HALE

11/1/98

MASTER INTAKE VALVE

DESCRIPTION, INSTALLATION AND OPERATION MANUAL

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 CORRESPONDENCE.

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IDEX CORPORATION

HALE GODIVA

HALE PRODUCTS INC.
ISO 9001
Certificate A4026

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NOTE TO INSTALLER

IMPORTANT: Warnings and cautions listed in Section 1 of this manual are necessary for safe installation and operation of the Hale MIV. When developing individual apparatus operating procedures make sure the warnings and cautions are incorporated as written.

Please provide a copy of the Hale Master Intake Valve manual to the end user of the equipment. For additional manuals, contact Hale Products, Inc at (610) 825-6300.

Ask for Manual P/N 029-0020-28-0.

1 SAFETY

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 operating procedures make sure the warnings and cautions are incorporated as written.

1. **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.

2. **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.

3. **WARNING:** Per NFPA 1962 requirements, large diameter hose marked "SUPPLY HOSE" 3-½ to 5 inches (89 to 127 mm) diameter shall not be used at operating pressures exceeding 185 PSI (13 BAR).

4. **WARNING:** Per NFPA 1962 requirements, large diameter hose marked "SUPPLY HOSE" 6 inches (152 mm) diameter shall not be used at operating pressures exceeding 135 PSI (9 BAR).

5. **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.

6. **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.

7. **WARNING:** Large diameter hose presents a tripping hazard. Use care when working around hose when in use.

8. **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

9. **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.

10. **WARNING:** Use tubing rated at the maximum discharge pressure of the fire pump, 500 PSI (34 BAR) minimum.

11. **WARNING:** 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.

12. **WARNING:** When a malfunction occurs and the motor stalls the circuit breaker will trip to disconnect electrical power to the motor. If power remains to the valve electrical system the motor and circuit breaker could become extemely hot.

Care must be taken when removing gearmotor cover.

13. **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.

14. **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.

15. **WARNING:** Keep hands and arms clear of the valve disc when valve is being operated without suction tube strainer or suction tube in place.

16. **WARNING:** The Hale MIV is shipped with a plastic plug in the ¾ inch NPT air bleeder 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.

17. **WARNING:** If the optional 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."

18. **CAUTION:** To prevent damage to the valve body hold the hex outlet on the valve with a wrench while tightening elbow.

19. **CAUTION:** Electric motor and wiring are protected by a circuit breaker. DO NOT remove or bypass the circuit breaker as severe damage to the electric motor or apparatus wiring could result during a motor stall condition.

20. **CAUTION:** The Hale MIV is designed for operation on 12 Volt DC negative ground electrical systems only.

21. **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.

22. **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.

2 GENERAL DESCRIPTION

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.

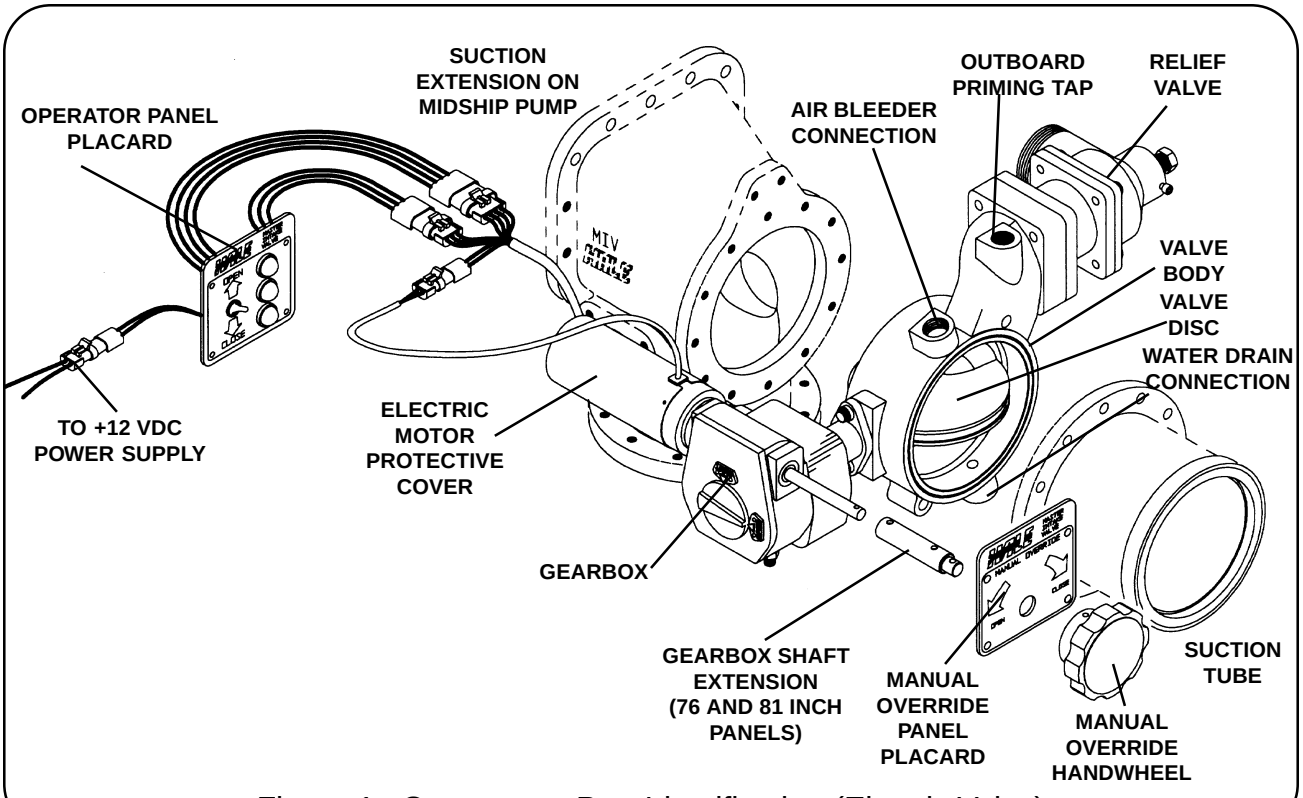


Figure 1. Component Part Identification (Electric Valve)

MASTER INTAKE VALVE

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 parts 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 ¾ 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 fire fighting 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.

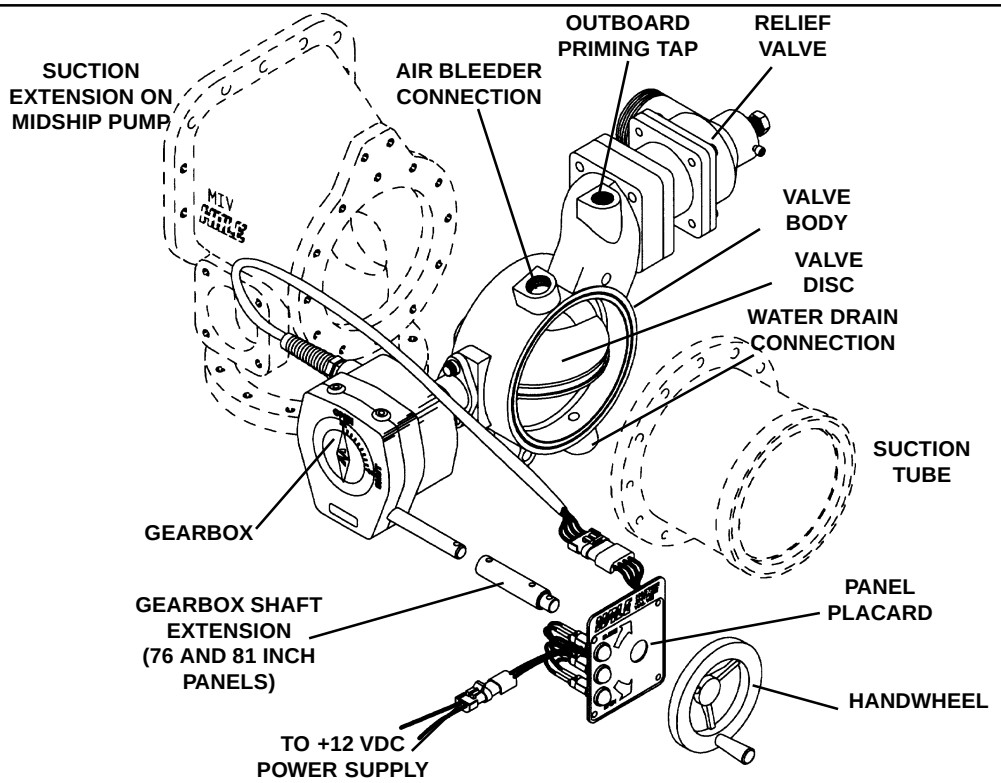


Figure 2. Component Part Identification (Manual Valve)

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.

3 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, reprinted in section 9 of this manual, 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 2-½ inch female NPT threads machined into the relief valve mounting flange of the MIV valve to permit remote mounting of the relief 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 current revision of Plates 814A, 815A, 841A and 842A, reprinted in Section 9 of this manual, provide 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 **A** through **J** in this section).

The following steps shall be followed when installing the valve on a midship fire pump. Steps **A** and **B** can be eliminated if the Hale MIV is installed on the midship pump at the factory.

A. MOUNTING OF SIDE SUCTION VALVES (when not ordered as part of midship pump)

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 Section 9 of this manual 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 current revision of Plate 814A and Plate 815A, reprinted in Section 9 of this manual, provide 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

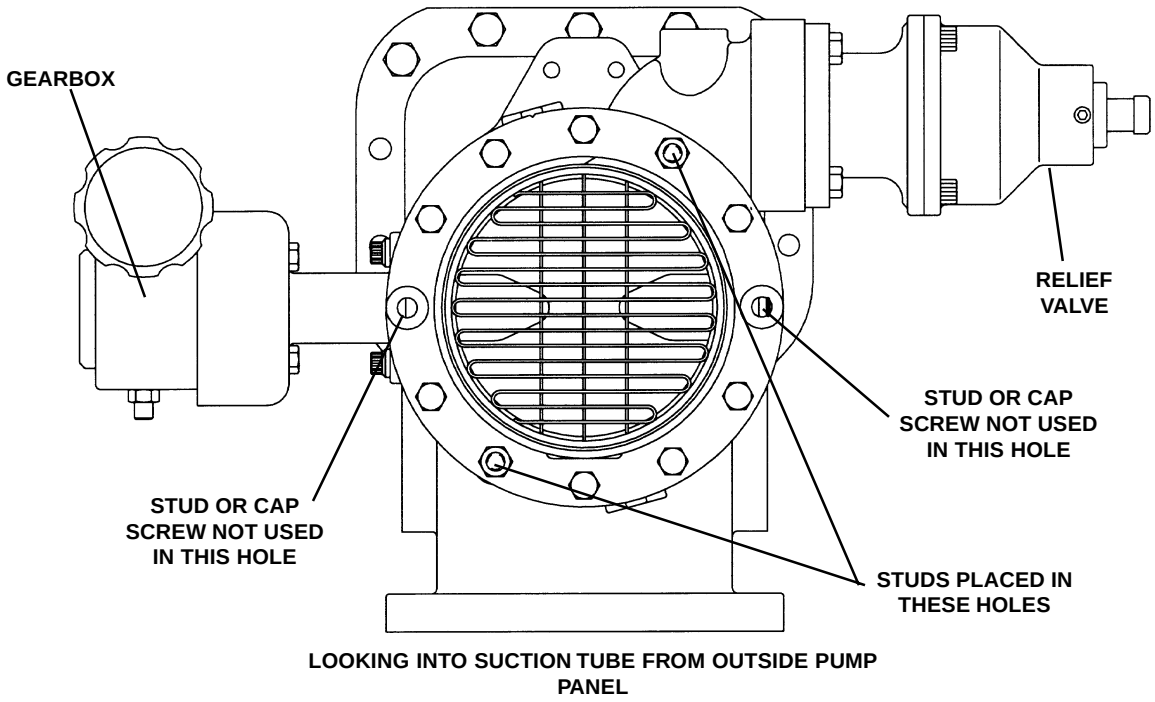


Figure 3. Stud Placement for MIV Installation

suction tube extension and suction tube mating surfaces.

NOTE: Use only 7/16-14 UNC X 4-¾ inches long grade 5 zinc plated steel cap screws, 7/16-14 UNC X 5-¼ inches long grade 5 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. When the Hale MIV is properly orientated for installation the gearbox will be located on the left and the relief valve will be located at the upper right. (See figure 3)

3. Apply a coating of Loctite #242 or equal thread sealing compound and install the 7/16-14 UNC X 5-¼ 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 #242 or equal thread sealing compound and insert the (8) 7/16 -14 UNC x 4-¾ inch long grade 5 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 #242 or equal to the threads on the studs and install the 7/16-14 UNC grade 5 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.

B. MOUNTING OF BOTTOM (FRONT/ REAR) SUCTION VALVES (when not ordered as part of midship pump)
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 suctions. 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 841A and Plate 842A, reprinted in Section 9 of this manual, for the overall mounting dimensions for the Hale MIV.

