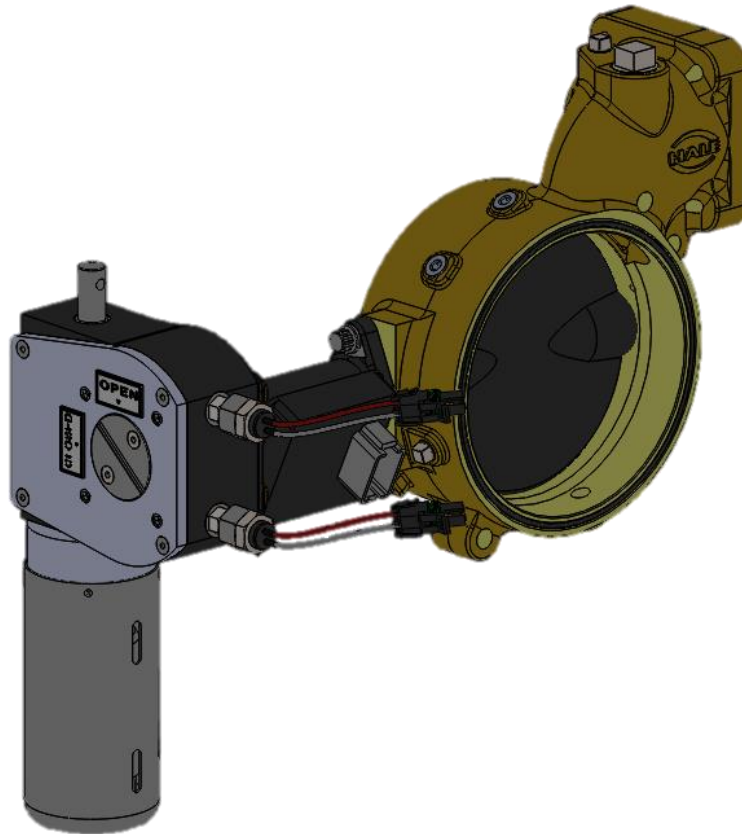




OPERATION INSTALLATION MAINTENANCE MANUAL FOR HALE MASTER INTAKE VALVE (MIV) 2.0



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Revision A

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Revision A	15 MAY 2020	All - Initial Release



Abbreviations And Acronyms

The abbreviations used in this manual (and Appendices) are limited to standard (commonly used and accepted) scientific units of measure and therefore are NOT defined or listed. The acronyms used in this manual (and Appendices) are defined in this listing (in numerical-alphabetical order) and are NOT defined within the text. The names of Hale Products Inc. specific devices are defined in the associated product literature.

ID	Identification
MIV	Master Intake Valve
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturer
OIM	Operation Installation Maintenance
P/N	Part Number
PPE	Personal Protection Equipment
R&R	Removal and Replacement
SAE	Society of American Engineers
SCR	Symptom, Cause, Remedy [Troubleshooting Table(s)]
AHJ	Authority Having Jurisdiction
FAST	Factory Authorized Service Team



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1. SAFETY

This section provides definitions for DANGERS, WARNINGS, CAUTIONS and NOTES contained herein, precautions to be taken for pump repair as well as an alphabetical summary listing of the WARNINGS and CAUTIONS used in this manual.

1.1. Safety Headings

DANGERS, WARNINGS, CAUTIONS, or NOTICES that immediately precede a step apply directly to that step and all sub steps. DANGERS, WARNINGS, CAUTIONS, or NOTICES that precede an entire procedure apply to the entire procedure. DANGERS, WARNINGS, CAUTIONS, and NOTICES consist of two parts: A heading (that identifies possible result if disregarded) and a statement of the hazard (that provides the minimum precautions). NOTES are used to highlight operating or maintenance procedures, practices, conditions or statements that are not essential to protection of personnel or equipment. NOTES may precede or follow the step or procedure, depending upon the information and how it pertains to the procedure/step. The headings used and their definitions are.

ATTENTION ▲ DANGER

INDICATES A HAZARDOUS SITUATION, WHICH IF NOT AVOIDED WILL RESULT IN SERIOUS INJURY OR DEATH.

ATTENTION ▲ WARNING

INDICATES A HAZARDOUS SITUATION, WHICH IF NOT AVOIDED COULD RESULT IN SERIOUS INJURY OR DEATH.

ATTENTION ▲ CAUTION

INDICATES A POTENTIALLY HAZARDOUS SITUATION, WHICH IF NOT AVOIDED MAY RESULT IN MINOR OR MODERATE INJURY.

IMPORTANT ▲ NOTICE

ADDRESSES PRACTICES NOT RELATED TO PERSONAL INJURY.

NOTE

Highlights an essential aspect of an operating or maintenance procedure, condition, or statement and/or provides pertinent ancillary information.

1.2. Safety Summary

The following warnings and cautions are used throughout the Hale MIV manuals (and/or the items they reference) and are provided here as a safety summary.

IMPORTANT ▲ NOTICE

BEFORE ATTEMPTING INSTALLATION OR OPERATION OF THE HALE MIV READ AND FOLLOW ALL SAFETY PRECAUTIONS LISTED BELOW. THE WARNINGS AND CAUTIONS LISTED ARE NECESSARY FOR THE SAFE INSTALLATION AND OPERATION OF THE HALE MIV. WHEN DEVELOPING DEPARTMENTAL APPARATUS OPERATION PROCEDURES MAKE SURE THE WARNINGS AND CAUTIONS ARE INCORPORATED AS WRITTEN.

ATTENTION ▲ DANGER

ALL ELECTRICAL SYSTEMS HAVE THE POTENTIAL TO CAUSE SPARKS DURING SERVICE, INSTALLATION OR REPAIR. TAKE CARE TO ELIMINATE EXPLOSIVE OR HAZARDOUS ENVIRONMENTS DURING SERVICE AND/OR REPAIR.

ATTENTION ⚠ WARNING

A PRESSURE HAZARD MAY EXIST EVEN WHEN THE PUMP IS NOT RUNNING. PRIOR TO REMOVING HOSES OR CAPS FROM PUMP CONNECTIONS, RELIEVE PRESSURE BY OPENING DRAINS. BLEEDER VALVES SHOULD ALSO BE USED WHEN CONNECTING TO AN INTAKE FROM A PRESSURIZED SOURCE.

ATTENTION ⚠ WARNING

ALWAYS FOLLOW LOCAL GUIDELINES FROM THE AHJ AND THE APPARATUS MANUFACTURER.

ATTENTION ⚠ WARNING

ALWAYS FOLLOW PROPER OPERATING PROCEDURES. THE PUMP OPERATOR MUST BE FAMILIAR WITH THE PUMP OPERATING INSTRUCTIONS AS WELL AS OTHER OPERATING GUIDELINES FOR THE APPARATUS AND ACCESSORIES.

ATTENTION ⚠ WARNING

ALWAYS STOP THE ENGINE, SET THE PARKING BRAKE, AND CHOCK THE WHEELS BEFORE GOING UNDER THE TRUCK FOR ANY REASON.

ATTENTION ⚠ WARNING

AVOID CONTACT WITH HOT SURFACES. THE PACKING GLAND AND PUMP BODY MAY PRESENT A TEMPERATURE HAZARD. OVERHEATING MAY RESULT IN A SCALDING WATER HAZARD.

ATTENTION ⚠ WARNING

DO NOT EXCEED OPERATING PRESSURE LIMITS OF PUMP, INSTALLED PLUMBING, HOSE(S), OR EQUIPMENT IN USE.

HOSE FAILURE CAN RESULT IF A HOSE IS EXPOSED TO EXCESSIVE PRESSURE.

ATTENTION ⚠ WARNING

OPERATORS, INSTALLERS, AND MAINTENANCE PERSONNEL MUST BE TRAINED AND QUALIFIED FOR ALL THE ACTIVITIES THEY PERFORM.

ATTENTION ⚠ WARNING

THE OUTLET OF THE RELIEF VALVE CAN FLOW LARGE VOLUMES OF WATER UNDER PRESSURE. THEREFORE, THE DISCHARGE MUST BE PIPED IN A MANNER THAT WILL NOT EXPOSE PERSONNEL TO HIGH PRESSURE WATER STREAMS.

ATTENTION ⚠ WARNING

THE SUCTION OF EACH RECEIVING PUMPER USING LARGE DIAMETER HOSE SHALL BE EQUIPPED WITH A RELIEF VALVE WITH A MAXIMUM PRESSURE SETTING OF NOT MORE THAN 10 PSI (0.7 BAR) OVER THE STATIC PRESSURE OF THE WATER SOURCE TO WHICH IT IS CONNECTED OR NOT MORE THAN 10 PSI (0.7 BAR) OVER THE DISCHARGE PRESSURE OF A SUPPLY PUMPER IN RELAY. IN NO EVENT WILL THE INTAKE RELIEF VALVE PRESSURE SETTING EXCEED THE WORKING PRESSURE OF THE HOSE BEING USED.

ATTENTION ⚠ WARNING

THE PROCEDURES IN THIS SECTION PROVIDE ONLY GENERAL AND MINIMAL INSTRUCTION. DO NOT REPLACE LOCAL PROCEDURES OR POLICIES OR RECOMMENDATIONS AND PROCEDURES PROVIDED IN THE APPARATUS/TRUCK/UNIT MANUAL WITH THESE PROCEDURES.

THE PROCEDURES IN THIS SECTION ARE GENERAL OPERATING PROCEDURES BASED ONLY ON HALE EQUIPMENT. NOT ALL PROCEDURES IN THIS SECTION MAY APPLY TO YOUR SPECIFIC OPERATIONAL REQUIREMENTS OR APPARATUS CONFIGURATION. REFER TO ONLY THE INFORMATION/PROCEDURES WHICH APPLY TO YOUR OPERATIONAL REQUIREMENTS AND ONLY WHEN LOCAL PROCEDURES, POLICIES, OR GUIDELINES ESTABLISHED BY THE AHJ DO NOT EXIST.

ALWAYS REFER TO THE PROCEDURES PROVIDED BY THE AHJ FOR SETTING WHEEL CHOCKS AS WELL AS LAYOUT AND CONNECTION OF HOSES, VALVES AND DRAINS.

ATTENTION ⚠ WARNING

PER NFPA 1962 REQUIREMENTS, LARGE DIAMETER HOSE MARKED "SUPPLY HOSE" SHALL NOT BE USED AT OPERATING PRESSURES EXCEEDING 185 PSI (13 BAR).

ATTENTION ⚠ WARNING

NEVER SET INTAKE RELIEF VALVE ABOVE HOSE MANUFACTURERS RATED PRESSURE. ALWAYS USE THE LOWEST POSSIBLE RELIEF VALVE SETTING TO ENHANCE OPERATOR AND EQUIPMENT SAFETY.

ATTENTION ⚠ WARNING

PER NFPA 1962 REQUIREMENTS, LARGE DIAMETER HOSE USED TO SUPPLY A PUMPER FROM A HYDRANT, OR ANOTHER PUMPER SHALL BE CONNECTED TO THE PUMPER(S) AND HYDRANT WITH A SLIGHT DOWNWARD BEND TO AVOID KINKING WHEN THE WATER IS TURNED ON.

ATTENTION ⚠ WARNING

LARGE DIAMETER HOSE PRESENTS A TRIPPING HAZARD. USE CARE WHEN WORKING AROUND HOSE WHEN IN USE.

ATTENTION ⚠ WARNING

MALE THREADS ON RELIEF VALVE OUTLET ARE SHARP AND CAN CAUSE SEVERE CUTS. BE CAREFUL WHEN WORKING AROUND THE EXPOSED THREADS ON THE RELIEF VALVE OUTLET.

ATTENTION ⚠ WARNING

THE RELIEF VALVE SPRING IS UNDER PRESSURE AND CAN CAUSE A PROJECTILE HAZARD. WHEN DISASSEMBLING THE RELIEF VALVE, BACK RELIEF VALVE ADJUSTMENT SCREW OUT TO LOWEST SETTING TO RELIEVE PRESSURE ON SPRING BEFORE REMOVING RELIEF VALVE HOUSING SCREWS.

ATTENTION ⚠ WARNING

PER NFPA 1901, USE TUBING RATED AT THE MAXIMUM DISCHARGE PRESSURE OF THE FIRE PUMP, 500 PSI (34 BAR) MINIMUM.

ATTENTION ▲ WARNING

WHEN INITIALLY CHARGING LARGE DIAMETER HOSE EXCESSIVE AIR WILL BE PRESENT IN THE HOSE. THIS AIR MUST BE BLED OFF WHILE THE HOSE IS CHARGING AND PRIOR TO OPENING THE HALE MIV TO PREVENT RECEIVING PUMP CAVITATION AND POSSIBLE LOSS OF PRIME.

ATTENTION ▲ WARNING

WHEN THE ELECTRIC MOTOR DRIVEN VALVE IS OPERATED THE MANUAL OVERRIDE HANDWHEEL WILL TURN. KEEP HANDS, FEET OR LOOSE CLOTHING AWAY FROM THE HANDWHEEL TO PREVENT ENTANGLEMENT.

ATTENTION ▲ WARNING

KEEP HANDS AND ARMS CLEAR OF THE VALVE DISC WHEN VALVE IS BEING OPERATED WITHOUT SUCTION TUBE STRAINER OR SUCTION TUBE IN PLACE.

ATTENTION ▲ WARNING

THE HALE MIV IS SHIPPED WITH A PLASTIC PLUG IN THE OUTBOARD CONNECTION PORT. DURING INSTALLATION OF THE HALE MIV THE PLUG MUST BE REMOVED AND AN AIR BLEEDER CONTROL VALVE, CONTROLLABLE AT THE PUMP OPERATOR POSITION, MUST BE INSTALLED.

ATTENTION ▲ WARNING

IF HALE AIR BLEEDER VALVE (ABV) ASSEMBLY IS NOT INSTALLED, A WARNING PLACARD MUST BE MOUNTED ON THE OPERATOR PANEL NEXT TO THE AIR BLEEDER CONTROL STATING: "WARNING: ALL AIR MUST BE BLED FROM INTAKE HOSE PRIOR TO OPENING MIV VALVE."

ATTENTION ▲ CAUTION

TO PREVENT DAMAGE TO THE AIR BLEED VALVE BODY HOLD THE HEX OUTLET ON THE VALVE WITH A WRENCH WHILE TIGHTENING ELBOW.

ATTENTION ▲ CAUTION

ELECTRIC MOTOR AND WIRING ARE PROTECTED BY THE MIV CONTROL MODULE. DO NOT REMOVE OR BYPASS THE MIV CONTROL MODULE AS SEVERE DAMAGE TO THE ELECTRIC MOTOR OR APPARATUS WIRING COULD RESULT DURING A MOTOR STALL CONDITION.

ATTENTION ▲ CAUTION

THE HALE MIV IS DESIGNED FOR OPERATION ON 12 VOLT DC NEGATIVE GROUND ELECTRICAL SYSTEMS ONLY.

ATTENTION ▲ CAUTION

FOLLOW NFPA REQUIREMENTS FOR APPARATUS ELECTRICAL WIRING. USE MINIMUM 14 AWG, TYPE SXL OR GXL (SAE J1128) WIRE. THE WIRING SHALL BE PROTECTED USING 289°F (143 C) MINIMUM FLAME RETARDANT, MOISTURE RESISTANT LOOM OR BRAID.

ATTENTION ▲ CAUTION

THE STEM ON THE TOP OF THE VALVE DISC EXTENDS APPROXIMATELY 1-½ INCHES INTO THE OPERATOR ASSEMBLY. THE BOTTOM OF THE VALVE DISC MUST BE REMOVED FIRST.



IMPORTANT ▲ NOTICE

AHJ MUST ENSURE PROPER TRAINING IS IN PLACE FOR ALL OPERATORS. THIS QUICK START GUIDE DOES NOT REPLACE OR SUPERSEDE THE OPERATION INSTALLATION MAINTENANCE MANUAL OR PROPER TRAINING.

1.3. PPE

The following is the minimum PPE required when performing maintenance.

- Safety Glasses
- Work Shoes (Steel Toe)
- Safety Gloves
 - General Protection
- Ear Protection
 - Single Use
 - Earmuffs



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2. INTRODUCTION

This section provides an overview of the Hale Master Intake Valve (MIV) currently in production. Additionally, the section provides information about How to Use This Manual and the Principles Of Operation for the Master Intake Valve.

