



ESP Primer System

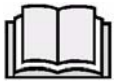
(Includes: SPV and PVG Valves)

Installation, Operation and Service Maintenance Manual



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NOTICE !

Hale Products, Inc. cannot assume responsibility for product failure resulting from improper maintenance or operation. Hale is responsible only to the limits stated in the product warranty. Product specifications contained in this manual are subject to change without notice.

All Hale products are quality components -- ruggedly designed, accurately machined, precision inspected, carefully assembled and thoroughly tested. In order to maintain the high quality of your unit, and to keep it in a ready condition, it is important to follow the instructions on care and operation. Proper use and good preventive maintenance will lengthen the life of your unit.

**ALWAYS INCLUDE THE UNIT SERIAL NUMBER
IN YOUR CORRESPONDENCE.**

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1 Safety Precautions



IMPORTANT !

THE HALE **ESP** PRIMER SYSTEM, WHICH INCLUDES THE **SEMI-AUTOMATIC PRIMING VALVE (SPV)** OR THE **PVG** PRIMER VALVE, IS DESIGNED FOR OPTIMUM SAFETY OF ITS OPERATORS. FOR ADDED PROTECTION, PLEASE FOLLOW THE SAFETY GUIDELINES LISTED IN THIS SECTION. ADHERE TO ALL WARNING, DANGER, CAUTION AND IMPORTANT NOTES FOUND WITHIN THIS MANUAL.

ALL SUPPLIED DOCUMENTATION MUST BE CAREFULLY READ, UNDERSTOOD AND ADHERED TO STRICTLY BY ALL INSTALLERS AND OPERATORS BEFORE ATTEMPTING INSTALLATION OR OPERATION.

WHEN DEVELOPING DEPARTMENTAL APPARATUS OPERATING PROCEDURES, INCORPORATE THE WARNINGS AND CAUTIONS AS WRITTEN.

Hale is a registered trademark of Hale Products, Incorporated. All other brand and product names are the trademarks of their respective holders.

1.1 DEFINITIONS



DANGER !

DANGER - Immediate hazard which WILL result in severe personal injury or death if the warning is ignored.



WARNING !

WARNING - Hazards or unsafe practices which COULD result in severe personal injury or death if the warning is ignored.



CAUTION !

CAUTION - Hazards or unsafe practices which COULD result in minor or moderate personal injury if the warning is ignored.



NOTICE !

NOTICE - Practices which could result in damage to the apparatus or other property.

1.2 GUIDELINES



NOTICE !

THE PROCEDURES IN THIS MANUAL ARE GENERAL OPERATING PROCEDURES. THEY DO NOT REPLACE THE PROCEDURES, POLICIES OR GUIDELINES ESTABLISHED BY THE AUTHORITY HAVING JURISDICTION, NOR DO THEY REPLACE THE RECOMMENDATIONS AND PROCEDURES PROVIDED IN THE APPARATUS MANUFACTURER'S MANUAL.

REFER TO THE PROCEDURES PROVIDED BY THE AUTHORITY HAVING JURISDICTION ON SETTING WHEEL CHOCKS (TO PREVENT ANY MOVEMENT OF THE APPARATUS), AS WELL AS LAYOUT AND CONNECTION OF HOSES, VALVES AND DRAIN COCKS.

- Use care when removing the primer system, including SPV and PVG valves, from its packaging to prevent personal injury and/or damage to the components.
- Use all mounting bolt holes provided on the primer to support the assembly. See the appropriate plate drawing, located at the back of this manual, for additional installation information.
- Installation should be performed by a trained and qualified installer, such as your authorized service representative. Be sure the installer has sufficient knowledge, experience and the proper tools before attempting any installation.
- The installer is responsible for observing all instructions and safety precautions in his or her daily routine as dictated by regional safety ordinances or departmental procedures.



CAUTION !

ALL FASTENERS USED HAVE BEEN SELECTED FOR THEIR APPLICATION. HALE PRODUCTS DOES NOT RECOMMEND REPLACING FASTENERS WITH ANYTHING OTHER THAN HALE PART NUMBERS PROVIDED. REPLACING WITH A WEAKER ALTERNATIVE POSES A SERIOUS SAFETY RISK.

ALL FASTENERS MUST BE INSTALLED WITH A LOCKING ANAEROBIC ADHESIVE/SEALANT, SUCH AS LOCTITE® #246.

**CAUTION - continued !**

BE SURE TO WEAR SAFETY GLASSES WHEN REMOVING AND/OR INSTALLING FORCE (PRESS) FITTED PARTS. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY.

- ❑ Parts under spring tension can become projectiles and cause serious injury. When removing or installing these parts make sure they are restrained and spring tension is released slowly.
- ❑ Disconnect or turn OFF the master battery switch prior to servicing the Hale SPV or PVG electrical components. Make sure there is NO power at the primer solenoid before starting service procedures.
- ❑ Any electrical system has the potential to cause sparks during installation, service or repair. Take care to eliminate explosive or hazardous environments during installation, service or repair.
- ❑ Before connecting any cord sets or wiring harnesses, inspect the seal washer in the connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion. This could resulting in possible system failure.
- ❑ DO NOT operate the system at pressures higher than the maximum rated pressure. Always use the lowest possible relief valve settings to enhance operator and equipment safety. Also see Section 3 “System Installation” on page 17 for additional information.
- ❑ Relieve all system pressure, then drain all water from the system before installing the primer.
- ❑ Use only pipe, hose and fittings which are rated at or above the maximum pressure rating at which the water pump system operates.
- ❑ Use only pipe, hose and fittings from the priming pump vacuum connection to the Hale SPV vacuum connection rated for 29 in. Hg. (737 mm) vacuum.
- ❑ Check all hoses for weak or worn conditions after each use. Ensure that all connections and fittings are tight and secure.

**CAUTION**

MAKE SURE THE HALE SPV IS LOCATED HIGHER THAN THE PUMP BODY ALLOWING WATER TO DRAIN FROM THE VACUUM HOSE.

- ❑ If there is primer lubricant in the reservoir, it is recommended to operate lubricated priming systems weekly to cycle the fresh lubricant through the primer.

Safety

Holding the primer ON for two (2) or three (3) seconds after a prime from draft will clean out residue in the primer.

- DO NOT run the primer over forty-five (45) seconds. If prime is not achieved within 45 seconds, stop and look for causes (air leaks or blocked suction hoses).
- Always use caution when handling or disposing of propylene glycol.
- DO NOT USE ETHYLENE GLYCOL.**
- DO NOT allow coolant to discharge to the ground. Review your departmental and/or local environmental regulations regarding the use of and disposal of propylene glycol coolants.
- Always follow the manufacturer's recommended instructions on the label affixed to the container.

2 Introduction

2.1 ESP PRIMER PUMP

Hale recommends and uses **Rotary Vane Positive Displacement** pumps (**ESP**) for priming. Priming pumps are used to evacuate air in the suction hose and pump. (See Figure 2-1: “Rotary Vane ESP Priming Pump.”)

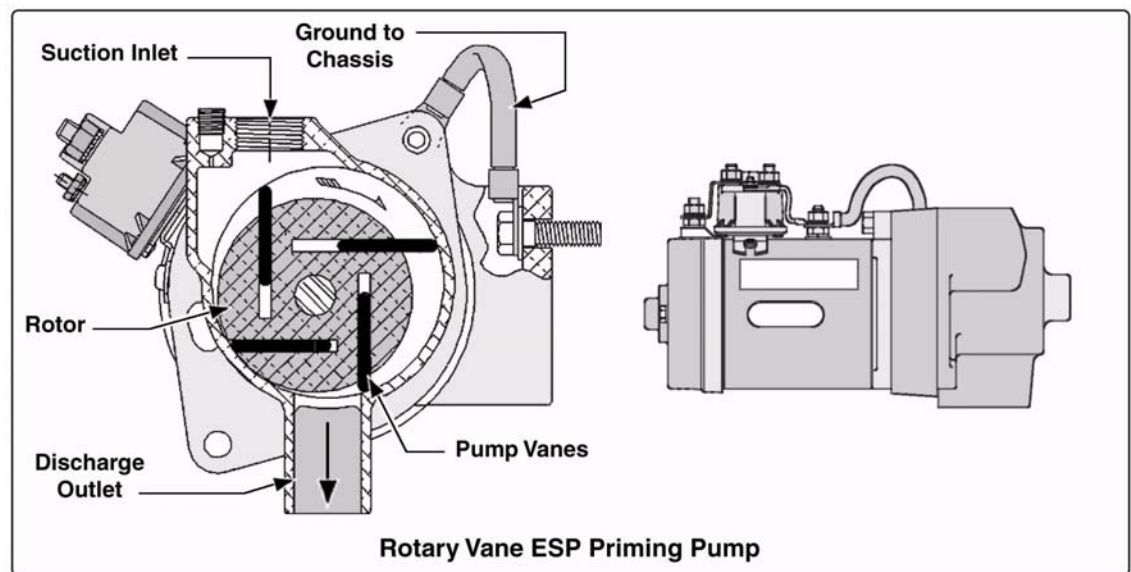


Figure 2-1: Rotary Vane ESP Priming Pump

The Hale **ESP** series priming pump is an environmentally friendly primer that does not require a separate lubricant reservoir.

The vanes and pump body are self-lubricating for maintenance free operation. An ESP priming pump also uses a single control to open the priming valve and start the priming motor.

Note: For an optional “ESP Primer lubricated system,” also see heading “Lubricated ESP Primer System” on page 14.)

Hale priming valves open when the priming pump is operated allowing the air to escape from the pump. Two priming valves offered:

- a. Semi-Automatic Priming Valve (SPV / SPVR) - also see heading “SPV Priming Valve” on page 12.
- b. PVG Priming Valve - also see heading “PVG Priming Valve” on page 14.

2.2 SPV PRIMING VALVE

The Hale **Semi-Automatic Priming Valve (SPV)** simplifies the priming operation of your pump allowing for a faster priming time and longer primer life . The **SPV** is a diaphragm-operated valve that opens using the vacuum generated by the priming pump.

Easily activated by a push button control, the SPV starts the primer motor creating a vacuum. The vacuum acts on the diaphragm in the valve causing the port to open allowing vacuum. (See Figure 2-2: “SPV Overview.”)

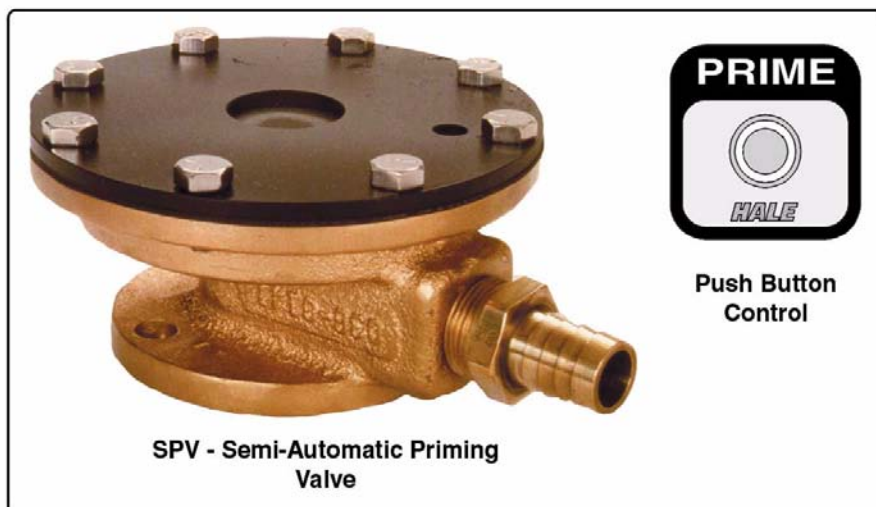


Figure 2-2: SPV Overview

The SPV conforms to NFPA requirements for priming time and hydrostatic test when bolted to Hale Midship series pumps. Each valve is factory tested to 26 in. (660 mm) hg. vacuum and 600 PSIG (41 BAR)

Overview

The SPV mounts directly to the priming connection of Hale Midship series pumps. Additionally, a universal adapter is available to mount the SPV on Hale Booster and Volute series pumps. The installer must also supply hose connections from the adapter to the pump priming connection.

When used on a midship fire pump, the valve mounts to the pump body with two studs and nuts, standard strainer and seal ring.

A short length of 3/4" (19 mm) ID vacuum hose connects the SPV to the priming pump, eliminating potential leak points in the priming hose.

The short length of hose also allows for a faster priming time and longer primer life by reducing the volume that must be evacuated.

The priming pump motor is push-button operated, located on the pump operator panel of the apparatus. There are NO hose connections at the pump operator panel thus saving valuable space.

Depressing and holding the PRIME push button energizes the priming pump motor creating a vacuum in the 3/4" (19 mm) ID hose. As sufficient vacuum is created the diaphragm depresses the spring to OPEN the priming valve, thus creating a vacuum in the main pump body, priming the main pump. Once primed, as indicated by water discharging to the ground from the priming pump outlet, the push button is released to STOP the priming pump. The SPV then CLOSES for normal pump operation.

Configuration Options

The Hale SPV is available from the factory in four (4) different configurations. A description of each follows, beginning on the next page.

Retrofit Kit Option

The retrofit kit contains the components necessary for installing the Hale SPV on a midship fire pump. The kit contains a Hale SPV Valve assembly, panel placard and push button switch.

Universal Mount Installation Kit Option

The Universal Mount Installation Kit contains the components necessary for installing the Hale SPV on a volute or booster type pump. The kit contains a Hale SPV Valve assembly, universal mounting adapter, panel placard and push button switch.

Midship Pump Mounted Option

This option mounts the Hale SPV to the priming flange connection on a "new" midship pump body. Components included with this option and shipped with the midship pump are the push button switch, panel placard and Installation Manual.

When completing the apparatus installation of the Hale SPV, the priming pump must be mounted on the apparatus with the vacuum hose connected in addition to the push-button switch and panel placard being installed on the operator panel.

Primer Mounted on Midship Pump

This option mounts the Hale SPV to the priming flange connection on a “new” midship pump body with the priming pump mounted to the pump gearbox. When this option is ordered, the vacuum hose is connected from the Hale SPV to the priming pump.

Components included with this option and shipped with the midship pump are the push button switch, panel placard and Installation Manual.

When completing the apparatus installation of the Hale SPV with this option the push-button switch and panel placard must be installed on the operator panel.

2.3 PVG PRIMING VALVE

The **PVG** is a combination valve and switch and is mounted on the pump operator’s panel. (See Figure 2-3: “PVG Priming Valves.”)

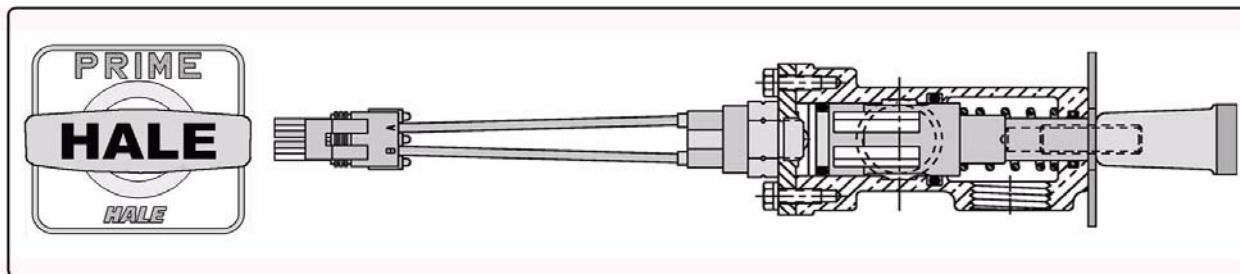


Figure 2-3: PVG Priming Valves

Pulling the handle out **OPENS** the valve and energizes the primer motor. Pushing the handle in de-energizes the primer motor and **CLOSES** the valve.

2.4 LUBRICATED ESP PRIMER SYSTEM

The **Hale ESP Priming System** has a proven history of reliable fast priming and high vacuum performance when properly maintained and operated in accordance with the instructions found in your Pump Installation, Operation and Service Maintenance Manual and in this guide. Under **NORMAL** operating conditions (standard climates) our research has found that no lubricant is required.

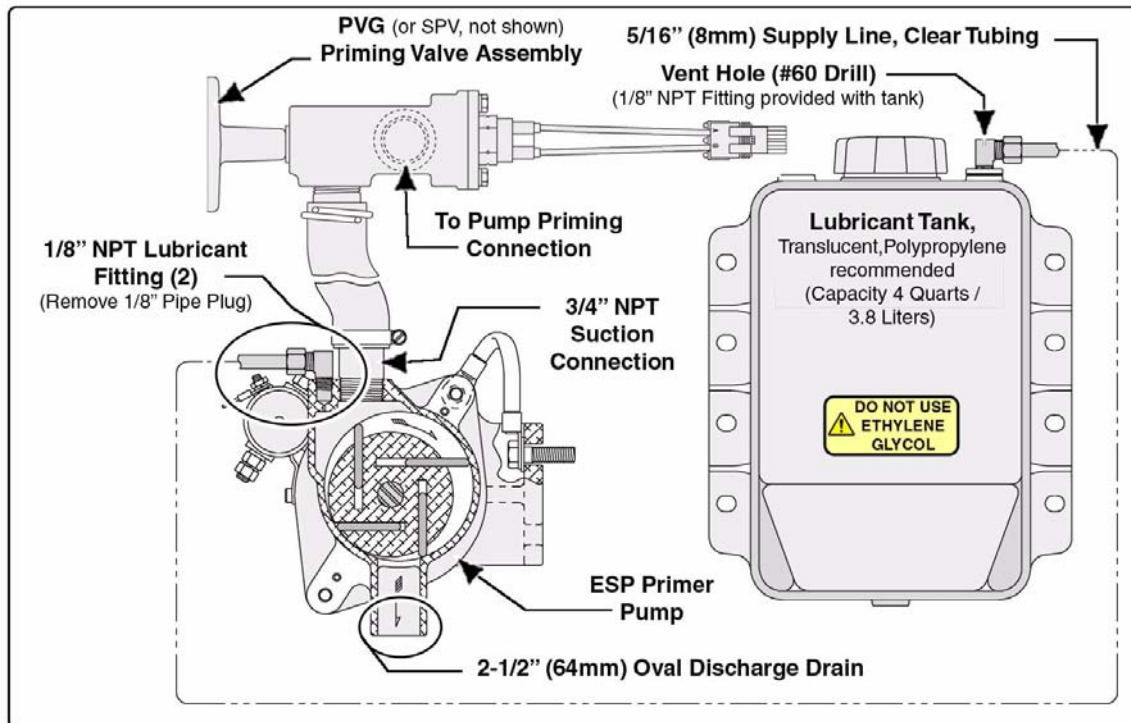


Figure 2-4: Typical ESP Lubricated System

The Hale ESP Priming System can be converted to a “lubricated system” by installing “separate” lubricant and discharge tanks and using a Propylene Glycol / water mixture as the lubricant. (See Figure 2-4: “Typical ESP Lubricated System.”)

Propylene Glycol is a less toxic and more environmentally-friendly coolant and is recommended over Ethylene Glycol based antifreeze. Propylene Glycol (PG) based antifreeze provides comparable system protection to that of conventional ethylene glycol (EG) based coolants (i.e., freeze, and corrosion protection).

Propylene glycol is readily available in automotive supply stores, under the following brand names:

- **Sierra Antifreeze** – use a 50 – 50 mix (www.sierraantifreeze.com)
- **RV & Marine Easy Going Antifreeze**, Camco Mfg. – use pure, DO NOT mix. (www.camco.net)

A 50/50 blend of propylene glycol coolant and water has a freezing point of -26°F (-32°C) and is applicable under most operating conditions.

If a lower temperature protection is required, it can readily be achieved by increasing the coolant. (See Chart 2-5: “Typical Freeze-Up Protection,” on page 16.)

Coolant	Water	Freezing Point F° (C°)
50%	50%	-26 (-32)
60%	40%	-54 (-48)
66%	34%	-76 (-60)

Chart 2-5: Typical Freeze-Up Protection

IMPORTANT!



IF THERE IS PRIMER LUBRICANT IN THE RESERVOIR, IT IS RECOMMENDED TO OPERATE LUBRICATED PRIMING SYSTEMS WEEKLY TO CYCLE THE FRESH LUBRICANT THROUGH THE PRIMER.

HOLDING THE PRIMER ON FOR TWO (2) OR THREE (3) SECONDS AFTER A PRIME FROM DRAFT WILL CLEAN OUT RESIDUE IN THE PRIMER.

3 System Installation

ESP Primer Systems are available mounted to Midship pump gearboxes or to the pump body on new orders.

3.1 PRIMER PUMP

For the Hale **12 volt** ESP Primer System installation instructions see drawing “12 Volt ESP System” on page 54. For the **24 volt** ESP Primer System installation instructions see drawing “24 Volt ESP System” on page 54.

Notes: The 12 and 24 volt drawings offer two sheets, one for mechanical installation and one for electrical.

For the optional **Lubricated** ESP Primer System installation instructions and drawings, see heading 3.3 “Lubricated Primer Installation” on page 29.

Installation Notes

- Select a mounting location that is rigid, is accessible for maintenance, is as close as possible to the main pump and with the primer discharge pointing down (to allow for proper drainage).

Notes:

- Mounting screws and washer are not provided by Hale.
 - For competitive brand optional installation, see heading “Optional Bracket Installation” on page 19. A bracket is available to mount the ESP primer to a competitive pump. Contact Hale Customer Service for additional information.
-
- Use 1/2” (13 mm) tubing for Hale Booster Pumps.
 - Use 3/4” (19 mm) tubing for Hale Midship Pumps.
 - Use 2-1/2” (64 mm) rubber hose for primer discharge.
 - Suction connection to priming valve is 3/4” NPT.
 - A shut-off valve, i.e., Hale PVG or SPV Priming Valve, must be located in the priming line between the primer pump and the main pump.
 - Ground the priming pump to the truck chassis, using the ground strap provided.

