

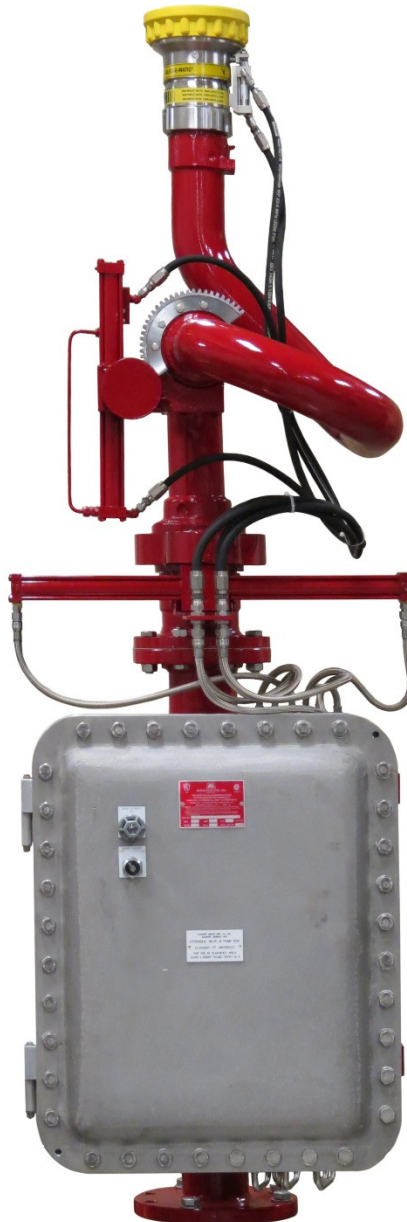
ELKHART BRASS

Fire Fighting Equipment

Industrial Hydraulic Remote Controlled Monitor

Models: 294-11XBHC-N4X, 294-11XBHC-N7/4, 299-20XHC-N4X, & 299-20XHC-N7/4

Installation, Operating, & Maintenance Instructions



98175000 REV. D

PRODUCT SAFETY



Important:

Before installing and operating this equipment, read & study this manual thoroughly. Proper installation is essential to safe operation. In addition, the following points should be adhered to in order to ensure the safety of equipment and personnel:

- All personnel who may be expected to operate this equipment must be thoroughly trained in its safe and proper use.
- Before flowing water from this device, check that all personnel (fire service and civilian) are clear of the stream path. Also confirm stream direction will not cause avoidable property damage.
- Become thoroughly familiar with the hydraulic characteristics of this equipment, and the pumping system used to supply it. To produce effective fire streams, operating personnel must be properly trained.
- Whenever possible, this equipment should be operated from a remote location to avoid exposing personnel to dangerous fire conditions.
- Always open and close valves supplying this equipment slowly, so that the piping fills with water slowly, thus preventing the possible occurrence of water hammer.
- After each use, and on a scheduled basis, inspect equipment per instructions in the maintenance section.
- Disconnect power prior to servicing controls.
- Any modifications to the electrical enclosure will destroy the NEMA 4 rating and void warranty coverage of the enclosure and all components within.
- All equipment must be installed in accordance with local codes (NFPA 70 or EN/IEC 60079-14) as appropriate and in areas where equipment classification is suitable.



WARNING: Do not attempt to disconnect or work on any electrical equipment in this system unless power is removed or the area is known to be non-hazardous.

SYSTEM INFORMATION:

SERIAL NUMBER: _____

DETAILS:

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I. OVERVIEW

Equipment

This Monitor, Nozzle, and Valve and Pump box is intended to be used in hazardous locations. Depending on the configuration ordered it may be suitable for NFPA 70 class 1, Division 1 locations and the compliance with local codes and company policies are required to maintain that area classification.

The equipment is hydraulically actuated by a self-contained hydraulic pump that is enclosed within the valve and pump box. All controls to the monitor are via hydraulic means and only control signals are electrical. Power for an entire monitor is typically all sourced from the valve and pump box connections except by special order in the case of remote/auxiliary control panels and RF controls.

Controls

Control switches are provided by push button or turn switches for:

- Power on/off
- Up
- Down
- Left
- Right
- Straight Stream
- Wide Fog
- Water on/off (if ordered as option)
- Foam on/off (if ordered as option)
- Oscillate on/off (if ordered as option)

Control voltages are typically 24VDC and share the same 24VDC power source as the hydraulic pump.