2.1. Overview

The Hale Master Intake Valve is a NFPA compliant large diameter intake valve that is mounted in the pump suction tube behind the pump operator panel. The valve is a butterfly type valve that is available either in manual or electric operation. Safety features on the valve include an integral relief valve and air bleeder valve tap that vent to the atmosphere. The valve assembly, less relief valve, is factory tested to 600 PSI (41 Bar).

The Hale Master Intake Valve has a 6.4 inch (163 mm) diameter bore with a butterfly disc designed to provide minimum flow restriction when the valve is open. The unique design of the valve and butterfly permits the valve to provide full water flow up to 1500 GPM (5678 LPM) from draft through a single 6 inch NST suction hose when mounted on Hale pumps directly to the main suction inlet under all standard operating conditions. Due to the design of the valve, there is minimum friction loss and pressure drop across the valve.

When the valve is ordered as part of a Hale Midship fire pump, the pump will pass UL requirements up to 1500 GPM (5678 LPM) from draft through a single 6 inch NST suction hose with the valve in place. When two valves are mounted to the fire pump the pump can achieve UL flows up to 2000 GPM (7570 LPM) from draft through dual 6 inch NST suction hoses. The disc design also permits easy maintenance and lubrication of the valve disc. The disc is coated with nitrile rubber material that is compatible with most chemicals in use on the fire ground.

The valve is available configured for manual operation using a panel mounted handwheel (MIV-M) or for electric operation using a panel mounted switch (MIV-E) for remote control operation. Whether the manual or electric operated valve is installed, lights on the panel placard will illuminate to indicate if the valve is open, closed or traversing from one position to the other.

Also provided with the electric valve is a manual override handwheel that permits valve operation from outside the operator panel. No special tools or part removal is required.

The valve gear actuator, manual or electric, is designed to move the valve disc from the fully closed to full open position using 10 turns of the handwheel. The electric operated valve will cycle from the fully closed to full open position in no less than 3 seconds therefore meeting NFPA requirements. The matched gear set is designed to permit operation with minimal torque even at high flows and pressures. The design of the gear actuator also permits the valve to be placed into a partially open position if it is necessary to gate the intake flow.

Master Intake Valves are provided with a $\frac{3}{4}$ inch NPT suction hose priming port. This port is located near the relief valve mounting flange on the valve body. During pump operations when an MIV is installed on the main pump suction it may be desirable to pre-prime the suction hose so firefighting capabilities are not lost when switching from tank to draft operations.

Since the valve mounts behind the operator panel, between the suction tube extension and the suction tube, or in-line for front and rear suction piping, there is less panel clutter, obstruction of valve handles or chance for damage to the valve body due to overhang beyond the apparatus running board.

The surface between the mounting flanges and Hale MIV valve body are sealed using reliable O-ring seals in grooves machined in the Hale MIV body.

Design of the relief valve permits the discharge to be piped behind the operator panel for increased operator and/or bystander safety.

2.2. Installation

The unique design of the Hale Master Intake Valve permits installation in the fire pump suction tube behind the pump compartment panel using a minimum of space. The valve body is only 3-3/8 inches (86 mm) wide and various suction tube options are available to fit most standard pump compartment widths. (Refer to Hale Bulletin 596 for various suction tube options.)

The side mounted valve is installed behind the pump compartment panel between the suction tube and suction tube extension (Figures 1 and 2). The design of the relief valve mounting flange permits rotation of the relief valve to redirect the outlet of the relief valve as necessary as well as remote mounting. There are 2-1/2 inch female NPT threads machined into the relief valve mounting flange of the MIV valve to permit remote mounting of the relief valve.

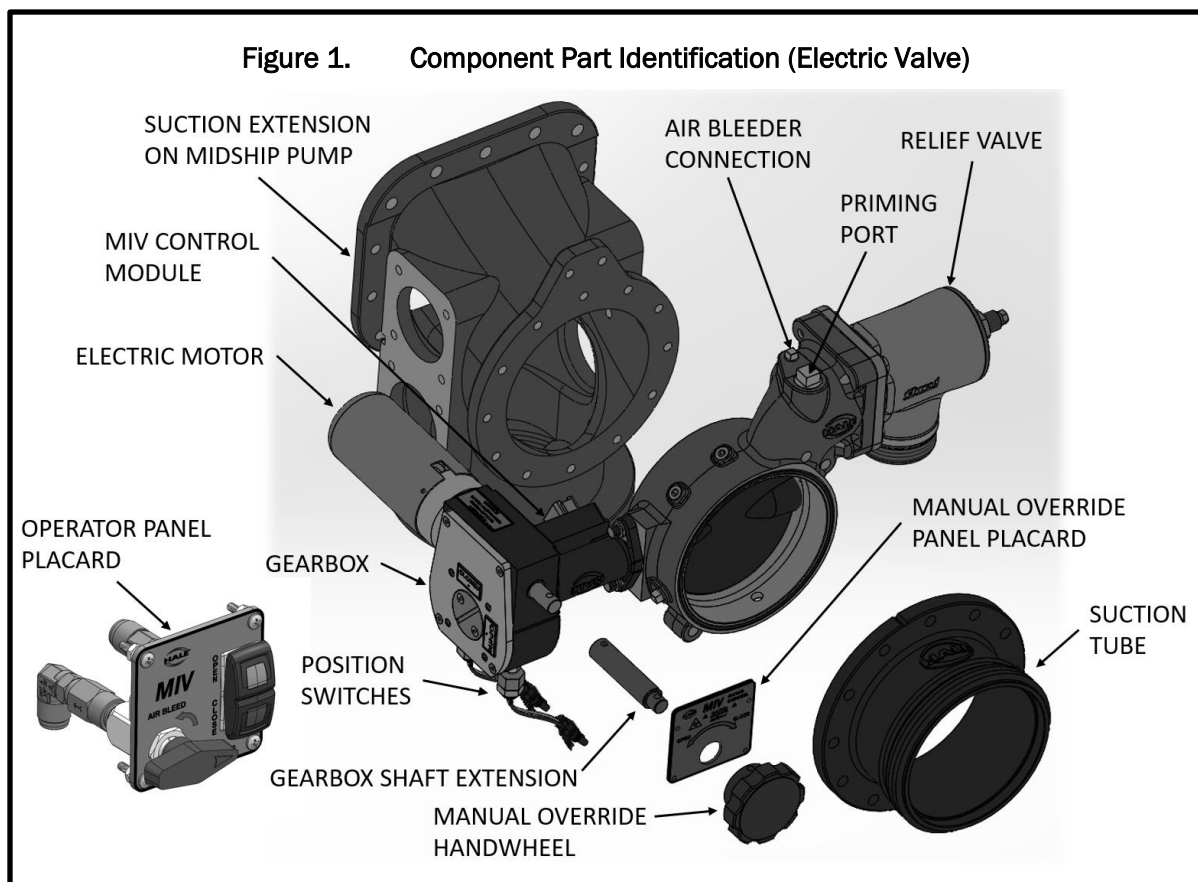
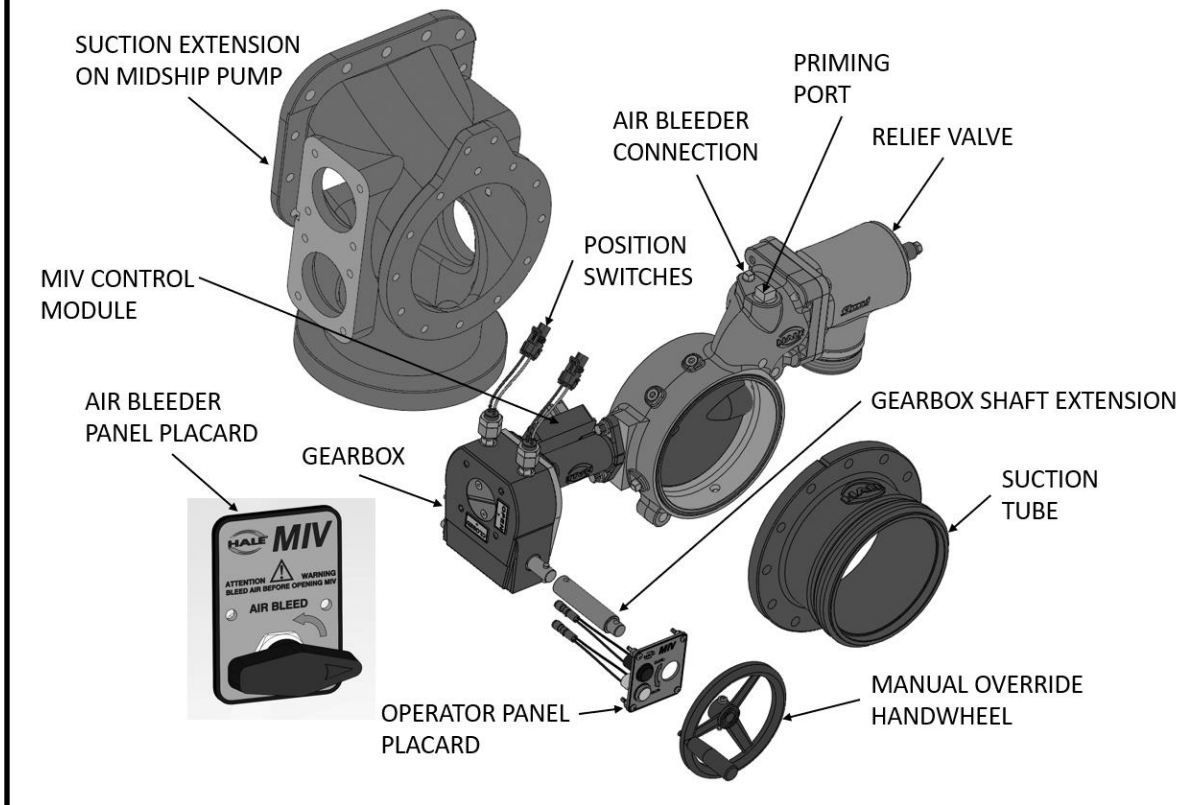


Figure 2. Component Part Identification (Manual Valve)



Bottom mounted valves are installed to bottom of the suction tube extension for use with front and/or rear suctions (Figure 4).

The valve may also be installed in-line or it may be used with large auxiliary pumps. Optional Hale 6-inch NPT threaded flanges are available for use in these installations.

Whether installing the valve during new construction or installing the valve as a retrofit proper planning and equipment layout will ensure smooth installation. The Hale MIV has been designed to mount onto a Hale midship pump without interference to other suction and discharge connections on the pump. The plate drawing, FSG-PL-01491, provides the overall mounting dimensions for various configurations of the Hale MIV.

When ordered as part of a new midship fire pump the valve will be pre-installed on the fire pump and tested at the factory per NFPA requirements. When installing the midship pump on the apparatus it will be necessary to install the relief valve discharge piping, air bleeder, suction hose priming and drain valve (steps 2.2.3 through 2.2.9 in this section).

2.2.1 Mounting of Side Suction Valves

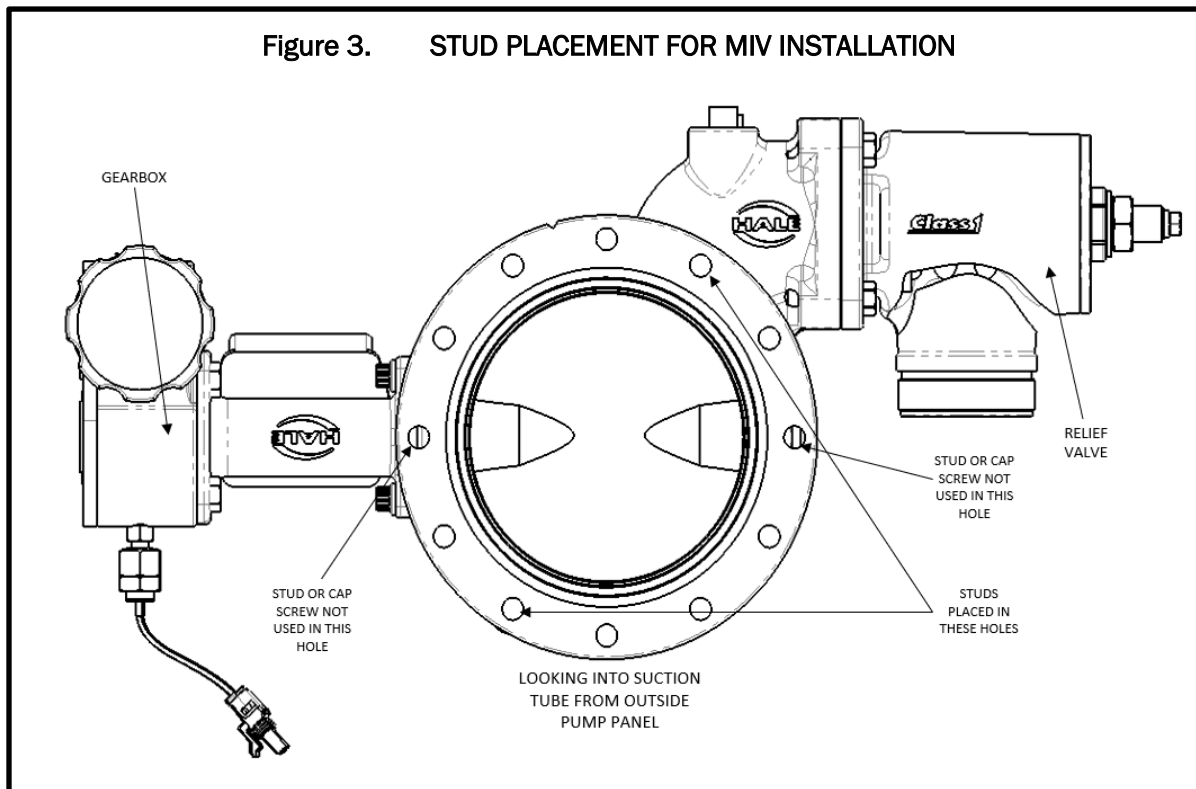
NOTE

WHEN INSTALLING THE HALE MIV AS A RETROFIT IT IS HIGHLY RECOMMENDED THAT THE STANDARD SUCTION EXTENSION BE REPLACED WITH THE HALE P/N 178-0063-00-0 SUCTION EXTENSION. THIS IS ESPECIALLY IMPORTANT ON APPARATUS WITH PANEL WIDTHS OF 70, 72 AND 74 INCHES TO MINIMIZE PANEL MODIFICATION REQUIRED. REFER TO MIV PARTS MANUAL, FSG-MNL-00218, FOR MOUNTING DIMENSION DRAWINGS FOR ASSISTANCE IN PLANNING RETROFIT INSTALLATIONS.

1. Determine the location of interferences on the fire pump and the pump operator panel. Proper planning and layout of the pump operator panel will reduce the potential interferences for other operating equipment. The plate drawing, FSG-PL-01491, provides the overall mounting dimensions for the Hale MIV.
2. Remove the cap screws that hold the suction tube to the suction tube extension. Remove the suction tube from the pump. Be sure to remove all old gasket or sealing material from the suction tube extension and suction tube mating surfaces.

NOTE

USE ONLY 7/16-14 UNC X 4-3/4 INCHES LONG GRADE 8 ZINC PLATED STEEL CAP SCREWS, 7/16-14 UNC X 5-1/4 INCHES LONG GRADE 8 ZINC PLATED STEEL STUDS AND 7/16-14 UNC ZINC PLATED STEEL NUTS TO INSTALL THE MASTER INTAKE VALVE AND SUCTION TUBE TO THE SUCTION TUBE EXTENSION.



NOTE

ALL CAP SCREWS, STUDS AND NUTS MUST BE LOCKED IN PLACE USING LOCTITE® #242 OR EQUAL THREAD SEALING COMPOUND.

NOTE

WHEN THE VALVE BODY IS INSTALLED MAKE SURE THE VALVE DISC IS NEXT TO THE SUCTION TUBE EXTENSION. THE RELIEF VALVE, DRAIN VALVE, AIR BLEEDER VALVE AND PRIMING VALVE MUST BE LOCATED ON THE INLET SIDE OF THE VALVE.



3. Apply a coating of Loctite® #243 or equal thread locking compound and install the 7/16-14 UNC X 5-1/4 inch long studs into two holes of the suction tube extension. Torque the studs to 40 lb-ft (54 N-m). These studs are used to support the valve and suction tube during installation. The studs are installed in the holes located at the 1 o'clock and 7 o'clock position on the suction tube extension. (See figure 3)
4. Make sure the O-ring seals are seated in the grooves on the valve body and coat all sealing surfaces with a light coat of general-purpose grease.
5. Install the valve body and suction tube over the studs taking care not to damage the threads on the studs. Apply a coat of Loctite® #243 or equal thread locking compound and insert the (8) 7/16 -14 UNC x 4-3/4 inch long grade 8 zinc plated steel cap screws through the holes in the suction tube and thread into the holes on the suction tube extension. DO NOT tighten the cap screws until all threads are started. Apply Loctite® #243 or equal to the threads on the studs and install the 7/16-14 UNC grade 8 zinc plated steel nuts on the studs.

