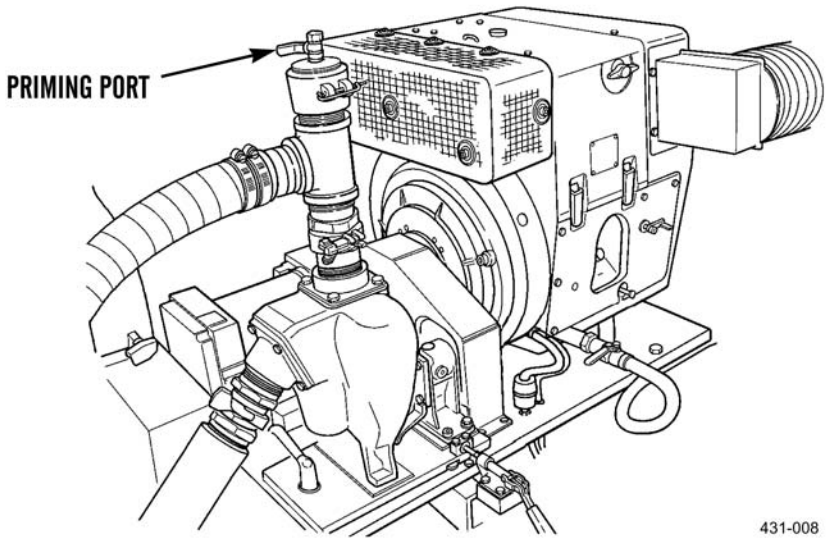
431-017



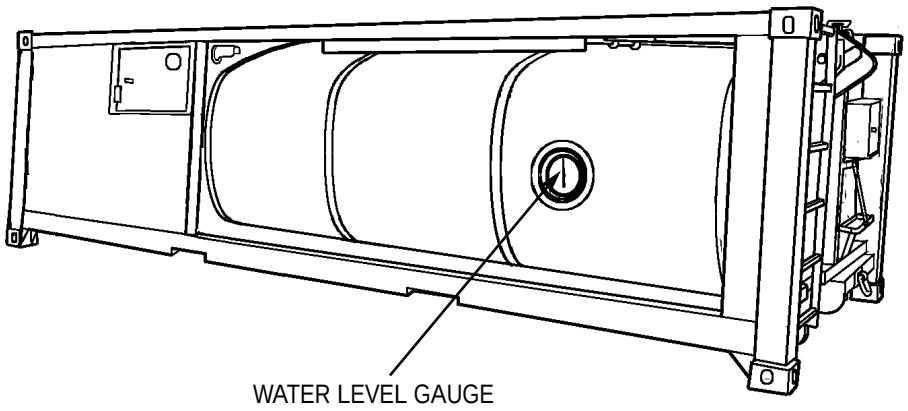
431-018

PRIMING PUMP WITH AUXILIARY WATER SOURCE - CONTINUED

6. Open the priming port air release valve by moving handle to the vertical position. Pour water from priming bottle into pump. Repeat this two more times for a total of three times or until the pump volute and priming port are full.
7. Return priming port air release valve to closed position by moving handle to the horizontal position. Return priming bottle to stowage.



8. Use start up procedures to start the engine (WP 0007 00). Watch hose for movement to indicate water is flowing. Monitor water level gauge for movement to indicate flow of water.



9. If pump fails to prime, repeat steps 6, 7, and 8

PRIMING PUMP WITH ON-BOARD WATER

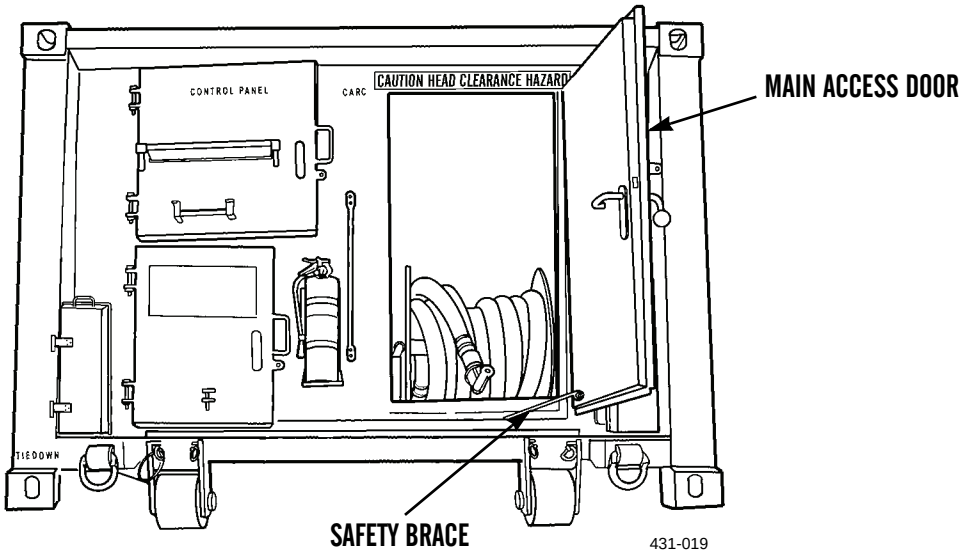
WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

NOTE

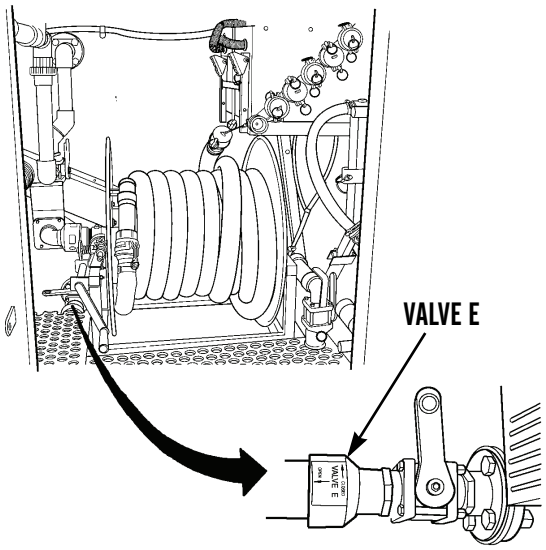
Refer to Valve Position Chart in this work package for valve location and operation.

1. Open Main Access Door and brace the Main Access Door using the safety brace.



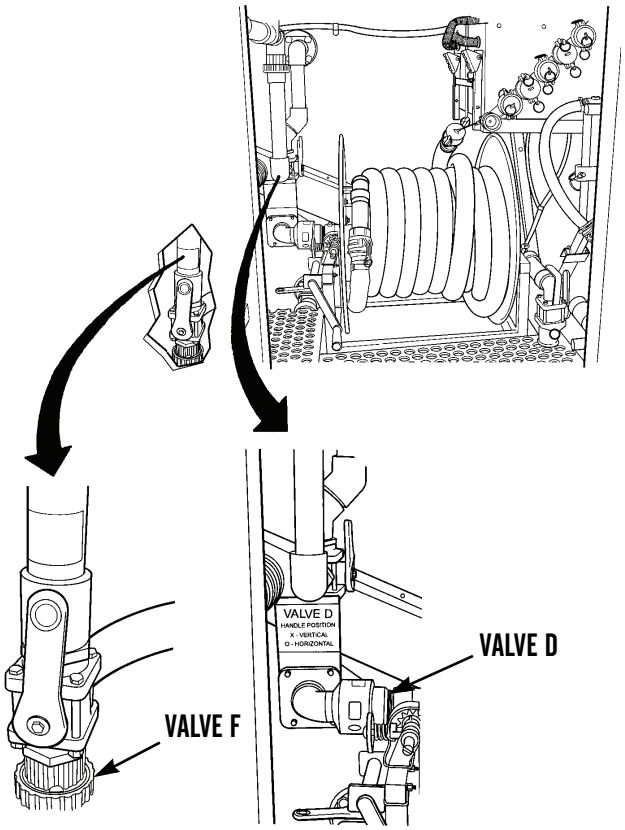
PRIMING PUMP WITH ON-BOARD WATER - CONTINUED

2. Open Valve E and flood plumbing with water.



431-020

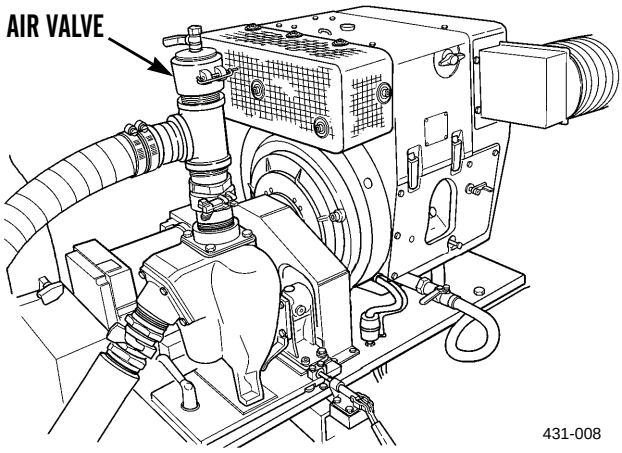
3. Open Valve F for recirculation purposes and put Valve D in closed position.



431-021

PRIMING PUMP WITH ON-BOARD WATER - CONTINUED

4. Open air valve on top of pump. If pump is full of water, close air valve and use start-up procedure to start (WP 0007 00).
5. If pump is not full of water, refer to Priming Pump with Auxiliary Water Source in this work package.



431-008

UTILIZATION OF GROUNDING ROD

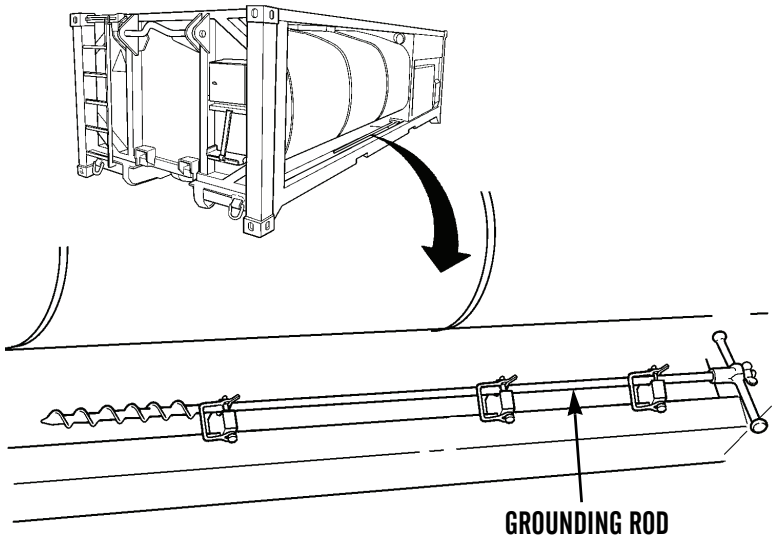
WARNING

Ensure Hippo is grounded to prevent electrical shock. Failure to follow this warning may result in injury or death to personnel.

NOTE

The following procedure can be performed with the Hippo on the ground or mounted atop a prime mover.

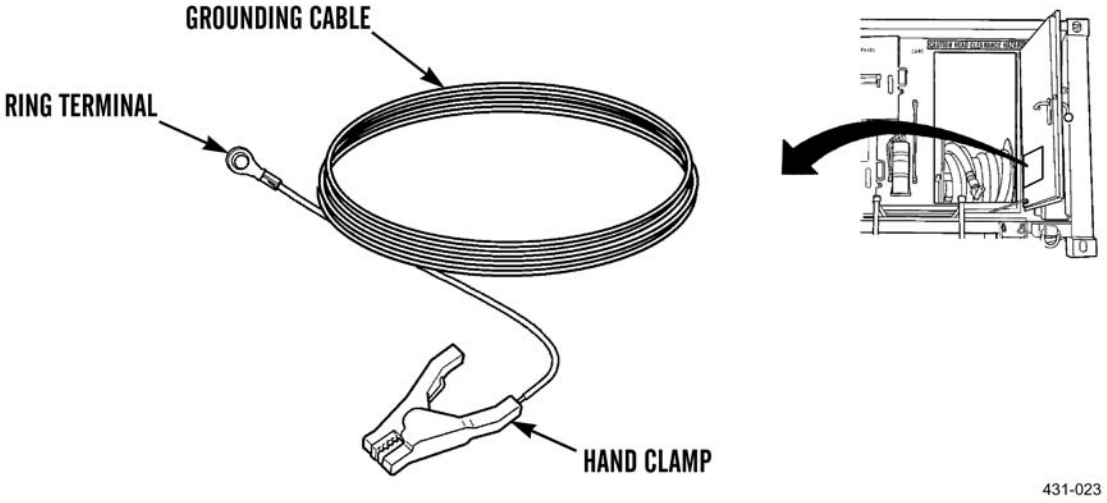
1. Remove the grounding rod from its stowage position along the driver's (left) side longitudinal beam.



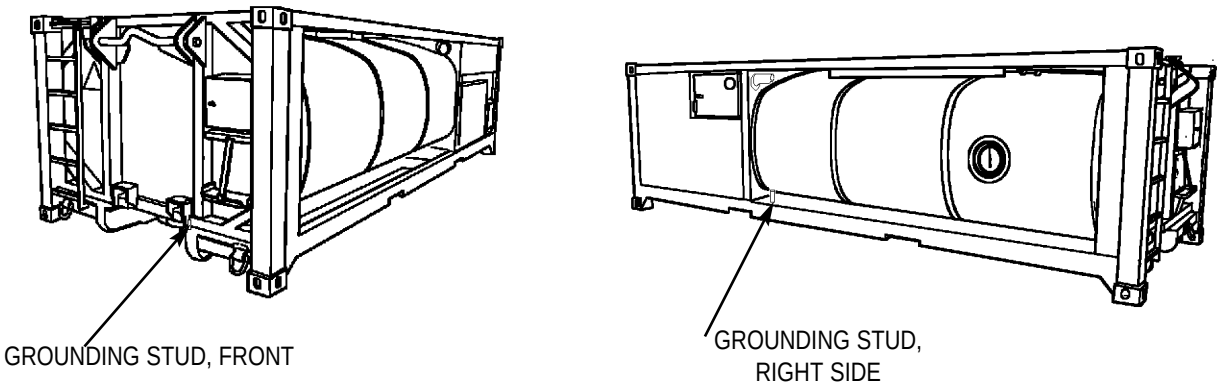
431-022

UTILIZATION OF GROUNDING ROD - CONTINUED

2. Remove the grounding cable assembly from the container located on the inside of the main access door.
3. Locate a suitable location for the grounding rod, which is within 20 ft (6.1 m) of the rear end of the Hippo. Insert the ground rod into the ground by threading it in a clockwise direction. The rod should be screwed down until at least 4 of the 6 ft (1.22 of the 1.83 m) of the total length has been inserted into the ground.
4. Attach the ring terminal of the cable to the lug on top of the grounding rod.



5. Attach the spring-loaded hand clamp onto the surface of one of the stainless steel grounding studs (one located on the forward end of the unit near the end of the main beam, and one located on the lower longitudinal beam just forward of the enclosure on the curb [right] side of the unit).



6. Reverse the above steps to return the rod and cable to their stowage locations.

SITE REQUIREMENTS

WARNING

When prime mover is stopped, always chock the wheels before filling the tank. Failure to follow this warning could result in injury or death to personnel or damage to equipment.

1. Location. When preparing to fill or discharge the tank and moving the prime mover into position near the water source, be sure that the ground is stable enough to support the weight of the fully loaded vehicle and the surrounding terrain is passable and as level as possible.
2. Terrain Requirements. When setting up the filling station, it is recommended that the filling station be set up on reasonably level terrain.

PREPARATION FOR MOVEMENT

1. Secure all Basic Issue Items (BII) in the BII box.
2. Remove the fire extinguisher from the outside bracket and secure the fire extinguisher in the inside bracket unless operating in cold weather (WP 0010 00).
3. Ensure that the unit is powered down unless operating in cold weather (WP 0010 00).
4. Remove ground rod and cable.
5. Close all doors and hatches and secure as mission requires.

CHEMICAL SUBSTANCES

WARNING

- Inhalation of calcium hypochlorite causes irritation to eyes, nose, mouth, throat, and lungs. It may also cause burns to respiratory tract which can result in shortness of breath, wheezing, choking, chest pain and lung failure.
- Calcium hypochlorite should be stored in its original container with the lid sealed in a cool, dry, wellventilated place. It should be kept away from heat, sparks, flames, direct sunlight, and other sources of heat, including lighted tobacco products. Failure to comply could result in injury or death to personnel and/or damage to equipment.
- A confined space entry permit is required before entering the water tank. No one is to enter the tank without a permit, the required training, and necessary personal protective equipment. Failure to follow this warning may result in injury or death to personnel.

NOTE

Refer to WP 0001 00 for cleaning instructions.

1. **Calcium Hypochlorite.**
   a. Storage. Keep tightly sealed. Store in a cool, dry, well-ventilated area. Do not store at temperatures greater than 125°F (52°C). Do not store near acids, other organic materials, oxidizers, or any corrosive liquids.
   b. Disposal. If the product becomes waste, it meets the criteria of hazardous waste as defined under 40 CFR 261 (Code of Federal Regulations) and is subject to land disposal restrictions under 40 CFR 268. It must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage, and disposal facility.
   c. Handling.
      (1) Respiratory Protection. Wear NIOSH/MSHA-approved, full-face piece respirator with chlorine cartridges and dust/mist filter.
      (2) Protective Gloves. Wear neoprene or PVC gloves.

CHEMICAL SUBSTANCES - CONTINUED

(3) Other Protective Equipment. Wear neoprene or PVC boots, aprons, or impermeable suit to avoid skin contact.

(4) Other Precautions. DO NOT take internally. Avoid contact with eyes, skin, or clothing. Upon contact with skin or eyes, wash off thoroughly with water.

WARNING

Chlorine gas occurs when calcium hypoclorite is mixed with water. Mixing should never take place in an enclosed structure or vehicle. Failure to follow this warning may result in injury or death to personnel.

d. **Mixing Instructions.** Water chlorination is manually performed using calcium hypochlorite solid/granular form. The chlorination compound must be mixed in an open environment, out of the wind, where toxic concentrations of reagents cannot form and wind will not cause exposure.

e. **Hygienic Practices.** Wash exposed skin and change contaminated clothing promptly after any exposure to the chlorination compound. Necessary hygienic practices include frequent hand washing and showering, and elimination of the use of tobacco, food, and drink while handling chlorination compound.

2. **Fuel and Non-Fuel Hygienic Practices.**

a. **Fuel Hygienic Practices.** Wash exposed skin and change fuel-soaked clothing promptly.

b. **Non-Fuel Hygienic Practices: Petroleum, Oils, and Lubricants.** Wash exposed skin and change liquid-soaked clothing promptly.

CONFINED SPACE ENTRY PERMIT

WARNING

A confined space entry permit is required before entering the water tank. No one is to enter the tank without a permit, the required training, and necessary personal protective equipment. Failure to follow this warning may result in injury or death to personnel.

1. **Label.** The Hippo water tank is labeled with a sign, located on the inside of the spill box lid, reading, “DANGER – PERMIT REQUIRED - CONFINED SPACE, DO NOT ENTER.” This label must be replaced if it becomes faded or unreadable in any way.

2. **Confined Space Entry Permit.**

a. It is a requirement to contact the local safety office to obtain a confined space entry permit before entering the water tank.

b. All requirements outlined in 29 CFR 1910.146 for confined space entry, as well as any applicable local requirements, must be met before entering the water tank.

CO MONITOR ALARM ACTIVATES

WARNING

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from severe exposure.

- Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation.

- DO NOT enter the engine compartment if the CO monitor alarm activates.

- Failure to follow these warnings may result in injury or death to personnel.

1. If the CO monitor alarm activates, power down the Hippo.
2. Open the main access door and engine access door.
3. Allow enclosure to air out.

CO MONITOR ALARM ACTIVATES - CONTINUED

4. If CO monitor deactivates, resume operation.
5. If CO monitor alarm does not deactivate, notify your supervisor.
6. After operation resumes, if problem recurs, notify your supervisor.

FIRE EXTINGUISHER OPERATION

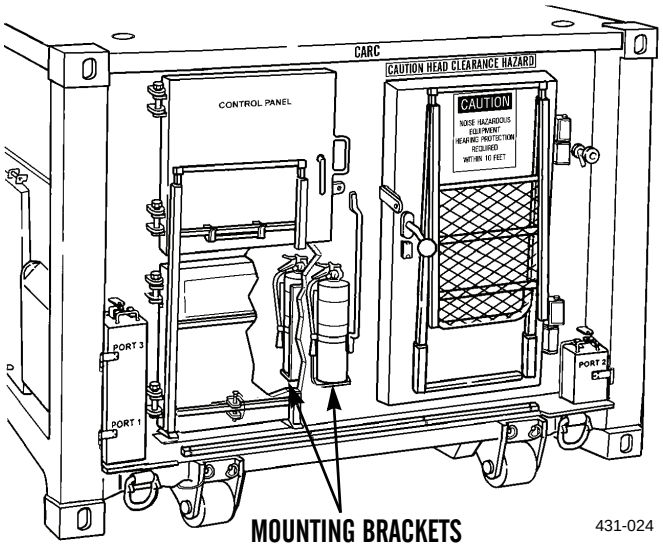
WARNING

- Fire extinguisher contents are under pressure. Do not puncture, incinerate, or discharge into another person's face.
- DO NOT store at high temperatures above 120°F (49°C).
- Keep away from small children.
- Avoid inhaling the extinguishing agent. Avoid inhaling smoke and fumes - all fires release toxic substances that are harmful. DO NOT remain in a closed area after use. Evacuate the area immediately and ventilate thoroughly before re-entering.
- Although extinguishing agents are non-toxic when properly used, contact with them may cause irritation to eyes, nose, and throat and other allergic symptoms.
- Failure to comply with the above warnings could result in injury or death to personnel or damage to equipment.

NOTE

This fire extinguisher can be used on trash, wood, paper, flammable liquids, and electrical equipment.

1. **Operation.**
   a. Remove the fire extinguisher from the mounting bracket.



   b. Hold the fire extinguisher upright and pull the ring pin out.
   c. Start back from the fire 10 ft. (3 m) and aim at the base of the fire.
   d. Squeeze the lever and sweep side to side.

FIRE EXTINGUISHER OPERATION - CONTINUED

2. **Spill and Leak Response.** Uncontrolled fire extinguisher releases should be responded to by trained personnel using pre-planned procedures. In case of a spill, clear the affected area, protect people, and respond with trained personnel.
3. **Protective Equipment.** Use Level C triple gloves (rubber gloves and nitrile gloves over latex gloves), chemically resistant suit and boots, hard hat, and air purifying respirator with a HEPA filter. Sweep up the spilled solid and place all spilled residue in a double plastic bag and seal. Dispose of in accordance with federal, state, and local hazardous waste disposal regulations. Decontaminate equipment using soapy water before maintenance begins.

END OF WORK PACKAGE

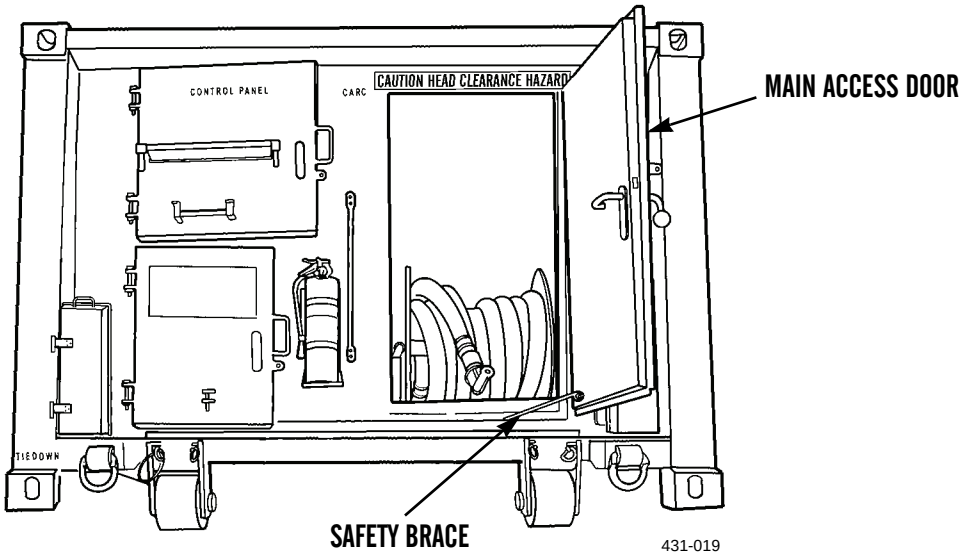
OPERATION UNDER USUAL CONDITIONS — STARTING/STOPPING ENGINE 0007 00

STARTING THE ENGINE

WARNING

- When engine is running during operations, all personnel within 10 ft (3.0 m) of the Hippo pump operator position are required to wear Army-approved hearing protection devices (HPDs). Failure to comply may result in hearing loss.
- Before engine is started, always make sure that no personnel are in the danger area (moving parts on engine or machinery). Ensure that all safety guards are in place. Ensure that area is clear from loose parts. Never use any spray starting aids. Failure to comply may result in injury to personnel.
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

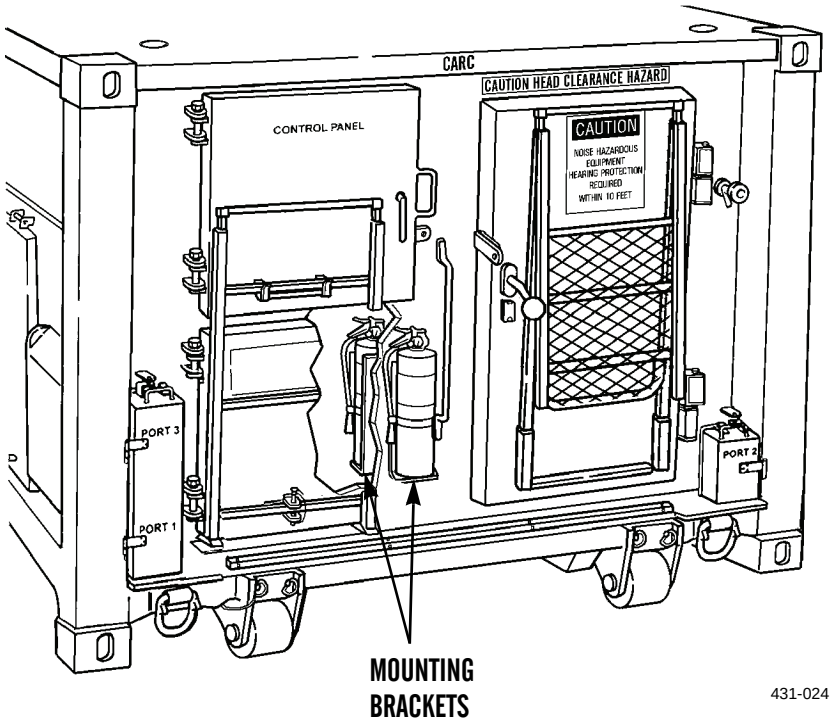
1. Open main access door and secure with safety brace on the inside of the door.



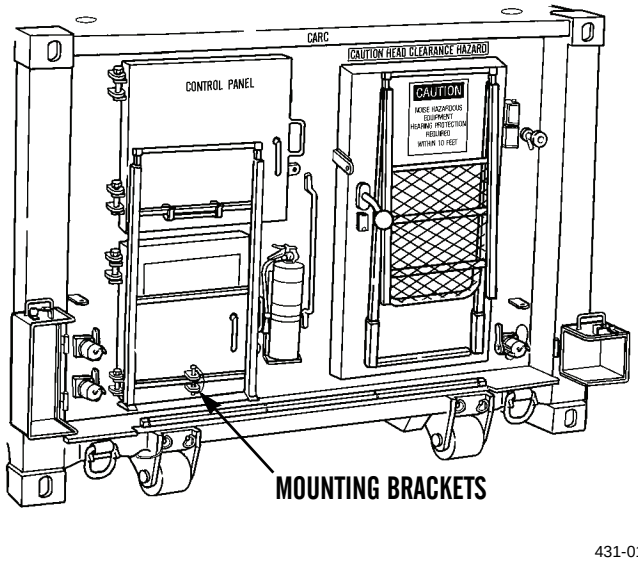
OPERATION UNDER USUAL CONDITIONS — STARTING/STOPPING ENGINE - CONTINUED 0007 00

STARTING THE ENGINE - CONTINUED

2. Remove fire extinguisher from interior bracket and mount in exterior bracket.



3. Unfasten the ladder on the control panel access door.



STARTING THE ENGINE - CONTINUED

WARNING

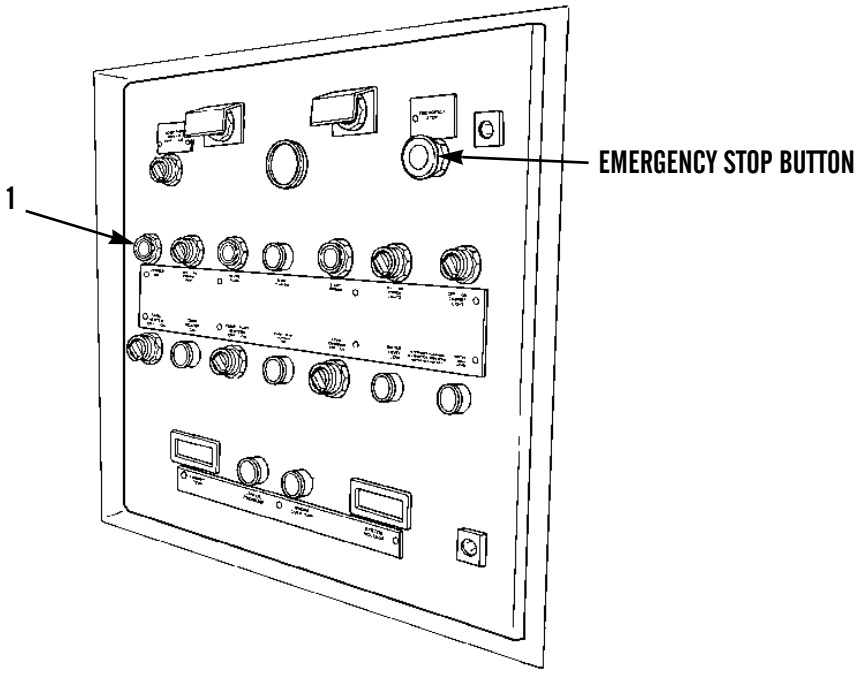
When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

4. Open the control panel access door and secure with the safety brace on the inside of the door.

NOTE

Before starting engine, ensure that the water pump is primed (WP 0006 00). Check to ensure that all valves are positioned to the recirculation mode (see "Valve Position Chart" in WP 0006 00).

5. Ensure EMERGENCY STOP button is pulled out.
6. Depress POWER ON button (1).



431-011

7. Wait 10 seconds for control panel to register any faults. Observe control panel indicators (LOW OIL PRESSURE, ENGINE OVER TEMP).
8. If LOW OIL PRESSURE indicator is illuminated, refer to Troubleshooting Symptom Index (WP 0013 00).
9. If ENGINE OVER TEMP indicator is illuminated, refer to Troubleshooting Symptom Index (WP 0013 00).

STARTING THE ENGINE - CONTINUED

NOTE

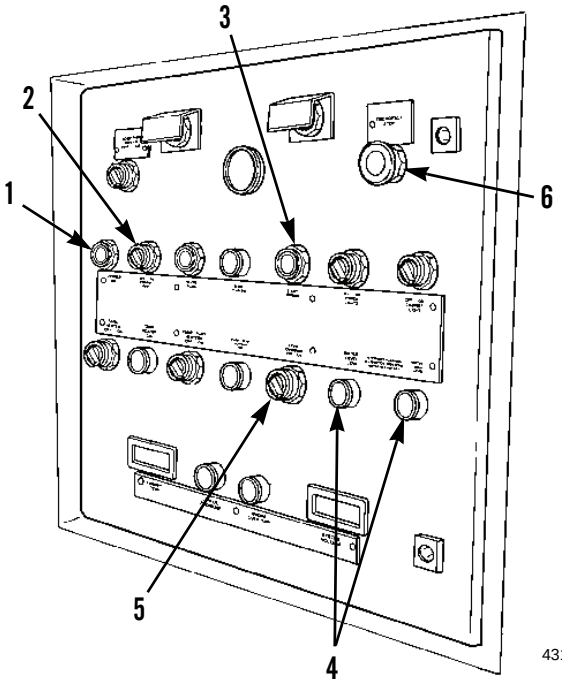
- If water tank is empty or full, WATER LOW LEVEL or WATER HIGH LEVEL indicators (4) will illuminate and engine will start and immediately shut down. To override automatic engine cutoff, place the LEVEL OVERRIDE switch (5) in the ON position. Override will enable the engine to start with low or high water in the system.
- Depress the START ENGINE button (3) within five seconds after turning the ENGINE RUN switch (2) to the ON position, or the system will automatically shut down because the oil pressure sensor will indicate low oil pressure.

10. Place the ENGINE RUN switch (2) in the ON position.

NOTE

The engine will not start with the heater switches in the ON position.

11. Push START ENGINE button (3). Engine should start without shutting off.
12. After engine runs for 15 seconds, WATER HIGH LEVEL and WATER LOW LEVEL indicators will turn off. Return LEVEL OVERRIDE switch to OFF position.



STOPPING THE ENGINE

1. Return the ENGINE RUN switch (2) to the OFF position.
2. To power down the Hippo, push the EMERGENCY STOP button (6).

NOTE

For emergency stop, push the EMERGENCY STOP button (6). The EMERGENCY STOP button should remain locked in this position.

TURNING ON CABINET LIGHT

1. Pull out EMERGENCY STOP button (6).
2. Push POWER ON button (1).

NOTE

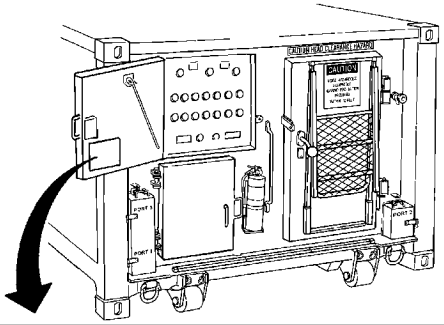
If BLACKOUT SWITCH is in the ON position, cabinet light will not work.

3. Turn CABINET LIGHT switch to ON position.

END OF WORK PACKAGE

PUMPING OPERATION

The Valve Position Chart, located on the interior of the control panel access door, provides information on valve positions for the various types of operations.



VALVE POSITION CHART

	VALVE A	VALVE B	VALVE C	VALVE D	VALVE E	VALVE F	ENGINE
Top Fill Port	X	X	X	X	X	X	OFF
Gravity Discharge-Port 1	O	X	X	X	O	O	OFF
Gravity Discharge-Port 2	X	O	X	X	O	O	OFF
Bulk Discharge With Pump-Port 1	O	X	X	X	O	X	ON
Bulk Discharge With Pump-Port 2	X	O	X	X	O	X	ON
Bottom Fill-Aux Pump-Port 3	X	X	O	X	X	O	OFF
Fill With Onboard Pump-Port 3	X	X	O	X	X	O	ON
Filling Station-Port 1	O	X	X	X	O	O	ON OR OFF
Filling Station-Port 2	X	O	X	X	O	O	ON OR OFF
Hose Reel Discharge	X	X	X	O	O	O	ON
Sampling/Discharge-Spigots 4	X	X	X	X	O	O	ON
Recirculation Mode	X	X	X	X	O	O	ON
Aux Pump Operation-Port 1	O	X	X	X	O	X	OFF
Aux Pump Operation-Port 2	X	O	X	X	O	X	OFF
Emergency On Board Pump Operation	O	X	O	X	X	X	ON
Bulk Discharge & Hose Reel	O	X	X	O	O	O	ON
Bulk Discharge & Filling Station	O	O	X	X	O	O	ON
Hose Reel Discharge & Fill Station Port A or B	O	X	X	O	O	O	ON
Plumbing Maintenance or Leakage	O	O	O	X	X	X	OFF
Drain Tank and System	O	O	O	O	O	O	OFF
WARNING- DO NOT USE FILL STATION ATTACHED TO HOSE REEL - EQUIPMENT DAMAGE MAY RESULT							
-LEGEND-							
O-VALVE OPEN							
X-VALVE CLOSED							

MIL-MAR CENTURY CORP.

WARNING

- When engine is running during normal operations, all personnel within 10 ft. of the Hippo pump operator position are required to wear Army-approved Hearing Protection Devices (HPDs). Failure to comply may result in hearing loss.
- Before engine is started, always make sure that no personnel are in the danger area (moving parts on engine or machinery). Ensure that all safety guards are in place. Ensure that area is clear from loose parts. Never use any spray starting aids. Failure to comply may result in injury to personnel.
- When using an auxiliary pump to fill the Hippo through the 4-in. fill port on the top of the unit, the operator MUST loosen the manhole cover latches prior to filling. Failure to do so could create a hazardous situation with pressure buildup inside the tank. The vents will not be able to relieve the pressure buildup and could create a dangerous situation, causing injury to personnel or damage to equipment.

The Hippo can be filled by the use of its internal pump or using an auxiliary pump. The Hippo can be filled by either the 4-in. fill port located on the top of the Hippo, or through the bottom fill port, Port 3.

FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3

WARNING

When moving the prime mover into position, be sure that the ground is stable enough to support the weight of the fully loaded vehicle and that the surrounding terrain is passable. When stopped, always chock the wheels before filling the tank. Personnel working at the water loading site must avoid placing themselves in a position where equipment malfunction or sudden equipment movement would injure them. Failure to follow these warnings could result in injury or death to personnel or damage to equipment.

CAUTION

The Hippo should be on a flat and level surface whenever possible for optimum sensor operation. All sensors have been preset and tested for operation at the manufacturer. Setting and testing is completed with the Hippo plumb and level. When filling or emptying the Hippo, the operator(s) should monitor the WATER LEVEL INDICATOR gauge on the side of the unit. When filling, it will be possible for water to overflow through the upper overflow vents if the control panel end of the Hippo is higher than the forward end of the unit. BE PREPARED TO SHUT DOWN THE ENGINE IF YOU OBSERVE WATER OVERFLOWING THROUGH THE VENTS. Failure to comply could result in damage to equipment.

NOTE

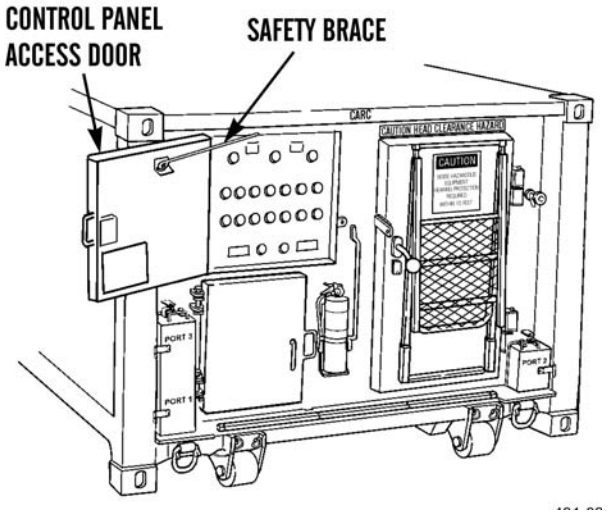
If the Hippo is mounted on the prime mover and filling or discharge procedures are to be utilized, the ladder assembly must be deployed.

1. Position the rear of the prime mover within 20 ft (6.1 m) of the water source.
2. Remove the ladder assembly (see “Assembly/Deployment of Ladder” in WP 0005 00). If the Hippo is used when mounted on the prime mover, use the center inserts for this operation.

WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

3. Open the control panel access door and secure using the safety brace on the inside of the access door.

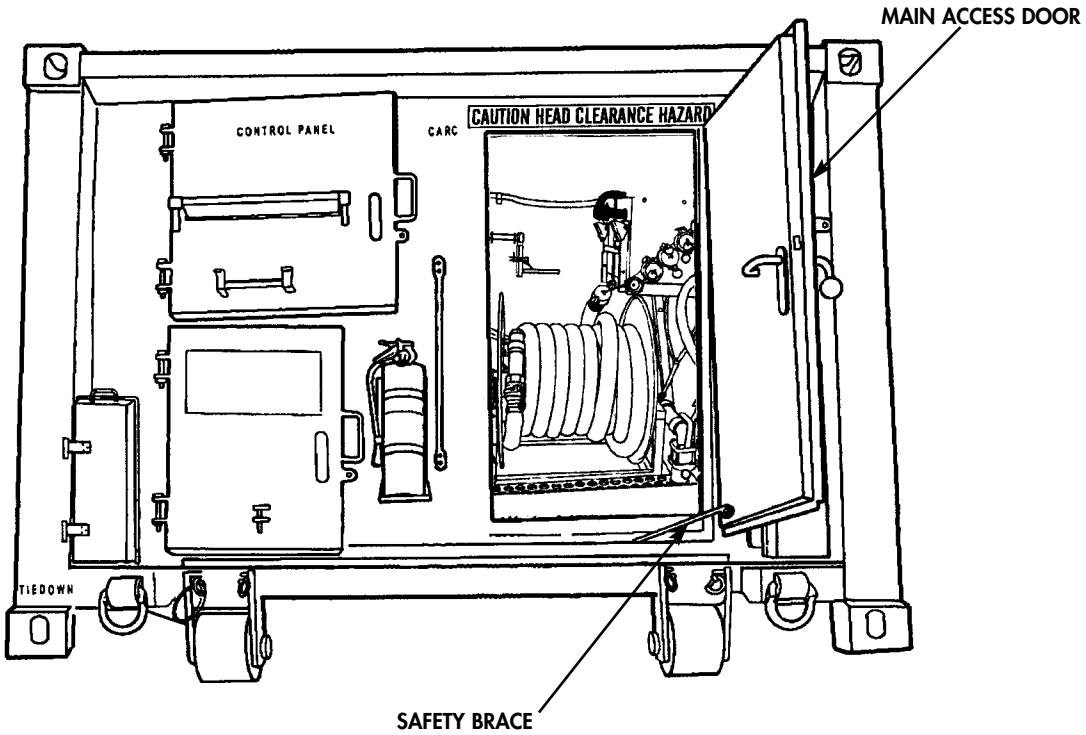


FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3 - CONTINUED

WARNING

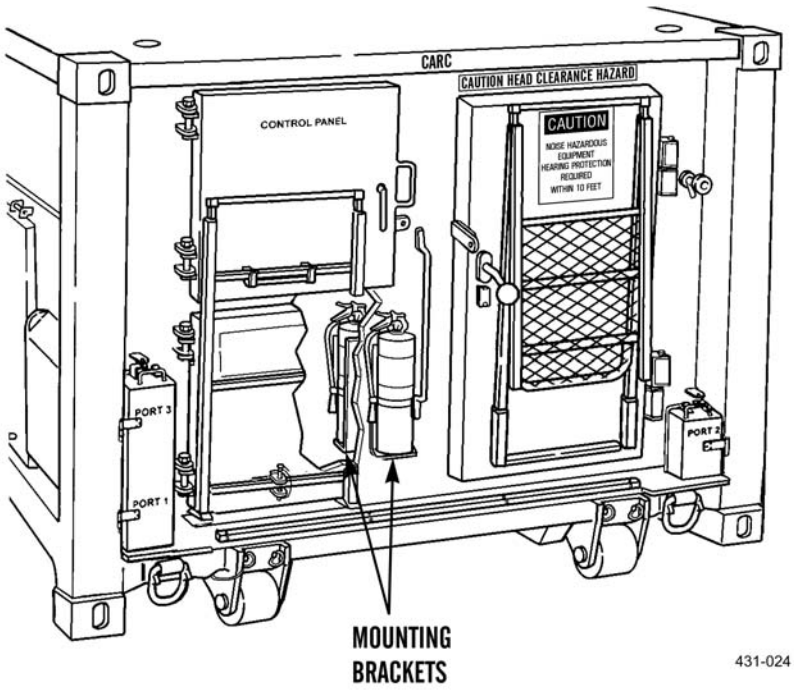
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

4. Open the main access door and secure the main access door using the safety brace on the inside of the access door. Use interior lights if needed.



FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3 - CONTINUED

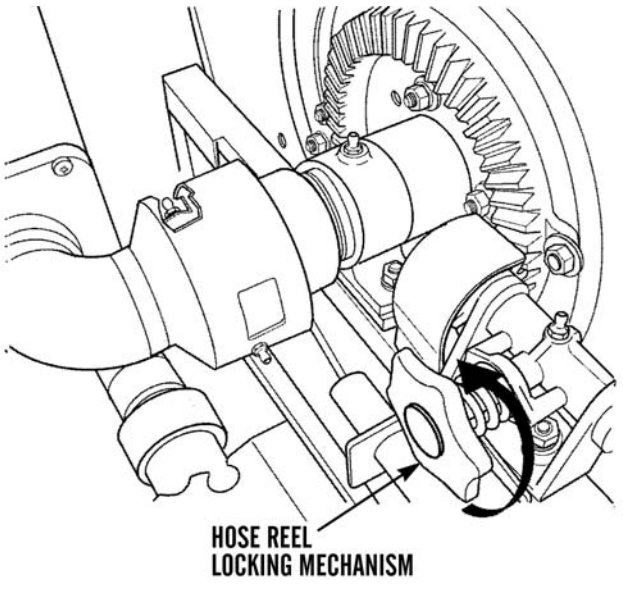
5. Remove the fire extinguisher from the inside mounting bracket and mount the fire extinguisher in the outside mounting bracket.

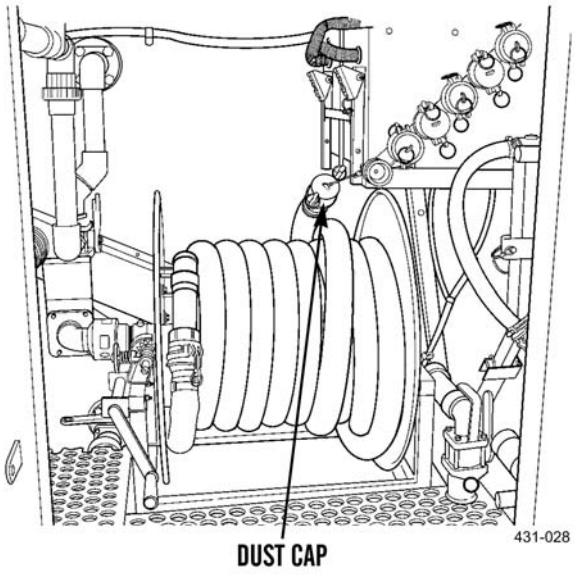


NOTE

Use only the non-collapsible hose for filling tank from an outside source.

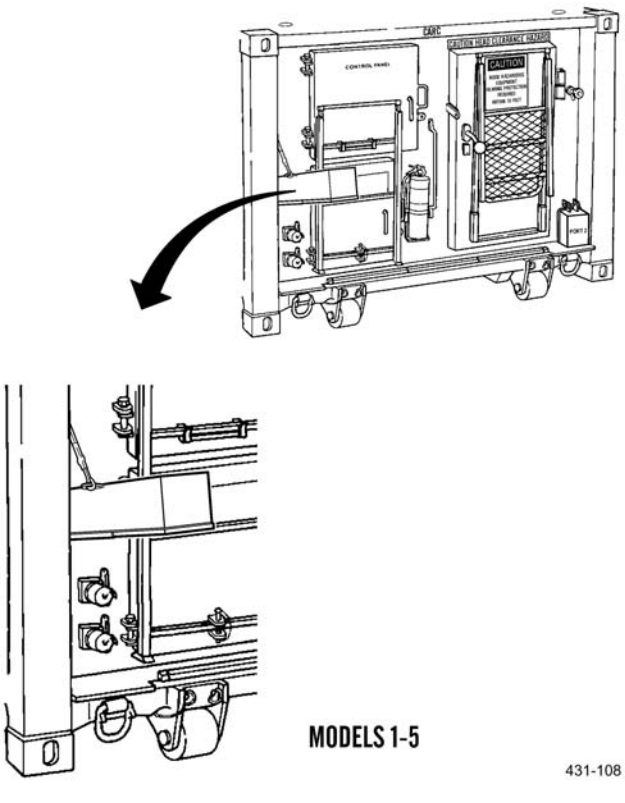
6. Remove dust cap from hose. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until the hose reel moves easily.

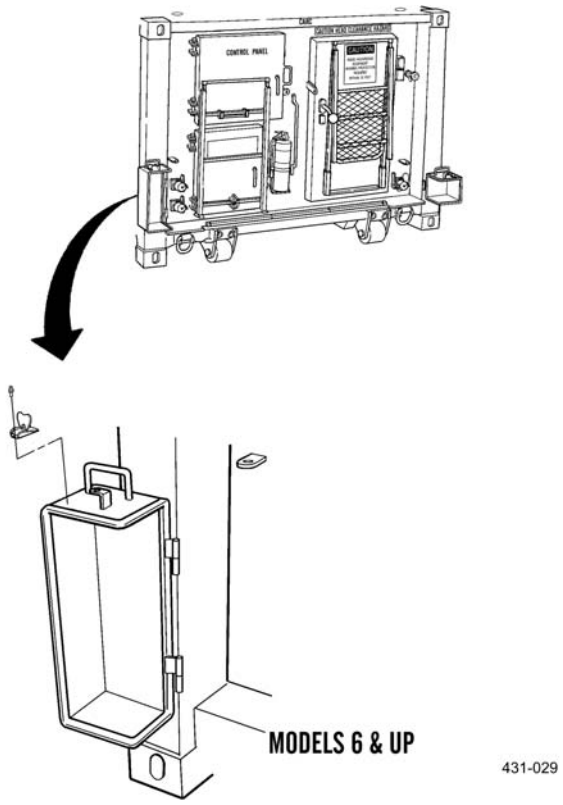




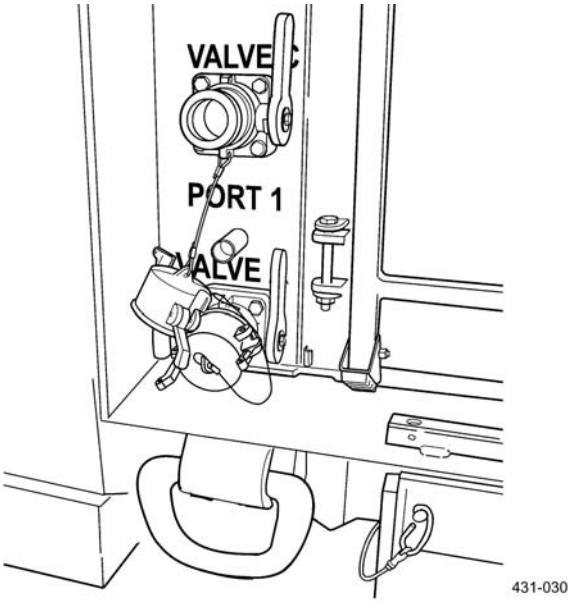
FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3 - CONTINUED

7. Disconnect sufficient hose length from the hose reel to make the proper connection from Port 3 to the source.
8. Open the port cover on Port 3. Secure in place with the safety chain (Models 1-5).