An auxiliary control panel can be supplied.

Construction

The monitor is constructed of marine brass (85 Brass) and an option for Stainless Steel is available for the 299-20 model.

The Valve and pump box is mounted on a steel riser spool and is a NEMA 7/4 enclosure constructed of heavy cast aluminum and meets NFPA 70 / NEC article 505-Class 1, Division 1 requirements.

General

While the equipment is designed for long service, regular maintenance is required to insure that these long life goals are achieved and your equipment is available for use when needed. Reduced maintenance schedules have been shown to significantly reduce equipment life and serviceability.

II. SPECIFICATIONS

General Specifications

- Input Power (Automatic Wide Range Power Supply)

Voltage 85-264 VAC, 50/60 Hz., 1 Phase

Max Current 7.0 Amp

Other power supplies available by special order

- Monitor and Valve & Pump Box approximate Dimensions (W x H x D)

294-11XBHC w/Oscillation 25(635) x 82(2090) x 30(765)

294-11XBHC w/o Oscillation 25(635) x 76(2000) x 30(765)

299-20XHC w/ Oscillation 25(635) x 95(2325) x 30(765)

299-20XHC w/o Oscillation 25(635) x 89(2260) x 30(765)

- Monitor and Valve & Pump Box Weight

294-11XBHC 650 lbs.

299-20XHC 650 lbs.

- Operating Temperature range

Monitors have been installed in a wide variety of climates ranging from equatorial locations to northern Europe. Due to the nature of the design with hydraulic controls, the forces available generally exceed operational requirements. However, it should be noted that at extremely low temperatures the viscosity of the oil will become thicker and movement rates will slow down. At such time as water begins to flow, and from general use, the monitor will be warmed by the water flowing to above freezing temperatures and the functions will approach room temperature operation.

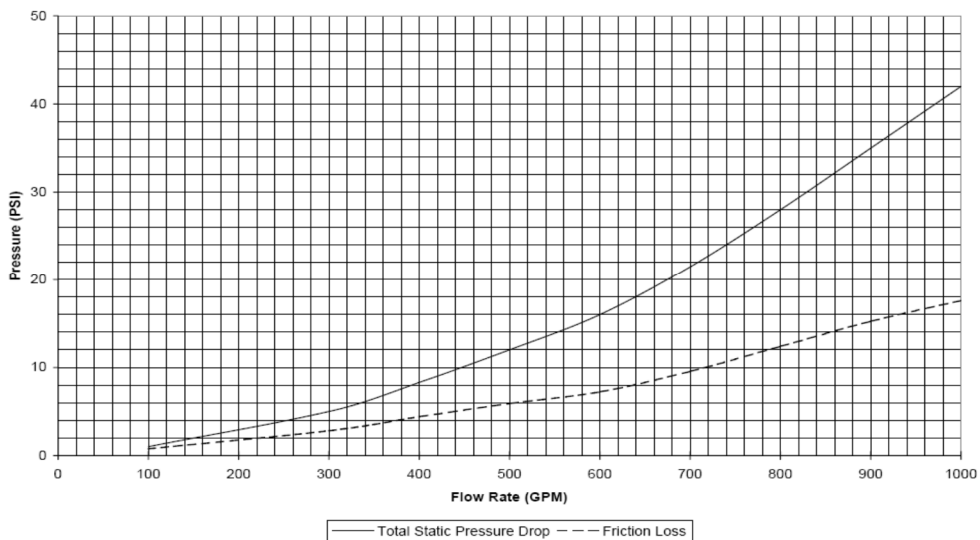
At extremely low temperatures the operation will be limited by the viscosity of the oil and lubricating grease used. We estimate a practical limitation to be at -20°F but satisfactory operation may be achieved below that temperature.