NOTE

WHEN INSTALLING THE HALE MASTER INTAKE VALVE 8 SUCTION TUBE CAP SCREWS, 2 STUDS AND 2 NUTS WILL BE USED. CAP SCREWS CANNOT BE INSERTED WHERE THE GEARBOX ADAPTER (9 O'CLOCK POSITION) AND TRUNNION (3 O'CLOCK POSITION) ARE LOCATED. SEE FIGURE 3.

6. Tighten all suction tube cap screws and nuts. Torque to 40 lb-ft (54 N-m) using a cross pattern.

2.2.2 Mounting of Bottom (Front/Rear) Suction Valves

The Hale MIV-E can be mounted to the bottom opening of Hale suction tube extension P/N 178-0063-01-0 for use in front and/or rear suction. The bottom opening of this extension is machined to accept Hale 2417 series 12 bolt flanges. A special 6 inch NPT threaded flange Hale P/N 115-0441-00-0 must be used when mounting the Hale MIV-E on the bottom opening of this suction tube extension. Ordinary flanges will not provide proper clearance for the valve disc.

When installing the Hale MIV-E in front or rear suction piping do the following:

1. Determine the location of interference on the fire pump and the pump operator panel. Proper planning and layout of the pump operator panel will reduce the potential interference with other operating equipment. Refer to the current revision of Plate FSG-PL-01491, for the overall mounting dimensions for the Hale MIV.

NOTE

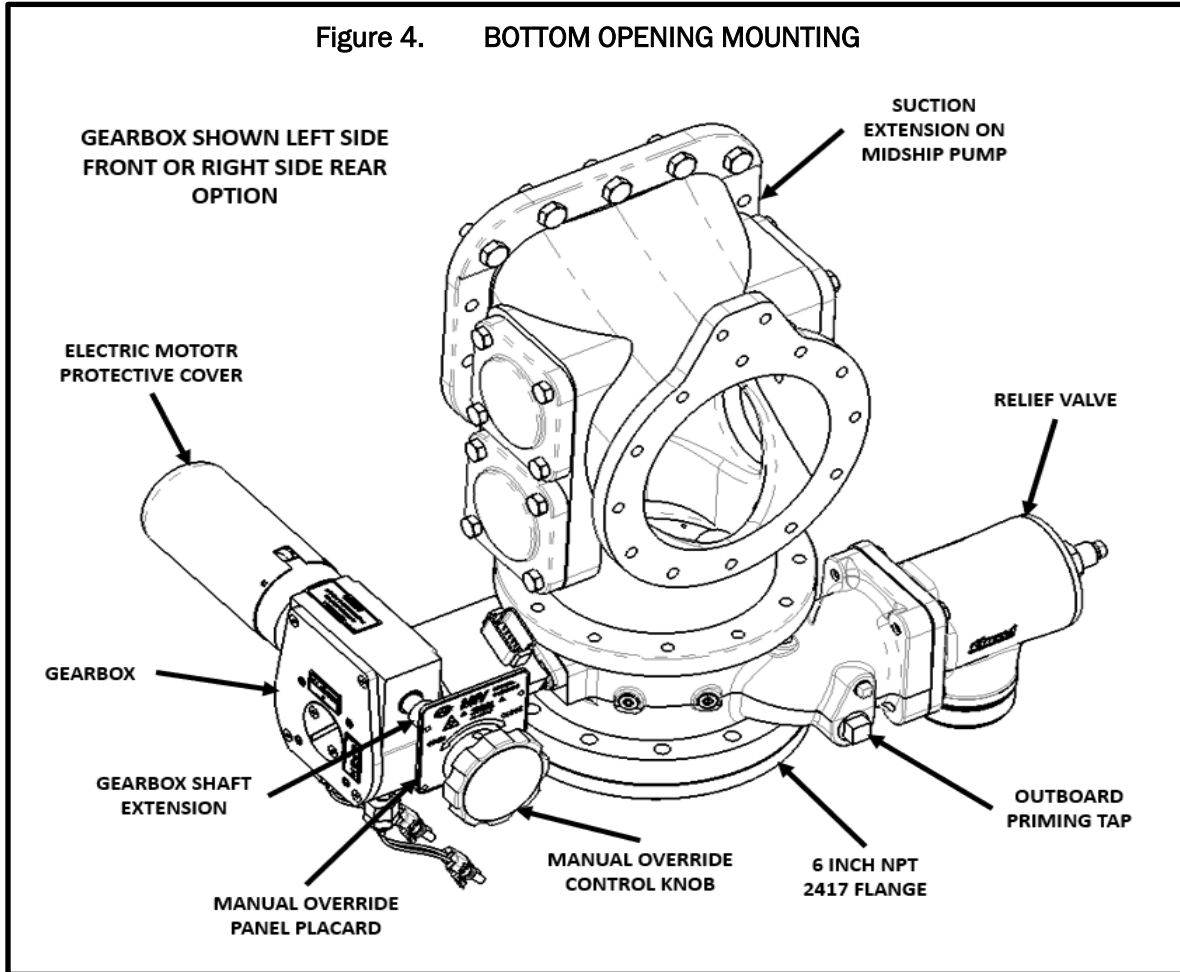
USE ONLY 7/16-14 UNC X 5-3/4 INCH LONG GRADE 5 ZINC PLATED STEEL CAP SCREWS, 7/16-14 UNC X 6-1/4 INCH LONG GRADE 8 ZINC PLATED STEEL STUDS AND 7/16-14 UNC ZINC PLATED STEEL NUTS TO INSTALL THE MASTER INTAKE VALVE AND FLANGE TO THE SUCTION TUBE EXTENSION.

NOTE

ALL CAP SCREWS, STUDS AND NUTS MUST BE LOCKED IN PLACE USING LOCTITE® #242 OR EQUAL THREAD SEALING COMPOUND.

NOTE

WHEN THE VALVE BODY IS INSTALLED MAKE SURE THE VALVE DISC IS NEXT TO THE SUCTION TUBE EXTENSION. THE RELIEF VALVE, DRAIN VALVE, AIR BLEEDER VALVE AND PRIMING VALVE MUST BE LOCATED ON THE INLET SIDE OF THE VALVE.



2. If necessary, the gearbox may be rotated for proper installation. Refer to Part J of this section for instructions on how to rotate gearbox.
3. Coat the threads on one end of two 7/16-14 x 6-1/4 inch long grade 8 studs with Loctite® #243 or equal and insert into threaded holes on bottom of suction tube extension. Torque studs to 40 ft-lb (54 N-m). The studs are installed in holes located at the 1 o'clock and 7 o'clock positions, when viewed from below, on the suction tube extension. See figure 3.
4. Orient valve so the relief valve and gearbox are located as shown in figure 4.
5. Make sure the O-ring seals are seated in the grooves on the valve body and coat all sealing surfaces with a light coat of general-purpose grease.
6. Carefully slide the valve and flange over the studs making sure the studs align with the holes in the valve body.
7. Apply Loctite® #243 or equal to threads on the studs and install two 7/16-14 nuts.

8. Coat the threads of eight 7/16-14 x 5-3/4 inch long grade 8 cap screws with Loctite® #242 or equal and insert through holes in the flange and thread into bottom opening of suction tube extension. Torque cap screws and nuts to 40 ft-lb (54 N-m).

2.2.3 Plumbing Relief Valve

ATTENTION ⚠ WARNING

MALE THREADS ON RELIEF VALVE OUTLET ARE SHARP AND CAN CAUSE SEVERE CUTS. BE CAREFUL WHEN WORKING AROUND THE EXPOSED THREADS ON THE RELIEF VALVE OUTLET.

ATTENTION ⚠ WARNING

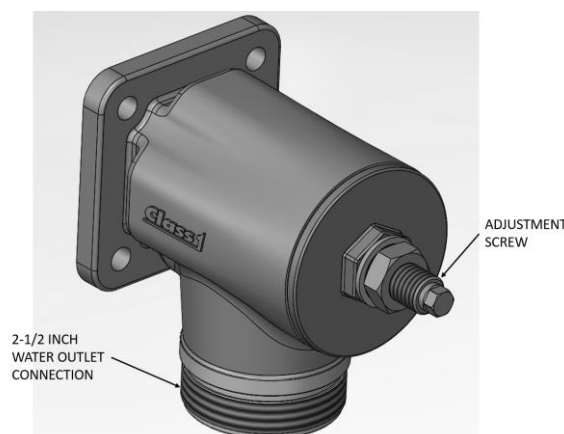
THE OUTLET OF THE RELIEF VALVE CAN FLOW LARGE VOLUMES OF WATER UNDER PRESSURE. THEREFORE, THE DISCHARGE MUST BE PIPED IN A MANNER THAT WILL NOT EXPOSE PERSONNEL TO HIGH PRESSURE WATER STREAMS.

NOTE

THE RELIEF VALVE IS ATTACHED TO THE HALE MIV WHEN SHIPPED FROM THE FACTORY. APPARATUS CONFIGURATION MAY REQUIRE THAT THE RELIEF VALVE BE MOUNTED IN A REMOTE LOCATION. STEP 1 BELOW PROVIDES PROCEDURES FOR MOUNTING RELIEF VALVE IN A REMOTE LOCATION.

1. To Mount the relief valve in a remote location do the following:
 - a. Remove the four 7/16-14 UNC X 1-1/4 inch long hex head cap screws that secure the relief valve to the mounting pad on the Hale MIV body.
 - b. The relief valve mounting pad on the Hale MIV valve body has 2-1/2 inch NPT female threads, install a 2-1/2 inch NPT threaded pipe nipple into the mounting pad or a use a Hale type 115 flange.
 - c. Install a 2-1/2 inch NPT Hale type 115 4-3/8 inch bolt circle flange onto the opposite side of the pipe nipple.
 - d. Making sure the relief valve discharge is pointing down and away from the operator position, attach the relief valve adapter and relief valve to the Hale 115 flange using a gasket, four 7/16-14 UNC X 2-1/2 inch long grade 8 zinc plated steel hex head cap screws, Loctite® #242 and four 7/16-14 UNC zinc plated steel nuts. Torque the cap screws and nuts to 40 lb- ft (54 N-m).

Figure 5. Relief Valve



2. Use appropriate hose or pipe on the 2-½ inch NPT outlet of the relief valve to direct the discharge of the relief valve away from the operator position. DO NOT restrict the flow of water through this pipe. Make sure the pipe is properly supported to withstand the potential force of water that can flow from the relief valve.

2.2.4 Suction Hose Water Drain

NOTE

ON BOTTOM MOUNT VALVES THE DRAIN CONNECTION ON THE VALVE IS NOT USED. REMOVE THE PLASTIC SHIPPING PLUG AND INSTALL A ¼ INCH NPT PIPE PLUG.

NOTE

COAT ALL PIPE THREADS WITH A SUITABLE SEALANT BEFORE CONNECTIONS ARE MADE.

1. Remove the plastic plug from the ¼ inch NPT water drain connection on the bottom of the valve body.
2. Install a ¼ inch NPT x 3/8 inch tube compression or push on hose fitting into drain hole.
3. Using 3/8 inch OD tubing rated at maximum pressure of fire pump (500 PSI (34 BAR) minimum) connect to an individual drain valve located on the pump operator panel.

2.2.5 Air Bleeder Valve

ATTENTION ⚠ WARNING

THE HALE MIV IS SHIPPED WITH A PLASTIC PLUG IN THE OUTBOARD CONNECTION PORT. DURING INSTALLATION OF THE HALE MIV THE PLUG MUST BE REMOVED AND AN AIR BLEEDER CONTROL VALVE, CONTROLLABLE AT THE PUMP OPERATOR POSITION, MUST BE INSTALLED.

ATTENTION ⚠ WARNING

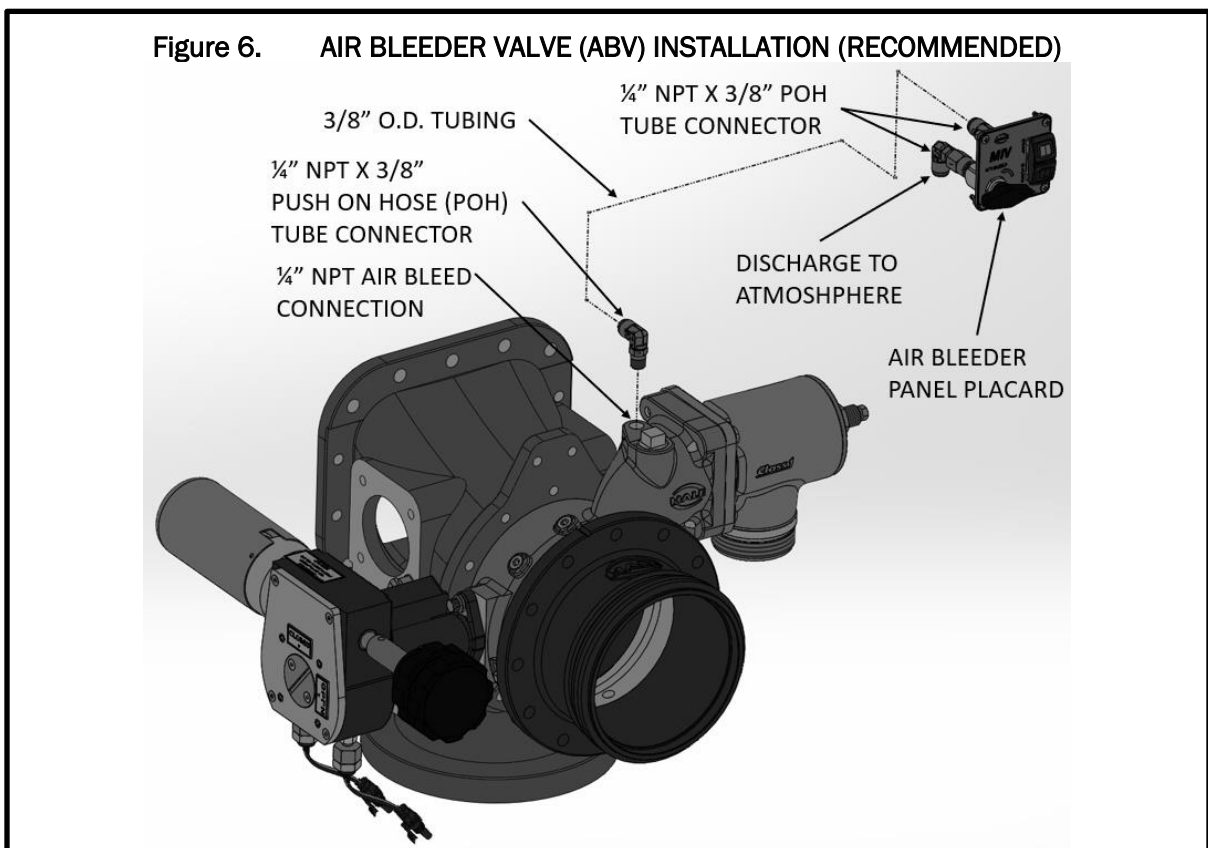
IF HALE AIR BLEEDER VALVE (ABV) ASSEMBLY IS NOT INSTALLED, A WARNING PLACARD MUST BE MOUNTED ON THE OPERATOR PANEL NEXT TO THE AIR BLEEDER CONTROL STATING: "WARNING: ALL AIR MUST BE BLED FROM INTAKE HOSE PRIOR TO OPENING MIV VALVE."

1. Remove the plastic shipping plug from the ¼ inch NPT air bleed connection that is located on the top of the valve body and install an air bleeder control valve that is controllable by the pump operator. The discharge of the air bleeder must be directed away from the pump operator position. If the Hale Air Bleeder Valve (ABV) is used, refer to figure 6 and do the following:
2. Install one of the ¼ inch NPT X 3/8 inch tube push on fittings into the ¼ inch NPT threaded hole in the valve body.
3. Install the remaining ¼ inch NPT X 3/8 inch tube push on fitting into inlet of the air bleeder valve body. Hold the valve with a wrench.

ATTENTION ⚠ CAUTION

TO PREVENT DAMAGE TO THE AIR BLEED VALVE BODY, HOLD THE HEX OUTLET ON THE VALVE WITH A WRENCH WHILE TIGHTENING ELBOW.