NOTE: Use only 7/16-14 UNC x 5-¾ inch long grade 5 zinc plated steel cap screws, 7/16-14 UNC x 6-¼ inch long grade 5 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.

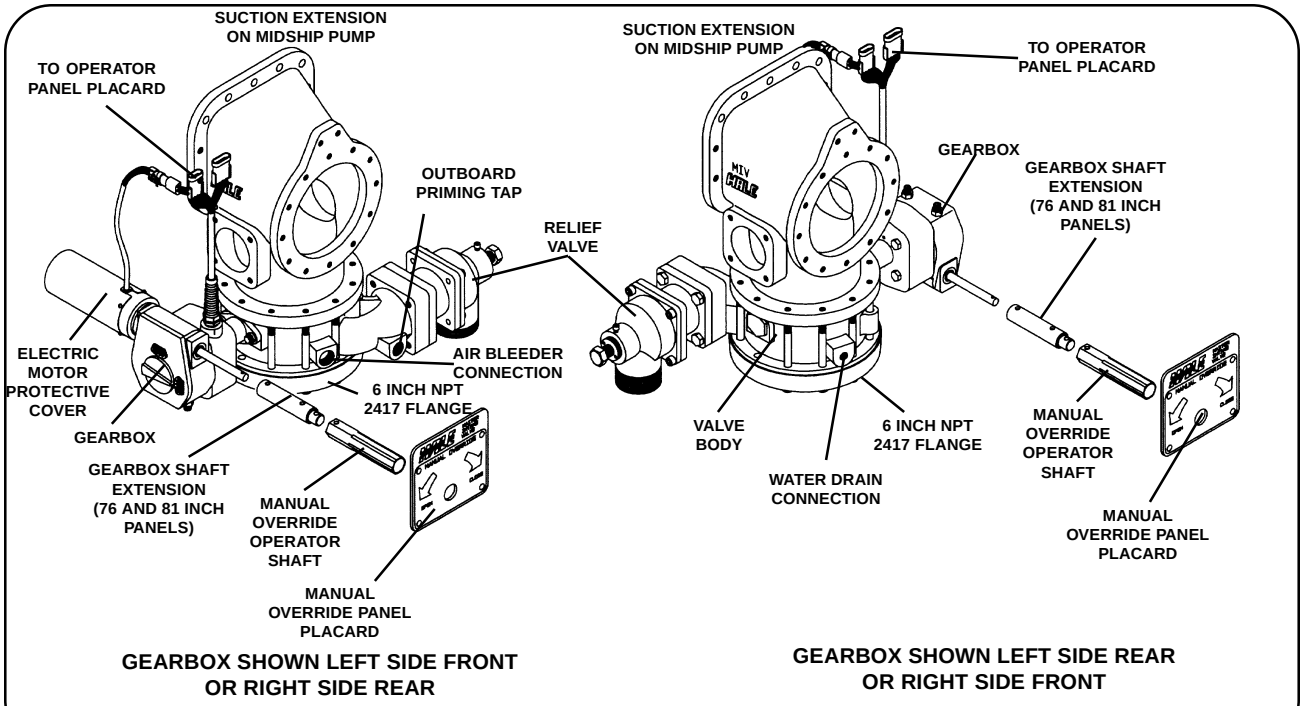


Figure 4. Bottom Opening Mounting

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. When the Hale MIV is properly orientated for installation the gearbox will be located towards the front or rear of the apparatus depending on which side of the pump the valve is located. See figure 4.

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 6-¼ inch long grade 5 studs with Loctite #242 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 #242 or equal to threads on the studs and install two 7/16-14 nuts.

8. Coat the threads of eight 7/16-14 x 5-¾ inch long grade 5 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).

C. PLUMBING RELIEF VALVE

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

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 1-¼ inch long hex head cap screws that secure the relief valve adapter and relief valve to the mounting pad on the Hale MIV body. (See figure 5)

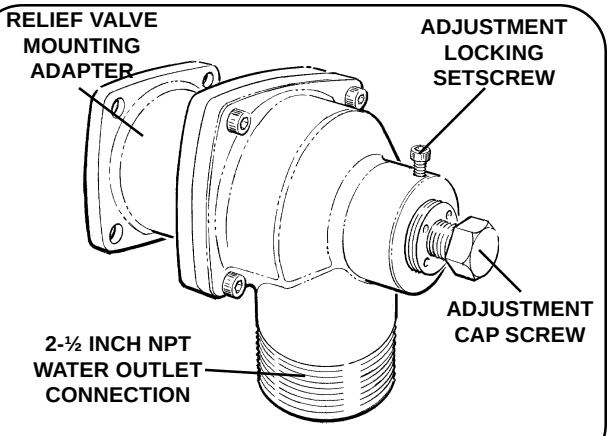


Figure 5. Relief Valve Adjustment

b. The relief valve mounting pad on the Hale MIV valve body has 2-½ inch NPT female threads, install a 2-½ inch NPT threaded pipe nipple into the mounting pad.

c. Screw a 2-½ inch NPT Hale type 115 4-3/8 inch bolt circle flange (Hale P/N 115-0070-00-0) onto 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 2-½ inch long grade 5 zinc plated steel hex head cap screws and four 7/16-14 UNC zinc plated steel nuts. Torque the cap screws and nuts to 40 lb-ft (54 N-m).

2. Attach a pipe or hose to 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.

3. Two aluminum relief valve warning placards, one wired to the relief valve adjustment screw and the other with the installation kit, are provided with the Hale MIV. One of the placards must be permanently affixed near the relief valve adjustment screw and the other must be mounted on the access panel for the relief valve.

D. 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 fitting or elbow 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.

E. AIR BLEEDER VALVE

WARNING: The Hale MIV is shipped with a plastic plug in the ¾ inch NPT air bleeder 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.

WARNING: If the optional 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 ¾ 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 optional Hale Air Bleeder Valve (ABV) is used, refer to figure 6 and do the following:

2. Install ¾ inch NPT X ¼ inch NPT bushing into the ¾ inch NPT tapped hole on the valve body.

3. Install one of the ¼ inch NPT X 3/8 inch tube compression fittings into the ¼ inch

NPT threaded hole in the bushing.

4. Install the remaining ¼ inch NPT X 3/8 inch tube compression fitting into inlet of the air bleeder valve body. Hold the valve with a wrench.

   CAUTION: To prevent damage to the valve body hold the hex outlet on the valve with a wrench while tightening elbow.

5. Install the ¼ inch NPT X 3/8 inch tube compression 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.

6. Using a 3/32 inch Allen wrench, loosen the setscrew and remove the valve handle from the valve body.

7. Remove the retaining nut from the valve body.

8. Insert the valve body into the panel placard making sure the elbow is oriented towards the top of the placard.

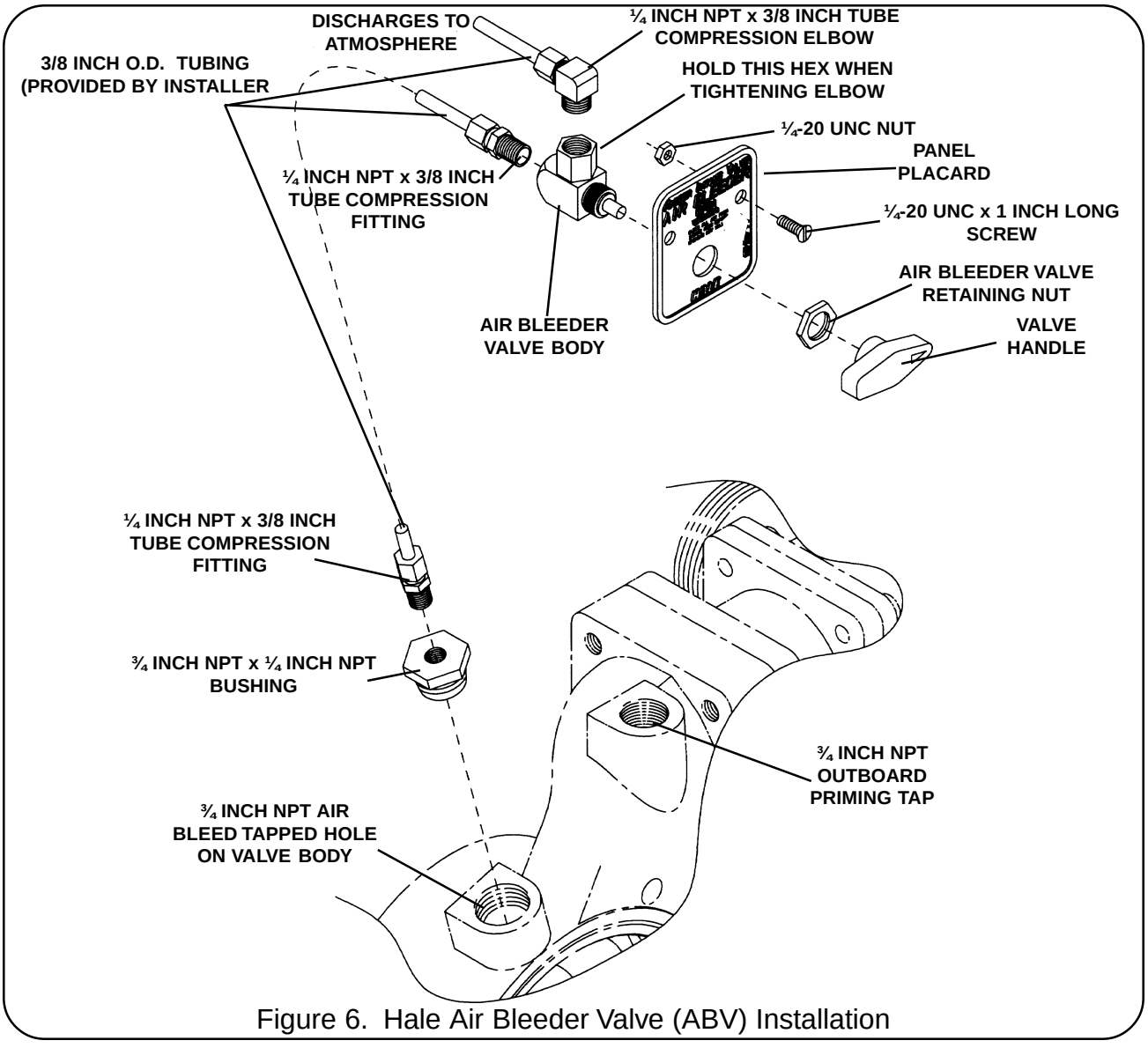


Figure 6. Hale Air Bleeder Valve (ABV) Installation

9. Install and tighten the retaining nut on the valve body making sure the valve remains in the correct orientation.
10. Install the valve handle and tighten setscrew with allen wrench.

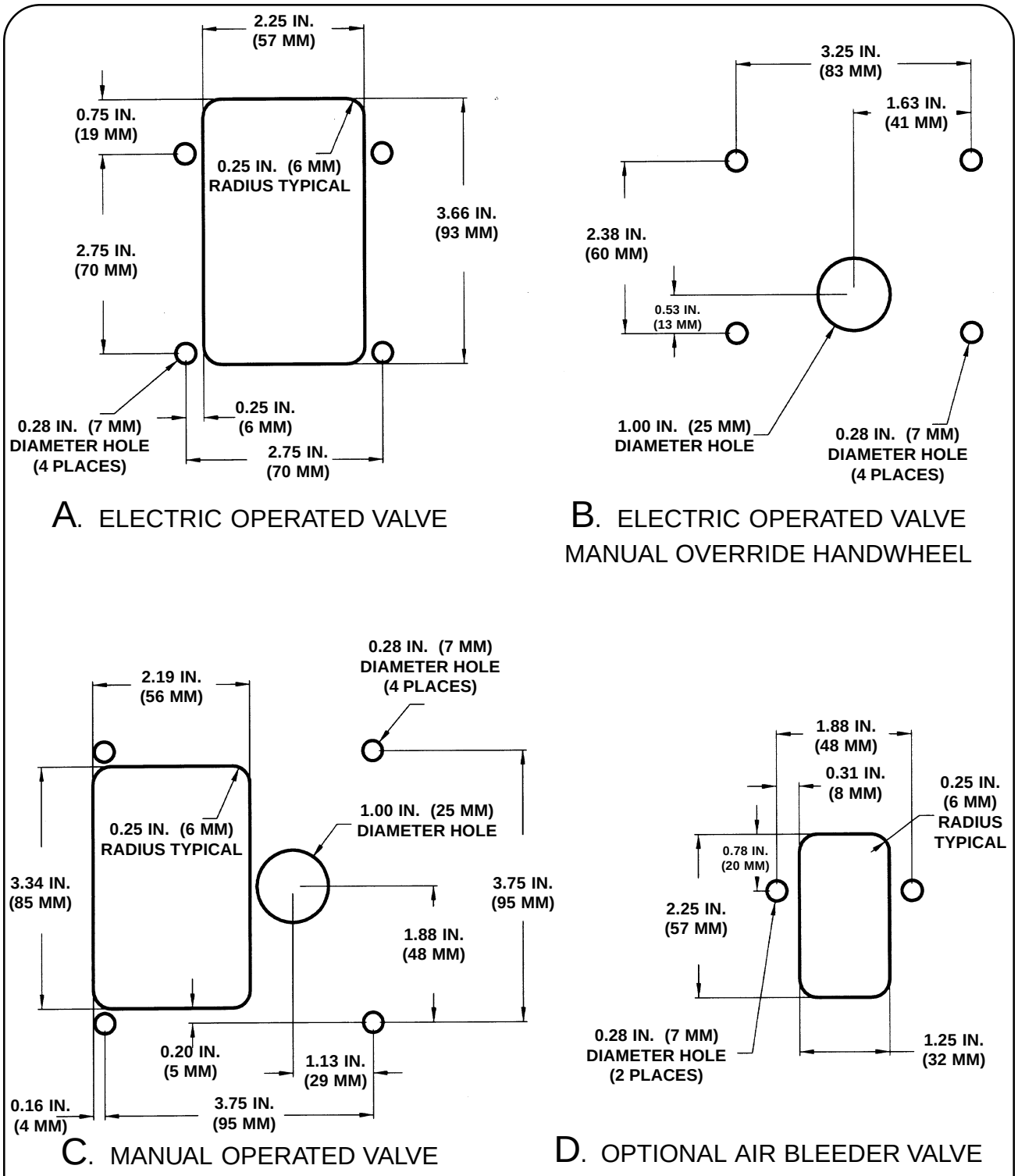


Figure 7. Master Intake Valve Panel Placard Mounting Dimensions

11. Determine location on the operator panel for the air bleeder valve and cut holes in the panel according to the dimensions shown in figure 7D.