III. INSTALLATION INSTRUCTIONS

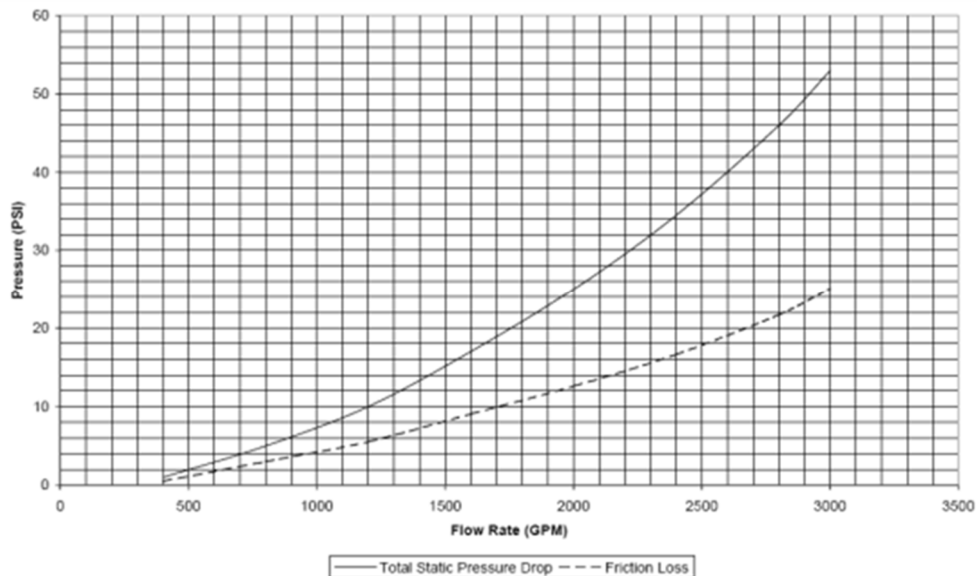
A. Component Mounting - Monitor and Nozzle Installation

1. Bolt the monitor to standpipe, terminated with 4" - 150# Flat Face ASA flange base. This is the standard inlet (other inlet sizes are optional).
2. Standpipe must be structurally strong enough to withstand reaction force of nozzle when discharging a straight stream at 90° of the standpipe or tower. The formula for calculating nozzle reaction is: $\text{REACTION FORCE (lbs.)} = 0.0505 \times \text{Flow (G.P.M.)} \times \sqrt{\text{Pressure (P.S.I.)}}$
3. Inlet pressure at base of monitor must be high enough to allow for pressure loss through the monitor and stream shaper. To accomplish this, use friction loss for G.P.M. flowing, from friction loss charts and add to nozzle pressure. (See chart below).

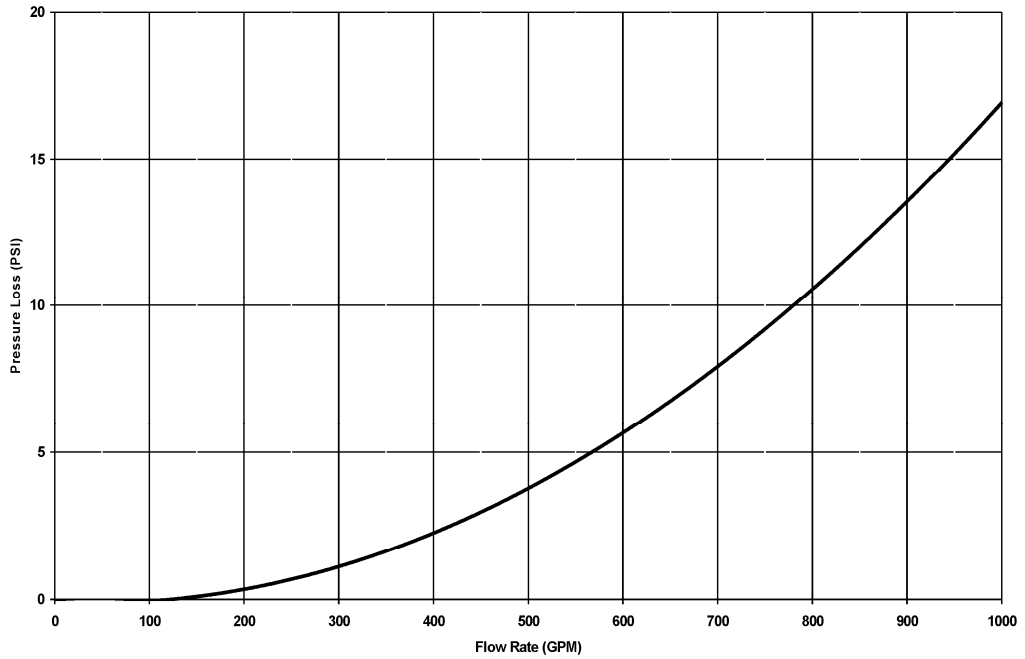
294-11XBHC Monitor (4" Inlet and 2.5" Outlet)