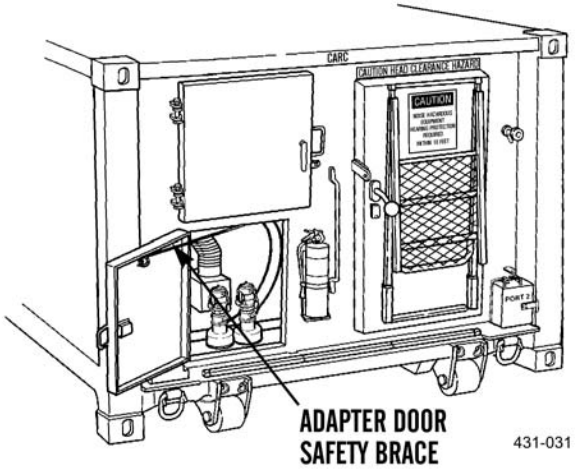


9. Remove the protective cap on Port 3 and connect the hose to the suction port.

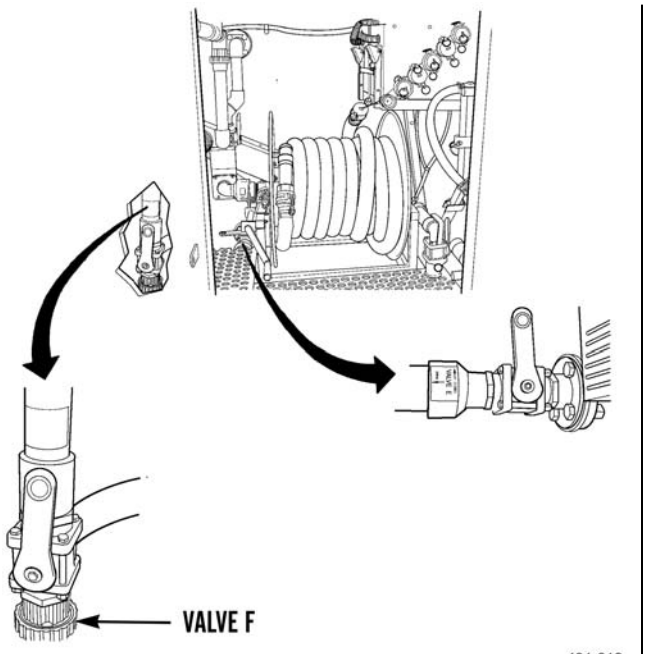


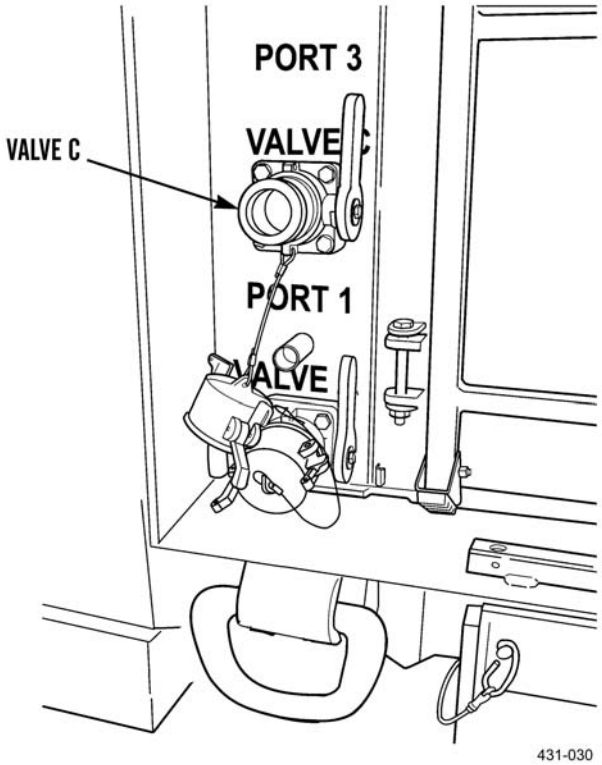
FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3 - CONTINUED

10. If necessary, open the adapter access door. Brace the adapter access door using the safety brace on the inside of the door, and select and install the appropriate adapter to connect the hose to the water source.



11. Connect the suction hose to the water supply or source.
12. Open Valve C and Valve F. Ensure that all other valves are closed.





FILLING TANK USING ON-BOARD PUMP THROUGH PORT 3 - CONTINUED

13. Close the main access door and the adapter access door to reduce noise level in operational area.
14. Ensure that the valves/controls at the water source are properly positioned to allow the water to flow.

CAUTION

- Be sure that all valves are in their proper position before starting the engine, or damage to equipment may result.
- Make sure that the pump is primed or damage to equipment may result.

15. Start the engine (see "Starting the Engine" in WP 0007 00).

WARNING

When filling tank, ensure that a hissing or whistling noise is coming from the vents on top of the tank. If no noise is noted, vents may be clogged; stop pumping. Pressure can build up, causing injury or death to personnel.

CAUTION

Once water has begun pumping, ensure the LEVEL OVERRIDE switch is in the OFF position. Failure to comply may result in tank overflow and cause damage to equipment.

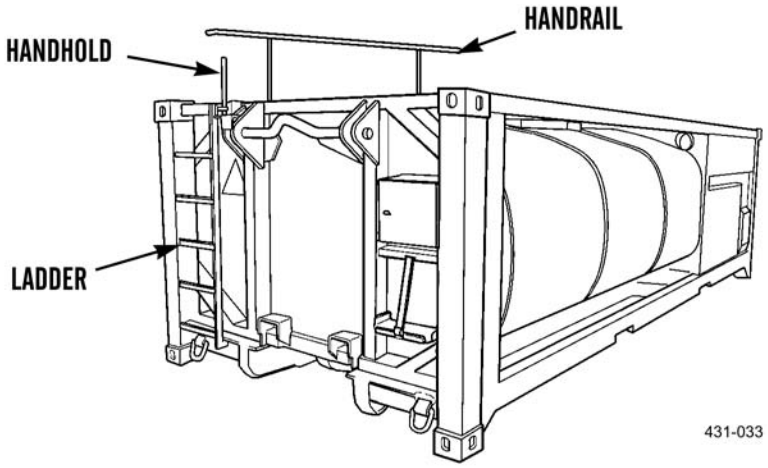
16. Monitor tank fill level by observing the water level indicator gauge.
17. When pumping operation is complete, shut down engine (WP 0006 00).
18. Close Valve C and F.
19. Disassemble hoses and adapters from source to Port 3.
20. Replace dust cap on Port 3 and close Port cover.
21. Stow hoses on hose reel. Lock hose reel and place dust cap on end of hose.
22. Stow adapters if used.
23. Replace fire extinguisher to inside bracket.
24. Turn ENGINE RUN switch to OFF position and shut down main power using the EMERGENCY STOP button on the control panel.
25. Close all access doors.
26. Stow ladder (see "Assembly/Deployment of Ladder" in WP 0005 00).
27. Close port covers.

FILLING TANK USING ON-BOARD PUMP THROUGH TOP FILL PORT

WARNING

- DO NOT lean on the handrail. The handrail is not load bearing. Failure to follow this warning may result in injury or death to personnel.
- There is a pinch hazard when deploying or stowing the handrail. Use caution and wear protective gloves. Failure to follow this warning may result in injury to personnel.

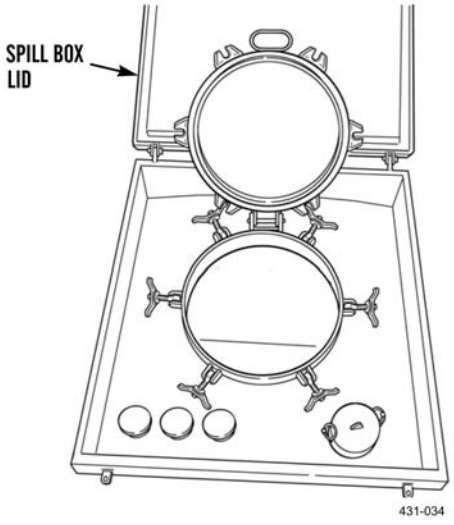
1. Place the ladder handhold in the upright position, ensuring it is in the locked position.
2. Safely climb to the top of the unit using the ladder, and unlock the handrail. Pull the handrail up, ensuring that it locks into place.



WARNING

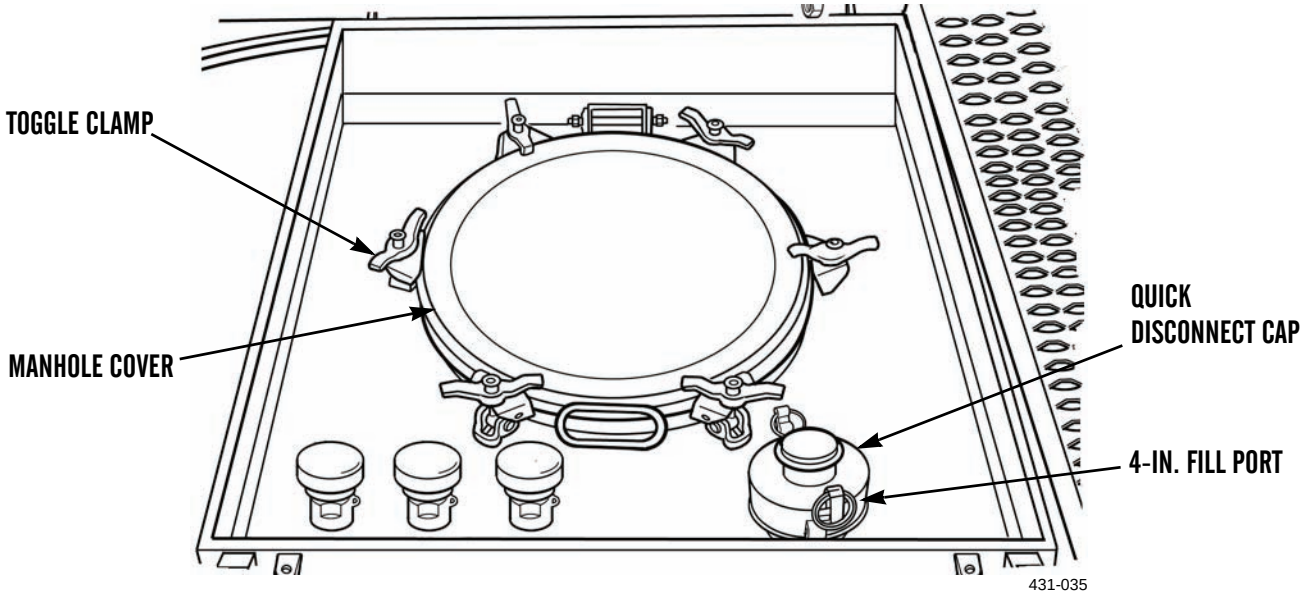
When using an auxiliary pump to fill the Hippo through the 4-in. fill port on the top of the unit, the operator MUST loosen the manhole cover latches prior to filling. 4-in. fill port cap should never be removed without first depressurizing tank. Failure to do so could create a hazardous situation with pressure buildup inside the tank. The vents will not be able to relieve the pressure buildup and could create a dangerous situation, causing injury to personnel or damage to equipment.

3. Unlock and open the spill box lid.



FILLING TANK USING AUXILIARY PUMP THROUGH TOP FILL PORT - CONTINUED

4. Remove the quick disconnect cap from the 4-in. port located within the spill box area (next to the manhole).

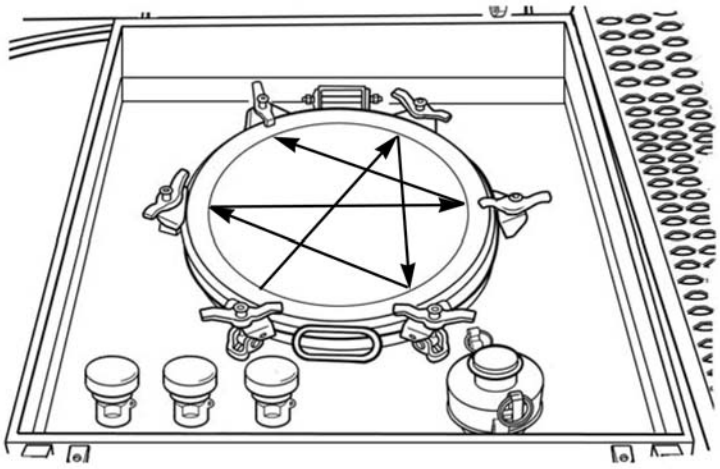


FILLING TANK USING AUXILIARY PUMP THROUGH TOP FILL PORT - CONTINUED

WARNING

When using an auxiliary pump to fill the Hippo through the 4-in. fill port on the top of the unit, the operator MUST loosen the manhole cover latches prior to filling. 4-in. fill port cap should never be removed without first depressurizing tank. Failure to do so could create a hazardous situation with pressure buildup inside the tank. The vents will not be able to relieve the pressure buildup and could create a dangerous situation, causing injury to personnel or damage to equipment.

5. Loosen all of the toggle clamps on the manhole cover so the manhole cover is resting in the closed position.
6. Attach the hose from the auxiliary pump to the 4-in. (10.16 cm) port. Use an adapter from the adapter storage compartment, if required to make the connection. If necessary, use sufficient hose from the hose reel to make ready the connections by performing Steps 7 and 8 - if not skip steps 7 and 8.
7. Remove dust cap from hose. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until the hose reel moves easily.
8. Disconnect sufficient hose length from the hose reel to make the proper connection.
9. Ensure all valves are closed.
10. Begin the filling operation using auxiliary pump.
11. Have an assistant monitor the water level indicator, located on the side of the water tank. As it reaches 2,000 gal. (7,571 L) full, stop the filling operation. If no assistant is available to monitor the gauge, open the manhole cover and visually watch the water until it reaches the bottom of the manhole opening, and then stop the filling operation.
12. Disconnect the fill hose from the 4-in. (10.16 cm) port on the Hippo.
13. Place the quick disconnect cap on the 4-in. (10.16 cm) port.
14. If the manhole cover is open, close the manhole cover.
15. Tighten all the toggles on the manhole cover in the following sequence:



16. Close the manhole spill box lid and lock the latches.
17. Unlock the handrail and fold it down into the stowage configuration.

FILLING TANK USING AUXILIARY PUMP THROUGH TOP FILL PORT - CONTINUED

18. Using the handhold, safely descend the ladder.
19. Fold the handhold down to place it in the stowage configuration.
20. Return auxiliary pump hose to pump location. Remove and stow any adapters used.
21. If hose were used from the hose reel, disconnect and stow hoses back on the hose reel. Lock hose reel and place dust cap on the end of hose.

FILLING TANK THROUGH BOTTOM PORT (PORT 3)

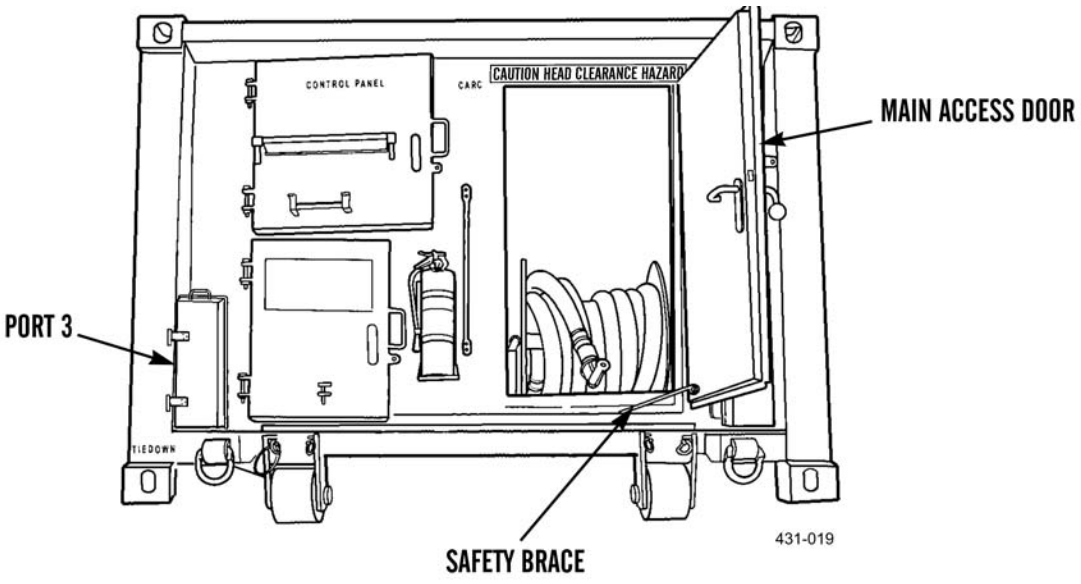
WARNING

- If bottom filling tank with an auxiliary pump rated greater than 125 gpm (473 lpm), ensure manhole cover is loosened/opened to prevent pressure buildup inside tank. Failure to comply may result in damage to equipment and possible injury to personnel.
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

CAUTION

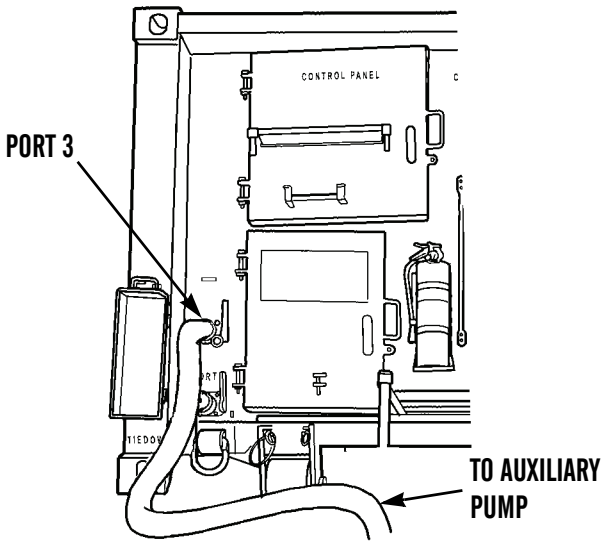
DO NOT attempt to transfer water into the Hippo with the following procedures if the ambient temperature drops below 30°F (-1°C).

1. Open main access door to access valves. Brace the door using the safety brace on the inside of the access door. Open port cover and remove dust cap from Port 3.



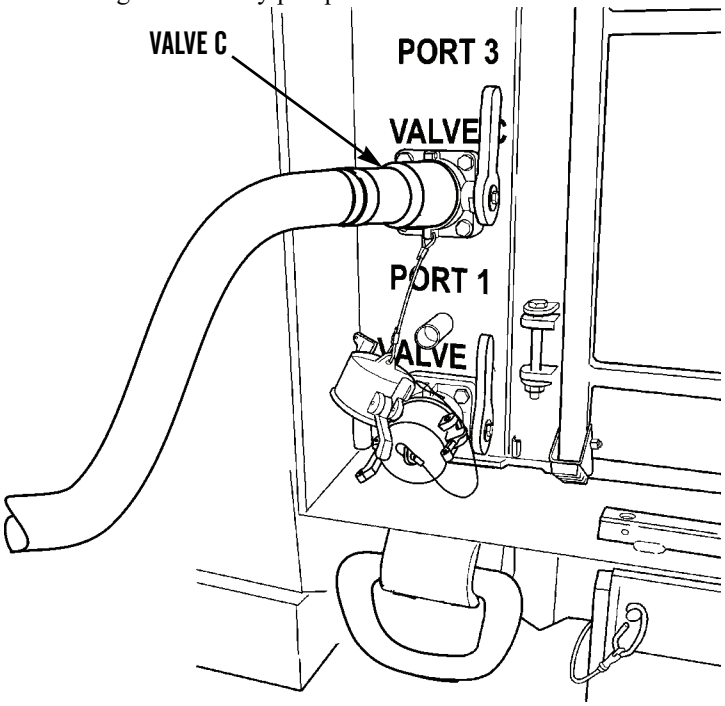
FILLING TANK THROUGH BOTTOM PORT (PORT 3) - CONTINUED

2. Attach the hose from the auxiliary pump to Port 3. Use an adapter from the adapter storage compartment if required to make the connection. If necessary, remove sufficient hose from the hose reel to reach from Port 3 to the auxiliary pump by performing steps 3 and 4.



431-036

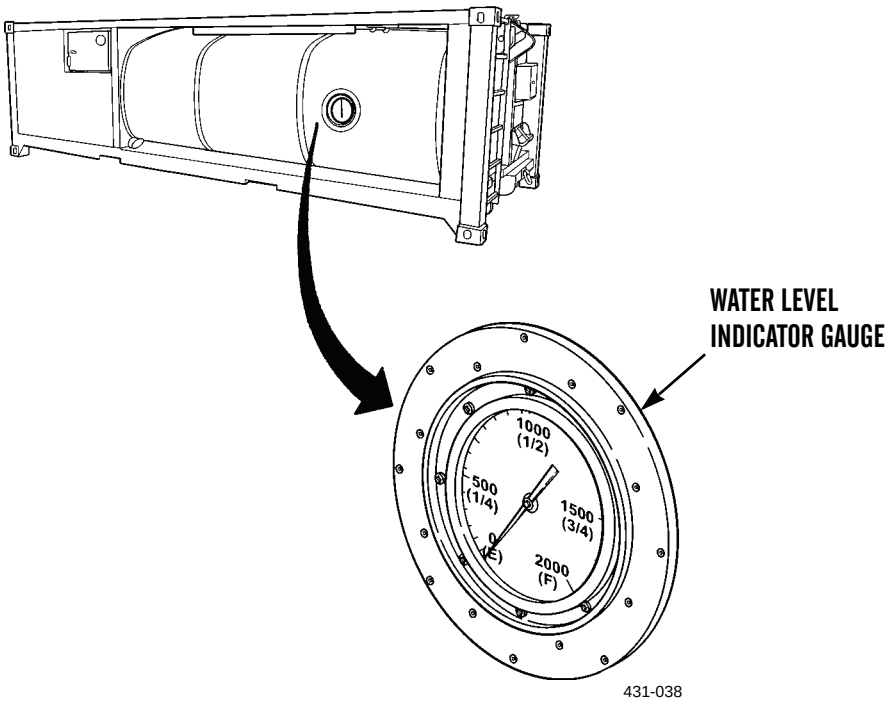
3. Remove dust cap from hose. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until the hose reel moves easily.
4. Disconnect sufficient hose length from the hose reel to make the proper connection.
5. Open Valve F and Valve C and ensure all other valves are closed.
6. Start the filling operation using the auxiliary pump.



431-037

FILLING TANK THROUGH BOTTOM PORT (PORT 3) - CONTINUED

7. Continuously monitor the water level indicator on the side of the Hippo in order to shut the pump OFF when the water load has reached 2,000 gal. (7,571 L). Upon shutdown of the auxiliary pump, close Valve C and Valve F.



8. Disconnect the fill hose from Port 3 and close port cover.
9. Remove and stow any adapters used.
10. If hoses were used from the hose reel, disconnect hose and return the hose reel within the housing. Lock hose reel and connect dust cap.
11. Replace dust cap on Port 3 and close Port cover.
12. Close and secure all access doors.
13. Secure the Hippo for transport (WP 0001 00).

END OF WORK PACKAGE

PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION)

NOTE

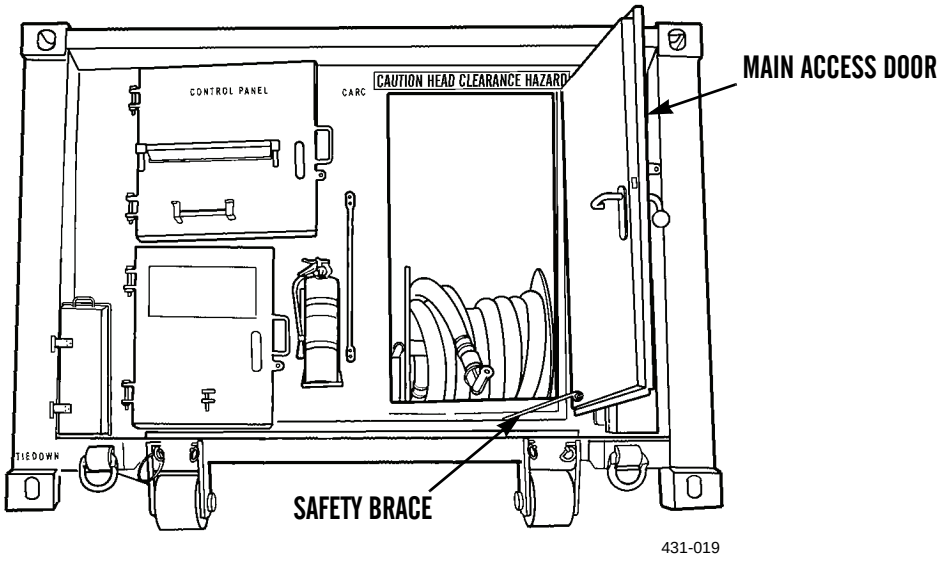
Refer to Valve Position Chart (WP 0006 00) for valve location and operation.

1. Position the Hippo for discharge operations.

WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

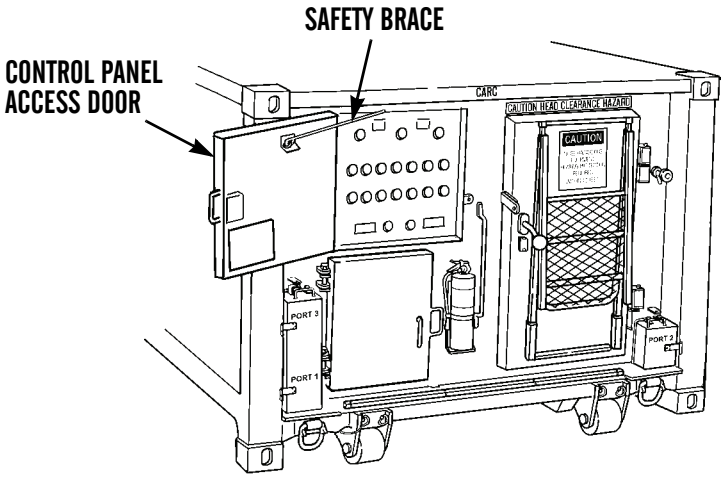
2. Open main access door and brace the door using the safety brace on the inside of the door.



OPERATION UNDER USUAL CONDITIONS — DISTRIBUTION - CONTINUED 0009 00

PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION) - CONTINUED

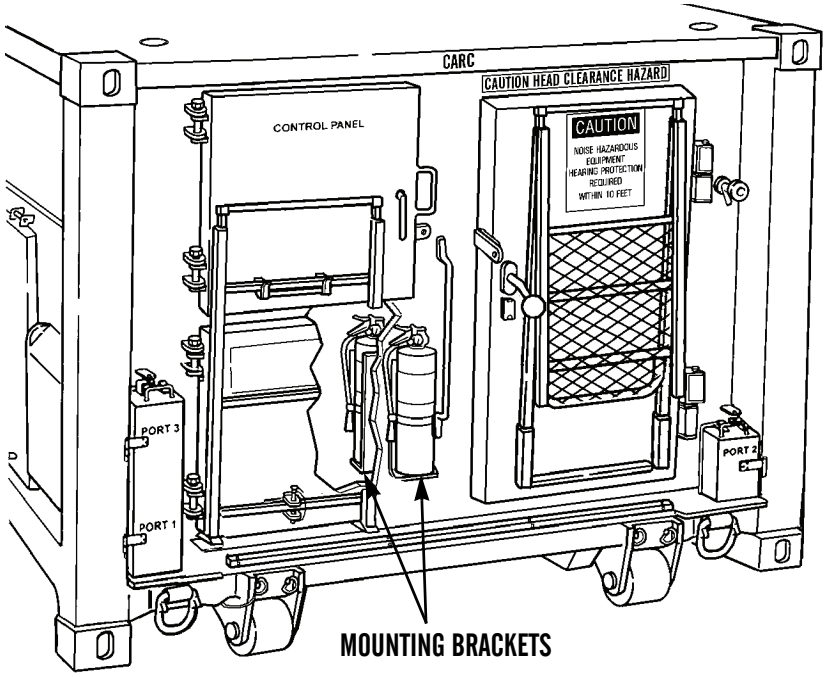
3. Remove ladder section. Open control panel access door and brace the door using the safety brace on the inside of the door.



431-027

4. If necessary, turn CABINET LIGHT switch to ON position (WP 0007 00).

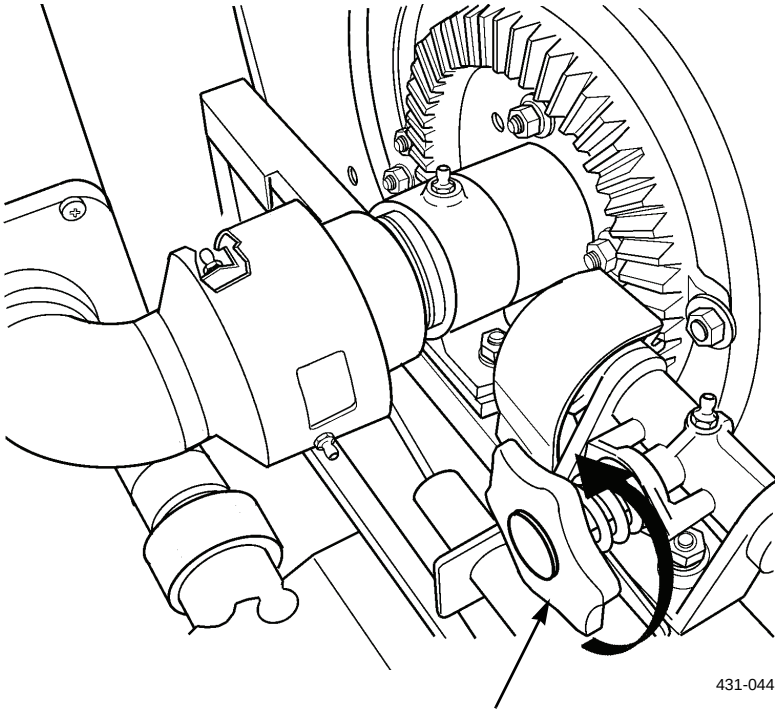
5. Move fire extinguisher from interior mounting bracket to exterior mounting bracket.



431-024

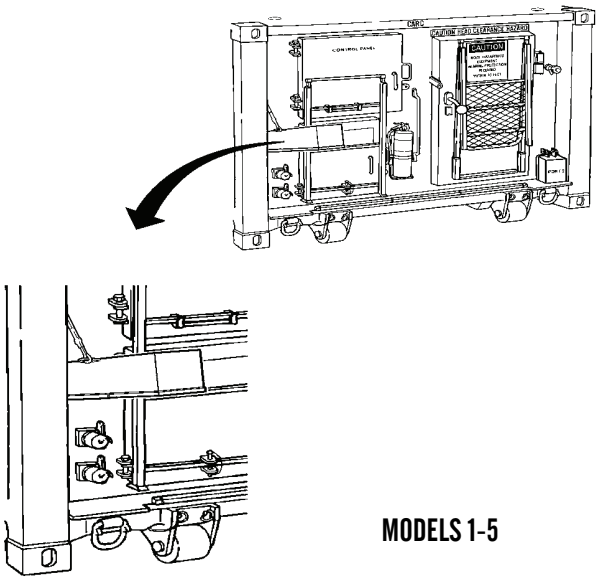
PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION) - CONTINUED

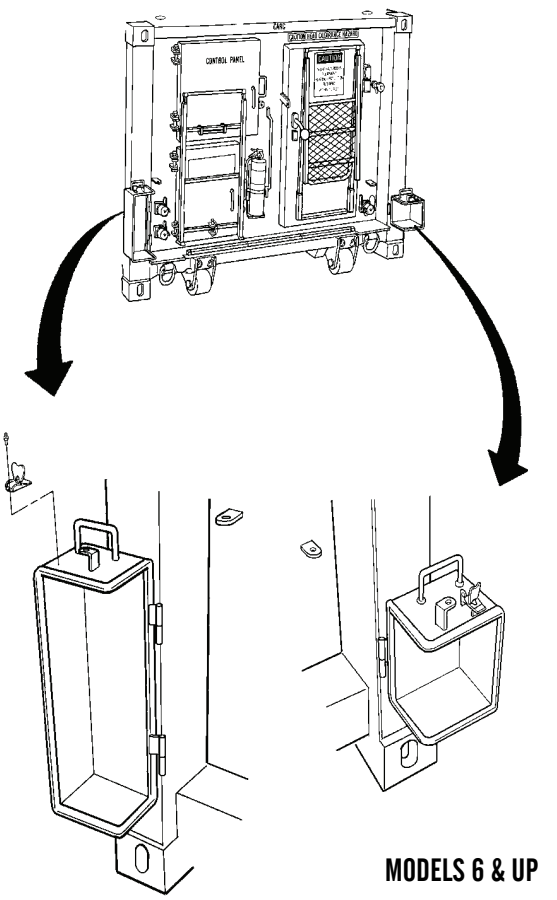
6. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until the hose reel moves easily.



PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION) - CONTINUED

7. Remove tethered cap on hose end.
8. Remove sufficient hose from the hose reel to reach from Port 1 or Port 2 to the container receiving the water.
9. Open the port cover to be used. Secure with the safety chain (Models 1-5).





10. Connect the hose to the selected discharge port to be used – Port 1 or Port 2.

PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION) - CONTINUED

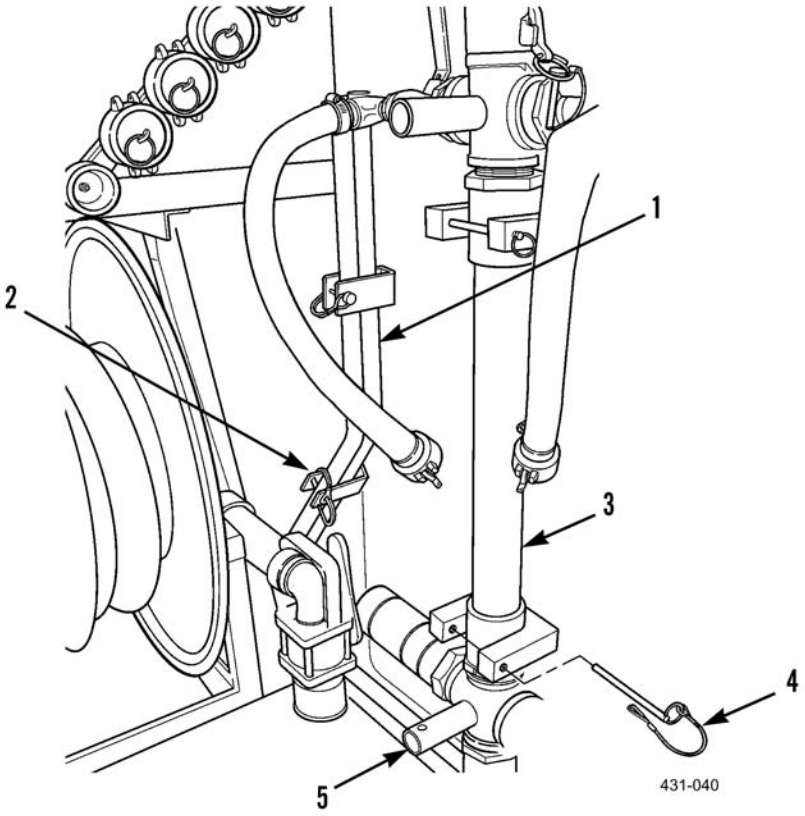
WARNING

Relieve pressure before disconnecting hose by closing Valve A or Valve B and opening fill port on fill station. Failure to relieve pressure could result in severe injury or death to personnel or damage to equipment.

CAUTION

Do not use hose reel with filling station. Failure to comply may result in damage to equipment.

11. Select method of distribution to be used:
    a. Discharge nozzle (step 12).
    b. Filling station (steps 13-17) (see “Deployment of Filling Station” in WP 0005 00).
12. Connect the nozzle to the end of the hose. Continue with step 18.
13. Remove the two supporting legs (1) for the filling station by releasing the pins (2) from the mounting bracket.
14. Remove the center component of the filling station (3) by releasing the pins (4) from the mounting bracket. Push the release button on the head of the pin to release the lock.
15. Identify level ground to set up filling station.
16. Insert supporting legs (1) into center component slot (5). Align the holes on the legs and the center component of the filling station, and insert the locking pins (4) to secure them together.
17. Reverse above steps to disassemble. Be sure to properly place the capped valve end down on the floor.



PUMPING OUT OF DISCHARGE PORT 1 OR 2 (NOZZLE OR FILL STATION DISTRIBUTION) - CONTINUED

CAUTION

- Be certain the discharge port valve is closed before starting the engine. Failure to comply may result in damage to equipment.
- When using the filling station, ensure Valve F is open or damage to equipment may result.

NOTE

When discharge has begun, closing Valve F will increase the discharge rate by approximately 20 percent. However, before shutting off the discharge operation, Valve F should be opened to eliminate pressure buildup within the plumbing system. If using fill station, ensure Valve F is open. When using the Fill Nozzle, the pressure can be lowered by approximately 20 percent by opening Valve F.

18. Open Valve E. Close Valve D and Valve F if necessary.
19. Close main access door.
20. Start the engine (see "Starting the Engine" in WP 0007 00).
21. Open Port Valve A or B on the discharge port to be used.

CAUTION

Once the tank has reached a low level, the WATER LOW LEVEL indicator will illuminate and the engine will shut down to prevent possible damage to the water pump.

22. When pumping operation is complete, close Port Valve A or B.
23. To shut down the engine, return the ENGINE RUN switch to the OFF position.

WARNING

Relieve pressure before disconnecting hoses by closing Valve A or Valve B and opening nozzle or valve on fill station. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.

24. Remove nozzle or disassemble filling station.
25. Return the nozzle/filling station to its stowage location within the housing.
26. Disconnect hoses and return to the hose reel within the housing. To facilitate draining of the hose, keep end of hose uncapped while cranking hose reel.
27. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counter-clockwise until the tethered cap is taut, and rotate hose reel locking mechanism clockwise until tight.
28. If used, return the adapters to the stowage location within the housing.
29. Move fire extinguisher to interior bracket.
30. Turn ENGINE RUN switch to OFF position and shut down main power using EMERGENCY STOP button.
31. Close access doors.
32. Stow ladder (WP 0005 00).
33. Close port covers.
34. Secure the Hippo for transport (WP 0001 00).

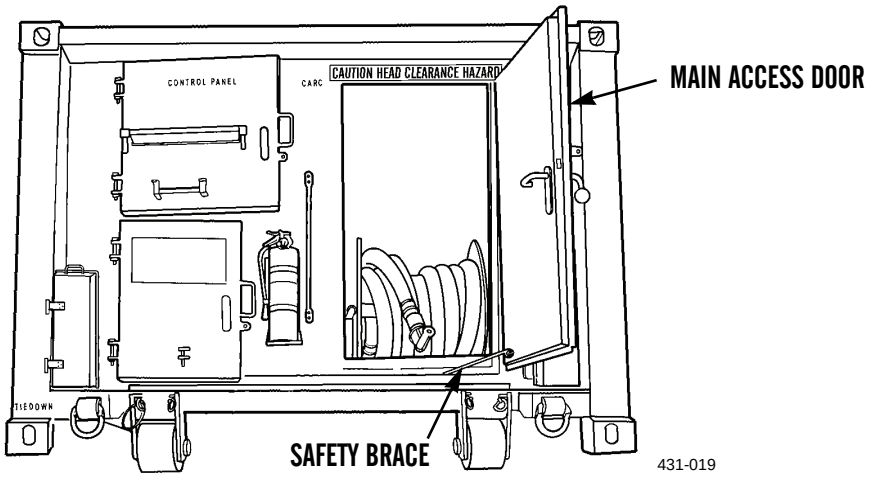
BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2

1. Position the Hippo for discharge operation.
2. If the unit is on the prime mover, deploy the ladder (WP 0005 00).

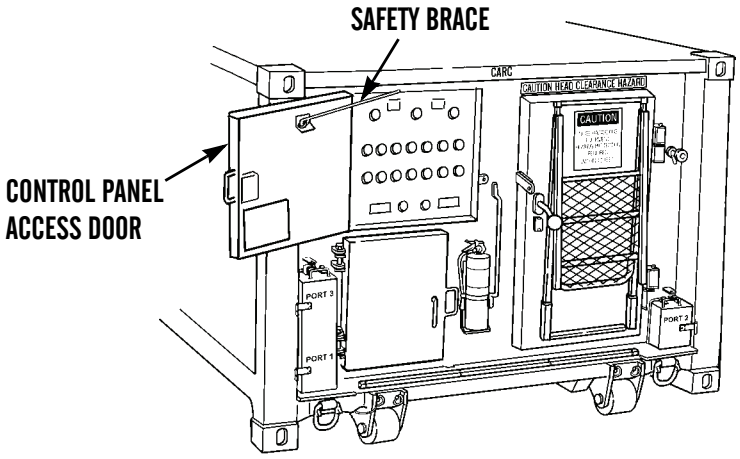
WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

3. Open main access door. Brace the door using the safety brace on the inside of the door.

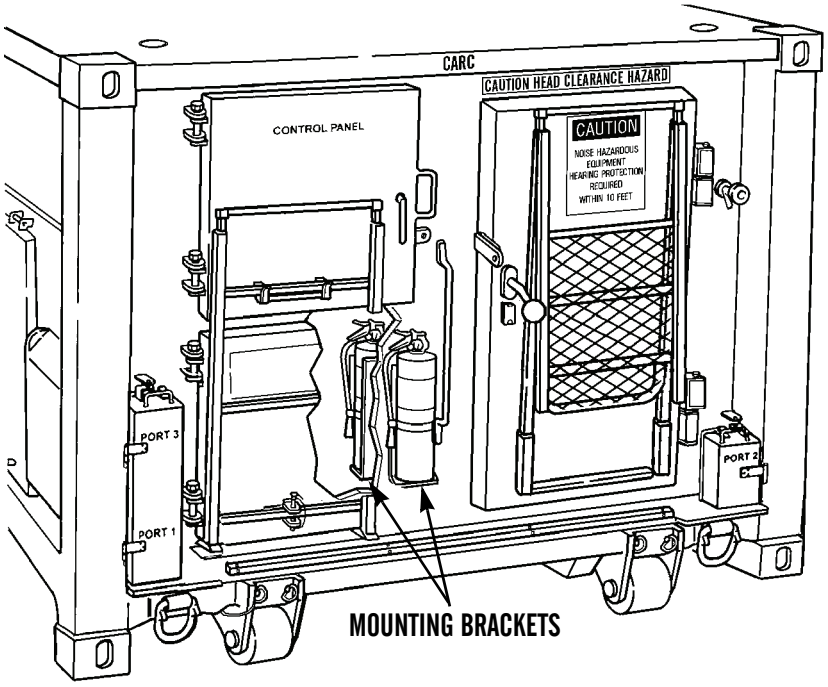


4. Remove ladder section if still stowed. Open control panel access door. Brace the door using the safety brace on the inside of the door.



BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2 - CONTINUED

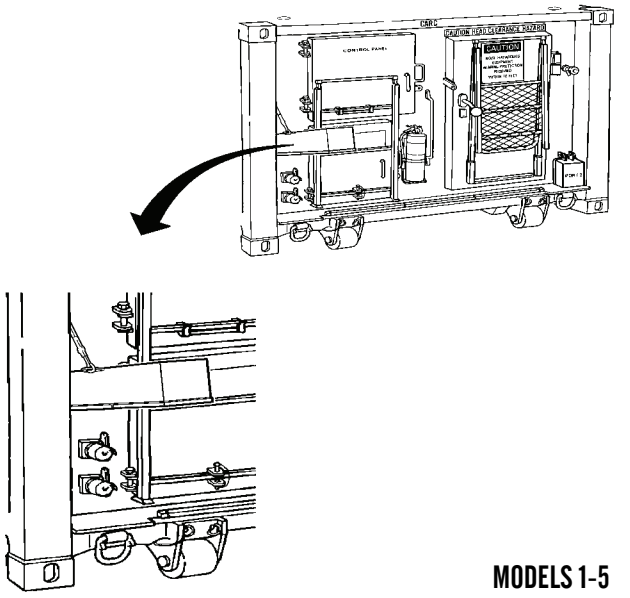
5. If necessary, turn CABINET LIGHT switch to ON position (WP 0007 00).
6. Move fire extinguisher from interior mounting bracket to exterior mounting bracket.



431-024

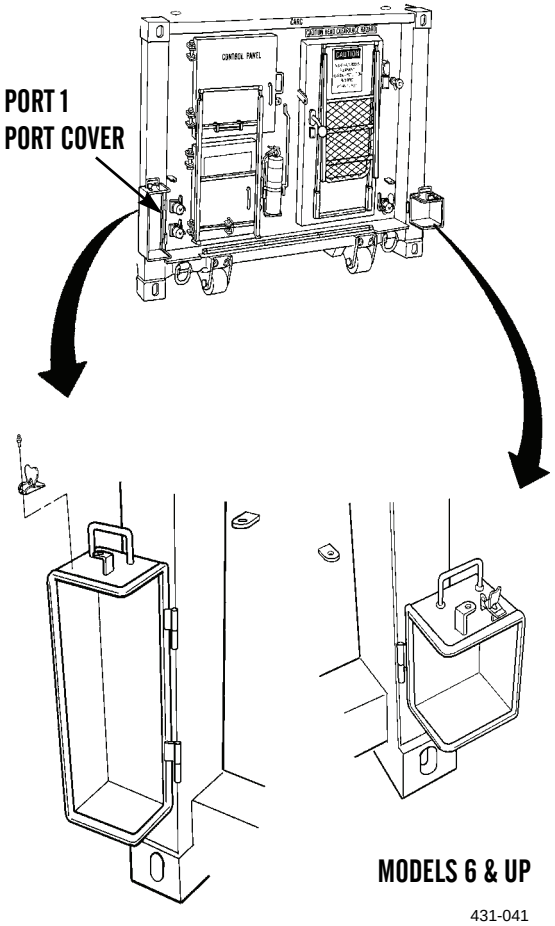
BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2 - CONTINUED

7. Open port covers to be used. Secure in place with safety chain (Models 1-5).



MODELS 1-5

431-108

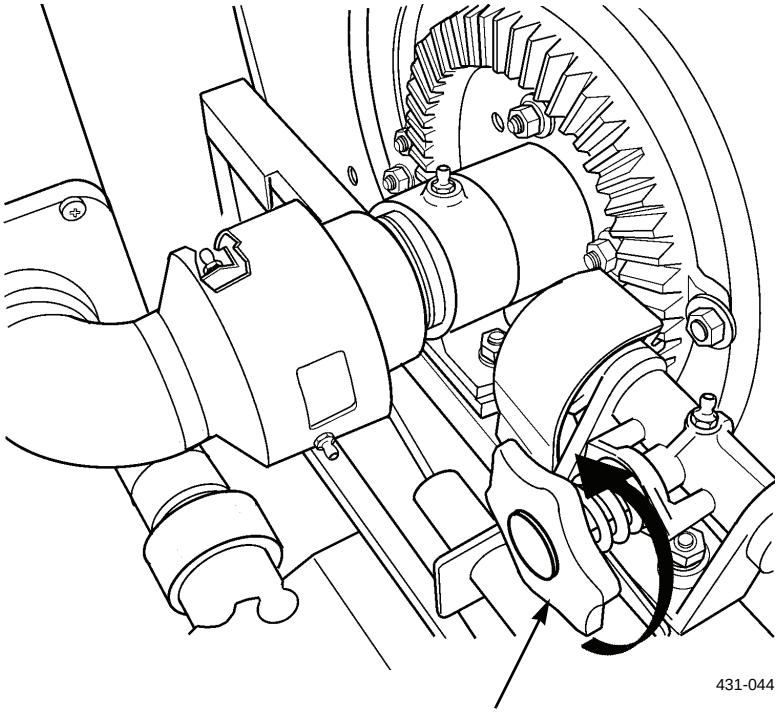


MODELS 6 & UP

431-041

BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2 - CONTINUED

8. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until hose reel moves easily.



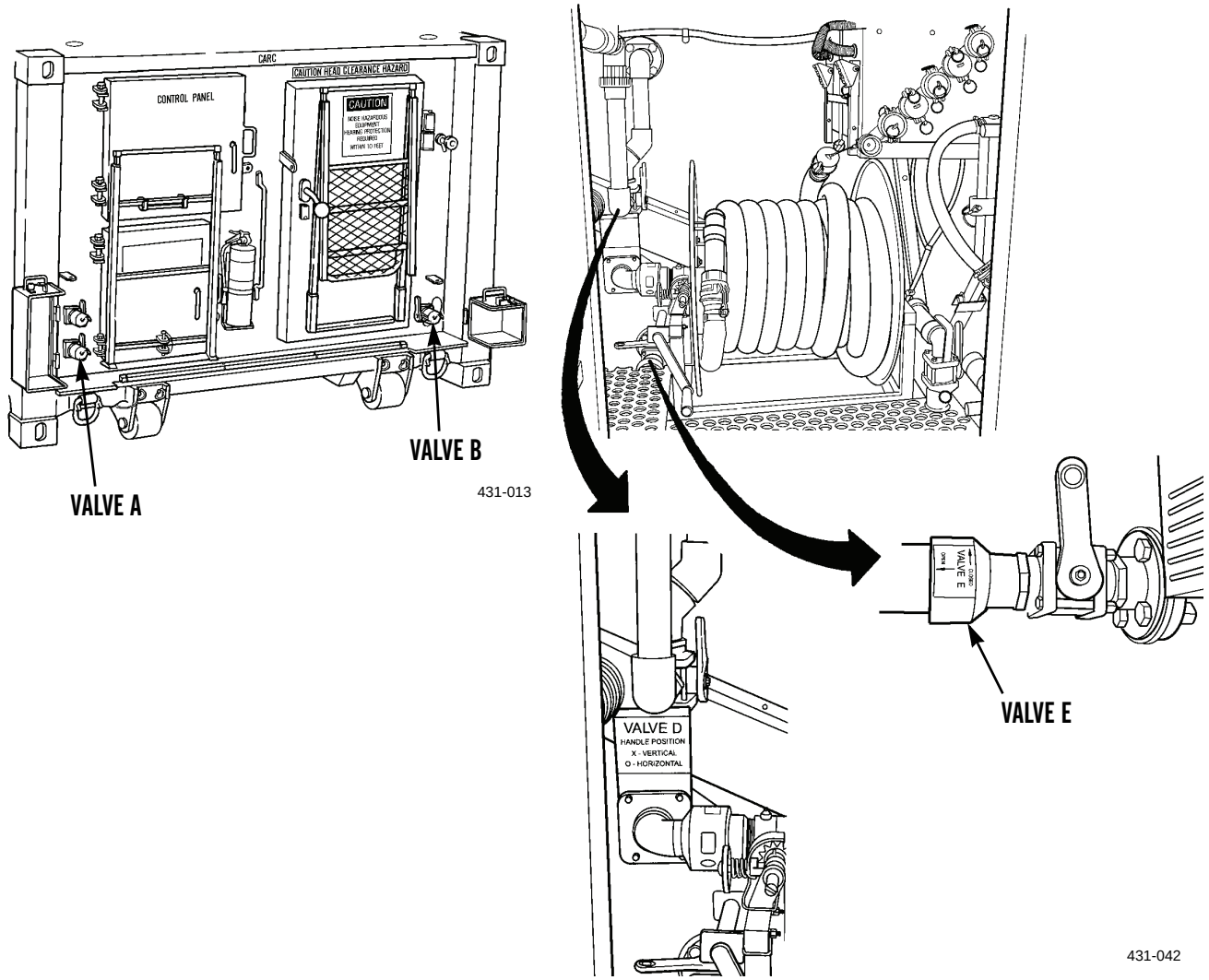
9. Remove tethered cap on hose end.
10. Reel out sufficient hose from reel to reach Port 1 or 2 to the receiving container. If 2 lines are to be used, reel out sufficient hose to make connections.
11. Connect the hose to the selected discharge port and to the receiving container using adapters if necessary.

WARNING

Unless the discharge nozzle has been added to the hose end, ensure there is physical control of the hose end prior to opening of Valve A, or injury to personnel or damage to equipment may result.

12. Open Port Valve A or B and Valve E on the discharge port to be used. If using 2 lines, open both valves.

BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2 - CONTINUED



13. Ensure that the valves/controls on the receiving container are positioned to allow the water to flow.

BULK DISCHARGE WITH PUMP - USING 1 OR 2 LINES THRU PORT 1 AND/OR PORT 2 - CONTINUED

14. Close the main access door and the adapter door if they are open.
15. Start the engine (WP 0007 00).
16. Discharge water into the container to be filled.
17. When filling is complete, shut down the engine and close Port Valve A and B if opened.
18. Disconnect hoses and return to the hose reel within the housing. To facilitate draining of the hose, keep end of hose uncapped while cranking hose reel.
19. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counter-clockwise until the tethered cap is taut, and rotate hose reel locking mechanism clockwise until tight.
20. If used, return the adapters to the stowage location within the housing.
21. Move fire extinguisher to interior bracket.
22. Turn ENGINE RUN switch to OFF position and shut down main power using EMERGENCY STOP button (WP 0007 00).
23. Close access doors.
24. Stow ladder (WP 0005 00).
25. Close port covers.
26. Secure the Hippo for transport (WP 0001 00).