12. Install panel placard with valve attached and secure in place using the ¼-20 UNC X 1 inch long cap screws and ¼-20 UNC nuts provided.

    WARNING: Use tubing rated at the maximum discharge pressure of the fire pump, 500 PSI (34 BAR) minimum.

13. 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.

14. 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.

F. SUCTION HOSE PRIMING

NOTE: If suction hose priming connection is not used, remove plastic shipping plug and replace with ¾ inch NPT pipe plug.

NOTE: Coat all fitting threads with a suitable sealant before connections are made.

1. Remove plastic plug from ¾ inch NPT outboard priming tap located next to relief valve.

2. Install a priming hose connection fitting into ¾ inch NPT tapped hole

3. Using hose rated at 26 in. (760 mm) Hg and 500 PSI (34 BAR) pressure, 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.

G. PANEL PLACARDS, 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.

   CAUTION: Electric motor and wiring are protected by a circuit breaker. DO NOT remove or bypass the circuit breaker as severe damage to the electric motor or apparatus wiring could result during a motor stall condition.

   WARNING: 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.

   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.

   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. This extension is used when truck panel widths exceed 74 inch (1880 mm). The extension is made to mount in one of two positions.

   a. The first position is for 81 inch (2060 mm) 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 76 inch (1930 mm) 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 81 inch panel widths both groove pins are used. While on 76 inch panel widths only one pin is used.

5. Once pump operator panel is closed install valve handwheel for manual operator.

   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 Sunoco Ultra Prestige 2EP grease or equal. Cycle the valve to check for smooth operation.

7. Hydrostatically test the fire pump and valve in accordance with accepted procedures.

H. RELIEF VALVE ADJUSTMENT

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.

WARNING: Per NFPA 1962 requirements, large diameter hose marked "SUPPLY HOSE" 3-½ to 5 inches (89 to 127 mm) diameter shall not be used at operating pressures exceeding 185 PSI (13 BAR).

WARNING: Per NFPA 1962 requirements, large diameter hose marked "SUPPLY HOSE" 6 inches (152 mm) diameter shall not be used at operating pressures exceeding 135 PSI (9 BAR).

The relief valve is factory set to open at 125 PSI (9 BAR). The relief valve can be adjusted to open from 75 to 250 PSI (5 to 17 BAR). Test and set relief valve as necessary using the following procedures and figure 5:

1. Open operator panel and gain access to the relief valve adjustment cap screw.

2. Make sure Master Intake Valve 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 valve opens or remains closed at the desired pressure.

6. Using a 3/16 inch allen wrench loosen, BUT DO NOT REMOVE, the screw that locks the pressure adjustment cap screw.

7. Using a 7/8 inch open end wrench, turn pressure adjustment cap screw to set the relief valve pressure (clockwise to increase opening pressure or counterclockwise to decrease opening pressure). Turn cap screw until relief valve just opens or closes.

8. Once relief valve opens or closes turn pressure adjustment cap screw ¼ turn in the clockwise (increase pressure) direction.

9. Lock the pressure setting by turning the adjustment locking screw until tight. Lock screw in place with wicking Loctite #290 or equivalent.

10. Turn off water source and relieve some pressure through the air bleeder allowing relief valve to reset.

11. Reenergize water source and return the pressure to the relief valve set point to verify valve opening point. Repeat adjustment procedures as necessary to verify relief valve operation.

12. Open drain valve and drain water from suction tube.

13. Disconnect water supply and remove test cap from suction tube.

14. Close operator panel and return apparatus to normal ready condition.

I. ROTATION OF GEARBOX (if necessary)

1. To avoid damage to switch rollers, manually rotate the valve to the half open position. (Approximately 5 turns from either the fully open or fully closed position.) This will place the switch sequencing slot of the shaft midway between both sets of switch rollers.

2. Remove the four 3/8-16 x 2-½ inch long cap screws that hold the gearbox to the gearbox adapter.

3. 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 and sequencing slot is between switch rollers.

4. The gearbox may now be rotated in any 90° increment.

5. Reinstall the gearbox onto the gearbox adapter by lining up square end of shaft with square bore in gearbox.

6. Apply Loctite #242 or equal to four 3/8-16 x 2-½ inch long cap screws. Tighten cap screws.

7. 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.

8. The circuit breaker, mounted on the gearmotor, should be located on the upper side of gearmotor. If not, remove the four #6-32 x 1/2 inch long socket

head screws. **Do not remove gearmotor** -the drive pin could drop out. Rotate gearmotor so circuit breaker is located toward top. Apply Loctite #242 or equal to threads of #6-32 socket head screws reinstall and tighten.

9. Be sure wiring connections are properly and firmly attached. Slide strain relief in cover cutout and slide cover over gearmotor and adapter lining up holes. Apply Loctite #242 or equal to threads of #6-32 screws reinstall and tighten.

10. 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 #242 or equal to threads of #6-32 screws reinstall and tighten.

4 OPERATION

WARNING: Per NFPA1962 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.

WARNING: Per NFPA1962 requirements, large diameter hose marked "SUPPLY HOSE" 3-½ to 5 inches (89 to 127 mm) diameter shall not be used at operating pressures exceeding 185 PSI (13 BAR).

WARNING: Per NFPA1962 requirements, large diameter hose marked "SUPPLY HOSE" 6 inches (152 mm) diameter shall not be used at operating pressures exceeding 135 PSI (9 BAR).

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.

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.

WARNING: Large diameter hose presents a tripping hazard. Use care when working around hose when in use.

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(dashed lines). (See figure 8 D).

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.

ELECTRIC MOTOR OPERATED VALVE (*HALE MIV-E*)

1. Energize 12 vdc power to pump operator panel.

   NOTE: As the valve is traversing from the CLOSED to OPEN position (or OPEN to CLOSED position) the yellow lamp will be illuminated.

   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.

2. To open valve, push toggle switch (figure 8 A) to the OPEN position and hold until the green OPEN indicator lights. 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. If apparatus configuration permits, observe the manual override handwheel on the operator panel to make sure the valve is turning. Release the switch.

MANUAL HANDWHEEL OPERATED VALVE (*HALE MIV-M*)

NOTE: As the valve is traversing from the CLOSED to OPEN position (or OPEN to CLOSED position) the yellow lamp will be illuminated.

1. To open the valve, turn handwheel (figure 8 C) 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.

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 B) 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.

COLD WEATHER OPERATION

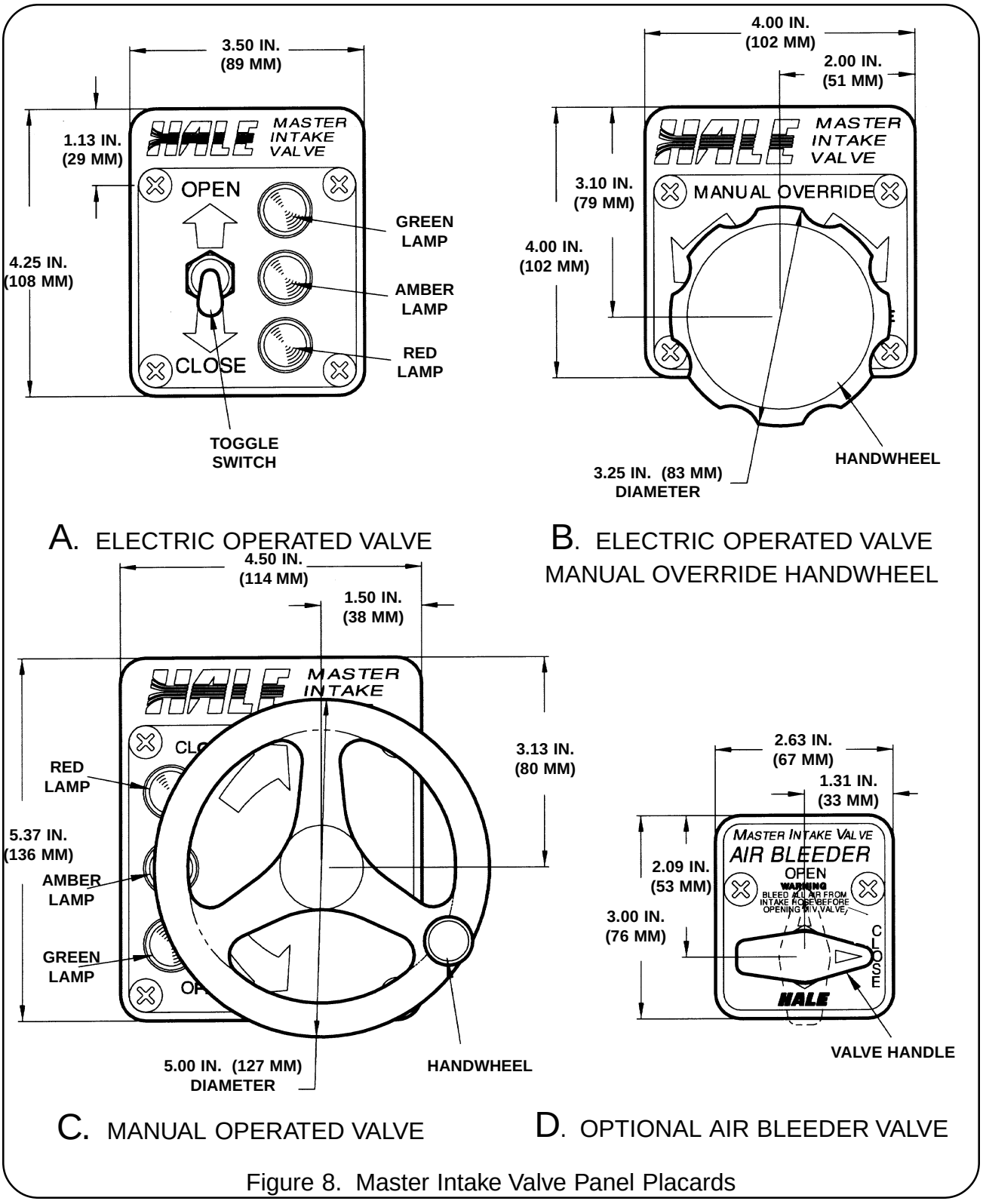
During extremely cold weather the pump and Hale MIV must be completely drained to prevent ice formation and possible damage. During cold weather operation use the following procedure for continued reliable operation.

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.

   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 A) on the operator panel from OPEN to CLOSED position jogging 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.



A. ELECTRIC OPERATED VALVE

B. ELECTRIC OPERATED VALVE MANUAL OVERRIDE HANDWHEEL

C. MANUAL OPERATED VALVE

D. OPTIONAL AIR BLEEDER VALVE

Figure 8. Master Intake Valve Panel Placards

5 MAINTENANCE

After each use:

1. Visually inspect the valve to make sure there is no debris caught between the valve body and valve disc.

2. If the system was operated with salt water, foam or contaminated water, flush valve and pump with fresh water in accordance with departmental procedures.

3. Cycle the valve to make sure the valve still operates smoothly. Apply Sunoco Ultra Prestige 2EP grease or equal to valve disc edges and to valve bore as necessary.