□ Installation

Attach the ground strap from the truck chassis to the priming pump terminal stud to ensure a ground for the motor. See appropriate drawing, sheet 2.

The ground strap is appropriately sized for a 12 or 24 volt DC, 300 or 150 amp load.

- To prevent damage to the solenoid plastic housing, when installing or removing wire leads, DO NOT apply side loads to the nuts. (See Figure 3-1: “Solenoid Connector Arrangement.”)

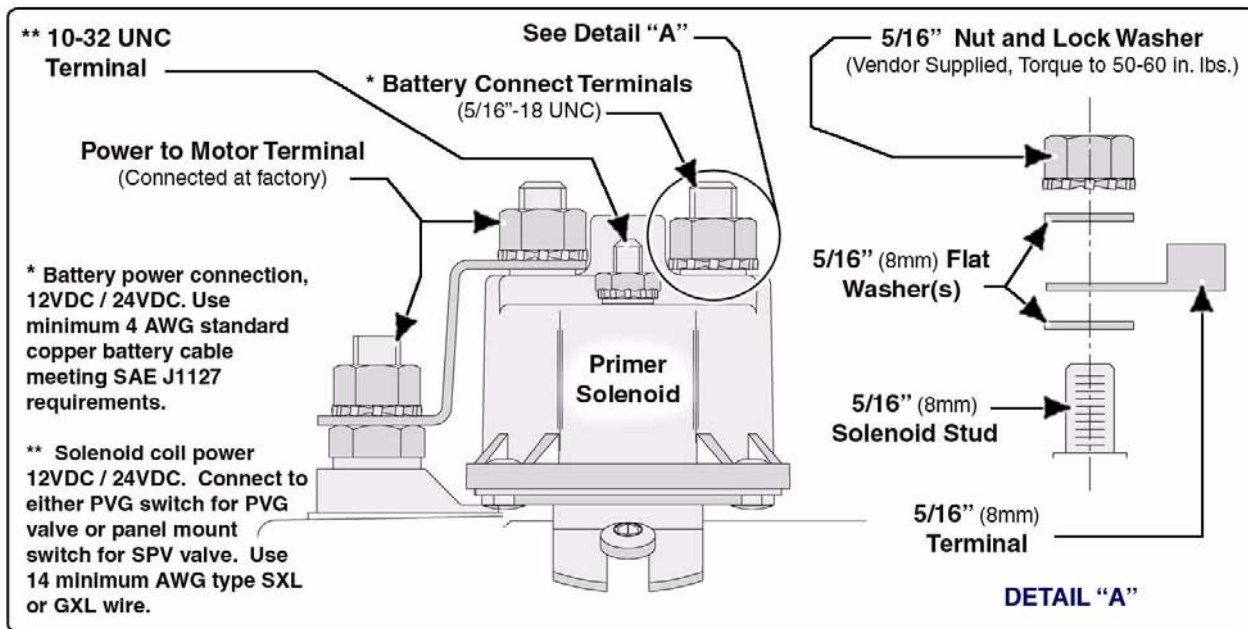


Figure 3-1: Solenoid Connector Arrangement

- When using a terminal lug on the battery connection with a 5/16” (8 MM.) diameter hole, the lower washer is not needed.
- If the hole is larger than 5/16”, washers are required both above and below the terminal. Torque to 50 - 60 in. lbs. (6 - 7 N-m) maximum.
DO NOT overtighten to avoid stripping the stud from plastic cap.
- The solenoid-to-ground terminal, 10-32 UNC, is factory connected and torqued to 15 - 20 in. lbs. (1.7 - 2 N-m).
DO NOT overtighten to avoid stripping the stud from plastic cap.
- For complete electrical installation instructions, see sheet 2 of drawing “12 Volt ESP System” on page 54 or see sheet 2 of drawing “24 Volt ESP System” on page 54.



NOTICE !

DO NOT RUN THE PRIMER OVER FORTY-FIVE (45) SECONDS. IF PRIME IS NOT ACHIEVED WITHIN 45 SECONDS, STOP AND LOOK FOR CAUSES (AIR LEAKS OR BLOCKED SUCTION HOSES).

Optional Bracket Installation

A mounting bracket is available to install the Hale ESP primer pump to some competitive pumps. Contact Hale Customer Service for additional information.

ESP System Plate Drawings

Hale ESP-12 Priming Pump, Mechanical Installation,
Sheet 1 of 2 821A

Hale ESP-12 Priming Pump, Electrical Installation,
Sheet 2 of 2 821A

Hale ESP-24 Priming Pump, Mechanical Installation,
Sheet 1 of 2 938A

Hale ESP-24 Priming Pump, Electrical Installation,
Sheet 2 of 2 938A

(Click above to view)

3.2 VALVE INSTALLATION, SPV OR PVG

When ordered as an option on a new midship fire pump, the Hale SPV assembly is already mounted to the pump body with the vacuum hose connected to the priming pump (when the primer is ordered mounted to the gearbox). All that remains is to install the panel placard and push button on the pump operator panel and make the electrical connections from the switch to the battery and priming pump solenoid. (See Figure 3-2: "Typical Hale SPV Typical System Layout," on page 20.)

If the midship pump is ordered with the primer shipped loose, it must be attached to the apparatus and the priming hose must be attached to the Hale SPV or PVG hose connection (3/4" NPT).

□ Installation

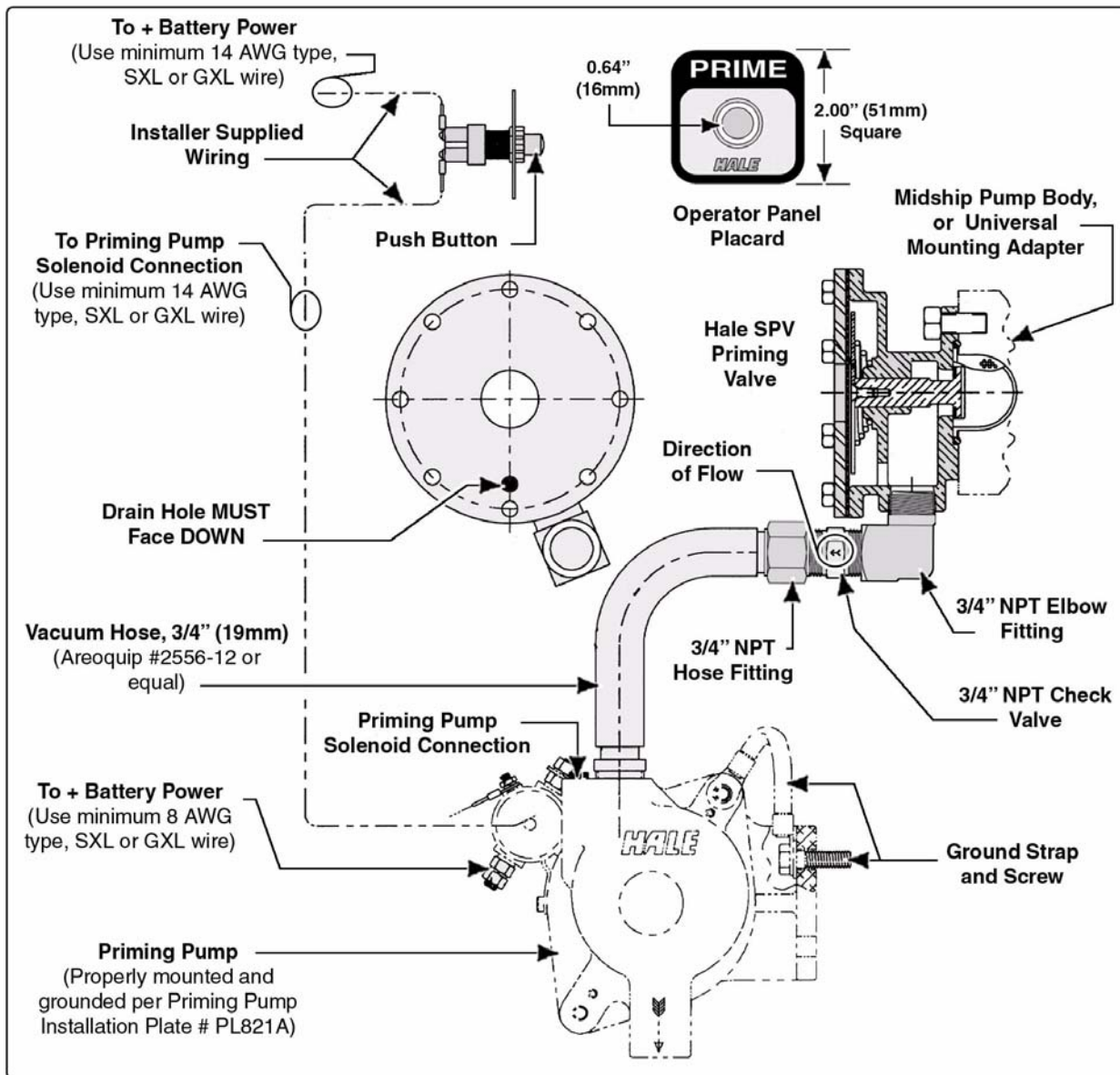


Figure 3-2: Typical Hale SPV Typical System Layout

SPV Placard and Pushbutton

WARNING !



DISCONNECT OR TURN OFF THE MASTER BATTERY SWITCH PRIOR TO SERVICING THE HALE SPV ELECTRICAL COMPONENTS.



WARNING - continued !

MAKE SURE THERE IS NO POWER AT THE PRIMER SOLENOID BEFORE STARTING SERVICE PROCEDURES. ALSO SEE SECTION 1 “SAFETY PRECAUTIONS” ON PAGE 7.

- Carefully locate the position of the pushbutton switch on the apparatus operator control panel. (See Figure 3-3: “SPV Pushbutton Placard Overview.”)

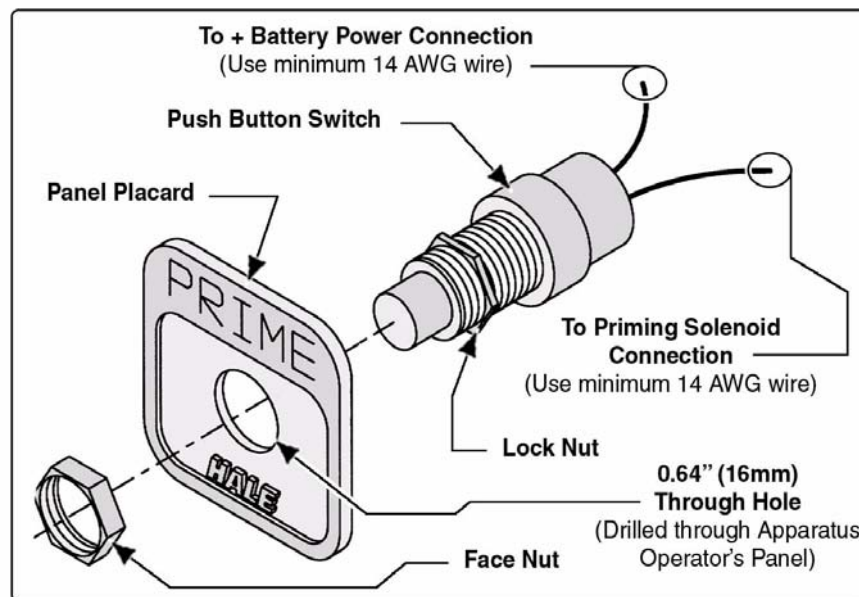


Figure 3-3: SPV Pushbutton Placard Overview

- Drill or punch a 0.64” (16 mm) diameter hole in the panel.
- Remove the push button switch from the packaging and install the lock-nut on the mounting neck.
- Insert the push button switch through the 0.64” (16 mm) diameter hole from the back of the operator control panel.
- Place the PRIME placard over the exposed end of push button switch on outside of operator panel.
- Install face nut on push button switch to hold the switch and placard in place. Tighten locknut and face nut.
- Using #10 ring terminals on the wire ends

□ Installation

- Install minimum 14 AWG type SXL or GXL wire (SAE J1128) from one switch terminal to the priming pump solenoid connection. Secure the ring terminal to the push button switch using the screws provided. (See Figure 3-3: “SPV Pushbutton Placard Overview,” on page 21.)
 - Install minimum 14 AWG type SXL or GXL wire (SAE J1128) from the other switch terminal to the positive battery power. Secure the ring terminal to the push button switch using the screws provided with the switch.
8. Test operation of the Hale SPV and priming pump. Conduct vacuum and hydrostatic tests in accordance with department procedures, NFPA1901 or NFPA 1911.

SPV Retrofit Installation, Midship

When installing the Hale SPV as a “retrofit” on an existing midship fire pump use the following procedures. (See Figure 3-4: “Typical SPV / Midship Pump Installation.”)

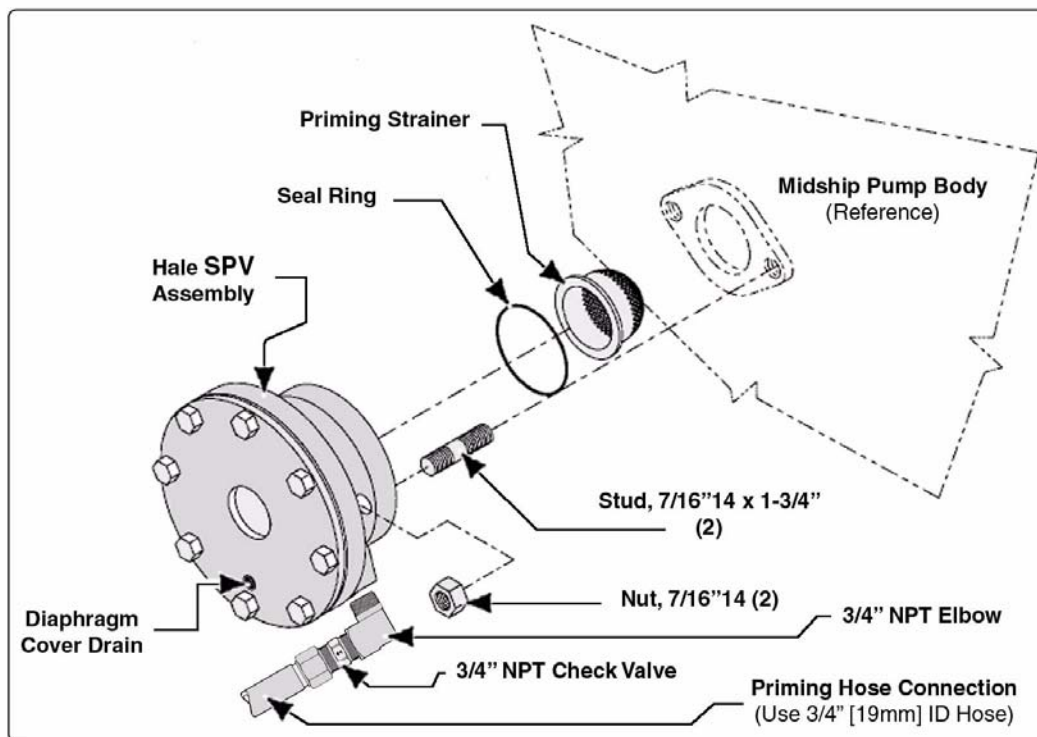


Figure 3-4: Typical SPV / Midship Pump Installation

1. Place the apparatus out of service in accordance with departmental procedures.



WARNING !

DISCONNECT OR TURN OFF THE MASTER BATTERY SWITCH PRIOR TO SERVICING THE HALE SPV ELECTRICAL COMPONENTS. MAKE SURE THERE IS NO POWER AT THE PRIMER SOLENOID BEFORE STARTING SERVICE PROCEDURES.

2. Drain all water from pump body.
3. Open the pump operator panel to gain access to the existing Hale PVG.
4. Disconnect the electrical leads and vacuum hoses to the Hale PVG.
5. If the Hale PVG is mounted at the operator panel, remove the Hale PVG and placard.
6. Install the panel placard and momentary contact push button provided with the Hale SPV on the operator panel.

Note: To mount the pushbutton switch, a spacer is required between the placard and the operator's panel. Manufacture a spacer using the template in Figure 3-5: "SPV Retrofit Panel Placard Spacer Layout" as a guide. The outer surface of the spacer must be flat to allow proper installation of the panel placard push button switch. Use material thickness and fastening devices that maintain a flat surface.

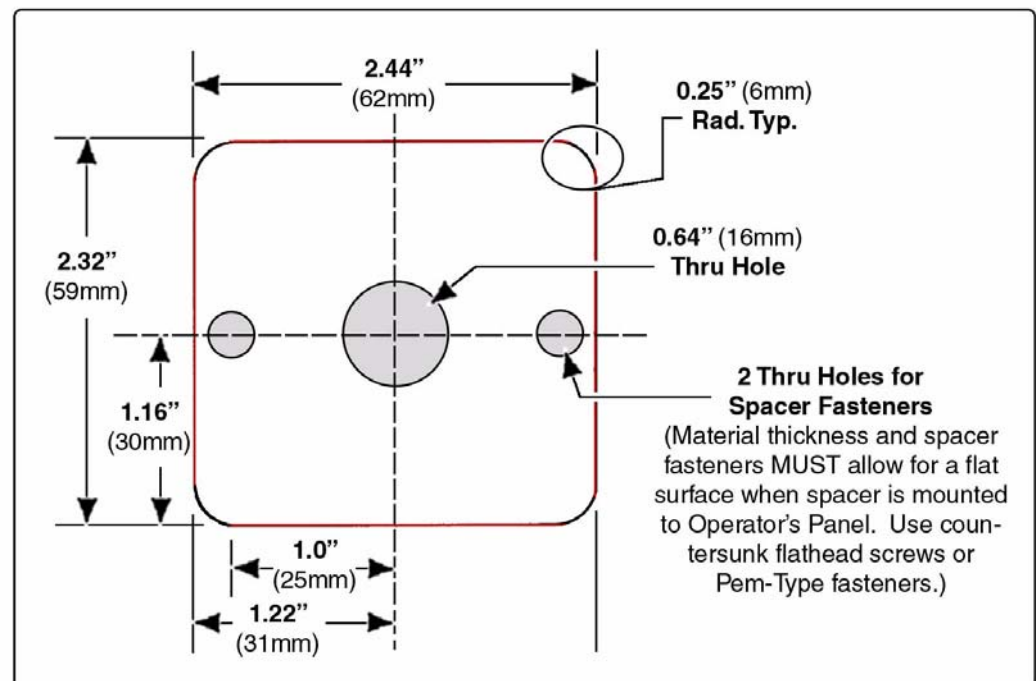


Figure 3-5: SPV Retrofit Panel Placard Spacer Layout

7. Connect electrical leads to the pushbutton contacts.
8. Locate the priming valve flange on the midship pump. (See Figure 3-4: “Typical SPV / Midship Pump Installation,” on page 22.) The priming valve flange is located next to the gearbox on the midship pump.
9. Remove the 7/16”-14 screws that hold the priming flange, hose and fittings on the midship pump body. Remove the flange assembly from the pump body.
10. Remove the strainer and seal ring from the pump body. Clean the strainer of all debris. DO NOT discard the strainer as it must be used with the Hale SPV.
11. Apply a light coat of thread locking compound (Loctite #290 or equivalent) to one end of the 7/16”14 x 1-3/4” long studs. Insert studs into the pump body where the cap screws were removed then tighten studs.
12. Insert the strainer and seal ring into the pump body, then install Hale SPV. Make sure the vacuum hose connection is facing in the downward direction when the SPV is installed.
13. Apply a light coating of thread locking compound (Loctite #290 or equivalent) to the exposed stud threads.

Secure SPV in place using the 7/16”-14 nuts provided.

WARNING !



USE ONLY PIPE, HOSE, AND FITTINGS FROM THE PRIMING PUMP VACUUM CONNECTION TO THE HALE SPV VACUUM CONNECTION RATED FOR 29 IN. (737 MM) HG. VACUUM.

14. Attach the 3/4” (19 mm) ID vacuum hose from the hose connection on the SPV to the priming pump connection. Use hose with 3/4” (19 mm) inside diameter (ID) that is rated for 29 in. (737 mm) Hg. vacuum (e.g., Aeroquip #2556-12 or equivalent).

Make sure the hose is routed and properly secured in place to prevent chaffing and abrasion.

15. Test operation of the Hale SPV and priming pump. Conduct vacuum and hydrostatic tests in accordance with department procedures, NFPA1901 or NFPA 1911.

SPV Retrofit Installation, Universal Mount

When installing the Hale SPV assembly with a universal mounting adapter use the following procedures. (See Figure 3-6: “Typical SPV / Universal Adapter Pump Installation.”)