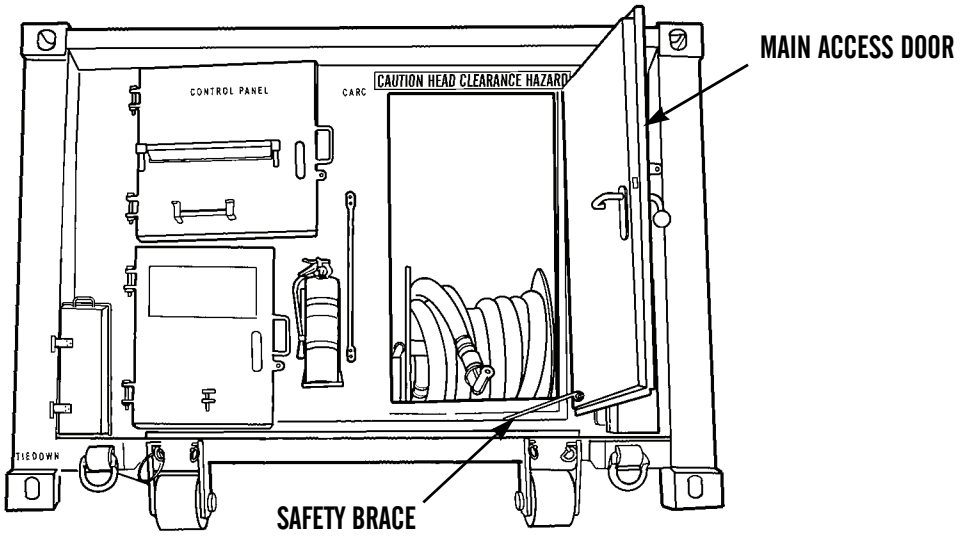
BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1

1. Position the Hippo for discharge operations.
2. If the unit is on the prime mover, deploy the ladder (WP 0005 00).

WARNING

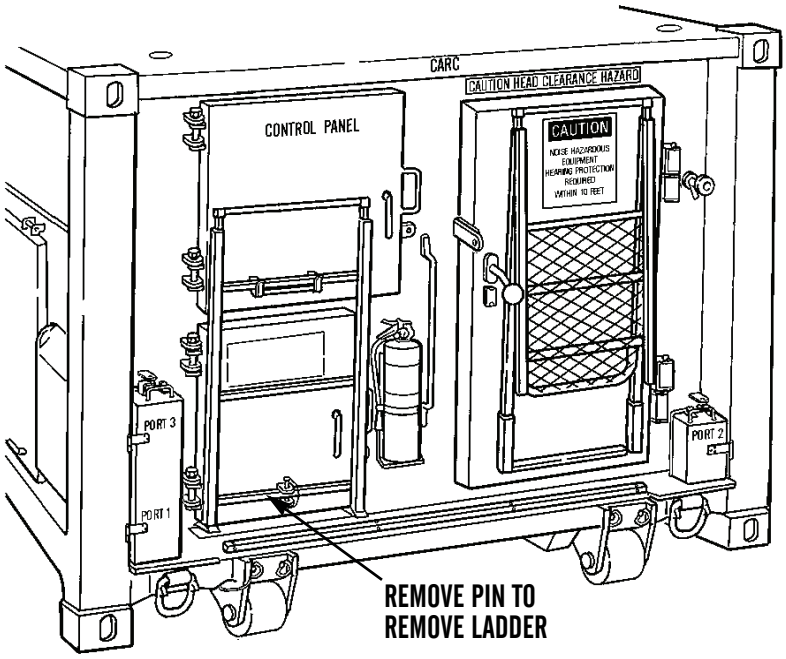
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

3. Open main access door. Brace the door using the safety brace on inside of door.



BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

4. Remove ladder section if still stowed.

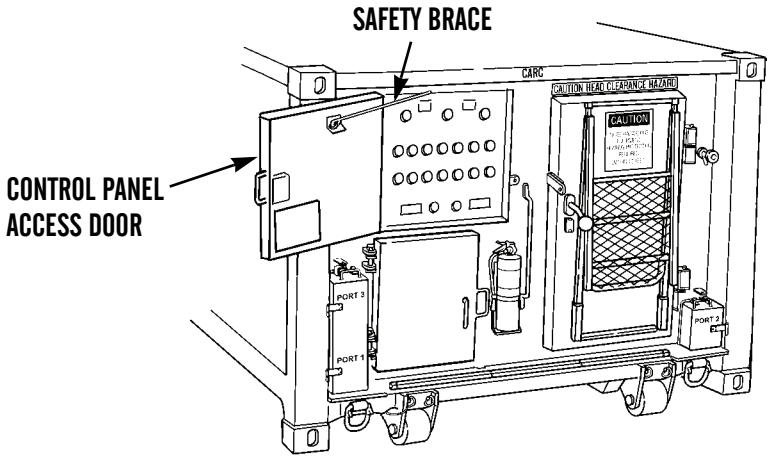


431-043

WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

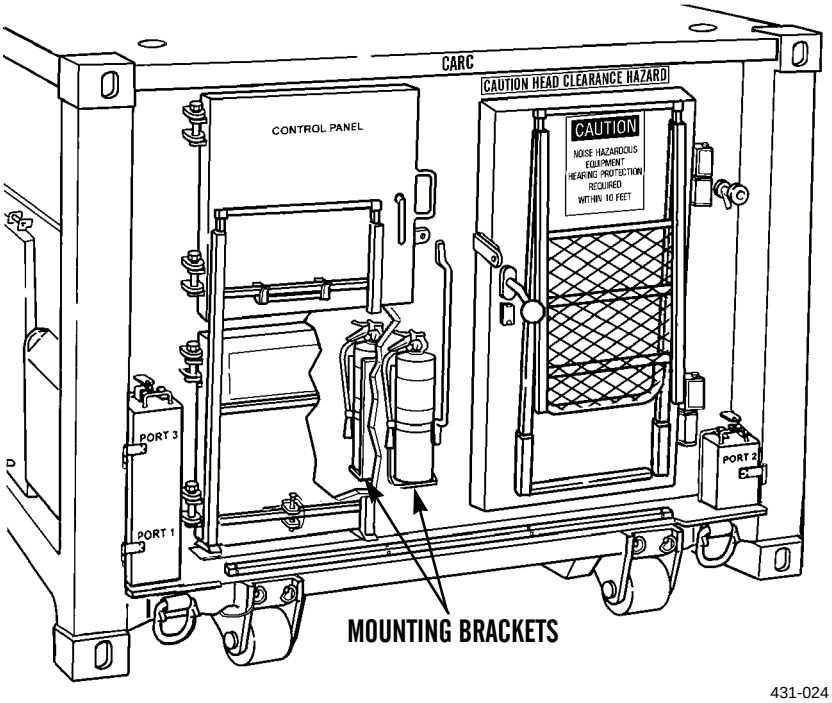
5. Open control panel access door. Brace the door using the safety brace on the inside of the door. If necessary, turn CABINET LIGHT switch to ON position (WP 0007 00).



431-027

BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

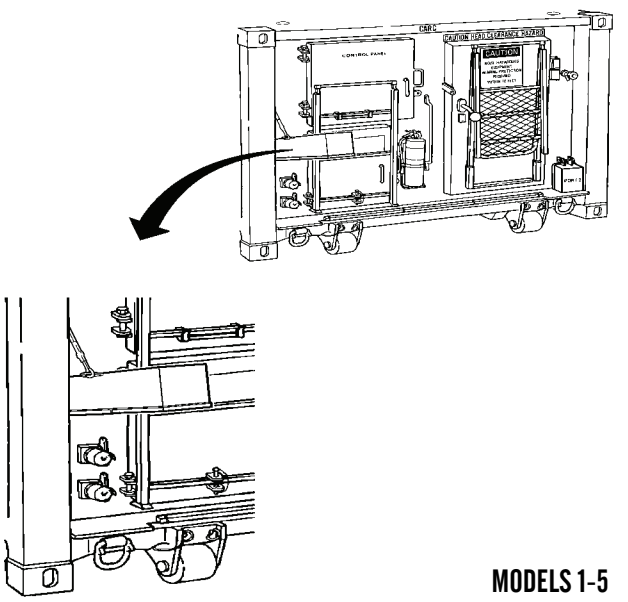
6. Move fire extinguisher from interior bracket to exterior bracket.



431-024

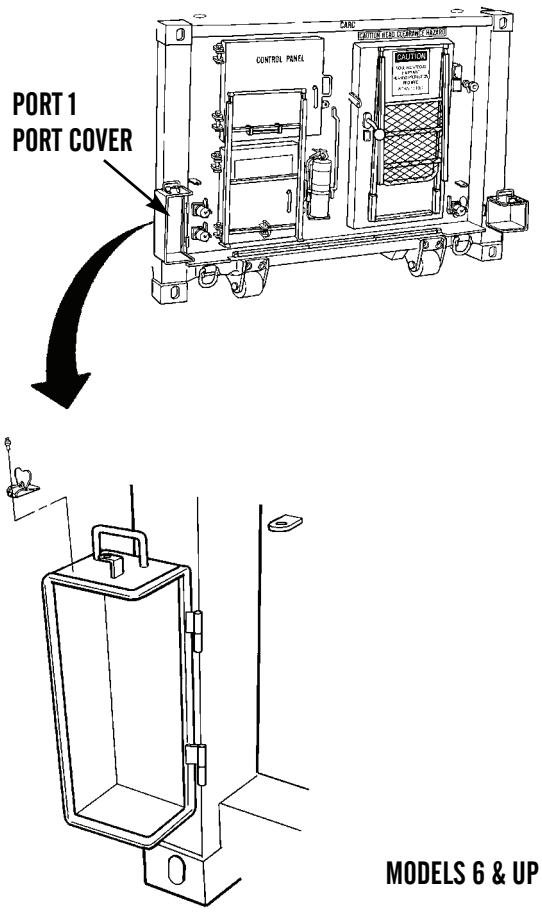
BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

7. Open Port 1 port cover. Secure in place with safety chain (Models 1-5).



MODELS 1-5

431-108

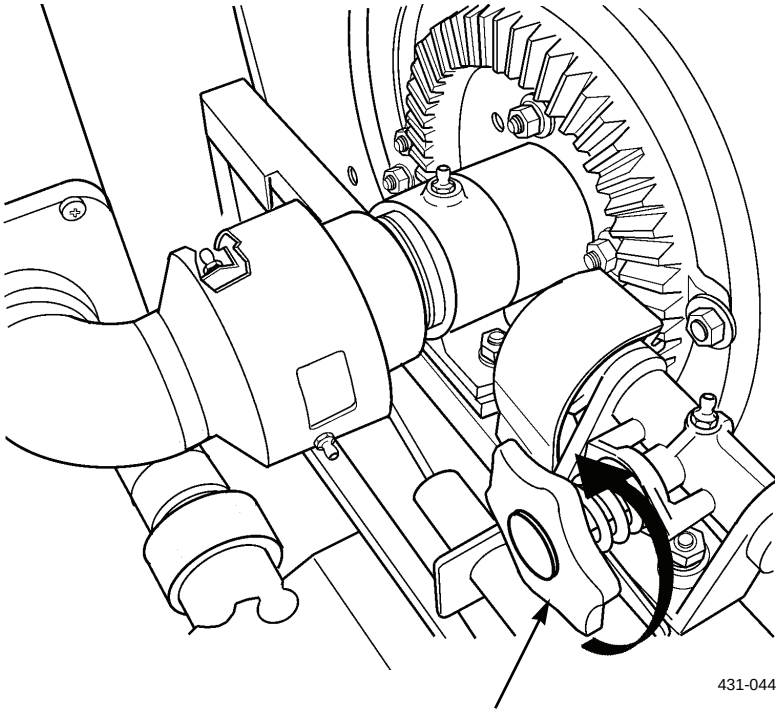


MODELS 6 & UP

431-029

BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

8. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until hose reel moves easily.



9. Remove tethered cap on the hose end.
10. Reel out sufficient hose from the hose reel to reach from Port 1 to the designated distribution point.
11. Connect the hose to Port 1.
12. Connect the appropriate discharge component to the end of the hose (adapter, nozzle, or fill station) (WP 0005 00) for the desired discharge operation.

NOTE

The method of discharge (direct connect, discharge nozzle, or the filling station) will determine the type of connection device uses.

13. Connect the distribution end of the hose to the receiving container.
14. Reel out the hose from the hose reel to the point of distribution.
15. Connect the appropriate discharge component to the end of the hose (adapter, nozzle, or fill station (see WP 0005 00 for deployment of fill station) for the desired discharge operation.

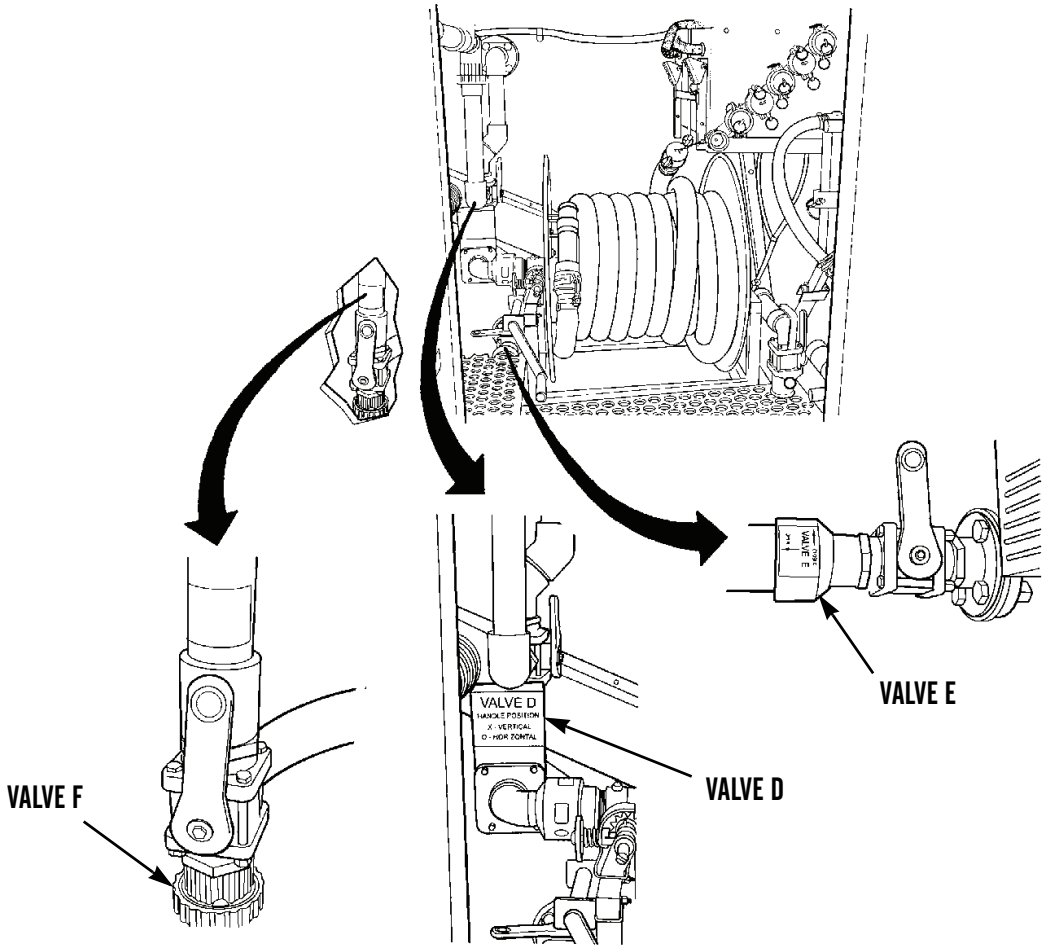
BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

16. Open Valve E, Valve D, and Valve F.
17. Close the adapter door if open.
18. Ensure that the valves/controls at the container(s) receiving the water are properly positioned to allow the water to flow. Close main access door.

WARNING

Unless the discharge nozzle has been added to the hose end, ensure there is physical control of the hosed end prior to opening of Valve A, or injury to personnel or damage to equipment may result.

19. Start the engine using normal starting procedures (WP 0007 00).



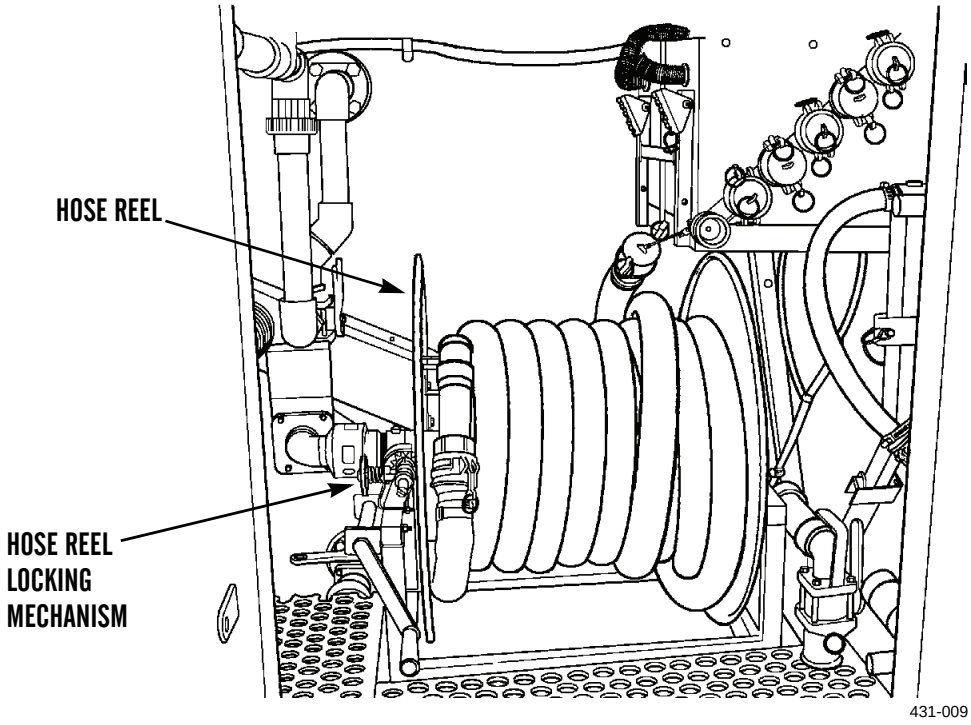
BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

20. Open Valve A.
21. Discharge water into the container(s) until the filling cycle has been completed.
22. When filling is complete, shut down the engine (WP 0007 00) and close valves.

WARNING

Relieve pressure before disconnecting hoses by closing Valve A and opening nozzle or Valve on fill station. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.

23. Return the selected discharge component to its stowage location within the housing.
24. Disconnect hoses and return to the hose reel within the housing. To facilitate draining of the hose, keep end of hose uncapped while cranking hose reel.
25. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counter-clockwise until the tethered cap is taut, and rotate hose reel locking mechanism clockwise until tight.



431-009

BULK DISCHARGE WITH TWO LINES USING HOSE REEL AND PORT 1 - CONTINUED

26. If used, return the adapters to the stowage location within the housing.
27. Move fire extinguisher to interior mounting bracket.
28. Turn ENGINE RUN switch to OFF position and shut down main power using EMERGENCY STOP button.
29. Close access doors.
30. Stow ladder (WP 0005 00).
31. Close port covers.
32. Secure the Hippo for transport (WP 0001 00).

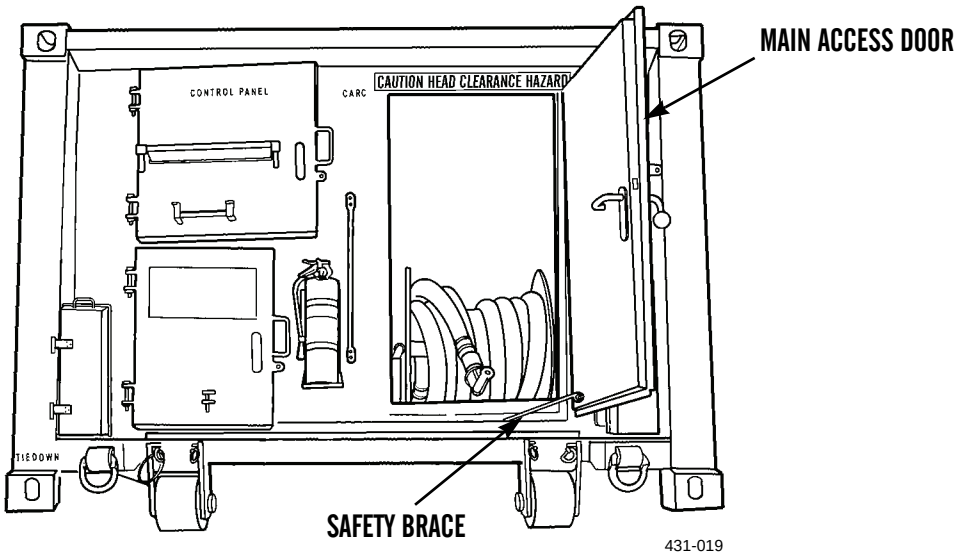
PUMPING OUT OF HOSE REEL

1. Position Hippo for discharge operations.
2. If unit is on prime mover, deploy the ladder (WP 0005 00).

WARNING

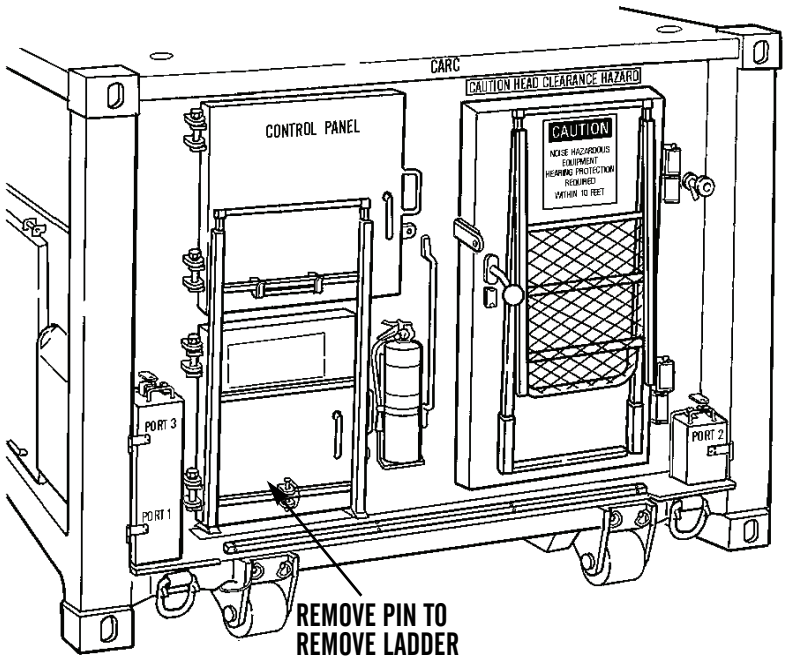
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

3. Open main access door. Brace door using the safety brace on inside of door.



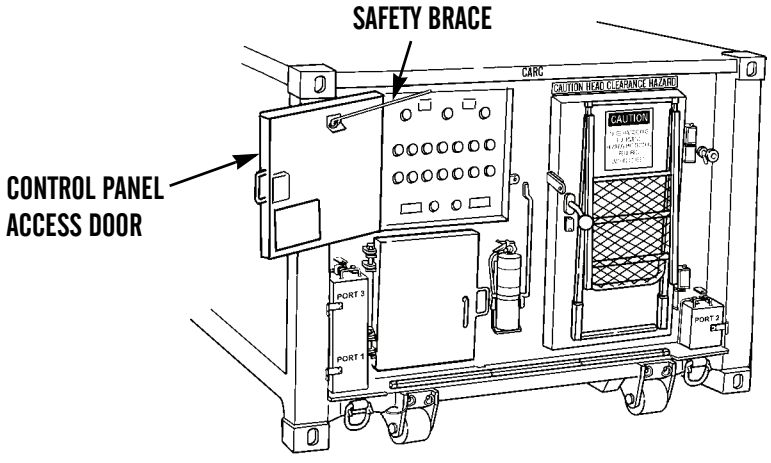
PUMPING OUT OF HOSE REEL - CONTINUED

4. Remove ladder section if still stowed.



431-043

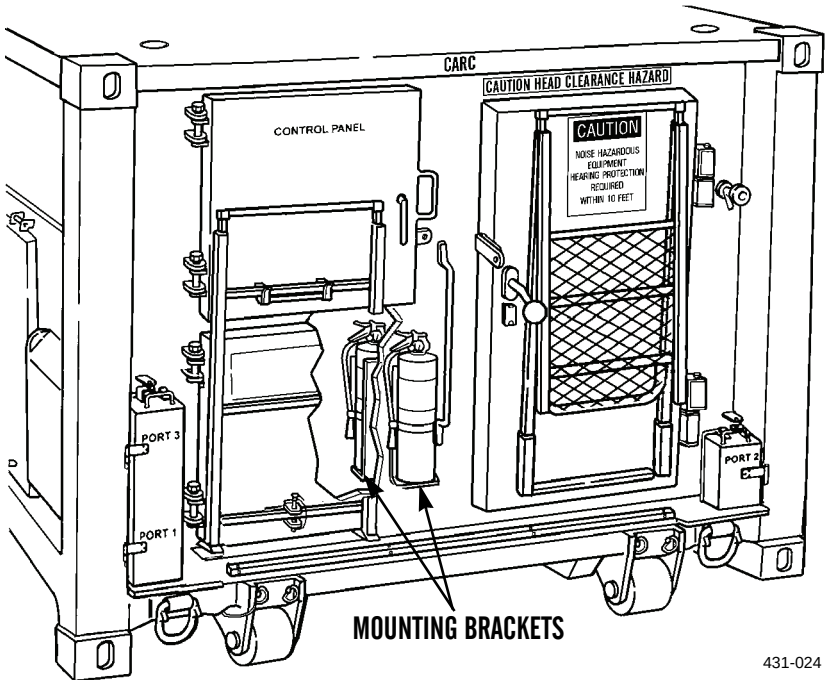
5. Open control panel access door. Brace the door using the safety brace on the inside of the door. If necessary, turn on cabinet light (WP 0007 00).



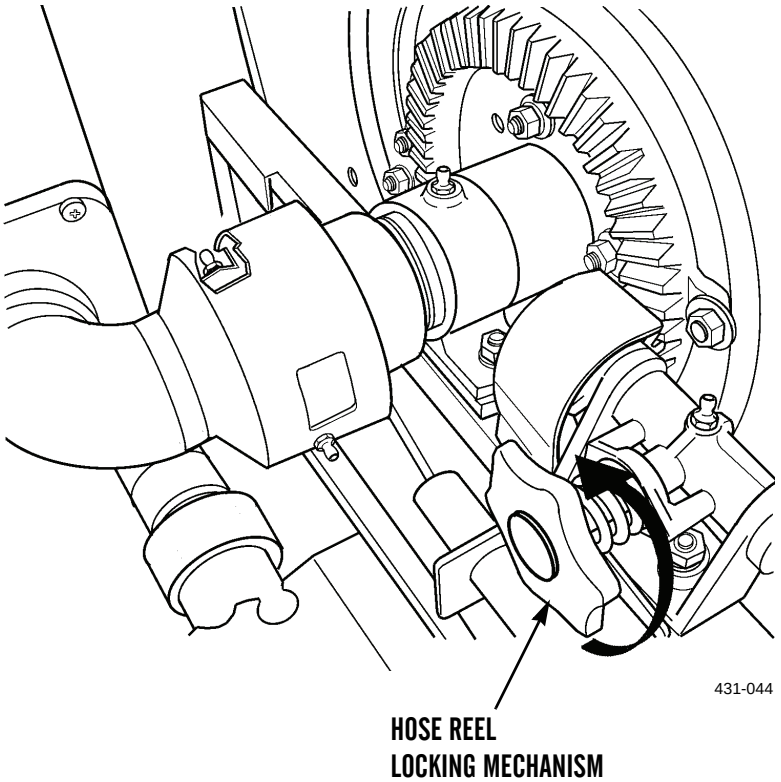
431-027

PUMPING OUT OF HOSE REEL - CONTINUED

6. Move fire extinguisher from interior mounting bracket to exterior mounting bracket.



7. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise.



PUMPING OUT OF HOSE REEL - CONTINUED

8. Remove tethered cap on hose end.
9. Reel out sufficient hose from the hose reel to reach to the designated distribution point.

CAUTION

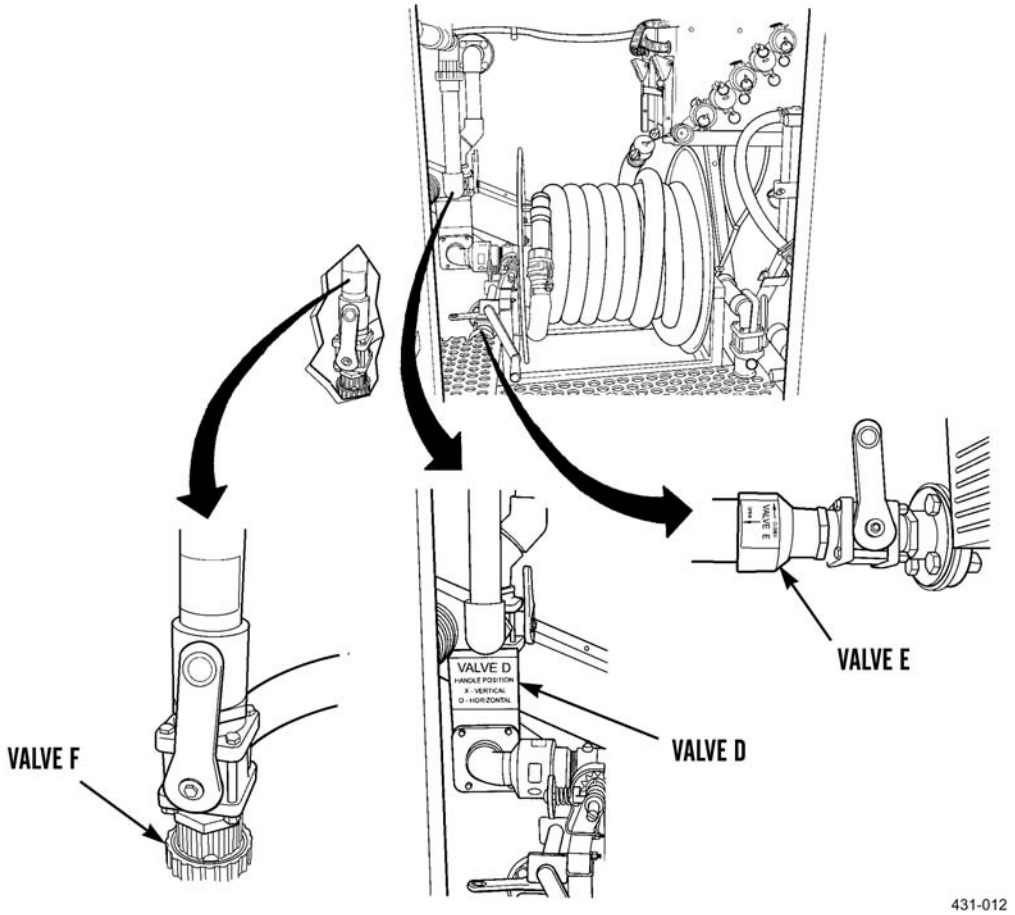
Do not use hose reel with filling station. Failure to comply may result in damage to equipment.

10. Connect the appropriate discharge component (adapter or nozzle) for the desired discharge operation.
11. Open Valve E, Valve F, and Valve D.
12. Start the engine (see "Starting the Engine" in WP 0007 00).
13. Commence water discharge until the distribution task is complete.
14. Immediately shut down the engine and close Valve D.

WARNING

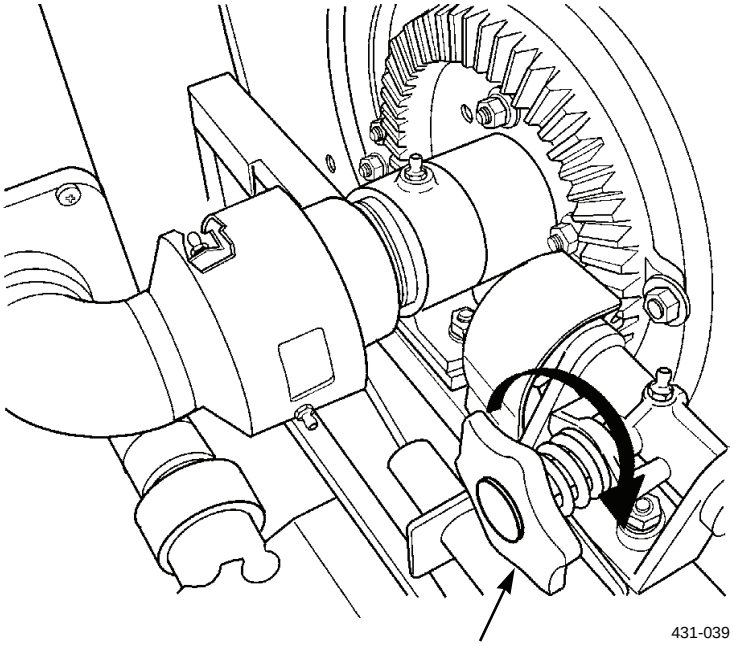
Before disconnecting discharge component, relieve the pressure from the hose by opening the nozzle or fill station valve. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.

15. Disconnect discharge component (adapter or nozzle).
16. Return the discharge component (adapter or nozzle) to the appropriate stowage location within the housing.



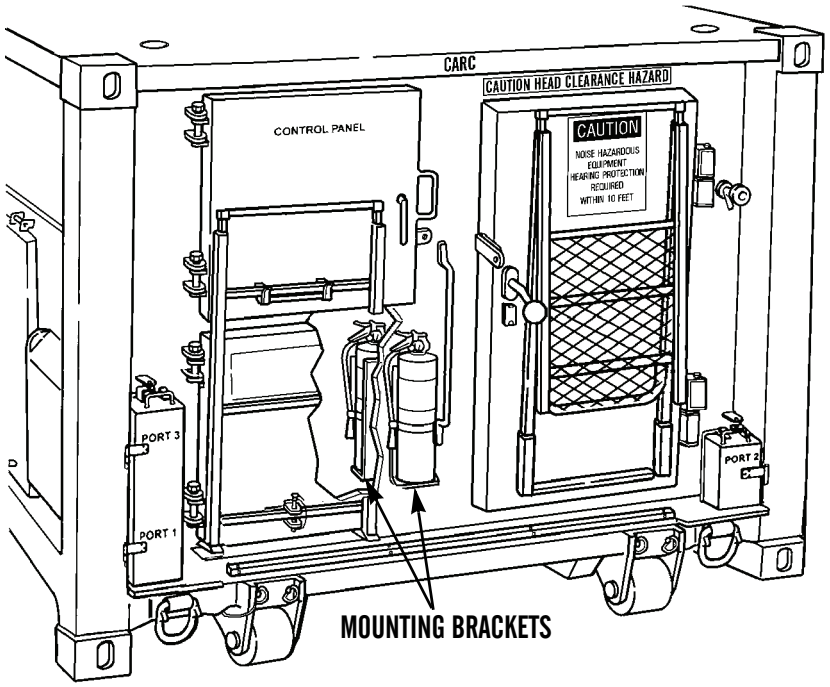
PUMPING OUT OF HOSE REEL - CONTINUED

17. Return hose to the hose reel within the housing. To facilitate draining of the hose, keep end of hose uncapped while cranking hose reel.
18. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counter-clockwise until the tethered cap is taut, and rotate hose reel locking mechanism clockwise until tight.



PUMPING OUT OF HOSE REEL - CONTINUED

19. Move fire extinguisher to interior bracket.



20. Turn engine run switch to the OFF position and shut down main power using the EMERGENCY STOP button.
21. Close access doors.
22. Stow ladder (WP 0005 00).
23. Secure the Hippo for transport (WP 0001 00).

DISCHARGE OUT OF THE SAMPLING PORT

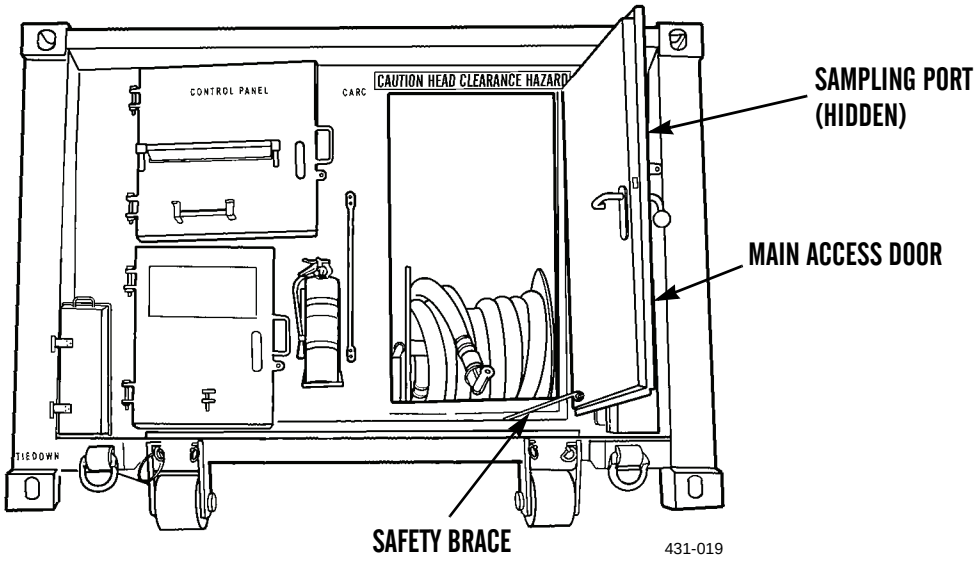
The sampling port, located on the curbside of the rear panel, approximately head high, is for obtaining water samples and filling individual canteens, especially in extreme cold weather conditions. To use the sampling port, perform the following tasks:

1. Position the Hippo for sampling operation.
2. If the unit is on the prime mover, deploy the ladder (WP 0005 00).

WARNING

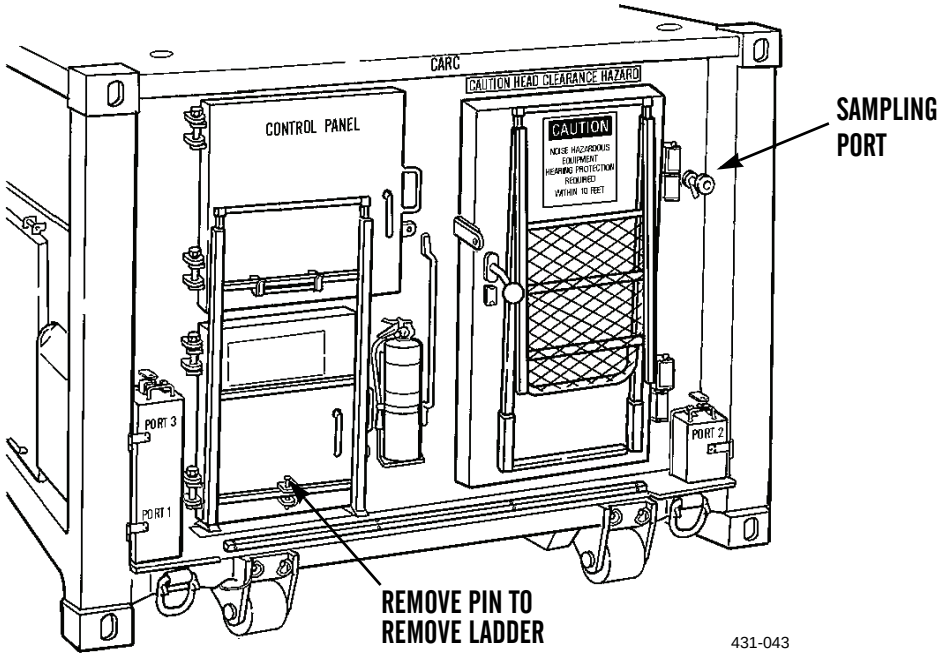
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

3. Open main access door. Brace the door using the safety brace on the inside of the door.



DISCHARGE OUT OF THE SAMPLING PORT - CONTINUED

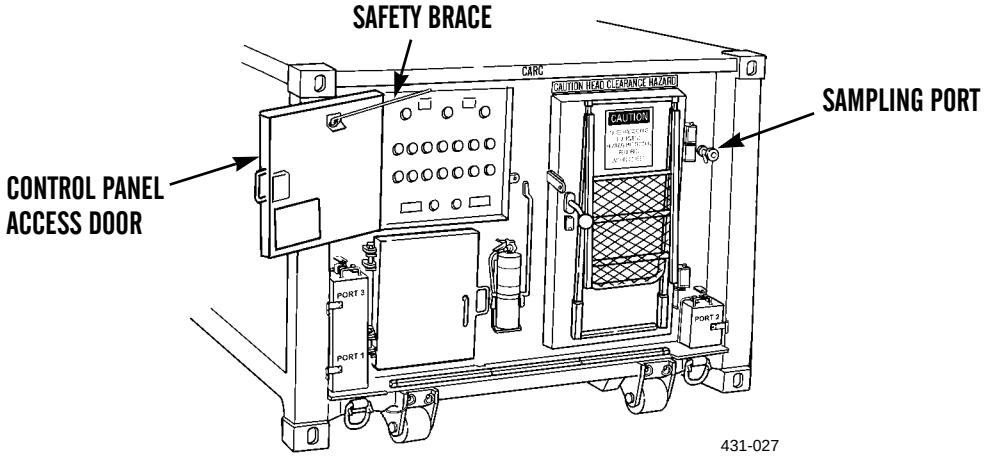
4. Remove ladder section if still stowed.



WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

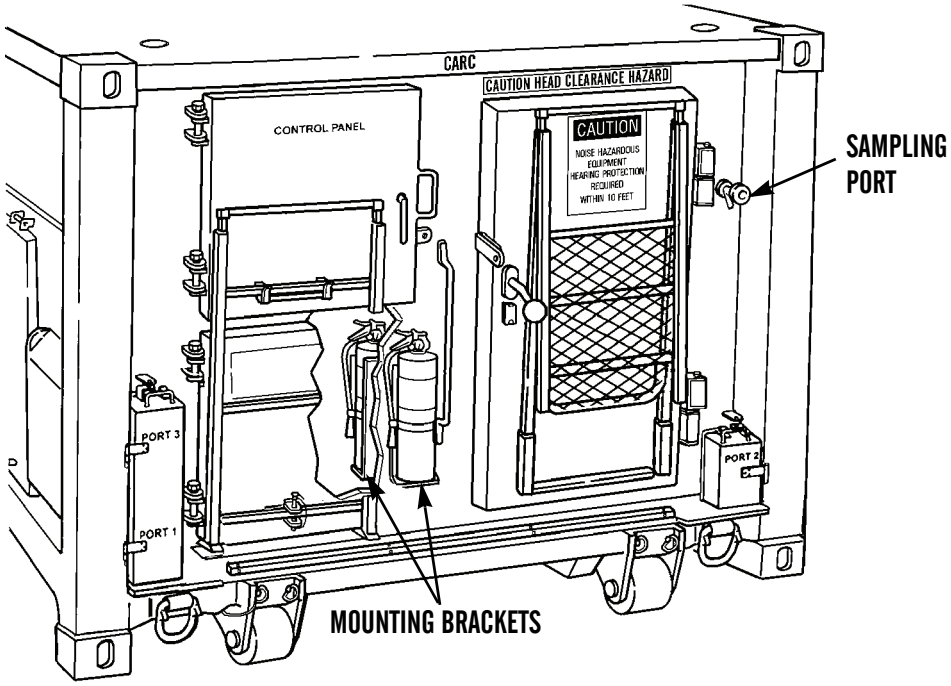
5. Open control panel access door. Brace the door using the safety brace on the inside of the door. If necessary, turn CABINET LIGHT switch to ON position (WP 0007 00).



OPERATION UNDER USUAL CONDITIONS — DISTRIBUTION - CONTINUED **0009 00**

DISCHARGE OUT OF THE SAMPLING PORT - CONTINUED

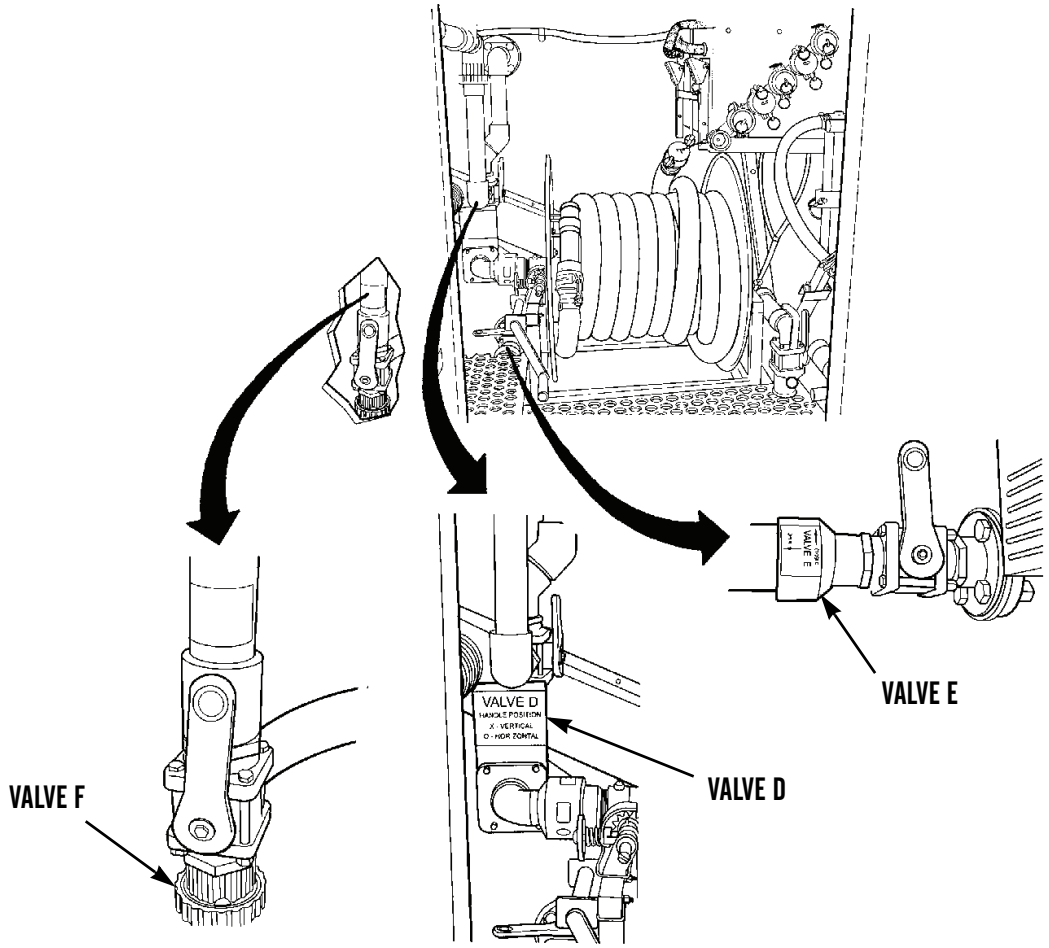
6. Move fire extinguisher from interior mounting bracket to exterior mounting bracket.



OPERATION UNDER USUAL CONDITIONS — DISTRIBUTION - CONTINUED 0009 00

DISCHARGE OUT OF THE SAMPLING PORT - CONTINUED

7. Open Valve E and Valve F. Close Valve D.
8. Close main access door.
9. Start the engine (WP 0007 00).
10. To allow the plumbing to clear, let water flow for approximately one minute before taking sample or filling container.
11. With canteen or sampling container positioned beneath the sampling port spigot, slowly open the sampling port spigot. Air will purge first from the port, but as the air is evacuated, water will begin to flow.
12. Shut off sampling port spigot when complete. Close Valve E and Valve F.
13. Move fire extinguisher to interior bracket.
14. Turn ENGINE RUN switch to OFF position and shut down main power using the EMERGENCY STOP button.
15. Close access doors.
16. Stow ladder (WP 0005 00).
17. Secure the Hippo for transport (WP 0001 00).



431-012

GRAVITY DISCHARGE PORT 1

NOTE

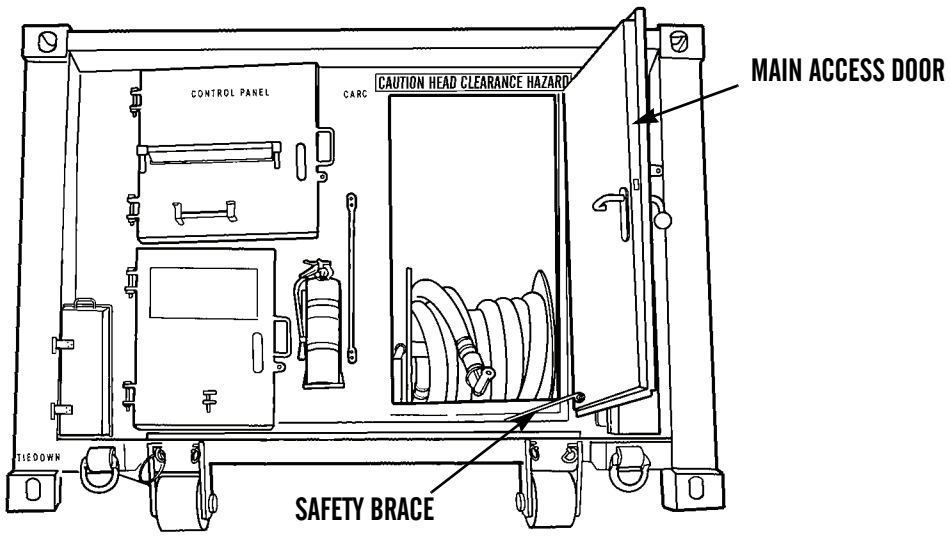
For extreme cold weather operations, this port is the preferred method for filling of canteens.

1. Position the Hippo for discharge operation.
2. Hippo must be higher than receiving container.
3. If Hippo is on the prime mover, deploy the ladder (WP 0005 00).

WARNING

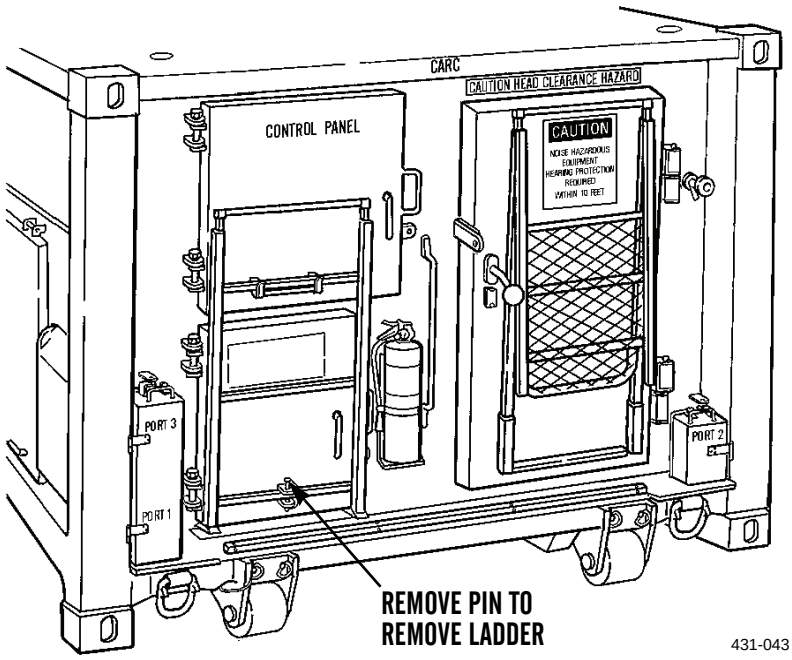
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

4. Open main access door. Brace the door using the safety brace on the inside of the door.



GRAVITY DISCHARGE PORT 1 - CONTINUED

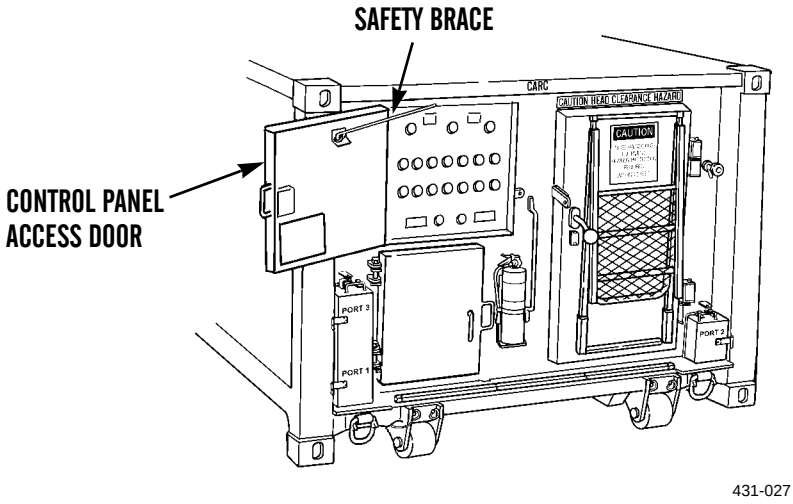
5. If cabinet lights are required, remove ladder section if still stowed.