VALVE DISC REPLACEMENT:

If inspection of the valve disc indicates that replacement is necessary order valve disc replacement kit (Hale P/N 546-1620-00-0) and proceed as follows:

1. To avoid damage to switch rollers, manually rotate the valve to the half open position. Approximately 5 turns from either the fully open or fully closed position. This will place the switch sequencing slot in the valve shaft midway between both sets of switch rollers.

   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 $^{3}/_{8}$-16 x 2-½ 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) may come out with the gearbox. If not, remove shaft and thrust washer.

9. Remove the two $^{7}/_{16}$-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 1-½ inch socket.

    CAUTION: The stem on top of the valve disc extends approximately 1-½ 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 Sunoco Ultra Prestige 2EP grease 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 Sunoco Ultra Prestige 2EP grease 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 Sunoco Ultra Prestige 2EP grease or equal to the o-ring and pin diameter. Apply Loctite #242 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 Sunoco Ultra Prestige 2EP grease 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 **MICRO 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 and that the switch sequencing slot is midway between both sets of switch rollers. 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 #242 or equal to four $^{3}/_{8}$-16 x 2-½ inch long cap screws. Tighten cap screws.

24. Apply a light coat of Sunoco Ultra Prestige 2EP grease 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 #242 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 red (closed) lamp/motor operation versus disc position timing must be set. Refer to **MICRO SWITCH REPLACEMENT** steps 23 through 34.

MICRO SWITCH REPLACEMENT:
If inspection or if troubleshooting indicates that replacement is necessary order switch replacement kit (Hale P/N 200-1210-50-0) for MIV-M or switch replacement kit (Hale P/N 200-1210-52-0) for MIV-E and proceed as follows:

1. To avoid damage to switch rollers, manually rotate the valve to the half open position. Approximately 5 turns from either the fully open or fully closed position. This will place the switch sequencing slot in the valve shaft midway between both sets of switch rollers.

   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 4-¼ 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. Remove the four 3/8-16 x 2-½ inch long cap screws that hold the gearbox to the gearbox adapter.

9. Carefully remove gearbox (MIV-M) or gearmotor/gearbox assembly (MIV-E) from gearbox adapter.

   NOTE: The shaft and thrust washer (MIV-E) may come out with the gearbox. If not, remove the shaft and thrust washer.

10. Remove the two #10-24 x ½ long hex washer head screws that hold the switch plate assembly to the gearbox adapter. Also loosen the strain relief nut on the gearbox wiring harness.

11. Carefully remove the switch plate assembly from the gearbox adapter by feeding the wiring harness through strain relief and pulling switch plate assembly out gearbox adapter opening. Only feed out enough wiring harness to get access to the wire terminals on the switches.

12. Disconnect wire terminals from switches. Remove the four #4-40 screws that hold the switches to the switch plate.

13. Refer to figure 9. The manual valve (MIV-M) uses two switches and four #4-40 x ½ inch long screws. The electric valve (MIV-E) uses four switches, two spacers and four #4-40 x 1 inch long screws. Mount switches to switch plate and apply a coat of Loctite #242 or equal to threads of screws and install screws.

    IMPORTANT: Pinch switches toward each other when tightening screws (See figure 10. Torque screws to 5 lb-in (0.6 N-m).

14. If previously removed, insert the gearbox wiring harness through the ¾ inch NPT

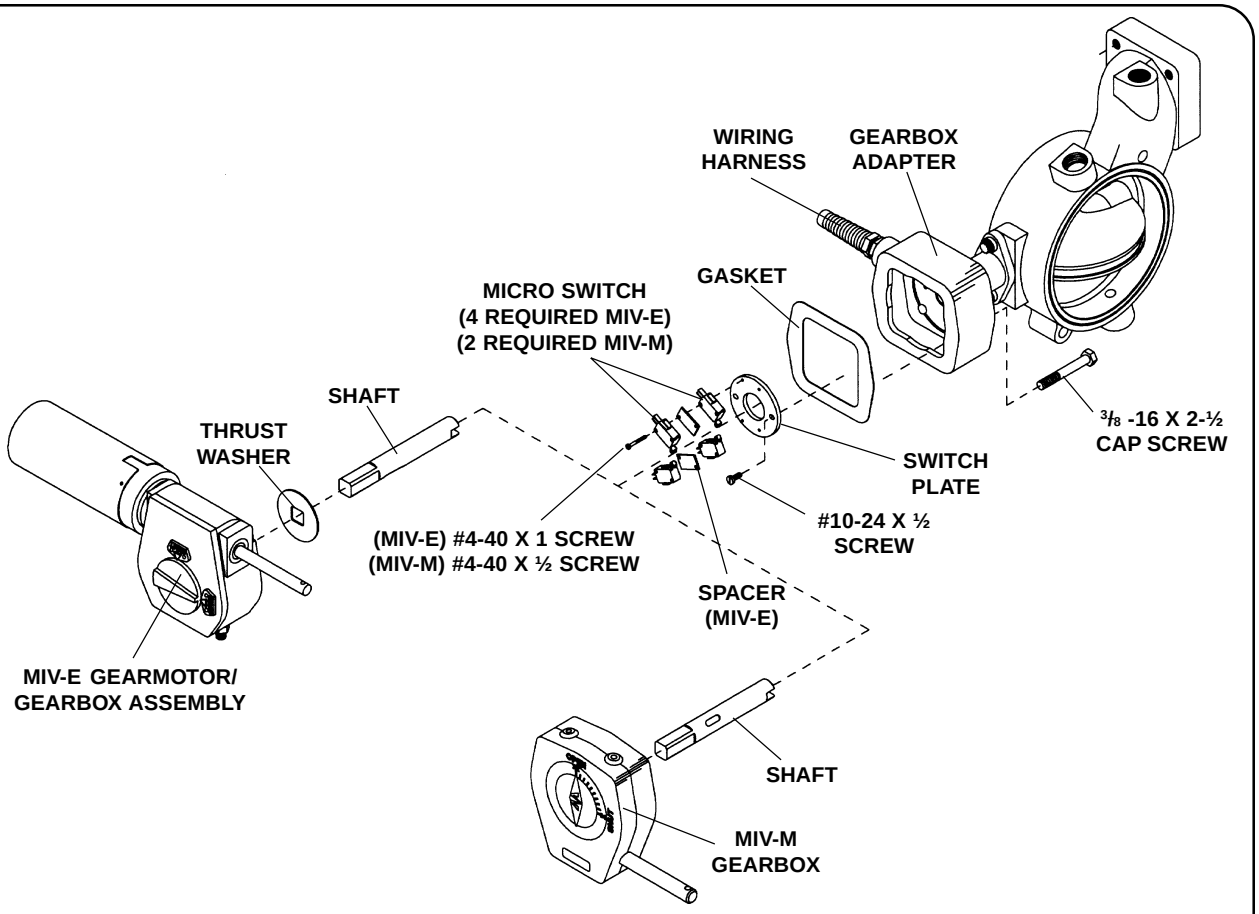


Figure 9. Micro Switch Replacement

tap in the gearbox adapter. Tighten fitting in ¾ inch NPT tap. **Do not tighten strain relief nut**. Push wires through strain relief, enough to easily attach wires to switches. Refer to wiring diagrams figure 12 for MIV-M manual valves or figure 13 for MIV-E electric valves. On electric valves the switches mounted closest (lower) to switch plate operate motor, while the upper switches operate the lights.

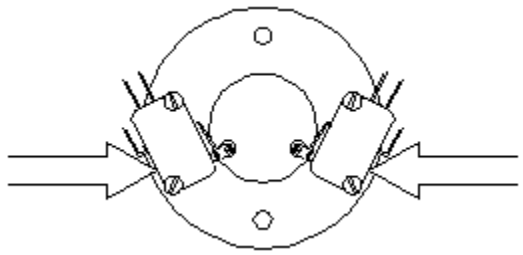
15. Carefully pull back on wiring harness and at the same time insert switch plate assembly into gearbox adapter.

16. Center switch plate assembly over the shaft bore. On newer models there is a raised pilot that switch plate centers on. Rotate switch plate to align mounting holes. Apply a coat of Loctite #242 or equal to threads of two #10-24 x ½ inch long hex washer head screws. Torque screws to 22 lb-in (2.5 N-m).

17. Tighten strain relief nut.

18. Install a new gasket to gearbox adapter.

19. 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 and that the switch sequencing slot is midway between both sets of switch rollers. 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.



PINCH MICRO SWITCHES WHERE INDICATED BY ARROWS WHILE TIGHTENING SCREWS

Figure10. Micro Switch Tightening

20. Reinstall the gearbox onto the gearbox adapter by lining up square end of shaft with square bore in gearbox.

21. Apply Loctite #242 or equal to four 3/8-16 x 2-½ inch long cap screws. Tighten cap screws.

22. Apply a light coat of Sunoco Ultra Prestige 2EP grease or equal to the valve bore and the disc edges.

23. Back out the gearbox mechanical stops. On manual valves (MIV-M) they are located under the rubber plugs on side of gearbox.

24. Connect the wiring harness and turn power on to illuminate panel placard lights.

25. Manually close valve. Using a reference point, such as the valve body mounting surface, measure the disc position. Refer to figure 11, 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.

26. Slightly loosen the two 7/16-14 x 1 inch long counterbore screws that hold the gearbox adapter to the valve body.

27. 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.

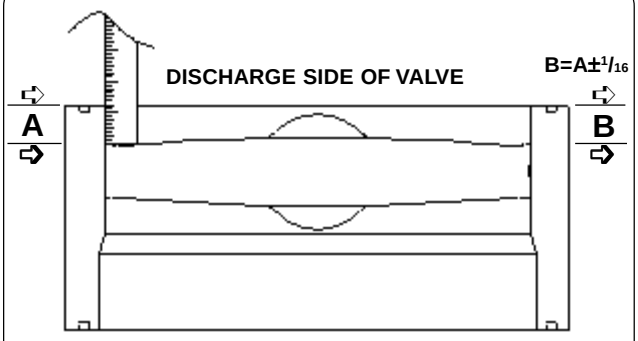
28. Operate the valve to the open position, then:
    a. Manual valves (MIV-M)
       a) Manually operate back to the closed position. Stop when the red lamp is lit.
    b. Electric valves (MIV-E)
       a) Use gearmotor to operate valve to the closed position and allow the switches to stop rotation.
       b) The lamps should sequence from amber to red then the motor should stop.

29. Measure the disc position. Refer to figure 11, the valve disc edge should be an equal distance within ±1/16 inch from this reference point.

    EXAMPLE: If A measures 5/8 inch, then B must be within 9/16 to 11/16 inch.

30. If measurement is OK proceed to step 31. Otherwise loosen gearbox adapter mounting screws and manually turn the handwheel 1/8 turn in one direction and tighten mounting screws. Repeat steps 28 and 29. If the measurement is worse than before loosen gearbox adapter mounting screws and manually turn the handwheel ¼ turn in the opposite direction and tighten mounting screws. Repeat steps 28 and 29.

31. When the disc, in the closed position, is within the ±1/16 dimension the closed position mechanical stop can be set.
    a. Manual valves (MIV-M)
       a) Tighten the screw until it stops. **Do not over tighten**. Operate valve in both



EXAMPLE: A MEASURES 5/8 INCH
B MUST MEASURE 9/16 TO 11/16 INCH

Figure11. Valve Disc Position Measurement

directions. Check lamp operation and disc stop position, if necessary back out screw a small amount until lamp and stop sequence properly.

b) Replace rubber plug.

b. Electric valves (MIV-E)

a) Operate the valve open then closed. See that motor stops, the red lamp is lit and valve disc is in the closed position.

b) Tighten the mechanical stop until it just touches the segment gear, then back out ½ to ¾ turn. Lock in place.

c) 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 ¾ turn before stopping against mechanical stop. If not back out setscrew another ¼ turn and repeat step.

32. Now operate the disc to the open position. The mechanical stop can be set.

a. Manual valves (MIV-M)

a) 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) Replace rubber plug.

b. Electric valves (MIV-E)

a) Operate the valve to the open position. See that motor stops, the green lamp is lit and valve disc is in the open position.

b) Tighten the mechanical stop until it just touches the segment gear, then back out ½ to ¾ turn. Lock in place.

c) 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 ¾ turn before stopping against mechanical stop. If not back out setscrew another ¼ turn and repeat step.

33. Close the operator panel and install the handwheel.

WARNING: Keep hands and arms clear of the valve disc when valve is being operated without suction tube strainer or suction tube in place.

34. Cycle the valve to ensure smooth operation.

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.

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.

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 3/16 inch Allen wrench remove the pressure adjustment cap screw locking screw.

5. Using a 7/8 inch open end wrench, remove the pressure adjustment cap screw to relieve pressure on the adjustment spring.

6. Using a ¼ inch Allen wrench remove the four 3/8-16 x 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. Aline valve bonnet on end cap and secure in place using the four 3/8-16 x 7/8 inch long socket head cap screws. Tighten screws using ¼ 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.

Fastener Torque Specifications: Unless otherwise specified use the following torque values for fasteners used on MIV valves.