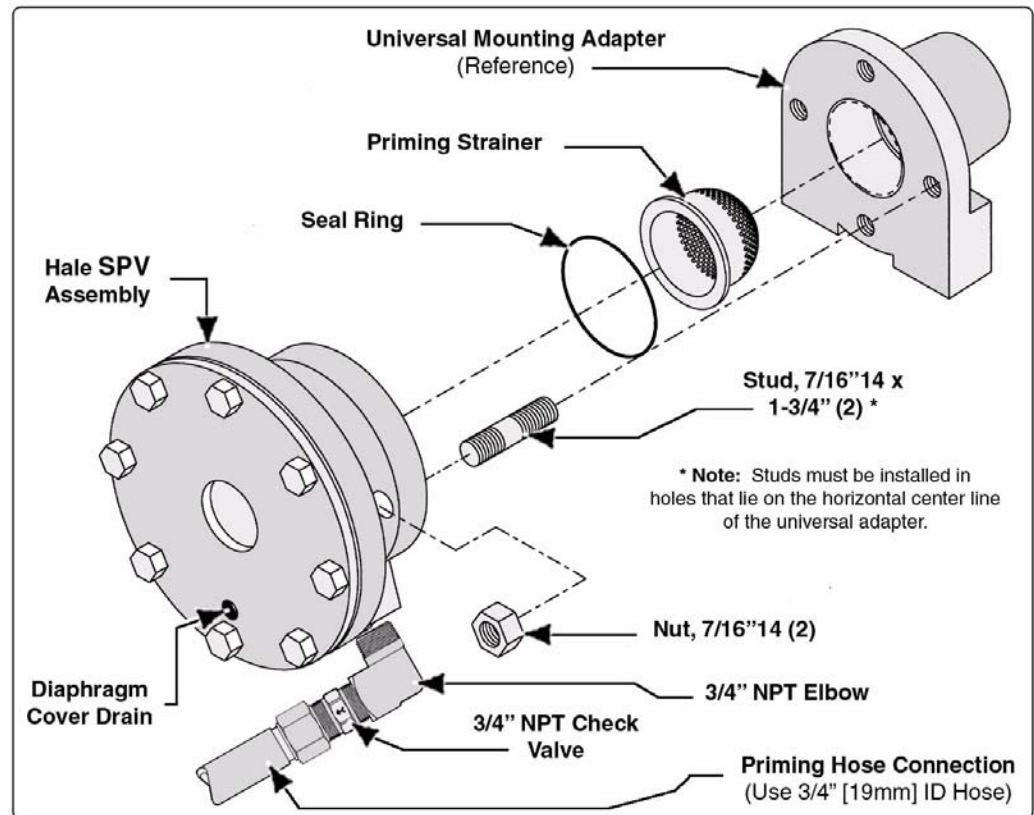


Figure 3-6: Typical SPV / Universal Adapter Pump Installation

1. Place the apparatus out of service in accordance with departmental procedures.



CAUTION !

MAKE SURE THE HALE SPV IS LOCATED HIGHER THAN THE PUMP BODY ALLOWING WATER TO DRAIN FROM THE VACUUM HOSE.

2. Determine location of the SPV Universal Mounting adapter on the apparatus. When choosing a location make sure there is minimum of 5" (127 mm) clearance for hose connections.

□ Installation

3. Drill two $\frac{29}{64}$ " (12 mm) holes 2-1/2" (64 mm) apart to attach the universal mounting adapter to a secure point on the apparatus. (See Figure 3-7: "Universal Mount Adapter Dimensions.")
4. Select the proper mounting adapter orientation and using the $\frac{7}{16}$ "14 x 1.0" screws attach the universal mounting adapter to the apparatus. (See Figure 3-8: "Universal Mount Adapter Positions.")
5. Apply a light coat of thread locking compound (Loctite #290 or equivalent) to one end of the $\frac{7}{16}$ "14 x 1-3/4" studs. Install the studs in the horizontal holes on the universal adapter. (See Figure 3-8: "Universal Mount Adapter Positions.")

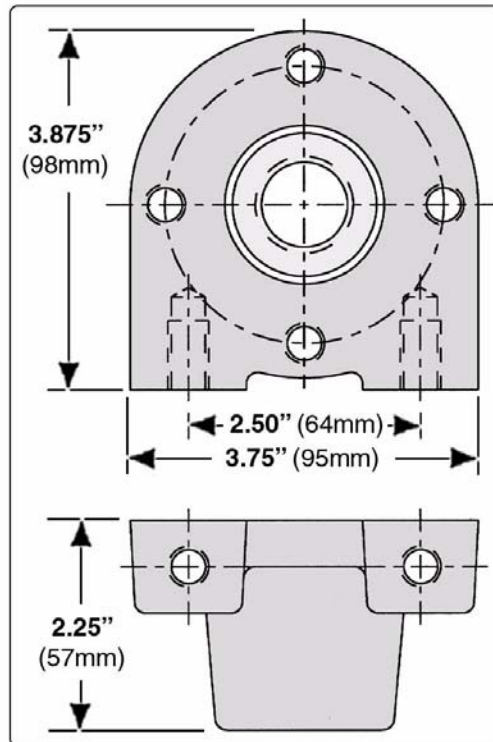


Figure 3-7: Universal Mount Adapter Dimensions

6. Insert strainer and seal ring in the universal adapter, then install Hale SPV on the universal adapter over the studs. (See Figure 3-6: "Typical SPV / Universal Adapter Pump Installation," on page 25.)

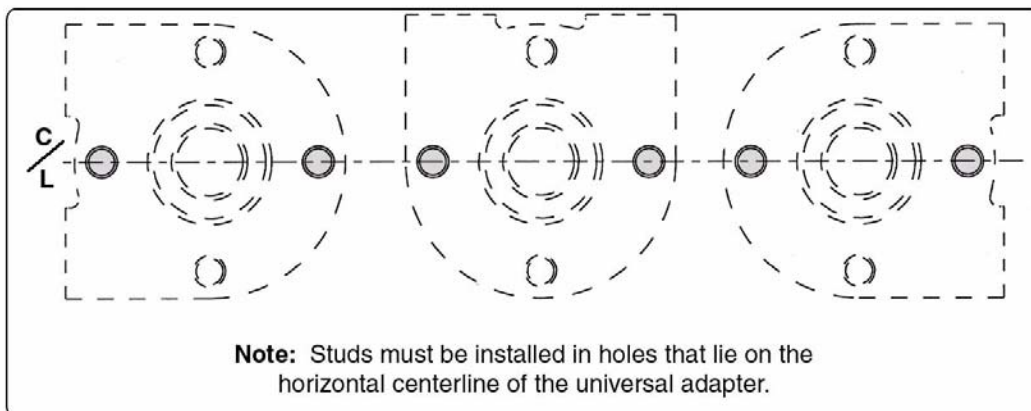


Figure 3-8: Universal Mount Adapter Positions

Make sure the vacuum hose connection is facing in the down direction when the Hale SPV is installed. Additionally, the small drain hole on the diaphragm cover will be in the down position.

7. Apply a light coating of thread locking compound (Loctite #290 or equal) to the exposed stud threads. Secure the Hale SPV valve in place on the universal mounting adapter using $\frac{7}{16}$ -14 nuts.

**WARNING !**

USE ONLY PIPE, HOSE, AND FITTINGS FROM THE PRIMING PUMP VACUUM CONNECTION TO THE HALE SPV VACUUM CONNECTION RATED FOR 29 IN. (737 MM) HG. VACUUM.

8. Attach 3/4" (19 mm) ID vacuum hose from the hose connection on the Hale SPV to the priming pump connection. Use hose with 3/4" (19 mm) inside diameter that is rated for 29 in. (737 mm) Hg. vacuum (e.g., Aeroquip #2556-12 or equivalent). Make sure the hose is routed and properly secured in place to prevent chaffing and abrasion.
9. Install a fitting on the side opposite the SPV on the universal adapter. Connect a 3/4" (19 mm) inside diameter hose rated for 29 in. (737 mm) Hg. vacuum (e.g., Aeroquip #2556-12 or equivalent) from the priming tap on the pump body to the hose fitting on the universal mounting adapter.
10. Test operation of the Hale SPV and priming pump. Conduct vacuum and hydrostatic tests in accordance with department procedures, NFPA1901 or NFPA 1911.

PVG Installation

Also see Section Drawing Package, Hale plate drawing "PVG Priming Valve" on page 54.

1. Place the apparatus out of service in accordance with departmental procedures.

**WARNING !**

DISCONNECT OR TURN OFF THE MASTER BATTERY SWITCH PRIOR TO SERVICING THE HALE PVG ELECTRICAL COMPONENTS. MAKE SURE THERE IS NO POWER AT THE PRIMER SOLENOID BEFORE STARTING SERVICE PROCEDURES.

2. Drain all water from pump body.

□ Installation

3. Drill or punch one 1.032" (26 mm) and two 0.266" (7 mm) diameter holes in the panel. (See Figure 3-9: "PVG Panel Placard and Valve Plumbing Layout.")

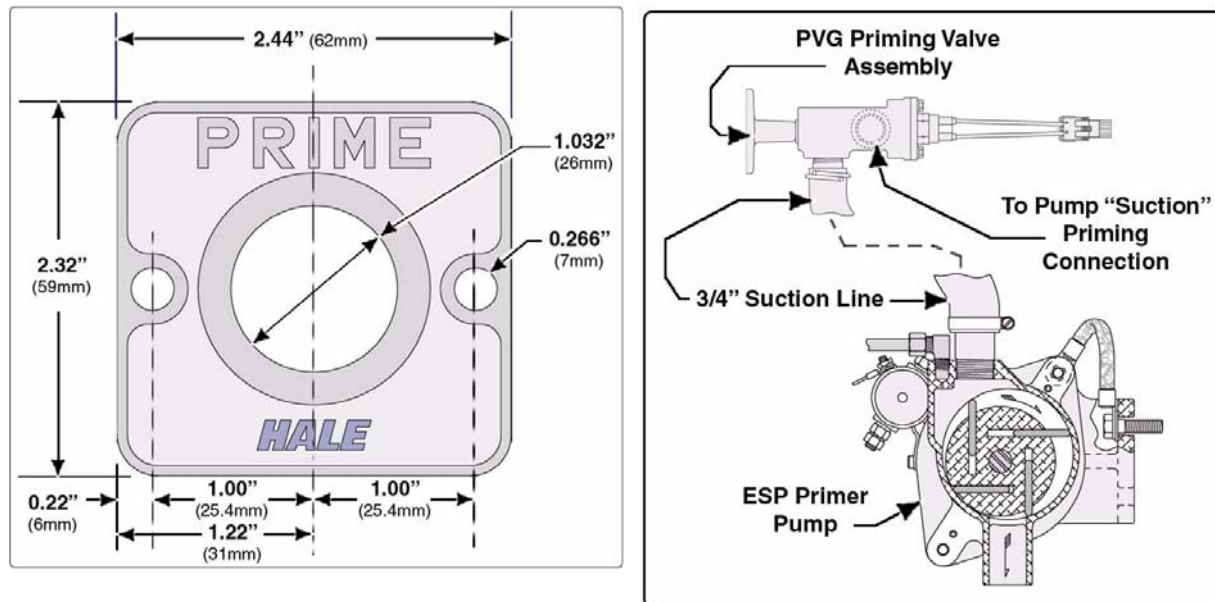


Figure 3-9: PVG Panel Placard and Valve Plumbing Layout

4. Install the PVG panel placard and valve body to the operator's panel. (See Figure 3-9: "PVG Panel Placard and Valve Plumbing Layout.")
5. Secure the assembly with two (2) 1/4"-20 screws. Apply a drop of Loctite #246 to each screw.
6. Install the setscrew, with allen head facing out, into the valve body stem until the setscrew bottoms-out. Apply a drop of Loctite #246 to the setscrew threads.
7. Install the handle and washer to the valve stud setscrew. Apply a drop of Loctite #246 to the setscrew threads to assure the handle does not work loose from use.
8. Install a 3/4" NPT hose fitting into the PVG valve and connect appropriate 3/4" ID hose between the valve and the primer pump.
9. Install another 3/4" NPT x 1/2" compression hose fitting, rated at 250 PSI minimum, into the side of the PVG valve and connect hose between the valve and the suction side of the pump. (See Figure 3-9: "PVG Panel Placard and Valve Plumbing Layout.")

10. Connect the PVG electrical connector to proper system electrical source. For specification, see Section Drawing Package, Hale plate drawing “PVG Priming Valve” on page 54.

3.3 LUBRICATED PRIMER INSTALLATION

Also see Figure 3-10: “Typical ESP Lubricated Primer Layout” on page 30.

To convert a Hale ESP Non-Lubricating Priming System to a Lubricated Priming System, the following parts are required for optimum performance and to conform to most regional environmental regulations.

- Separate lubricant storage tank, Hale p/n: 108-0012-00-0 (4 quart / 3.8 liter capacity).
The tank includes a 1/8” NPT x 5/16” (8 mm) tube fitting with #60 vent hole.
- **WARNING !** label for lubricant tank — **DO NOT USE ETHYLENE GLYCOL**, provided by installer.
- Fluid Capacity Placard (required by NFPA) — installed in the operator’s cab, provided by installer.
- Separate discharge tank, with drain valve and tank breather vent, provided by installer.
- Applicable DOT air brake tubing or soft tubing, 5/16” (8 mm), provided by installer.
- 2-1/2” (64 mm) ID rubber drain / discharge hose, provided by installer.
- Tube fittings, 1/8” NPT x 5/16” (8 mm) — (tank fitting provided with Hale tank).

Installation



WARNINGS !

- **MAKE SURE THE APPARATUS SYSTEM IS COMPLETELY SHUT-DOWN, FLUSHED WITH CLEAN, FRESH WATER AND FULLY DRAINED BEFORE MODIFYING AN EXISTING PRIMER SYSTEM.**
- **FOLLOW YOUR DEPARTMENTAL AND/OR ENVIRONMENTAL REGULATIONS AND THE INSTRUCTIONS RECOMMENDED BY THE MANUFACTURER AS STATED ON THEIR CONTAINER LABEL.**

WARNINGS - continued !



- **ALWAYS USE CAUTION WHEN HANDLING OR DISPOSING OF PROPYLENE GLYCOL.**
- **DO NOT USE ETHYLENE GLYCOL.**

The tank should be a translucent, polypropylene tank to allow visual inspection of the lubricant level. Order Hale p/n: 108-0012-00-0 (4 quart / 3.8 liter capacity), which includes the 1/8" NPT x 5/16" (8 mm) tube fitting with a #60 vent hole. (See Figure 3-10: "Typical ESP Lubricated Primer Layout.")

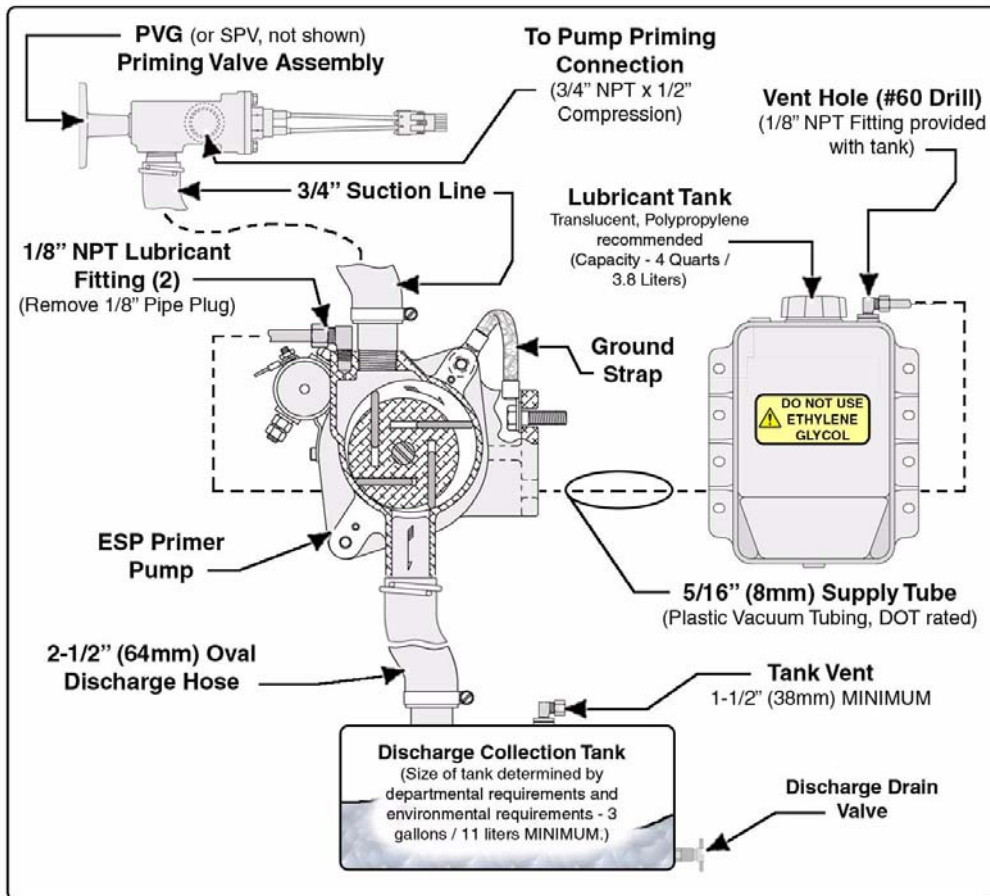


Figure 3-10: Typical ESP Lubricated Primer Layout

1. The tank should be located within proximity of the primer pump, preferably LEVEL with or BELOW the primer pump. Select a location visible to the operator for checking and refilling.

2. Remove the 1/8" NPT pipe plug in the top of the primer pump and install one 1/8" NPT x 5/16" (8 mm) tube fitting. (See Figure 3-11: "Pump Fittings.") Use appropriate thread sealant.

Note: If the tank is installed above the primer pump and is not a Hale tank, the fitting installed in the top of the lubricant tank must contain a vent hole (#60 drill,) in the top of the fitting to create a vacuum break (break the siphon and stop the flow of lubricant when priming stops).

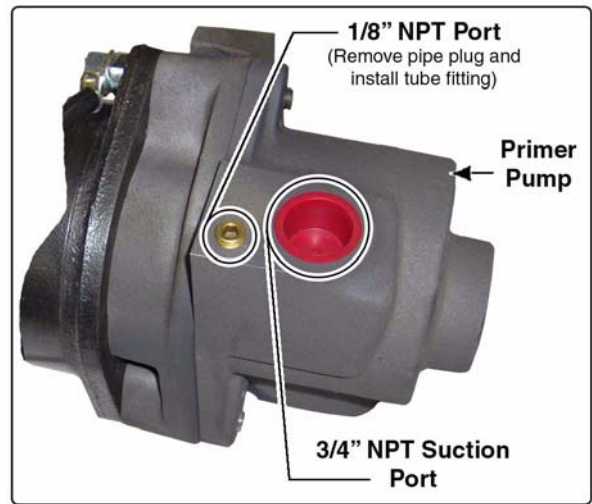


Figure 3-11: Pump Fittings

3. Run DOT air brake tubing (5/16" / 8 mm) from the lubricant storage tank to the primer pump fitting and secure the tubing (tubing clamps). (See Figure 3-10: "Typical ESP Lubricated Primer Layout," on page 30.)
4. Install a separate discharge collection container (tank), three (3) gallons (11 liters) MINIMUM, to collect all discharged fluid during priming in accordance with your departmental and/or local environmental regulations.
5. Connect a hose (2-1/2" / 64 mm) from the primer pump discharge to a separate discharge collection container. Clamp hose using appropriate hose clamps.
6. Install a tank vent, 1-1/2" (38 mm) MINIMUM at the top of the discharge tank. (See Figure 3-10: "Typical ESP Lubricated Primer Layout," on page 30.)
7. Install a drain valve in the discharge tank to enable easy fluid drainage and disposal, in accordance with your departmental and/or local environmental regulations.



WARNING !

DO NOT ALLOW COOLANT TO DISCHARGE TO THE GROUND. REVIEW YOUR DEPARTMENTAL AND/OR LOCAL ENVIRONMENTAL REGULATIONS REGARDING THE USE OF AND DISPOSAL OF PROPYLENE GLYCOL COOLANTS.

WARNING - continued !



ALWAYS FOLLOW THE MANUFACTURER'S RECOMMENDED INSTRUCTIONS ON THE LABEL AFIXED TO THE CONTAINER.

Notes:

- DO NOT use water only in the lubricant tank in FREEZING climates.
 - The propylene glycol must be the type that includes corrosion inhibitors. An example would be propylene glycol antifreeze recommended for the RV or Marine type cooling systems.
8. Make sure the vent hole in the lubricant tank fitting and discharge tank breather vent are clean (not clogged or blocked).
 9. Fill the tank with an approved propylene glycol coolant - see heading "Lubricated ESP Primer System" on page 14.

DO NOT USE ETHYLENE GLYCOL.



10. Make sure the drain valve in the discharge collection tank is CLOSED to prevent accidental discharge to the ground.
11. Install the Fluid Capacity Placard, required by NFPA, inside the operator's cab. The placard must state "**DO NOT USE ETHYLENE GLYCOL**" in the lubricant system and should include the lubricant warnings listed in the section.

4 Primer Operation



WARNING !

THE PROCEDURES IN THIS SECTION ARE GENERAL OPERATING PROCEDURES. NOT ALL PROCEDURES IN THIS SECTION MAY APPLY TO YOUR SPECIFIC OPERATIONAL REQUIREMENTS.

THESE PROCEDURES DO NOT REPLACE THE PROCEDURES, POLICIES OR GUIDELINES ESTABLISHED BY THE AUTHORITY HAVING JURISDICTION, NOR DO THEY REPLACE THE RECOMMENDATIONS AND PROCEDURES PROVIDED IN THE APPARATUS MANUFACTURER'S MANUAL.

ALWAYS REFER TO THE PROCEDURES PROVIDED BY THE AUTHORITY HAVING JURISDICTION FOR OPERATING PROCEDURES, SETTING WHEEL CHOCKS, AS WELL AS LAYOUT AND CONNECTION OF HOSES, VALVES AND DRAIN COCKS. ALL VALVES, DRAIN COCKS AND CAPS SHOULD BE CLOSED.

4.1 PRIMING THE PUMP

1. Position the apparatus as close to the water source as practical. The pump can draw 100% of its rated capacity with less than a 10 foot (3.05 meters) vertical lift and 20 feet (6 meters) of suction hose.
2. Activate the priming pump - pull the control handle, or press the push button.

Your departmental manual for pumping should specify the correct RPM for priming. However, in general, priming should be operated at IDLE.