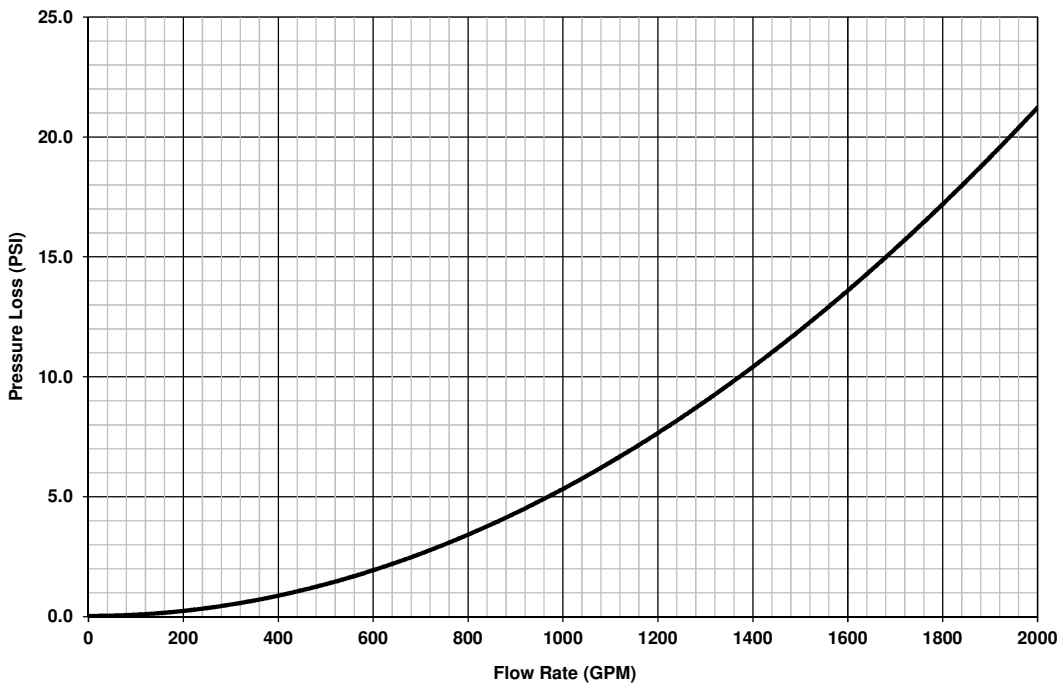
299-20XHC Monitor (4" Inlet and 3.5" Outlet)



282-A, 282-B Stream Shaper Friction Loss



284 & 284-B Stream Shaper Friction Loss



4. After Modular Monitor is installed on standpipe, open Valve & Pump Box door and remove yellow cap from pump reservoir. Remove rubber disc from inside of cap and replace it with breather filter supplied in zip-loc bag attached to hydraulic pump. Replace cap on reservoir.

B. Interconnecting and Wiring Control System

1. Install control boxes at designated locations and cut out holes in box to attach conduit. All cable entry knockouts on all NEMA #4X enclosures are provided by others. All NEMA #7/4 enclosures have N.P.T. female threaded entries provided.
2. Install conduit and pull electrical conductors between control boxes and Valve & Pump Box. Main power source to be connected at Valve & Pump Box, supplied by others. Primary power source required is: 85-265 VAC, 47-264 Hz., single-phase power. When power is connected, ACDC power supplies will automatically set at voltage and cycles within range required. All operating voltages for control system and hydraulic pump is 24-VDC powered through power supply located in Valve & Pump Box. 15 conductors are required from each valve & pump box to control box, see electrical drawings for connections.
3. Conductor size is determined by length of wire needed between control boxes. Recommended conductor size is as follows:
 - 0 – 300 foot length use #22 AWG wire (voltage drop = 0.48 maximum)
 - 301 – 500 foot length use #20 AWG wire (voltage drop = 0.52 maximum)
 - 501 – 800 foot length use #18 AWG wire (voltage drop = 0.52 maximum)
 - 801 – 1200 foot length use #16 AWG wire (voltage drop = 0.51 maximum)
 - 1201 – 1800 foot length use #14 AWG wire (voltage drop=0.49 maximum)
 - 1801 – 3000 foot length use #12 AWG wire (voltage drop = 0.51 maximum)



WARNING: Make sure panels are grounded according to area classification and company policy to assure panel code compliance.