WARNING

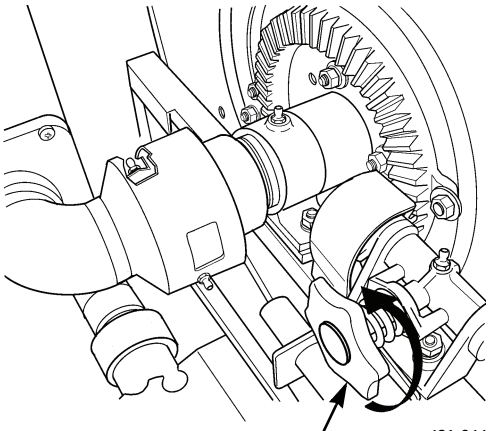
When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

6. Open control panel access door. Brace the door using the safety brace on the inside of the door. Turn on cabinet light (WP 0007 00).



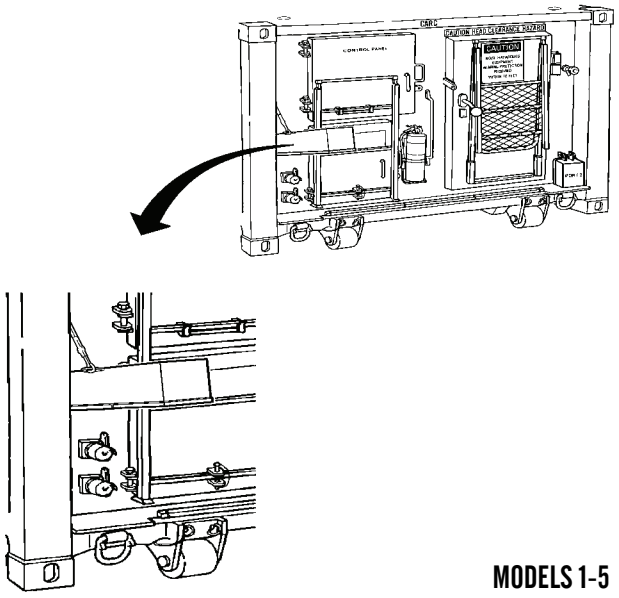
GRAVITY DISCHARGE PORT 1 - CONTINUED

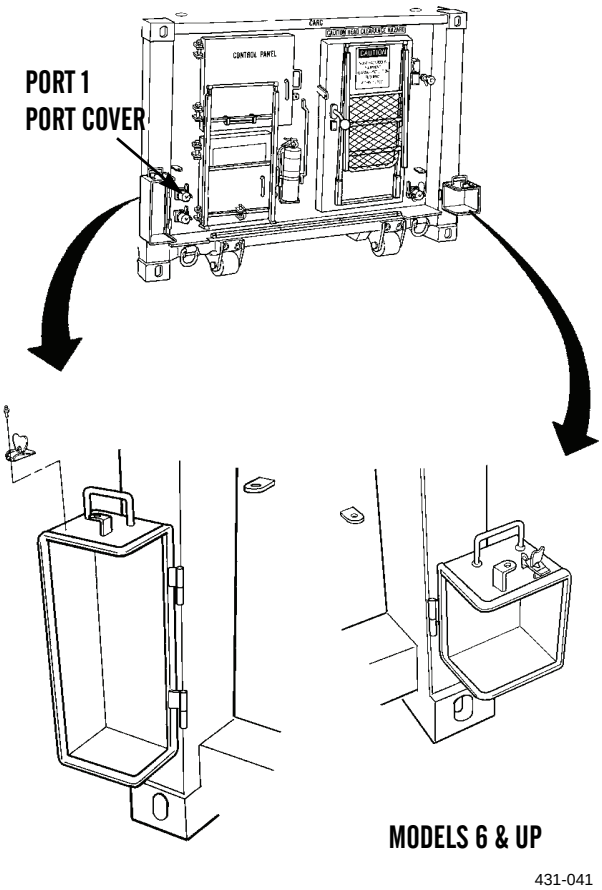
7. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise until hose reel moves easily.



GRAVITY DISCHARGE PORT 1 - CONTINUED

8. Remove tethered cap on hose end.
9. Remove sufficient hose from the hose reel to reach to the designated distribution point.
10. Open Port 1 cover. Secure in place with safety chain (Models 1-5).





11. Connect hose to Port 1.
12. Connect the appropriate discharge component (adapter, nozzle, or filling station) for the desired discharge operation.
13. Open Valve E and Valve A.

GRAVITY DISCHARGE PORT 1 - CONTINUED

14. Gravity will cause the water load to be discharged until nearly empty. Should the Hippo be resting on the rollers on the ground, it will not be able to discharge its full load through gravity, as it will be on a slight backward angle.
15. Commence water discharge until the distribution task is complete.
16. Close Valve E and Port Valve A.

WARNING

Before disconnecting discharge component, relieve the pressure from the hose by opening the nozzle or fill station valve. Failure to relieve pressure could result in injury or death to personnel or damage to equipment.

17. Disconnect discharge component (adapter, nozzle, or filling station).
18. Return the discharge component (adapter, nozzle, or filling station) to the appropriate stowage location within the housing.
19. Disconnect hose from Port 1.
20. Return hose to the hose reel within the housing. To facilitate draining of the hose, keep end of the hose uncapped while cranking hose reel.
21. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counterclockwise until the tethered cap is taut, and rotate hose reel locking mechanism clockwise until tight.
22. Shut down main power using the EMERGENCY STOP button.
23. Close access doors.
24. Stow ladder (WP 0005 00).
25. Close port covers.
26. Secure the Hippo for transport (WP 0001 00).

GRAVITY DISCHARGE PORT 2

Follow the same procedure for Gravity Discharge - Port 1, except Valve B will be used instead of Valve A.

GRAVITY DRAINING OF THE TANK AND PLUMBING

WARNING

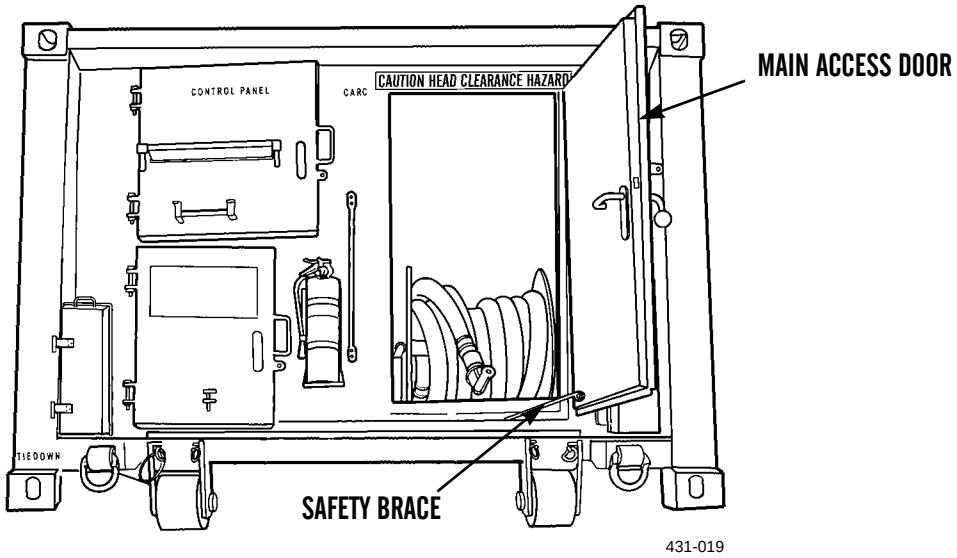
DO NOT stand in the path of the water when draining water from the Hippo. Injury to personnel could result from the force of the water.

1. Position the Hippo on ground for draining operation.

WARNING

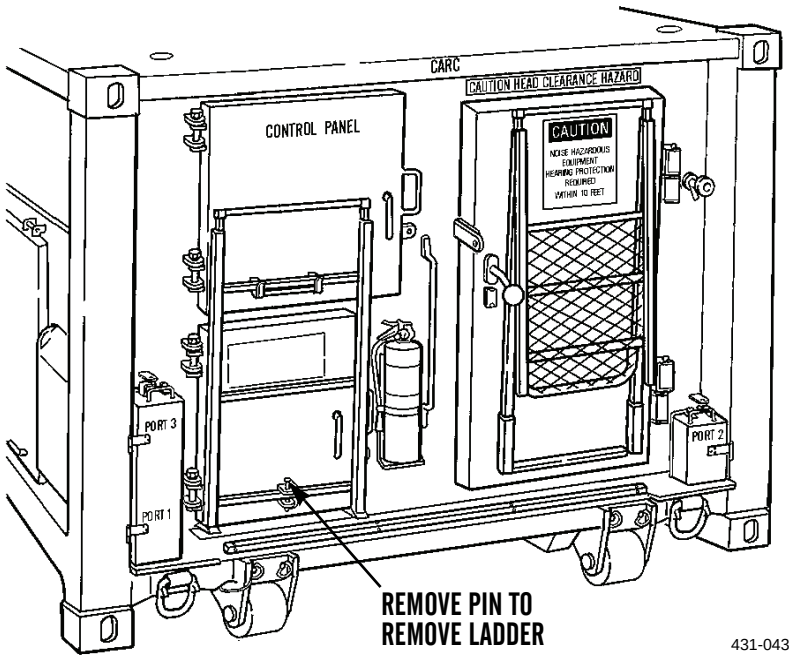
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

2. Open main access door. Brace the door using the safety brace on the inside of the door.



GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

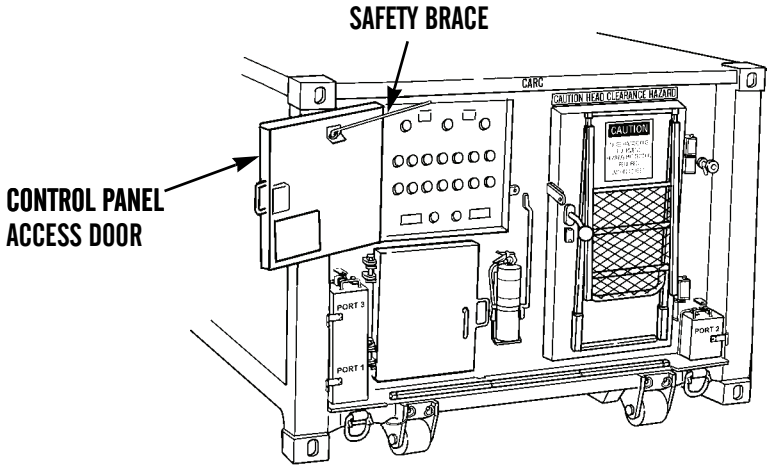
3. If cabinet light is required, remove ladder section if still stowed.



WARNING

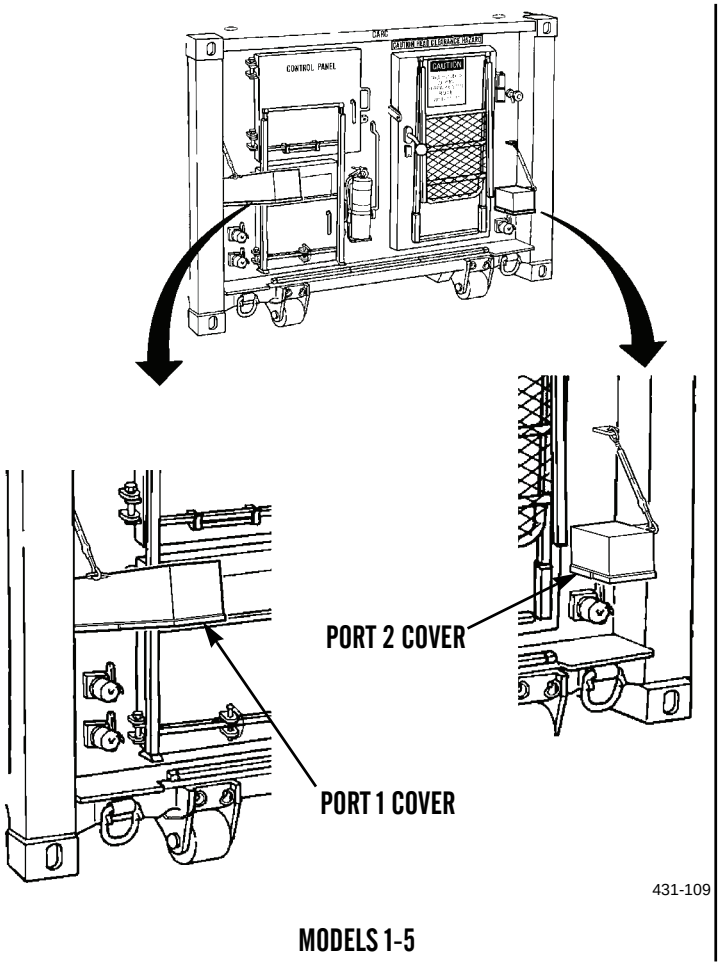
When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

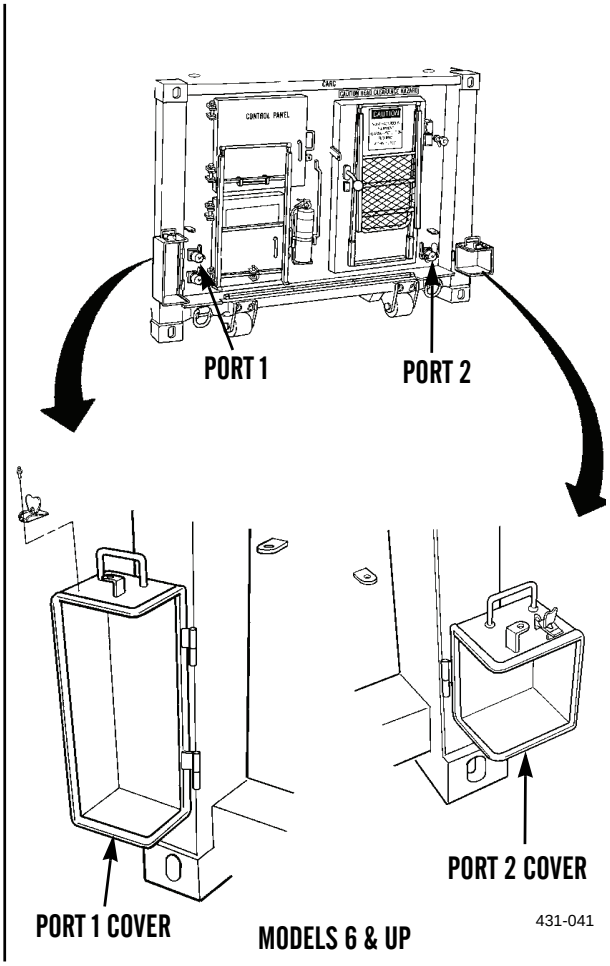
4. Open control panel access door. Brace the door using the safety brace on the inside of the door. Turn on cabinet lights.



GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

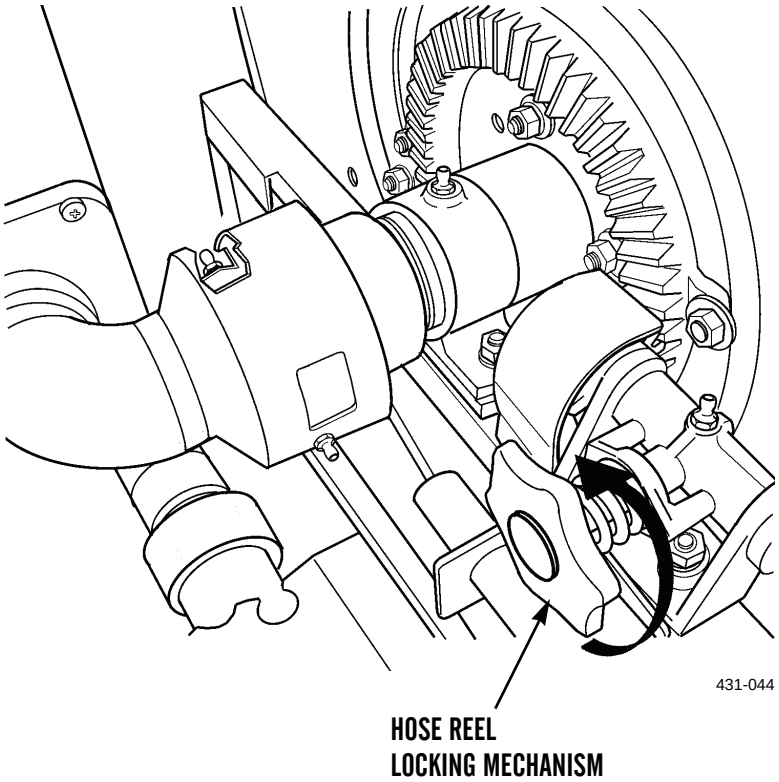
5. Open Port 1 and Port 2 port covers. Secure in place with safety chains (Models 1-5).





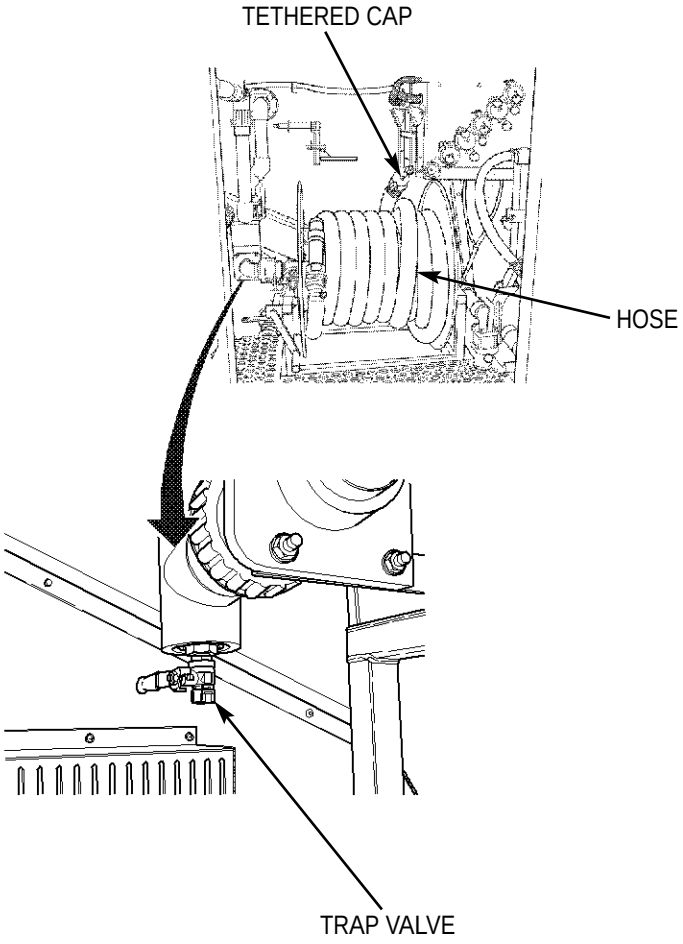
GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

6. Unlock the hose reel by rotating the hose reel locking mechanism counterclockwise.



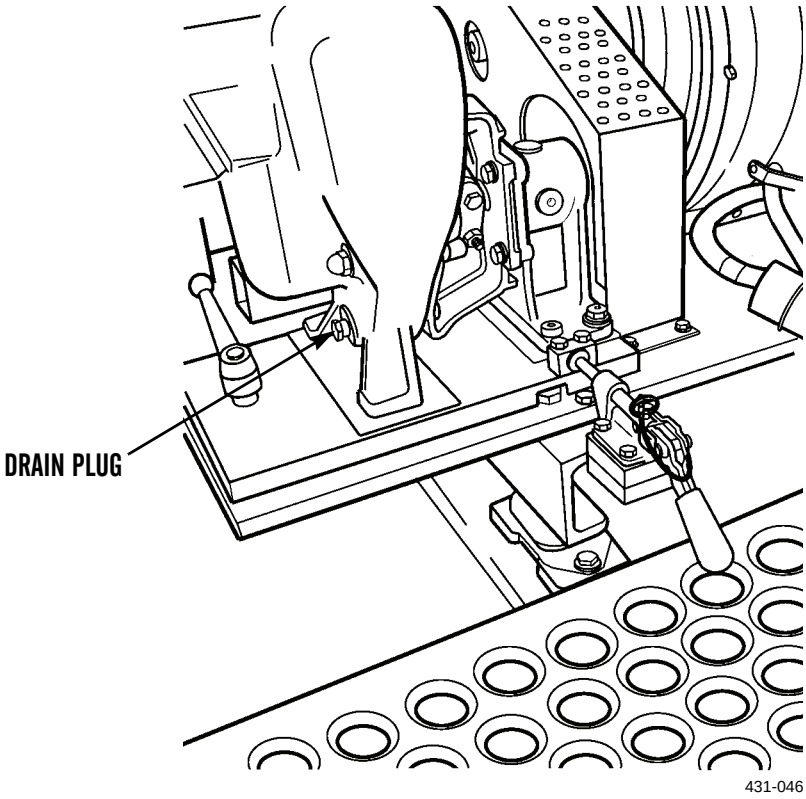
GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

7. Remove tethered cap on hose end.
8. Unwind all hose from the hose reel.
9. Open all valves.
10. Using the prime mover, lift the front end of the Hippo approximately 16 to 24 in. (41 to 61 cm).
11. Drain the Hippo until the tank and plumbing are empty of water.
12. Open the trap valve located under Valve D and allow any water caught in the trap to be drained out.



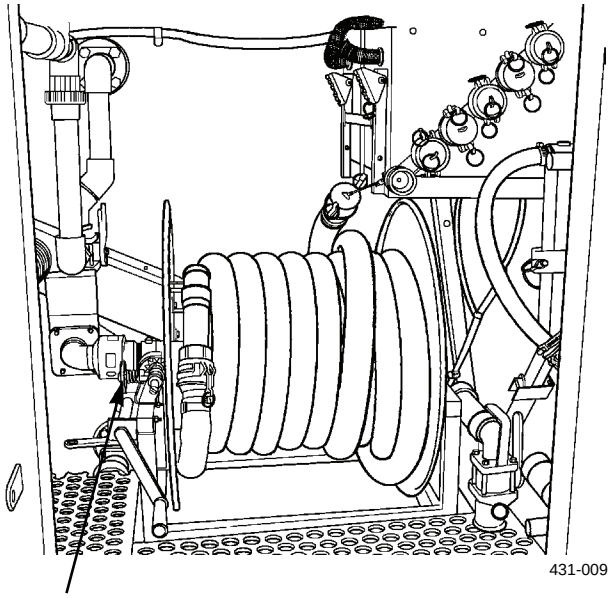
GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

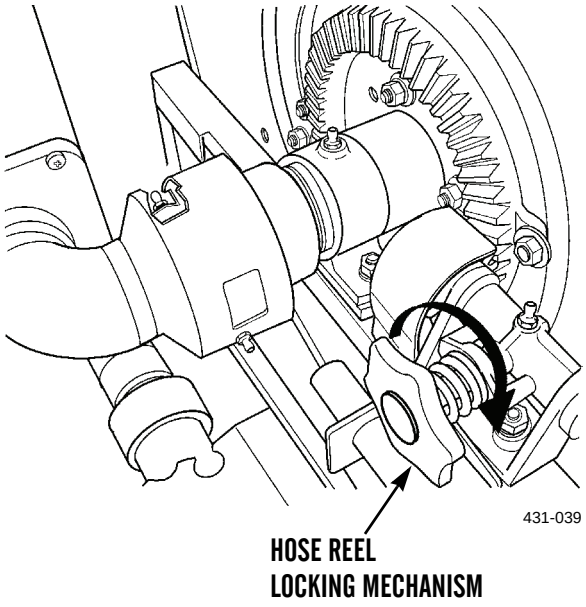
13. Drain pump by removing drain plug at the base of the pump. Drain until empty.



GRAVITY DRAINING OF THE TANK AND PLUMBING - CONTINUED

14. Once draining is complete, close all valves, including the trap valve and pump valve.
15. Return hose to the hose reel within the housing. To facilitate draining of the hose, keep end of hose uncapped while cranking hose reel.
16. Place tethered cap on the end of the hose. Place the hose in its stowed configuration by rotating the hose reel counter-clockwise until the tethered cap is taut.
17. Rotate hose reel locking mechanism clockwise until tight.





18. Shut down main power using EMERGENCY STOP button (WP 0007 00).
19. Close access doors.
20. Stow ladder (WP 0005 00).
21. Close port covers.
22. Secure the Hippo for transport (WP 0001 00).

END OF WORK PACKAGE

OPERATION UNDER UNUSUAL CONDITIONS 0010 00

GENERAL

This section contains special instructions for the operation of the M105 Hippo in unusual conditions. The standard guidelines for Hippo operation should be followed along with the following precautions for various weather conditions.

WARNING

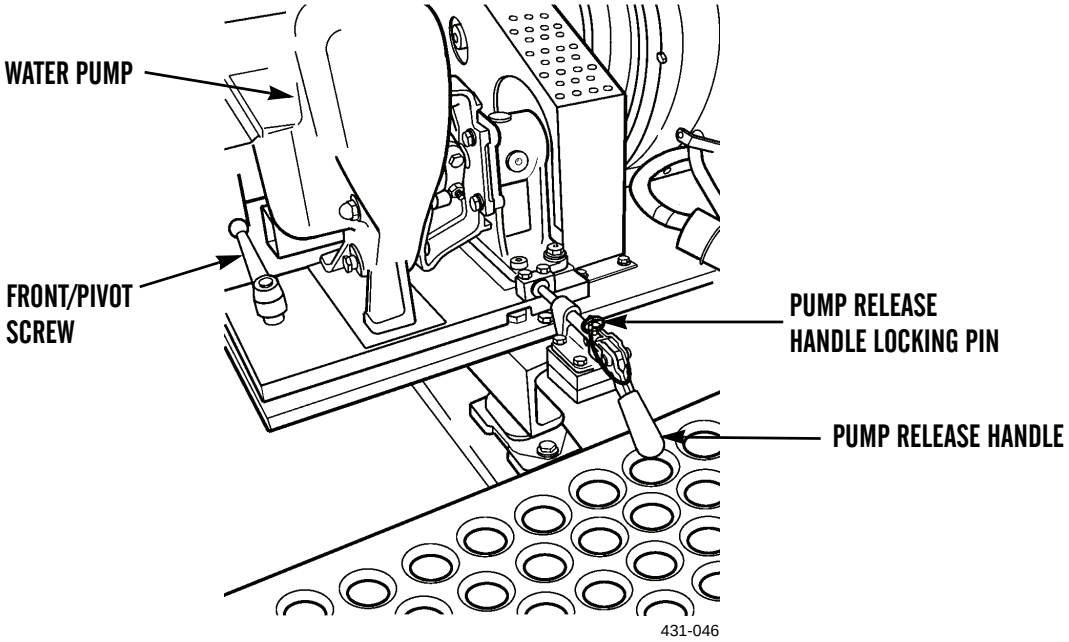
- Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and, when breathed, deprives the body of oxygen, causing SUFFOCATION. Breathing air with carbon monoxide produces symptoms of headache, dizziness, drowsiness, loss of muscular control, and coma. Permanent BRAIN DAMAGE or DEATH can result from severe exposure.
- Because the engine is operating in an enclosed area, ensure that all the exhaust tunnels are not leaking. Carbon monoxide may be generated and is an invisible poisonous gas. Failure to comply may result in injury or death to personnel.
- Wear arctic clothing when housing temperatures fall and remain below 30°F (-1°C). Cold stress preventive measures in FM 31-70 should be applied when housing temperatures fall and remain below 30°F (-1°C). Failure to comply may result in serious injury or death to personnel.

ENGAGING AND DISENGAGING WATER PUMP

CAUTION

- If the water pump has not been placed offline, it may be necessary to heat the pump plate to free up the movement of the pump (notify Unit Maintenance). Failure to do so could result in damage to equipment.
- When starting the unit in extreme cold, the water pump must be taken offline to allow the water pump to thaw out. Failure to do so may cause severe damage to water pump.

1. To take the water pump offline for operations in extreme cold or storage:
   a. Remove the pump release handle locking pin.
   b. Loosen the front pivot screw.
   c. Pull up the pump release handle.
   d. Push the water pump in to allow slack in the belt.
   e. Tighten the front pivot screw.



CAUTION

Before putting pump online or introducing water to the unit, the housing temperature needs to be at least 35°F (2°C). Ensure the pump is primed (WP 0006 00). Failure to comply may result in damage to equipment.

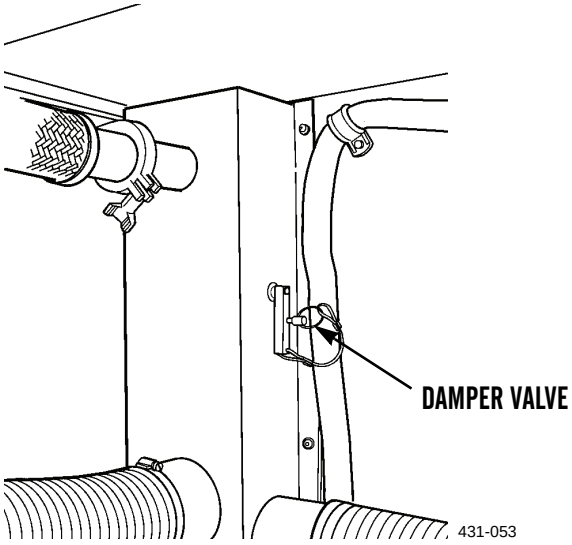
2. Putting pump online:
   a. Loosen front pivot screw.
   b. Pull up pump release handle.
   c. Insert pump release handle locking pin.
   d. Tighten front pivot screw.

COLD WEATHER STARTUP

WARNING

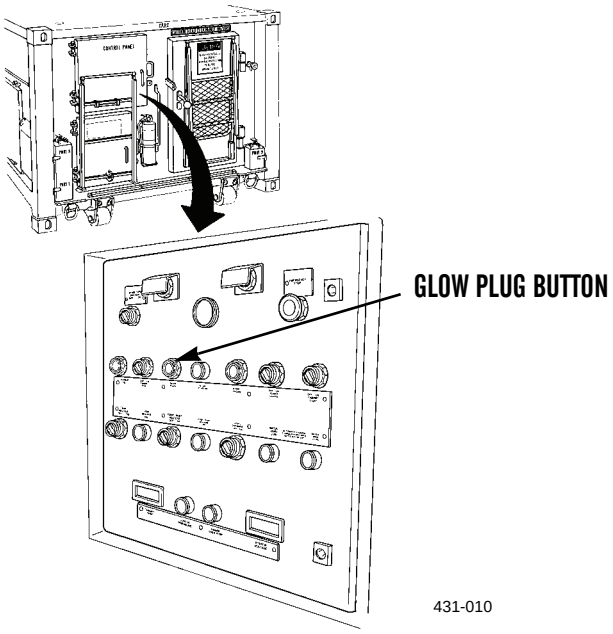
- DO NOT touch extremely cold metal. Bare skin may freeze to cold metal. Failure to comply may result in injury to personnel.
- Wear gloves when operating or handling metallic equipment that is wet or ice covered. Failure to comply may result in injury to personnel.
- Exercise caution when working on the catwalk where snow or ice exists. Failure to comply may result in injury to personnel.

1. Pull out EMERGENCY STOP button and push in POWER ON button. Turn CABINET LIGHT switch to ON position (WP 0007 00).
2. Turn LEVEL OVERRIDE switch to the ON position.
3. Enter the Hippo through main access door and verify that pump has been disengaged. This should have occurred when unit was totally drained (see “Cold Weather Storage” in this work package). Verify that engine heat system has been positioned to supply heat to interior of compartment by placing damper valve on exhaust tunnel in closed position and valves on two heater plenums to open position. Refer to “Heater Plenum Damper Valves” in WP 0004 00.



4. Exit enclosed area, shut main access door, and turn CABINET LIGHT switch to OFF position.

COLD WEATHER STARTUP - CONTINUED



5. Depress GLOW PLUG button and hold in accordance with table below:

GLOW PLUG OPERATION	
+32°F (0°C)	No plug use, or ONLY during cranking.
0° - 32°F (-18°-0°C)	30 - 45 seconds of plug use and plug engaged during cranking.
-10° - 0°F (-23°- -18°C)	One minute plug use and plug engaged during cranking.
Below -10°F (-23°C)	Two minutes plug use and plug engaged during cranking.

COLD WEATHER STARTUP - CONTINUED

6. Start engine (WP 0007 00).
7. If engine fails to start, wait 30-45 seconds, turn ENGINE RUN switch to OFF position, and repeat steps 5 and 6.

NOTE

- Part of heating effort is to provide warm air to Ports 1, 2, and 3. In order to maximize value of this heat, be sure that port covers are closed and secure.
- In the event the operator wishes to energize both heaters at a temperature above 35°F (2°C) the temperature controller may be reset. Refer to Temperature Controller Setting in this work package.

8. Once Hippo engine is running, turn both heater switches to ON and verify by visual indication of two amber heater lights. Tank heaters and heat trace will not activate if ambient temperature is above 35°F (2°C) due to setting of temperature controller.
9. Allow Hippo to heat sufficiently before addition of water. This will require a period of running until interior temperature gauge reads 35°F (2°C) or higher. Once temperature gauge reads 35°F (2°C), check to see if Valves A, B, C, D, E, and F open and close. If valves do not open and close freely, then allow unit to thaw until they do.

NOTE

When exposed to freezing temperatures, it will be necessary to use thermal blankets. Thermal blankets can be used to insulate metal ends of each hose segment. This should be performed IMMEDIATELY upon connecting hose segment to Hippo. There is a small blanket for hose connection to Hippo and nozzle. The longer blanket can be used where two lengths of hose are joined. Wrap blankets as tightly as possible and secure with straps.

10. Prime pump in accordance with WP 0006 00.

NOTE

When engaging pump, if slide plate does not move, allow unit to thaw until it can be engaged properly.

11. Engage the pump.

NOTE

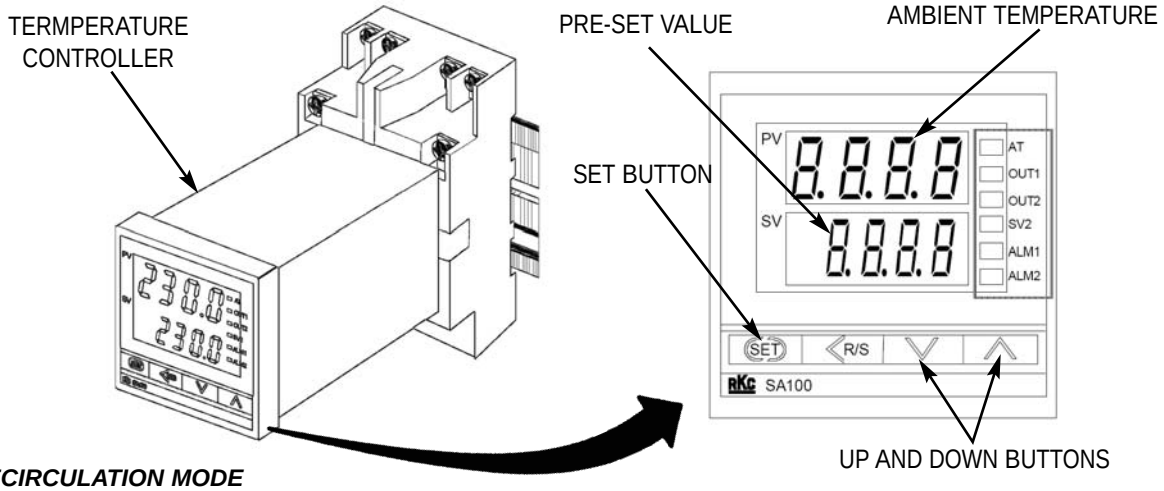
- At -10°F (-23°C), PLC will not operate the three water sensors.
- Upon completion of distribution or filling process, and securing the appropriate valves on Hippo, immediately return hose to hose reel within enclosure. Remove insulation sleeves and stow them on front pipe that can hold water. Reel hose back into unit.
- **20°F (-7°C) and above.** Hippo operations can proceed as normal when temperatures are within this range. Frequently check the temperature of enclosure. When the temperature drops below 35°F (2°C), engine must be started and heat applied to enclosure area.
- When utilizing hose segments on Port 1, Port 2, and Port 3, be sure and return them to the enclosure interior when not being utilized. DO NOT allow the system to sit idle for more than five hours without draining at least the pump and the plumbing within the enclosure. The tank with water will not freeze when at this temperature range for a considerable amount of time (24 hours).
- **Below 20°F (-7°C).** When operating below 20°F (-7°C), it is recommended to utilize only the hose reel for ALL distribution activities. When the temperatures drops to 0°F (-18°C) and below, ONLY the hose reel can be used for distribution activities. Upon completion of any distribution effort, immediately rewind the hose onto the hose reel and allow the heat of the enclosure to warm the hose. DO NOT ALLOW WATER TO REMAIN STANDING IN THE HOSE FOR ANY PERIOD OF TIME (greater than one minute). When ceasing the distribution of water from the hose reel, allow the Hippo to recirculate water and immediately drain the water from the hose as you rewind it. Recirculation is accomplished by opening Valve E and Valve F, closing Valve D, and closing all other valves.
- When filling the Hippo through Port 3, you must use a section of the rigid hose from the hose reel that has been subjected to the warm enclosure. Connect the hose to the water source and immediately start the filling operation. Upon completion of the filling operation, allow the Hippo to continue recirculating (see recirculation procedures) and immediately return the hose segment to the enclosure.

TEMPERATURE CONTROLLER SETTING

NOTE

The temperature controller is pre-set for 35° (2°C) and has an operating range of three degrees. The temperature controller can be re-programmed to allow the tank heaters and heat trace to energize at a higher temperature.

1. Turn on main power by depressing POWER ON button. Refer to WP 0004 00.
2. Open control panel using BII key and locate temperature controller. Refer to WP 0004 00.
3. Press SET button once. Observe the selected digit flash.
4. Use UP and DOWN arrow keys to change digit's value.
5. When desired value is achieved, press SET button to store value.
6. Close and lock control panel and turn off main power. Refer to WP 0004 00.



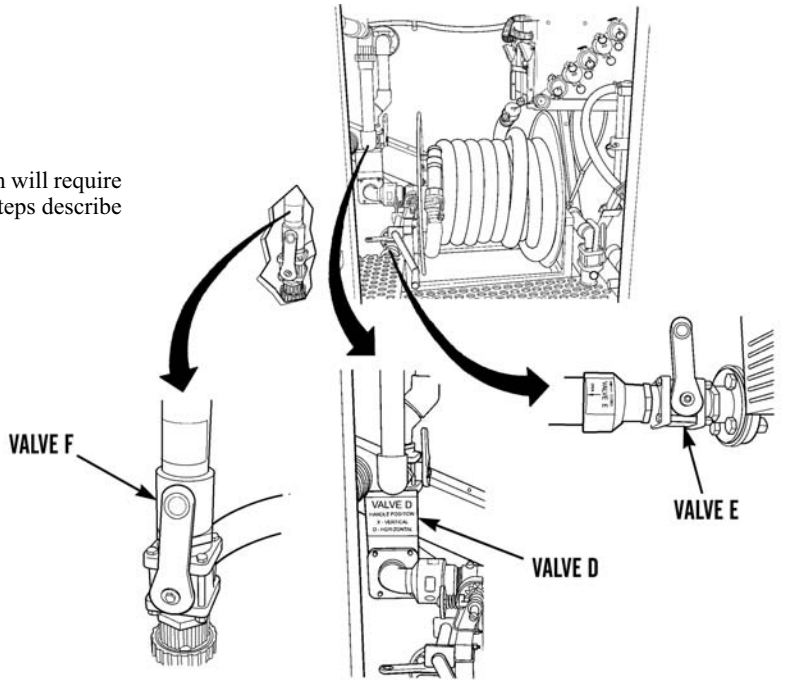
RECIRCULATION MODE

NOTE

Refer to Valve Position Chart (WP 0006 00) for valve location and operation.

There are several circumstances which will require the water to be recirculated. The following steps describe the correct procedure:

1. Open Valves E and F. Close Valve D.
2. Start the engine (WP 0007 00).



431-012

TRANSPORT OF WATER IN COLD WEATHER

NOTE

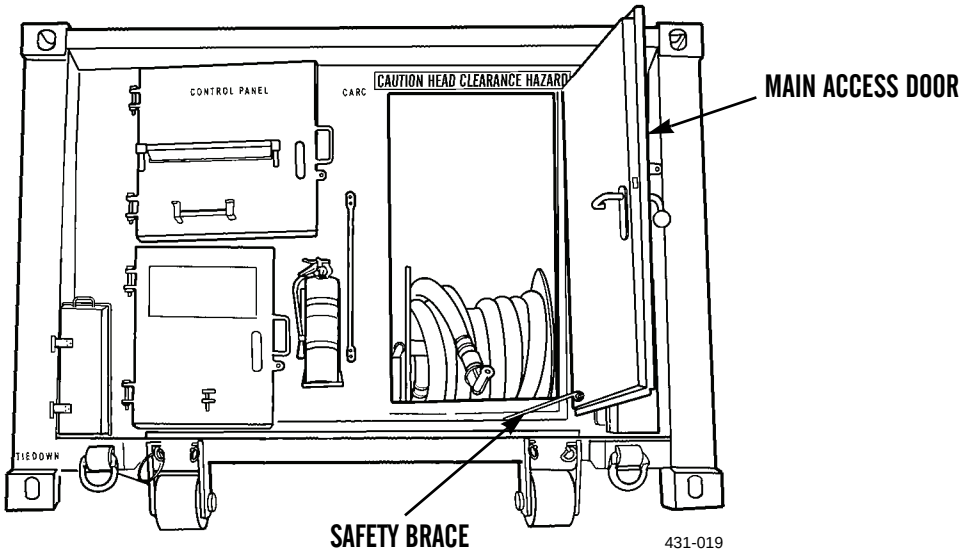
Prior to transport of Hippo, housing must be warmed to 35°F (2°C). All hoses, nozzles and adapters must be properly stowed.

1. Make sure fuel tank is full.

WARNING

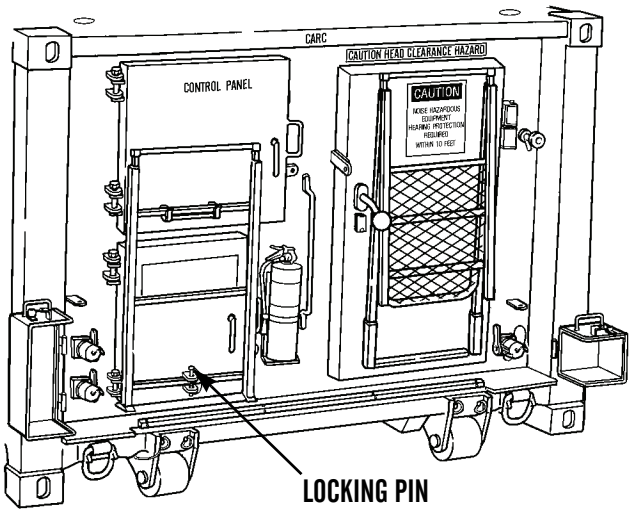
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

2. Open main access door. Brace the door using the safety brace on the inside of the door.



TRANSPORT OF WATER IN COLD WEATHER - CONTINUED

3. Remove locking pin. Remove ladder section.

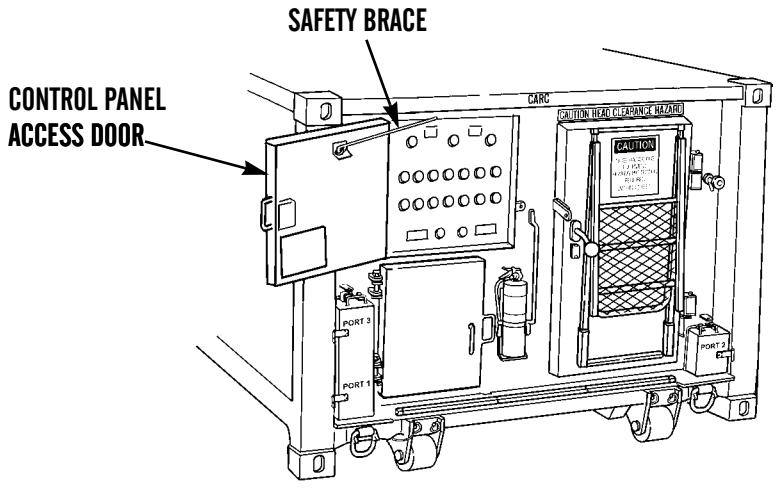


431-013

WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

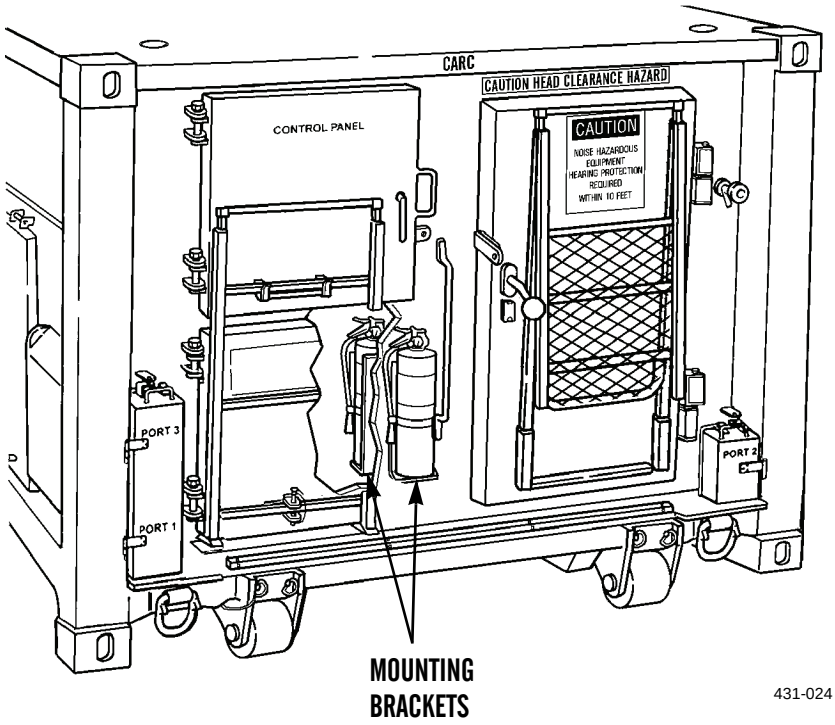
4. Open control panel access door. Brace the door using the safety brace on the inside of the door.



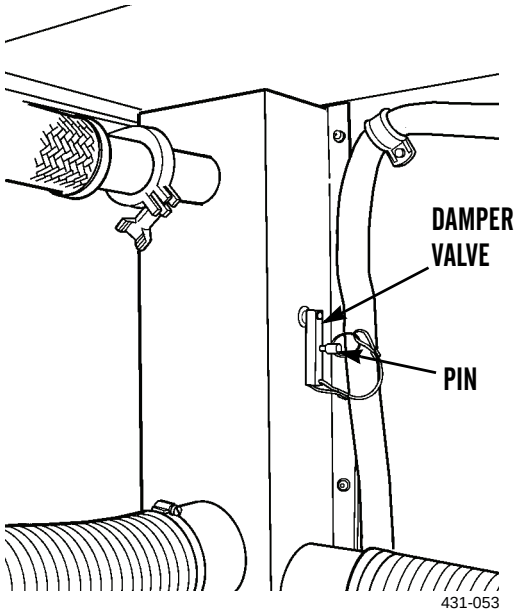
431-027

TRANSPORT OF WATER IN COLD WEATHER - CONTINUED

5. If necessary, turn CABINET LIGHT switch to ON position (WP 0007 00).
6. Move fire extinguisher from interior mounting bracket to exterior mounting bracket.

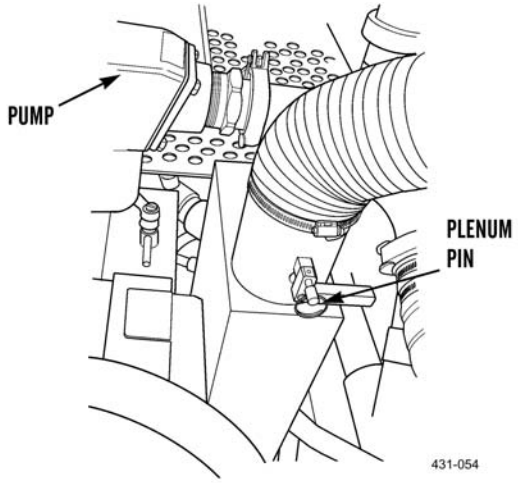


7. Put plumbing in recirculation mode and open Valve E and Valve F. All other valves must be closed. Refer to illustration in “Recirculation Mode” earlier in this work package.
8. Close tunnel damper assembly by removing pin and placing handle in desired position. Reinstall pin.



TRANSPORT OF WATER IN COLD WEATHER - CONTINUED

9. Open plenums at Valve E and at front of pump by removing pin and placing handle in desired position. Reinstall pin.



10. Put pump on line (see "Engaging and Disengaging Water Pump" in this work package).
11. Prime pump (WP 0006 00).
12. Close main access door.
13. Start engine (see "Cold Weather Startup" in this work package). Water should be recirculating.
14. Turn PUMP/PORT switch to ON position then turn TANK HEATER switch to ON position (WP 0004 00).
15. Turn the CABINET LIGHT and PANEL LIGHTS switches to OFF position.
16. Close control panel door.
17. Stow ladder (WP 0005 00).
18. Close port covers.
19. Secure Hippo for transport (WP 0001 00).

CAUTION

If Hippo becomes inoperable in cold weather, water must be drained from the tank, plumbing, and pump prime to avoid damage to equipment. Failure to comply may result in damage to equipment.

20. Check periodically to make sure engine pump is still running.
21. Refuel within 3 hours.

COLD WEATHER STORAGE

When a fully or partially loaded Hippo will be dropped in an area that may incur cold weather (well below freezing), and the Hippo requires draining (WP 0009 00) due to weather, remove rollers and place them in their stowage brackets (WP 0001 00) prior to Hippo being dropped on the ground. Removal of rollers will eliminate a level condition that would prevent Hippo from being completely drained. When temperature is not expected to drop below freezing, removal of rollers are not necessary. If being stored and drained (WP 0009 00), pump must be offline. For ideal draining conditions, lift front of Hippo 16 to 24 in. (41 to 61 cm) off the ground and follow draining procedures.

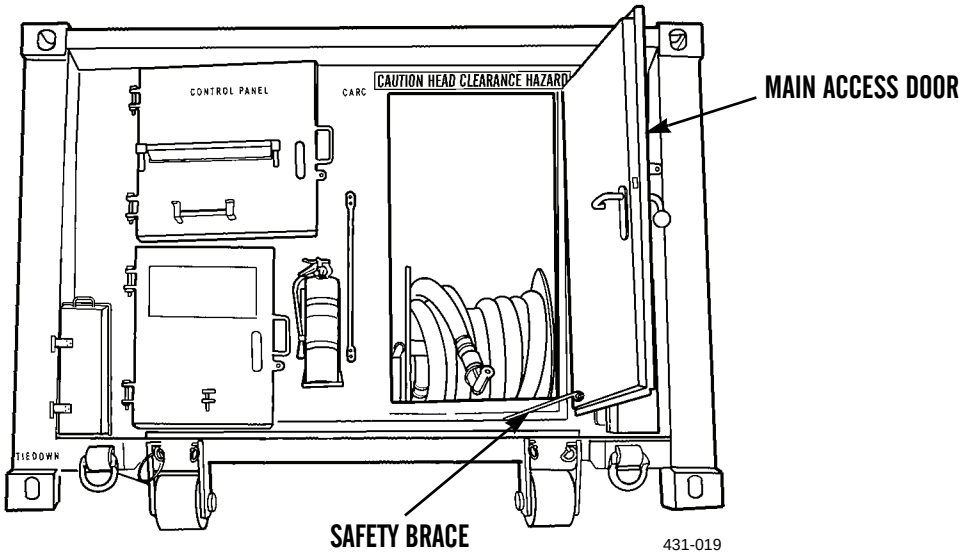
EMERGENCY PUMPING PROCEDURE FROM INOPERABLE HIPPO

This procedure uses an operable Hippo to transfer or disperse water from a disabled Hippo to an alternate water container.