Running the engine at speeds higher than 1,000 RPM during priming is not recommended. It does not improve the priming operation but can cause damage to the pump.



CAUTION !

IF THE DISCHARGE GAUGE READING DOES NOT INCREASE, THE INTAKE GAUGE READING DOES NOT FALL BELOW ZERO (0), OR THE PRIMING PUMP DOES NOT DISCHARGE WATER WITHIN 30 TO 45 SECONDS, DO NOT CONTINUE TO RUN THE PRIMING PUMP.

STOP THE PUMP AND CHECK FOR AIR LEAKS OR POSSIBLE PROBLEMS. SEE SECTION 6 "TROUBLESHOOTING," ON PAGE 47.

3. Monitor the intake and discharge master gauges. When the pump is primed, the intake reading falls below zero (0), and the discharge pressure starts to increase. You may also hear or see water discharging from the primer, indicating the pump is primed.
4. Gradually open the discharge valve until water emerges in a steady stream. Then open the other discharge valves to the desired setting.
5. Gradually open the engine throttle until the desired pressure or flow is achieved.



CAUTION !

DO NOT CAUSE A WHIRLPOOL AT THE STRAINER. THIS ALLOWS AIR INTO THE PUMP CAUSING ROUGH OPERATION AND PULSATION. REPOSITION THE STRAINER OR REDUCE FLOW.

DO NOT USE THE PRIMER TO EVACUATE AIR FROM LDH SUPPLY HOSES. NFPA SPECIFIES AIR BLEEDS FOR THIS PURPOSE. HIGH PRESSURES CAN DAMAGE THE PRIMER.

Note: Holding the primer ON for about one (1) or two (2) seconds while discharging water after prime helps keep the primer clean of debris and promotes longer primer life.

5 System Maintenance

5.1 GENERAL MAINTENANCE

The following procedures are for normal use and conditions. Extreme conditions may indicate a need for increased maintenance. The procedures in this section identify measures needed to ensure lengthened pump life and continuing dependability. Always follow local maintenance and test procedures.

Wherever there is a requirement for new parts, it is recommended to use only Hale authorized replacement parts for optimum safety of the equipment and its operators and to limit “downtime.”

For a parts breakdown and identification, see Section 7, “Drawing Package” on page 53.



**READ ALL INSTRUCTIONS THOROUGHLY
BEFORE BEGINNING ANY SERVICE REPAIR.**

Weekly

Priming System Test

1. Tighten all pump caps, and close all pump valves.
2. Pull the primer control while you watch for a below-zero (0) reading on the master intake gauge.
3. Continue operation for two (2) or three (3) seconds after the primer starts flushing water to clear any possible dirt or sludge (gum) buildup. This buildup affects primer operation by jamming vanes which reduces primer life.
4. Verify that the master intake gauge readings hold for approximately five (5) minutes after you release the primer control. A drop of up to 10” Hg. during this 5 minute period is anticipated per NFPA 1901 standards.
5. If air leaks are heard or the gauge bounces back to or above zero (0), the pump or valves require service.

Monthly

Priming System Test, Dry Vacuum Test

(Refer to NFPA 1901 or NFPA 1911)

1. Close all valves and drains. Cap all suction openings and the outlet of the suction side relief valve (if so equipped).
2. Connect a test vacuum gauge or manometer to the intake test gauge connection on the pump panel.
3. Engage the priming pump until the gauge indicates 22" Hg. vacuum.

For SPV, press and hold the prime push button to energize the priming pump motor; **for PVG**, pull the primer handle.



Figure 5-1: PVG Priming Valve Handle

4. Compare the readings of the test gauge and the apparatus gauge. Note any difference.
5. STOP the priming pump and observe the gauge.
6. If the vacuum falls more than 10" Hg. in five (5) minutes, it is an indication of at least one air leak.

Vacuum leaks may often be detected by ear if the apparatus engine is turned OFF.

Correct leaks immediately before returning the pump to service.

7. Test the suction hose as follows:
 - Attach the suction hose to the pump.
 - Place the suction tube cap on the end of the hose in place of a strainer.
 - Close all valves and drains. Cap all suction openings and the outlet of the suction side relief valve (if so equipped).
 - Connect a test vacuum gauge or manometer to the intake test gauge connection on the pump panel.
 - Engage the priming pump until the gauge indicates at least 22" Hg.
 - If the vacuum falls more than 10" in 5 minutes, at least one air leak.
 - Verify the test gauge and the apparatus gauge display the same readings. Repair and/or replace gauges that do not display the correct pressure.



IMPORTANT !

IF LEAKS CANNOT BE DETECTED BY FOLLOWING THE PROCEDURE, IT IS ADVISABLE TO TEST THE PUMP HYDROSTATICALLY. TO TEST:

- OPEN ALL VALVES
- PLACE CAPS ON ALL VALVES
- CONNECT A POSITIVE PRESSURE SOURCE (TYPICALLY 250 PSI / 17 BAR)
- INSPECT THE PUMP FOR LEAKS

Annually

Clean ESP Priming Pump

Disassemble the priming pump and inspect and clean the housing and vanes. (See Figure 5-2: “Primer Pump Parts Overview.”)

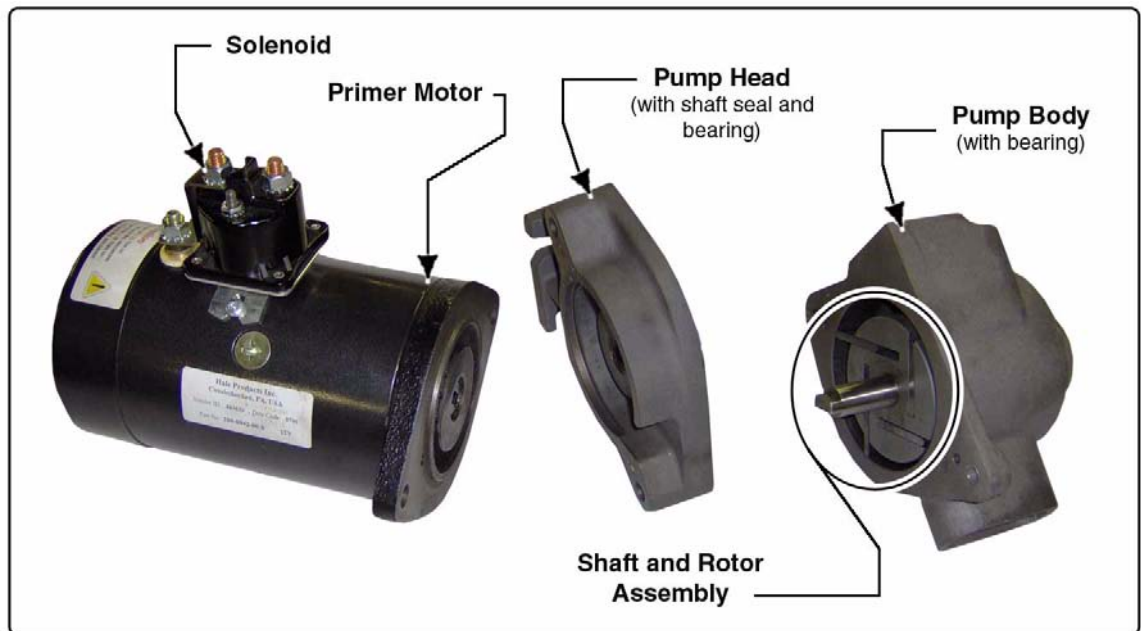


Figure 5-2: Primer Pump Parts Overview

1. Place apparatus out of service in accordance with your departmental procedures.
2. Park the vehicle on a level surface. Set the parking brake and chock the front and rear wheels in accordance with your departmental procedures.

□ Maintenance

3. Match mark, tag and/or note, or photograph the orientation the mechanical and electrical connections to the primer pump before disassembly. This aids in proper reassembly.
4. Make sure the main power supply is deactivated, then disconnect the battery connection from the primer solenoid. (See Figure 3-1: “Solenoid Connector Arrangement” on page 18.)
5. Drain the lubrication system main tank, if included, in accordance with your local departmental procedures and/or environmental regulations.
6. Disconnect the suction inlet, drain (and if included, the lubrication) tubing / hoses.
7. Disassemble the pump head assembly from the primer motor - 3/8”-16 screws, ground wire and hardware. (See Figure 5-2: “Primer Pump Parts Overview” on page 37.)
8. Slide the assembly from the motor, then separate the pump body from the pump head being careful not to drop the rotor vanes.
9. Slide the shaft and rotor assembly from the pump head.
10. Inspect:
 - Rotor vanes for excessive wear and scaring — replace if necessary.
 - Inside surface the pump body for scaring or pitting.
 - Bearings in pump head and body for excessive wear, scoring, etc.Repair and/or replace parts as needed.

Note: Abrasives passing through the pump can damage sealing surfaces. Corrosion and/or the breakdown of biodegradable lubricants can cause rotor vanes to stick or break. Sand entering the pump can cause the vanes to stick or break and can damages the inside wall of the pump body. Replace defective parts.

Wherever there is a requirement for new parts, it is recommended to use only Hale authorized replacement parts for optimum safety of the equipment and its operators and to limit “downtime.”

11. Clean all parts of black buildup or contaminates with Safety Kleen or Standard Solvent.
12. Check the motor by rotating the motor (insert large screwdriver in slot) to make sure it turns freely. Also check the rotor vane cylinder assembly for free spin when installed in bearings.

13. Reassemble the pump making sure the vanes are inserted properly. (See Figure 5-2: “Primer Pump Parts Overview” on page 37.)

Use a Lithium-based grease with 1% to 3% Molybdenum Disulfate and lubricate the rotor cylinder shaft at the bearings.



IMPORTANT !

DO NOT USE A LUBRICANT ON THE ROTOR VANES AND CYLINDER SLOTS. LUBRICANT AND COLD WATER FORM AN EVENTUAL GUMMY RESIDUE THAT RENDERS THE PRIMING SYSTEM INOPERATIVE. A COMPLETE AND THOROUGH DISASSEMBLY AND CLEANING IS THEN REQUIRED.

14. Test the system for proper operation — see heading “Priming System Test” on page 35.

5.2 SPV VALVE REPAIR

The Hale SPV is designed to provide trouble free service with a minimum of preventive maintenance. Performance degradation can result from a ruptured diaphragm or worn seat on the valve. A Hale SPV repair kit that contains a manual, seal ring, valve and diaphragm is available from Hale Products, Inc. Order Hale repair kit, p/n: 546-1680-00-0. Also see Figure 5-3: “Hale SPV Parts Overview” on page 40.

1. Disconnect the vacuum hose from the hose connection on the valve body. Have clean disposable shop rags and oil dry handy.
2. Remove the 7/16”-14 nuts that hold the valve assembly to the pump body or universal adapter. Remove the valve assembly, strainer and seal ring from the pump.
3. Match mark, tag and/or note, or photograph the orientation of all mechanical and electrical components and connections before disassembly. This aids in proper reassembly.
4. Match mark the diaphragm cover and valve body for proper realignment of the drain hole during re-assembly.



WARNING !

PARTS UNDER SPRING TENSION CAN BECOME PROJECTILES AND CAUSE SERIOUS INJURY. WHEN REMOVING OR INSTALLING THESE PARTS MAKE SURE THEY ARE RESTRAINED AND SPRING TENSION IS RELEASED SLOWLY.

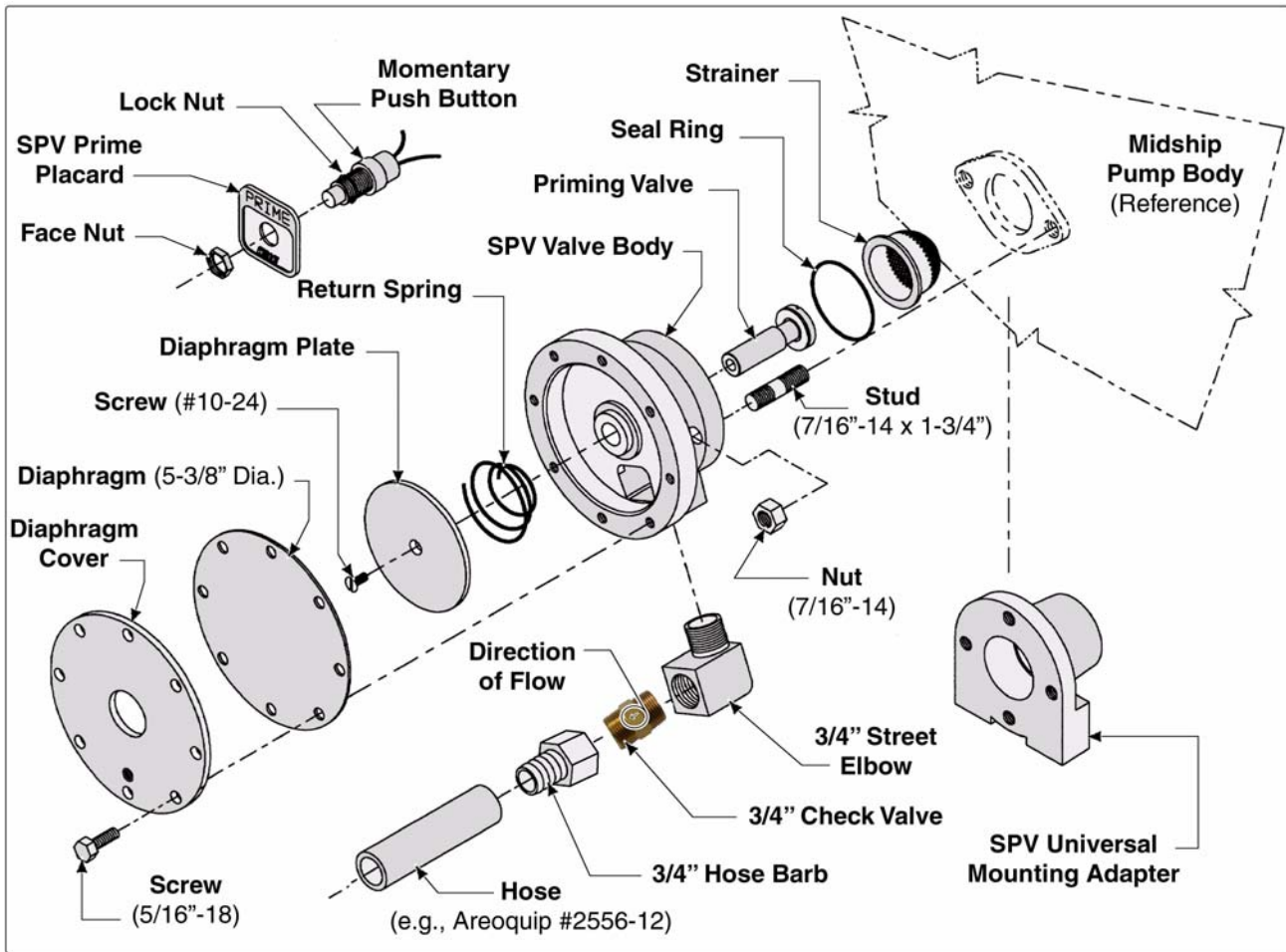


Figure 5-3: Hale SPV Parts Overview

5. Remove the 5/16"-18 screws that hold the diaphragm cover and diaphragm to the valve body.
6. Carefully pry the cover and diaphragm from the valve body being careful to not damage the diaphragm. Separate the cover and diaphragm. (See Figure 5-3: "Hale SPV Parts Overview.")
7. Support the valve on a stable work surface to prevent accidental release of spring tension.
8. While pressing in on the diaphragm plate unscrew the #10-24 screw. Once the screw is removed slowly release the spring tension and remove the diaphragm plate.
9. Remove valve spring, then remove the valve from the valve body.

10. Remove vacuum hose connection fitting and service elbow from the valve.
11. Inspect all components of the valve for damage and wear. The Hale SPV repair kit (p/n: 546-1680-00-0) contains a new diaphragm, valve and seal ring. Always replace these components when the valve is disassembled. If the brass seat on the valve body is damaged the SPV must be replaced.
12. For Hale recommended cleaners, see heading “Lubricant Specifications” on page 45.
13. During re-assembly of the valve use thread locking compound (Loctite #290 or equal) to lock threads in place.
14. Apply a light coating of thread sealing compound and install the service elbow and vacuum hose connection fitting into the valve body.
15. Insert the new valve into the valve body from the side that attaches to the pump or universal adapter.
16. Place the small end of the compression spring over the boss in the valve body around the valve.

**WARNING !**

PARTS UNDER SPRING TENSION CAN BECOME PROJECTILES AND CAUSE SERIOUS INJURY. WHEN REMOVING OR INSTALLING THESE PARTS MAKE SURE THEY ARE RESTRAINED AND SPRING TENSION IS RELEASED SLOWLY.

17. With the Hale SPV on a stable surface, place the diaphragm plate over the spring and press down to compress spring. While holding diaphragm plate down with spring compressed, install the #10-24 screw into the valve.
18. Place a new diaphragm on the valve body and align screw holes.
19. Place the diaphragm cover over diaphragm aligning match marks assuring the cover drain hole is in the correct position when the valve is installed on the pump.
20. Install the 5/16-18 screws to hold the cover in place.
21. Apply a light coating of grease to the seal ring then place strainer and new seal ring into valve body. Install seal ring, strainer and valve assembly on pump (or universal adapter) over studs.

Use a Lithium-based grease with 1% to 3% Molybdenum Disulfate. For a listing, see heading “Lubricant Specifications” on page 45.

22. Secure in place using 7/16"-14 nuts - tighten and torque accordingly nuts.
23. Connect the 3/4" (19 mm) ID vacuum hose from the priming pump to the hose connection fitting on the Hale SPV assembly.
24. Before placing apparatus into operation, test operation of the Hale SPV. Conduct vacuum and hydrostatic tests in accordance with department procedures.

5.3 PVG VALVE REPAIR

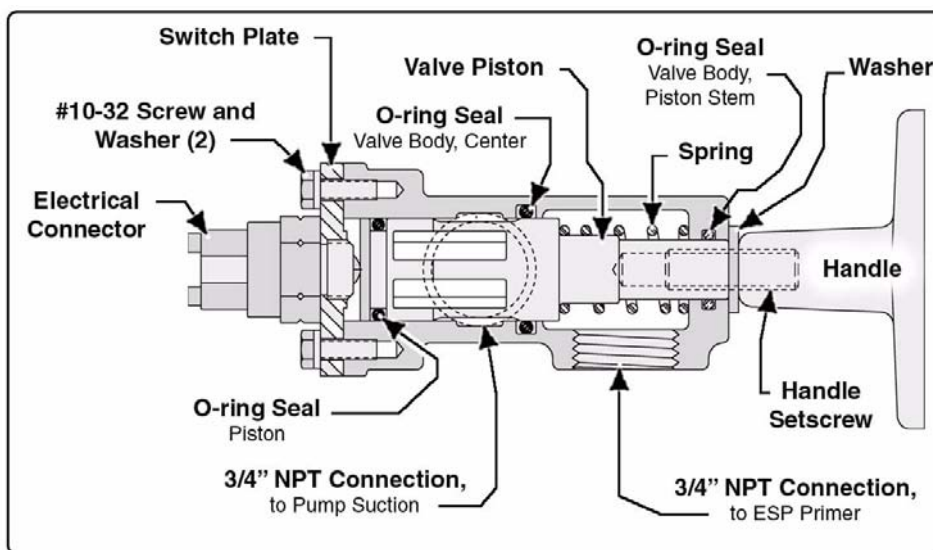


Figure 5-4: Hale PVG Parts Overview

The Hale PVG is designed to provide trouble free service with a minimum of preventive maintenance. Over time, performance degradation could result from a worn O-ring seals, causing leaks, a weakened spring, or a failed electrical switch. (See Figure 5-4: "Hale PVG Parts Overview.")

A Hale PVG repair kit is available that contains, O-ring seals (3), and the electrical switch. Order Hale repair kit, p/n: 546-1420-00-0. (See Figure 5-5: "PVG Valve Parts Breakdown.")

1. Place apparatus out of service in accordance with your departmental procedures.
2. Make sure the main power supply is deactivated, then disconnect the valve connection from the main source.

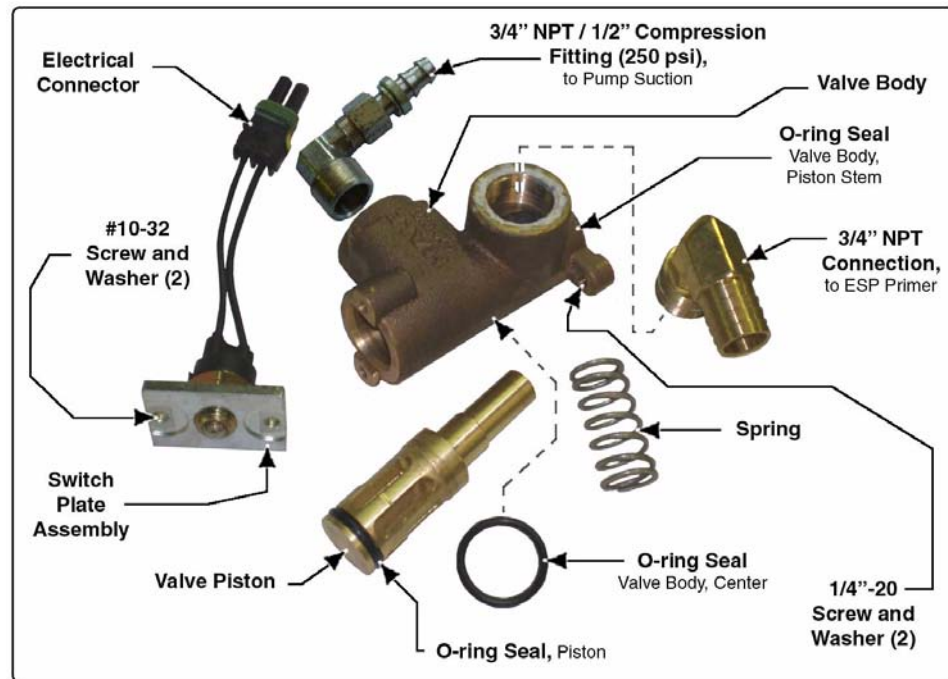


Figure 5-5: PVG Valve Parts Breakdown

3. Drain the pump in accordance with your departmental procedures. Have clean disposable shop rags and oil dry handy.
4. Disconnect the ESP and pump vacuum hoses from the hose connections on the valve body.
5. Remove both 3/4" fittings in the valve body to allow visible access to the piston and spring.