4. Install the ¼ inch NPT X 3/8 inch tube push on elbow into the hex outlet of the air bleeder valve. To prevent damage to the valve body, hold the hex outlet on the valve with a wrench while tightening elbow. Make sure the outlet of the elbow is facing away from the valve handle.
5. Using a 3/32 inch Allen wrench, loosen the setscrew and remove the valve handle from the valve body.
6. Remove the retaining nut from the valve body.
7. Insert the valve body into the panel placard making sure the elbow is oriented towards the top of the placard.
8. Install and tighten the retaining nut on the valve body making sure the valve remains in the correct orientation.
9. Install the valve handle and tighten setscrew with Allen wrench.



10. Determine location on the operator panel for the air bleeder valve and cut holes in the panel according to the dimensions shown in figure 7. Location of air bleed valve should allow for proper drainage of tubing.
11. Install panel placard with valve attached and secure in place using the 8-32 X 0.75-inch-long screws and 8-32 nuts provided.

ATTENTION ⚠ WARNING

PER NFPA 1901, USE TUBING RATED AT THE MAXIMUM DISCHARGE PRESSURE OF THE FIRE PUMP, 500 PSI (34 BAR) MINIMUM.

12. Connect a length of 3/8 inch O.D. tubing from the fitting on the Hale MIV valve body to the fitting on the inlet of the air bleeder valve.
13. Connect a length of 3/8 inch O.D. tubing from the outlet of the elbow on the outlet of the air bleeder valve and route this tubing away from the operator position. Make sure the outlet of this tube is visible to the pump operator.

2.2.6 Suction Hose Priming

If suction hose priming connection is not used, remove plastic shipping plug and replace with 3/4 inch NPT pipe plug.

NOTE

COAT ALL FITTING THREADS WITH A SUITABLE SEALANT BEFORE CONNECTIONS ARE MADE.

1. Remove the plastic shipping plug from the 3/4 inch NPT outboard priming tap located next to relief valve.
2. Install a priming hose connection fitting into 3/4 inch NPT tapped hole
3. Using hose rated at 26 in. (760 mm) Hg and 500 PSI (34 BAR) pressure per NFPA 1901, connect the outboard priming tap to Priming pump. Continue installation of priming pump in accordance with procedures provided with priming pump. Dependent on configuration either an additional priming pump is installed, or a three-way valve is installed to control priming.

2.2.7 Panel Placard, Handwheel and Handwheel Extension

1. Locate and install the panel placard(s) on the pump operator panel. Mounting dimensions are provided in figure 7 to assist in making cutouts for placard mounting.

ATTENTION ⚠ CAUTION

ELECTRIC MOTOR AND WIRING ARE PROTECTED BY THE MIV CONTROL MODULE. DO NOT REMOVE OR BYPASS THE MIV CONTROL MODULE AS SEVERE DAMAGE TO THE ELECTRIC MOTOR OR APPARATUS WIRING COULD RESULT DURING A MOTOR STALL CONDITION.

ATTENTION ⚠ DANGER

ALL ELECTRICAL SYSTEMS HAVE THE POTENTIAL TO CAUSE SPARKS DURING SERVICE, INSTALLATION OR REPAIR. TAKE CARE TO ELIMINATE EXPLOSIVE OR HAZARDOUS ENVIRONMENTS DURING SERVICE AND/OR REPAIR.

ATTENTION ⚠ CAUTION

THE HALE MIV IS DESIGNED FOR OPERATION ON 12 VOLT DC NEGATIVE GROUND ELECTRICAL SYSTEMS ONLY.

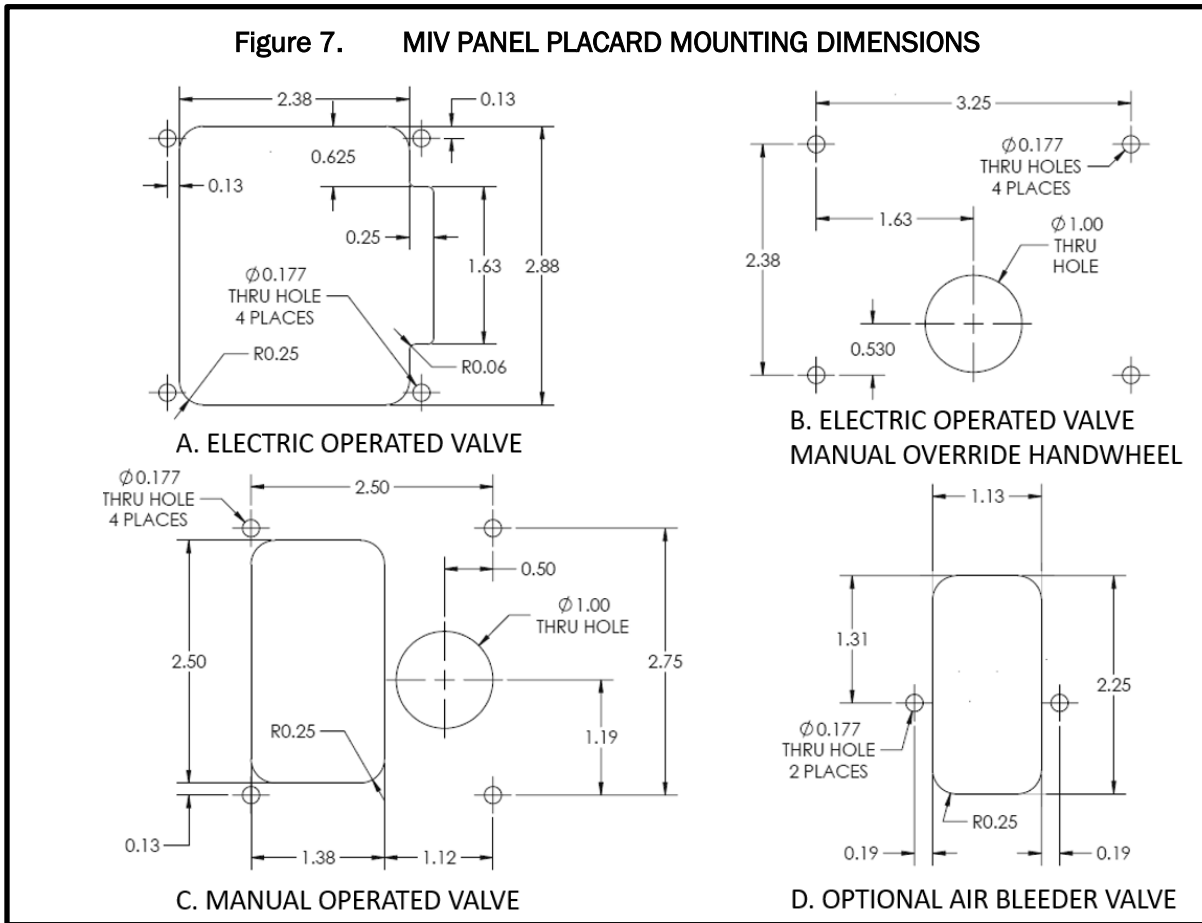
NOTE

THE ELECTRIC PANEL PLACARD WIRING HARNESS IS 96 INCHES (2438 MM) LONG. IF THE PANEL LAYOUT REQUIRES EXTRA WIRE LENGTH A JUMPER (HALE P/N 513-0270-06-0) IS AVAILABLE OR ONE MAY BE FABRICATED USING MINIMUM 14 AWG CHEMICAL RESISTANT WIRE WITH PACKARD WEATHERPACK CONNECTORS. CARE SHOULD BE TAKEN TO MAKE SURE THE COLOR CODE IS MAINTAINED PER THE

ORIGINAL WIRING. WIRING DIAGRAMS ARE PROVIDED IN THE TROUBLESHOOTING SECTION OF THIS MANUAL.

ATTENTION ⚠ CAUTION

FOLLOW NFPA REQUIREMENTS FOR APPARATUS ELECTRICAL WIRING. USE MINIMUM 14 AWG, TYPE SXL OR GXL (SAE J1128) WIRE. THE WIRING SHALL BE PROTECTED USING 289°F (143 C) MINIMUM FLAME RETARDANT, MOISTURE RESISTANT LOOM OR BRAID.



2. Connect the wiring harness from the panel placard to the wiring harness from the gearbox adapter. The Packard WeatherPack end connectors are keyed and will only assemble one way.
3. Connect +12 VDC power to the RED pigtail provided using 14 AWG type SXL or GXL (SAE J1128) wire. Make sure the power supply is capable of providing 12 VDC power at 10 AMPS. Connect the end of the BLACK wire to a ground point on the chassis frame. Make sure the wires are routed away from sources of heat and avoid sharp edges. Make sure all wires are protected with loom and connections are sealed to protect them from the under-truck environment.
4. If required a handwheel extension is provided in the installation kit. The extension is made to mount in one of two positions.

- a. The first position is for 76-81 inch truck panel widths. The extension is pushed on until the first hole in the extension lines up with the hole in the gearbox handwheel shaft.
 - b. The second position is for 70-76 inch truck panel widths. The extension is pushed on all the way until the second hole in the extension lines up with the hole in the gearbox handwheel shaft.
 - c. Two groove pins are provided in the installation kit. On 76-81 inch panel widths both groove pins are used. While on 70-76 inch panel widths only one pin is used.
5. Once pump operator panel is closed install valve handwheel for manual operator.

ATTENTION ⚠ WARNING

KEEP HANDS AND ARMS CLEAR OF THE VALVE DISC WHEN VALVE IS BEING OPERATED WITHOUT SUCTION TUBE STRAINER OR SUCTION TUBE IN PLACE.

6. Lubricate the valve bore and disc edges using Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal. Cycle the valve to check for smooth operation.
7. Hydrostatically test the fire pump and valve in accordance with accepted procedures.

2.2.8 Relief Valve Adjustment

ATTENTION ⚠ WARNING

NEVER SET INTAKE RELIEF VALVE ABOVE HOSE MANUFACTURERS RATED PRESSURE. ALWAYS USE THE LOWEST POSSIBLE RELIEF VALVE SETTING TO ENHANCE OPERATOR AND EQUIPMENT SAFETY.

ATTENTION ⚠ WARNING

PER NFPA 1962 REQUIREMENTS, LARGE DIAMETER HOSE MARKED "SUPPLY HOSE" SHALL NOT BE USED AT OPERATING PRESSURES EXCEEDING 185 PSI (13 BAR).

The relief valve is factory set to open at 125 PSI (9 BAR). Refer to manufacturers relieve valve instructions when adjusting. The Hale relief valve can be adjusted to open from 75 to 215 PSI (5 to 15 BAR). Test and set relief valve as necessary using the following procedures and figure 5:

1. Open operator panel and gain access to the relieve valve adjustment screw (See Figure 5)
2. Make sure MIV is closed and install a pressure test cap on the suction tube.
3. Connect a pressurized water source or hydrostatic test pump and water supply to the pressure test cap fitting.
4. Open water supply valve and air bleed valve. Fill suction tube until water flows from air bleed. Close air bleed.
5. Pressurize to desired set pressure in accordance with the above warnings. Observe whether relief valves open or remains closed at the desired pressure.
6. Turn off water source and relieve pressure through the air bleeder allowing relief valve to reset.
7. Release locking nut one turn.
8. Zero adjusting shaft by backing it out (counterclockwise) until it stops, then turning it back (clockwise) to increase relief pressure.
9. Consult Table 1 for the adjustment setting for the desired opening pressure.

Table 1. Relief Valve Adjustment Settings

NO. OF 360 DEGREE TURNS FROM ZERO	OPENING PRESSURE (PSIG)
0	75
1	100
2	125
3	155
4	185
5	215

10. Tighten nut to lock adjusting shaft at the desired setting.
11. All pressure settings are approximate.
12. Repeat steps 4-6 to test desired pressure settings.
13. Repeat adjustment procedures as necessary to verify relief valve operation.
14. Open drain valve and drain water from suction tube.
15. Disconnect water supply and remove test cap from suction tube.
16. Close operator panel and return apparatus to normal ready condition.

2.2.9 Rotation of Gearbox (if necessary)

1. Remove the four 3/8-16 x 2-1/2 inch long cap screws that hold the gearbox to the gearbox adapter.
2. Carefully remove gearbox (MIV-M) or gearmotor/gearbox assembly (MIV-E) from gearbox adapter.

NOTE

THE SHAFT AND THRUST WASHER (MIV-E ONLY) MAY COME OUT WITH THE GEARBOX. PUSH SHAFT AND THRUST WASHER BACK INTO PLACE, BEING SURE SLOT IN END OF SHAFT SEATS OVER TANG ON VALVE DISC.

3. The gearbox may now be rotated in any 90° increment.
4. Reinstall the gearbox onto the gearbox adapter by lining up square end of shaft with square bore in gearbox.
5. Apply Loctite® #243 or equal to four 3/8- 16 x 2-1/2 inch long cap screws. Tighten cap screws.
6. If valve is equipped with an electric gearmotor and the gearmotor is mounted horizontally, the gearmotor cover must have the drain slots facing down toward the ground. If the slots are not facing the ground remove the four #6-32 x 1/2 inch long screws and remove the cover.
7. If valve is equipped with an electric gearmotor and the gearmotor is mounted vertically, the gearmotor cover must have a drain hole added in the bottom. Remove the four #6-32 x 1/2 inch long screws and remove the cover. Drill a 5/16 hole through end of cover and



deburr. Slide strain relief in cover cutout and slide cover over gearmotor and adapter lining up holes. Apply Loctite® #243 or equal to threads of #6-32 screws reinstall and tighten.

2.3. How To Use This Manual

This manual was developed for the purposes of FAST team and OEM support. This manual provides information and procedures to perform MIV maintenance (preventive and corrective). The manual also provides information to be used to troubleshoot and R&R failed components.

The Introduction section is of interest to management for MIV familiarization, visual recognition, system identification documentation, and risk assessment information (an EN 1028 only requirement).

The Safety section is of interest to both management and maintainers as it provides precautions for maintenance (including operation for maintenance purposes) and definitions of dangers, warnings, cautions, notices, and notes. This section also provides a summary of both PPE and a DANGER/WARNING/CAUTION/NOTICE summary. The section provides a single point view of compiled hazards and PPE in a condensed format. The appropriate DANGER, WARNING, CAUTION, NOTICE, and PPE listed also appear at each point of use throughout the manual.

Notice that the use of this manual also requires maintenance personnel to have received Hale training prior to using it. Use Hale Training Academy (Pumping And Maintenance) training (see paragraph **Error! Reference source not found.**, Training – page **Error! Bookmark not defined.**) and the two Maintenance sections for all aspects of maintaining the MIV system. These include:

- Preventive Maintenance
- Corrective Maintenance
- Troubleshooting
- Remove And Replace Instructions

Within the two Maintenance sections, the troubleshooting provided utilizes SCR tables, which provide the list of known symptoms associated with a MIV trouble/problem/failure. To use a SCR table, locate the indicated SYMPTOM, verify the associated CAUSE (the maintainer must verify ALL the associated causes if multiple causes are listed) and then perform the associated REMEDY (or remedies). The component repair is treated as bench procedures. Maintenance requires the associated repair kit be utilized. Utilizing the associated repair kit ensures all the required components are available for replacement. Utilizing the repair kits as intended prolongs system performance and supports the manufacturer's warranty.

Performing a procedure is NOT the ONLY key action in maintaining the system, documentation of the Preventive Maintenance, R&R, and SYMPTOM/REMEDY history is also key to maintaining each MIV system (including meaningful tracking of when each issue occurred). A maintenance log with meaningful entries will provide invaluable insight, time/money savings (in reduced down time and shorted troubleshooting time), and cost savings over the life cycle of the system.

2.4. Disclaimer

Our policy is one of continuous development. We therefore reserve the right to amend specifications without notice or obligation.

2.5. Principles Of Operation

This section provides the principles of operation for maintainers to use when communicating with an OEM/apparatus manufacturer or a Hale Customer Support representative

ATTENTION ⚠ WARNING

PER NFPA 1962 REQUIREMENTS, LARGE DIAMETER HOSE USED TO SUPPLY A PUMPER FROM A HYDRANT, OR ANOTHER PUMPER SHALL BE CONNECTED TO THE PUMPER(S) AND HYDRANT WITH A SLIGHT DOWNWARD BEND TO AVOID KINKING WHEN THE WATER IS TURNED ON.

ATTENTION ⚠ WARNING

PER NFPA 1962 REQUIREMENTS, LARGE DIAMETER HOSE MARKED "SUPPLY HOSE" SHALL NOT BE USED AT OPERATING PRESSURES EXCEEDING 185 PSI (13 BAR).