WARNING

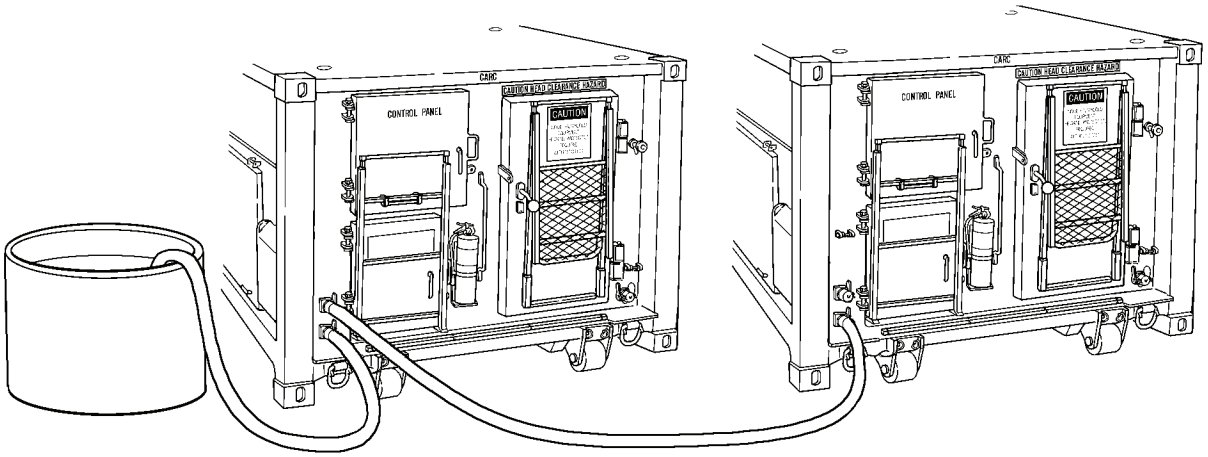
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

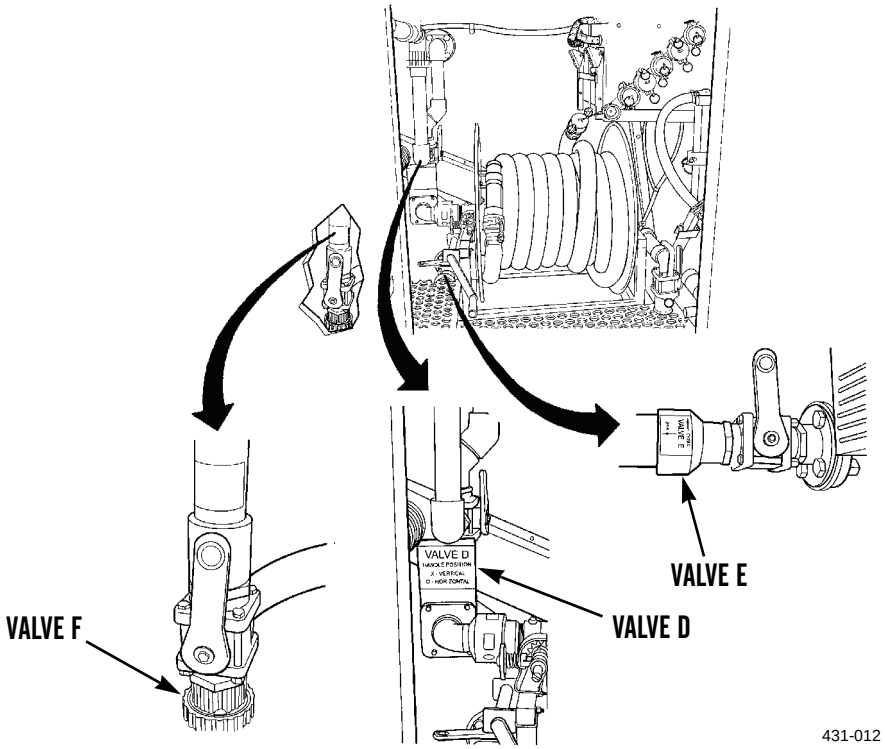
1. Open main access door on disabled Hippo and secure safety brace.



EMERGENCY PUMPING PROCEDURE FROM INOPERABLE HIPPO - CONTINUED

2. Remove sufficient hose from the hose reel to reach from the discharge port on disabled Hippo to the Port 3 on the usable Hippo and from the discharge port on the usable Hippo to the transfer destination.
3. Connect a hose from discharge Port 1 of disabled Hippo to Port 3 on usable Hippo.
4. Connect a hose from discharge Port 1 on usable Hippo to transfer destination.
5. Close Valve E, Valve D, and Valve F of usable Hippo.
6. Open Valve A and Valve E, and close Valve D and Valve F on disabled Hippo.
7. Make sure the transfer destination container is open and ready to accept water.



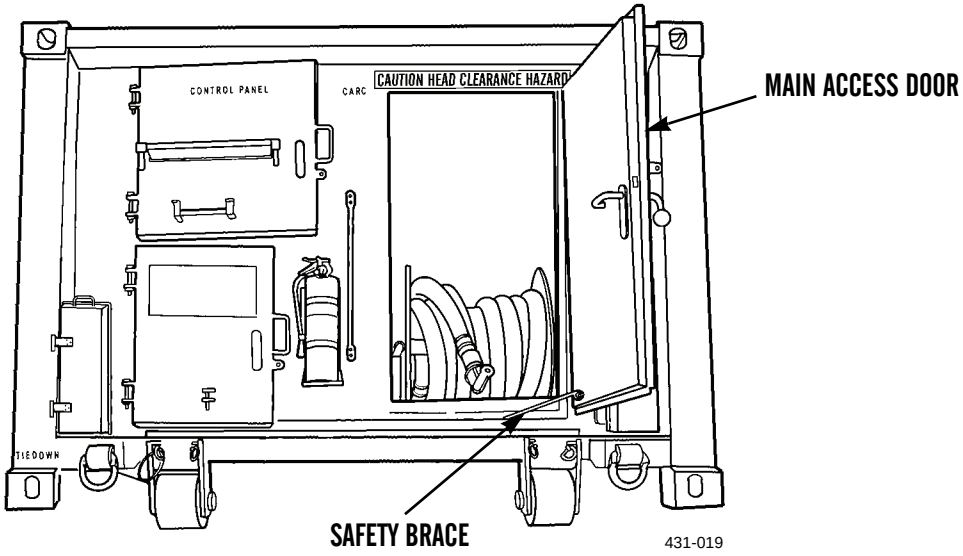


EMERGENCY PUMPING PROCEDURE FROM INOPERABLE HIPPO - CONTINUED

WARNING

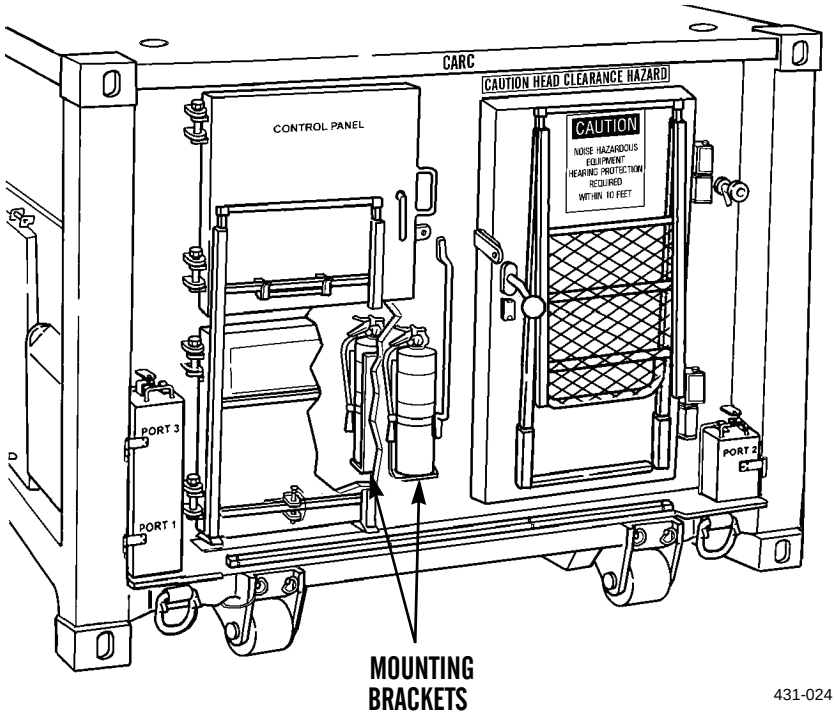
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

8. Open the main access door on the usable Hippo and secure safety brace.



EMERGENCY PUMPING PROCEDURE FROM INOPERABLE HIPPO - CONTINUED

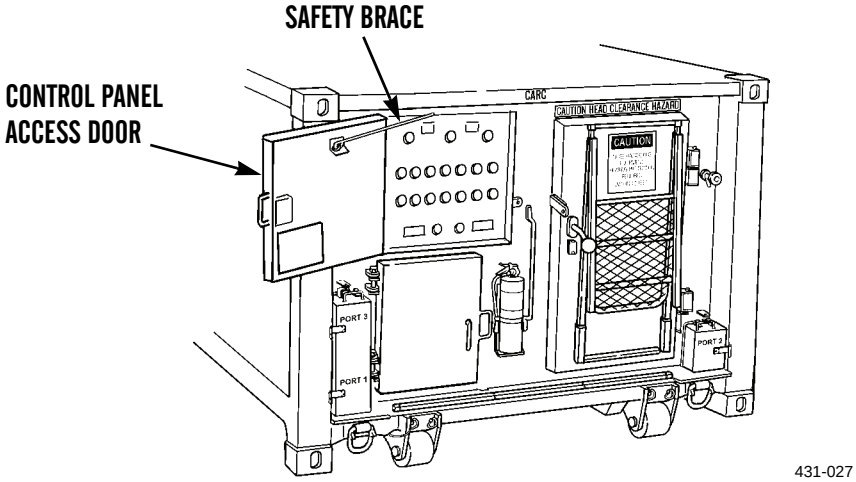
9. Remove fire extinguisher from interior mounting bracket of usable Hippo and secure in exterior mounting bracket of usable Hippo.



WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

10. Open the control panel access door of the usable Hippo and secure the safety brace.



EMERGENCY PUMPING PROCEDURE FROM INOPERABLE HIPPO - CONTINUED

11. Ensure pump of usable Hippo is primed (WP 0010 00).
12. Start engine of usable Hippo (WP 0007 00).
13. Open Valve C on usable Hippo. Water should be flowing to destination container.
14. Monitor destination container for fill.

CAUTION

DO NOT run the pump dry during transfer operation. Damage to the equipment will result. Operator must monitor flow of water, as automatic shutoff features will not work when using this procedure.

15. Upon completion of transfer or discontinuation of water flow, shut down usable Hippo.
16. Close all valves on usable Hippo and disabled Hippo.
17. Return all hoses to hose reels.
18. Return fire extinguisher to interior mounting bracket.
19. Close all access doors.

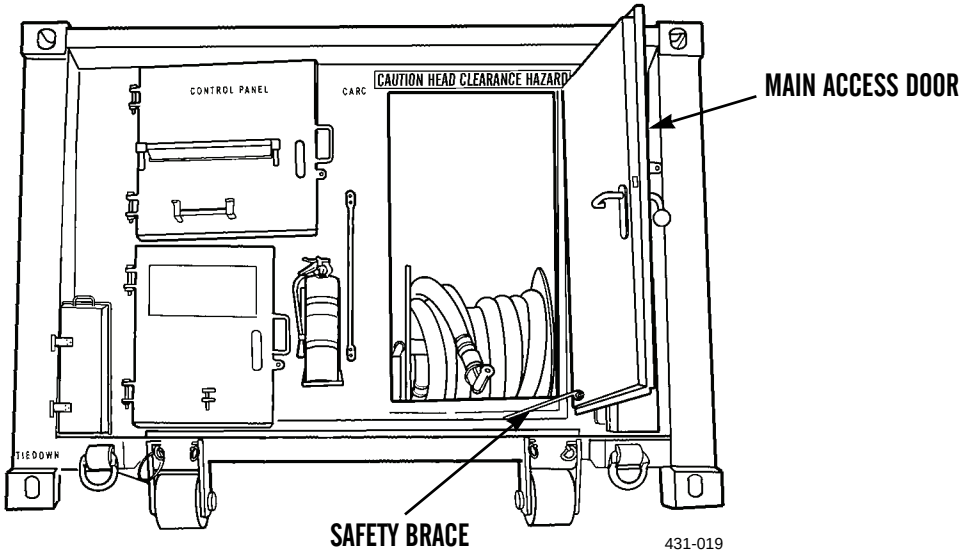
EMERGENCY TRANSFER OPERATION

Use the following procedure to transfer water from disabled Hippo to usable Hippo.

WARNING

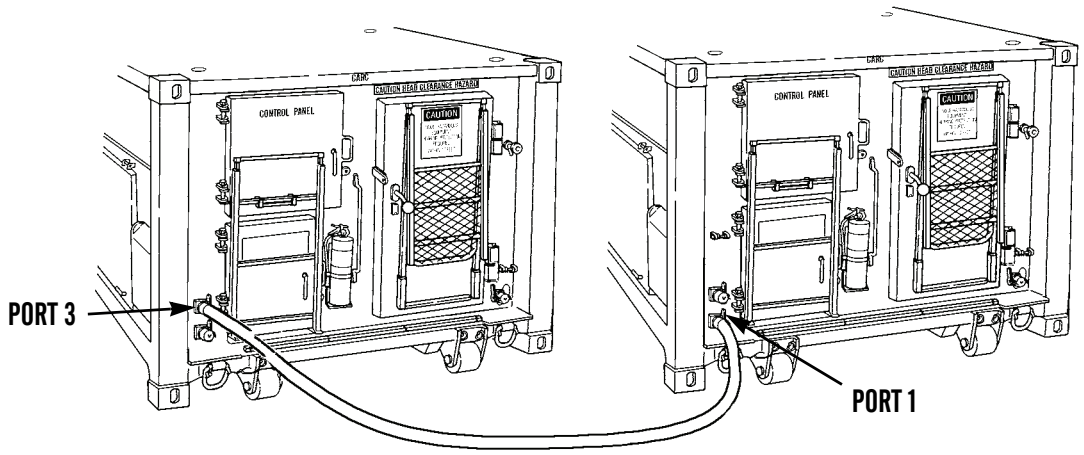
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

1. Open main access door on disabled Hippo and secure safety brace.



EMERGENCY TRANSFER OPERATION - CONTINUED

2. Remove sufficient hose from hose reel to reach from discharge port on disabled Hippo to Port 3 on usable Hippo.
3. Connect a hose from discharge Port 1 of disabled Hippo to Port 3 on usable Hippo.



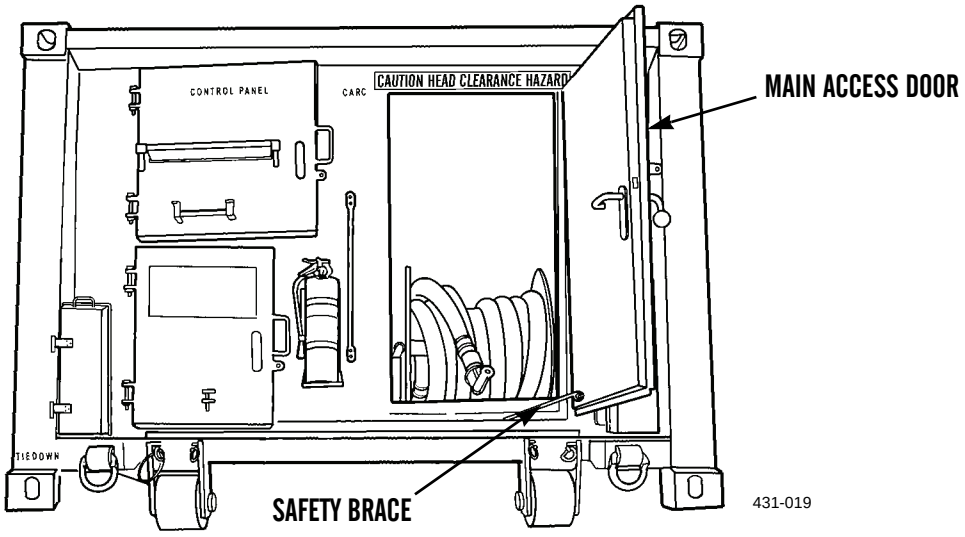
431-232

4. Close Valve E and Valve D, and open Valve F and Valve C of the usable Hippo. Refer to illustration in "Recirculation Mode" earlier in this work package.
5. Open Valve A and Valve E, and close Valve D and Valve F on the disabled Hippo.

WARNING

- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel.

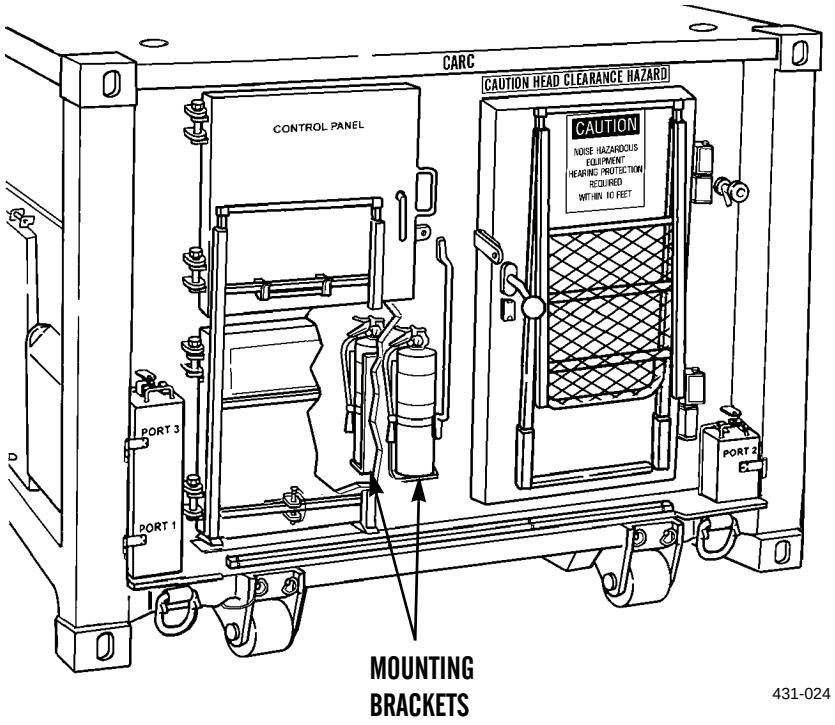
6. Open the main access door on the usable Hippo and secure safety brace.



431-019

EMERGENCY TRANSFER OPERATION - CONTINUED

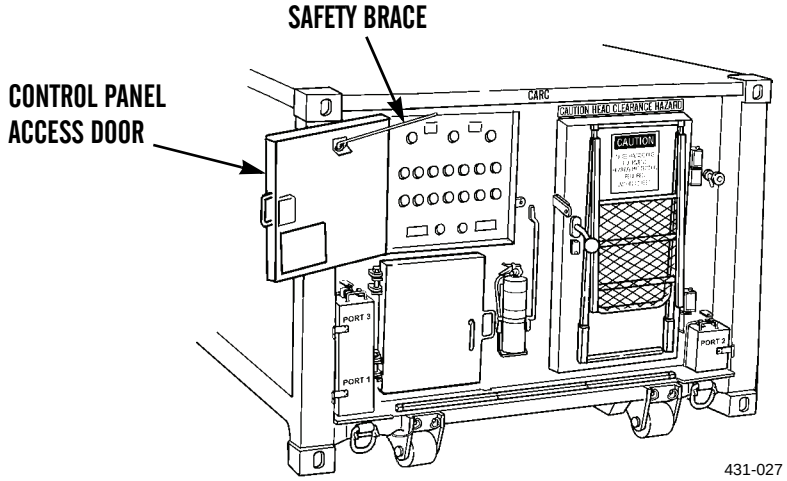
7. Remove the fire extinguisher from the interior mounting bracket of the usable Hippo and secure in the exterior mounting bracket of the usable Hippo.



WARNING

When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.

8. Open the control panel access door of usable Hippo and secure safety brace.



EMERGENCY TRANSFER OPERATION - CONTINUED

9. Start the engine of usable Hippo (WP 0007 00).
10. Water should be flowing to destination container.
11. Monitor destination container for filling.

CAUTION

Do not run the pump dry during transfer operation. Damage to the equipment will result. Operator must monitor flow of water, as automatic shutoff features will not work when using this procedure.

12. Upon completion of transfer or discontinuation of water flow, shut down usable Hippo.
13. Close all valves on usable Hippo and disabled Hippo.
14. Return all hoses to hose reels.
15. Replace fire extinguisher to interior bracket.
16. Close all access doors.

OPERATION IN EXTREME HEAT/HIGH HUMIDITY

WARNING

When mission requires system or unit operator and crew to remain stationary in outside temperatures above 90°F (32°C), operator and crew must observe proper safety precautions to prevent heat stress injury. Refer to FM 21-10, *Field Hygiene and Sanitation,* and FM 4-25.11, *First Aid,* for proper precautions and preventive measures. Failure to comply may result in injury or death to personnel.

NOTE

- The Hippo is designed to operate in extreme heat. Breather and pressure valves control the release of high temperature buildup within the water container.
- The housing needs to have proper ventilation in extreme heat operations. Temperature buildup will be higher within the housing when operating the unit with all access doors closed.

1. The on-board engine is equipped with a high-temperature shutdown sensor. Engine will shut down when engine temperature is too high. Engine must be allowed to cool down before restarting.
2. Monitor fluid levels and change engine oil more frequently than listed in WP 0015 00.

OPERATION IN RAINY OR HUMID CONDITIONS

WARNING

Exercise caution when working where there are wet surfaces. Equipment may become slippery. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.

Keep moving parts clean and well lubricated.

OPERATION IN SALT WATER AREAS

Salt water will cause metal parts to rust and corrode. Clean, inspect, and lubricate as needed.

OPERATION IN DUSTY OR SANDY AREAS

1. Dusty and sandy areas will cause buildup within the housing. Ensure that access doors are closed at all times.
2. After operation, clean, inspect, and lubricate equipment.
3. Due to the quick buildup of dust and sand, clean, inspect, lubricate equipment, and change engine oil more frequently than listed in WP 0015 00.
4. In dusty conditions, because of excessive buildup, it may be necessary to clean and change the engine air filter more often than normal (WP 0015 00). If engine continually runs hot, air intake plumbing may need to be cleaned.

NBC DECON PROCEDURES

WARNING

- If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.
- Refer to FM 3-5, NBC Decontamination.

1. Operator's spray-down should be done within 15 minutes of exposure.
2. Use the on-board decontamination apparatus to decontaminate surfaces. Follow instructions in FM 3-5.

CO MONITOR ALARM ACTIVATES IN COLD WEATHER

WARNING

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from severe exposure.
- Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation.
- DO NOT enter the engine compartment if the CO monitor alarm activates.
- Failure to follow these warnings may result injury or death to personnel.

CAUTION

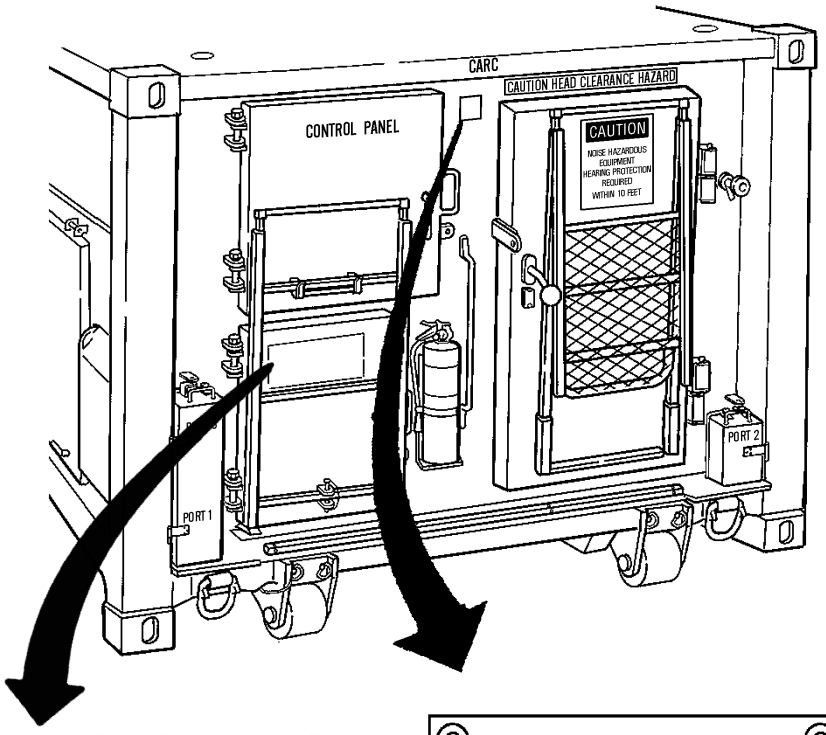
Do not leave man door and engine door open for extended periods of time. Cold temperatures may cause damage to equipment.

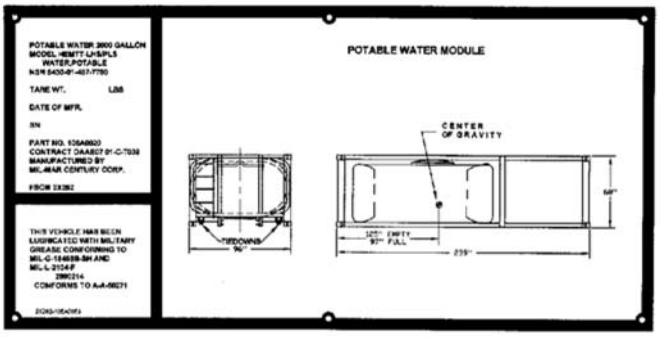
1. If the CO monitor alarm activates in cold weather, keep operating in recirculating mode and notify your supervisor.
2. Open the main access door and engine access door.
3. Allow enclosure to air out.
4. If CO monitor deactivates, resume operation.
5. If CO monitor alarm does not deactivate, notify your supervisor.
6. After operation resumes, if problem recurs, notify your supervisor.

END OF WORK PACKAGE

LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

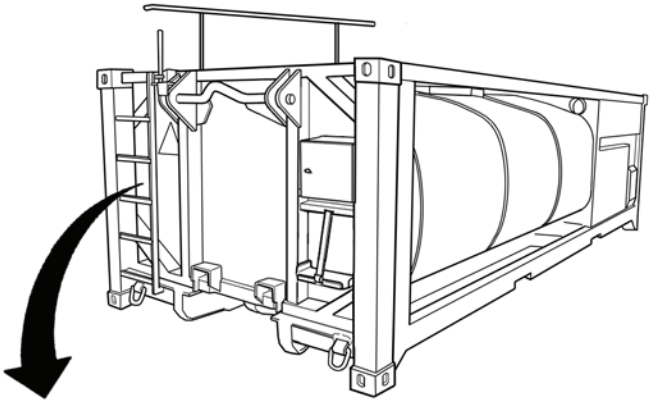
DATA PLATES

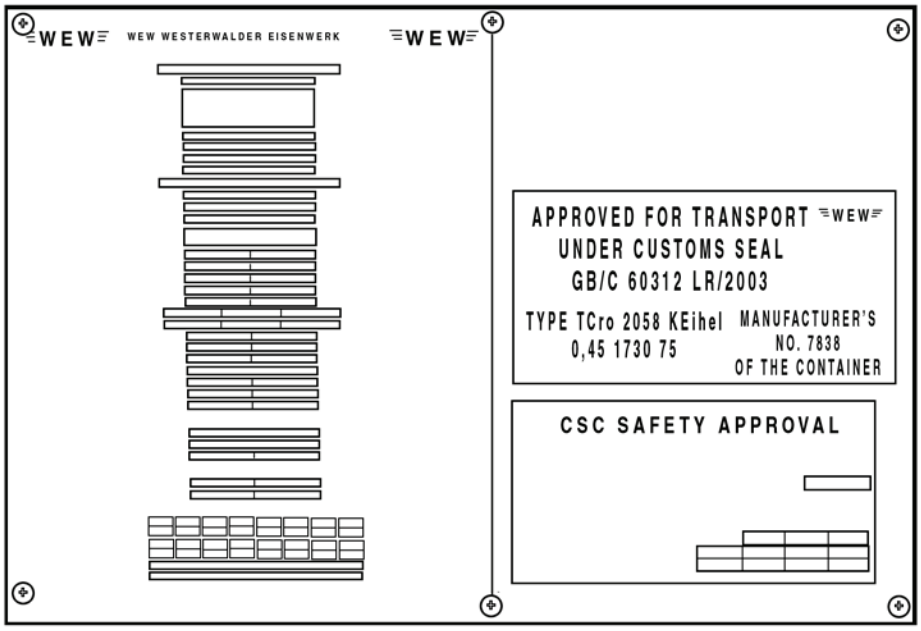




LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

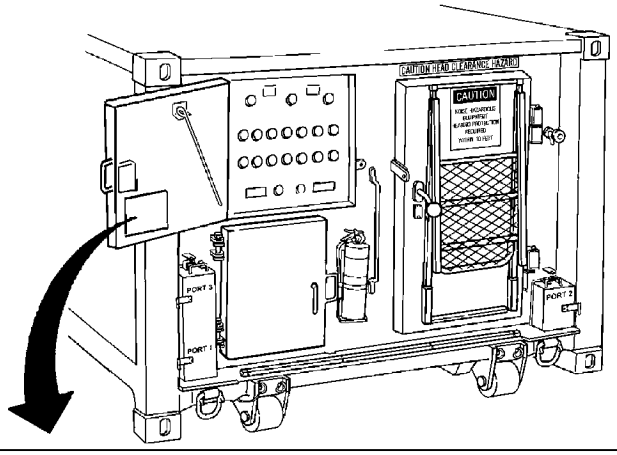
DATA PLATES - CONTINUED





431-058

DATA PLATES – CONTINUED



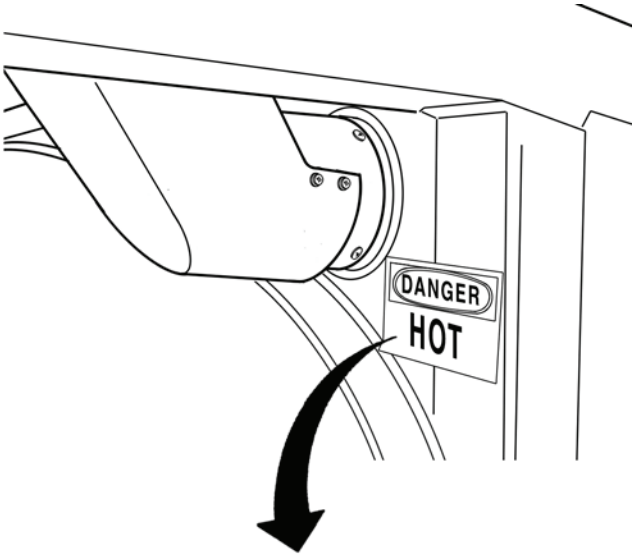
VALVE POSITION CHART

	VALVE A	VALVE B	VALVE C	VALVE D	VALVE E	VALVE F	ENGINE
Top Fill Port	X	X	X	X	X	X	OFF
Gravity Discharge-Port 1	O	X	X	X	O	O	OFF
Gravity Discharge-Port 2	X	O	X	X	O	O	OFF
Bulk Discharge With Pump-Port 1	O	X	X	X	O	X	ON
Bulk Discharge With Pump-Port 2	X	O	X	X	O	X	ON
Bottom Fill-Aux Pump-Port 3	X	X	O	X	X	O	OFF
Fill With Onboard Pump-Port 3	X	X	O	X	X	O	ON
Filling Station-Port 1	O	X	X	X	O	O	ON OR OFF
Filling Station-Port 2	X	O	X	X	O	O	ON OR OFF
Hose Reel Discharge	X	X	X	O	O	O	ON
Sampling/Discharge-Spigots 4	X	X	X	X	O	O	ON
Recirculation Mode	X	X	X	X	O	O	ON
Aux Pump Operation-Port 1	O	X	X	X	O	X	OFF
Aux Pump Operation-Port 2	X	O	X	X	O	X	OFF
Emergency On Board Pump Operation	O	X	O	X	X	X	ON
Bulk Discharge & Hose Reel	O	X	X	O	O	O	ON
Bulk Discharge & Filling Station	O	O	X	X	O	O	ON
Hose Reel Discharge & Fill Station Port A or B	O	X	X	O	O	O	ON
Plumbing Maintenance or Leakage	O	O	O	X	X	X	OFF
Drain Tank and System	O	O	O	O	O	O	OFF
WARNING- DO NOT USE FILL STATION ATTACHED TO HOSE REEL - EQUIPMENT DAMAGE MAY RESULT							
-LEGEND-							
O-VALVE OPEN							
X-VALVE CLOSED							

MIL-MAR CENTURY CORP.

LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

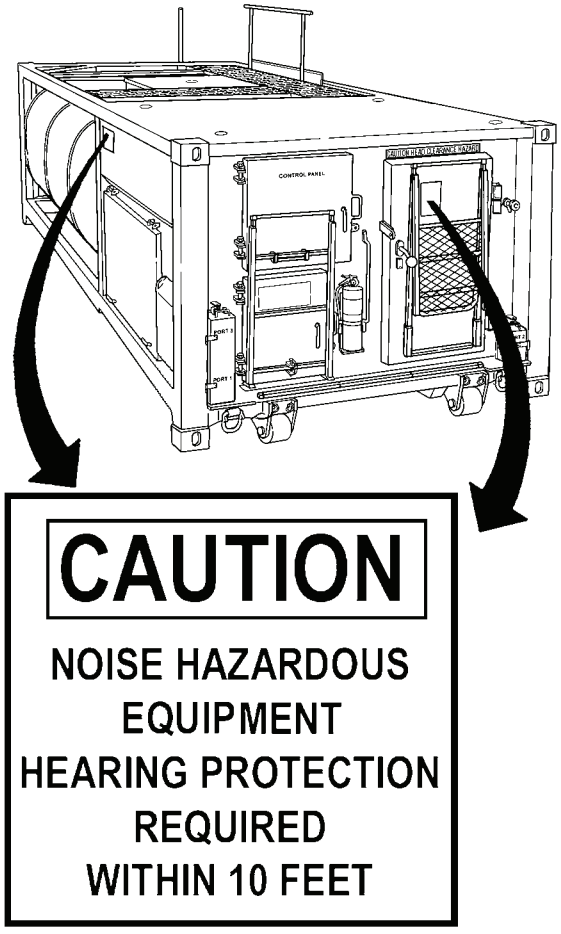
DECALS



431-110

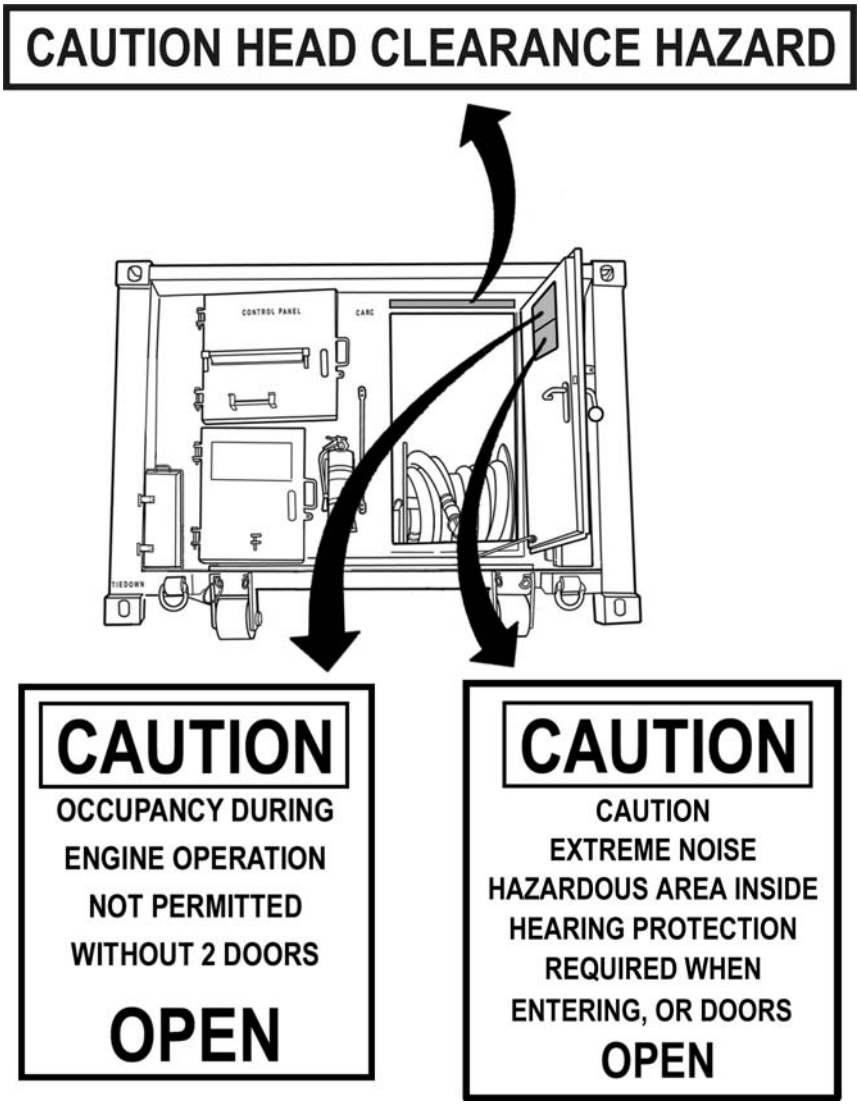
LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED



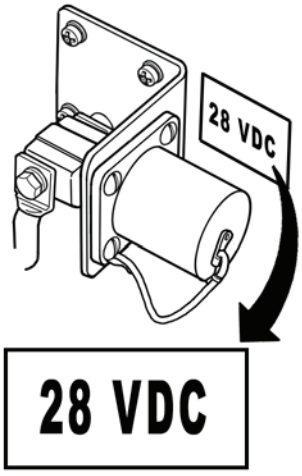
431-111

DECALS - CONTINUED



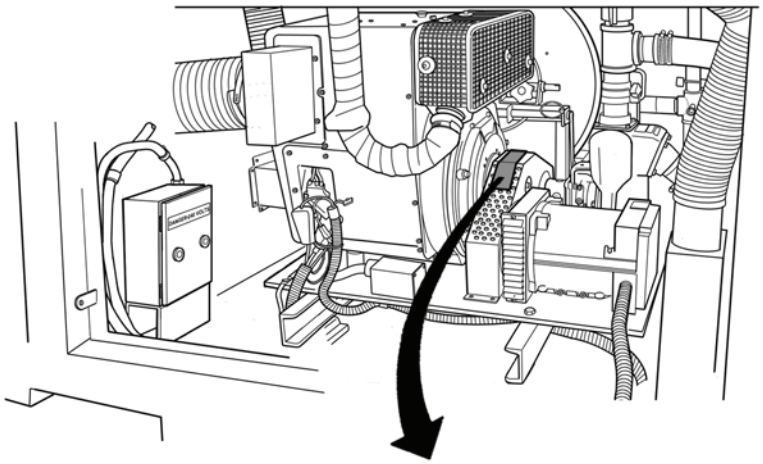
LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED



28 VDC

431-123

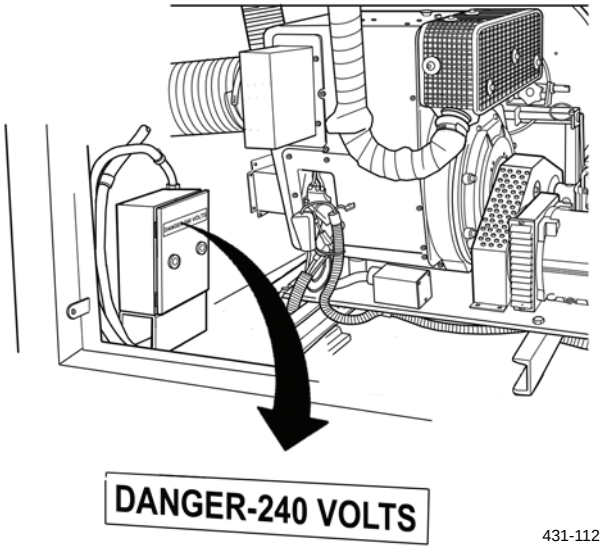


CAUTION FINGER HAZARD

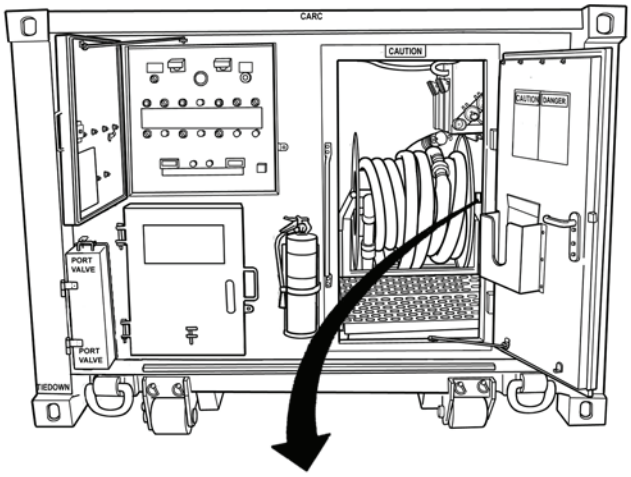
431-116

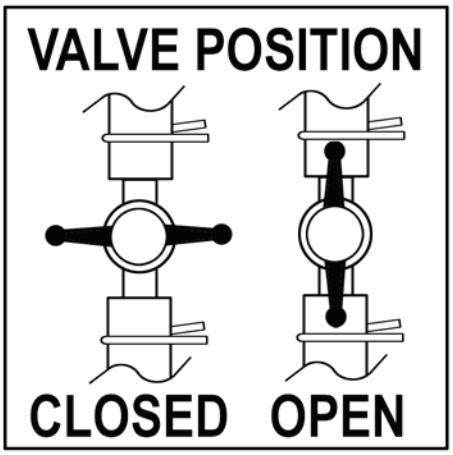
LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED



431-112

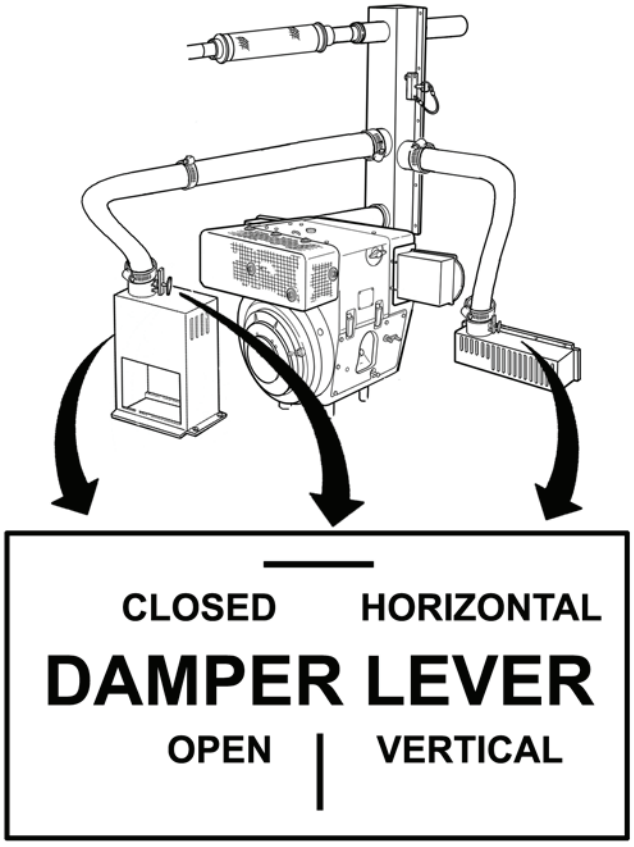




431-115

LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

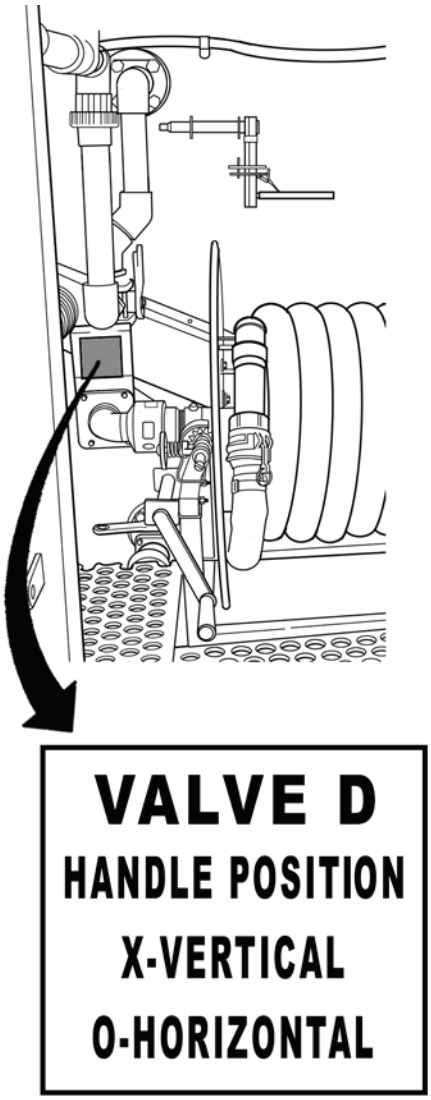
DECALS - CONTINUED



431-117

LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED



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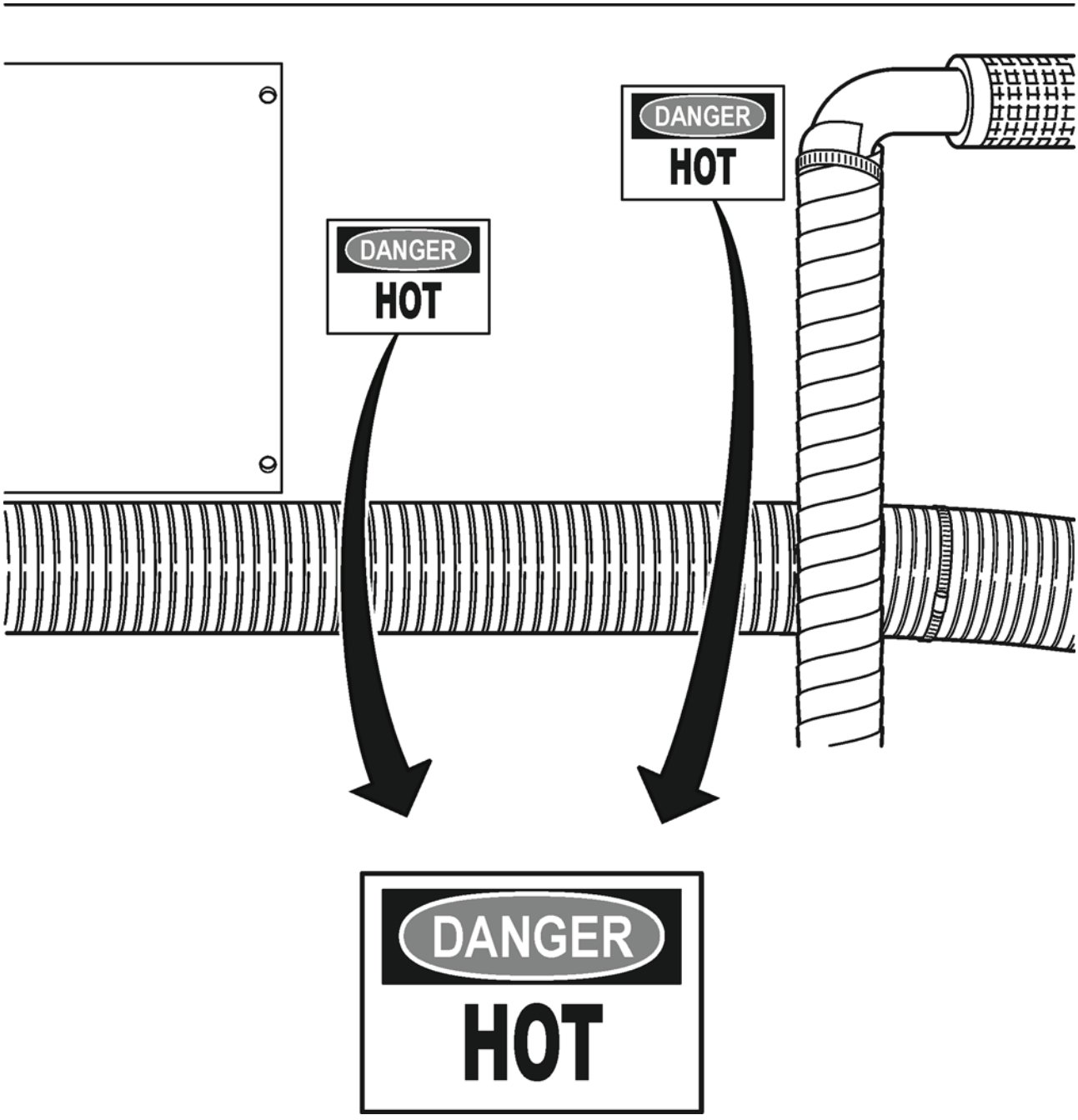
LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED



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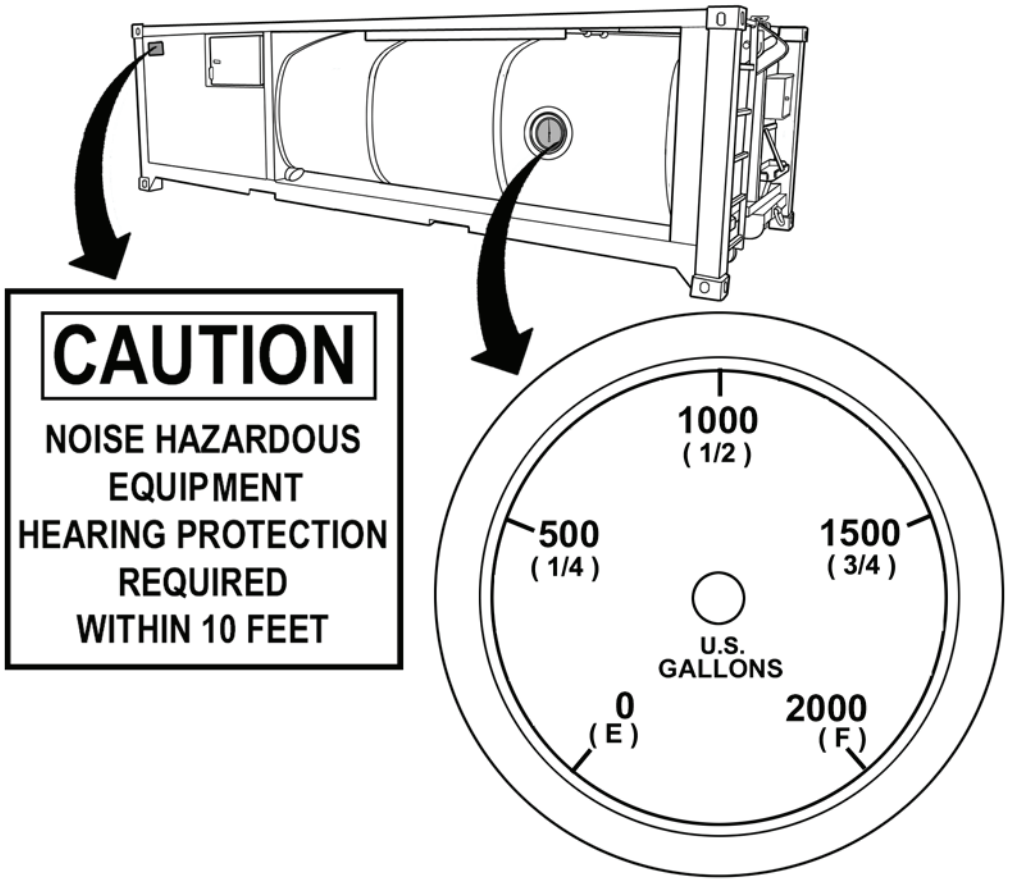
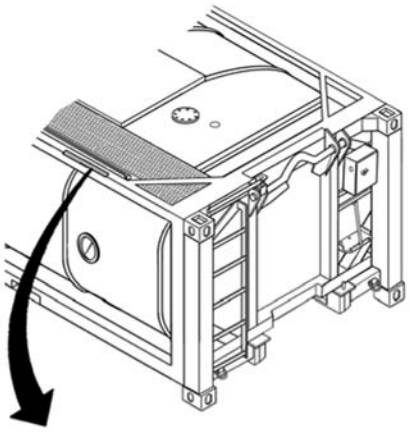
LOCATION AND DESCRIPTION OF DATA PLATES AND DECALS - CONTINUED 0011 00

DECALS - CONTINUED

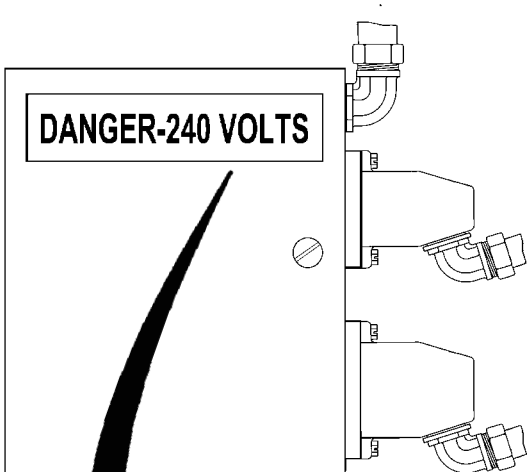


431-119

DECALS - CONTINUED

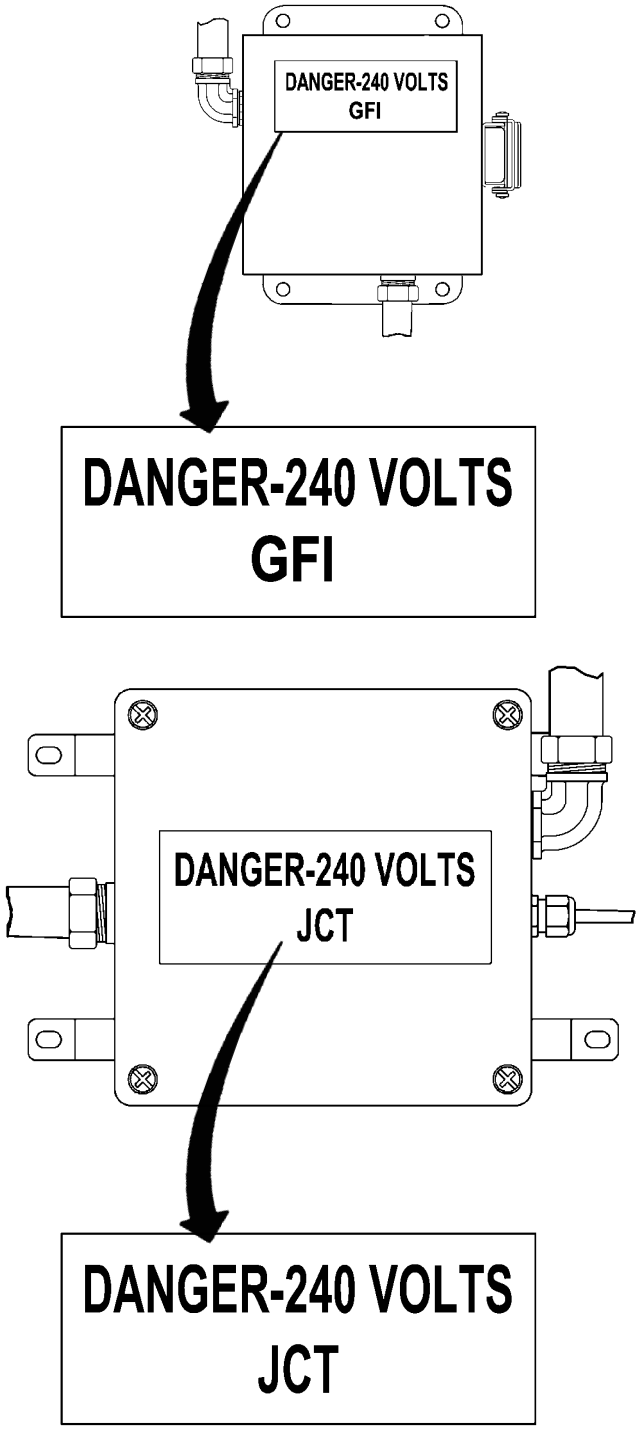


NO LEAN - NON LOAD BEARING



DANGER-240 VOLTS

DECALS - CONTINUED



END OF WORK PACKAGE

CHAPTER 3
OPERATOR TROUBLESHOOTING

TROUBLESHOOTING INTRODUCTION 0012 00

INTRODUCTION

1. Troubleshooting procedures are grouped by system, containing information required to locate malfunctions. A troubleshooting symptom index in 0013 00 is provided to aid in locating a malfunction or symptom and direct you to the appropriate troubleshooting table in 0014 00.
2. The troubleshooting table contains a listing of malfunctions, test, and inspection procedures, and corrective actions. The corrective action column further directs you to the required corrective maintenance procedure within this manual by work package number. However, if the required maintenance procedure is beyond operator level capabilities, the direction is to notify Unit Maintenance.