TORQUE TABLE	
SCREW SIZE	**VALUE (+-10%)**
#4-40	5 lb-in (0.6 N-m)
#6-32	10 lb-in (1.1 N-m)
#10-24	22 lb-in (2.5 N-m)
M6	32 lb-in (3.6 N-m)
3/8-16 (MIV-M)	15 lb-ft (20 N-m)
3/8-16 (MIV-E)	25 lb-ft (34 N-m)
7/16-14	40 lb-ft (54N-m)
LOWER TRUNION	120 lb-ft (163 N-m)

Table 1. Fastener Torque Values

6 TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
Valve is difficult to open or close (Electric valve must be manually operated to 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
MIV-E valve is difficult to operate (tight through complete operating range) Refer to Table 2 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 531-0150-50-0).
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.

SYMPTOM	PROBABLE CAUSE	REMEDY
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 gasket P/N 046-6640-00-0 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 200-1250-50-0 and adjust gearbox mechanical stops. 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 531-0150-50-0)
	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 200-1250-50-0 and adjust gearbox mechanical stops.
One or more panel lamps do not sequence properly, flicker or light incorrectly and/or motor doesnot operate properly	No 12 VDC Power	Energize battery master switch Check wiring connections
	Bulb burnt out (No effect on motor operation)	Replace bulb with P/N 200-0540-02-0
	Defective micro switch	Check micro-switch operation. If micro-switch is defective replace switchesusing micro-switch replacement kit (P/N 200-1210-50-0 for MIV-M and P/N 200-1210-52-0 for MIV-E).
	Wire shorted out	Check wiring for abrasion, cuts and wear. Repair as necessary

SYMPTOM	PROBABLE CAUSE	REMEDY
Amber lamp stays lit; does not change to green or red when valve is either fully open or closed (on MIV-E valve turning the manual override handwheel a slight amount changes light)	MIV-M 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 micro switch(es). Refer to "Micro Switch Replacement"
	MIV-E Upper micro switch roller too close to lower sequencing slot in shaft	Add switch spacer (P/N 159-1520-00-0) between switches
	Incorrectly wired micro switch(es)	Refer to wiring diagrams Figures 12 and 13.

MASTER INTAKE VALVE MAXIMUM OPERATING TORQUE		
TO OPEN	TO CLOSE	RUNNING
100 lb-in (11 N-m)	100 lb-in (11 N-m)	25 lb-in (3 N-m)

Table 2. Maximum Operating Torque

NOTE: On MIV-M valves the maximum force at the knob on the handwheel is 46 lb (205 N) to open or close and 11 lb (49 N) running.

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. To check for proper operation remove gearbox mechanical stops (long set screws) from gearbox.

3. 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.

   CAUTION: Do not allow segment gear in gearbox to hit gear housing or damage could result to gearmotor.

4. If valve continues to rotate past legend by about 3/8 inch **STOP.** Try operating valve in opposite direction, valve should not operate if over-travel (indicator moving past legend) occurred.

5. Manually turn valve back in opposite direction until amber light illuminates.

6. Carefully operate the valve in the opposite direction using panel toggle switch and repeat steps 3 and 4 above.

7. 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 Figure 13 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.

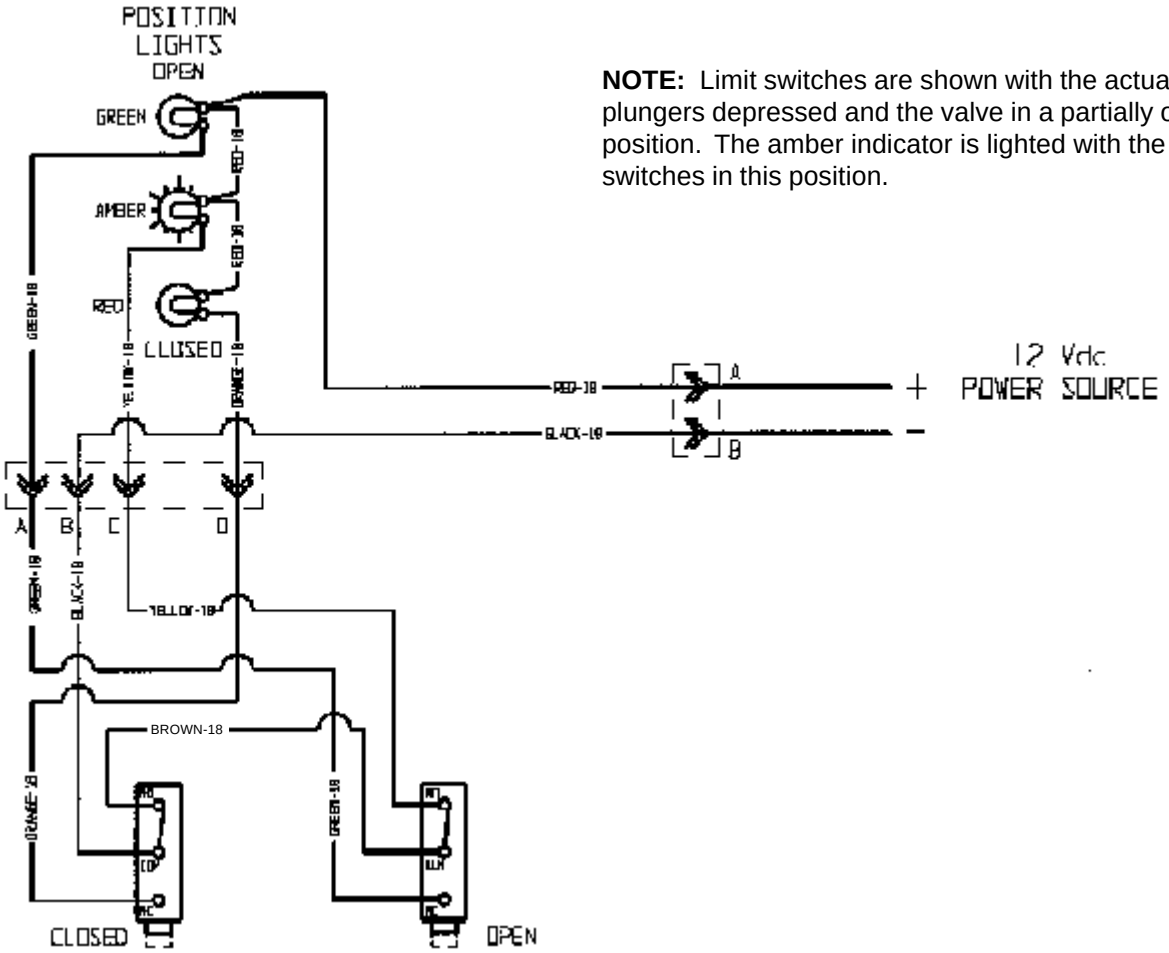
8. Operate the valve open then closed. See that motor stops, the red lamp is lit and the valve disc is in the closed position.

9. Tighten the mechanical stop until it just touches the segment gear, then back out ½ to ¾ turn. Lock in place.

10. 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 ¾ turn before stopping against mechanical stop. If not, back out setscrew another ¼ turn and repeat step.

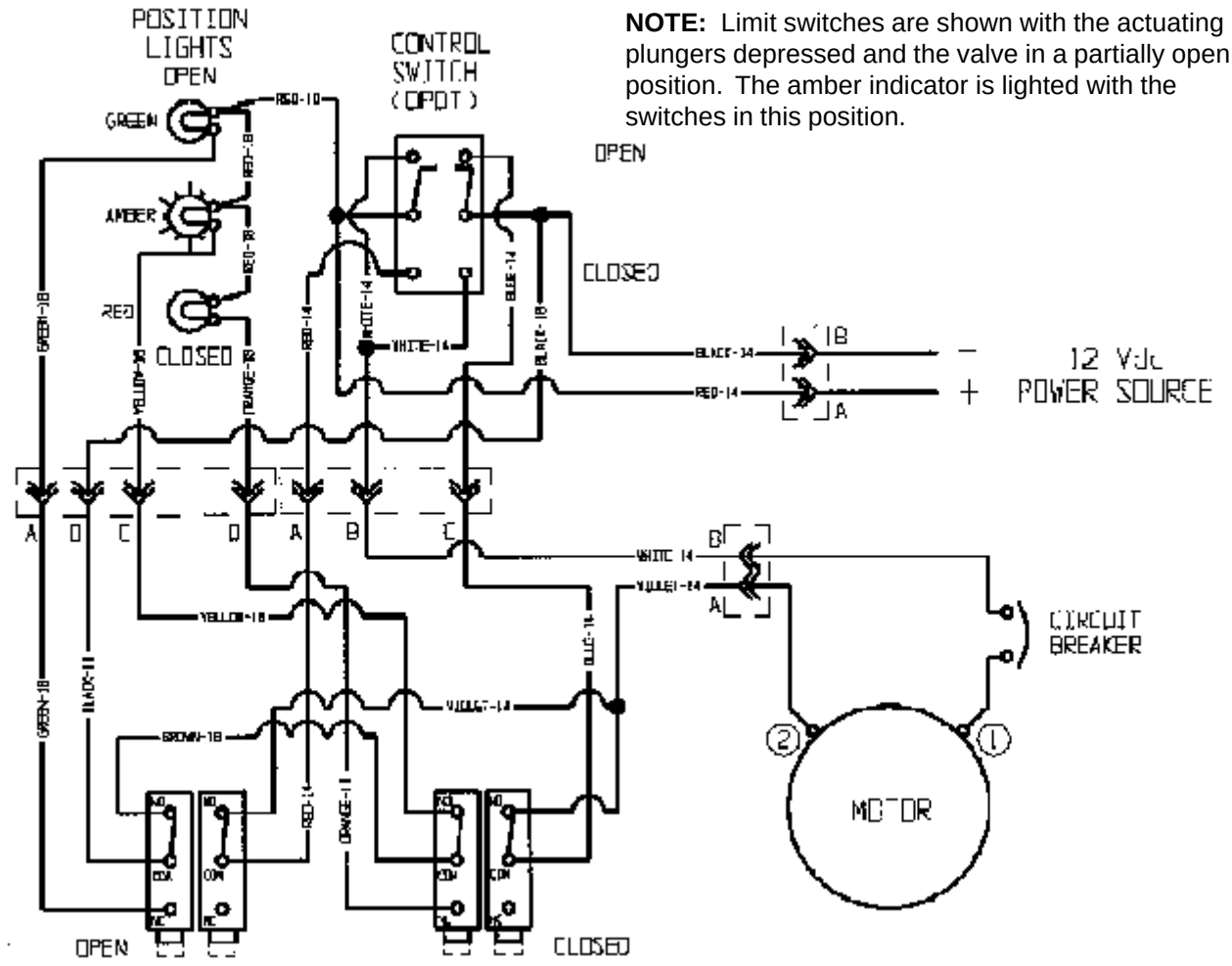
11. Operate the valve to the open position. See that motor stops, the green lamp is lit and valve disc is in the open position.

12. Tighten the mechanical stop until it just touches the segment gear, then back out ½ to ¾ turn. Lock in place.



NOTE: Limit switches are shown with the actuating plungers depressed and the valve in a partially open position. The amber indicator is lighted with the switches in this position.