Insert a screw driver into the cage opening, through the pump port, to hold the piston from spinning as you remove (unscrew) the handle. **DO NOT** attempt to secure the brass stem of the piston with vise grips. If the piston stem is nicked or scratched it will damage the O-ring seal and cause leaks.

6. Remove the PVG valve handle from the valve setscrew stem. (See Figure 5-4: "Hale PVG Parts Overview" on page 42.)
7. Remove the two 1/4"-20 screws securing the valve and placard to the operator's panel and remove the assembly from the apparatus.
8. Stabilize the unit (in a vise) and remove the two #10-32 screws and washers from the switch plate. (See Figure 5-5: "PVG Valve Parts Breakdown.")
9. Remove the switch plate with electrical connector and set safely aside.

Note: If the Switch is being replaced only, simply unthread the switch from the plate and install the new switch.

10. Thread a 3/8"-16 screw into the piston stem, then tap the piston from the valve body. Remove the spring.
11. Using an O-ring hook-type tool, reach into the valve body and remove the center valve body O-ring and the piston stem O-ring. Also remove the O-ring from the piston and discard all. (See Figure 5-5: "PVG Valve Parts Breakdown" on page 43.)
12. Examine the piston and valve body bore for defects, e.g., scratches, nicks or pitting. Repair or replace accordingly.
13. For Hale recommended cleaners, see heading "Lubricant Specifications" on page 45.

Reassembly Hints

- Reassemble the PVG valve by following the preceding steps in reverse order.
- Apply a light film of general purpose grease to the new O-rings and install two within the body of the valve and one on the piston.
- Apply a thin film of grease to the valve piston before inserting into the valve body.
- Use a Lithium-based grease with 1% to 3% Molybdenum Disulfate. For a listing, see heading "Lubricant Specifications" on page 45.
- Apply Loctite #246 to all screws and an appropriate pipe sealant to the 3/4" NPT pipe threads.
- If the switch is removed from the plate, install the plate with the counterbore side facing the housing mounting bosses. (See Figure 5-4: "Hale PVG Parts Overview" on page 42.)
- Before placing apparatus into operation, the system must be tested and checked for leaks.

5.4 LUBRICANT SPECIFICATIONS

Grease, for O-ring Seals

Use a Lithium-based grease with 1% to 3% Molybdenum Dissolved, i.e.,

- Dow Corning BR2-PLUS
- Shell Super Duty Grease
- Mobile Grease Special
- Lubricate-Fiske #3000
- Imperial #777
- Sunoco Moly #2EP

Note: For Hale SVS Torrent Stainless Valves see separate manual for additional lubrication information.

Loctite Sealant

- #246 High Temperature Removable Threadlock (or equivalent) - primarily for gearbox assembly
- #242 Medium Strength Threadlock (or equivalent) - primarily for pump assembly

Recommended Cleaners

- Safety Kleen®
- Stoddard Solvent

IMPORTANT ! The use and disposal of solvents / cleaners must be in accordance with your local environmental regulations.

Lubricants

- **Never-Seez®**, White Food Grade with PTFE, manufactured by:
Bostik Findley, Inc.
211 Boston Street, Middleton, MA 01949-2128
web: www.bostikfindley-us.com



Notes

Two columns of horizontal lines for taking notes.

6 Troubleshooting

Table 6-1 lists conditions, possible causes and suggested corrective action measures. Before calling Hale Products or your Hale authorized parts service center for assistance, eliminate problem causes using the following table.

If you cannot correct a problem, please have the following information prior to calling the Hale Customer Service for assistance. Contact Customer Service at telephone number **610-825-6300**.

Condition	Possible Cause	Suggested Corrective Action
Pump Loses Prime or Will Not Prime.	Electric priming system. Note: Weekly priming is recommended to ensure proper operation.	<ul style="list-style-type: none"> To prevent possible pump damage, DO NOT EXCEED an engine speed of 1,000rpm! See Section 2.2 “SPV Priming Valve” on page 12. Also see “PVG Priming Valve” on page 14.
	Inoperative priming system or possible clogged priming pump.	<p>Note: Using lubricant on the vanes and vane slots during disassembly and cleaning eventually causes a gummy residue to develop, rendering the system inoperative.</p> <p>DO NOT LUBRICATE VANES AND VANE SLOTS.</p> <ul style="list-style-type: none"> Check the priming system by performing a “Dry Vacuum Test” per NFPA standards. If the pump holds vacuum, but primer pulls less than 22” Hg., it could indicate excessive wear in the primer. <ul style="list-style-type: none"> See Section 5 Maintenance, heading “Weekly” on page 35. Also see Section 5 Maintenance, heading “Annually” on page 37. See Section 2.2 “SPV Priming Valve” on page 12. Also see “PVG Priming Valve” on page 14. Repair and/or replace accordingly. <p>Note: Using lubricant on the vanes and vane slots during disassembly and cleaning eventually causes a gummy residue to develop, rendering the system inoperative.</p>
	Suction lifts too high.	<ul style="list-style-type: none"> DO NOT attempt lifts exceeding 22’ (6.7 meters) except at low elevation.
	Blocked or restricted suction strainer.	<ul style="list-style-type: none"> Remove obstruction from suction hose strainer. Thoroughly clean strainer screen.

Chart continued on next page.

Figure 6-1: Troubleshooting Chart

□ Troubleshooting



Condition	Possible Cause	Suggested Corrective Action
Pump Loses Prime or Will Not Prime - continued.	Suction connections.	<ul style="list-style-type: none"> • Clean and tighten all suction connections. • Check suction hose and hose gaskets for possible defects - repair and/or replace.
	Air trapped in suction line.	<ul style="list-style-type: none"> • Avoid placing any part of the suction hose higher than the suction intake. • Suction hose should be laid out with continuous decline to fluid supply. • If trap in hose is unavoidable, repeated priming may be needed to eliminate air pockets in suction hose.
	Insufficient priming.	<ul style="list-style-type: none"> • Proper priming procedures should be followed. • Do not release the primer control before assuring a complete prime. • Open the discharge valve slowly during completion of prime to ensure complete prime.
	 NOTICE !  <p>DO NOT RUN THE PRIMER OVER FORTY-FIVE (45) SECONDS. IF PRIME IS NOT ACHIEVED WITHIN 45 SECONDS, STOP AND LOOK FOR CAUSES (AIR LEAKS OR BLOCKED SUCTION HOSES).</p>	
	Pump pressure too low when nozzle is opened.	<ul style="list-style-type: none"> • Prime pump again and maintain higher pump pressure while opening the discharge valve slowly.
	Air leaks.	<ul style="list-style-type: none"> • Attempt to located and correct air leaks using the following procedures: <ul style="list-style-type: none"> • Perform “Dry Vacuum Test” on pump per NFPA standards with 22” Hg. minimum vacuum required with loss not to exceed 10” Hg. in five (5) minutes. • If a minimum of 22” Hg. cannot be achieved, the priming device or system may be inoperative, or the leak is too big for the primer to overcome (such as an open valve). The loss of vacuum indicates leakage and could prevent priming or cause loss of prime. • After priming shut OFF the engine. Audible detection of a leak is often possible. • Connect the suction hose from the hydrant or the discharge of another pumper to pressurize the pump with water and look for visible leakage and correct. A pressure of 100 PSI (6.9 BAR / 0.7 MPa) should be sufficient. DO NOT exceed pressure limitations of pump, accessories or piping connections. • The suction side relief valve can leak. Plug the valve outlet connection and retest

Chart continued on next page.

Figure 6-1: Troubleshooting Chart

Condition	Possible Cause	Suggested Corrective Action
Primer Solenoid - 12VDC and 24VDC		
<p>Switch is dead - no click is heard.</p> <p>See electrical installation detail plate drawing on page 54.</p> <p>For 12VDC Solenoid, see Figure 6-2: “12VDC Solenoid Arrangement Troubleshooting” on page 50.</p> <p>For 24VDC solenoid, see Figure 6-3: “24VDC Solenoid Arrangement Troubleshooting” on page 50.</p>	<p>Bad base ground. <i>(For 24VDC - bad ground at (I) terminal.)</i></p> <p>Low voltage on switch terminal. <i>(For 24VDC - bad voltage at (S) terminal.)</i></p> <p>Dead switch wire.</p> <p>Bad Battery.</p> <p>Hardware not properly tightened.</p> <p>Check plastic body for cracks allowing moisture to enter.</p>	<ul style="list-style-type: none"> • Check solenoid base screws for tightness and corrosion, especially under the hold-down tangs - clean accordingly. Switch base must be properly grounded to chassis. • Continuity test and check each cable for defects, i.e., fraying, splits, corrosion, etc. See electrical installation detail plate drawing on page 54. Repair and/or replace accordingly. • Check apparatus battery for full charge - service accordingly. • Using VOM (volt ohm meter), check wires for proper voltage - 12VDC requires minimum of 9.0VDC; 24VDC requires minimum of 18.0VDC. • Check that hardware is tight and torqued to specifications. See mechanical installation detail plate drawing on page 54. • Hair line cracks in the plastic body allow moisture to enter and short the internal circuitry. If suspect, replace solenoid.
<p>Switch chatters, pops or clicks, but the motor does not work.</p> <p><i>Chart continued on next page.</i></p>	<p>Bad base ground. <i>(For 24VDC - bad ground at (I) terminal.)</i></p> <p>Bad positive (+) or negative (-) cables.</p> <p>Bad or weak battery.</p> <p>Low voltage to switch terminal. <i>(For 24VDC - bad voltage at (S) terminal.)</i></p> <p>Hardware not properly tightened.</p> <p>Check plastic body for cracks allowing moisture to enter.</p>	<ul style="list-style-type: none"> • Check solenoid base screws for tightness and corrosion, especially under the hold-down tangs - clean accordingly. • Continuity test and check each cable for defects, i.e., fraying, splits, corrosion, etc. See electrical installation detail plate drawing on page 54. Repair and/or replace accordingly. • Check that each cable is tight and torqued to specifications. See mechanical installation detail plate drawing on page 54. • Check apparatus battery for full charge - service accordingly. • Using VOM (volt ohm meter), check wires for proper voltage - 12VDC requires minimum of 9.0VDC; 24VDC requires minimum of 18.0VDC. • Check that hardware is tight and torqued to specifications. See mechanical installation detail plate drawing on page 54. • Hair line cracks in the plastic body allow moisture to enter and short the internal circuitry. If suspect, replace solenoid.

Figure 6-1: Troubleshooting Chart

□ Troubleshooting

Condition	Possible Cause	Suggested Corrective Action
Switch stays ON (sticks) - motor keeps running.	Positive (+) cable touching the switch terminal on the solenoid. Switch wire and cable wire shorted. Bad solenoid switch.	<ul style="list-style-type: none"> • Check that cables are not touching each other or other objects. • Continuity test and check each cable for defects, i.e., fraying, splits, corrosion, etc. Repair and/or replace accordingly. • Check that each cable is tight and torqued to specifications. See mechanical installation detail plate drawing on page 54. • Using VOM, check solenoid for proper operation, i.e., solenoid opens and closes with the control switch. If it does not - replace solenoid. • Using VOM (volt ohm meter), check wires for proper voltage - 12VDC requires minimum of 9.0VDC; 24VDC requires minimum of 18.0VDC.

Notes:

If problems still exist, replace solenoid and recheck all connections and batteries.

It is NOT recommended to put RTV silicone or epoxy over the solenoid connections. Use **Never-Seez®**, White Food Grade with PTFE or a suitable battery spray. Also see Section 5 Maintenance, heading “Lubricants” on page 45.

Figure 6-1: Troubleshooting Chart

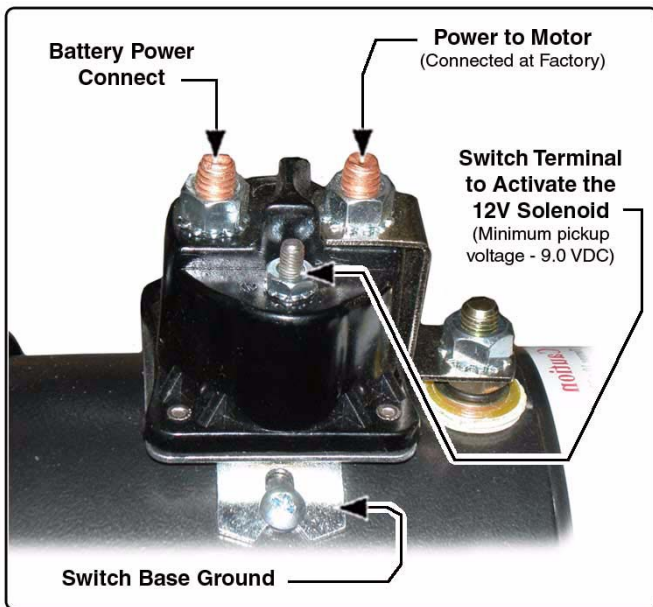


Figure 6-2: 12VDC Solenoid Arrangement Troubleshooting

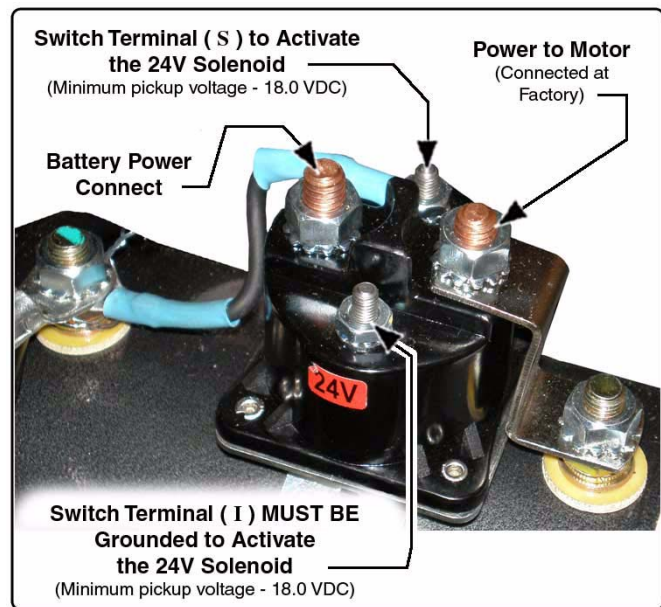


Figure 6-3: 24VDC Solenoid Arrangement Troubleshooting

Express Warranty

EXPRESS WARRANTY: Hale Products, Inc. (HALE) hereby warrants to the original Buyer that products manufactured by Hale are free of defects in material and workmanship for two (2) years or 2,000 hours usage, whichever shall first occur. The "Warranty Period" commences on the date the original Buyer takes delivery of the product from the manufacturer.

LIMITATIONS: Hale's obligation is expressly conditioned on the Product being:

- Subjected to normal use and service.
- Properly maintained in accordance with Hale's Instruction Manual as to recommended services and procedures.
- Not damaged due to abuse, misuse, negligence, or accidental causes.
- Not altered, modified, serviced (non-routine) or repaired other than by an Authorized Service Facility.
- Manufactured per design and specifications submitted by the original Buyer.

THE ABOVE EXPRESS LIMITED WARRANTY IS EXCLUSIVE. NO OTHER EXPRESS WARRANTIES ARE MADE. SPECIFICALLY EXCLUDED ARE ANY IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATIONS, THE IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE OR USE; QUALITY; COURSE OF DEALING; USAGE OF TRADE; OR PATENT INFRINGEMENT FOR A PRODUCT MANUFACTURED TO ORIGINAL BUYER'S DESIGN AND SPECIFICATIONS.

EXCLUSIVE REMEDIES: If Buyer promptly notifies HALE upon discovery of any such defect (within the Warranty Period), the following terms shall apply:

- Any notice to HALE must be in writing, identifying the Product (or component) claimed defected and circumstances surrounding its failure.
- HALE reserves the right to physically inspect the Product and require Buyer to return same to HALE's plant or other Authorized Service Facility.
- In such event, Buyer must notify HALE for a Returned Goods Authorization Number and Buyer must return the product F.O.B. within thirty (30) days thereof.
- If determined defective, HALE shall, at its option, repair or replace the Product, or refund the purchase price (less allowance for depreciation).
- Absent proper notice *within* the Warranty Period, HALE shall have no further liability or obligation to Buyer therefore.

THE REMEDIES PROVIDED ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE. IN NO EVENT SHALL HALE BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE INCLUDING, WITHOUT LIMITATION, LOSS OF LIFE; PERSONAL INJURY; DAMAGE TO REAL OR PERSONAL PROPERTY DUE TO WATER OR FIRE; TRADE OR OTHER COMMERCIAL LOSSES ARISING, DIRECTLY OR INDIRECTLY, OUT OF PRODUCT FAILURE.



Hale Products Inc.

A Unit of IDEX Corporation

700 Spring Mill Avenue

Conshohocken, PA 19428 U.S.A.

Telephone.....1-610-825-6300

Fax1-610-825-6440

Web www.haleproducts.com





ESP Primer System

Drawing Package



Hale Products Inc. ♦ A Unit of IDEX Corporation
700 Spring Mill Avenue ♦ Conshohocken, PA 19428 U.S.A.
Telephone: 610-825-6300 ♦ FAX: 610-825-6440
Web.....www.haleproducts.com



Contents

7 Drawings.....Plate Number

12 Volt ESP System

Hale ESP-12 Priming System, Mechanical Installation Sheet 1 of 2	821A
Hale ESP-12 Priming System, Electrical Installation Sheet 2 of 2.....	821A