PRELIMINARY TROUBLESHOOTING PROCEDURES

NOTE

Fluid leaks are classified as either Class I, Class II, or Class III.

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

Before starting any specific troubleshooting procedures, perform the following:

1. Visually check all hoses and tubes for leaks.
2. Check for mechanical jamming or binding caused by rocks or other foreign matter.
3. Check fluid levels in subject area and fill as required (0015 00).

ELECTRICAL TROUBLESHOOTING

1. Analyze the symptoms and conditions to determine the most likely cause for the problem, then troubleshoot that circuit first. The more information you have concerning the problem, the easier it will be to troubleshoot.
2. Isolate to the subsystem level (in cases where more than one subsystem is involved); next isolate the problem to a single circuit within the subsystem; then, isolate the problem to the faulty component using the troubleshooting symptom index (WP 0013 00).
3. Frayed, broken, loose, or corroded wiring is a common source of problems in any electrical circuit. Always make a visual inspection before starting detailed troubleshooting. Inspect contacts to ground carefully because components with case grounds are especially troublesome.

END OF WORK PACKAGE

TROUBLESHOOTING SYMPTOM INDEX 0013 00

END OF WORK PACKAGE

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL	
1. No/Low System Voltage.	**WARNING** Remove jewelry or other loose metal items before servicing electrical components. Failure to adhere to this warning may result in injury or death to personnel. **NOTE** Before checking items on the control panel for correct operation, ensure that the individual blackout lights are in the OFF position to ensure that the indicator lights are visible.	
	1. EMERGENCY STOP button is pulled out and is has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, notify Unit Maintenance. 2. If POWER ON button is not in the proper position, place in the proper position (WP 0004 00). 3. If POWER ON button is damaged, notify Unit Maintenance.
2. Blackout Function Not Operational.	1. BLACKOUT SWITCH is in the ON position and has no physical damage.	1. If BLACKOUT SWITCH is in the ON position and not damaged, notify Unit Maintenance. 2. If BLACKOUT SWITCH is not in the ON position, place in the proper position (WP 0004 00). 3. If BLACKOUT SWITCH is damaged, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
2. Blackout Function Not Operational - Continued.	2. Check SYSTEM VOLTAGE monitor for 20-24 VDC.	1. If monitor display is blank, notify Unit Maintenance. 2. If 0-23 is displayed, go to Test 3.
	3. Check if battery terminal connections/cables are loose, damaged, or corroded. a. Open battery box and slide out batteries (WP 0004 00). b. Check terminals for corrosion. c. Check terminals for loose connections. d. Check battery cables for corrosion and damage.	1. If battery connections/cables are free from corrosion, are not damaged, and terminals are not loose, notify Unit Maintenance. 2. If battery terminal connections/cables are corroded or loose, or are damaged, notify Unit Maintenance.
3. Cabinet Light Fails To Operate.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, go to Test 2. 2. If POWER ON button is damaged, notify Unit Maintenance.
	3. CABINET LIGHT switch is in the ON position and has no physical damage.	1. If CABINET LIGHT switch is in the proper position and not damaged, go to Test 2. 2. If CABINET LIGHT switch is not in the proper position, place in the proper position (WP 0004 00). 3. If CABINET LIGHT switch is damaged, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
3. Cabinet Light Fails To Operate - Continued.	4. BLACKOUT SWITCH is in the OFF position and has no physical damage.	1. If BLACKOUT SWITCH is in the proper position and not damaged, go to Test 2. 2. If BLACKOUT SWITCH is not in the proper position, place in the proper position (WP 0004 00). 3. If BLACKOUT SWITCH is damaged, notify Unit Maintenance.
	5. Check SYSTEM VOLTAGE monitor for 20-24 reading.	1. If 20-24 is not displayed, go to No/Low System Voltage fault. 2. If 20-24 is displayed, notify Unit Maintenance.
4. Panel Lights Fail To Operate.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button is pushed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, go to Test 2. 2. If POWER ON button is not in the proper position, place in the proper position (WP 0004 00). 3. If POWER ON button is damaged, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
4. Panel Lights Fails To Operate - Continued.	3. PANEL LIGHTS switch is in the ON position and has no physical damage.	1. If PANEL LIGHTS switch is in the proper position and not damaged, go to Test 2. 2. If PANEL LIGHTS switch is not in the proper position, place in the proper position (WP 0004 00). 3. If PANEL LIGHTS switch is damaged, notify Unit Maintenance.
	NOTE If BLACKOUT SWITCH is in the ON position, panel lights should be lighted but dimmer than under normal operation.	
	4. BLACKOUT SWITCH is in the OFF position.	1. If BLACKOUT SWITCH is in the proper position and not damaged, go to Test 2. 2. If BLACKOUT SWITCH is not in the proper position, place in the proper position (WP 0004 00). 3. If BLACKOUT SWITCH is damaged, notify Unit Maintenance.
	5. Check SYSTEM VOLTAGE monitor for 20-24 reading.	1. If 20-24 is not displayed, go to No/Low System Voltage fault. 2. If 20-24 is displayed, notify Unit Maintenance.
5. CABINET TEMP Monitor Fails To Operate.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00).
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, go to Test 3. 2. If POWER ON button is not in the proper position, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
5. CABINET TEMP Monitor Fails To Operate - Continued.	3. Check SYSTEM VOLTAGE monitor for 20-24 reading.	1. If 20-24 is not displayed, go to No/Low System Voltage fault. 2. If 20-24 is displayed, notify Unit Maintenance.
6. All Controls And Indicators Fail To Operate.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, go to Test 2. 2. If POWER ON button is damaged, notify Unit Maintenance.
	3. BLACKOUT SWITCH is in the OFF position and has no physical damage.	1. If BLACKOUT SWITCH is in the proper position and not damaged, go to Test 2. 2. If BLACKOUT SWITCH is not in the proper position, place them in the proper position (WP 0004 00). 3. If BLACKOUT SWITCH is damaged, notify Unit Maintenance.
	4. Check SYSTEM VOLTAGE monitor for 20-24 reading.	1. If 20-24 is not displayed, go to No/Low System Voltage fault. 2. If 20-24 is displayed, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
7. Water High Level Function Not Operational.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, go to Test 2. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, go to Test 2. 2. If POWER ON button is damaged, notify Unit Maintenance.
	3. LEVEL OVERRIDE switch is in the OFF position and has no physical damage.	1. If LEVEL OVERRIDE switch is in the proper position and not damaged, go to Test 2. 2. If LEVEL OVERRIDE switch is not in the proper position, place in the proper position (WP 0004 00). 3. If LEVEL OVERRIDE switch is damaged, notify Unit Maintenance.
	4. WATER HIGH LEVEL indicator illuminated. Check to make sure WATER HIGH LEVEL indicator bevel is open.	1. If WATER HIGH LEVEL indicator is illuminated and unit overflowed, notify Unit Maintenance. 2. If WATER HIGH LEVEL indicator is illuminated and unit did not overflow, notify Unit Maintenance. 3. If WATER HIGH LEVEL indicator is not illuminated and unit overflowed, go to Test 3.
	5. Check to make sure Hippo is level (WP 0009 00)	1. If Hippo is level, notify Unit Maintenance. 2. If Hippo is not level, level the Hippo (WP 0009 00).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
8. Water Low Level Indicator Not On.	1. EMERGENCY STOP button is pulled out and has no physical damage.	1. If EMERGENCY STOP button is in the proper position and not damaged, notify Unit Maintenance. 2. If EMERGENCY STOP button is not in the proper position, place in the proper position (WP 0004 00). 3. If EMERGENCY STOP button is damaged, notify Unit Maintenance.
	2. POWER ON button was pressed in and has no physical damage.	1. If POWER ON button is in the proper position and not damaged, notify Unit Maintenance. 2. If POWER ON button is damaged, notify Unit Maintenance.
	3. LEVEL OVERRIDE switch is in the OFF position and has no physical damage	1. If LEVEL OVERRIDE switch is in the proper position and not damaged, notify Unit Maintenance. 2. If LEVEL OVERRIDE switch is not in the proper position, place in the proper position (WP 0004 00). 3. If LEVEL OVERRIDE switch is damaged, notify Unit Maintenance.
9. CO System Not Operational.	.	Notify Unit Maintenance.
10. Pump/Port Heater Function Not Operational.	Check the following controls for proper position: a. EMERGENCY STOP button is pulled out and has no physical damage. b. POWER ON button was pressed in and has no physical damage. c. Engine running, pump disengaged. d. PUMP/PORT HEATERS switch in the ON position and has no damage or damage to indicator light.	If PUMP/PORT HEATERS are not working, notify Unit Maintenance.
11. Batteries Fail To Charge Or Lose Charge.		Notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ELECTRICAL - CONTINUED	
12. Tank Heater Or Heat Trace Function Not Operational.	Check the following controls for proper position: a. EMERGENCY STOP button is pulled out and has no physical damage. b. POWER ON button was pressed in and has no physical damage. c. Ambient temperature is 35°F (2°C) or below. d. GFCI is ON. e. Engine running with pump disengaged. f. Tank heater switch in the on position and has no damage and indicator light has no damage.	If TANK HEATERS are not working, notify Unit Maintenance. Reset GFCI if OFF.
13. Low Oil Pressure Function Not Operational.		Notify Unit Maintenance.
14. Engine Over Temp Function Not Operational.		Notify Unit Maintenance.
15. Glow Plug Function Not Operational.	Check the following controls for proper position: a. EMERGENCY STOP button is pulled out and has no physical damage. b. POWER ON button was pressed in and has no physical damage. c. GLOW PLUG button pushed and has no physical damage. d. GLOW PLUG ON indicator bevel open and is illuminated.	If glow plugs are not working or GLOW PLUG ON indicator is not illuminated, notify Unit Maintenance.
	PUMP	
1. Leaks Around Pump.	Hoses are properly connected to ports and pump.	1. If hoses are properly connected to ports and pump, notify Unit Maintenance. 2. If hoses leak excessively around connections, reconnect hoses.
2. Pump Fails To Operate.	1. Pump is online.	1. If pump is online, go to Test 2. 2. If pump is offline, place pump online (WP 0009 00).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	PUMP - CONTINUED	
2. Pump Fails To Operate - Continued.	2. Pump has no air in the prime.	1. If pump has no air in the prime, go to Test 3. 2. If pump has air in the prime, bleed pump (WP 0006 00).
	3. Pump is primed.	1. If pump is primed, notify Unit Maintenance. 2. If pump is NOT primed, prime pump (WP 0006 00).
3. Restricted Water Flow.	1. Temperature is above 0°F (-18°C).	1. If temperature is above 0°F (-18°C), go to Test 2. 2. If temperature is below 0°F (-18°C), notify supervisor.
	2. All valves are in correct position for function being performed.	1. If all valves are in correct position for function being performed, go to Test 3. 2. If all valves are NOT in correct position for function being performed, correct valve position according to Valve Position Chart.
	3. Hoses are properly connected to ports and pump.	1. If hoses are properly connected to ports and pump, notify Unit Maintenance. 2. If hoses leak excessively around connections, reconnect hoses (WP 0016 00).
	4. Hoses are free of kinks, fraying, or dry rotting.	1. If hoses are free of kinks, fraying, or dry rotting, notify Unit Maintenance. 2. If hoses have kinks, fraying, or dry rotting, replace hoses (WP 0016 00).
4. Pump Making Noise.		Notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE	
1. Engine Will Not Turn Or Crank.	1. Check the following switches/buttons for proper operating position and damage: a. EMERGENCY STOP switch OFF b. POWER ON Button ON c. ENGINE RUN Switch ON d. START ENGINE Button Pressed e. TANK HEATER Switch OFF f. PUMP PORT HEATERS Switch OFF	1. If switch/button is not in proper operating position and not damaged, toggle to proper operating position. 2. If switch/button will not toggle to proper operating position or is damaged, notify Unit Maintenance.
2. Engine Stops During Normal Operation.	1. ENGINE OVER TEMP indicator ON.	1. If on, go to *Engine Runs Excessively Hot And Shuts Down*. 2. If not on, go to Test 2.
	2. Fuel level is sufficient for operation.	1. If fuel level is sufficient for operation, go to Test 3. 2. If fuel level is NOT sufficient for operation, add fuel (WP 0004 00).
	3. WATER HIGH/ LOW LEVEL indicator activated.	1. If WATER HIGH/ LOW LEVEL indicator not activated, go to Test 4. 2. If WATER HIGH/ LOW LEVEL indicator activated, add water (WP 0008 00).
	4. Air intake is free of debris.	1. If air intake is free of debris, go to Test 4. 2. If air intake is NOT free of debris, clean air intake (WP 0018 00).
	5. Exhaust is free of debris.	1. If exhaust is free of debris, notify Unit Maintenance. 2. If exhaust is NOT free of debris, clean exhaust (WP 0016 00).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE - CONTINUED	
3. Engine Difficult To Start.	NOTE If temperature is below 0°F (-18°C), refer to cold starting procedure (WP 0010 00).	
	1. Check the following switches/buttons for proper operating position and damage: a. EMERGENCY STOP switch OFF b. POWER ON Button ON c. ENGINE RUN Switch ON d. START ENGINE Button Pressed e. TANK HEATER Switch OFF f. PUMP PORT HEATERS Switch OFF	1. If switch/button is not in proper operating position and not damaged, toggle to proper operating position. 2. If switch/button will not toggle to proper operating position or is damaged, notify Unit Maintenance.
	2. Battery terminal connections are not loose, damaged, or corroded.	1. If battery is clean of corrosion and terminals are not loose or damaged, go to Test 3. 2. If battery terminal connections are corroded or loose, clean battery or tighten terminals (WP 0016 00). 3. If battery terminal connections are damaged, notify Unit Maintenance.
	3. 20-24 Volt is displayed.	1. If 20-24 Volt is not displayed, go to NO SYSTEM VOLTAGE. 2. If 20-24 Volt is displayed, go to Test 4.
	4. Fuel level is sufficient for operation.	1. If fuel level is sufficient for operation, go to Test 5. 2. If fuel level is NOT sufficient for operation, add fuel (WP 0006 00).
	5. Air intake is free of debris.	1. If air intake is free of debris, go to Test 6. 2. If air intake is NOT free of debris, clean air intake (WP 0018 00).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE – CONTINUED	
3. Engine Difficult To Start - Continued.	6. Exhaust is free of debris.	1. If exhaust is free of debris, go to Test 7. 2. If exhaust is NOT free of debris, clean exhaust (WP 0016 00).
	7. Speed control lever is in OPEN (fully counter-clockwise) position.	1. If speed control lever is in OPEN position, go to Test 8. 2. If speed control lever is NOT in OPEN position, notify Unit Maintenance.
	8. Air filter is free of debris.	1. If air filter is free of debris, notify Unit Maintenance. 2. If air filter is NOT free of debris, clean air filter (WP 0018 00).
4. Engine Loses Power or Runs Roughly.	1. Air intake is free of debris.	1. If air intake is free of debris, go to Test 2. 2. If air intake is NOT free of debris, clean air intake (WP 0018 00).
	2. Exhaust is free of debris.	1. If exhaust is free of debris, notify Unit Maintenance. 2. If exhaust is NOT free of debris, clean exhaust (WP 0016 00).
	3. Air filter is free of debris.	1. If air filter is free of debris, notify Unit Maintenance. 2. If air filter is NOT free of debris, clean air filter (WP 0018 00).
	4. Engine oil level is to correct level mark on dipstick.	1. If engine oil level is to correct level mark or high on dipstick, notify Unit Maintenance. 2. If engine oil level is low, add oil to correct level mark on dipstick (WP 0016 00). 3. If engine oil level is high, notify Unit Maintenance.
5. Engine Vibrates Excessively.	Engine mounting bolts are not loose.	1. If engine mounting bolts are not loose, notify Unit Maintenance. 2. If engine mounting bolts are loose, damaged, or missing, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	ENGINE – CONTINUED	
6. Engine Emits Discolored Smoke From Exhaust.	1. Air intake is free of debris.	1. If air intake is free of debris, go to Test 2. 2. If air intake is NOT free of debris, clean air intake (WP 0018 00).
	2. Exhaust is free of debris.	1. If exhaust is free of debris, notify Unit Maintenance. 2. If exhaust is NOT free of debris, clean exhaust (WP 0016 00).
	3. Speed control lever is in OPEN (fully counter-clockwise) position.	1. If speed control lever is in OPEN position, go to Test 4. 2. Speed control lever is NOT in OPEN position, notify Unit Maintenance.
	4. Air filter is free of debris.	1. If air filter is free of debris, notify Unit Maintenance. 2. If air filter is NOT free of debris, clean air filter (WP 0018 00).
7. Engine Runs Excessively Hot And Shuts Down.	1. Air intake is free of debris.	1. If air intake is free of debris, go to Test 2. 2. If air intake is NOT free of debris, clean air intake (WP 0018 00).
	2. Engine cowling is free of debris.	If engine cowling is suspected to be obstructed with sand, dust, or debris, notify Unit Maintenance.
	3. Exhaust is free of debris.	1. If exhaust is free of debris, notify Unit Maintenance. 2. If exhaust is NOT free of debris, clean exhaust (WP 0016 00).
	4. Engine oil level is to correct level mark on dipstick.	1. If engine oil level is to correct level mark or high on dipstick, notify Unit Maintenance. 2. If engine oil level is low, add oil to correct level mark on dipstick (WP 0016 00). 3. If engine oil level is high, notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	PLUMBING	
1. Plumbing Piping Leaks.		Notify Unit Maintenance.
2. Unions Leak.	1. Union is properly connected.	1. If union is properly connected, notify Unit Maintenance. 2. If union is not properly connected, tighten union (WP 0016 00).
	2. Sanitary connections leaking.	1. If connections leaking, tighten connections (WP 0016 00). 2. If connections not leaking, go to Test 3.
	3. Hose connection to fitting leaking.	1. If connections leaking, tighten connections (WP 0016 00). 2. If connections not leaking, notify Unit Maintenance.
3. Valves Leak Or Do Not Operate Properly.	NOTE Before checking items for correct operation, ensure that the temperature is within normal operating limits. Ice may have formed in valves and may prohibit normal functions. If temperature is below 0°F (-18°C), refer to cold starting procedure.	
	1. All valves are in correct position for function being performed.	1. If all valves are in correct position for function being performed, go to Test 2. 2. If all valves are NOT in correct position for function being performed, correct valve position according to Valve Position Chart (WP 0006 00).
	2. Temperature is above 0°F (-18°C).	1. If temperature is above 0°F (-18°C), notify Unit Maintenance. 2. If temperature is below 0°F (-18°C), notify supervisor.
	3. Valve does not move freely or valve leaks.	Notify Unit Maintenance.
4. External Hose Leaks.		Notify Unit Maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	PLUMBING – CONTINUED	
5. Fill Station Fails To Shut Off Or Continues To Drip/Leak.	Valve F is fully open. Verify Fill Station is connected to Port A or B only.	Fully open Valve F. Connect Fill station to Port A or B only.
	MANHOLE	
Leaking Around Manhole.	Fill cover properly tightened.	1. If fill cover tightened, notify Unit Maintenance. 2. If fill cover not tight, Tighten fill cover (WP 0016 00).

END OF WORK PACKAGE

CHAPTER 4
OPERATOR MAINTENANCE INSTRUCTIONS

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION 0015 00

GENERAL

To ensure that the Hippo is ready for operation at all times, it must be inspected on a regular basis so that defects may be found and corrected before they result in serious damage, equipment failure, or injury to personnel. WP 0016 00 contains systematic instructions on inspections, lubrications, adjustments, and corrections to be performed by the operator to keep your equipment in good operating condition and ready for its primary mission.

EXPLANATION OF TABLE ENTRIES

1. **Item Number (Item No.) Column**. Numbers in this column are for reference. When completing DA Form 2404 or DA Form 5988-E *(Equipment Inspection and Maintenance Worksheet)*, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must perform checks and services for the interval listed.

2. **Interval Column.** This column tells you when you must perform the procedure in the procedure column.

   a. *Before* procedures must be done immediately before you operate the equipment.

   b. *During* procedures must be done while you are operating the equipment.

   c. *After* procedures must be done immediately after you have operated the equipment.

   d. *Weekly* procedures must be done once each week.

   e. *Monthly* procedures must be done once each month.

3. **Man-Hours Column.** This column indicates man-hours required to complete prescribed lubrication service.

4. **Location, Item to Check/Service Column.** This column provides the location and item to be checked or serviced.

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table must always be observed. WARNINGs and CAUTIONs appear before applicable procedures. You must observe these WARNINGs to prevent serious injury to yourself and others, and CAUTIONs to prevent your equipment from being damaged.

5. **Procedure Column.** This column gives the procedure you must perform to know if the equipment is ready or available for its intended mission or for operation. You must perform the procedure at the time stated in the interval column.

6. **Not Fully Mission Capable If: Column.** Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you perform check/service procedures that show faults listed in this column, the equipment is not mission-capable. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

GENERAL PMCS PROCEDURES

1. Always perform PMCS in the same order. With experience, you should be able to identify problems easily. If the machine does not perform as required, refer to the appropriate troubleshooting index (WP 0013 00). If anything looks wrong and you can't fix it, write it on your DA Form 2404 or DA Form 5988-E. If you find something seriously wrong, IMMEDIATELY report it to your supervisor.

2. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare everything needed to make all the checks. For example, you'll always need a rag (Item 10, WP 0022 00) or two.

GENERAL PMCS PROCEDURES - CONTINUED

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may cause injury or death to personnel.

a. **Keep It Clean.** Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use solvent cleaning compound (Item 2, WP 0022 00) on all metal surfaces. Use detergent (Item 3, WP 0022 00) and water when you clean rubber, plastic, and painted surfaces.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845. Failure to follow this warning may result in injury to personnel.

b. **Hazardous Waste Disposal.** Ensure all spills are cleaned up and disposed of in accordance with local policy and ordinances.

c. **Rust and Corrosion.** Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of lubricating oil (Item 6, 7, or 8, WP 0022 00). Report it to your supervisor.

d. **Bolts, Nuts, and Screws.** Check bolts, nuts, and screws for obvious looseness and missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one you think is loose, tighten it.

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

f. **Electric Wires and Connectors.** Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure that the wires are in good condition.

g. **Hoses and Fluid Lines.** Look for wear, damage, and signs of leaks. Ensure that clamps and fittings are tight. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it to your supervisor.

h. **Fluid Leakage.** It is necessary for you to know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your machine. Learn and be familiar with them, and remember - when in doubt, notify your supervisor.

CAUTION

Operation is allowable with Class I and Class II leakage. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR. When operating with Class I or Class II leaks, check fluid levels more frequently. Class III leaks must be reported immediately to your supervisor. Failure to do this will result in damage to machine and/or components.

GENERAL PMCS PROCEDURES - CONTINUED

NOTE

Notify Unit Maintenance of any leaks the operator cannot fix.

Leakage Definitions for PMCS

Class I	Leakage indicated by wetness or discoloration, but not great enough to form drops.
Class II	Leakage great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class III	Leakage great enough to form drops that fall from the item being checked/ inspected.

LUBRICATION PROCEDURES

1. Included in this PMCS are lubrication services to be performed by the operator.
2. Keep all lubricants in an environmental storage container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep lubrication equipment clean and ready for use. Clean top of container before opening.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may cause injury or death to personnel.

3. Clean area around lubrication points with solvent cleaning compound (Item 2, WP 0022 00) or equivalent before lubricating equipment. Keep all external parts of equipment not requiring lubrication free of lubricants. After lubrication, wipe off excess lubricant to prevent accumulation of foreign matter.
4. Maintain a record of lubrication performed and report any problems noted during lubrication. Refer to DA PAM 750-8 for forms and procedures to record and report any findings.

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION - CONTINUED 0015 00

LUBRICATION PROCEDURES - CONTINUED

NOTE

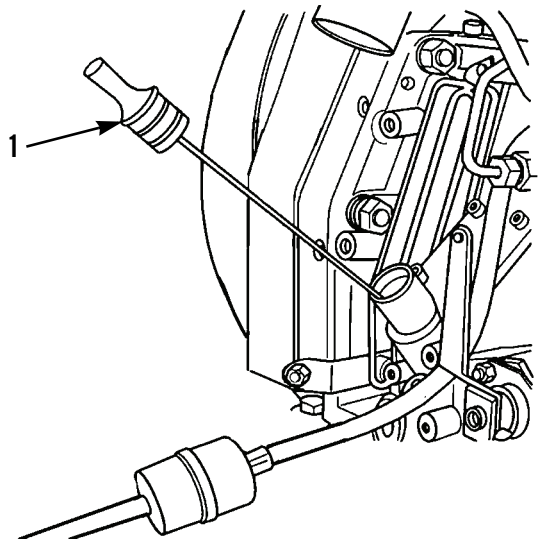
Only lubricants authorized for use by the operator are listed in this KEY.

- KEY -

LUBRICANT/ COMPONENT	REFILL CAPACITY	EXPECTED TEMPERATURES*		
		+6°F to +122°F (-14°C to +50°C)	-4°F to +50°F (-20°C to +10°C)	-25°F to +32°F (-14°C to 0°C)
Engine Crankcase	2 qt. (1.9 L)	OEA	5W/40	15W40
GAA Grease, Automotive and Artillery		All Temperatures		
*** For arctic operation, refer to FM 9-207.**				

LUBRICATION INSTRUCTIONS

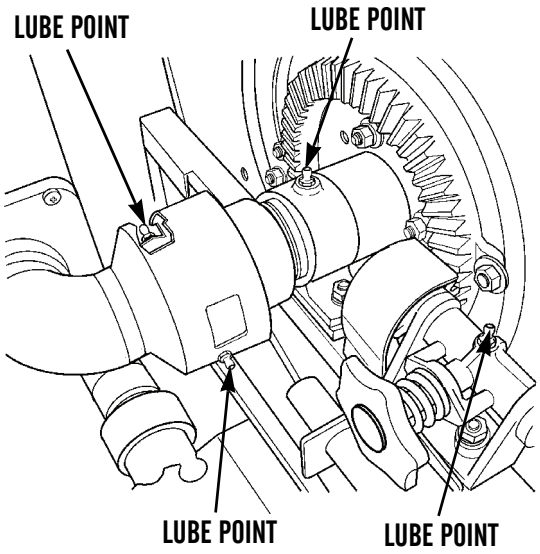
1. **Every 8-15 hours of Operation:**
   a. **Check Engine Oil Level.** When checking the oil level, the engine should be standing level and must not be running.
      (1) Remove any dirt in the dipstick (1) area.
      (2) Check oil level at the dipstick (1). Fill as necessary up to the “MAX” mark on the dipstick.



431-059

LUBRICATION INSTRUCTIONS - CONTINUED

b. **Every 100 Hours of Operation.** Lightly lubricate all hatch and door hinges, latches, control linkages, and exposed adjusting threads with OE/HDO. Use GAA on the hose reels four points.



431-060

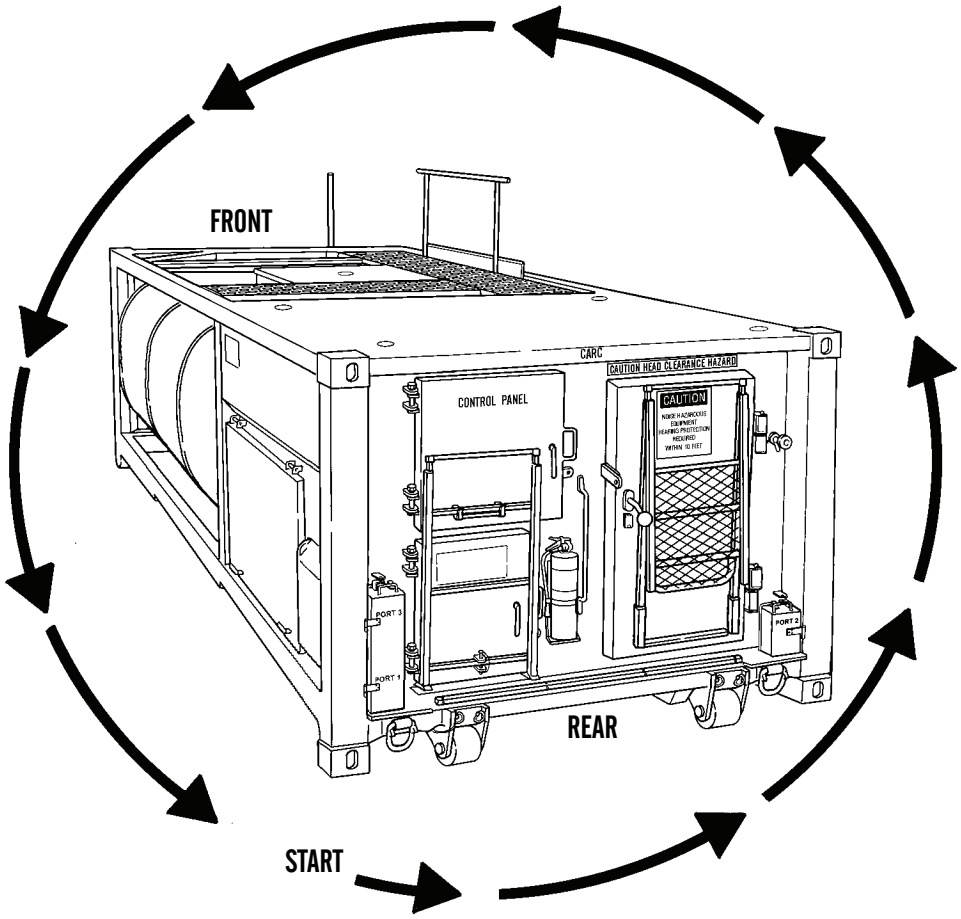
END OF WORK PACKAGE

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) 0016 00

This PMCS uses the one-look format, beginning at the left-front, and then proceeding around the unit counterclockwise. During PMCS, follow the directions of inspection.

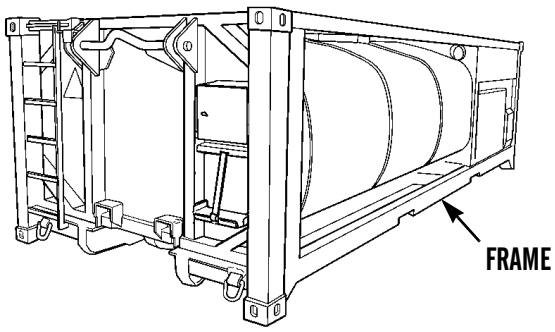
WARNING

Ensure that components and assemblies are correctly installed. Incorrect installation may cause additional equipment damage or failure. When checking/servicing an item, ensure that all attaching/mounting hardware is properly secured. Loose, cracked, broken, or missing hardware may cause equipment failure or injury to personnel.



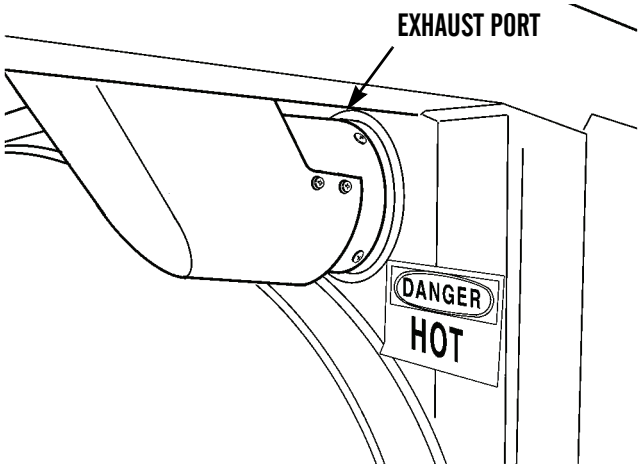
431-064

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
				NOTE Perform all PMCS if you are the assigned operator and have not operated the unit since the last weekly PMCS, or you are operating the module for the first time.	
			LEFT SIDE		
1	**Before**		**Frame, Left**	a. Inspect frame for obvious damage or cracked welds.	Frame has cracks.
				b. Inspect tank and shell for rips or leaks and broken welds.	Tank shell has leakage due to puncture or damage.
				c. Inspect shell cover for frayed or cracked straps and damaged or missing hardware.	
				d. Inspect left side housing or shelter wall for damage, puncture holes, or cracked welds.	
				e. Check that ground rod is present, not damaged, and secure.	Ground rod is damaged or missing.



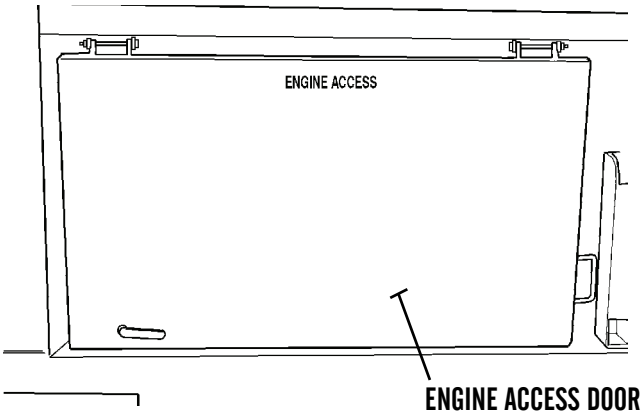
431-066

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
2	Before		Exhaust Port	Inspect exhaust port for clogs or damaged or missing hardware.	Exhaust port is clogged or damaged or has missing hardware.



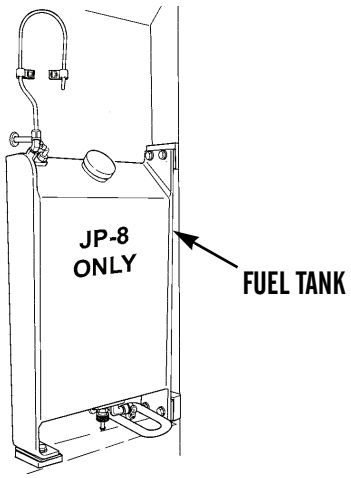
431-069

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
3	Before		Engine Access Door	NOTE When checking all doors and latches, if they drag or are hard to operate, apply a mid-weight oil to the latch mechanism and cycle several times to allow the oil to penetrate along the moving surface.	
				Inspect engine access door for damage or missing hardware.	Engine access door has damaged or missing hardware.



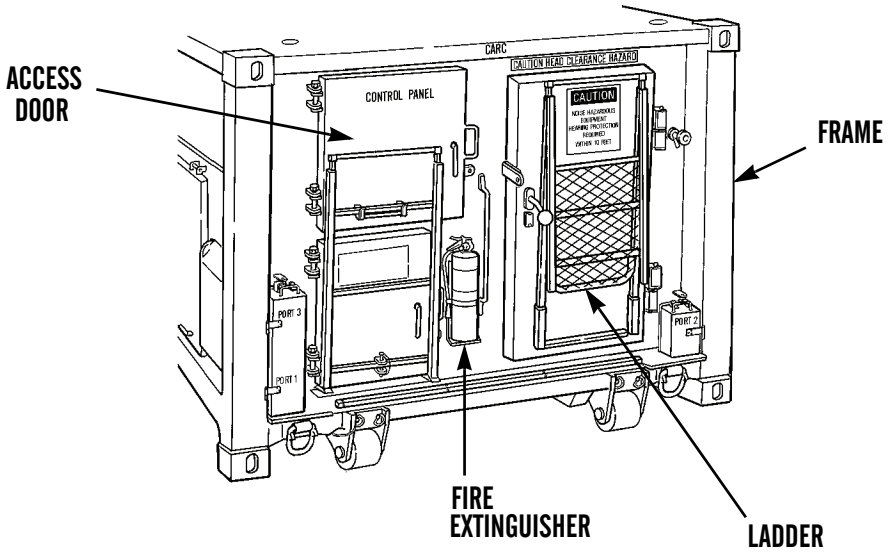
431-068

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
4	Before		Engine Components	**WARNING** When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment. **NOTE** Open engine access door to access engine.	
				Check engine compartment for damage or leaks.	Engine is damaged or has Class III leak.
5	Before		Fuel Tank	**WARNING** • DO NOT smoke or permit any open flame in area of Hippo while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage. • DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel, or damage to vehicle. • Operation personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
				a. Inspect fuel tank for damage, missing parts, or leakage.	Tank has leak or punctured hole.
				b. Remove fuel tank cap and check fuel level.	Fuel tank is empty.



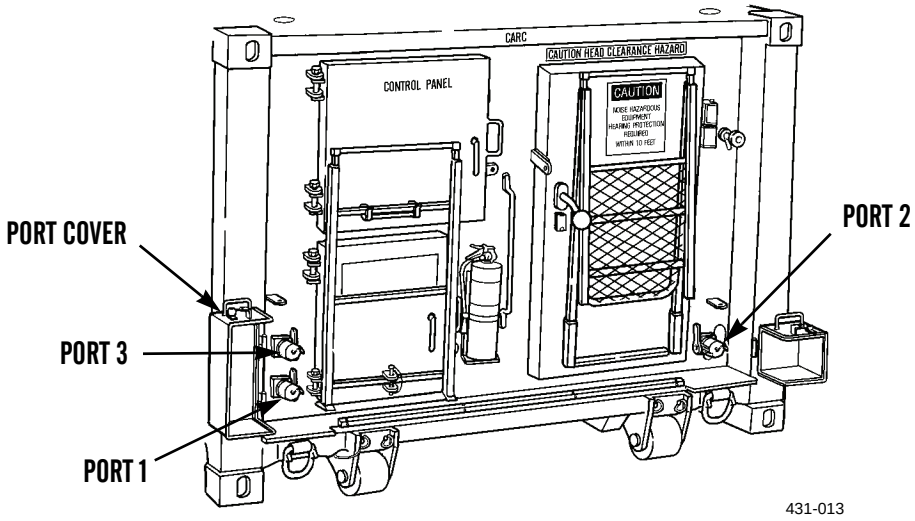
431-067

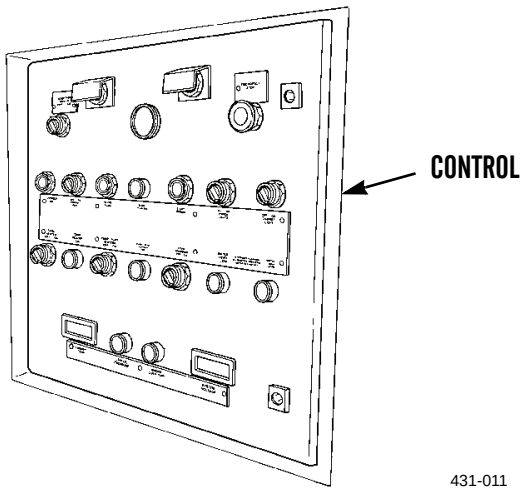
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
5 (Con't)	Before		Fuel Tank	c. Check fuel line and vent tank fuel line for cracks, damage, or leaks.	Lines are cracked, damaged, or leaking.
			REAR		
6	Before		Overall	a. Inspect frame and housing or shelter walls for damage or cracked welds.	Frame and housing or shelter walls have damaged or cracked welds.
				b. Insect fire extinguisher and bracket for damage or missing hardware. Ensure fire extinguisher is fully charged.	Fire extinguisher is discharged or missing.
				c. Inspect ladder assembly for damaged, loose, or missing hardware.	Ladder assembly has damaged, loose, or missing hardware.



431-043

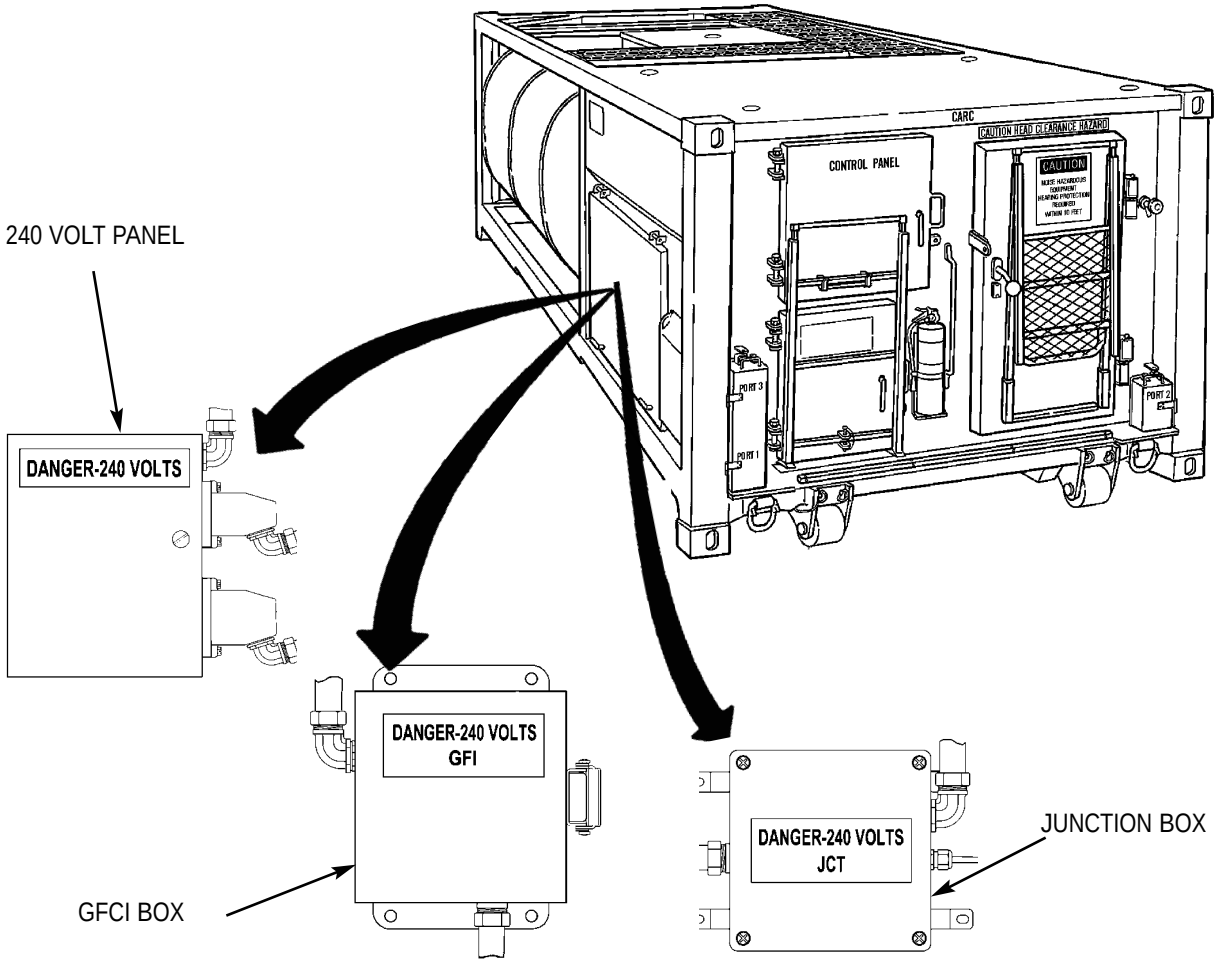
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
7	**Before**		**Valve Port**	a. Inspect valve ports 1, 2, and 3 for damaged, loose, or missing hardware.	Valve ports have damaged, loose, or missing hardware.
				b. Inspect valve port covers for damaged or missing hardware.	Valve port cover has missing or damaged hardware.



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
8	Before		Control Panel	WARNING When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment. NOTE Open control panel access door to access control panel.	
				a. Inspect control panel controls and indicators for damaged, loose, or missing hardware.	Missing or damaged controls or indicators.
				 431-011	
				b. With power on, inspect control panel indicators for operability.	Inoperable indicators.

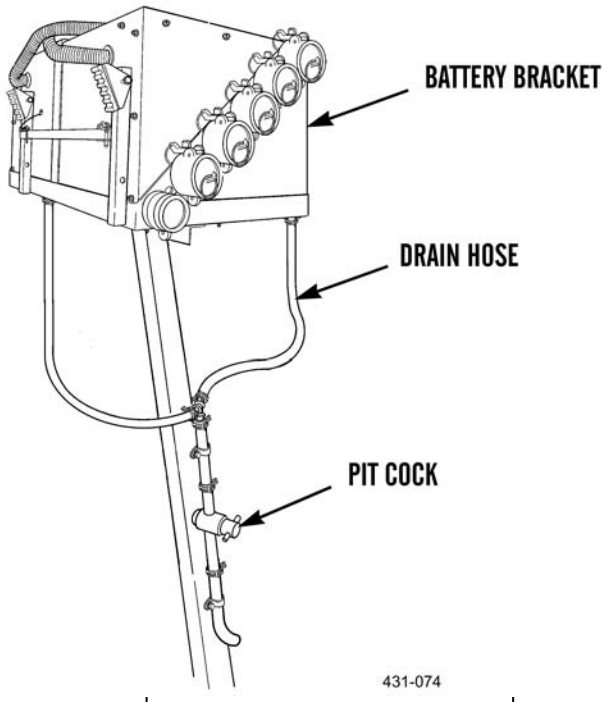
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
9	Before		Control Panel Gauges	Inspect control panel gauges, indicators, and switches for signs of damage with power control switch in ON position	Any gauge, indicator, or switch is broken or inoperative.
			INTERIOR		
10	Before		240 Volt Panel, Junction Box, and GFCI Box	WARNING • When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment. • There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel. • Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury to personnel. NOTE Open engine access door to access interior of unit.	
				Visually inspect 240 volt panel, junction box, and GFCI box for any damage, loose connections, loose doors or signs of worn wires.	Damage, loose connections, loose doors or signs of worn wires.