ATTENTION ⚠ WARNING

THE SUCTION OF EACH RECEIVING PUMPER USING LARGE DIAMETER HOSE SHALL BE EQUIPPED WITH A RELIEF VALVE WITH A MAXIMUM PRESSURE SETTING OF NOT MORE THAN 10 PSI (0.7 BAR) OVER THE STATIC PRESSURE OF THE WATER SOURCE TO WHICH IT IS CONNECTED OR NOT MORE THAN 10 PSI (0.7 BAR) OVER THE DISCHARGE PRESSURE OF A SUPPLY PUMPER IN RELAY. IN NO EVENT WILL THE INTAKE RELIEF VALVE PRESSURE SETTING EXCEED THE WORKING PRESSURE OF THE HOSE BEING USED.

ATTENTION ⚠ WARNING

WHEN INITIALLY CHARGING LARGE DIAMETER HOSE EXCESSIVE AIR WILL BE PRESENT IN THE HOSE. THIS AIR MUST BE BLED OFF WHILE THE HOSE IS CHARGING AND PRIOR TO OPENING THE HALE MIV TO PREVENT RECEIVING PUMP CAVITATION AND POSSIBLE LOSS OF PRIME.

ATTENTION ⚠ WARNING

LARGE DIAMETER HOSE PRESENTS A TRIPPING HAZARD. USE CARE WHEN WORKING AROUND HOSE WHEN IN USE.

2.5.1 Air Bleeder Valve

1. Using standard departmental operating procedures connect large diameter hose from the supply pumper to the receiving pumper.
2. Make sure the Hale MIV on the receiving pumper is in the CLOSED position.
3. Open air bleeder valve by turning the valve handle ¼ turn counterclockwise to the OPEN position (See figure 8).
4. Have supply pumper energize the large diameter hose and observe the air bleeder discharge tube end. When water flows from the air bleeder discharge tube end, close the air bleeder valve by turning the valve handle ¼ turn clockwise to the CLOSED position.
5. Operate the Hale MIV using the procedures that follow.

2.5.2 Electric Motor Operated Valve (HALE MIV-E)

NOTE

AS THE VALVE IS TRAVERSING FROM THE CLOSED TO OPEN POSITION (OR OPEN TO CLOSED POSITION) THE YELLOW LAMP WILL BE ILLUMINATED.

ATTENTION ⚠ WARNING

WHEN THE ELECTRIC MOTOR DRIVEN VALVE IS OPERATED THE MANUAL OVERRIDE HANDWHEEL WILL TURN. KEEP HANDS, FEET OR LOOSE CLOTHING AWAY FROM THE HANDWHEEL TO PREVENT ENTANGLEMENT.

1. Energize 12 vdc power to pump operator panel.
2. To open valve, push toggle switch (figure 8) to the OPEN position and hold until the green OPEN indicator lights (while in between open/close, the lights will not be luminated). If apparatus configuration permits, observe the manual override handwheel on the operator panel to make sure the valve is turning. Release the switch.
3. To close valve, push toggle switch to the CLOSED position and hold until the red CLOSED indicator lights (while in between open/close, the lights will not be luminated). If apparatus configuration permits, observe the manual override handwheel on the operator panel to make sure the valve is turning. Release the switch.

2.5.3 Manual Handwheel Operated Valve (HALE MIV-M)

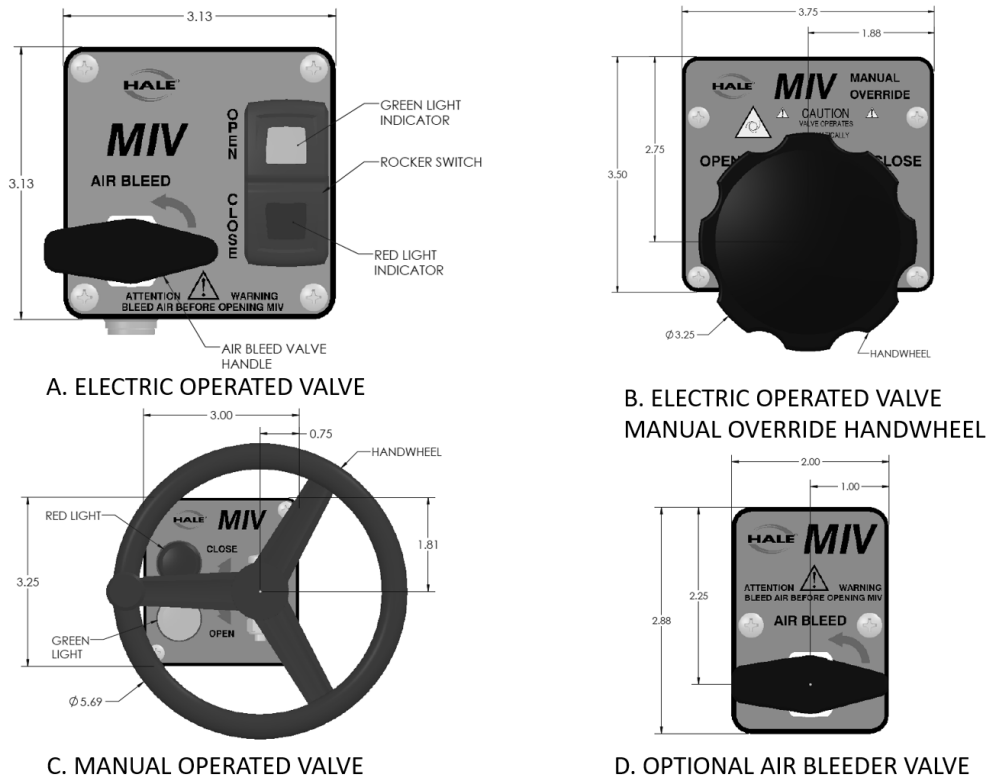
1. To open the valve, turn handwheel (figure 8) in the direction indicated by the arrow on the panel placard until the green OPEN indicator lights.
2. To close the valve, turn handwheel in the direction indicated by the arrow on the panel placard until the red CLOSED indicator lights.

2.5.4 Manual Override (Electric Operated Valve Only)

The electric motor operated valve has a panel mounted handwheel to open or close the valve in the event power is not available from the apparatus electrical system. To operate the valve in the event of apparatus electrical power failure use the following procedures:

1. To open the valve, turn handwheel (figure 8) in the direction indicated by the arrow on the panel placard until the handwheel stops.
2. To close the valve, turn handwheel in the direction indicated by the arrow on the panel placard until the handwheel stops.

Figure 8. MIV PANEL PLACARD MOUNTING DIMENSIONS



2.5.5 Cold Weather Operation

During extremely cold weather the pump and Hale MIV must be completely drained to prevent ice formation and possible damage. During cold weather operation use the following procedure for continued reliable operation.

1. Immediately after completion of operations drain and disconnect the large diameter hose. Open all apparatus suction valves, discharge valves, Hale MIV and drain valves. Remove the suction tube caps. Permit water to drain completely from the pump and piping.
2. After pump is completely drained replace all caps and close all valves. The Hale MIV should be kept in the closed position during cold weather.

ATTENTION ⚠ WARNING

WHEN THE ELECTRIC MOTOR DRIVEN VALVE IS OPERATED THE MANUAL OVERRIDE HANDWHEEL WILL TURN. KEEP HANDS, FEET OR LOOSE CLOTHING AWAY FROM THE HANDWHEEL TO PREVENT ENTANGLEMENT.

3. If, during cold weather the formation of ice in the pump suction tube prevents normal opening of the Hale MIV-E, the valve disc may be freed by repeatedly moving the toggle switch (figure 8) on the operator panel from OPEN to CLOSED position joggng the valve disc to release the ice. Repeat movement of the toggle switch as many times as necessary to break the disc free. Observe the manual override handwheel to determine when disc is free, and valve is operating.



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3. PREVENTIVE MAINTENANCE

Hale Products recommends the preventive maintenance and inspections listed in Table 2.

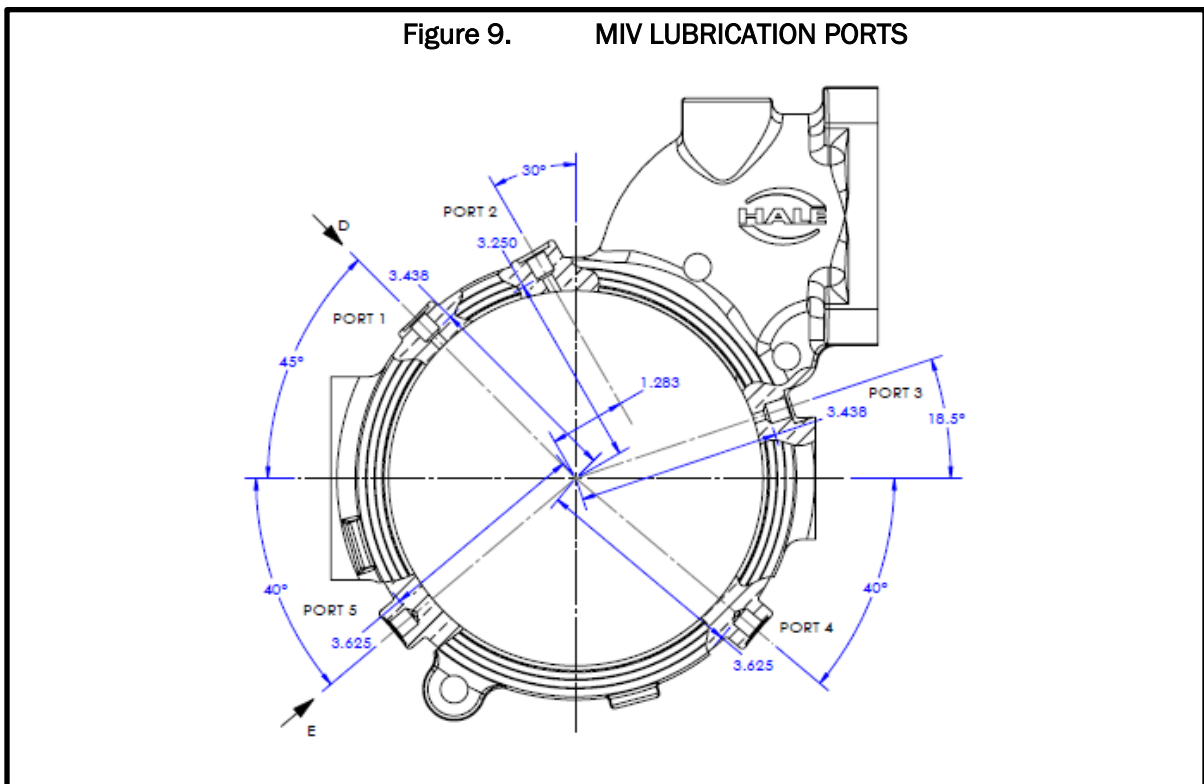
Table 2. Recommended Preventive Maintenance

Interval	Check/Test	Action Required	Item(s) Required
After Each Use			
	Visual Check	Inspect the valve to make sure there is no debris caught between the valve body and valve disc. Also, verify no damage to valve disc.	None
	Saltwater, Foam or Contaminated Water Operation	Flush valve and pump with fresh water in accordance with departmental procedures	Clean water
	Lubricate MIV Disc	Using lubrication ports on MIV to lubricate MIV disc to ensure proper movement	Allen wrenches, Super-Lube
	Functional Check		None

3.1. MIV Disc Lubrication

The following will provide instructions on lubricating the MIV disc while the MIV is installed using the inline lubrication techniques.

1. Ensure MIV is in the close position
2. Mark a spot on the MIV motor as your “zero/start” position
3. Lubrication ports are in the positions below.





4. To lubricate Port 1, remove 1/8" BSPP plug, complete 2.5 revolutions using MIV motor (manual or electric). Spray 2-3 spurts of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal. Reinstall 1/8" BSPP plug.
5. Return MIV to closed position.
6. To lubricate Port 2, Port 4 and Port 5, remove 1/8" BSPP plug, complete 2 revolutions using MIV motor (manual or electric). Spray 2-3 spurts of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal. Reinstall 1/8" BSPP plug.
7. Return to closed position.
8. To lubricate Port 3, remove 1/8" BSPP plug, complete 4.5 revolutions using MIV motor (manual or electric). Spray 2-3 spurts of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal. Reinstall 1/8" BSPP plug.
9. Return to closed position.



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4. CORRECTIVE MAINTENANCE

This section provides general repair guidelines, MIV system troubleshooting, and bench repair instructions for the following MIV components.

- Valve Disc
- Switches
- Relief Valve

4.1. General Repair Guidelines

The following subparagraphs provide general guidelines to be utilized and/or followed whenever the maintenance procedure being performed is associated with the type of information/ instructions provided in these subparagraphs.

4.1.1 Recommended Tools

Individual tool and consumable lists are NOT provided for each bench procedure. The following tools are the minimum required to perform maintenance/repairs on the Manual Intake Valve, Hale does NOT supply any of the suggested tools listed.

- Allen Wrenches (or Hex Key Socket Set)
- Torque Wrench(s) Or Torque Limiting Socket(s) (Capable of 0.6 – 1.1 Nm)
- Wire Tags
- Ratchet(s), Sockets, and Wrenches
- Shop Rags
- Wire Cutter

4.1.2 Recommended Cleaners

Hale recommends the following:

- Safety Kleen
- Stoddard Solvent
- Loctite Clean-Up Solvent (thread locker/bonder removal for hardware)

4.1.3 Recommended Lubricants

Where grease is called for, use lithium-based grease with 1 to 3% Molybdenum Disulfate. The following lists examples of approved greases.

- Dow Corning BR2-PLUS
- Lubriplate Fiske #3000
- Shell Super Duty Grease
- Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal
- Imperial #777
- Mobil Grease Special
- Sunoco® Moly #2EP

The lubricant listed in Table 3 is recommended to protect the O-ring from damage, speeds up assembly, and to ensure continued service and operation.



Table 3. Recommended O-ring Lubricant

Application	Lubricant <u>1</u> /
O-ring	Synthetic Multi-Purpose Clear O-ring Lubricant (Synthetic NLGI Grade 2 Heavy Duty, Multi-Purpose)

Note 1 Or equivalent lubricant.

4.1.4 Thread Lock And Sealant Compounds

Loctite®™ (or suitable equivalent/substitute thread locker, bonding compound, or sealant) shall be used when directed. Reference the procedures associated list of tools and/or consumables for the specific thread locker/bonding or sealant required. Loctite®™ (242/243/270) and sealant (580) was used during factory assembly for all fasteners/hardware and fittings requiring the use of a thread lock, bonding, or sealant compound. Remnant compound ALWAYS causes false torque reading when installing old and/or new fasteners/hardware. See paragraph 4.1.2 Recommended Cleaners, for thread lock or bonding compound cleaning information. The Loctite®™ compounds listed in Table 4 may be used for thread lock or bonding compounds.

Table 4. Recommended Thread Lock And Sealant Compounds

Thread Lock Compounds	Used on: (Description)	Sealant Compounds	Used on: (Description)
Loctite® 242/243™	Mounting and Retaining Hardware (Medium Strength, All-Purpose, Removable, Thixotropic, Blue)	Loctite® 580™	Pipe Fittings (Medium Strength, High Temperature, Slow Cure, White)
Loctite® 270™	Eductor Threads (High Strength High Temperature, Slow Cure, Green)		

4.2. Cleaning and Inspection Guidelines

Wherever a procedure calls for cleaning and inspection, these guidelines should be followed.

- A. Inspect all components for excessive or abnormal wear.
- B. Wherever a requirement for new parts is indicated, obtain new components from Hale Products Inc.
- C. Wherever procedures call for removal of gaskets, gasket should be replaced. Clean all gasket mating surfaces before installing new gaskets.
- D. Replace any hardware that shows signs of excessive wear, corrosion, or bolts/screws that are torqued to greater than 100 ft-lb with new hardware.

4.2.1 Cleaning Required for Thread Lock Compounds

Always clean the threads of all bolts/fasteners/screws as remnant compound causes false torque reading when installing existing hardware. Always use a clean out tap to clean old thread lock from bolt/ fastener/screw holes to prevent remnant compound causing false torque reading when installing old and/or new hardware.

To remove and clean factory installed thread lock compounds, follow the instruction provided in the applicable Loctite®™ Technical Data Sheet (See the Loctite® web site [<http://www.loctite.com>] or Henkel web site [<https://www.henkel.com>].)