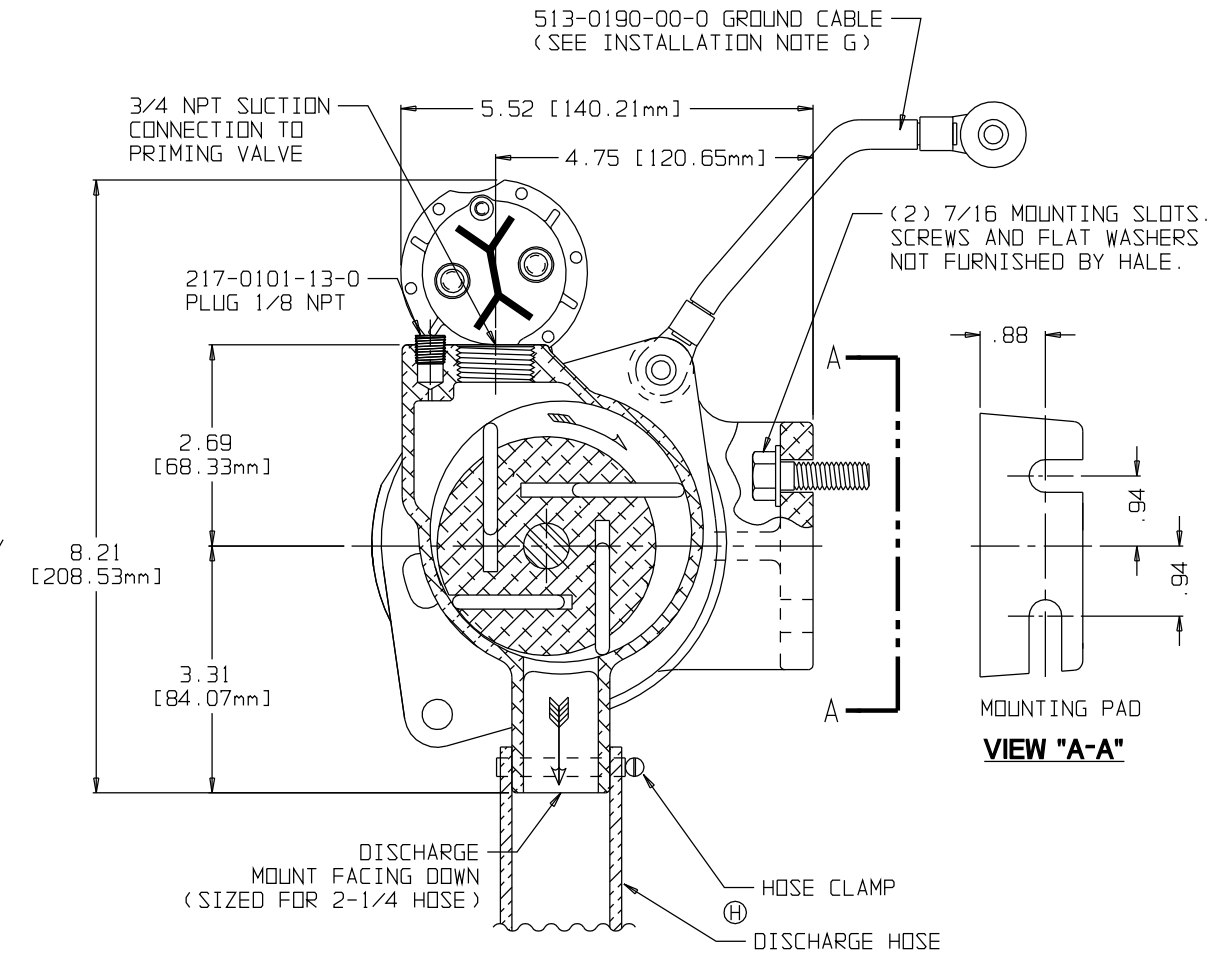
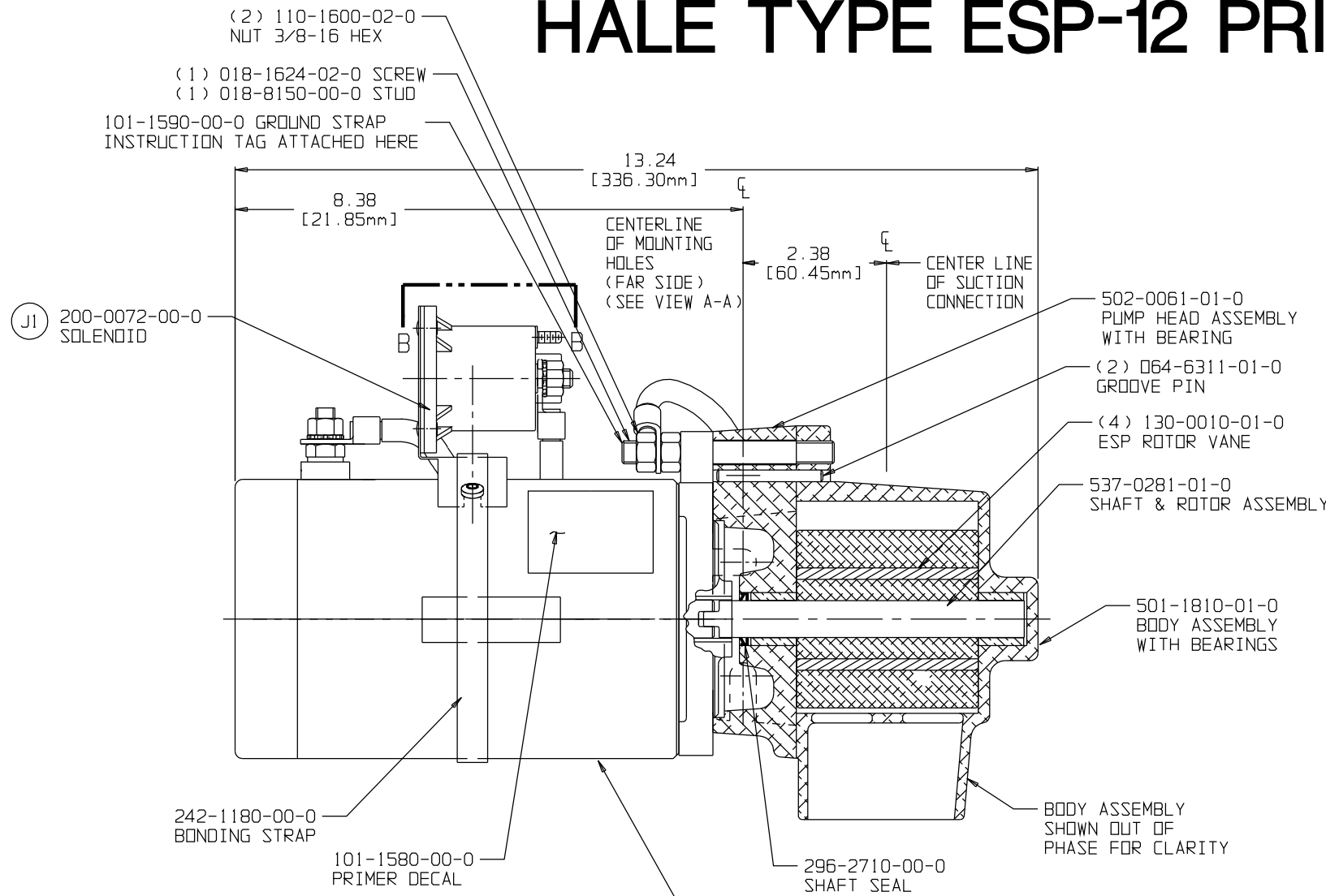
24 Volt ESP System

Hale ESP-24 Priming System, Mechanical Installation Sheet 1 of 2	938A
Hale ESP-24 Priming System, Electrical Installation Sheet 2 of 2.....	938A

Priming Valves, PVG / SPV

Hale PVG Valve.....	480A
Hale SPV Valve, Universal Mount	828A
Hale SPV Valve, Pump Mount.....	819A

HALE TYPE ESP-12 PRIMING PUMP



PART NO.	VOLTAGE DC	AMPERES MAX.
(J1) 200-0043-00-0	12	280

NOTES:

- 1) WEIGHT OF PRIMING PUMP AND MOTOR IS 27 LBS. (12.2 Kg).
- 2) THEORETICAL DISPLACEMENT IS .066 GAL. (.25 LITERS) PER REVOLUTION OR 47,000 CU. IN. (770,000 CU. CM) AIR PER MINUTE.
- 3) VACUUM CAPABILITY: 24 IN. Hg (610 MM Hg).
- 4) TO AID IN LONG PRIMER LIFE AND PROPER PERFORMANCE, IT IS RECOMMENDED THAT THE PRIMING PUMP BE CLEANED YEARLY OR AFTER 500 CYCLES OF USE. SEPARATE THE PUMP BODY AND HEAD FROM THE MOTOR AND REMOVE ANY BLACK BUILD UP OR CONTAMINATES WITH SAFETY KLEEN OR STODDARD SOLVENT. USE CARE TO REINSTALL THE VANES IN THE SAME ORIENTATION AND TO GREASE THE SHAFT SEAL.
- 5) SEE PLATE NO. 938 FOR 24V PRIMING PUMP DETAILS.
- 6) TO PREVENT DAMAGE TO PLASTIC HOUSING WHEN INSTALLING OR REMOVING LEADS, DO NOT APPLY SIDE LOADS TO NUTS.
- 7) WHEN USING A TERMINAL LUG ON THE BATTERY CONNECTION WITH A 5/16 DIA. HOLE, LOWER WASHER IS NOT NEEDED. IF HOLE DIA. IS LARGER THAN 5/16, WASHERS ARE REQUIRED BOTH ABOVE AND BELOW THE TERMINAL.
- 8) FOR ELECTRICAL DETAILS REFER TO SHEET 2

INSTALLATION NOTES:

- A) USE A MINIMUM OF 1/2 TUBING FOR BOOSTER PUMPS.
- B) USE A MINIMUM OF 3/4 PIPE FOR MIDSHIP PUMPS.
- C) CONNECT TO HIGHEST POINT ON DISCHARGE OF MAIN PUMP IF PRIMING WHILE THE PUMP IS STATIONARY.
- D) CONNECT TO HIGHEST POINT ON THE SUCTION NEAR THE IMPELLER EYE IF PRIMING WHEN THE MAIN PUMP IS RUNNING.
- E) A SHUT-OFF VALVE, SUCH AS A HALE PVG OR SPV PRIMING VALVE, MUST BE LOCATED IN THE PRIMING LINE BETWEEN THE PRIMING PUMP AND THE MAIN PUMP.
- F) THE PRIMING PUMP MUST BE MOUNTED SO THAT THE MOTOR SHAFT IS IN A HORIZONTAL PLANE WITH THE PRIMING PUMP DISCHARGE FACING DOWN.
- G) GROUND THE PRIMING PUMP TO THE TRUCK CHASSIS, USING THE GROUND STRAP FURNISHED. THE GROUND STRAP IS REQUIRED FROM THE TRUCK CHASSIS TO THE TERMINAL STUD ON THE PRIMING PUMP. THIS IS TO INSURE A GROUND FOR THE MOTOR. THE CABLE IS SIZED FOR A 12 VOLT DC 300 AMP LOAD.
- H) DURING THE PRIMING OPERATION (EVACUATING AIR), DO NOT RUN MOTOR FOR MORE THAN 60 SECONDS.

PLUMBING INSTALLATION DETAILS

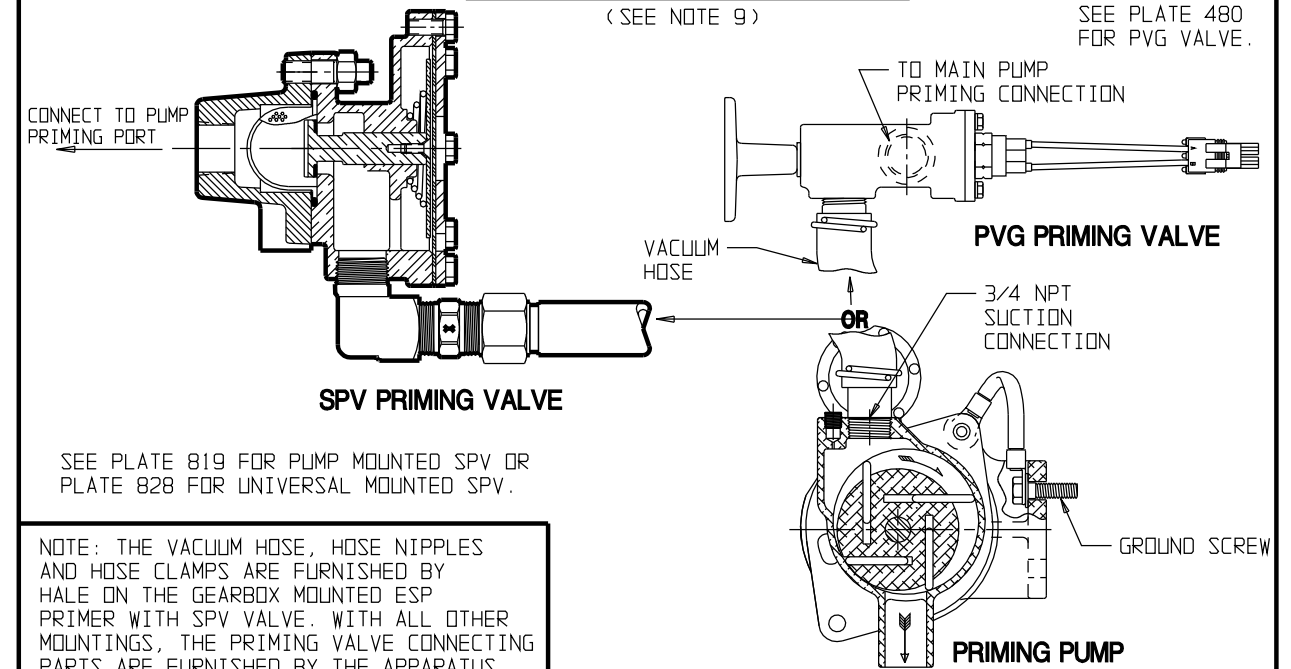


PLATE NO. 821AJ (SHEET 1 OF 2)

ECD NO	REV	CHANGED FROM	BY	DATE	APVD	ECD NO	REV	CHANGED FROM	BY	DATE	APVD
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Q411	H	ADDED DETAIL C AND HOSE	KSM	7-24-06	MAL	0815	J2	ADDED NOTE I	JRP	01-22-09	MAL
Q526	I	REDRAWN AND ADDED SHEET 2	MLJ	2-22-07	MAL						



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NOT TO BE REPRODUCED OR USED TO MAKE OTHER DRAWINGS OR MACHINERY. DRAWN: [] ROT: [] DATE: 2-19-95. SIZE: [] SCALE: FULL

HALE TYPE ESP-12 PRIMING PUMP

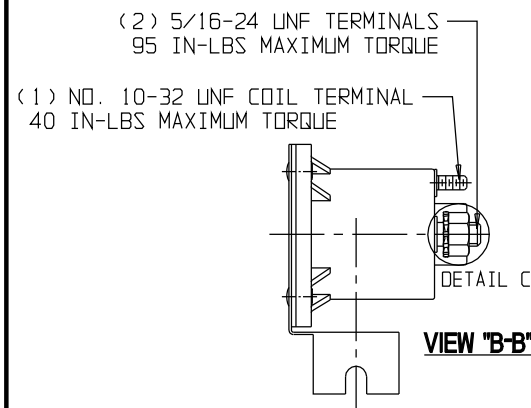
ELECTRICAL INSTALLATION DETAILS

MATING CONNECTOR NOT PROVIDED BY HALE
 CAN BE PURCHASED AS HALE KIT # 546-1780-00-0
 PACKARD WEATHER PACK SEALED CONNECTOR:
 (1) P/N: 12010973 (2 CONTACT) SHROUD HALF
 (2) P/N: 12124582 (16-14 GAGE) MALE TERMINAL
 (2) P/N: 12010293 (16-14 GAGE) LT GRAY CABLE SEAL
 USE A MINIMUM OF 14 AWG SXL, GXL OR TXL
 SAE J1128 WIRE TYPE

SOLENOID RELOCATION INSTRUCTIONS

- 1-REMOVE (2) SCREWS HOLDING THE SOLENOID TO THE MOTOR AND LOOSEN THE SOLENOID CLAMP SCREW.
- 2-LOOSELY INSTALL THE CLAMP USING THE EXISTING SOLENOID MOUNTING HOLES. THE SCREWS MUST GO THROUGH TWO OF THE HOLES IN THE CLAMP.
- 3-POSITION THE SOLENOID IN THE DESIRED LOCATION. PLACE THE CLAMP BETWEEN THE FOUR CLAMP GUIDES ON THE SOLENOID MOUNTING BRACKET. TIGHTEN THE THE SOLENOID CLAMP, THEN TIGHTEN THE SOLENOID SCREWS. MAKE SURE CLAMP AND SCREWS ARE TIGHTENED IN THIS ORDER.
- 4-TIGHTEN THE LOWER TERMINAL NUT TO 50 LBS-IN. INSTALL THE CABLE AND THE UPPER TERMINAL NUT. HOLD THE LOWER TERMINAL NUT WITH A WRENCH WHILE TIGHTENING THE UPPER TERMINAL NUT TO 50 LBS-IN.
- 5-INSTALL THE CABLE TO THE SOLENOID TERMINAL AND TIGHTEN THE TERMINAL NUT TO 35 LBS-IN.
- 6-INSTALL THE SOLENOID POWER CABLE AND TIGHTEN THE LARGE SOLENOID NUT TO 35 LBS-IN. INSTALL THE SOLENOID "ACTIVATION" WIRE AND TIGHTEN THE SMALL NUT TO 15 LBS-IN. POSITION THE CABLES SO THEY HAVE THE LEAST POSSIBILITY FOR DAMAGE.

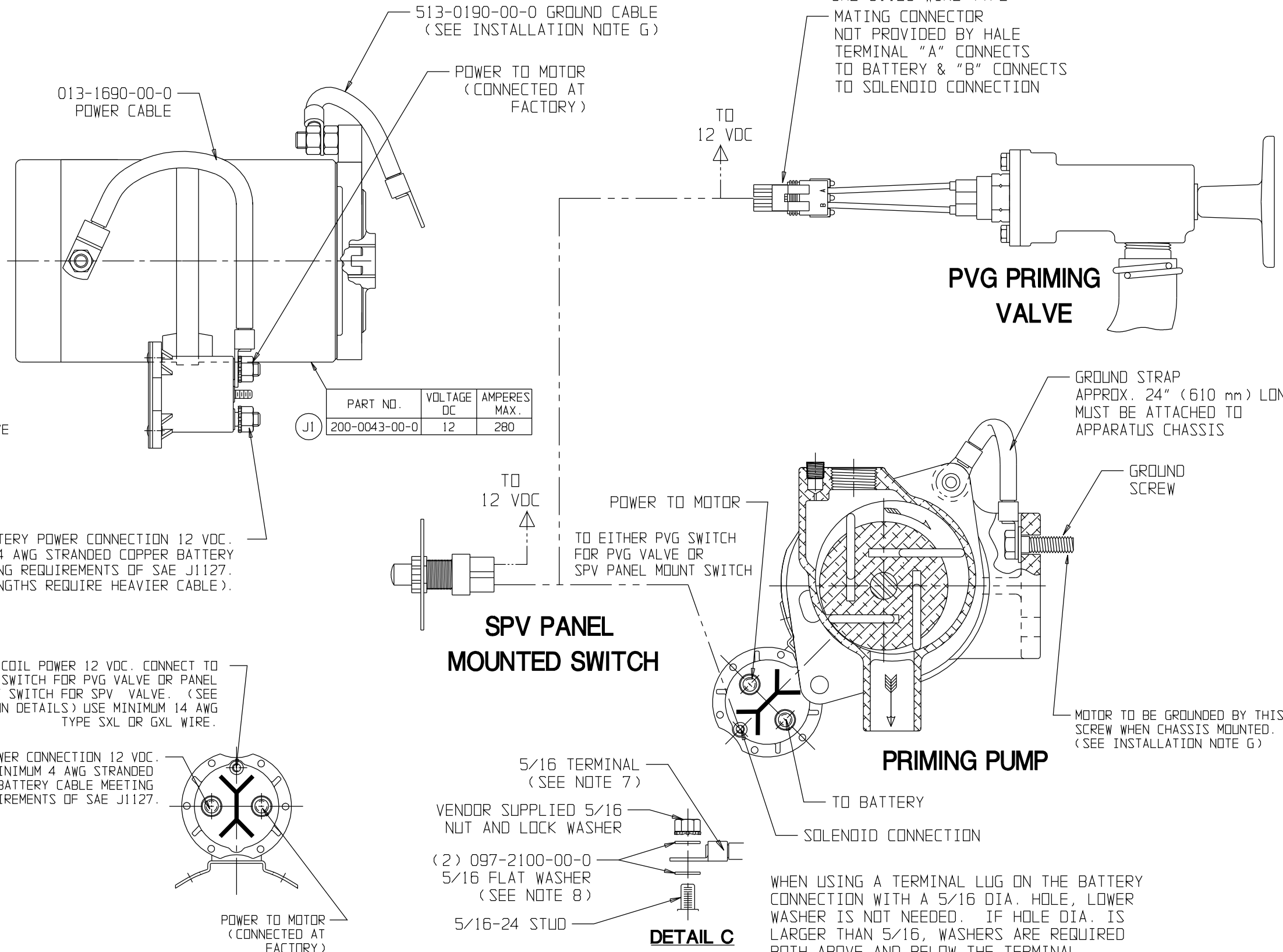
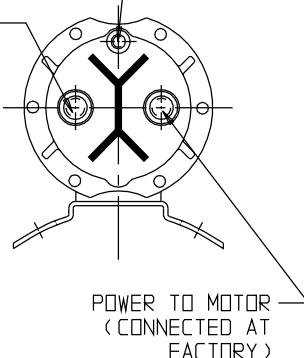
SOLENOID FASTENER TORQUE SPECIFICATION



BATTERY POWER CONNECTION 12 VDC.
 USE MINIMUM 4 AWG STRANDED COPPER BATTERY
 CABLE MEETING REQUIREMENTS OF SAE J1127.
 (LONGER LENGTHS REQUIRE HEAVIER CABLE).

SOLENOID COIL POWER 12 VDC. CONNECT TO
 EITHER PVG SWITCH FOR PVG VALVE OR PANEL
 MOUNT SWITCH FOR SPV VALVE. (SEE
 INSTALLATION DETAILS) USE MINIMUM 14 AWG
 TYPE SXL OR GXL WIRE.

BATTERY POWER CONNECTION 12 VDC.
 USE MINIMUM 4 AWG STRANDED
 COPPER BATTERY CABLE MEETING
 REQUIREMENTS OF SAE J1127.



PART NO.	VOLTAGE DC	AMPERES MAX.
200-0043-00-0	12	280

WHEN USING A TERMINAL LUG ON THE BATTERY
 CONNECTION WITH A 5/16 DIA. HOLE, LOWER
 WASHER IS NOT NEEDED. IF HOLE DIA. IS
 LARGER THAN 5/16, WASHERS ARE REQUIRED
 BOTH ABOVE AND BELOW THE TERMINAL.