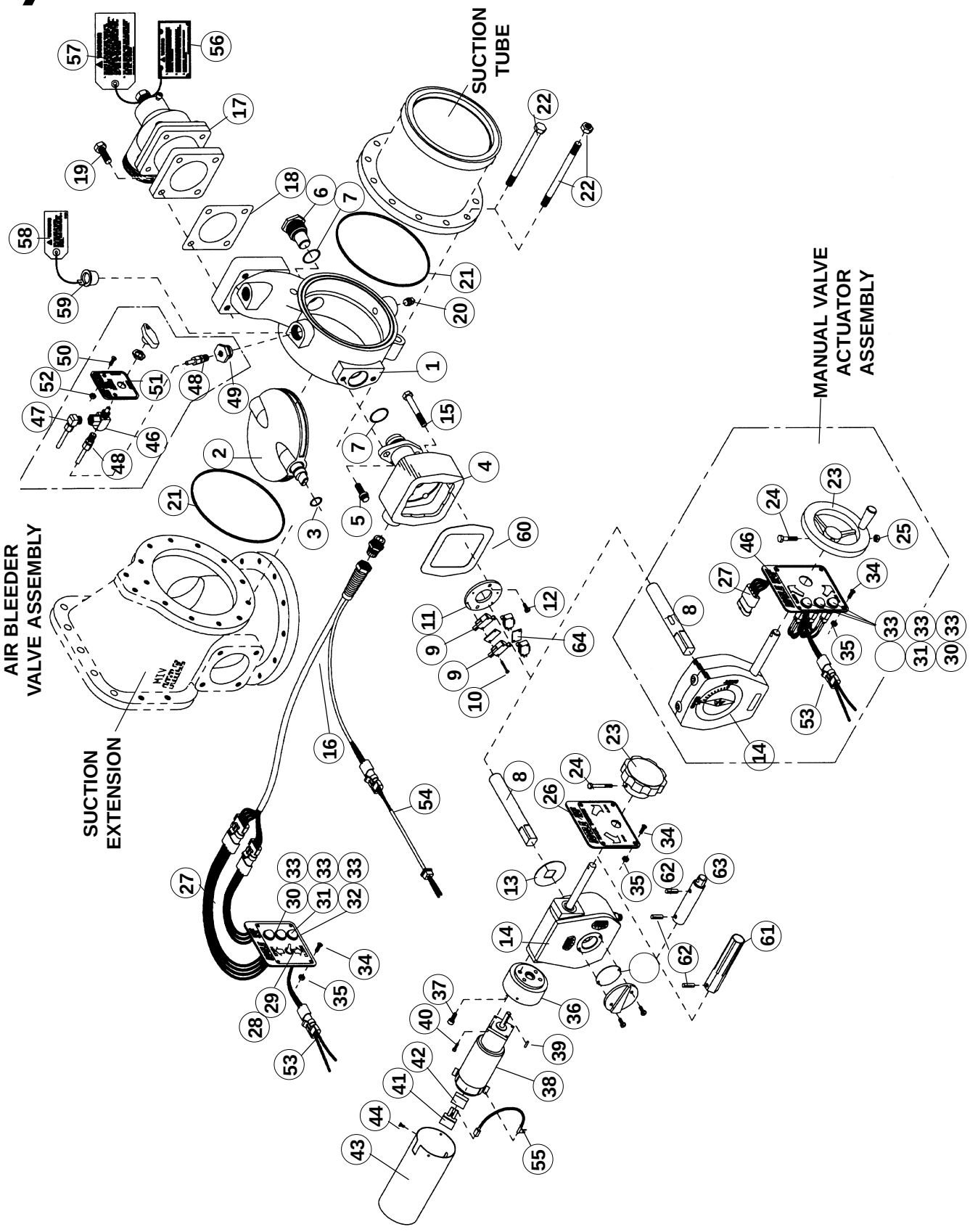
Figure 12. Manual Valve Wiring Diagram



NOTE: Limit switches are shown with the actuating plungers depressed and the valve in a partially open position. The amber indicator is lighted with the switches in this position.

Figure 13. Electric Valve Wiring Diagram

7 PARTS LIST


SUCTION TUBE
MANUAL VALVE ACTUATOR ASSEMBLY
AIR BLEEDER VALVE ASSEMBLY
SUCTION EXTENSION

PARTS LIST

Item	Part Number	Qty	Name Of Part
	538-1560-00-0		MANUALLY OPERATED MASTER INTAKE VALVE ASSEMBLY (MIV-M)
	538-1560-20-0		ELECTRIC MOTOR OPERATED MASTER INTAKE VALVE ASSEMBLY (MIV-E)
	538-1560-25-0		ELECTRIC MOTOR OPERATED BOTTOM MOUNT MASTER INTAKE VALVE ASSEMBLY (MIV-E) (RIGHT SIDE FRONT)
	538-1560-27-0		ELECTRIC MOTOR OPERATED BOTTOM MOUNT MASTER INTAKE VALVE ASSEMBLY (MIV-E) (LEFT SIDE FRONT)
1	038-1740-01-0	1	BODY
2	505-0230-00-0	1	DISC
3	040-1159-00-0	1	QUAD-RING
4	007-3250-00-0	1	GEARBOX ADAPTER
5	018-1810-22-0	2	SCREW, 7/16-14 X 1 LG. COUNTERBORE
6	041-0520-00-0	1	TRUNNION
7	040-9160-00-0	2	O-RING
8	037-2110-00-0	1	SHAFT, MANUALLY OPERATED VALVE (MANUFACTURED AFTER AUGUST 1997)
	037-1940-01-0	1	SHAFT, MANUALLY OPERATED VALVE (MANUFACTURED BEFORE AUGUST 1997)
	037-2110-01-0	1	SHAFT, ELECTRIC MOTOR OPERATED VALVE (MANUFACTURED AFTER AUGUST 1997)
	037-1941-01-0	1	SHAFT, ELECTRIC MOTOR OPERATED VALVE (MANUFACTURED BEFORE AUGUST 1997)
9	200-1210-00-0	2	POSITION MICRO SWITCH, MANUALLY OPERATED VALVE
	200-1210-00-0	4	POSITION MICRO SWITCH, ELECTRIC MOTOR OPERATED VALVE
10	018-0404-45-0	4	SCREW- #4-40 X ½ LG. , MANUALLY OPERATED VALVE
	018-0410-45-0	4	SCREW- #4-40 X 1 LG. , ELECTRIC MOTOR OPERATED VALVE
11	005-1210-00-0	1	SWITCH MOUNTING PLATE
12	018-1004-27-0	2	SCREW- #10-24 X ¼ LG.
13	097-1950-00-0	1	THRUST WASHER, ELECTRIC MOTOR OPERATED VALVE (MANUFACTURED BEFORE AUGUST 1997)
14	531-0150-00-0	1	GEARBOX, ELECTRIC MOTOR OPERATED VALVE
	531-0160-00-0	1	GEARBOX, MANUALLY OPERATED VALVE
15	018-1624-02-0	4	SCREW 3/8-16 X 2-½ LG.
16	513-0270-01-0	1	GEARBOX WIRING HARNESS, MANUALLY OPERATED VALVE
	513-0270-00-0	1	GEARBOX WIRING HARNESS, ELECTRIC MOTOR OPERATED VALVE
17	538-1550-00-0	1	RELIEF VALVE
18	046-0050-00-0	1	GASKET
19	018-1812-02-0	4	SCREW, 7/16-14 X 1-¼ LG.
20	217-4003-05-0	1	¼ INCH CAPPLUG
21	142-0110-00-0	2	SQUARE SEAL RING
22	018-1846-02-0	8	SCREW, 7/16-14 X 4-¾ LG.
	018-1854-02-0	8	SCREW, 7/16-14 X 5-½ LG. (BOTTOM MOUNT)
	018-8260-02-0	2	STUD, 7/16-14 X 5-¼ LG.
	018-8260-01-0	2	STUD, 7/16-14 X 6-½ LG. (BOTTOM MOUNT)
	110-1800-02-0	2	NUT, 7/16-14
23	512-0070-00-0	1	MANUAL HAND WHEEL, MANUALLY OPERATED VALVE
	012-1420-00-0	1	MANUAL OVERRIDE HANDWHEEL, ELECTRIC MOTOR OPERATED VALVE
24	018-1214-45-0	1	HAND WHEEL RETAINING SCREW, MANUALLY OPERATED VALVE
	018-1212-61-0	1	HAND WHEEL RETAINING SCREW, ELECTRIC MOTOR OPERATED VALVE
25	110-1205-11-0	1	HAND WHEEL RETAINING NUT, MANUALLY OPERATED VALVE

PARTS LIST (Cont'd)

Item	Part Number	Qty	Name Of Part
26	101-1480-02-0	1	MANUAL OVERRIDE PANEL PLACARD, ELECTRIC MOTOR OPERATED VALVE
27	513-0270-52-0	1	PANEL PLACARD AND WIRING HARNESS ASSEMBLY, ELECTRIC MOTOR OPERATED VALVE
	513-0270-53-0	1	PANEL PLACARD AND WIRING HARNESS ASSEMBLY, MANUALLY OPERATED VALVE
28	200-1220-00-0	1	CONTROL SWITCH, ELECTRIC MOTOR OPERATED VALVE
29	200-1220-01-0	1	CONTROL SWITCH BOOT, ELECTRIC MOTOR OPERATED VALVE
30	200-0540-01-0	1	GREEN LIGHT ASSEMBLY
31	200-0540-04-0	1	AMBER LIGHT ASSEMBLY
32	200-0540-11-0	1	RED LIGHT ASSEMBLY
33	200-0540-02-0	3	14 VOLT BULB
34	018-1205-44-0	8	PLACARD RETAINING SCREW, ELECTRIC MOTOR OPERATED VALVE
	018-1205-44-0	4	PLACARD RETAINING SCREW, MANUALLY OPERATED VALVE
35	110-1200-02-0	8	PLACARD RETAINING NUT, ELECTRIC MOTOR OPERATED VALVE
	110-1200-02-0	4	PLACARD RETAINING NUT, MANUALLY OPERATED VALVE
36	007-3330-00-0	1	GEARMOTOR ADAPTER, ELECTRIC MOTOR OPERATED VALVE
37	218-0608-08-0	4	SCREW, M6 X 16MM LG. SOC. HD., ELECTRIC MOTOR OPERATED VALVE
38	200-1250-50-0	1	GEARMOTOR ASSEMBLY, ELECTRIC MOTOR OPERATED VALVE (INCLUDES ITEMS 41 &42)
39	064-6350-00-0	1	DRIVE PIN (1/8 DIA. X 7/8 LG.) , ELECTRIC MOTOR OPERATED VALVE
40	018-0604-08-0	4	SCREW, #6-32 X ½ LG. SOCKET HEAD, ELECTRIC MOTOR OPERATED VALVE
41	200-1240-00-0	1	CIRCUIT BREAKER, ELECTRIC MOTOR OPERATED VALVE
42	048-1080-01-0	1	CIRCUIT BREAKER MOUNTING PAD, ELECTRIC MOTOR OPERATED VALVE
43	044-1480-00-0	1	GEARMOTOR COVER, ELECTRIC MOTOR OPERATED VALVE
44	018-0604-45-0	4	SCREW, #6-32 X ½ LG. , ELECTRIC MOTOR OPERATED VALVE
45	538-1540-00-0	1	OPTIONAL AIR BLEEDER VALVE ASSEMBLY
46	038-1760-00-0	1	AIR BLEEDER VALVE
47	082-0203-02-0	1	ELBOW, ¼ INCH NPT X 3/8 TUBE COMPRESSION
48	082-0206-02-0	2	FITTING, ¼ INCH NPT X 3/8 TUBE COMPRESSION
49	082-0513-02-0	1	BUSHING, ¾ INCH NPT X ¼ INCH NPT
50	101-1480-03-0	1	AIR BLEEDER PANEL PLACARD
51	018-1205-44-0	2	PLACARD RETAINING SCREW
52	110-1200-02-0	2	PLACARD RETAINING NUT
53	513-0270-04-0	1	POWER CABLE WIRING HARNESS
54	513-0270-05-0	1	GEARMOTOR WIRING HARNESS, ELECTRIC MOTOR OPERATED VALVE
55	013-1360-00-0	1	WHITE WIRE, ELECTRIC MOTOR OPERATED VALVE
56	101-1570-00-0	2	RELIEF VALVE WARNING PLACARD (ONE SHIPPED LOOSE)
57	101-1540-00-0	1	RELIEF VALVE WARNING TAG
58	101-1540-01-0	1	AIR BLEED WARNING TAG
59	217-4006-00-0	1	AIR BLEED CAPPLUG
60	046-6650-00-0	1	GEARBOX ADAPTER GASKET
61	041-0560-00-0	1	VALVE EXTENSION, BOTTOM MOUNT
62	064-7330-00-0	1	GROOVE PIN, BOTTOM MOUNT
	064-7330-00-0	2	GROOVE PIN, USE WITH 76 AND 81 INCH PANEL WIDTHS
63	041-0550-00-0	1	GEAR ACTUATOR SHAFT EXTENSION, USE WITH 76 AND 81 INCH PANEL WIDTHS
64	159-1520-00-0	2	SWITCH SPACER, ELECTRIC MOTOR OPERATED VALVE
65	046-6640-00-0	1	INDICATOR GASKET, ELECTRIC MOTOR OPERATED VALVE

VALVE DISC REPLACEMENT KIT

546-1620-00-0	1	VALVE DISC REPLACEMENT KIT

Consists of the following items:

505-0230-00-0	1	DISC
040-1159-00-0	1	QUAD-RING
040-9160-00-0	2	TRUNNION SEAL
046-6650-00-0	1	GEARBOX ADAPTER GASKET
142-0110-00-0	2	SQUARE SEAL RING

GEARMOTOR/GEARBOX REPLACEMENT ASSEMBLY

531-0150-50-0	1	GEARMOTOR/GEARBOX REPLACEMENT ASSEMBLY

Consists of the following items:

531-0150-00-0	1	GEARBOX
007-3330-00-0	1	GEARMOTOR ADAPTER
218-0608-08-0	4	SCREW, M6 x 16mm LG. SOC. HD.
064-6350-00-0	1	DRIVE PIN (1/8 DIA. x 7/8 LG.)
200-1250-50-0	1	GEARMOTOR ASSEMBLY
018-0604-08-0	4	SCREW, #6-32 x ½ LG. SOC. HD.
013-1360-00-0	1	GEARMOTOR WHITE WIRE
513-0270-05-0	1	GEARMOTOR WIRE HARNESS
044-1480-00-0	1	GEARMOTOR COVER
018-0604-45-0	4	SCREW, #6-32 x ½ LG. RD. HD.
101-0850-44-0	1	INSTRUCTION SHEET

MICRO SWITCH REPLACEMENT KITS

200-1210-50-0	1	MICRO SWITCH REPLACEMENT KIT, MANUALLY OPERATED VALVE

Consists of the following items:

200-1210-00-0	2	POSITION MICRO SWITCH
018-0404-45-0	4	SCREW, #4-40 x ½ LG. RD. HD.
046-6650-00-0	1	GEARBOX ADAPTER GASKET
101-0850-49-0	1	INSTRUCTION SHEET

200-1210-52-0	1	MICRO SWITCH REPLACEMENT KIT, ELECTRIC MOTOR OPERATED VALVE

Consists of the following items:

200-1210-00-0	4	POSITION MICRO SWITCH
159-1520-00-0	2	SWITCH SPACER
018-0410-45-0	4	SCREW, #4-40 x 1" LG. RD. HD.
046-6650-00-0	1	GEARBOX ADAPTER GASKET
101-0850-49-0	1	INSTRUCTION SHEET

8 WARRANTY

LIMITED WARRANTY

EXPRESS WARRANTY. Hale Products Inc. ("Hale") hereby warrants to the original buyer that products manufactured by it are free of defects in material and workmanship for two (2) years or 2000 hours usage, whichever shall first occur. The "Warranty Period" commences on the date the Product is first placed in service.