4.3. Removal and Replacement Guidelines

R&R instructions are provided ONLY for components of MIV assemblies (in the form of bench procedures). NO procedures are provided to R&R the MIV component from the apparatus. To reduce unnecessary work and to avoid the introduction of additional/new issues, only dismantle the parts instructed and only when necessary to accomplish the target inspection and/or R&R.

4.3.1 Match Mark or Note Component Orientation

As a general maintenance practice, match mark and/or note (document/photograph/record) the orientation of a component before disconnecting or removing it.

4.4. Troubleshooting

To troubleshoot the system, locate the SCR table (Table 5) listing the indicated SYMPTOM, verify the associated CAUSE (verify ALL if multiple are listed) and perform the associated REMEDY.

The SCR tables assume a single fault and the SYMPTOM, CAUSE, and REMEDY columns have been listed in a hierarchy order. Treat each SYMPTOM as the result of a single CAUSE, trace through the SCR table until a single REMEDY is indicated. Perform the REMEDY, and then check the system again. Determine if the same SYMPTOM exists, or a different SYMPTOM is now indicated, or no symptoms exist.

If multiple faults exist, repeat following the table using multiple passes unless the REMEDY is always the same and does NOT remedy the symptom. When this occurs contact Hale Customer Support (800-533-3569 or www.haleproducts.com) for further assistance.

Table 5. Hale MIV SCR Table

SYMPTOM	CAUSE	REMEDY
Valve is difficult to open or close (Electric valve must be manually operated first open or finally close. Operates properly through rest of cycle)	Little or no grease on valve disc (New valves may require more lubrication until valve disc and bore wear in)	Lubricate valve: Remove strainer from suction connection. Manually operate valve to open position and coat valve bore and disc edges with Sunoco® Ultra® Prestige® 2EP grease or equal.
	Valve left closed for extended periods	Periodically operate valve to ensure proper operation. Grease if necessary
Valve is difficult to open or close (only operates a few degrees)	Inadequate clearances with mating parts.	Check bores on mating parts. The bore on the mating part on the outlet side of the valve must be 6-½ inches (165 mm) to a depth of ½ inch (13 mm).
		If bore is undersize, carefully machine or grind to provide proper clearance.
		Make sure correct Hale suction extension is installed. P/N 178-0063-00-0 without bottom opening. P/N 178-0063-01-0 with bottom opening

Table 5. Hale MIV System Level SCR Table – CONTINUED

SYMPTOM	CAUSE	REMEDY
MIV-E valve is difficult to operate (tight through complete operating range) Refer to Table 6 for maximum operating torque.	MIV-E gearbox tight or binding due to improperly installed shims, washers and needle bearings	Remove six screws that hold gearbox cover and position indicator on gearbox then remove indicator and cover. Inspect each end of worm gear looking for material being extruded from shim, washer, bearing pack or look for loose metal in grease. If any of the above is found order gearbox/gearmotor assembly (P/N 538-00075-000).
Valve is difficult to operate (Sticks, Jams or Binds. Sometimes intermittently)	Little or no grease on valve shaft	Check valve shaft, there are two bearing points in the gearbox adapter for the shaft. Lubricate shaft and bore with Sunoco® Ultra® Prestige® 2EP grease or equal.
Valve is difficult to operate (Sticks, Jams or Binds. Sometimes intermittently) (Cont'd)	Forked end of valve shaft digging into gearbox adapter bore.	Check valve shaft forked end. edges of slot should not be sharp, remove sharp edges with file or emery cloth. Remove chips or burrs from gearbox adapter bore.
MIV-E Valve has water in gearbox adapter housing	Water seeps between indicator cover and segment gear.	Install O-ring P/N 040-00036-000 between indicator cover and top of segment gear. Make sure adhesive side of gasket is toward gear.
MIV-E motor operates but valve does not open or close (valve works manually)	Gearmotor output shaft failure caused by improper setting of the mechanical stops.	Replace gearmotor assembly with P/N 200-1251-50-0 and adjust gearbox switches. Refer to Instructions for "Testing MIV-E Valves for Proper Operation".
	Gearmotor output shaft failure caused by non-concentric shaft bore.	If shaft bore is non-concentric order gearbox/gearmotor assembly (P/N 538-00075-000)
	Gearmotor output shaft failure caused by overloading of gearmotor/gearhead.	Ensure valve works properly, is lubricated and free of obstructions. Replace gearmotor assembly with P/N 200-1251-50-0 and adjust gearbox switches.
Rocker switch lights do not sequence properly, flicker or light incorrectly and/or motor does not operate properly	No 12 VDC Power	Energize battery master switch Check wiring connections
	Light burn out (No effect on motor operation)	Replace panel placard with P/N 513-0273-52-0
	Defective location switch	Check location switch operation. If switch is defective replace using switch replacement kit (P/N 546-00087-000)
	Defective MIV Control	

Table 5. Hale MIV System Level SCR Table – CONTINUED

SYMPTOM	CAUSE	REMEDY
	Wire shorted out	Check wiring for abrasion, cuts and wear. Repair as necessary.
Lights stay lit; does not change to green or red when valve is either fully open or closed (on MIV-E turning the manual override handwheel a slight amount changes light)	Mechanical stop(s) improperly adjusted	Adjust mechanical stop(s) for proper operation.
	MIV-E manual override handwheel only needs to be turned a slight amount and light changes.	Improperly installed switch(es). Refer to “Switch Replacement”
	Incorrectly wired switch(es)	MIV control harness is wired backwards to the gearmotor assembly.

4.4.1 General Testing MIV-E Valves for Proper Operation

The following is a test to determine if the MIV-E valve is operating correctly electrically.

1. The limit switches stop the rotation and therefore the position of the butterfly disc.

NOTE

THE MECHANICAL STOPS MUST NOT STOP THE ROTATION OF THE MIV-E WHEN OPERATED ELECTRICALLY.

2. Carefully operate the valve using panel toggle switch. Watch indicator on top of gearbox. If valve is operating properly the valve will stop rotating when the indicator is close to legend on gearbox.
3. If valve continues to rotate past legend by about 1/4 inch STOP. Try operating valve in opposite direction, valve should not operate if over-travel (indicator moving past legend) occurred.
4. Manually turn valve back in opposite direction until indicator light illuminates.
5. Carefully operate the valve in the opposite direction using panel toggle switch and repeat steps 2 and 3 above.
6. If the valve operated properly in both directions, the valve works correctly electrically.

If valve did not operate properly in both directions a check of the electrical wiring will be necessary. It is most likely the “+” and “-” voltages are reversed. Pay close attention to the switch wiring on the panel placard, the gearmotor terminals or wiring at the micro switches.

7. Operate the valve open then closed. See that motor stops, the red indicator on the rocker switch is lit and the valve disc is in the closed position.
8. Tighten the switch cap until it just touches the segment gear, then back out 1/2 to 3/4 turn. Lock in place with locknut.
9. Operate the valve open then closed. See that the motor stops electrically and not against the mechanical stop. When the motor stops operating, the handwheel should be able to rotate about 3/4 turn before stopping against mechanical stop. If not, back out switch cap another 1/4 turn and repeat step.
10. Operate the valve to the open position. See that motor stops, the green lamp is lit and valve disc is in the open position.

11. Tighten the mechanical stop until it just touches the segment gear, then back out $\frac{1}{2}$ to $\frac{3}{4}$ turn. Lock in place.

4.5. MIV Component Bench Procedures

The infinite mounting possibilities and/or apparatus configurations preclude providing MIV assembly R&R instructions herein. See the OEM (or apparatus manufacturers) documentation to R&R the selected MIV assembly.

Once removed from the apparatus, perform the associated REMEDY referenced bench procedure (or procedures) to repair the failed MIV component.

4.5.1 Valve Disc Replacement

If inspection of the valve disc indicates that replacement is necessary order valve disc replacement kit (Hale P/N 546-00086-000) and proceed as follows:

1. Manually rotate the valve to the half open position. Approximately 5 turns from either the fully open or fully closed position.

ATTENTION ⚠ WARNING

KEEP HANDS AND ARMS CLEAR OF THE VALVE DISC WHEN VALVE IS BEING OPERATED WITHOUT SUCTION TUBE STRAINER OR SUCTION TUBE IN PLACE.

2. Remove valve handwheel and open the operator panel.
3. Tag and disconnect the electrical wires from the valve.
4. Disconnect the relief valve discharge piping, air bleeder tubing, outboard primer tubing and drain tubing from the valve body.
5. Remove the cap screws and nuts, then remove the suction tube and valve from the fire pump.
6. Take the valve body to a clean work area and clamp into a vise or other stable work holding device being careful not to damage the valve sealing surfaces.
7. Remove the four $\frac{3}{8}$ -16 x 2- $\frac{1}{2}$ inch long cap screws that hold the gearbox to the gearbox adapter.
8. Carefully remove gearbox (MIV-M) or gearmotor/gearbox assembly (MIV-E) from gearbox adapter.

NOTE

THE SHAFT AND THRUST WASHER (MIV-E ONLY) MAY COME OUT WITH THE GEARBOX. IF NOT, REMOVE SHAFT AND THRUST WASHER.

9. Remove the two $\frac{7}{16}$ -14 x 1-inch long counterbore screws that holds the gearbox adapter to the valve body. Remove the gearbox adapter from the valve body.
10. Remove the trunnion from the bottom of the valve body using a 1- $\frac{1}{2}$ inch socket.

NOTE

THE STEM ON TOP OF THE VALVE DISC EXTENDS APPROXIMATELY 1- $\frac{1}{2}$ INCHES INTO THE GEARBOX ADAPTER BORE. THE BOTTOM OF THE DISC, AT THE TRUNNION END, MUST BE REMOVED FIRST AND THEN THE DISC MUST BE SLIGHTLY ROTATED FOR THE STEM TO CLEAR THE BORE.

11. Remove the old disc from the valve body.
12. Clean and inspect all components for damage and/or excessive wear. Replace those components beyond repair.
13. Install a new O-ring into the groove on the valve disc stem. Apply a light coat of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal to the stem, O-ring and pivoting surfaces of the new disc.
14. Install the new disc into the valve body by inserting the stem end first. The disc must be slightly rotated for the stem to clear the bore. With the disc now positioned in the fully open position, push the trunnion end of the disc into position. This will take some force to get disc into position; however, well lubricated pivot points greatly help.
15. Once disc is in place, roughly center both the stem and trunnion ends in their respective valve body bores.
16. Apply a light coat of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal to the stem and gearbox adapter pilot bore, as well as, the bore for the trunnion pin.
17. Place a new O-ring on the trunnion. Apply a light coat of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal to the O-ring and pin diameter. Apply Loctite® #243 or equal to the threads on the trunnion. Insert the trunnion into the valve body and tighten using a 1-½ inch socket wrench. Torque the trunnion to 120 lb-ft (163 N-m).
18. Place a new O-ring into the groove on the gearbox adapter. Apply a light coat of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal to the O-ring and pilot diameter, as well as the bore in the gearbox adapter. Install the gearbox adapter into the valve body. Reinstall the two 7/16-14 x 1 inch long counterbore screws, but do not completely tighten.
19. If switches need to be replaced refer to instructions on **SWITCH REPLACEMENT**.
20. Install a new gasket to gearbox adapter.
21. Rotate the valve disc to its half open position. Apply a light coat of Sunoco® Ultra® Prestige® 2EP grease or equal to the valve shaft. Insert the shaft into the gearbox adapter making sure that the slot in the end of the shaft lines up with the tang on the end of the valve disc stem. On MIV-E type valves install the thrust washer over the square end of the shaft. Lightly grease the top surface of the thrust washer.
22. Reinstall the gearbox onto the gearbox adapter by lining up square end of shaft with square bore in gearbox.
23. Apply Loctite® #243 or equal to four 3/8-16 x 2-½ inch long cap screws. Tighten cap screws.
24. Apply a light coat of Super Lube® Multi-Purpose Synthetic Grease Food Grade with Silicone or equal to the valve bore and the disc edges.
25. Install valve and suction tube on the fire pump. Apply a coat of Loctite® #243 or equal to threads of cap screws and nuts before installing. Torque cap screws and nuts to 40 lb-ft (54 N-m).
26. Connect electrical wires.
27. Operate the valve to the closed position

28. To complete the installation the rocker switch/motor operation versus disc position timing must be set. Refer to **SWITCH REPLACEMENT**.

4.5.2 Switch Replacement Bench Procedure

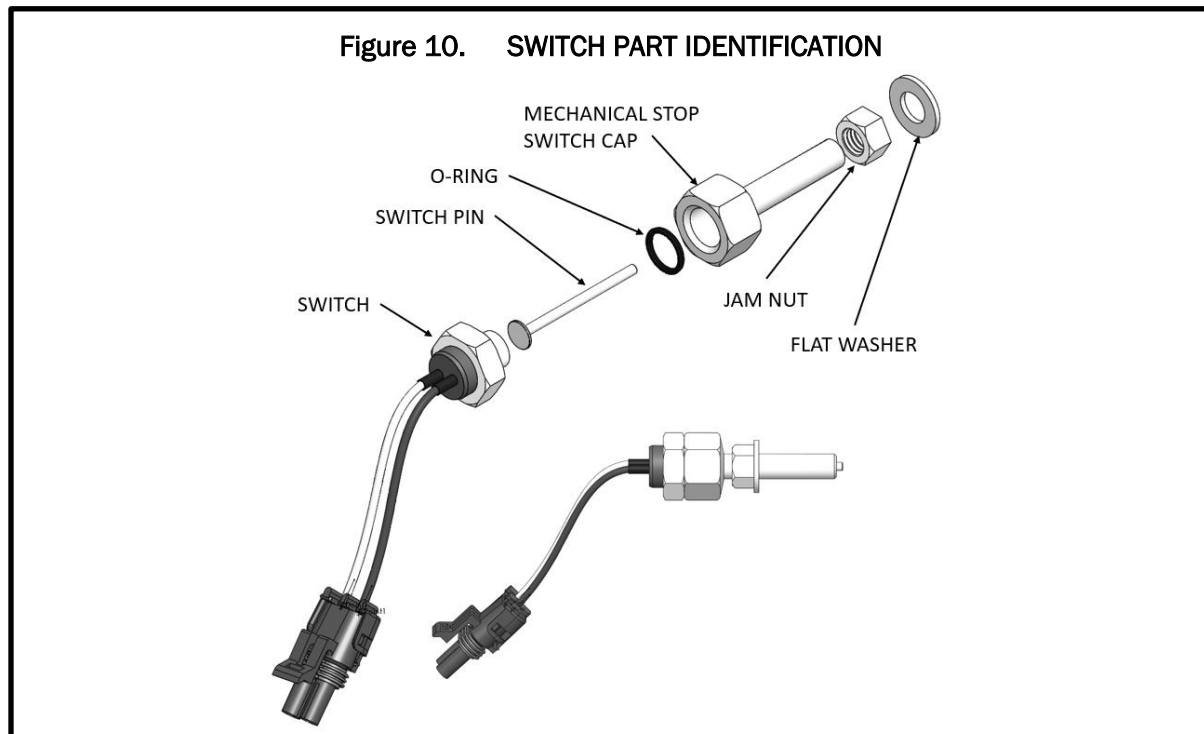
If inspection or if troubleshooting indicates that replacement is necessary order switch replacement kit (Hale P/N 546-00087-000) and proceed as follows:

1. Manually rotate the valve to the half open position. Approximately 5 turns from either the fully open or fully closed position.

ATTENTION ⚠ WARNING

KEEP HANDS AND ARMS CLEAR OF THE VALVE DISC WHEN VALVE IS BEING OPERATED WITHOUT SUCTION TUBE STRAINER OR SUCTION TUBE IN PLACE.

2. Remove valve handwheel and open the operator panel.
3. Tag and disconnect the electrical wires from the valve.
4. If there is enough room to remove the gearbox and valve shaft (approximately 4-1/4 inches) the valve may not have to be removed from the truck, skip to step 8.
5. Disconnect the relief valve discharge piping, air bleeder tubing, outboard primer tubing and drain tubing from the valve body.
6. Remove the six cap screws and two nuts that hold the suction tube and valve to the fire pump. Remove the suction tube and valve.
7. Take the valve body to a clean work area and clamp into a vise or other stable work holding device being careful not to damage the valve sealing surfaces.