ECO NO	REV	CHANGED FROM	BY	DATE	APVD	ECO NO	REV	CHANGED FROM	BY	DATE	APVD
02-251	G	ADDED TOP VIEW OF SOLENOID AND DIMENSIONS IN MILLIMETER. FIXED GROUND STRAP TO BE ATTACHED TO APPARATUS CHASSIS.	BVP	08-15-02	MAL	0815	J1	WAS 200-0042-00-0 & 200-0071-00-0	JRP	01-22-09	MAL
0411	H	ADDED DETAIL C AND HOSE	KSM	7-24-06	MAL	0815	J2	ADDED SOLENOID ROTATION NOTE	JRP	01-22-09	MAL
0526	I	REDRAWN AND ADDED SHEET 2	MLJ	2-22-07	MAL						

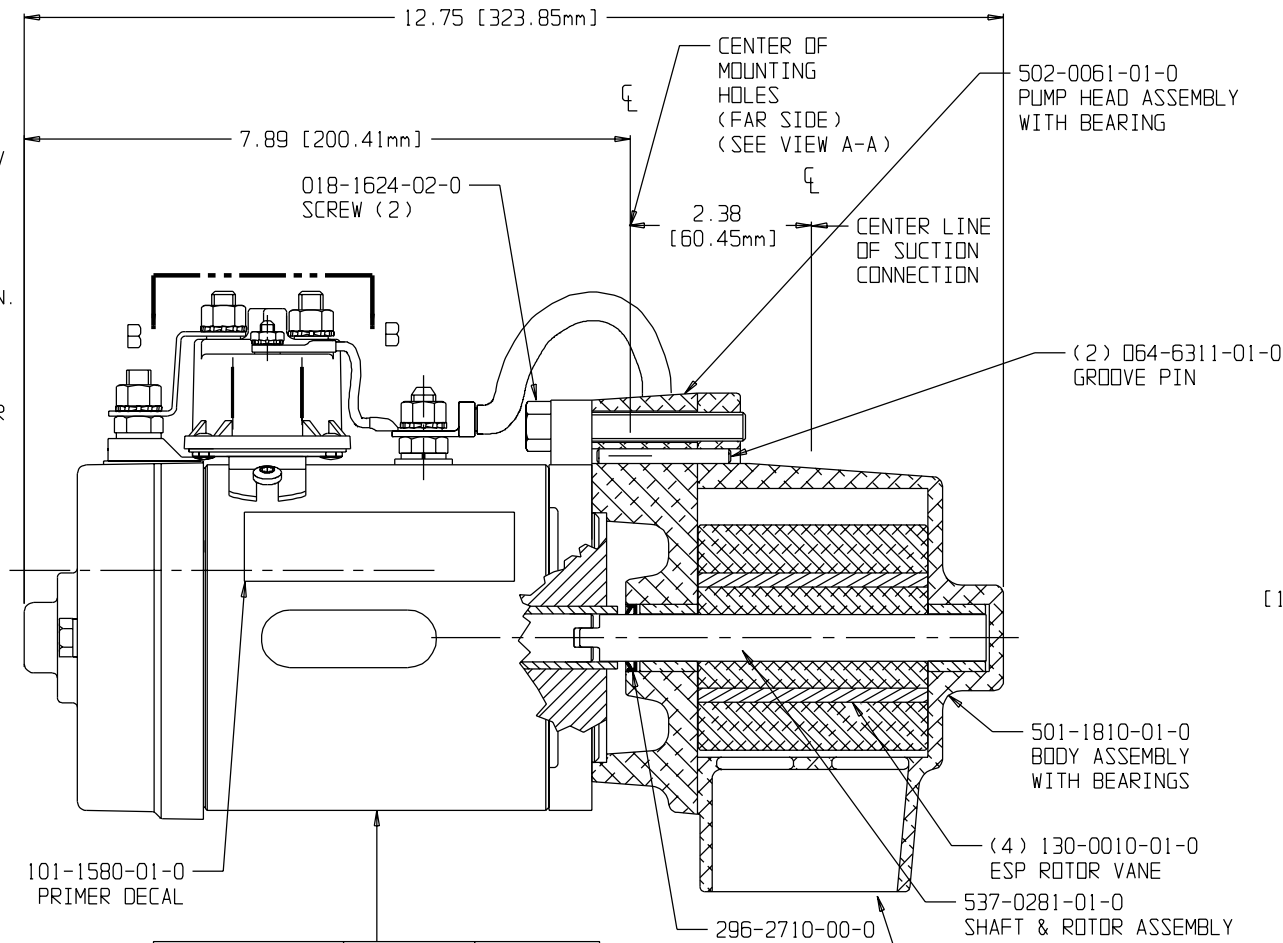
INSTALLATION NOTES:

- A) USE A MINIMUM OF 1/2 TUBING FOR BOOSTER PUMPS.
- B) USE A MINIMUM OF 3/4 PIPE FOR MIDSHIP PUMPS.
- C) CONNECT TO HIGHEST POINT ON DISCHARGE OF MAIN PUMP IF PRIMING WHILE THE PUMP IS STATIONARY.
- D) CONNECT TO HIGHEST POINT ON THE SUCTION NEAR THE IMPELLER EYE IF PRIMING WHEN THE MAIN PUMP IS RUNNING.
- E) A SHUT-OFF VALVE, SUCH AS A HALE PVG OR SPV PRIMING VALVE, MUST BE LOCATED IN THE PRIMING LINE BETWEEN THE PRIMING PUMP AND THE MAIN PUMP.
- F) THE PRIMING PUMP MUST BE MOUNTED SO THAT THE MOTOR SHAFT IS IN A HORIZONTAL PLANE WITH THE PRIMING PUMP DISCHARGE FACING DOWN.
- G) GROUND THE PRIMING PUMP TO THE TRUCK CHASSIS, USING THE GROUND STRAP FURNISHED. THE GROUND STRAP IS REQUIRED, FROM THE TRUCK CHASSIS TO THE TERMINAL STUD ON THE PRIMING PUMP. THIS IS TO INSURE A GROUND FOR THE MOTOR. THE CABLE IS SIZED FOR A 24 VOLT DC 150 AMP LOAD.
- H) DURING THE PRIMING OPERATION (EVACUATING AIR), DO NOT RUN THE MOTOR FOR MORE THAN 60 SECONDS.

HALE TYPE ESP-24 PRIMING PUMP

NOTES:

- 1) MOTOR ROTATION IS THE SAME FOR BOTH NEGATIVE AND POSITIVE GROUND SYSTEMS.
- 2) WEIGHT OF PRIMING PUMP AND MOTOR IS 27 LBS. (12.2 Kg).
- 3) THEORETICAL DISPLACEMENT IS .066 GAL. (.25 LITERS) PER REVOLUTION OR 47,000 CU. IN. (770,000 CU. CM) AIR PER MINUTE.
- 4) VACUUM CAPABILITY: 24 IN. Hg (610 MM Hg).
- 5) TO AID IN LONG PRIMER LIFE AND PROPER PERFORMANCE, IT IS RECOMMENDED THAT THE PRIMING PUMP BE CLEANED YEARLY OR AFTER 500 CYCLES OF USE. SEPARATE THE PUMP BODY AND HEAD FROM THE MOTOR AND REMOVE ANY BLACK BUILD UP OR CONTAMINATES WITH SAFETY KLEEN OR STODDARD SOLVENT. USE CARE TO REINSTALL THE VANES IN THE SAME ORIENTATION AND TO GREASE THE SHAFT SEAL.
- 6) SEE PLATE NO. 821 FOR 12V PRIMING PUMP CONFIGURATION.
- 7) TO PREVENT DAMAGE TO PLASTIC HOUSING WHEN INSTALLING OR REMOVING LEADS, DO NOT APPLY SIDE LOADS TO NUTS.
- 8) WHEN USING A TERMINAL LUG ON THE BATTERY CONNECTION WITH A 5/16 DIA. HOLE, LOWER WASHER IS NOT NEEDED. IF HOLE DIA. IS LARGER THAN 5/16, WASHERS ARE REQUIRED BOTH ABOVE AND BELOW THE TERMINAL.
- 9) FOR ELECTRICAL DETAILS REFER TO SHEET 2
- 10) FOR MECHANICAL DETAILS REFER TO SHEET 1



PART NO.	VOLTAGE D.C.	AMPERES MAX.
200-0062-00-0	24	150

NOTE - SOME COMPONENTS IN SECTION VIEW ARE SHOWN OUT OF POSITION FOR CLARITY

SOLENOID COIL POWER 24 VDC CONNECT TO EITHER PVG SWITCH FOR PVG VALVE OR PANEL MOUNT SWITCH FOR SPV VALVE. (SEE INSTALLATION DETAILS) USE MINIMUM 14 AWG TYPE SXL OR GXL WIRE

POWER TO MOTOR (CONNECTED AT FACTORY)

SOLENOID GROUND (CONNECTED AT FACTORY)

VIEW "B-B"

BATTERY POWER CONNECTION 24 VDC. USE MINIMUM 4 AWG STRANDED COPPER BATTERY CABLE MEETING REQUIREMENTS OF SAE J1127.

(2) 10-32 UNC TERMINALS TORQUE TO 15-20 IN LBS MAX (SEE NOTE 7)

(2) 5/16-18 UNC TERMINALS TORQUE TO 50-60 IN LBS MAX (SEE NOTE 7)

VENDOR SUPPLIED 5/16 NUT AND LOCK WASHER

(2) 097-2100-00-0 5/16 FLAT WASHER (SEE NOTE 8)

5/16-18 STUD

5/16 TERMINAL (SEE NOTE 8)

SOLENOID FASTENER TORQUE SPECIFICATION

DETAIL C

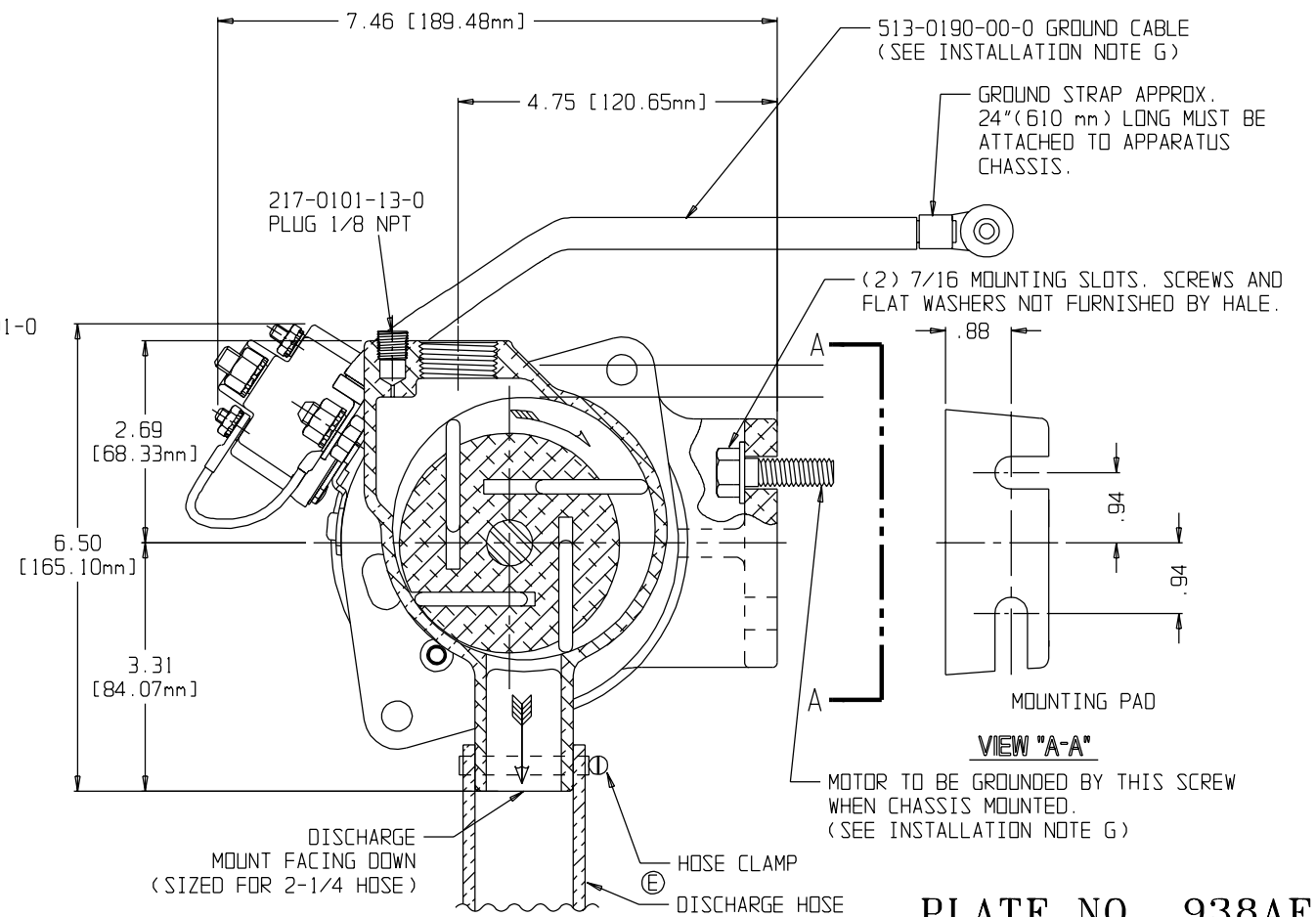
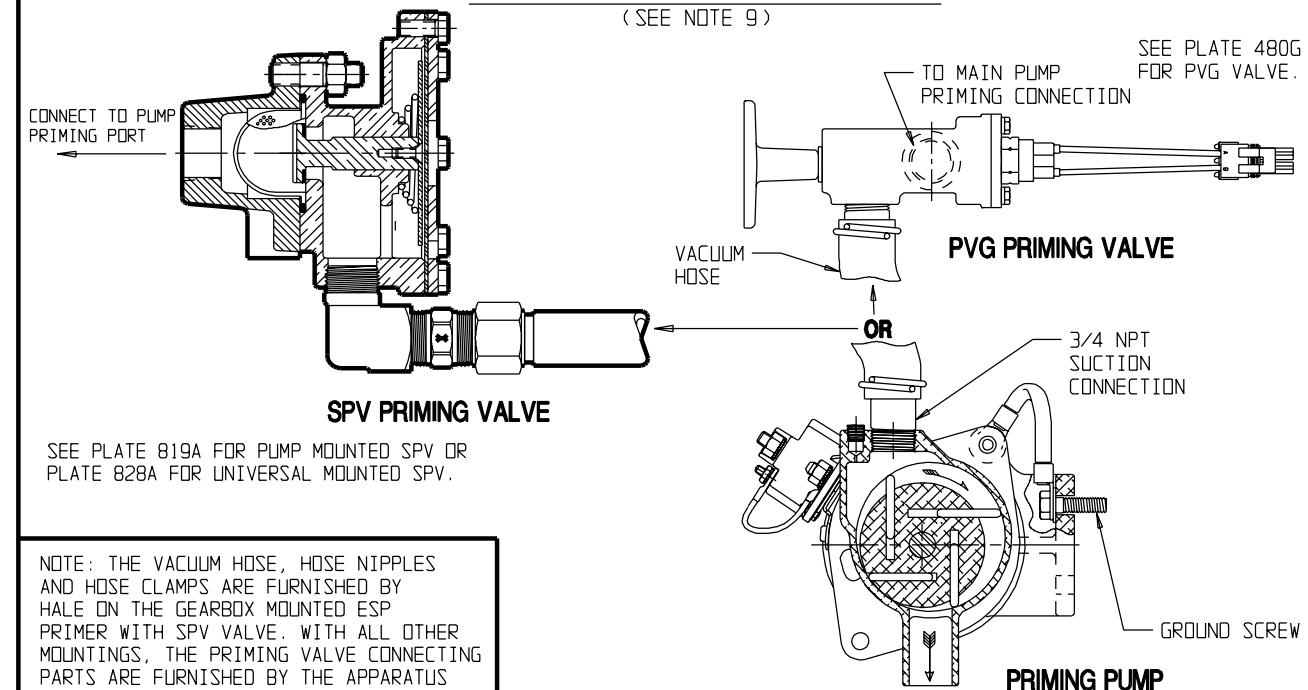


PLATE NO. 938AF

PLUMBING INSTALLATION DETAILS

(SEE NOTE 9)



NOTE: THE VACUUM HOSE, HOSE NIPPLES AND HOSE CLAMPS ARE FURNISHED BY HALE ON THE GEARBOX MOUNTED ESP PRIMER WITH SPV VALVE. WITH ALL OTHER MOUNTINGS, THE PRIMING VALVE CONNECTING PARTS ARE FURNISHED BY THE APPARATUS BUILDER.

PLATE NO. 938AF (SHEET 1 OF 2)

ECD NO	REV	CHANGED FROM	BY	DATE	APVD	ECD NO	REV	CHANGED FROM	BY	DATE	APVD
02-251	D	ADDED TOP VIEW OF SOLENOID AND DIMENSIONS IN MILLIMETER. FIXED GROUND STRAP TO BE ATTACHED TO APPARATUS CHASSIS.	BVP	08-15-02	MAL	01-172	A	RELEASE FOR PRODUCTION	ERB	4-03-01	MAL
0411	E	ADDED DETAIL C AND HOSE	KSM	7-24-06	MAL	01-257	B	UPDATED SOLENOID CONNECTION CALLOUTS	DJK	06-12-01	MAL
0526	F	REDRAWN AND ADDED SHEET 2	MLJ	2-22-07	MAL	01-258	C	(INSTRUCTION NOTE 7) REMOVED. *WHEN THE PRIMING "PUMP" IS MOUNTED ON THE PUMP GEARBOX. *ADDED SOLENOID TORQUE SPACE.	DJK	06-22-01	MAL



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Conshohocken, PA 19428 USA

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HALE TYPE ESP-24 PRIMING PUMP

ELECTRICAL INSTALLATION DETAILS

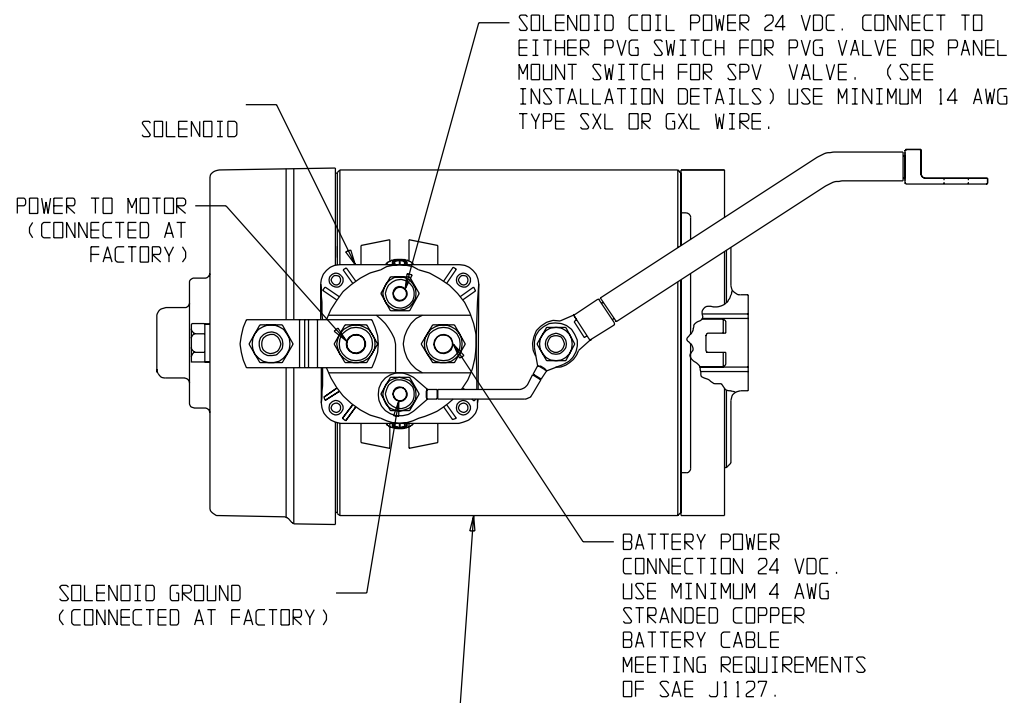
(SEE NOTE 10)

INSTALLATION NOTES:

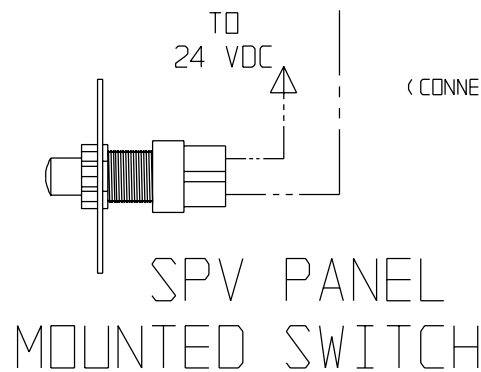
- A) USE A MINIMUM OF 1/2 TUBING FOR BOOSTER PUMPS.
- B) USE A MINIMUM OF 3/4 PIPE FOR MIDSHIP PUMPS.
- C) CONNECT TO HIGHEST POINT ON DISCHARGE OF MAIN PUMP IF PRIMING WHILE THE PUMP IS STATIONARY.
- D) CONNECT TO HIGHEST POINT ON THE SUCTION NEAR THE IMPELLER EYE IF PRIMING WHEN THE MAIN PUMP IS RUNNING.
- E) A SHUT-OFF VALVE, SUCH AS A HALE PVG OR SPV PRIMING VALVE, MUST BE LOCATED IN THE PRIMING LINE BETWEEN THE PRIMING PUMP AND THE MAIN PUMP.
- F) THE PRIMING PUMP MUST BE MOUNTED SO THAT THE MOTOR SHAFT IS IN A HORIZONTAL PLANE WITH THE PRIMING PUMP DISCHARGE FACING DOWN.
- G) GROUND THE PRIMING PUMP TO THE TRUCK CHASSIS, USING THE GROUND STRAP FURNISHED. THE GROUND STRAP IS REQUIRED FROM THE TRUCK CHASSIS TO THE TERMINAL STUD ON THE PRIMING PUMP. THIS IS TO INSURE A GROUND FOR THE MOTOR. THE CABLE IS SIZED FOR A 24 VOLT DC 150 AMP LOAD.
- H) DURING THE PRIMING OPERATION (EVACUATING AIR), DO NOT RUN THE MOTOR FOR MORE THAN 60 SECONDS.