LIMITATIONS. HALE'S obligation is expressly conditioned on the Product being.

- Subjected to nominal 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; 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.

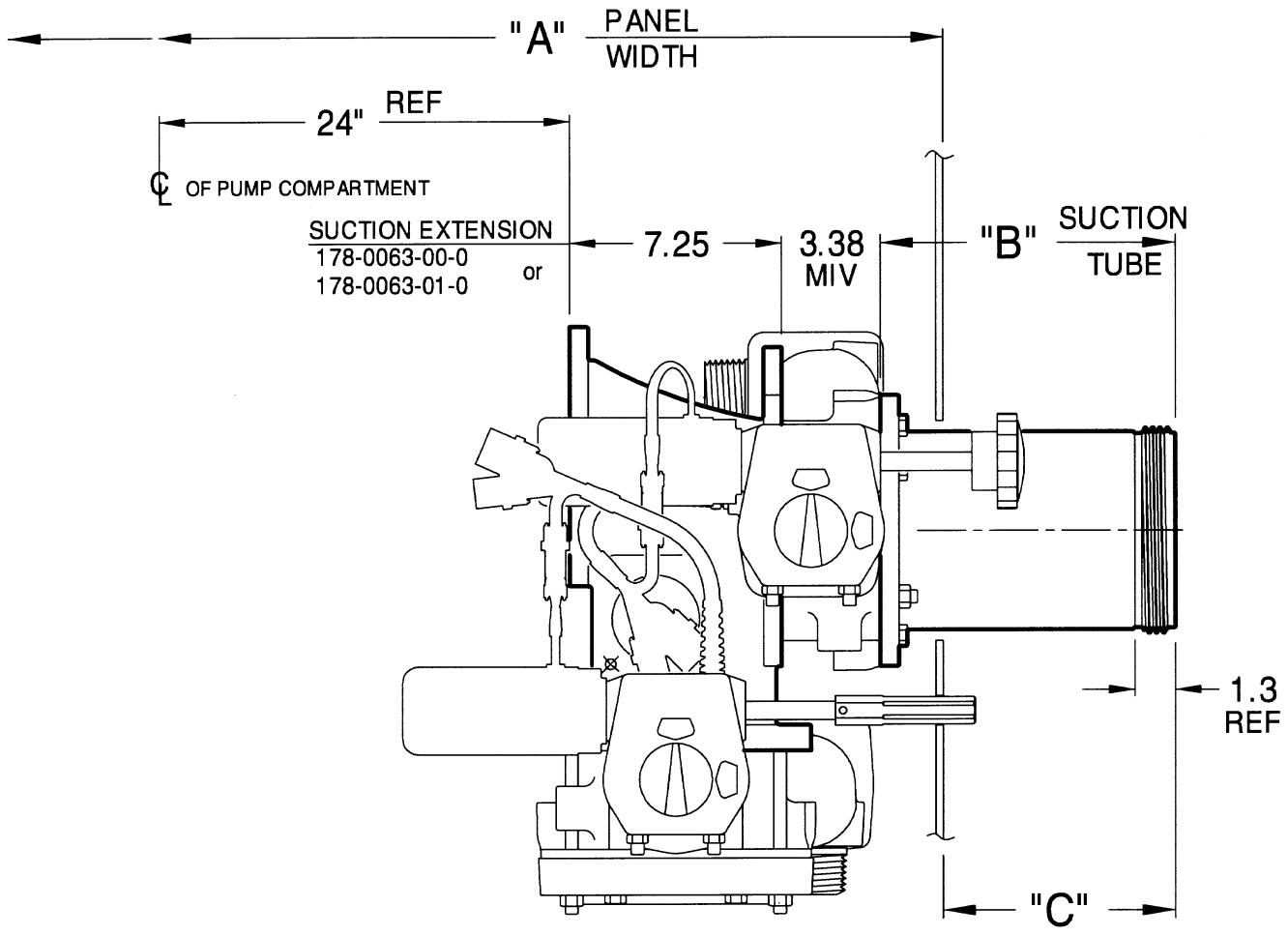
EXCLUSIVE REMEDIES. If Buyer promptly notifies HALE upon discovery of any such defect (within the Warranty Period), the following terms shall apply:

- Any notice to HALE must be in writing, identifying the Product (or component) claimed defective 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, HALE will provide a Returned Goods Authorization and Buyer must return the Product F.O.B. within (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 DAMAGES 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 THE PRODUCT FAILURE.

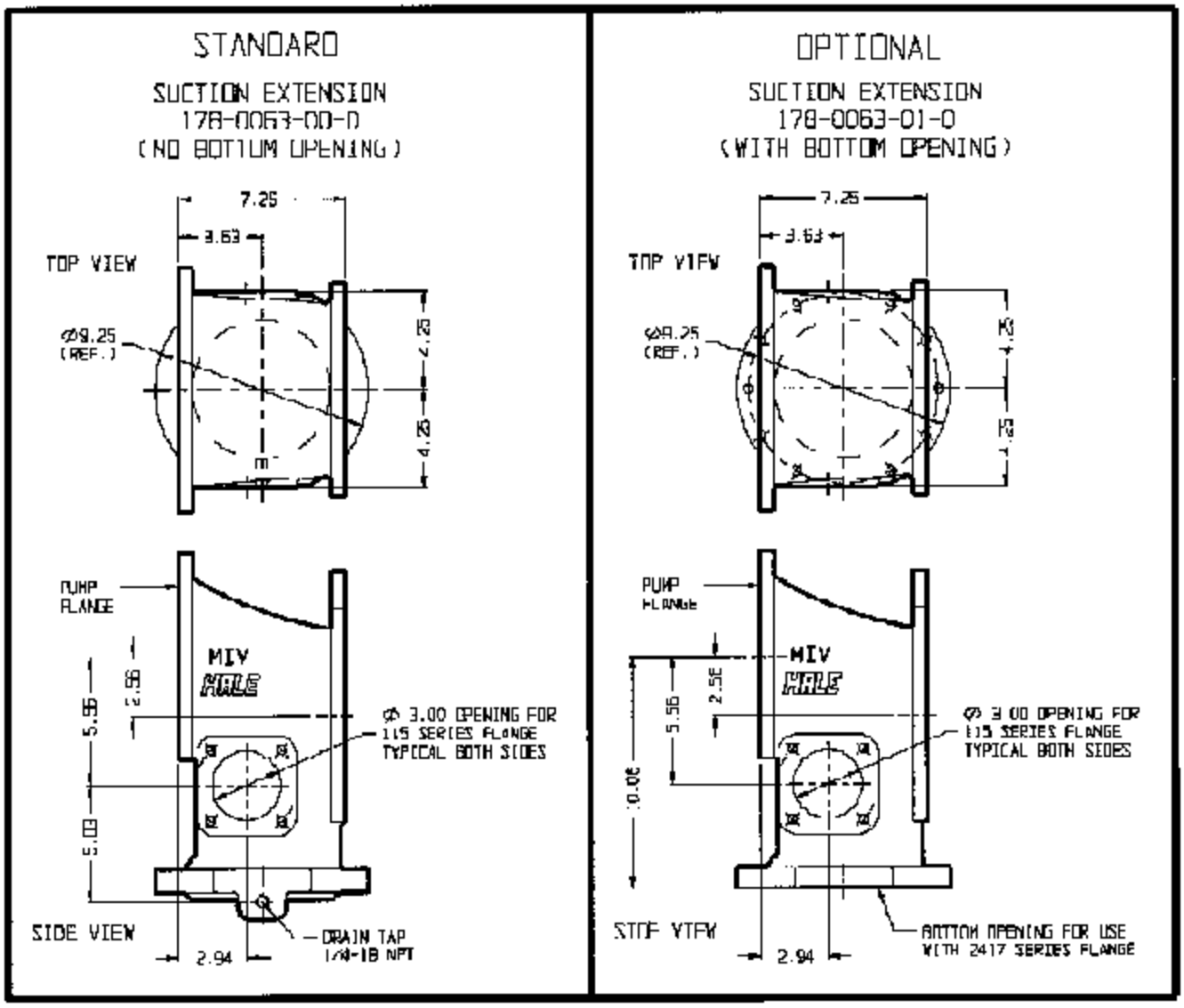
9 INSTALLATION DIMENSIONS

Suction Tube Length versus Truck Panel Width

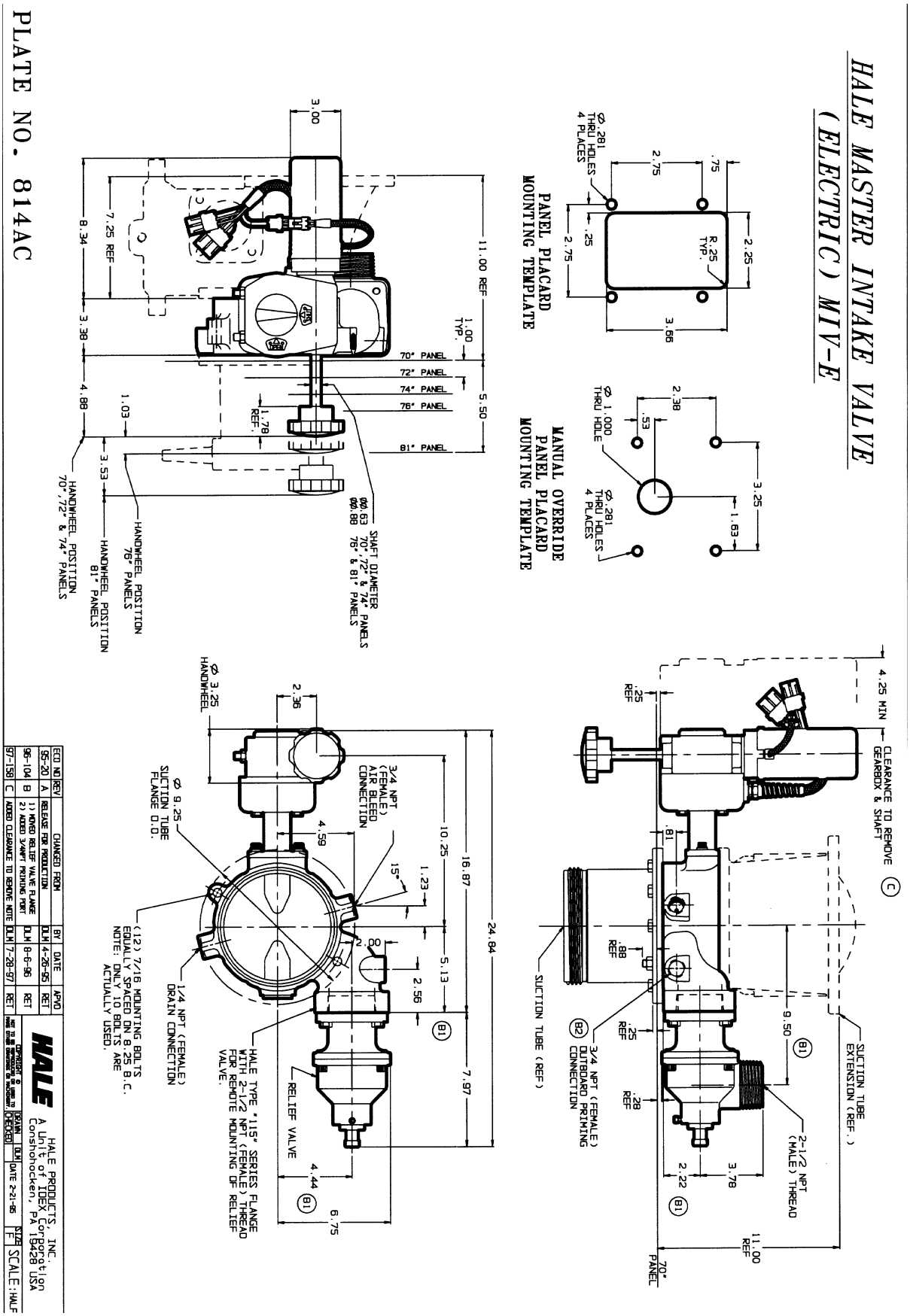


Suction Tube Length "B"	Truck Panel Width "A"					
	70"	72"	74"	76"	78"	81"
	Dimension "C"					
4" 007-0030-06-0 (6)	3.62	2.62	1.62	N/A	N/A	N/A
6" 007-0010-00-0 (4-1/2) 007-0020-00-0 (5) 007-0030-00-0 (6)	5.62	4.62	3.62	2.62	1.62	N/A
9" 007-0110-00-0 (4-1/2) 007-0120-00-0 (5) 007-0130-00-0 (6)	8.62	7.62	6.62	5.62	4.62	3.12