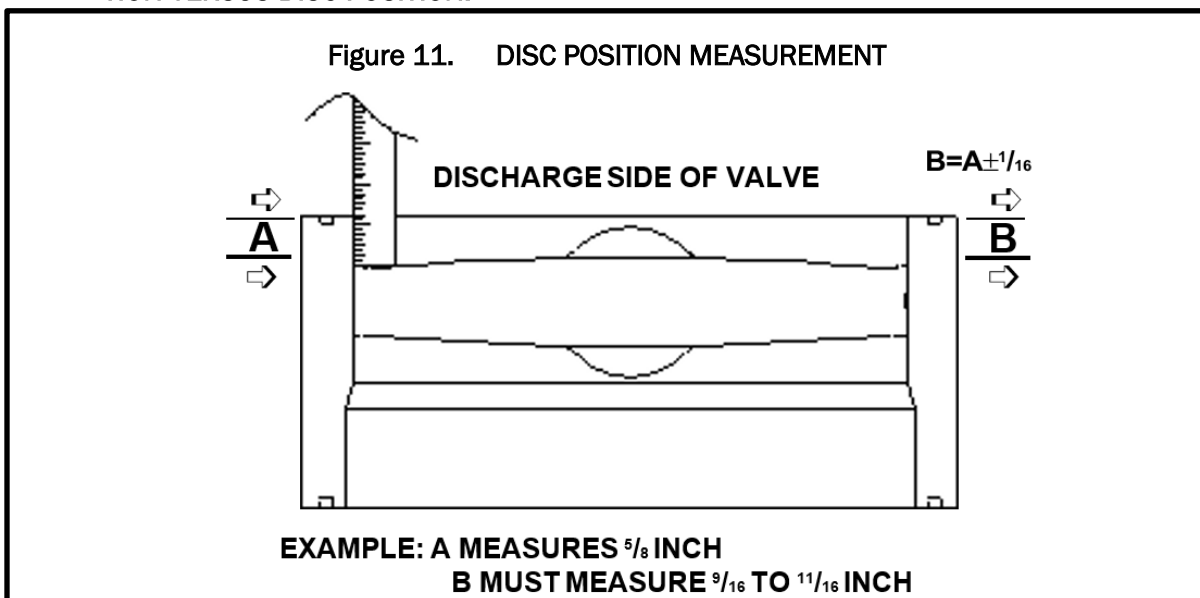


8. Loosen 3/8" lock nut from switch against gearbox
9. Remove the switch cap that holds the switch assembly from the gearbox.

10. Refer to Figure 10 to assemble new switch assembly from switch replacement kit.
11. Operate the valve open then closed. The red indicator on the rocker switch or red indicator on the manual placard is lit and the valve disc is in the closed position.
12. Tighten the switch until it just touches the segment gear, then back out $\frac{1}{2}$ to $\frac{3}{4}$ turn. Lock in place with locknut.
13. Operate the valve open then closed. See that the motor stops electrically and not against the mechanical stop. When the motor stops operating, the handwheel should be able to rotate about $\frac{3}{4}$ turn before stopping against mechanical stop. If not, back out switch cap another $\frac{1}{4}$ turn and repeat step.
14. Operate the valve to the open position. See that motor stops, the green lamp is lit and valve disc is in the open position.
15. Tighten the mechanical stop until it just touches the segment gear, then back out $\frac{1}{2}$ to $\frac{3}{4}$ turn. Lock in place.
16. Connect the wiring harness and turn power on to illuminate panel placard lights.
17. Manually close valve. Using a reference point, such as the valve body mounting surface, measure the disc position. Refer to figure 10, the valve disc edge should be an equal distance from this reference point. The valve disc is now centered in the valve body in the closed position.

NOTE

THE GEARBOX ADAPTER HAS OVERSIZED MOUNTING HOLES THAT ALLOW SOME ADJUSTMENT TO BE MADE TO SET THE TIMING OF THE CLOSED LIGHT/MOTOR OPERATION VERSUS DISC POSITION.



18. Slightly loosen the two $\frac{7}{16}$ -14 x 1-inch long counterbore screws that hold the gearbox adapter to the valve body.
19. Manually turn back gearbox handwheel a small amount until gearbox and gearbox adapter are free to move. Find the mid position of this free play and tighten the two mounting screws.
20. Operate the valve to the open position, then:

- a. Manual valves (MIV-M)
 - i. Manually operate back to the closed position. Stop when the red light is lit.
 - b. Electric valves (MIV-E)
 - i. Use gearmotor to operate valve to the closed position and allow the switches to stop rotation.
 - ii. The lamps should sequence from flashing red/green to red then the motor should stop.
21. Measure the disc position. Refer to figure 10, the valve disc edge should be an equal distance within $\pm 1/16$ inch from this reference point.
22. If measurement is OK proceed to step 23. Otherwise loosen gearbox adapter mounting screws and manually turn the handwheel $1/8$ turn in one direction and tighten mounting screws. Repeat steps 20 and 21. If the measurement is worse than before loosen gearbox adapter mounting screws and manually turn the handwheel $1/4$ turn in the opposite direction and tighten mounting screws. Repeat steps 20 and 21.
23. When the disc, in the closed position, is within the $\pm 1/16$ dimension the closed position mechanical stop can be set.
- a. Manual valves (MIV-M)
 - i. Tighten the screw until it stops. Do not over tighten. Operate valve in both directions. Check lamp operation and disc stop position, if necessary, back out screw a small amount until lamp and stop sequence properly.
 - b. Electric valves (MIV-E)
 - i. Operate the valve open then closed. See that motor stops, the red light is lit, and valve disc is in the closed position.
 - c. Tighten the mechanical stop until it just touches the segment gear, then back out $1/2$ to $3/4$ turn. Lock in place.
 - d. Operate the valve open then closed. See that the motor stops electrically and not against the mechanical stop. When the motor stops operating, the handwheel should be able to rotate about $3/4$ turn before stopping against mechanical stop. If not back out setscrew another $1/4$ turn and repeat step.
24. Now operate the disc to the open position. The mechanical stop can be set.
- a. Manual valves (MIV-M)
 - i. Tighten the screw until it stops. Do not over tighten. Operate valve in both directions. Check light operation and disc stop position, if necessary, back out screw a small amount until lamp and stop sequence properly.
 - b. Electric valves (MIV-E)
 - i. Operate the valve to the open position. See that motor stops, the green light is lit, and valve disc is in the open position.
 - ii. Tighten the mechanical stop until it just touches the segment gear, then back out $1/2$ to $3/4$ turn. Lock in place.
 - iii. Operate the valve closed then open. See that the motor stops electrically and not against the mechanical stop. When the motor stops operating, the

handwheel should be able to rotate about $\frac{3}{4}$ turn before stopping against mechanical stop. If not back out setscrew another $\frac{1}{4}$ turn

25. Close the operator panel and install the handwheel.

ATTENTION ⚠ WARNING

KEEP HANDS AND ARMS CLEAR OF THE VALVE DISC WHEN VALVE IS BEING OPERATED WITHOUT SUCTION TUBE STRAINER OR SUCTION TUBE IN PLACE.

26. Cycle the valve to ensure smooth operation.

4.5.3 Relief Valve Component Replacement

If operation of the relief valve indicates that component replacement is necessary, do the following:

1. Remove apparatus from service.
2. Remove valve handwheel and interferences to open pump compartment cover and gain access to relief valve.

ATTENTION ⚠ WARNING

MALE THREADS ON RELIEF VALVE OUTLET ARE SHARP AND CAN CAUSE SEVERE CUTS. BE CAREFUL WHEN WORKING AROUND THE EXPOSED THREADS ON THE RELIEF VALVE OUTLET

3. Disconnect discharge piping from the relief valve outlet.

ATTENTION ⚠ WARNING

THE RELIEF VALVE SPRING IS UNDER PRESSURE AND CAN CAUSE A PROJECTILE HAZARD. WHEN DISASSEMBLING THE RELIEF VALVE, BACK RELIEF VALVE ADJUSTMENT SCREW OUT TO LOWEST SETTING TO RELIEVE PRESSURE ON SPRING BEFORE REMOVING RELIEF VALVE HOUSING SCREWS.

4. Using a $\frac{3}{16}$ inch Allen wrench remove the pressure adjustment cap screw locking screw.
5. Using a $\frac{7}{8}$ inch open end wrench, remove the pressure adjustment cap screw to relieve pressure on the adjustment spring.
6. Using a $\frac{1}{4}$ inch Allen wrench remove the four $\frac{3}{8}$ -16 x $\frac{7}{8}$ inch long socket head cap screws that hold the valve bonnet to the end cap.
7. Remove the piston, coil spring and tension washer from inside the valve bonnet.
8. Remove the adjustment bushing from the valve bonnet.
9. Clean and inspect all components and replace those that are worn.
10. Install adjustment bushing into valve bonnet and turn in until threaded hole lines up with hole in bonnet.
11. Insert tension washer, coil spring and piston into valve bonnet.
12. Align valve bonnet on end cap and secure in place using the four $\frac{3}{8}$ -16 x $\frac{7}{8}$ inch long socket head cap screws. Tighten screws using $\frac{1}{4}$ inch Allen wrench.
13. Install pressure adjustment cap screw into the adjustment bushing and tighten until contact with the spring can be felt.

14. Install pressure adjustment locking cap screw into hole on valve bonnet.
15. Adjust relief valve in accordance with procedures in section 3, part H of this manual.
16. Return apparatus to normal ready condition.

Table 6. Fastener Torque Values

Screw Size	Value (+/- 10%)
#4-40	5 in-lb (0.6 N-m)
#6-32	10 in-lb (1.1 N-m)
#10-24	22 in-lb (2.5 N-m)
M6	32 in-lb (3.6 N-m)
3/8-16 (MIV-M)	15 ft-lb (20 N-m)
3/8-16 (MIV-E)	25 ft-lb (34 N-m)
7/16-14	40 ft-lb (54 N-m)
Lower Trunnion	120 ft-lb (163 N-m)

4.5.4 Bench Procedure for MIV Control Module Replacement

If the MIV control Module replacement is necessary order a control module replacement (Hale P/N 610-00050). If no access to remove MIV control manual in the apparatus proceed as follows:

1. Remove valve handwheel and open the operator panel.
2. Tag and disconnect the electrical wires from the valve.
3. Disconnect the relief valve discharge piping, air bleeder tubing, outboard primer tubing and drain tubing from the valve body.
4. Remove the cap screws and nuts, then remove the suction tube and valve from the fire pump.
5. Take the valve body to a clean work area and clamp into a vise or other stable work holding device being careful not to damage the valve sealing surfaces.
6. Remove two 8-32 pan head screws holding MIV control module to gearbox adapter.
7. Replace with new MIV Control Module (Hale P/N 610-00050)
8. Install two 8-32 pan head screws to fasten MIV control module to MIV gearbox adapter
9. Install valve and suction tube on the fire pump. Apply a coat of Loctite #242 or equal to threads of cap screws and nuts before installing. Torque cap screws and nuts to 40 lb-ft (54 N-m).
10. Connect electrical wires.
11. Operate the valve to the closed position



Figure 12. MIV Control Module



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5. PARTS LIST

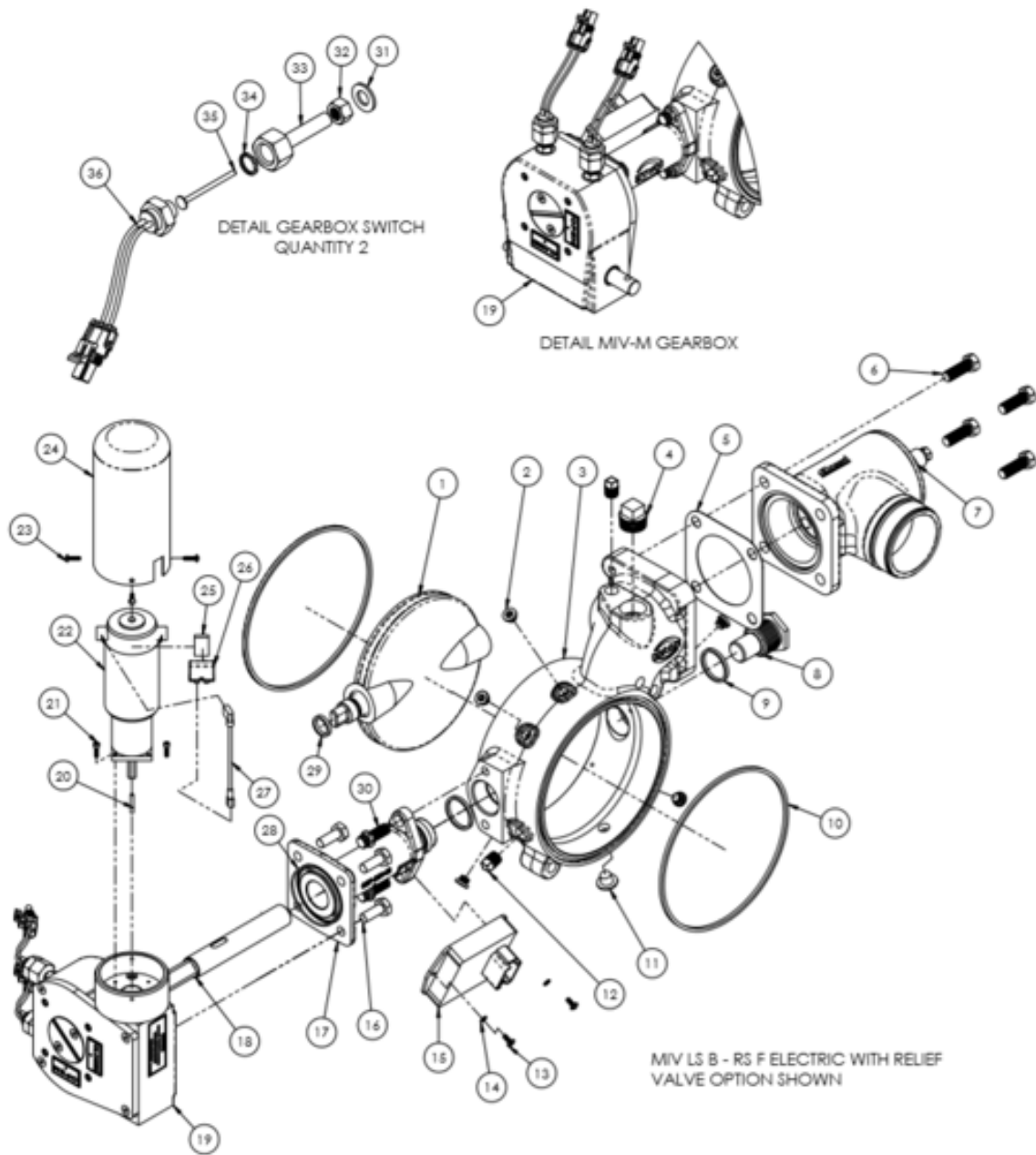




Table 7. PARTS LIST

Item	Part Number	Qty	Name of Part
1	505-0230-00-0	1	MIV DISC
2	082-30100-611	5	PLUG, 1/8 BSPP, PLTD BRASS
3	038-1741-00-0	1	MIV VALVE BODY
4	217-0501-00-0	1	PLUG-3/4 NPT M.I.
5	046-0050-00-0	1	GASKET, 115 FLANGE
6	018-1812-02-0	4	SCREW, 7/16-14 X 1-1/4L
7	538-1920-00-0	1	VALVE, RELIEF, 2.5 SUCTION, VIC
	538-1920-10-0		VALVE, RELIEF, 2.5 SUCTION, NPT
	538-1920-20-0		VALVE, RELIEF, 2.5 SUCTION, NST
8	041-0520-00-0	1	MIV TRUNNION
9	040-9160-00-0	2	SQUARE SEAL RING 1.40" O.D.
10	142-0110-00-0	2	SQUARE SEAL RING
11	217-4003-05-0	1	1/4" CAR PLUG
12	217-0201-00-0	2	1/4 NPT SQUARE HEAD STEEL PLUG
13	102521	2	SCREW, PAN PH 8-32X.38 SS
14	097-0620-00-0	2	WASHER 1/4 LOCK STEEL + ZINC
15	610-00050	1	MIV CONTROL MODULE
16	018-1610-02-0	4	CSW HH 3/8-16 X 1.00 Z
17	007-00143-000	1	MIV ADAPTER ASSEMBLY
18	037-2110-01-0	1	SHAFT, MIV ELECTRIC
19	538-00074-000	1	MIV-E GEARBOX ASSEMBLY
	538-00072-000		MIV-M GEARBOX ASSEMBLY
20	064-6350-00-0	1	PIN 1/8X7/8 MIV-E VLV DRIVE
21	018-0604-08-0	4	CSW SH 6-32 X 0.50 ZINC
22	200-1250-01-1	1	MOTOR MIV-E
23	018-0604-45-0	4	SCREW, RD SL 6-32 X 0.50 ZINC
24	044-1480-00-0	1	MIV-E VLV GEARMOTOR COVER
25	048-1080-01-0	1	MOUNTING PAD
26	200-1240-00-0	1	CIRCUIT BREAKER
27	013-1360-00-0	1	SR4-14LR WHITE WIRE
28	040-00036-000	1	O-RING, 2-036 BUNA-N
29	040-1159-00-0	1	SQUARE SEAL RING .870" O.D.
30	018-1810-22-0	2	SCREW 7/16-14 X 1.00 12-PT ZINC PL
31	097-5730-01-0	2	WASHER, FLAT M10 SS
32	105218	2	NUT, FINISHED 3/8-16 SS
33	008-0791-00-0	2	SWITCH CAP
34	040-8210-00-0	2	SEAL RING
35	064-6600-00-0	2	SWITCH PIN
36	200-2450-00-0	2	SWITCH
37	513-0270-05-0	1	HARN, MIV POWER CABLE WIRING (NOT SHOWN)