C. Energize and adjust the hydraulic system

1. Fill reservoir with hydraulic fluid. For best results use automatic transmission fluid (Dexron III or Chevron MD-3). Check reservoir fluid after each function is bled out.

WARNING!! Do not operate hydraulic pump without hydraulic fluid to avoid pump damage.

2. Priming hydraulic pump:
3. Remove electrical plug from valve solenoid V1B and hydraulic pressure tube between pump & solenoid valve manifold.
4. Jog “UP” switch on control panel until hydraulic fluid flows out pressure port of pump.
5. Reconnect pressure hydraulic tube and valve solenoid electrical plug.
6. Bleed air out of system by using the following procedure:
 - a) Set pump relief valve pressure to 50 P.S.I., which is as low as possible. Lower monitor vertical movement to maximum down position and disconnect hydraulic hoses from vertical actuator ports V1A & V1B. Open port controls at both ends of rotary actuator; turn screws counterclockwise until it stops. (See illustration 1 for location of port control valve adjusting screws).
 - b) Insert open end of V1B hydraulic hose into clean container, and activate “UP” mode switch at control box. Hold switch until hydraulic fluid is discharging from hose and is free of air. Reconnect hydraulic hose to port V1B, increase pump pressure then, activate “UP” switch until monitor rises to maximum elevation.

- c) Close port controls valves at V1A & V1B actuator ports, turn screws clockwise until it stops, and then open both screws one complete revolution.
- d) Insert open end of V1A hydraulic hose into clean container, and activate “DOWN” mode switch at control box. Hold switch until hydraulic fluid is discharging from hose and is free of air. Reconnect hydraulic hose to port V1A, then activate “DOWN” switch until monitor is lowered to minimum elevation.
- e) Disconnect hydraulic lines from horizontal actuator ports V2A & V2B. Open port control valves at both ends of rotary actuator, turn screws counterclockwise until they stop. (See illustrations 1 & 4 for location). Manually turn monitor to maximum horizontal clockwise position.
- f) Insert open end of V2A hydraulic hose into clean container, and activate “LEFT” mode switch at control box. Hold switch until hydraulic fluid is discharging from hose and is free of air. Reconnect hydraulic hose to actuator port V2A, then activate “LEFT” switch until monitor reaches maximum counterclockwise position.
- g) Insert open end of V2B hydraulic hose into clean container, and activate “RIGHT” mode switch at control box. Hold switch until hydraulic fluid is discharging from hose and is free of air. Reconnect hydraulic hose to actuator port V2B, then activate “RIGHT” switch until monitor is moved to maximum clockwise position.
- h) Reposition monitor so nozzle hydraulic line connections are easily accessible. Disconnect hydraulic lines V3A & V3B from nozzle ports. Open needle valve on nozzle (see illustration 2) to full counterclockwise position. Then manually push nozzle tip to full fog position. Insert open end of V3A hydraulic hose into clean container and activate “STRT” switch at control box. Hold switch until fluid is discharging from hose and is free of air. Reconnect hydraulic hose to nozzle port V3A and activate “STRT” switch until nozzle reaches the straight stream position.
- i) Insert open end of V3B hydraulic hose into clean container and activate “FOG” switch at control box. Hold switch until fluid is discharging from hose and is free of air. Reconnect hydraulic hose to nozzle port V3B and activate “FOG” switch until nozzle reaches the maximum fog position. Lower monitor to approximately 45° below horizontal and move from fog to straight stream positions several times allowing about one minute idle time at each end of stroke, this will remove any remaining air bubbles in nozzle cylinder.