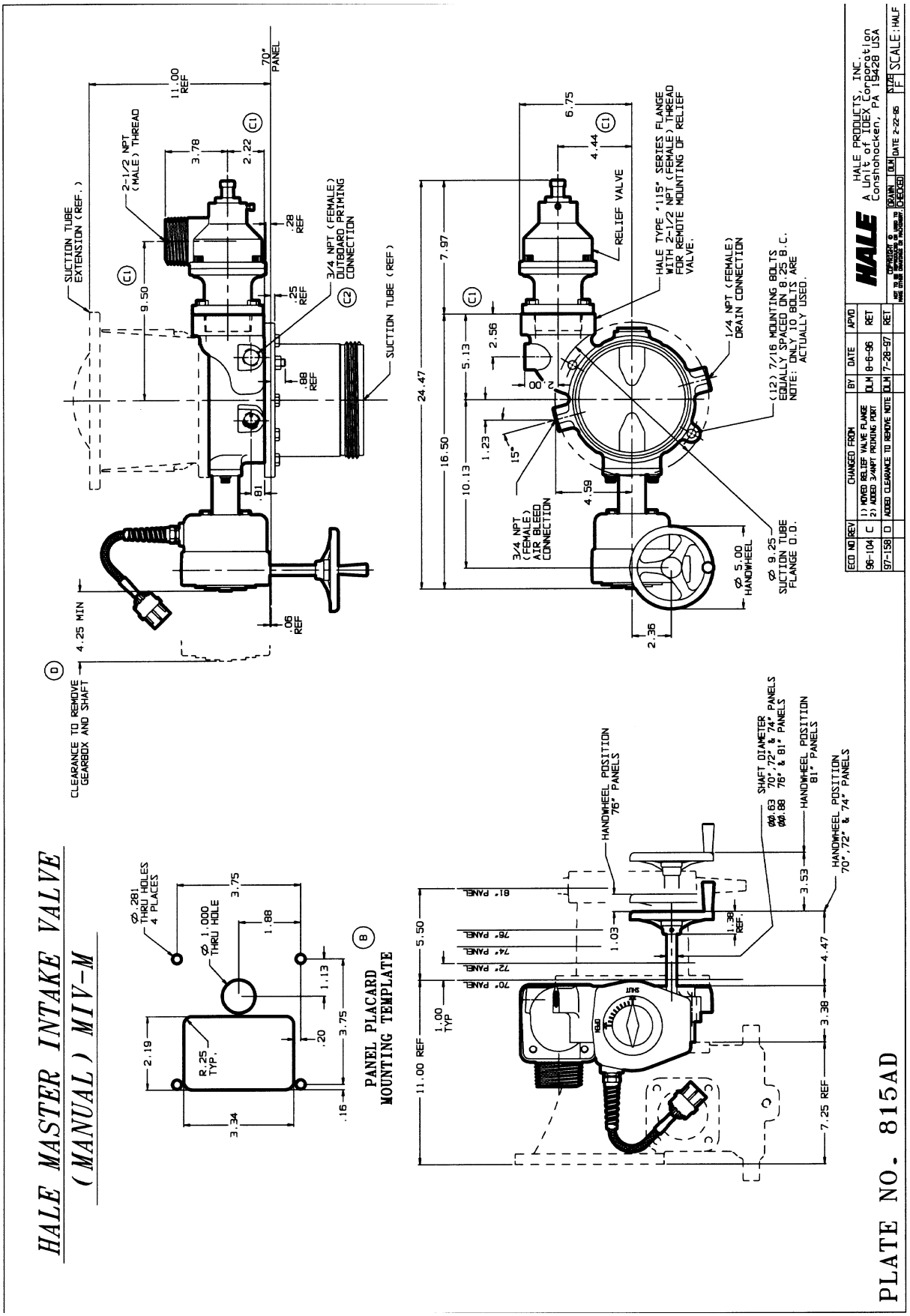
Bulletin 596 REV A



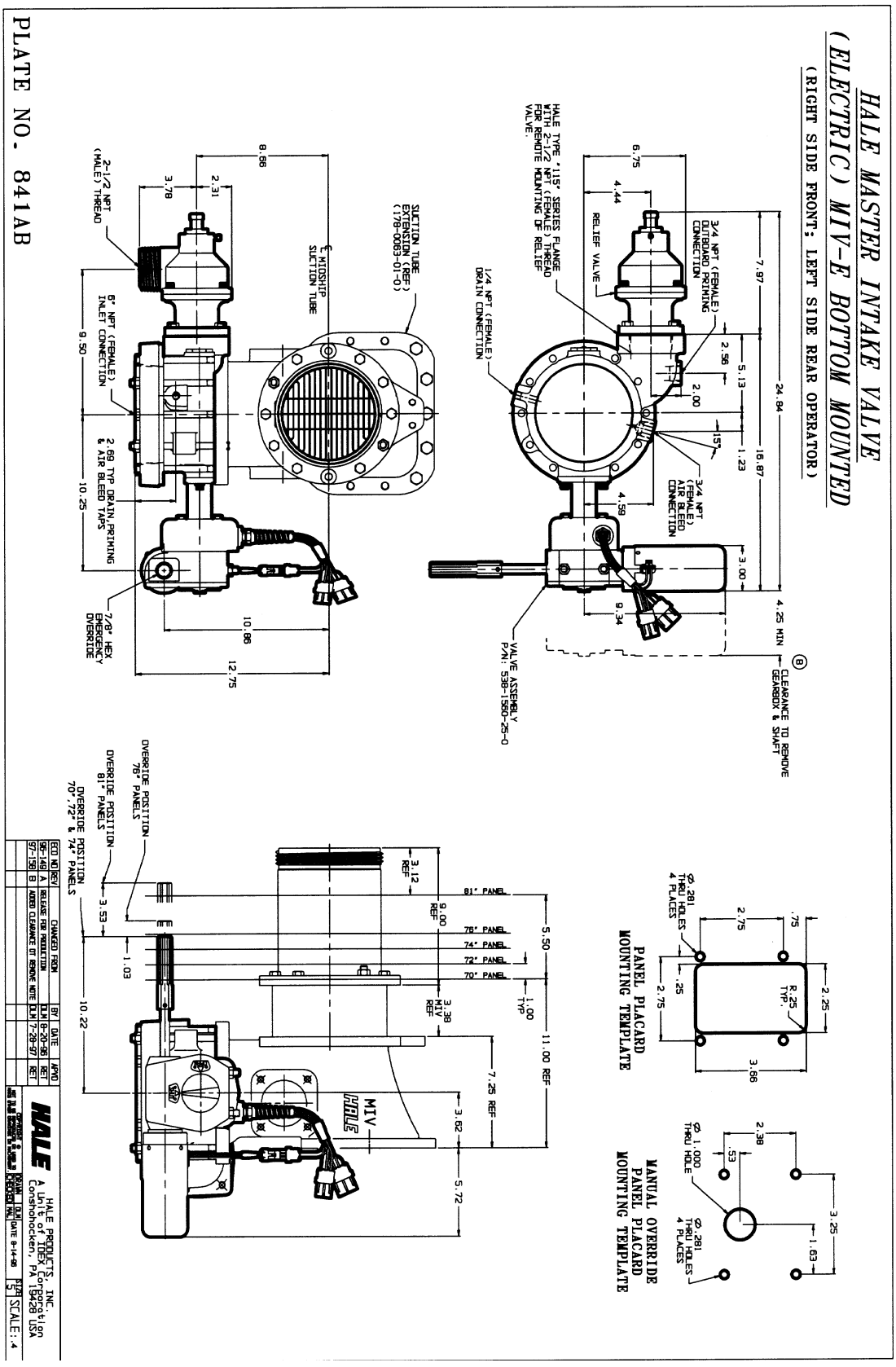
Suction Tube Extension Options



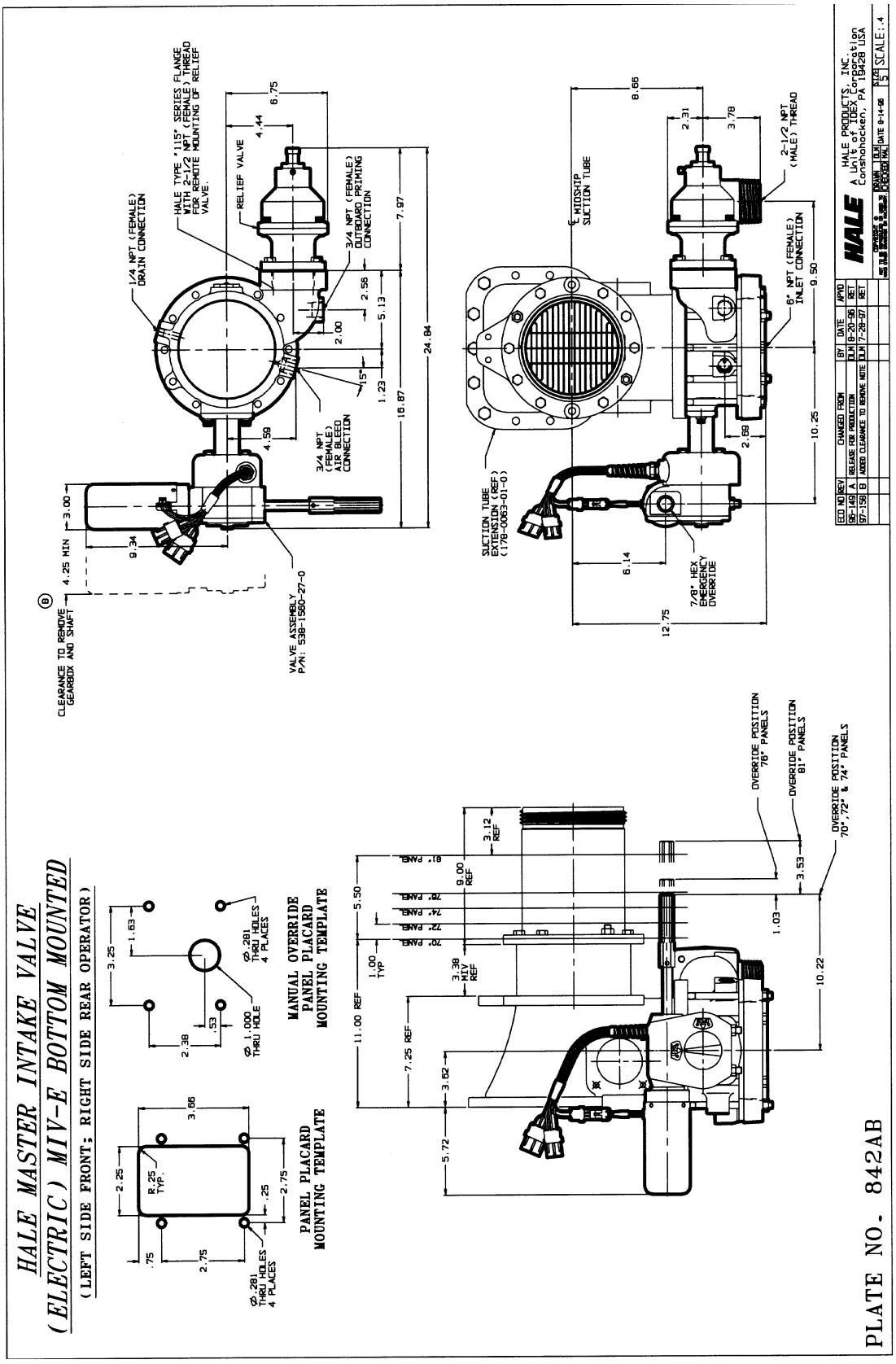
Hale MIV-E mounting dimensions



Hale MIV-M mounting dimensions



Hale MIV-E Bottom Suction Mounting Dimensions
(Right Side Front, Left Side Rear Operator)



Hale MIV-E Bottom Suction Mounting Dimensions
(Right Side Rear, Left Side Front Operator)