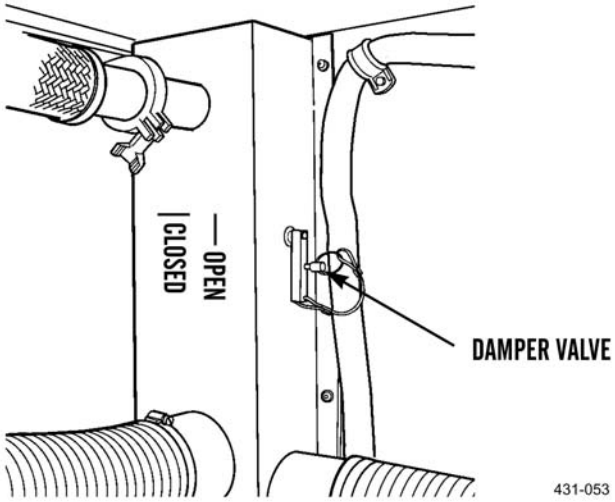
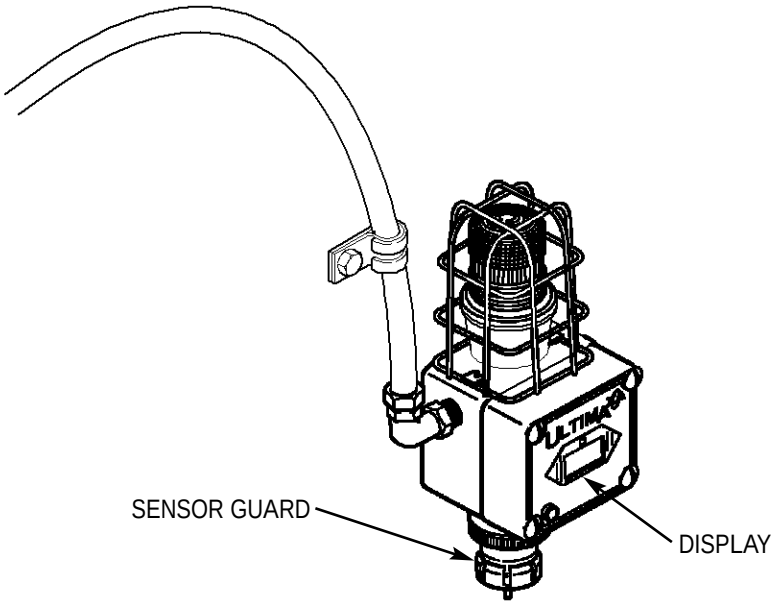
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
10 (Con't)	Before		240 Volt Panel, Junction Box, and GFCI Box		



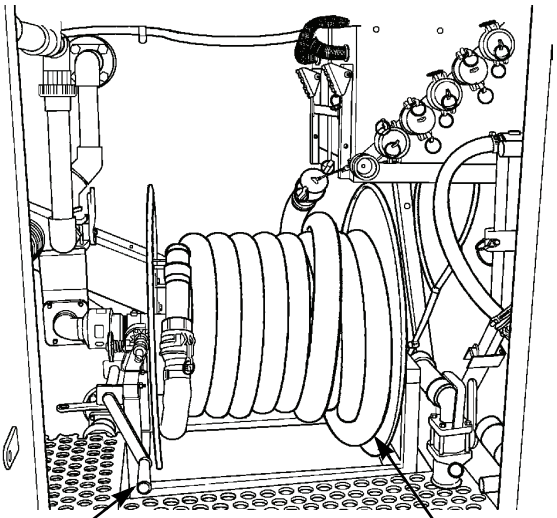
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
11	**Before**		**Housing Interior**	a. Inspect NATO receptacle for damaged or missing hardware.	NATO receptacle is damaged or has missing hardware.
				 431-123	
				b. Inspect housing and shelter flooring for damaged, loose, or missing hardware.	Shelter flooring has damaged, loose, or missing hardware.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
11 Con't	**Before**		**Housing Interior**	b. Inspect battery bracket for cracked welds. c. Inspect drain hoses for cracks or breaks. d. Inspect pit cock for ease of operation.	Battery bracket has cracked or broken welds. Drain hoses have cracks or breaks. Pit cock inoperable.



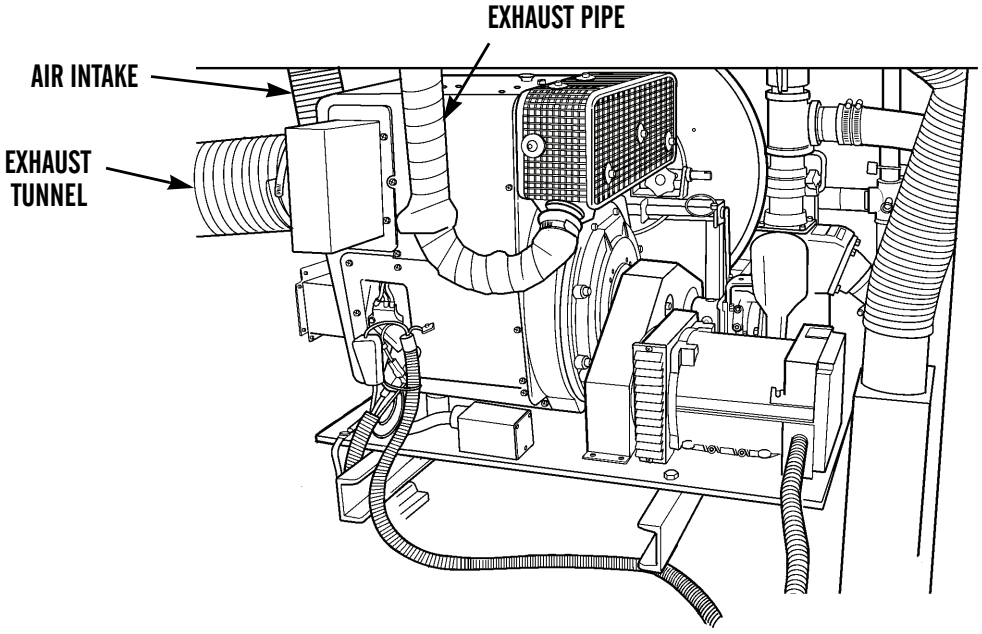
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
11 Con't	**Before**		**Housing Interior**	e. Inspect damper for damaged or missing hardware.	Damper has damaged or missing hardware.
					
12	**Before**		**CO Monitor**	a. Inspect. Check that there are no broken or missing pieces.	Damaged housing or if sensor guard is missing.
					

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
13	Before		Hose Reel	a. Inspect hose reel assembly for damage. Inspect for loose, broken, or missing hardware. b. Inspect manual crank assembly for damaged or missing hardware.	Hose reel is damaged. Broken or missing hardware.



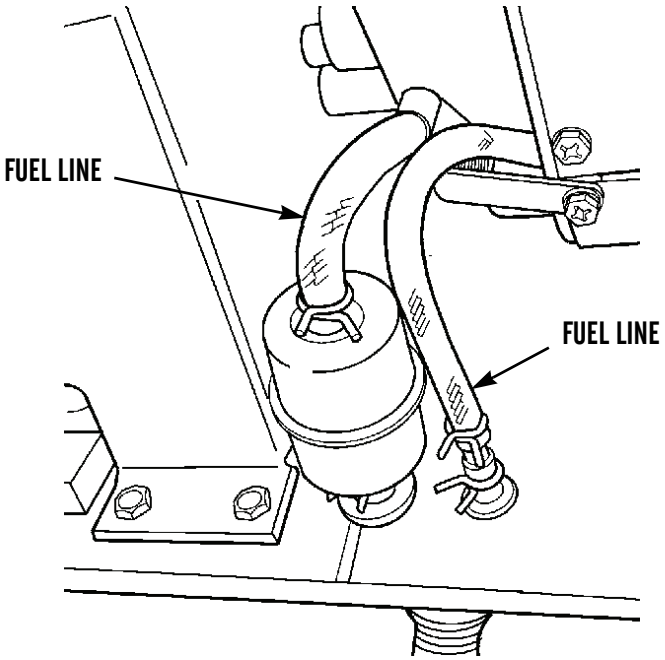
431-009

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
14	Before		**Air Intake, Exhaust Tunnels, and Exhaust Pipe**	a. Inspect air intake and exhaust tunnels and the exhaust pipe for debris or obstructions and damage. Remove debris and obstructions if present. Inspect for loose or missing hardware.	Air intake tunnel, exhaust tunnel, or exhaust pipe is damaged or has missing hardware.
				b. Inspect intake and exhaust flex coupling for damage. Inspect for loose or missing hardware.	Exhaust coupling is damaged or has leakage or missing hardware.



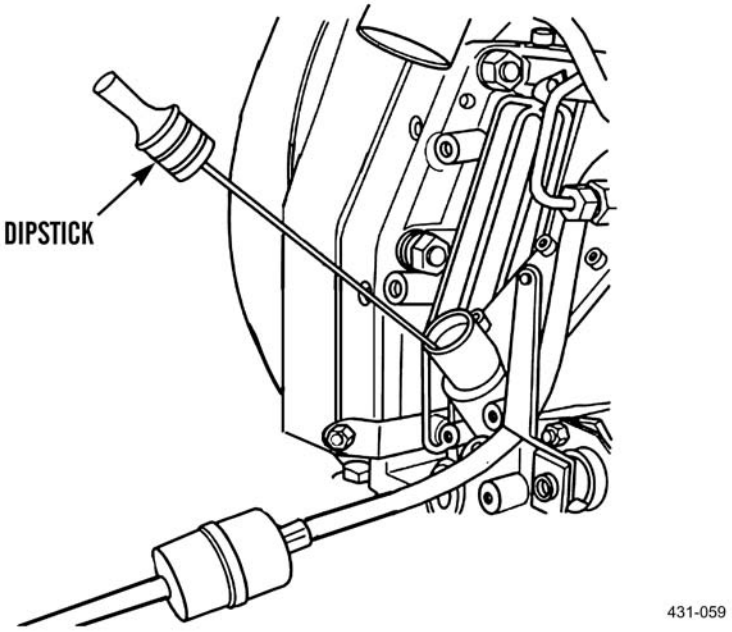
431-075

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
15	**Before**		**Engine**	a. Inspect engine assembly for leaks and damaged, loose, or missing hardware.	Engine has Class III leaks or damaged, loose, or missing hardware.
				b. Inspect fuel lines and fuel filter for damage or leakage.	Fuel lines or fuel filter is damaged or has Class III leaks.

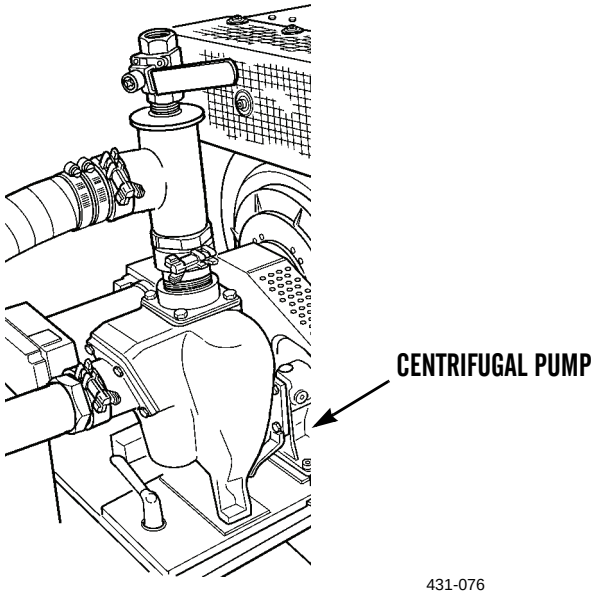


431-063

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
16	**Before**	**0.1**	**Engine Oil**	Before engine is started: NOTE Ensure engine oil is checked more frequently when operating in extreme heat and dusty or sandy conditions. a. Check engine oil for proper level. b. Pull out dipstick and add engine oil (Item 6, 7, or 8, WP 0022 00) up to “MAX” mark of dipstick.	Engine oil level is not correct.

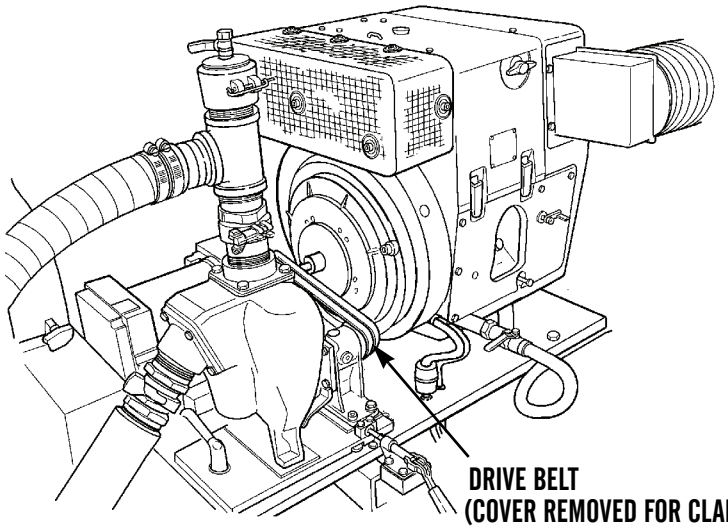


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
17	**Before**		**Centrifugal Pump**	Inspect centrifugal pump for signs of leaks.	Centrifugal pump has Class III leak.



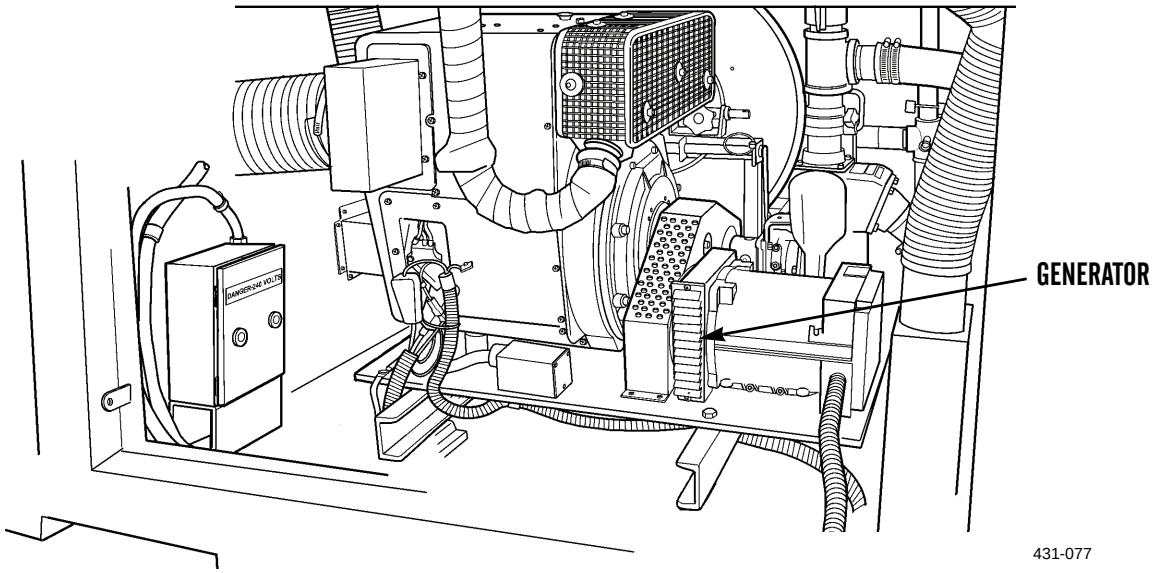
431-076

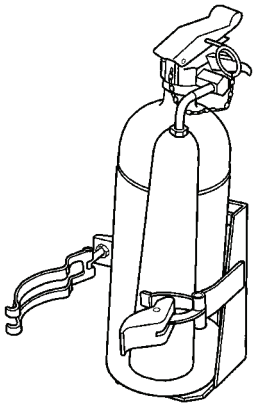
18	**Before**		**Drive Belts**	Check for presence of drive belts.	Drive belts are missing or broken.



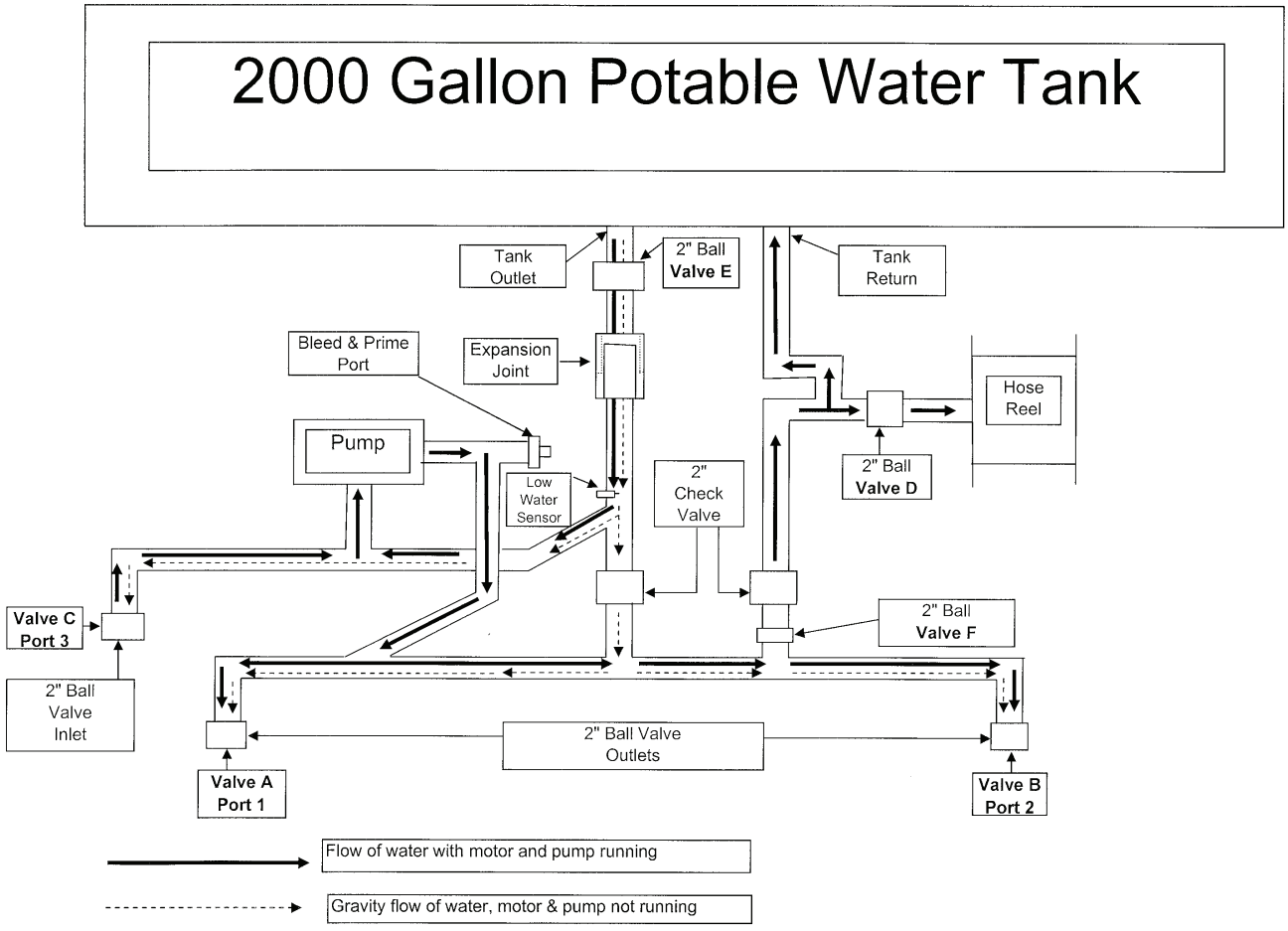
431-080

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
19	**Before**		**Generator**	a. Inspect generator for damaged or missing hardware. b. Check generator housing for cracks.	Generator is damaged or has missing hardware. Housing cracked or damaged.

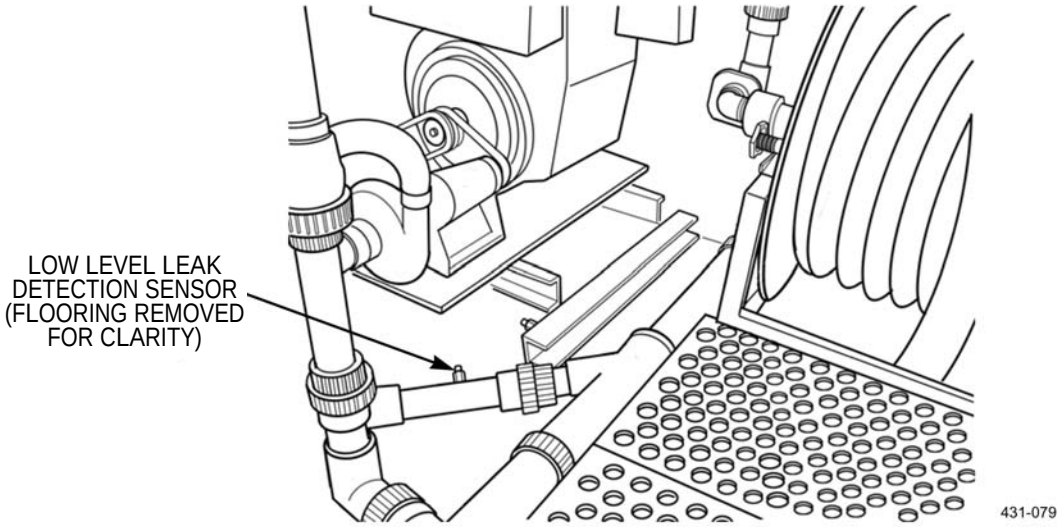


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
20	**Before**		**Fire Extinguisher**	Check for missing, damaged, or loose fire extinguisher.	Fire extinguisher is missing, damaged, or does not have a full charge.
				 431-085	
			PLUMBING SYSTEM		
21	**Before**		**Lines and Fittings**	a. Inspect lines and fittings for obvious damage, loose or missing hardware, and loose or damaged plumbing or electrical connections.	Damaged or missing hardware, damaged connection, or any leakage.
				b. Check entire plumbing system for obvious damage or leaks.	Class III leak is present.
				c. Check all valves for proper operations.	Valve is hard to open or close.
				d. Check all hoses for cracks or fraying.	
				e. Check unions for looseness and tighten if necessary.	

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
20 (Con't)	Before		Lines and Fittings		

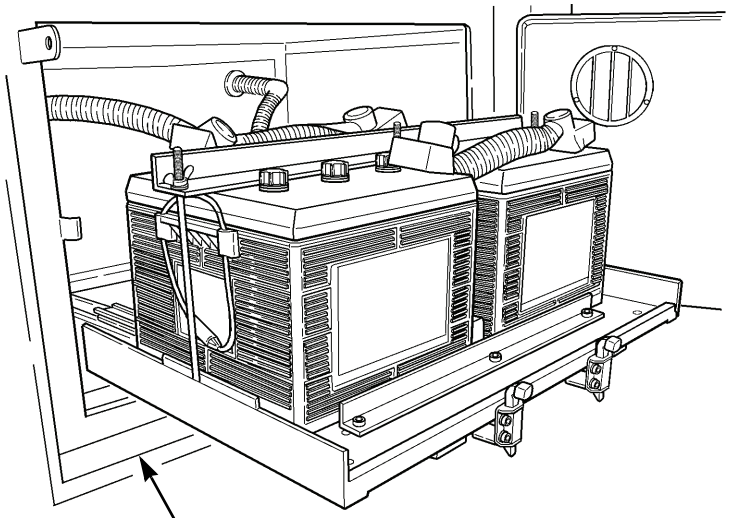


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
22	**Before**		**Low Level Leak Detection Sensor**	Inspect low level sensor for damaged, loose, or missing hardware.	Sensor does not operate and is required for mission.

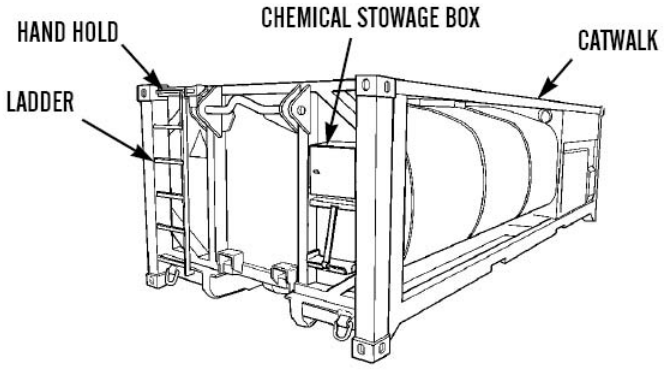


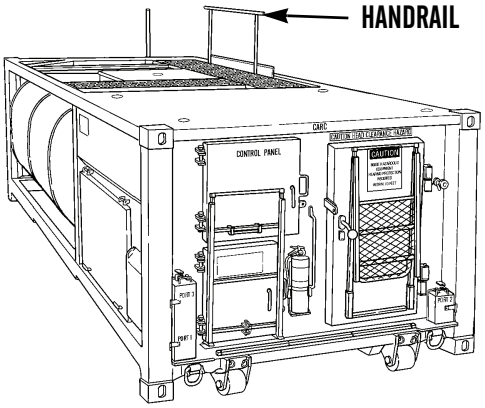
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			RIGHT SIDE	**WARNING** • To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel. a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately. b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required. c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately. d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.	
23	**Before**		**Battery Box**	a. Inspect exterior of battery box and mounting hardware for damage and loose or missing hardware.	Missing mounting hardware.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
23 (Cont)	**Before**		**Battery Box**	b. Inspect batteries for damage and loose or missing hardware.	Battery is damaged.
				c. Inspect battery and battery tray by sliding out tray and checking for leakage.	Battery leakage.
24	**Before**		**Frame, Right**	a. Inspect frame and housing or shelter walls for damage or cracked welds.	Frame has weld cracks.
				b. Inspect tank and shell for rips or leaks and broken welds.	Tank shell has leakage due to puncture or damage.
				c. Inspect tank shell cover straps for frays, cracks, or damage.	Cracked or frayed shell cover straps.
				d. Inspect water level indicator for damage and loose, missing, or cracked hardware.	Water level indicator is damaged.

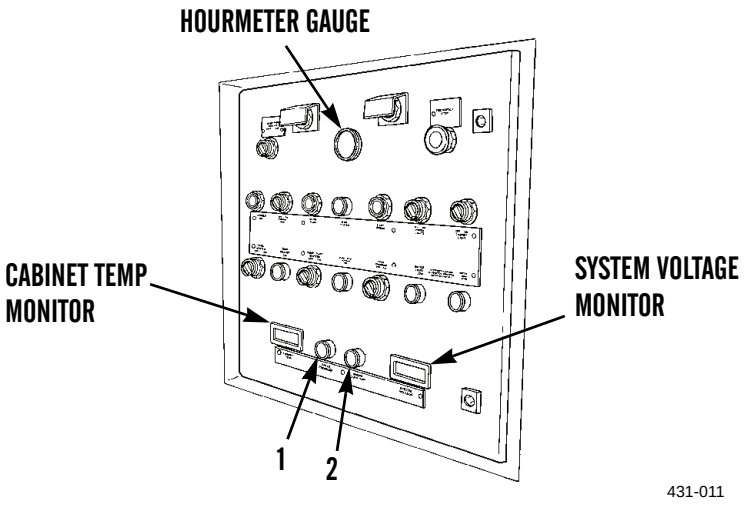


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			FRONT		
25	Before		Ladder	Inspect access ladder for damage or cracked welds.	
26	Before		Chemical Stowage Box	Inspect chemical stowage box for damage or missing hardware.	Chemical stowage box is missing or damaged.
27	Before		Handhold	Visually inspect handhold for damage or missing hardware.	



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			TOP		
28	**Before**		**Handrail**	WARNING • DO NOT lean on the handrail. The handrail is not load bearing and is unstable. Failure to follow this warning may result in injury or death to personnel. • There is a pinch hazard when deploying or stowing the handrail. Use caution and wear protective gloves. Failure to follow this warning may result in injury to personnel.	
				Inspect safety handrail for damaged, loose, or missing hardware.	Safety handrail damaged.
				 431-006	
29	**Before**		**Catwalk**	Inspect catwalk for damaged, loose, or missing hardware.	Catwalk has loose, missing, or damaged hardware.
30	**Before**		**Frame**	Inspect top tank frame for damaged or cracked welds.	Top tank frame has damaged or broken welds.
31	**Before**		**Housing Roof**	Inspect housing or shelter for obvious damage, cracked welds, or puncture holes.	Housing or shelter top has large, punctured holes or weld cracks.

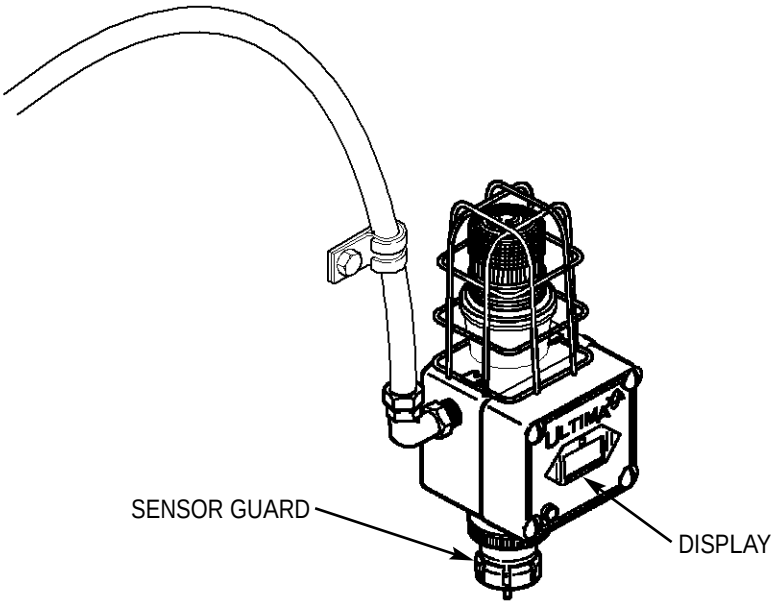
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
32	During		Control Panel Gauges	**WARNING** When any access door is open, safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.	
				a. Inspect SYSTEM VOLTAGE monitor and hourmeter gauge for signs of damage with POWER ON button in the ON position.	SYSTEM VOLTAGE monitor and hourmeter gauge does not read 22-24 volts.
				b. Monitor LOW OIL PRESSURE (1) and ENGINE OVER TEMP (2) indicators.	LOW OIL PRESSURE or ENGINE OVER TEMP indicators are lit during pumping operation.



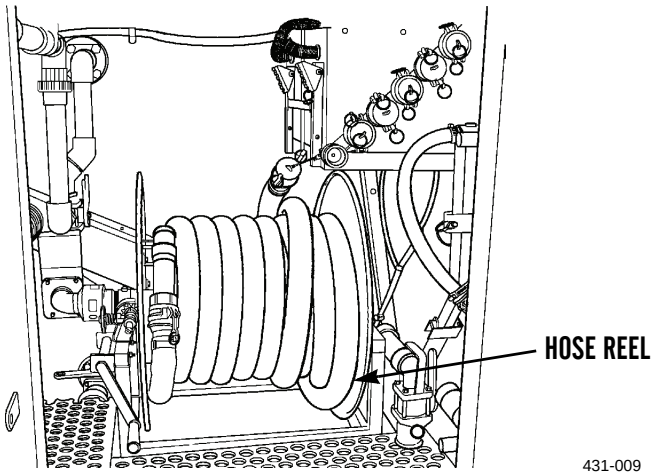
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
33	**During**		**Overall**	Check for evidence for broken or damaged welds or leaks on module.	Damage is present that will impair the operation.

WARNING

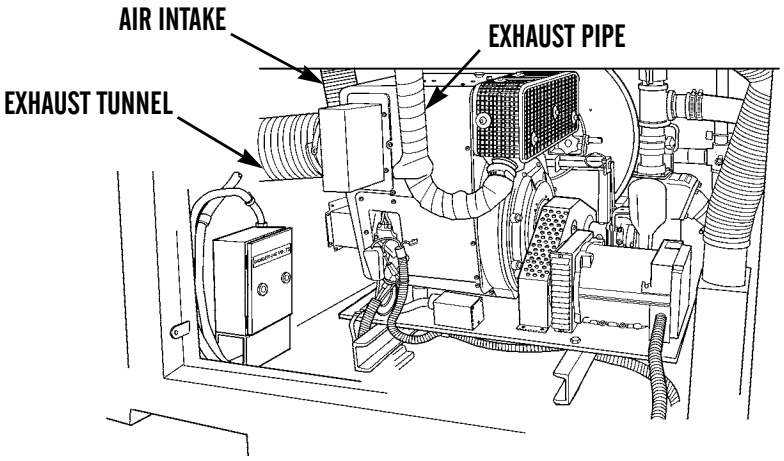
- When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment.
- There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel.
- Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and the engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury to personnel or damage to equipment.
- BE ALERT at all times during operations for exhaust odors and exposure symptoms. Always ventilate housing when operating engine. Treatment of affected personnel shall be: expose to fresh air, keep warm, DO NOT permit physical exercise. If necessary, give cardiopulmonary resuscitation as described in FM 4-25-11, and get immediate medical attention. Failure to follow this warning may result in serious injury or death to personnel.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
34	**During**		**CO Monitor**	a. Ensure initialization sequence goes through cycle.	Does not sequence through initialized cycle. There is no PPI reading on display. Screen is black.
					
35	**During**		**Hose Reel**	NOTE Open main access door to access interior of unit.	
				a. Inspect hose reel assembly for damaged, loose, broken, or missing hardware. b. Inspect manual crank assembly for damaged or missing hardware.	Hose reel is damaged or broken or missing hardware.

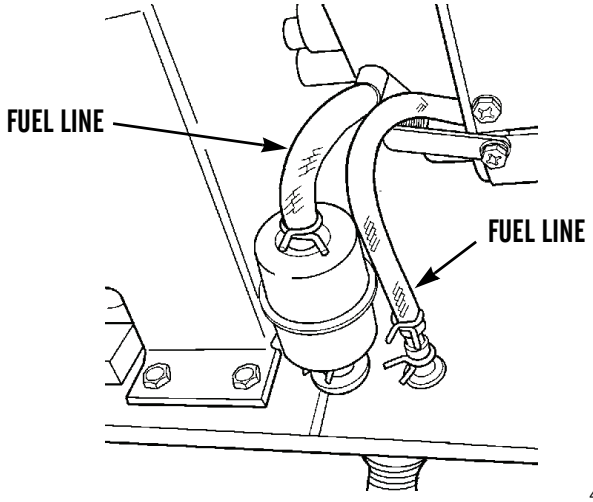
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
35 (Con't)	**During**		**Hose Reel**	c. Inspect for frayed, damaged, or punctured hoses, and damaged or missing gaskets.	Hose is damaged or has leakage. Gasket is damaged or missing.



36	**During**		**Air Intake, Exhaust Tunnels, and Exhaust Pipe**	a. Inspect air intake and exhaust tunnels and exhaust pipe for damaged, loose, or missing hardware. b. Inspect intake and exhaust flex coupling for damaged, loose, or missing hardware.	Exhaust coupling is damaged or leaking or has damaged, loose or missing hardware.

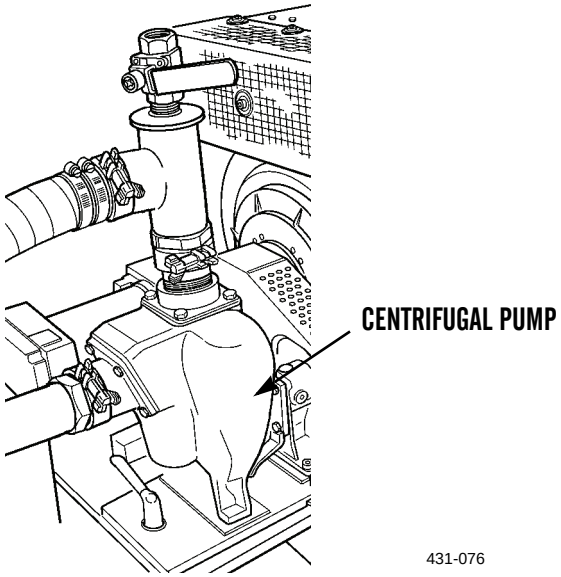


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
37	**During**		**Engine**	Inspect engine assembly for leaks and damaged, loose, or missing hardware. Inspect fuel lines for damage or leakage.	Engine has Class III leaks or damaged, loose, or missing hardware.

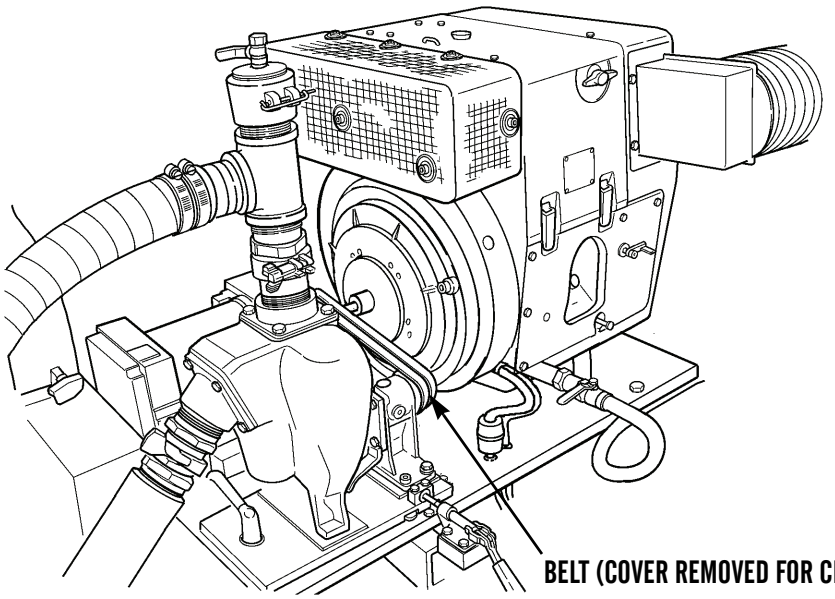


431-063

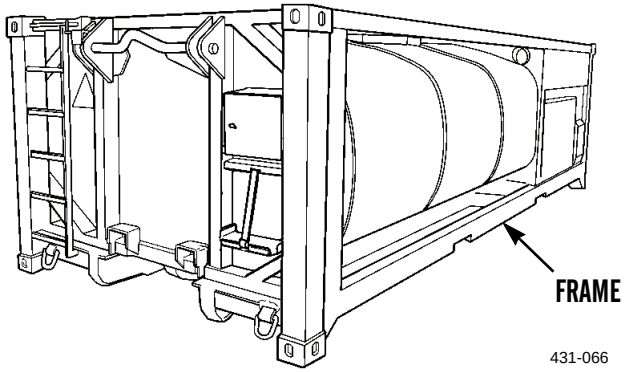
38	**During**		**Centrifugal Pump**	Inspect centrifugal pump for signs of leaks.	Centrifugal pump has Class III leak.



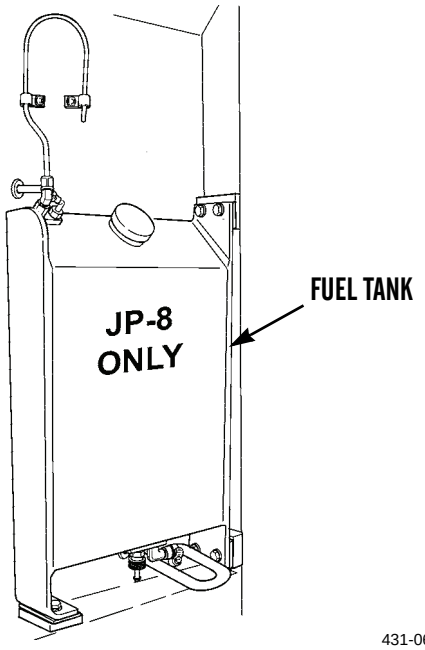
431-076

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
39	**During**		**Belts**	Check for presence of belt.	Belt is missing or broken.
				 431-080	
			EXTERNAL COMPO-NENTS		
40	**After**		**Tank Shell**	a. Check for evidence of broken or damaged welds or leaks on the module. b. Inspect tank and shell for rips or leaks and broken welds. If any damage is found, notify your supervisor. c. Inspect shell cover for frayed or cracked straps and damaged or missing hardware. d. Inspect housing and shelter wall for damage, punctured holes, or cracked welds.	Damage is present that will impair the operation. Tank shell has leakage due to puncture or damage.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			LEFT SIDE		
41	**After**		**Frame, Left**	Inspect frame for damage or cracked welds.	Frame has cracks.

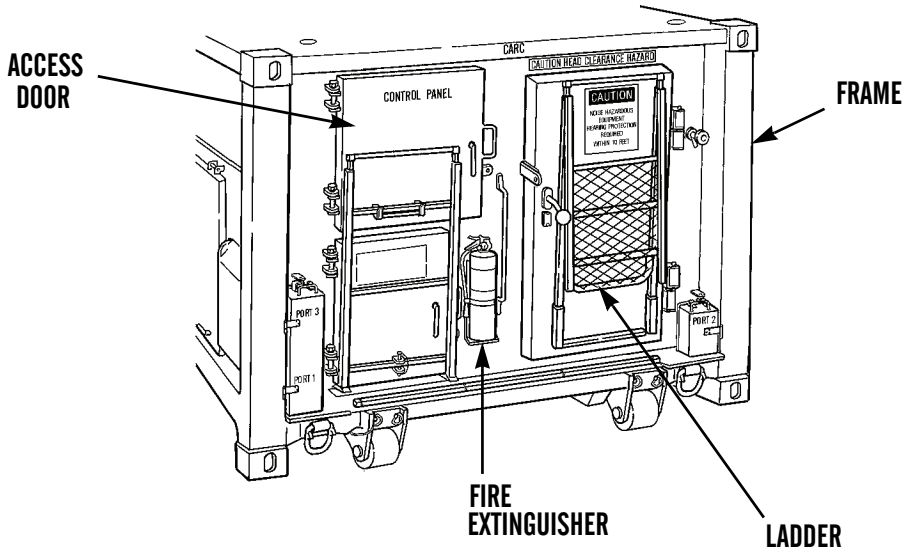


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
42	After		Fuel Tank	WARNING • DO NOT smoke or permit any open flame in area of Hippo while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury to personnel or equipment damage. • DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel, or damage to vehicle. • Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.	
				Inspect fuel tank for damage, missing parts, or leakage.	Fuel tank has leak, missing parts, or damage.

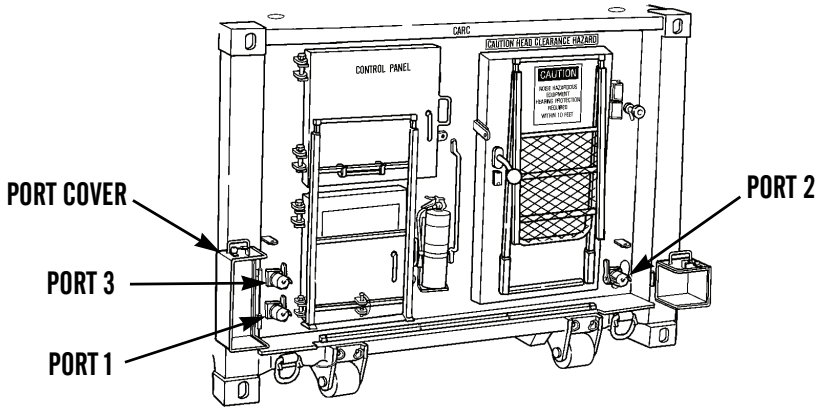


431-067

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			REAR		
43	**After**		**Frame, Rear**	a. Inspect frame, access doors, and housing or shelter walls for damage or cracked welds.	Frame has damaged or cracked welds.
				b. Inspect valve port covers for damaged or missing hardware.	Valve port covers have damaged or missing hardware.
				c. Inspect fire extinguisher and bracket for damage or missing hardware.	Fire extinguisher is discharged or missing.
				d. Inspect ladder assembly for damaged, loose, or missing hardware.	Ladder assembly has damaged, loose, or missing hardware.

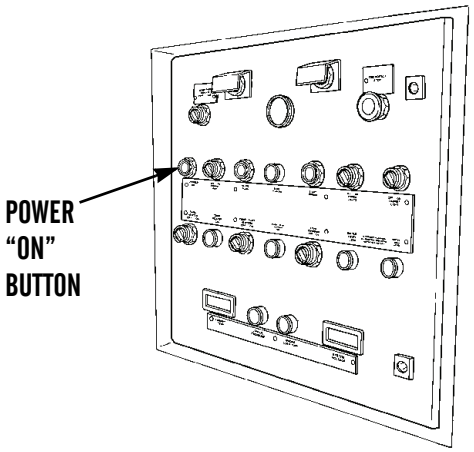


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
44	After		Valve Port	a. Inspect valve Port 1, 2, and 3 for damaged, loose, or missing hardware.	Valve ports have damaged, loose, or missing hardware.
				b. Inspect valve port covers for damaged or missing hardware.	Valve port covers have missing or damaged hardware.



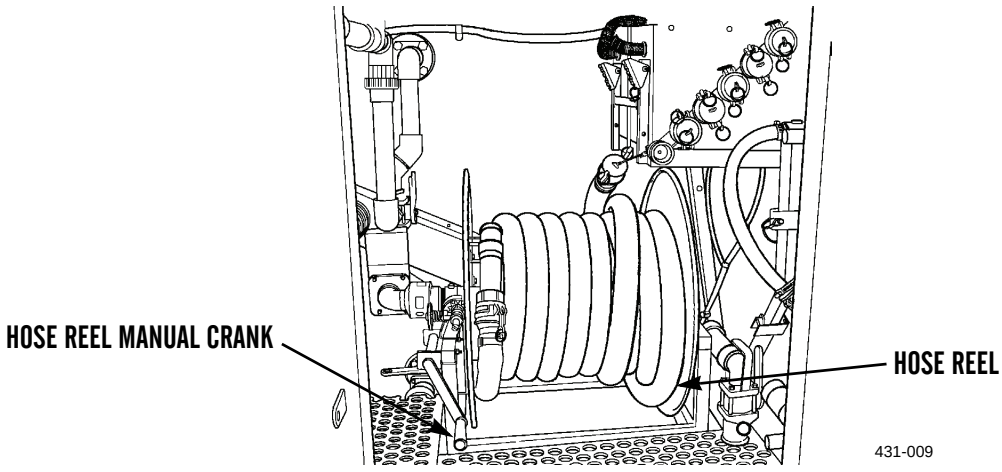
431-013

45	After		Control Panel Gauges	**WARNING** When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment. Inspect control panel gauges for signs of damage with POWER ON button on.	Any gauge is broken or inoperative.

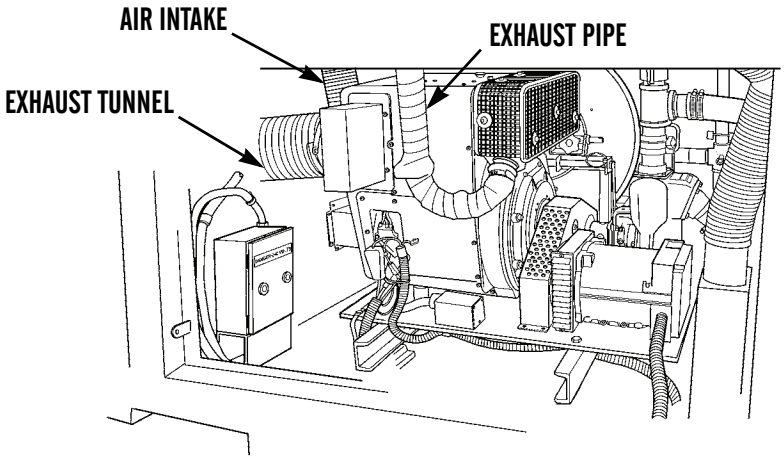


431-011

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			INTERIOR		
46	**After**		**Hose Reel**	**WARNING** • When any access door is open, the safety brace must be used to brace the access door open. Failure to follow this warning may result in injury to personnel or damage to equipment. • There is a head clearance hazard when entering the engine compartment through the main access door. Use caution not to bump your head. Failure to follow this warning may result in injury to personnel. • Toxic exhaust fumes could leak into the engine compartment and build up, causing a suffocation hazard. During engine compartment occupancy, both the main access door and engine access door must be open and secured with their safety braces. DO NOT use the engine compartment as a shelter. Failure to follow this warning may result in injury or death to personnel. **NOTE** Open main access door to access interior of unit.	
				a. Inspect hose reel assembly for damage and loose, broken, or missing hardware.	Hose reel is damaged or has loose, broken, or missing hardware.
				b. Inspect hose reel manual crank assembly for damage or missing hardware.	Hose reel manual crank is damaged or has missing hardware.
				c. Inspect for frayed, damaged, or punctured hoses.	Hose is damaged or has leakage due to cut or puncture.

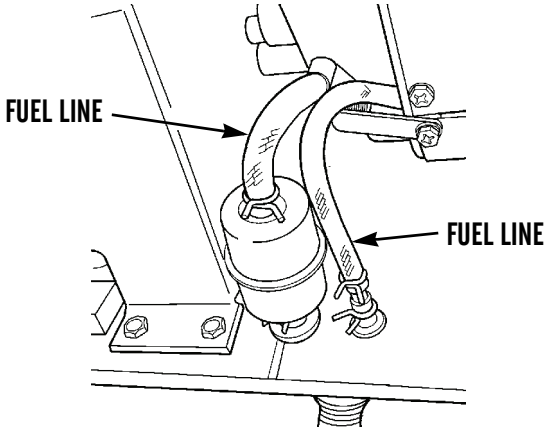


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
47	After		**Air Intake, Exhaust Tunnels, and Exhaust Pipe**	a. Inspect the intake and exhaust tunnels and the exhaust pipe for damaged, loose, or missing hardware. b. Inspect intake and exhaust flex coupling for damaged, loose, or missing hardware.	Exhaust coupling is damaged or leaking or has loose, damaged, or missing hardware.



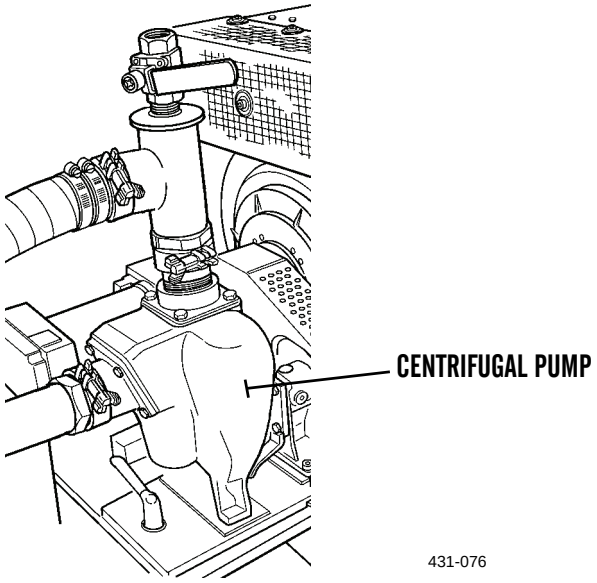
431-077

48	After		**Engine**	a. Inspect engine assembly for leaks and damaged, loose, or missing hardware. b. Inspect fuel lines for damage or leaks.	Engine has Class III leaks or damaged, loose, or missing hardware. Fuel lines damaged or leaking.



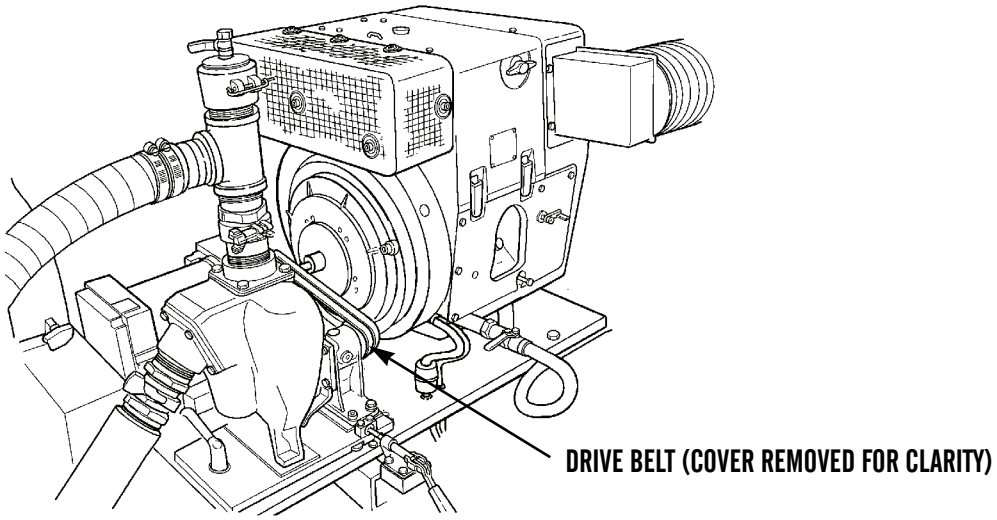
431-063

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
49	**After**		**Centrifugal Pump**	Inspect pump for signs of leaks.	Pump has Class III leak.