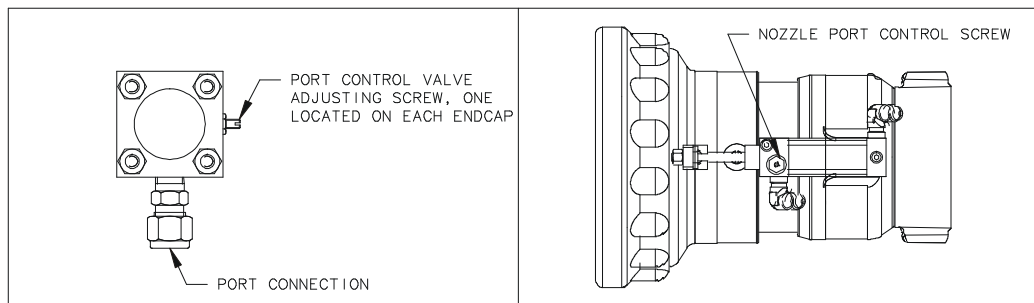
D. Hydraulic pump pressure adjustment procedure

1. Check hydraulic fluid levels in reservoir, if low add fluid.
2. Activate and hold “FOG” function switch, this will start hydraulic pump and move tip to fog position. Hold switch in fog position and check pressure on gauge located in valve & pump box.
3. Open adjustable relief valve until pressure reads 1000 PSI, and then tighten down lock nut on relief valve screw. Turn relief valve screw clockwise to increase pressure and counter clockwise to decrease pressure.

E. Adjusting speed of monitor and nozzle

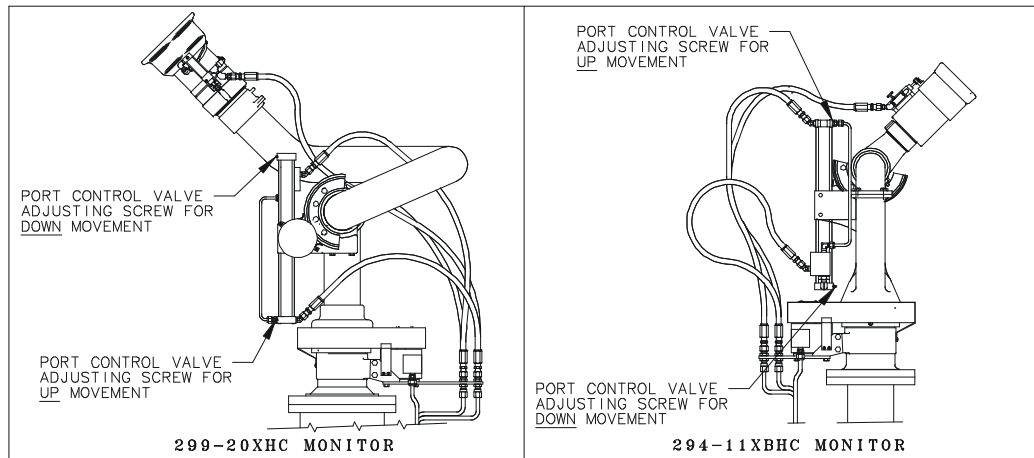
1. Port control valves are located at each end of the monitor rotary actuators and needle valve is plumbed into hydraulic line of piston on nozzle. (See illustrations on page 5).
2. Horizontal movement should operate at proper speed with port control valves at full open (counter-clockwise) position.

3. To adjust vertical speed of monitor, open port control valves completely at both ends of actuator. Turn screw counterclockwise.
4. Raise nozzle to full up vertical position. With nozzle in fully up position close port control valve, turning in clockwise direction slowly until desired speed in downward movement is reached and nozzle lowers at a steady rate. Turn port control valve screw in counter clockwise direction to increase speed.
5. If monitor starts to jerk when moving downward, raise nozzle to the full vertical position. While lowering nozzle, turn port control screw for down movement (see Illustration 3) clockwise slowly until nozzle lowers smoothly. By doing this removes backpressure on pilot check valve and allows valve to stay open while monitor is moving to the down position.
6. To adjust nozzle tip speed, port control valve is provided in nozzle hydraulic cylinder (see illustration 2). Turn screw clockwise to slow tip speed down and counter (anti)clockwise to increase speed. When nozzle speed is set, flow water through nozzle and recheck.

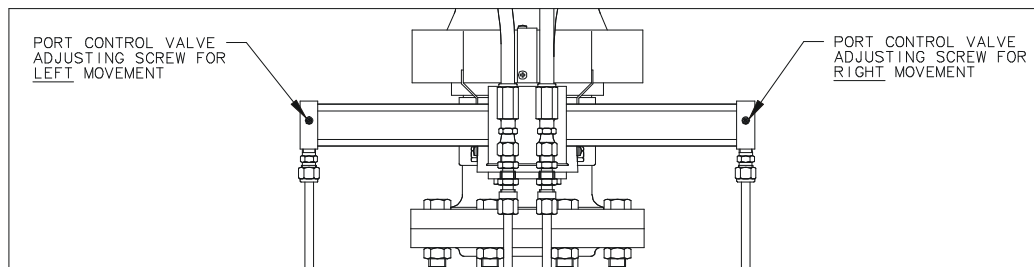


Rotary Actuator Port Control Valve
(Illustration 1)