NOTES:

- 1) MOTOR ROTATION IS THE SAME FOR BOTH NEGATIVE AND POSITIVE GROUND SYSTEMS.
- 2) WEIGHT OF PRIMING PUMP AND MOTOR IS 27 LBS. (12.2 Kg).
- 3) THEORETICAL DISPLACEMENT IS .066 GAL. (.25 LITERS) PER REVOLUTION OR 47,000 CU. IN. (770,000 CU. CM) AIR PER MINUTE.
- 4) VACUUM CAPABILITY: 24 IN. Hg (610 MM Hg).
- 5) TO AID IN LONG PRIMER LIFE AND PROPER PERFORMANCE, IT IS RECOMMENDED THAT THE PRIMING PUMP BE CLEANED YEARLY OR AFTER 500 CYCLES OF USE. SEPARATE THE PUMP BODY AND HEAD FROM THE MOTOR AND REMOVE ANY BLACK BUILD UP OR CONTAMINATES WITH SAFETY KLEEN OR STODDARD SOLVENT. USE CARE TO REINSTALL THE VANES IN THE SAME ORIENTATION AND TO GREASE THE SHAFT SEAL.
- 6) SEE PLATE NO. 821 FOR 12V PRIMING PUMP DETAILS.
- 7) TO PREVENT DAMAGE TO PLASTIC HOUSING WHEN INSTALLING OR REMOVING LEADS, DO NOT APPLY SIDE LOADS TO NUTS.
- 8) WHEN USING A TERMINAL LUG ON THE BATTERY CONNECTION WITH A 5/16 DIA. HOLE, LOWER WASHER IS NOT NEEDED. IF HOLE DIA. IS LARGER THAN 5/16, WASHERS ARE REQUIRED BOTH ABOVE AND BELOW THE TERMINAL.
- 9) FOR ELECTRICAL DETAILS REFER TO SHEET 2
- 10) FOR MECHANICAL DETAILS REFER TO SHEET 1



PART NO.	VOLTAGE DC	AMPERES MAX.
200-0062-00-0	24	150



MATING CONNECTOR NOT PROVIDED BY HALE CAN BE PURCHASED AS HALE KIT # 546-1780-00-0
 PACKARD WEATHER PACK SEALED CONNECTOR:
 (1) P/N: 12010973 (2 CONTACT) SHROUD HALF
 (2) P/N: 12124582 (16-14 GAGE) MALE TERMINAL
 (2) P/N: 12010293 (16-14 GAGE) LT GRAY CABLE SEAL
 USE A MINIMUM OF 14 AWG SXL, GXL OR TXL SAE J1128 WIRE TYPE

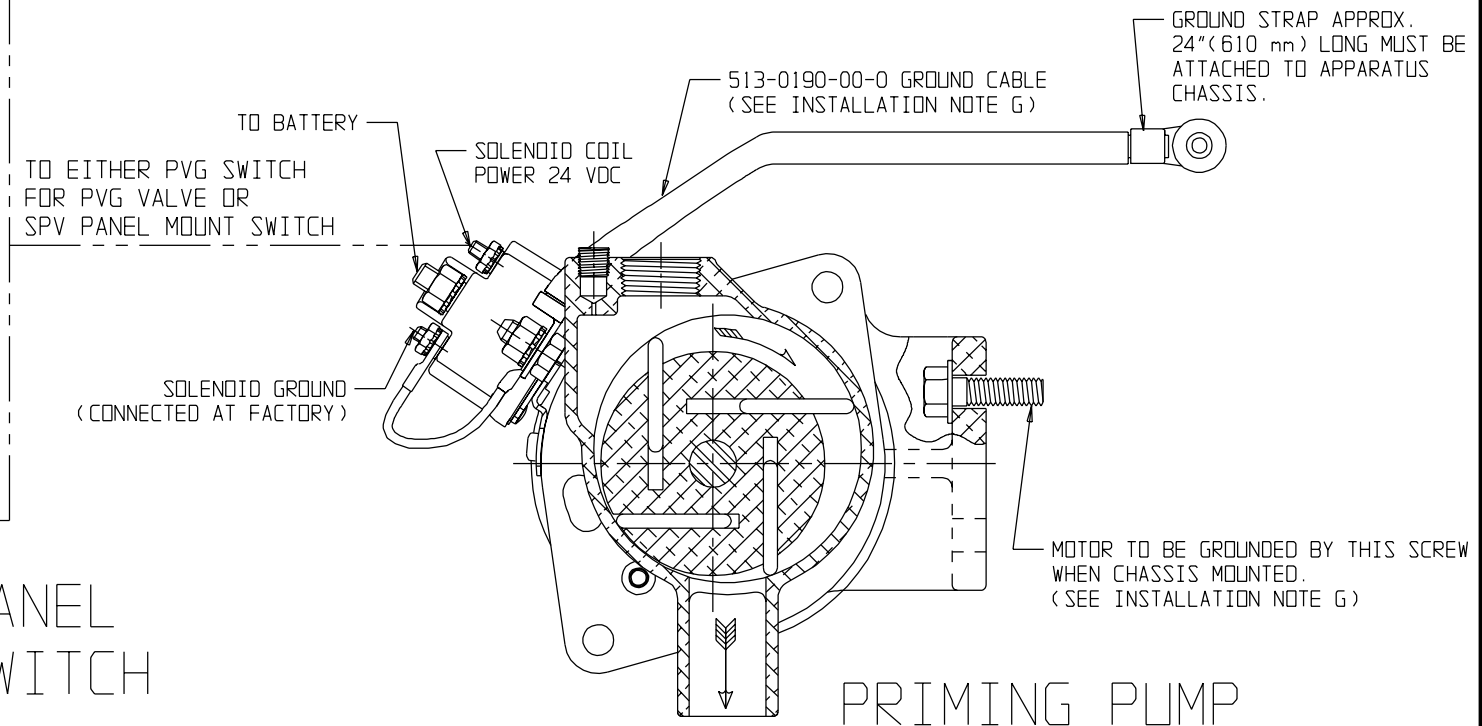
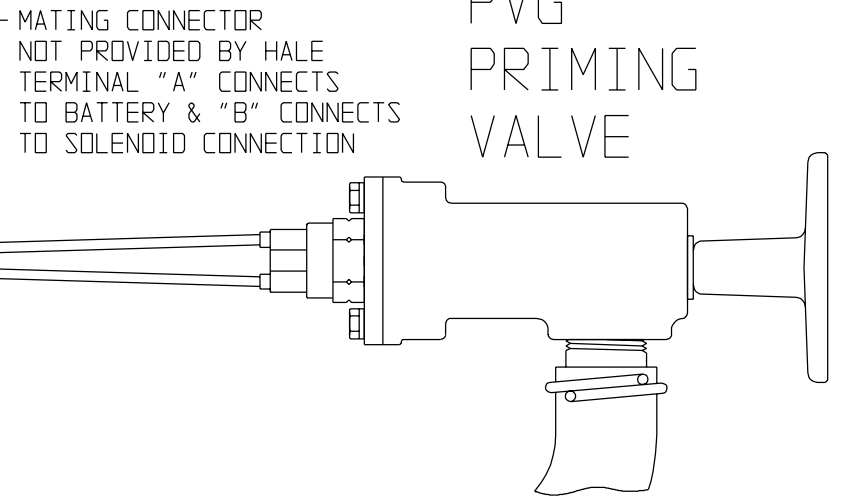


PLATE NO. 938AF (SHEET 2 OF 2)

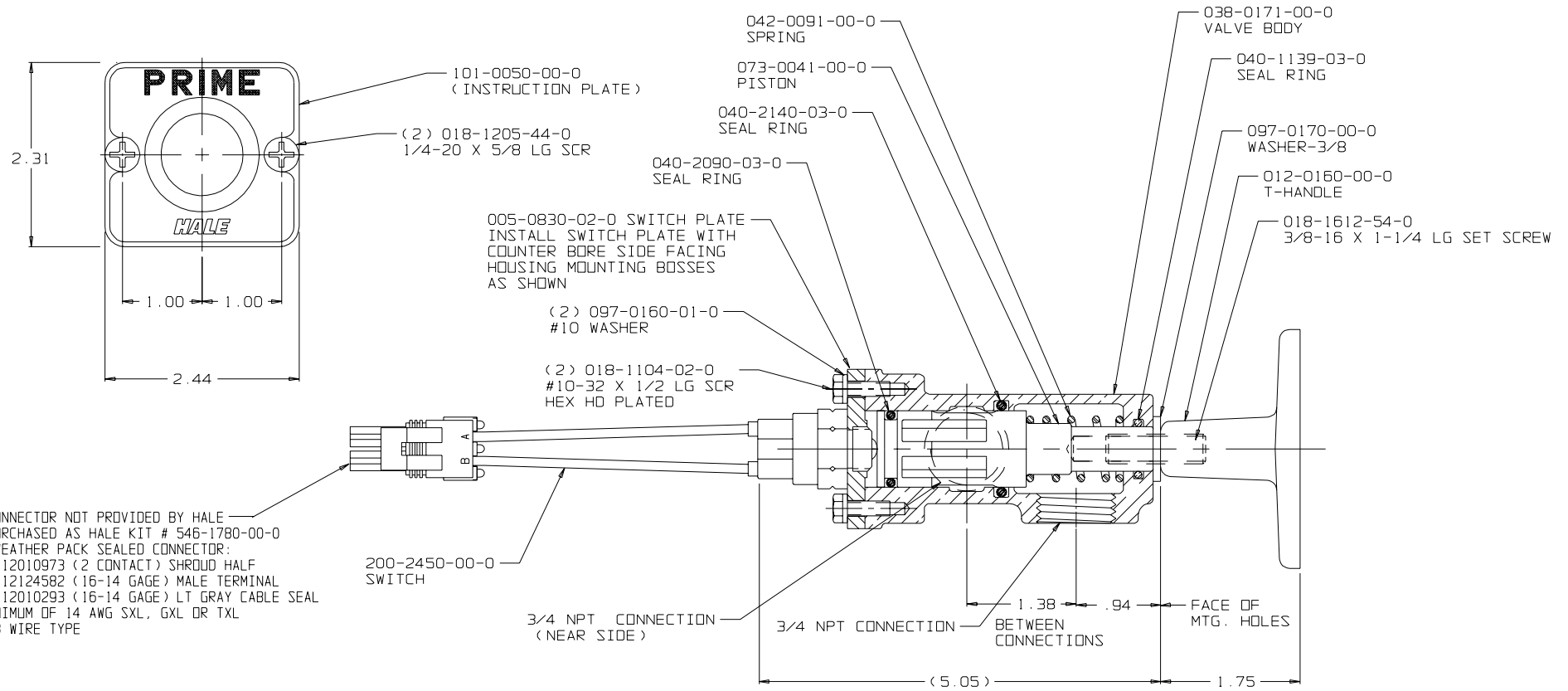
ECD NO	REV	CHANGED FROM	BY	DATE	APVD	ECD NO	REV	CHANGED FROM	BY	DATE	APVD
02-251	G	ADDED TOP VIEW OF SOLENOID AND DIMENSIONS IN MILLIMETER. FIXED GROUND STRAP TO BE ATTACHED TO APPARATUS CHASSIS.	BVP	08-15-02	MAL	01-257	E	UPDATED SOLENOID CONNECTION CALLOUTS	DJK	06-12-01	MAL
0411	H	ADDED DETAIL C AND HOSE	KSM	7-24-06	MAL	01-258	F	(INSTRUCTION NOTE 7) REMOVED. *WHEN THE PRIMING PUMP IS MOUNTED ON THE PUMP GEARBOX*. ADDED: SOLENOID TORQUE SPECS	DJK	06-22-01	MAL
0526	I	REDRAWN AND ADDED SHEET 2	MLJ	2-22-07	MAL						



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 Conshohocken, PA 19428 USA

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HALE TYPE PVG PRIMING VALVE



MATING CONNECTOR NOT PROVIDED BY HALE
CAN BE PURCHASED AS HALE KIT # 546-1780-00-0
PACKERD WEATHER PACK SEALED CONNECTOR:
(1) P/N: 12010973 (2 CONTACT) SHROUD HALF
(2) P/N: 12124582 (16-14 GAGE) MALE TERMINAL
(2) P/N: 12010293 (16-14 GAGE) LT GRAY CABLE SEAL
USE A MINIMUM OF 14 AWG SXL, GXL OR TXL
SAE J1128 WIRE TYPE

PANEL CUTOUT

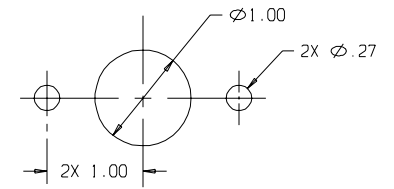


PLATE NO. 480GC

ECD NO	REV	CHANGED FROM	BY	DATE	APVD
01-035	A	REDESIGNED PLATE NO. 480FA	TKC	1-19-01	MAL
01-091	B	CLARIFIED SWITCH PLATE ORIENTATION.	DJK	02-20-01	MAL
03-277	C	ADDED PANEL CUTOUT	JBS	09-03-03	MAL



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DRAWN TKC
CHECKED MAL

DATE 10-6-00

SIZE C SCALE: FULL

538-1580-10-0

HALE TYPE SPV SEMI-AUTOMATIC PRIMING VALVE (WITH UNIVERSAL MOUNTING ADAPTER)

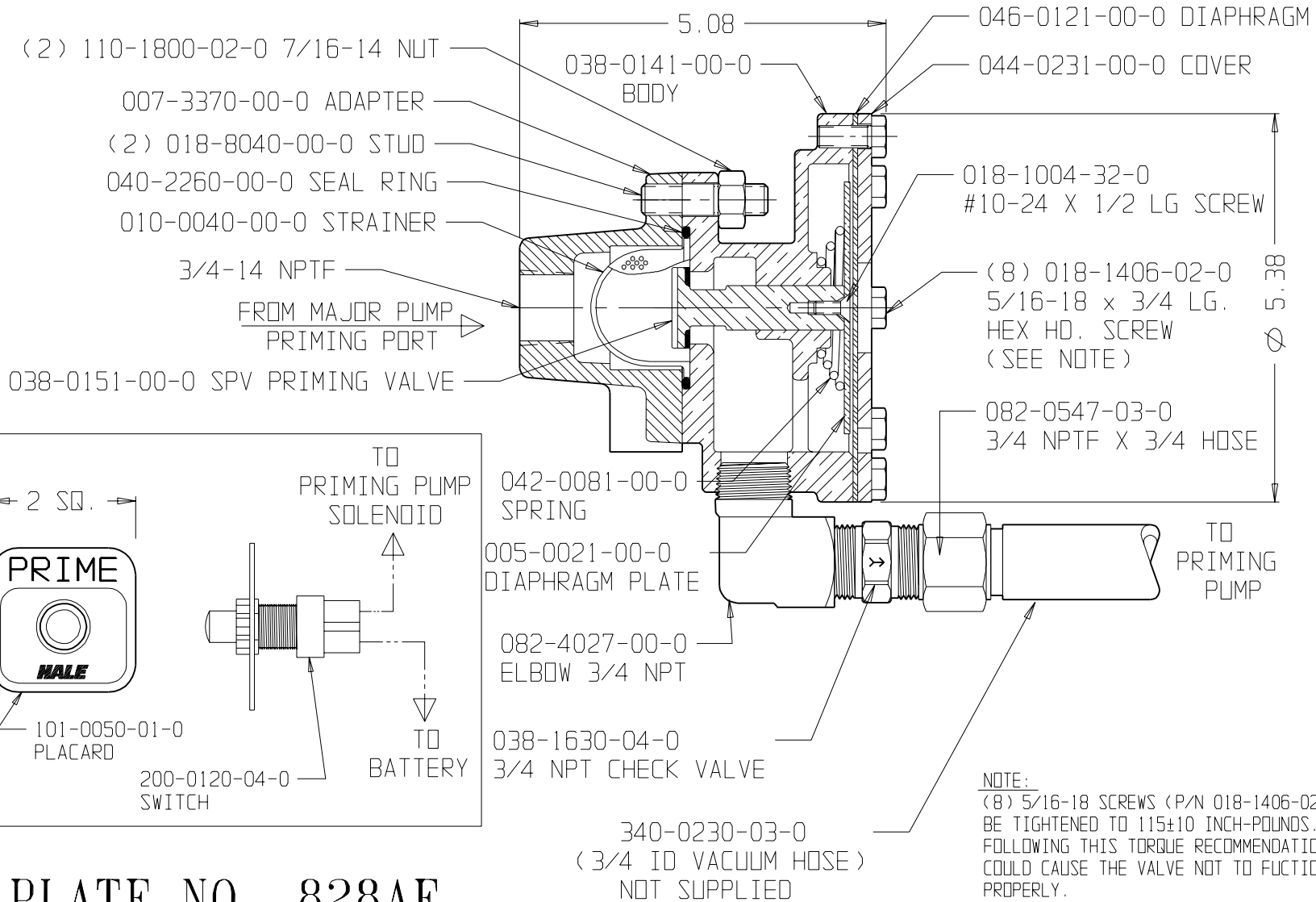


PLATE NO. 828AE

NOTE:
(8) 5/16-18 SCREWS (P/N 018-1406-02-0) SHALL BE TIGHTENED TO 115±10 INCH-POUNDS. NOT FOLLOWING THIS TORQUE RECOMMENDATION COULD CAUSE THE VALVE NOT TO FUNCTION PROPERLY.

ECO NO	REV	CHANGED FROM	BY	DATE	APVD	ECO NO	REV	CHANGED FROM	BY	DATE	APVD
01-177	E	UPDATED W/DESCRIPTIONS	TKC	4-5-01	MAL	95-169	A	RELEASED FOR PRODUCTION	DLM	8-15-95	RET
						96-63	B	B1. ADDED: 82, 082-4027-01-0. B3. 340-0640-00-1	PRW	3-29-96	RET
						00-525	C	DELETED 038-1630-03-0, 082-0501-02-0 & 082-0547-02-0 ADDED 038-1630-04-0 & 082-0547-03-0	JBS	07-14-00	MAL
						00-602	D	ADDED NOTE	JBS	09-20-00	MAL



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NOT TO BE REPRODUCED OR USED TO MAKE OTHER DRAWINGS OR MACHINERY	DRAWN	DLM	DATE 8-15-95	SIZE	SCALE: FULL
CHECKED	RET			C	

HALE TYPE SPV SEMI-AUTOMATIC PRIMING VALVE

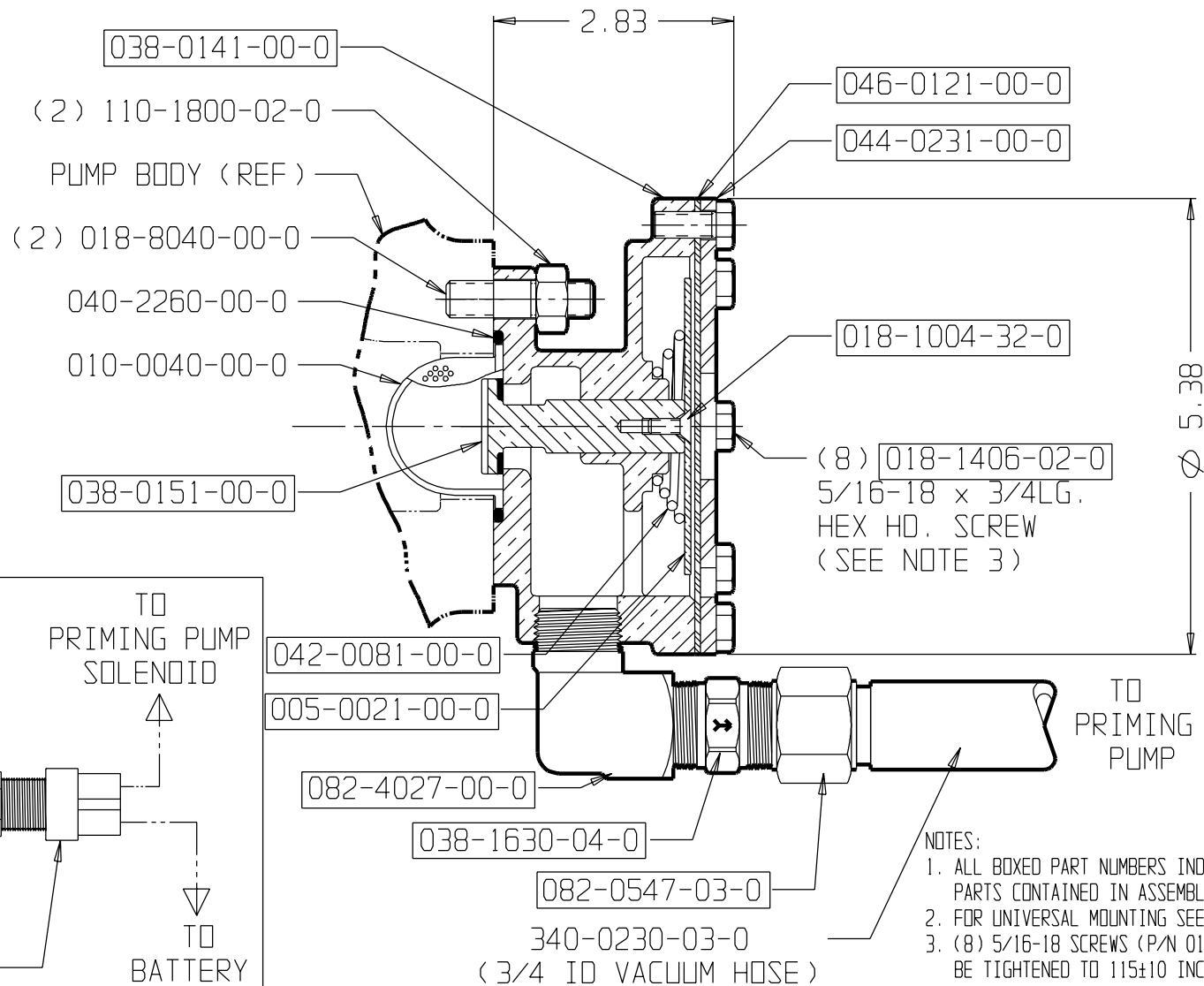


PLATE NO. 819AF

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
95-15	A	RELEASED FOR PRODUCTION	ROT	2-15-95	RET
95-186	B	(2) MOUNTING SCREWS	DLM	8-17-95	RET
96-63	C	C1, ADDED; C2, 082-4027-01-0; C3, 340-0640-00-1	PRW	3-29-96	RET
00-525	D	DELETED 038-1630-03-0, 082-0501-02-0 & 082-0547-02-0 ADDED 038-1630-04-0 & 082-0547-03-0	JBS	7-14-00	MAL
00-575	E	REMOVED P/N 538-1580-00-0	JBS	9-07-00	MAL
00-602	F	ADDED NOTE 3	JBS	09-20-00	MAL



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