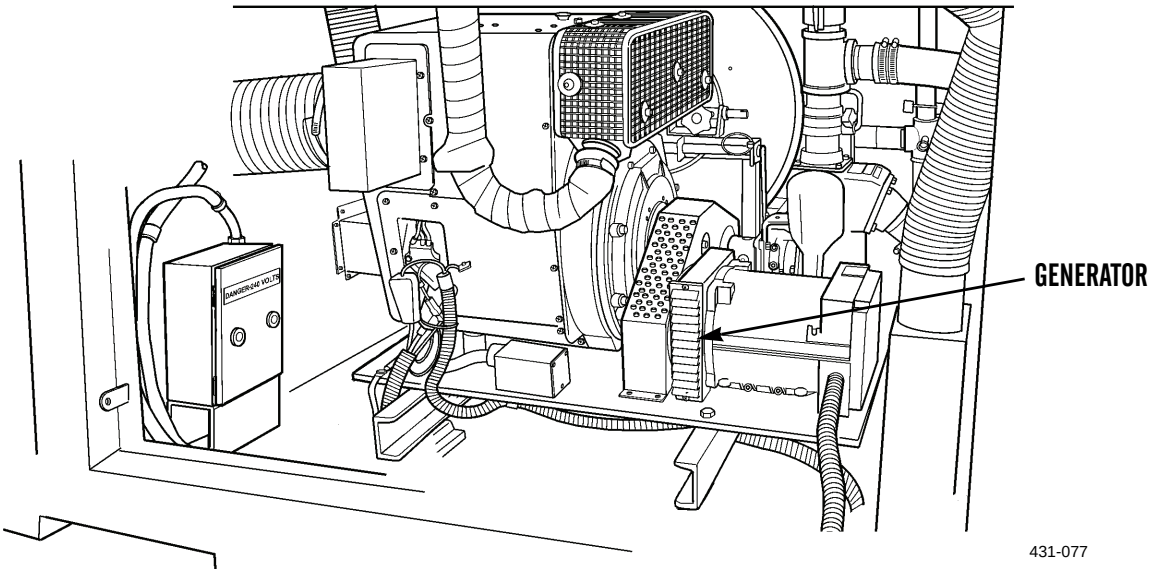
431-076

50	**After**		**Drive Belts**	Check for presence of drive belts.	Drive belts are missing or broken.

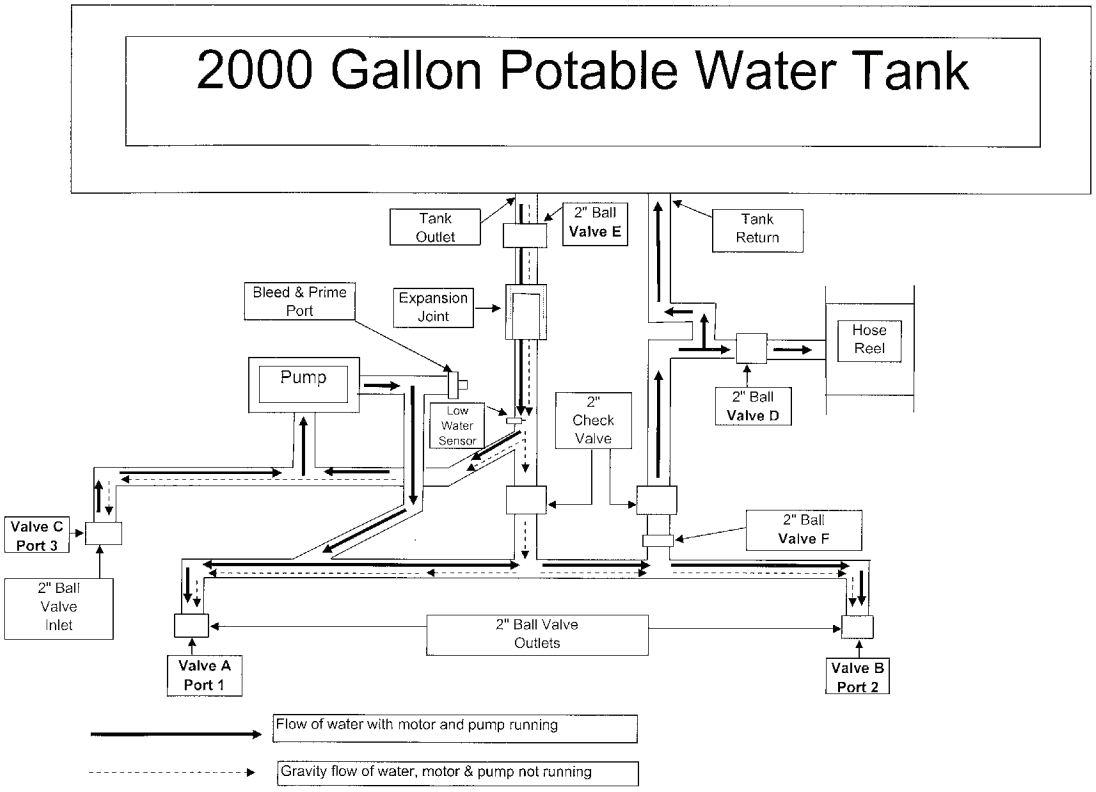


431-080

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
51	**After**		**Generator**	Inspect generator for damaged or missing hardware.	Generator is damaged or has missing hardware.

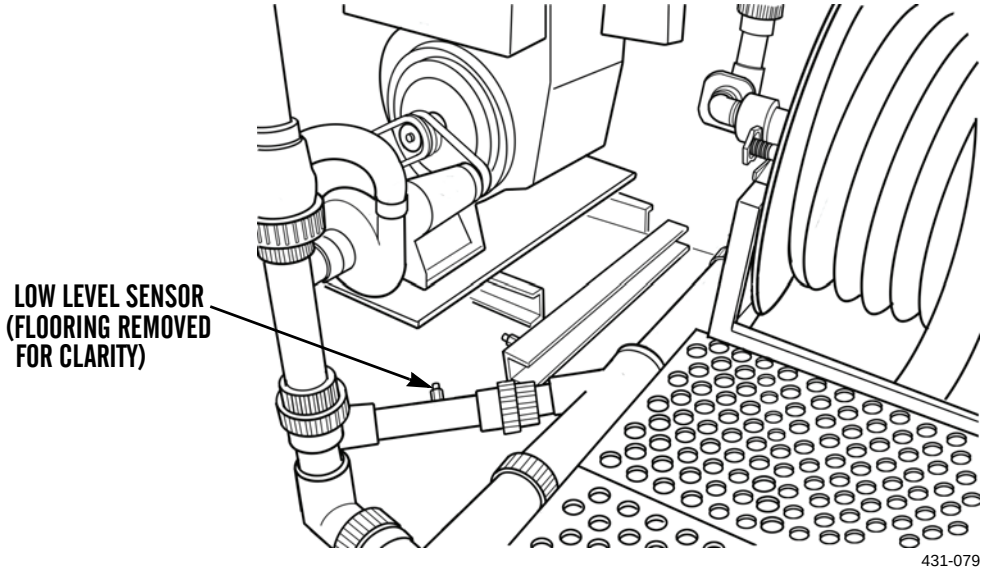


ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			PLUMBING SYSTEM		
52	**After**		**Lines and Fittings**	a. Inspect lines and fittings for obvious damage, loose or missing hardware, and loose or damaged plumbing or electrical connections. Tighten loose hardware and connectors.	Damaged or missing hardware, damaged connection, or any leakage.
				b. Check entire plumbing system for obvious damage or leaks.	Class III leak is present.
				c. Check all valves for proper operations.	Valve is hard to open or close.
				d. Check all hoses for cracks or fraying.	

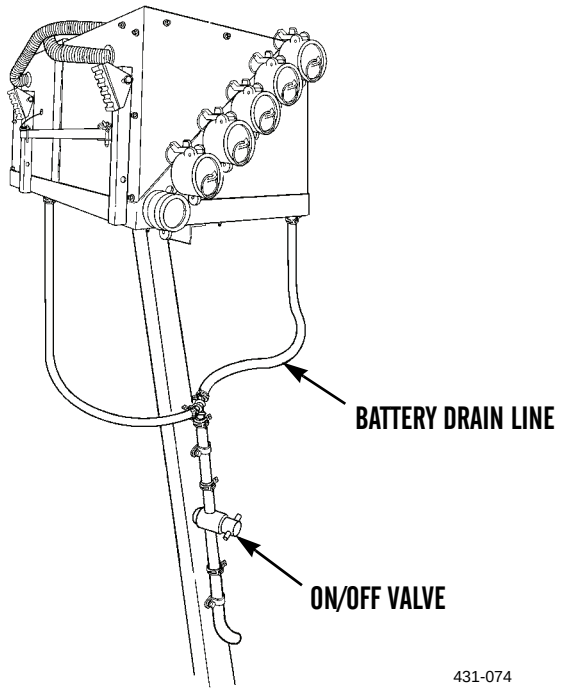


431-078

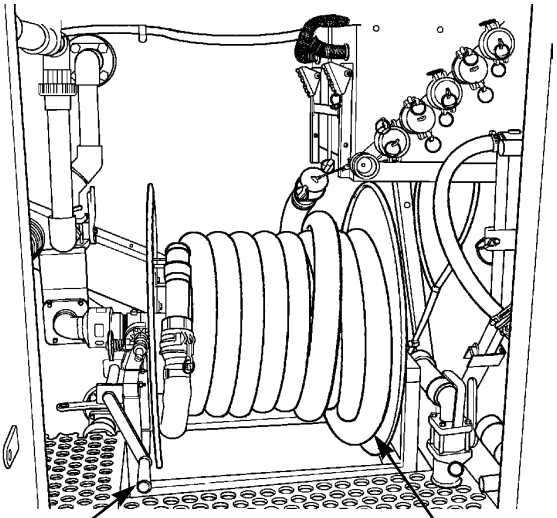
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
53	**After**		**Low Level Sensor**	Inspect low level sensor for damaged, loose, or missing hardware.	Sensor does not operate and is required for mission.



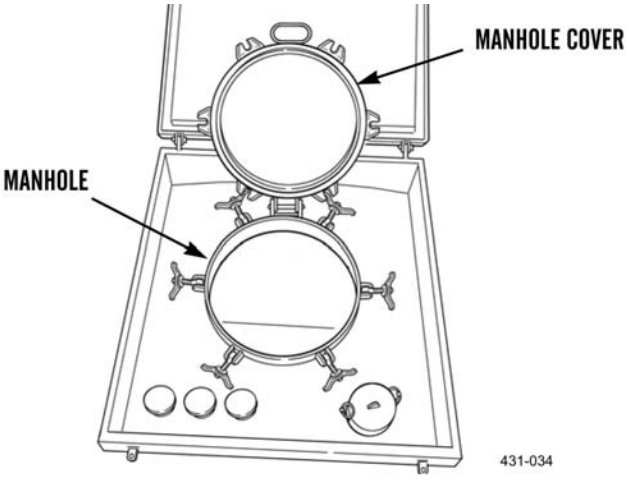
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
				WARNING • To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel. a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately. b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required. c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately. d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.	
54	**Weekly**		**Batteries**	a. Check battery drain line for sediments. Place a non-metallic container at end of battery drain line. Open ON/OFF valve and drain all sediments. b. Service the batteries (WP 0017 00).	ON/OFF valve does not operate correctly.

ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
					
55	**Weekly**		**Engine Air Filter**	Service air filter and check exhaust and intake connections (WP 0018 00).	

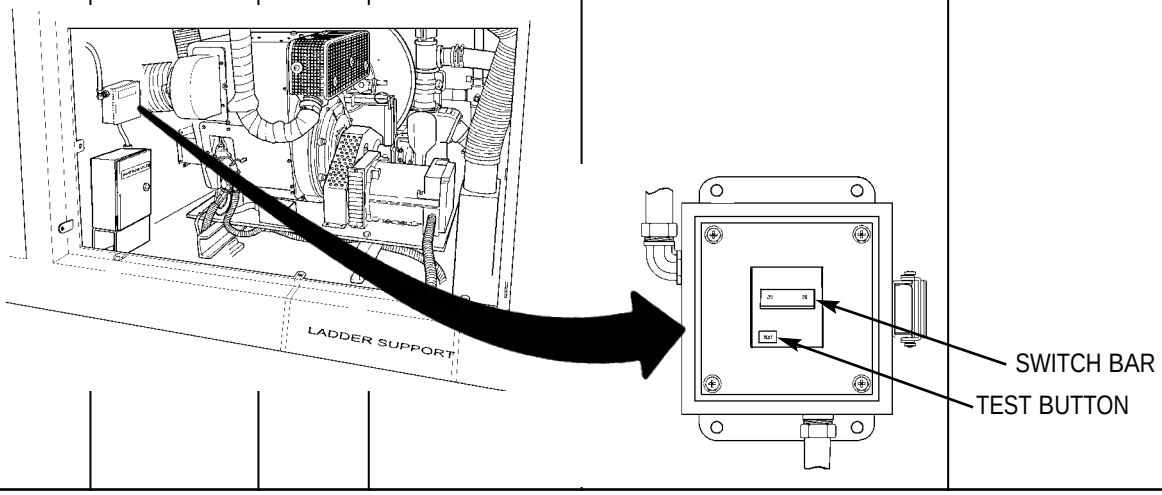
ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
56	Weekly		Hose Reel	NOTE Cap hose end prior to inspecting hoses.	
				a. Unlock hose reel locking mechanism, by turning knob counter clockwise (to the left).	
				b. Uncoil hose completely.	
				c. Inspect entire length of hose for obvious damage, frays, cracks, or punctures.	Hose is damaged or has leakage.



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
57	Monthly		Manhole, Lid, and Cover	a. Inspect housing and shelter top for damage, cracked welds, damaged hinges or locking mechanisms, or missing hardware.	
				b. Check for leaks around manhole cover. If leaks are evident, check for damaged gasket or loose mounting ring. Also, check to see that cover can be opened, closed, and securely latched.	Manhole cover gasket is damaged or missing; manhole cover cannot be securely closed.
				WARNING • Manhole cover does not lock open. Injury may occur if manhole cover accidentally closes on personnel. • A confined space entry permit is required before entering the water tank. Failure to follow this warning may result in injury or death to personnel.	
				NOTE Secure helmet, hat, and other personal items prior to inspecting interior tank.	
				c. Inspect breather and pressure valves for damage or missing hardware.	Breather or pressure valves are damaged.



ITEM NO.	INTERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
58	Monthly		GFCI	WARNING Engine housing components and accessories may be extremely hot when engine is running or had been running recently. Use caution when working around engine unit. Failure to comply may result in injury to personnel. 1. If running, stop engine and allow it to cool. Refer to WP 0007 00. 2. Open GFI box. 3. Start engine. Refer to WP 0007 00. 4. Depress white GFCI test button and observe if switch bar trips to lower position. 5. Shut down engine. 6. Reset GFCI by pushing switch bar down until it clicks, then back up to top position. 7. Close and latch GFCI box door.	Switch bar does not trip to lower position. Switch bar cannot be reset to top position.



END OF WORK PACKAGE

THIS WORK PACKAGE COVERS

Servicing

INITIAL SETUP:

Tools and Special Tools

None

Materials/Parts

Rag, wiping (Item 10, WP 0022 00)

Materials/Parts - Continued

Rubber gloves
Protective goggles

Equipment Condition

Engine shut down (WP 0006 00)

WARNING

- The deployment of the ladder to check or perform battery maintenance is designed to be utilized only when the Hippo is on the ground. UNDER NO CIRCUMSTANCES SHOULD THE BATTERY MAINTENANCE BE PERFORMED WHEN THE HIPPO IS ON THE PRIME MOVER. Failure to follow this warning could result in injury or death to personnel and/or damage to equipment.
- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel.

a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

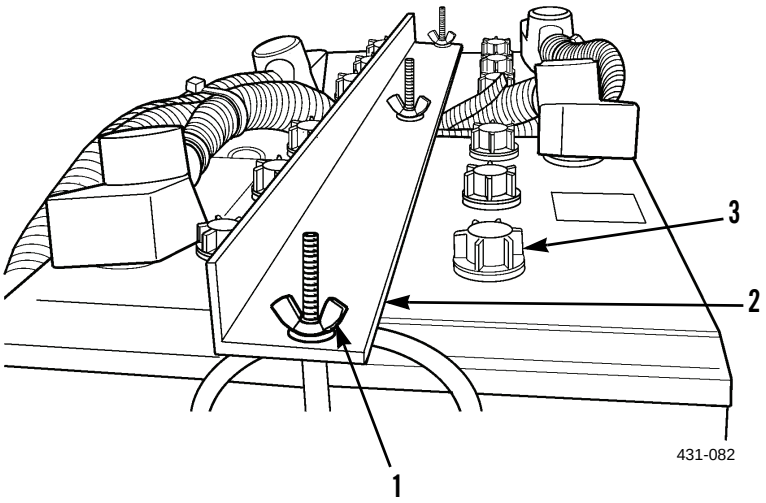
b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.

c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

SERVICING

1. Remove wing nuts (1) and remove battery holddown bracket (2).
2. Clean top of batteries with a clean, dry cloth.
3. Remove the caps (3) from each battery cell and visually check the electrolyte level inside each battery cell.
4. If the top of the plate in any of the cells is not covered by electrolyte, notify Unit Maintenance.
5. Replace the caps (3) on the battery cells securely.
6. Replace battery holddown bracket (2) and wing nuts (1).



END OF WORK PACKAGE

ENGINE AIR FILTER SERVICING 0018 00

THIS WORK PACKAGE COVERS

Servicing

INITIAL SETUP

Tools and Special Tools

N/A

Materials/Parts

Rag, wiping (Item 10, WP 0022 00)

Equipment Condition

Engine shut down (WP 0006 00)

WARNING

Ensure engine is cool before servicing engine air filter. Failure to comply may result in injury to personnel.

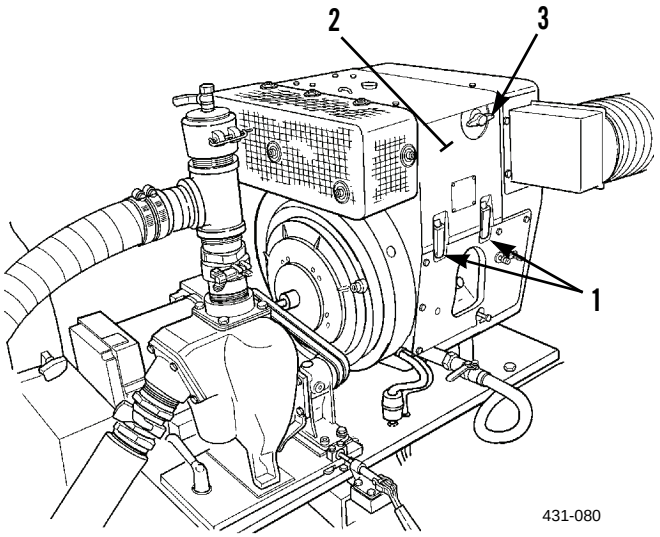
SERVICING

1. Unlatch two latches (1) from outer cover (2).

NOTE

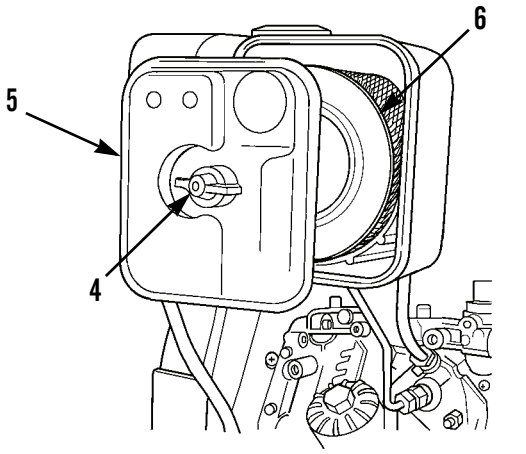
Step 2 is for models 1-5 only.

2. Turning clockwise, remove black knob (3) with outer cover (2).



SERVICING - CONTINUED

3. Loosen inner cover wing nut (4) by turning wing nut counterclockwise.
4. Remove inner cover (5) by pulling inner cover outward.
5. Remove air filter (6) by pulling air filter straight out.
6. Clean, shake out excessive dirt, and wipe clean with rag, or replace if air filter (6) is dirty.
7. Check exhaust and intake connections. Tighten any bolts or screws that may be loose, or replace if missing.
8. Install air filter (6) by seating firmly into inner casing.
9. Install inner cover (5) by placing it firmly onto inner casing.
10. Tighten inner cover (5) by turning inner cover wing nut (4) clockwise, ensuring that there is a tight seal between inner cover and casing.



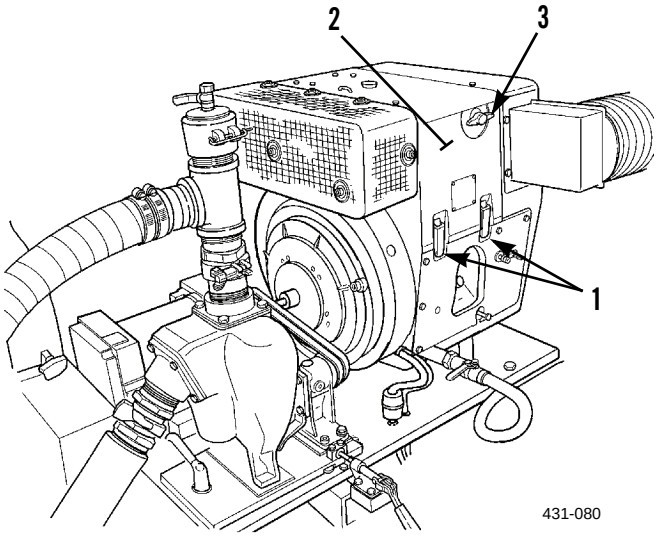
431-083

11. Install outer cover (2) ensuring to slide top tabs under top cover.
12. Latch two latches (1) to secure outer cover (2) in place.

NOTE

Step 13 is for models 1-5 only.

13. Install black knob (3) by aligning black knob on shaft and pushing black knob straight on shaft until it is set firmly.



431-080

END OF WORK PACKAGE

CHAPTER 5
SUPPORTING INFORMATION

REFERENCES 0019 00

SCOPE

This work package lists all publication indexes, forms, field manuals, technical bulletins, technical manuals, and other publications referenced in this manual and which apply to operation and operator maintenance of the Hippo.

PUBLICATION INDEXES

The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual.

Consolidated Army Publications and Forms Index. . . . . DA PAM 25-30
Functional Users Manual for The Army Maintenance Management System (TAMMS). . . . . DA PAM 750-8

FORMS

NOTE

Refer to DA PAM 750-8, Functional Users Manual for The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms.

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404, DA Form 5988-E
Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines . . . . . DD Form 1397
Product Quality Deficiency Report . . . . . SF Form 368
Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028
Report of Discrepancy (ROD). . . . . SF Form 364
Shipping and Storage Instructions . . . . . DD Form 250 or DD Form 1149

FIELD MANUALS

Basic Cold Weather Manual . . . . . FM 31-70
Field Hygiene and Sanitation . . . . . FM 21-10
First Aid . . . . . FM 4-25.11
NBC Decontamination . . . . . FM 3-5
Railway Operating and Safety Rules . . . . . FM 55-2 1

TECHNICAL BULLETINS

Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment . . . . . TB 43-0209
Corrosion Prevention and Control, Including Rustproofing Procedures for Tactical Vehicles and Trailers . . . . . TB 43-0213
Hand Portable Fire Extinguishers Approved for Army Users . . . . . TB 5-4200-200-10
Maintenance in the Desert. . . . . TB 43-0239
Occupational and Environmental Health: Sanitary Control and Surveillance of Field Water Supplies . . . . . TB MED 577

TECHNICAL MANUALS

First Aid. . . . . TM 4.25-11
Operator's Manual for Truck, M1074 and M1075 Palletized Load System (PLS) . . . . . TM 9-2320-364-10
Operator's, Organizational, and Direct Support and General Support Maintenance Manual (Including RPSTL) for LHS HEMTT Models M1120, M1120A2, M1120A2 R1 . . . . . TM 9-2320-304-14&P
Operator's, Unit, Direct Support and General Support Maintenance Manual for Palletized Load System Trailer (PLST) Model M1076 . . . . . TM 9-2320-385-14
Procedures for Destruction of Tank-automotive Equipment to Prevent Enemy Use (U.S. Army Tank-automotive Command) . . . . . TM 750-244-6

OTHER PUBLICATIONS

Abbreviations and Acronyms . . . . . ASME Y14.38-1999
Army Logistics Readiness and Sustainability . . . . . AR 700-138
Army Medical Department Expendable/Durable Items . . . . . CTA 8-100
Association of American Railroads (AAR) . . . . . Section 6, figure 58
Engineering for Transportability Document . . . . . AR 70-47
Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) . . . . . CTA 50-970
Military Standard Transportation and Movements Procedures (MILSTAMP) . . . . . DOD 4500.32
NATO Document (for shipments by European Railways) . . . . . STANAG 2832
Performance Specifications: General Style and Format, Test Program Sets for Automatic Test Equipment MIL-PRF-49503B
Title 29, Code of Federal Regulations, Standard Number 19 10.146: Permit-Required Confined Spaces . . . . . 29 CFR 1910.146
Title 40, Code of Federal Regulations, Part 261: Identification and Listing of Hazardous Waste . . . . . 40 CFR 261
Title 40, Code of Federal Regulations, Part 268: Land Disposal Restrictions . . . . . 40 CFR 268

END OF WORK PACKAGE

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS 0020 00

SCOPE

This work package lists COEI and BII for the Hippo, to help you inventory items required for safe and efficient operation.

GENERAL

The COEI and BII information is divided into the following tabular lists:

1. **Table 1, Components of End Item List.** This listing is for informational purposes only and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.
2. **Table 2, Basic Issue Items List.** These are the minimum essential items required to place the Hippo in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the Hippo during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of end item. Illustrations are furnished to assist you in identifying the items.

EXPLANATION OF COLUMNS

Below is an explanation of columns found in the tabular listings:

1. **Column (1) - Illustration Number (Illus Number).** This column indicates the number of the illustration that shows the item.
2. **Column (2) - National Stock Number.** Indicates the National Stock Number (NSN) assigned to the item and used for requisitioning purposes.
3. **Column (3) - Description, CAGEC, and Part Number.** Indicates the Federal item name (in all capital letters) and, if required, a minimum description in parentheses to identify and locate the item. The entry for each item ends with the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.
4. **Column (4) - Usable ON Code.** Indicates a code if the item needed is not the same for all models of equipment. Usable ON Codes for the Hippo are not applicable.
5. **Column (5) - Unit of Measure (U/M).** Indicates how the item is issued for the NSN shown in Column (2).
6. **Column (6) - Quantity Required (Qty Rqd).** Indicates the quantity of the item required.

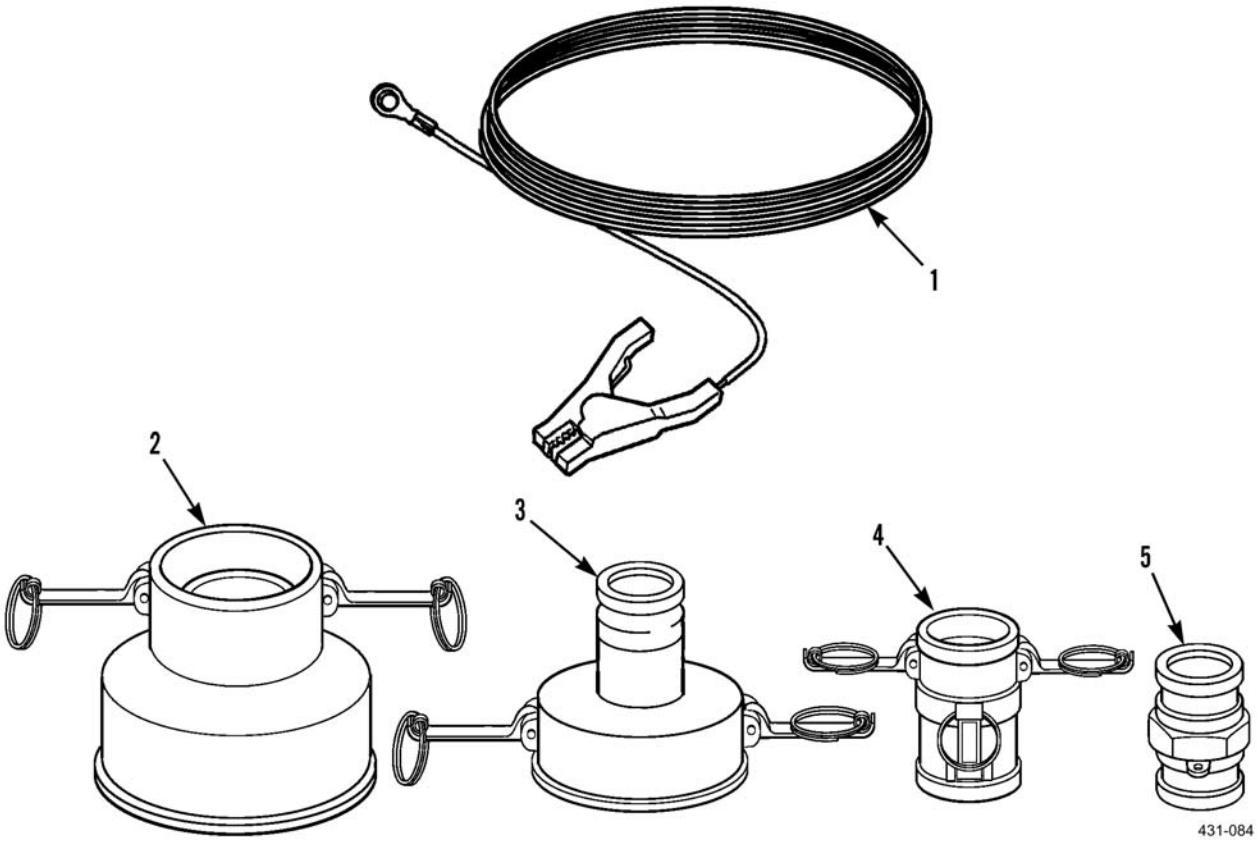


Table 1. Components of End Item List (COEI).

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
1	5999-01-526-9193	STRIP, ELECTRICAL GROUNDING (2X262) 1 06A0238		EA	1
2	4730-01-526-9228	ADAPTER, CAM-LOCK: 4 Inch Male x 2 Inch Female (33813) 70262040		EA	1
3	4730-01-526-9230	ADAPTER, CAM-LOCK: 4 Inch Female x 2 Inch Male (33813) 70264020		EA	1
4	4730-01-526-9226	ADAPTER, CAM-LOCK: 2 Inch Female x Female (33813) 68272020		EA	2
5	4730-01-526-9233	ADAPTER, CAM-LOCK: 2 Inch Male x Male (33813) 70282020		EA	2

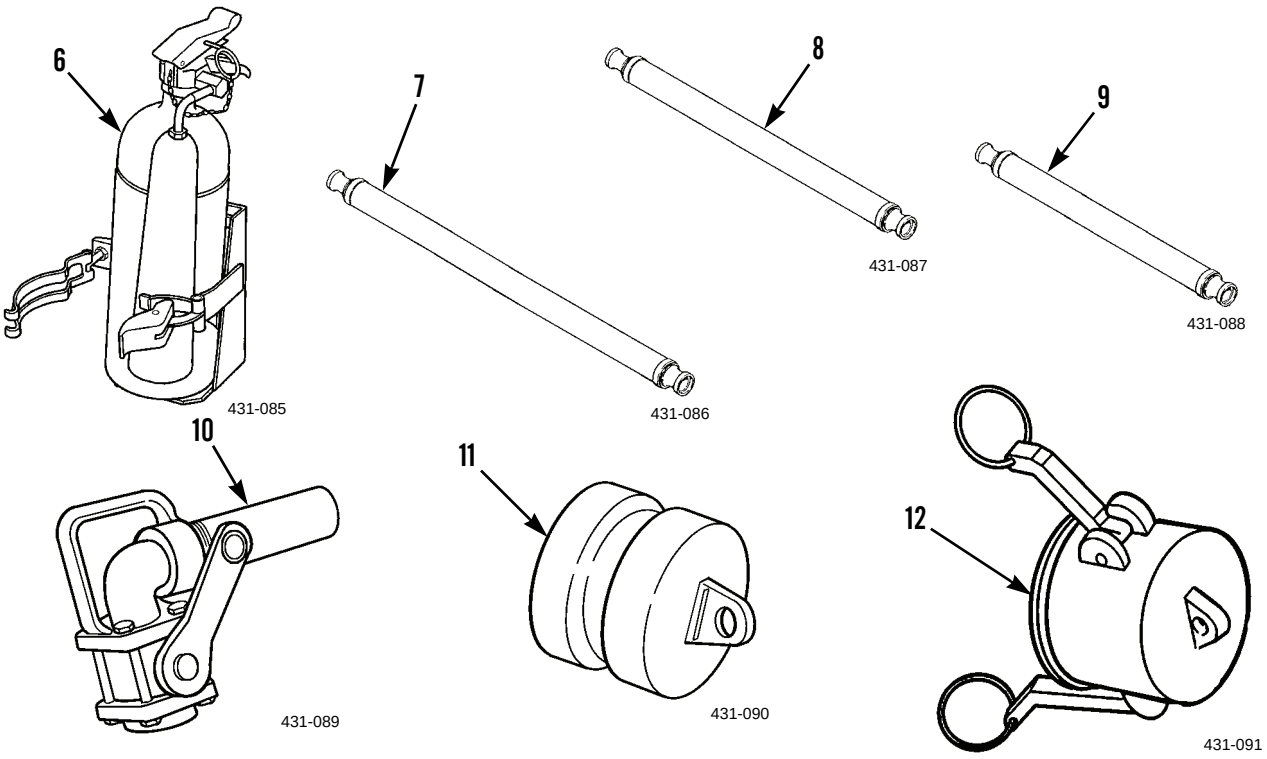


Table 1. Components of End Item List (COEI) - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
6	4210-00-808-4544	EXTINGUISHER, FIRE (03670) 25201		EA	1
7	4720-01-526-9197	HOSE ASSEMBLY, NON-METALLIC: 2 Inch x 35 Feet (2X262) 106A0011-1		EA	1
8	4720-01-526-9195	HOSE ASSEMBLY, NON-METALLIC: 2 Inch x 20 Feet (2X262) 106A0011-2		EA	1
9	4720-01-526-9194	HOSE ASSEMBLY, NON-METALLIC: 2 Inch x 15 Feet (2X262) 106A0011-3		EA	1
10	4820-01-526-9222	NOZZLE, VALVE: 2 Inch (1G3R1) VA200		EA	1
11	4730-01-534-7422	CAP, PLUG DUST: 2 Inch (39428) 51415K75		EA	1
12	5340-01-506-2773	CAP, PROTECTIVE, DUST: (4X630) 863-000325		EA	1

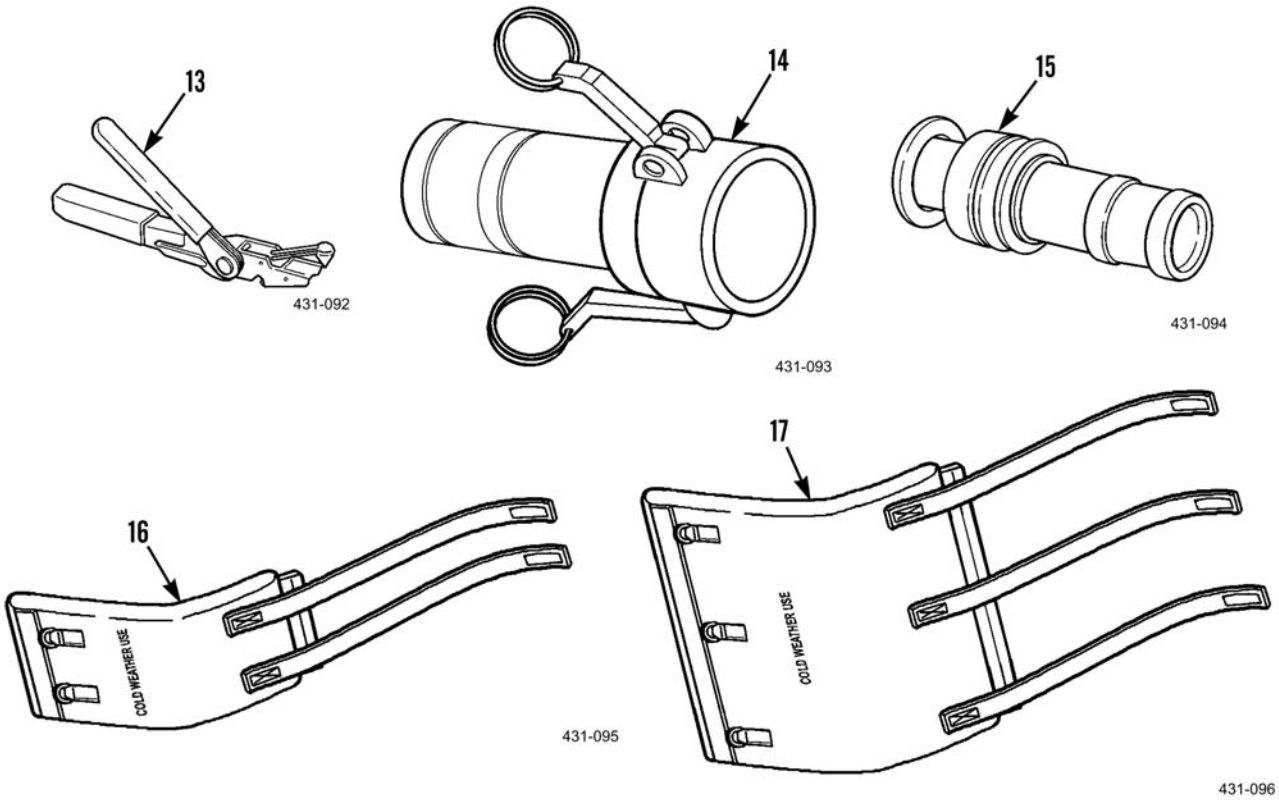


Table 1. Components of End Item List (COEI) - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
13	4730-01-540-5274	CLAMP, HOSE (39428) 5655K22		EA	1
14	4730-01-242-5373	COUPLING HALF, QUICK DISCONNECT (39428) 51415K35		EA	1
15	4730-01-534-4941	ADAPTER, HOSE (39428) 51415K65		EA	1
16	5970-01-539-1465	BLANKET (2X262) 1 06A0296		EA	2
17	5970-01-539-1472	BLANKET (2X262) 106A0297		EA	1

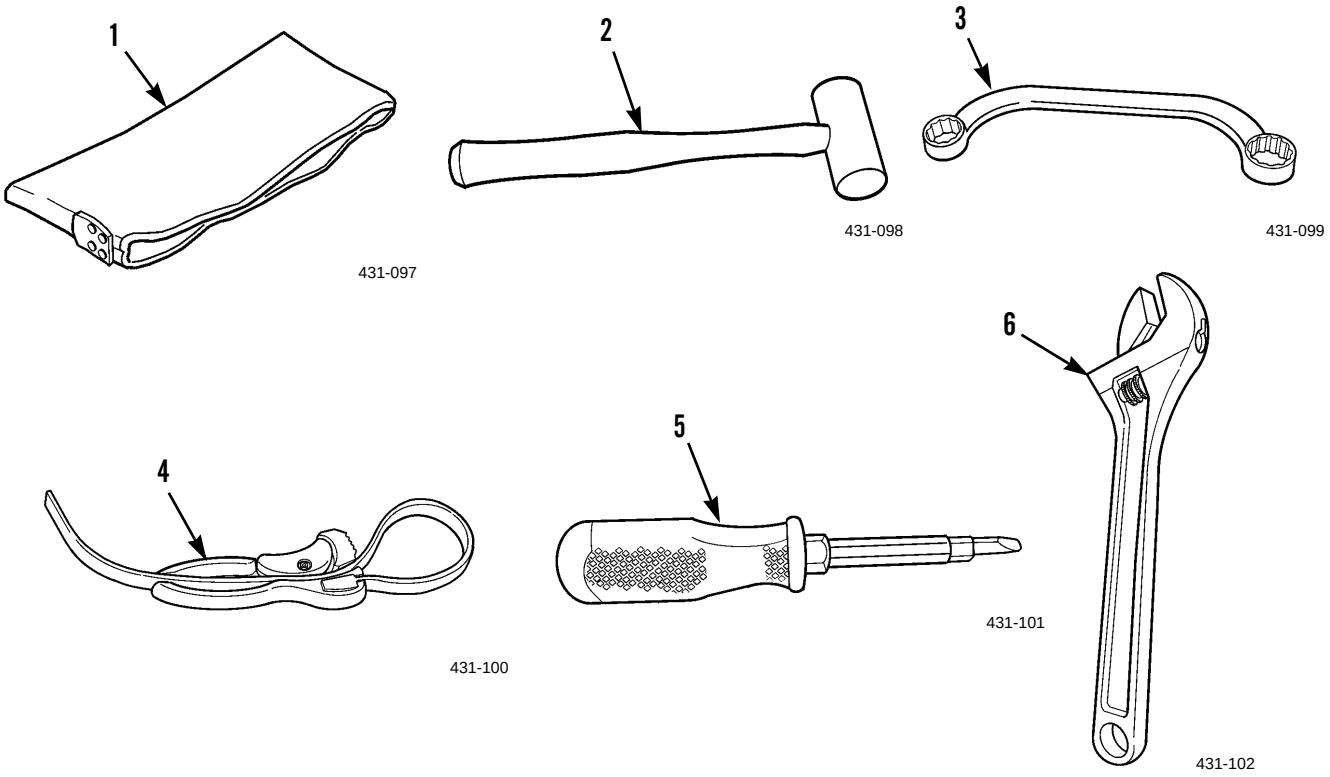


Table 2. Basic Issue Items List (BII).

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
1	8105-01-438-9279	BAG, TOOLS AND SPARE PARTS (39428) 6565A11		EA	1
2	5120-01-536-2363	MALLET, PLASTIC (39428) 5913A1		EA	1
3	5120-01-535-7641	WRENCH, BOX (39428) 5466A11		EA	1
4	5120-01-461-1810	WRENCH, STRAP (39428) 54325A24		EA	1
5	5120-01-535-7245	SCREWDRIVER SET (39428) 6127A38		EA	1
6	5120-01-535-9280	WRENCH, ADJUSTABLE: 10 Inch (39428) 5386A4		EA	1

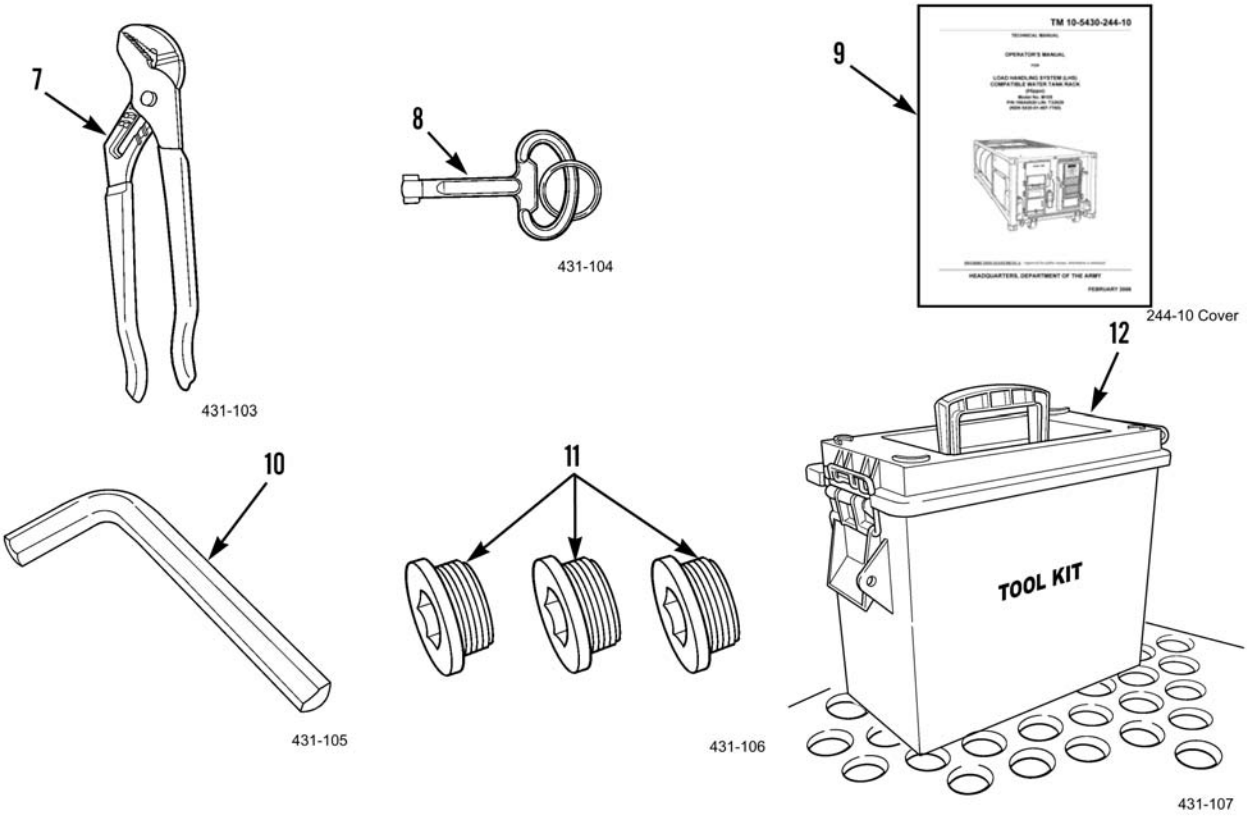


Table 2. Basic Issue Items List (BII) - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQD
7	5 120-01-535-9279	PLIERS, SLIP JOINT (39428) 5765A3		EA	1
8	5315-01-535-5101	KEY, CONTROL PANEL (65671) 2531000		EA	1
9	5430-01-487-7760	TM 10-5430-244-10 Operator's Manual		EA	1
10		KEYS, SOCKET HEAD SCREW (0XY83) DIN911M22		EA	1
11		AIR TRANSPORTABILITY PLUGS (0XY83) DIN 908AG 1 1/4-A4		EA	3
12	2540-01-535-2775	BOX ACCESSORIES (2X262) 106A0369		EA	1

END OF WORK PACKAGE

ADDITIONAL AUTHORIZATION LIST (AAL) 0021 00

SCOPE

This work package lists additional items that you are authorized for the support of the Hippo.

GENERAL

This list identifies items that do not have to accompany the machine and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA, or JTA.

EXPLANATION OF COLUMNS

1. **Column (1) - National Stock Number.** Indicates the National Stock Number (NSN) assigned to the item and will be used for requisitioning purposes.
2. **Column (2) - Description, CAGEC, and Part Number.** Indicates the Federal item name followed by a minimum description when needed. The entry for each item ends with the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.
3. **Column (3) - Usable on Code.** Indicates a code if the item needed is not the same for different models of equipment. Usable ON Codes for the Hippo are not applicable.
4. **Column (4) - Unit of Measure (U/M)**. Indicates how the item is issued for the National Stock Number shown in Column (1).
5. **Column (5) - Qty Recm.** Indicates the quantity recommended.

Table 1. Additional Authorization List (AAL).

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, CAGEC, AND PART NUMBER	(3) USABLE ON CODE	(4) U/M	(5) QTY RQD
8415-00-082-6108	APRON, CLOTH, RUBBER COATED (58536) A-A-55063		EA	1
2530-01-089-4992	BOOT, VEHICULAR COMPONENTS (19207) 12290948			
7240-01-337-5269	CAN, GASOLINE, MILITARY: 5 Gallon (58536) CID A-A-59592		EA	1
6515-01-457-0631	FACE SHIELD, GENERAL (1AG17) 75-1564-03		EA	1
5415-01-526-8501	GLOVES, NEOPRENE (07BM2) 1AZ03		EA	1
8415-00-268-7859	GLOVES, WELDERS (58536) A-A50022		EA	1
4240-00-052-3776	GOGGLES, INDUSTRIAL (45152) 3336841		EA	1
5340-01-346-4611	PADLOCK (81346) ASTM F883		EA	1

END OF WORK PACKAGE

EXPENDABLE AND DURABLE ITEMS LIST 0022 00

SCOPE

This work package lists expendable and durable items you will need to operate and maintain the Hippo. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, *Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)*, or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

1. **Column (1) - Item Number.** This number is referenced in the appropriate work package Initial Setup list or in the narrative instructions to identify the item; e.g., Use chlorine test tablets (Item 1, WP 0022 00).
2. **Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item.

   C - Operator/Crew
3. **Column (3) - National Stock Number.** This is the National Stock Number assigned to the item, which you can use to requisition it.
4. **Column (4) - Description, CAGEC, and Part Number.** This provides the other information you need to identify the item.
5. **Column (5) - Unit of Measure (U/M).** This column shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1	C	6550-01-044-0315	CHLORINE TEST TABLETS (34807) 6903-J	PK
2	C		CLEANING COMPOUND: Solvent, Type III (81349) MIL-PRF-680	
		6850-01-474-2318	1 Gallon Can	CN
		6850-01-474-2320	5 Gallon Can	CN
		6850-01-474-2321	55 Gallon Drum	DR
3	C		DETERGENT: General Purpose, Liquid (83421) 7930-00-282-9699	
		7930-00-282-9699	1 Gallon Can	CN
4	C	9130-01-031-5816	FUEL, TURBINE: Aviation (81349) MILT83133 GR JP8	GL
5	C		GREASE: Automotive and Artillery GAA	
		9150-01-197-7688	(81349) M-10924-A 1-1/4 Ounce Tube	TU
		9150-01-197-7693	(81349) M-10924-B 14 Ounce Cartridge	CA
		9150-01-197-7690	(81349) M-10924-C 1-3/4 Pound Can	CN
		9150-01-197-7692	(81349) M-10924-E 35 Pound Can	CN
6	C		OIL: Lubricating, OE/HDO 10 (81349) MIL-PRF-2104	
		9150-00-189-6727	1 Quart Can	CN
		9150-00-186-6668	5 Gallon Can	CN
		9150-00-191-2772	55 Gallon Drum	DR
7	C		OIL: Lubricating, OE/HDO 15W/40 (81349) MIL-PRF-2104	
		9150-01-152-4117	1 Quart Can	CN
		9150-01-152-4118	5 Gallon Can	CN
		9150-01-152-4119	55 Gallon Drum	DR
8	C		OIL: Lubricating, OE/HDO 30 (81349) MIL-PRF-2104	
		9150-00-186-6681	1 Quart Can	CN
		9150-00-188-9858	5 Gallon Can	CN

Table 1. Expendable and Durable Items - Continued.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
9	C	6550-01-095-6757	PHENOL RED PH TEST TABLETS (34807) 6915-J	PK
10	C		RAG: Wiping (64067) 7920-00-205-1711	
		7920-00-205-1711	50 Pound Bale	
11	C	5330-00-291-7947	SEAL, PLAIN, ENCASED (14153) 00044	BL
12	C	8030-01-014-5869	SEALANT (39428) 91458A15	EA
13	C	8030-01-542-7384	SEALANT (39428) 9695T15	EA
14	C	8030-01-516-0406	SEALING COMPOUND (32849) 91458A14	EA

END OF WORK PACKAGE

INDEX

INDEX (Contd)

INDEX (Contd)

INDEX (Contd)

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0600501

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RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE **1 July 2007**

TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*
AMSTA-LC-LMIT/TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-5430-244-10	29 January 2007	Operator's Manual for Load Handling System (LHS) Compatible Water Tank Rack (Hippo)

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0017 00-2					Part number supplied for item 2 is incorrect.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

SAMPLE

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

APD V4.00

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ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

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ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

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PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

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TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

Weights

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Pounds
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

Liquid Measure

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

Square Measure

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gal.s	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gal.	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gal.s	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gal.	2.354
Kilometers per Hour	Miles per Hour	0.621

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