Table 8. MIV-E GEARBOX ASSEMBLY 538-00074-000

Part Number	Qty	Name of Part
531-00017	1	GEARBOX MIV REVERSIBLE
101-00282	1	LABEL, OPEN
101-00283	1	LABEL, CLOSED
101-00285	1	LABEL, MATCHED ASSEMBLY
007-00113-000	1	ADAPTER, MIV-E GEARMOTOR
008-0791-00-0	2	CAP SVS SWITCH
064-6600-00-0	2	PIN
040-8210-00-0	2	SEAL RING
200-2450-00-0	2	SWITCH GEARSHIFT

Table 9. MIV-M GEARBOX ASSEMBLY - 538-00072-000

Part Number	Qty	Name of Part
531-00017	1	GEARBOX MIV REVERSIBLE
101-00282	1	LABEL, OPEN
101-00283	1	LABEL, CLOSED
019-01586-000	1	BRACKET, MIV-M COVER PLATE
218-0608-08-0	4	CSW SH M6 X 16.00MM(1.00 TP)ZI
008-0791-00-0	2	CAP SVS SWITCH
064-6600-00-0	2	PIN
040-8210-00-0	2	SEAL RING
200-2450-00-0	2	SWITCH GEARSHIFT

Table 10. RELIEF VALVE ASSEMBLY

Part Number	Qty	Name of Part
538-1920-00-0	1	RELIEF VALVE ASSEMBLY, 2.5 SUCTION, VIC
538-1920-10-0	1	RELIEF VALVE ASSEMBLY, 2.5 SUCTION, NPT
538-1920-20-0	1	RELIEF VALVE ASSEMBLY, 2.5 SUCTION, NST

Table 11. MIV-E INSTALLATION KIT

Part Number	Qty	Name of Part
513-0273-52-0	1	MIV-E PLACARD & HARNESS ASSEMBLY
102525	8	NUT, 8-32 HEX, SS
064-7330-00-0	2	MIV EXTENSION GROOVE PIN
113404-007	1	ADAPTER, MIV-E HANDLE
113404-004	1	ADAPTER, MIV-E HANDLE
101-1482-02-0	1	MIV-E MANUAL OVERRIDE PLACARD
012-1420-00-0	1	MIV MANUAL OVERRIDE KNOB
102529	8	SCREW, PAN PH 8-32 X 0.75 SS
018-1212-63-0	1	SCREW-1/4-20 X 1-1/4 PLTD
513-00144-000	1	HARN, MIV CONTROL (NOT SHOWN)
513-0270-04-0	1	HARN, MIV POWER CABLE WIRING (NOT SHOWN)

Table 12. MIV-M INSTALLATION KIT

Part Number	Qty	Name of Part
512-0070-00-0	1	ASSY WHEEL MANUAL ADJUSTING
018-1214-45-0	1	SCREW,RND HEAD,1/4-20 X 1.5
113404-007	1	ADAPTOR, MIV-E HANDLE
113404-004	1	ADAPTOR, MIV-E HANDLE
064-7330-00-0	1	MIV EXTENSION GROOVE PIN
513-0273-53-0	1	MIV-M PLACARD & HARNESS ASSEMBLY
102525	4	NUT, 8-32 HEX, SS
102529	4	SCREW, PAN PH 8-32 X 0.75 SS
110-1205-11-0	1	NUT, NYLOCK 1/4-20 SS
513-00144-000	1	HARN, MIV CONTROL (NOT SHOWN)
513-0270-04-0	1	HARN, MIV POWER CABLE WIRING (NOT SHOWN)

Table 13. MIV-E GEARBOX REPLACEMENT ASSEMBLY – 538-00075-000

Part Number	Qty	Name of Part
538-00074-000	1	MIV-E GEARBOX ASSEMBLY
113404-004	1	ADAPTER MIV GEARBOX HANDLE
113404-007	1	ADAPTER MIV GEARBOX HANDLE
064-7330-00-0	2	MIV EXTENSION GROOVE PIN

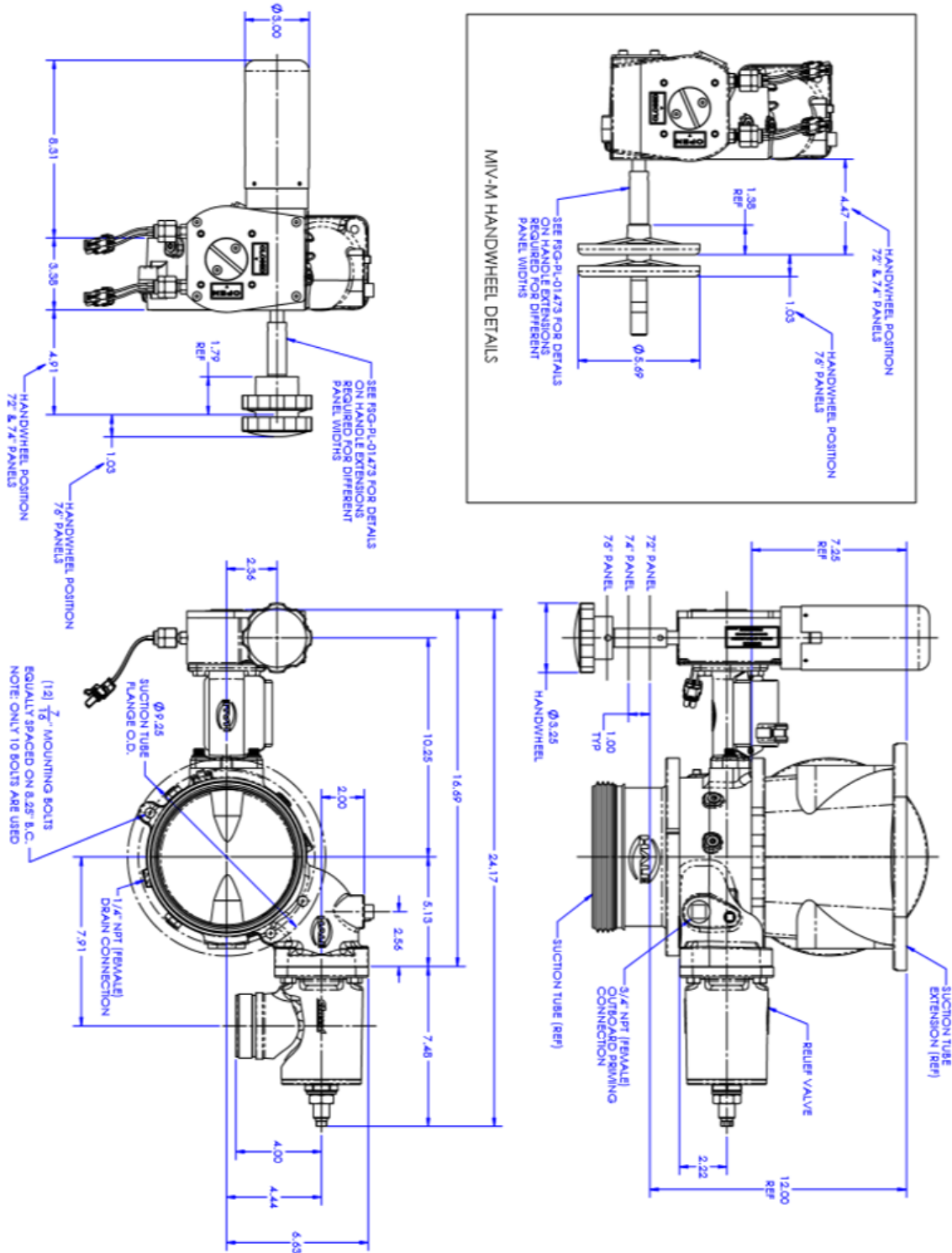
Table 14. MIV-E GEARBOX REPLACEMENT ASSEMBLY – 538-00075-000

Part Number	Qty	Name of Part
538-00072-000	1	MIV-M ACTUATOR ASSY STRONGWELL
064-7330-00-0	2	MIV EXTENSION GROOVE PIN
113404-004	1	ADAPTER MIV GEARBOX HANDLE
113404-007	1	ADAPTER MIV GEARBOX HANDLE



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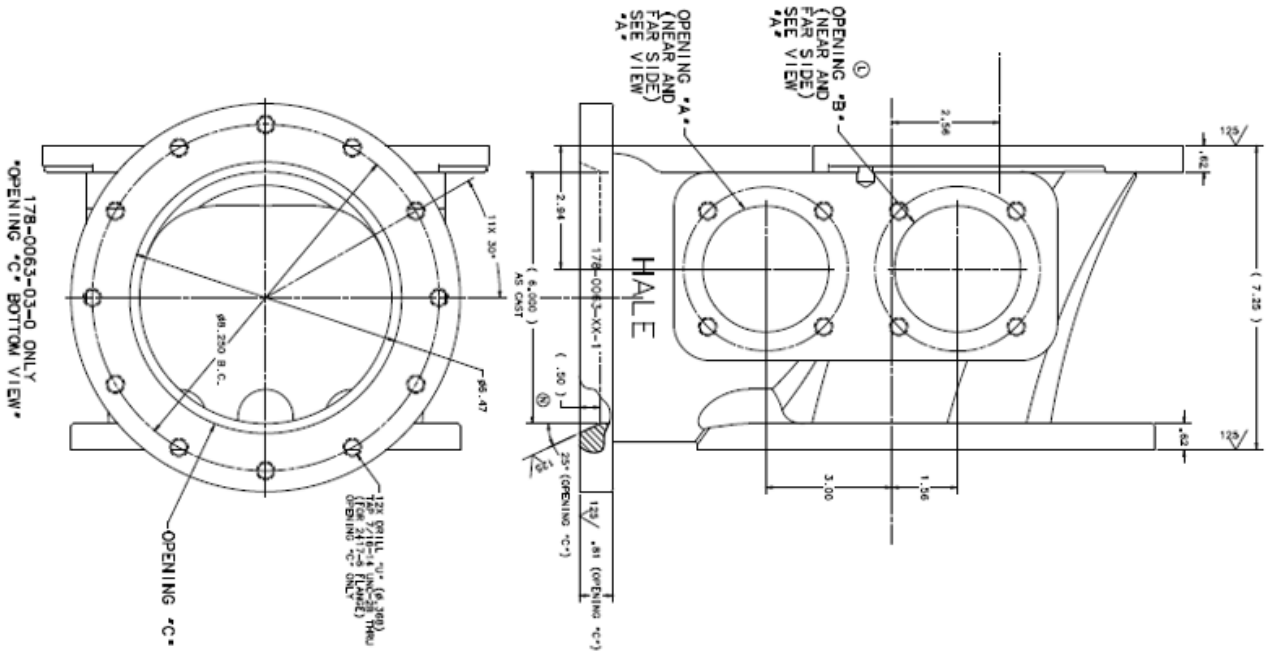
6. INSTALLATION DRAWING



**STANDARD
SUCTION EXTENSION**

178-0063-00-0

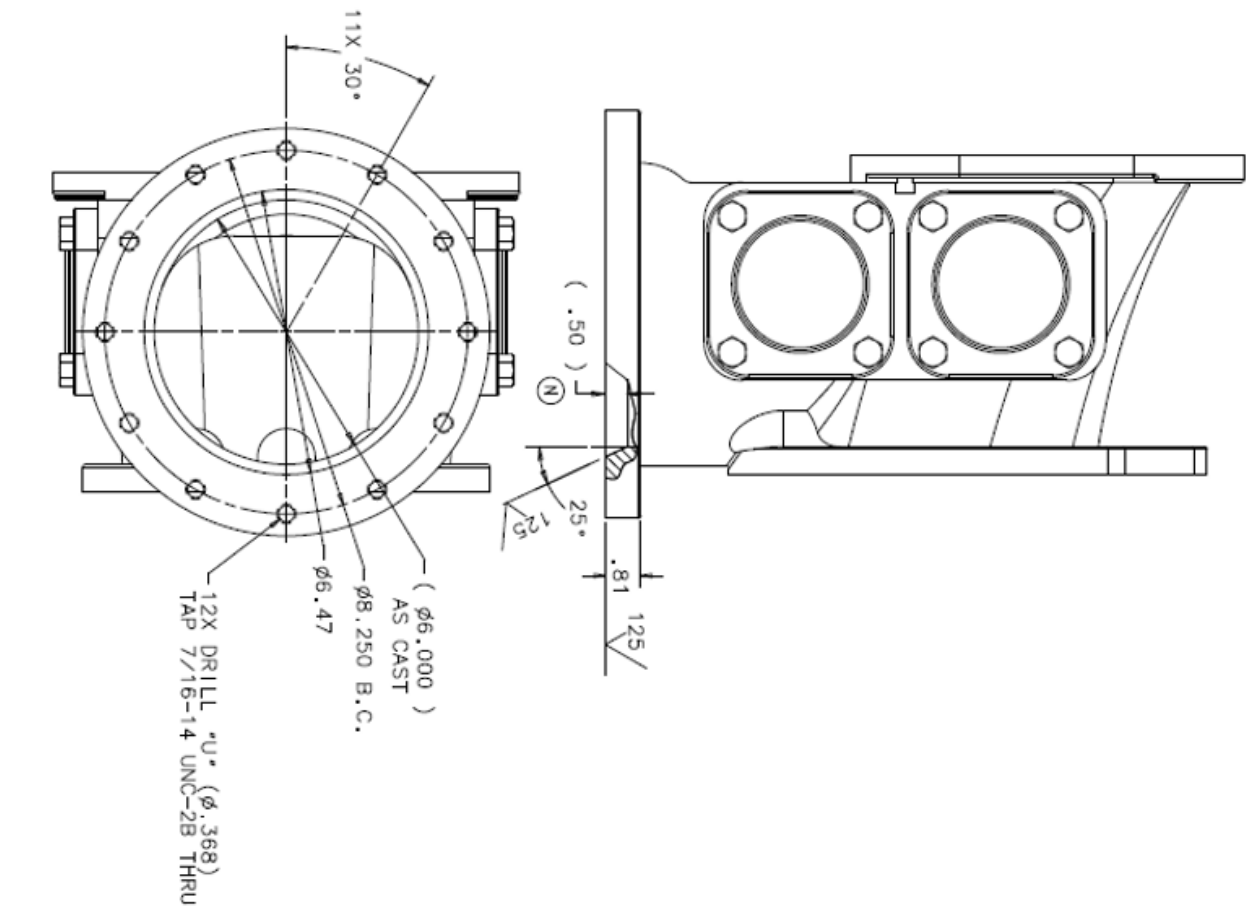
(NO BOTTOM OPENING)



**OPTIONAL
SUCTION EXTENSION**

178-0063-01-0

(WITH BOTTOM OPENING)





APPENDIX A. MANUFACTURER'S INFORMATION

This section provides a list that includes the name, address, and telephone number of the manufacturer's points of contact. Each provides the name address and telephone number of the manufacturer's representative and/or service organization that can provide replacements and is most convenient to the project sight.

Additionally, included herein is warranty information.

A.1. MANUFACTURER'S INFORMATION

Division	Address	Telephone
Class 1	Mailing: 607 NW 27th Ave, Ocala, FL 34475 Email: https://www.haleproducts.com	(800) 533-3569
Hale Products	Mailing: 607 NW 27th Ave, Ocala, FL 34475 Email: https://www.haleproducts.com	(800) 533-3569
Godiva LTD (A Unit of IDEX Corp.)	Mailing: Charles Street, Warwick, England, CV34 5LR Email: godiva@idexcorp.com	Tel: +44 (0) 1926 623600 FAX: +44 (0) 1926 623666

A.2. WARRANTY

See the Hale website (www.haleproducts.com) for product specific warranty and warranty procedures.