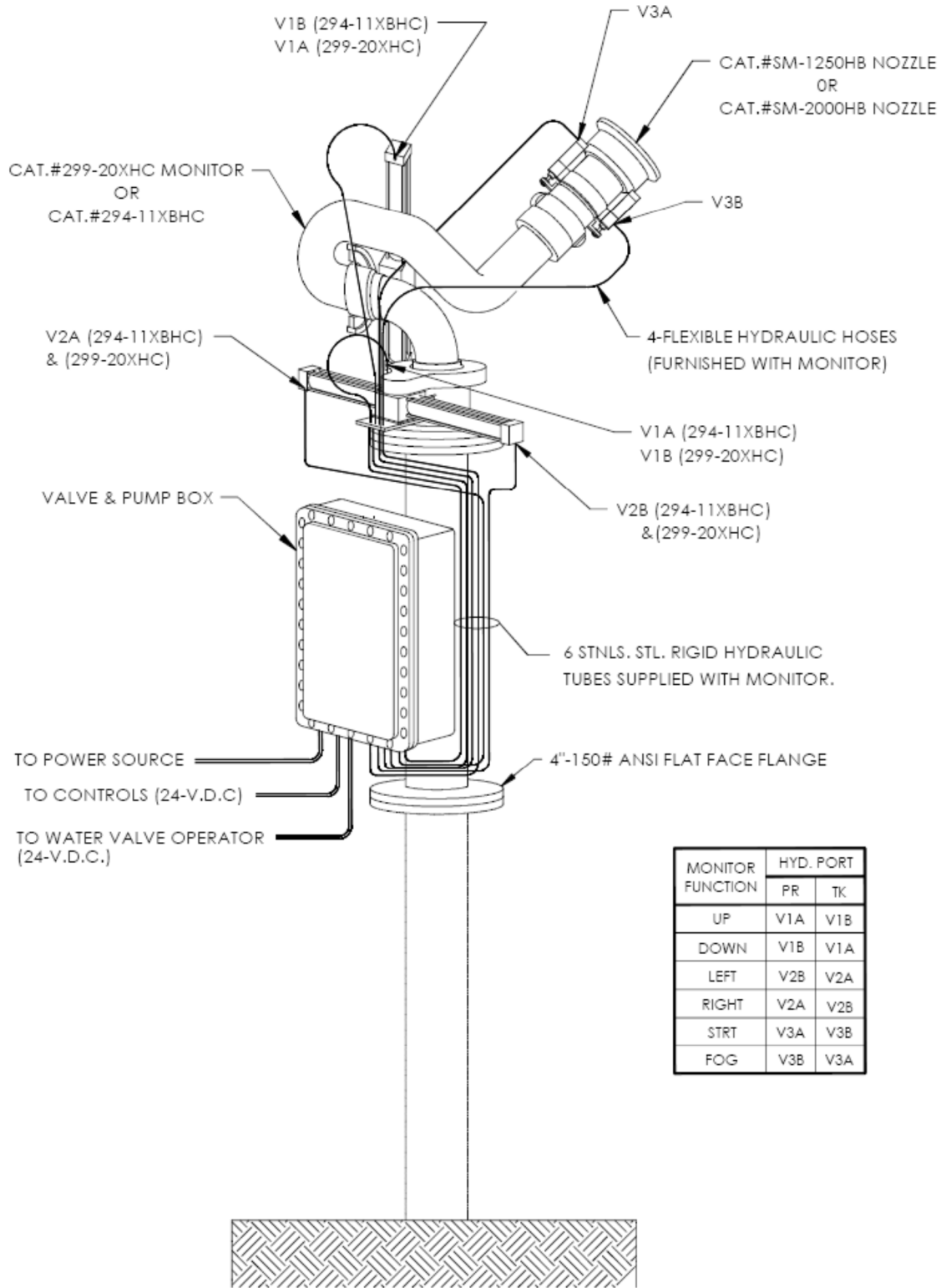
Nozzle Port Control Valve
(Illustration 2)



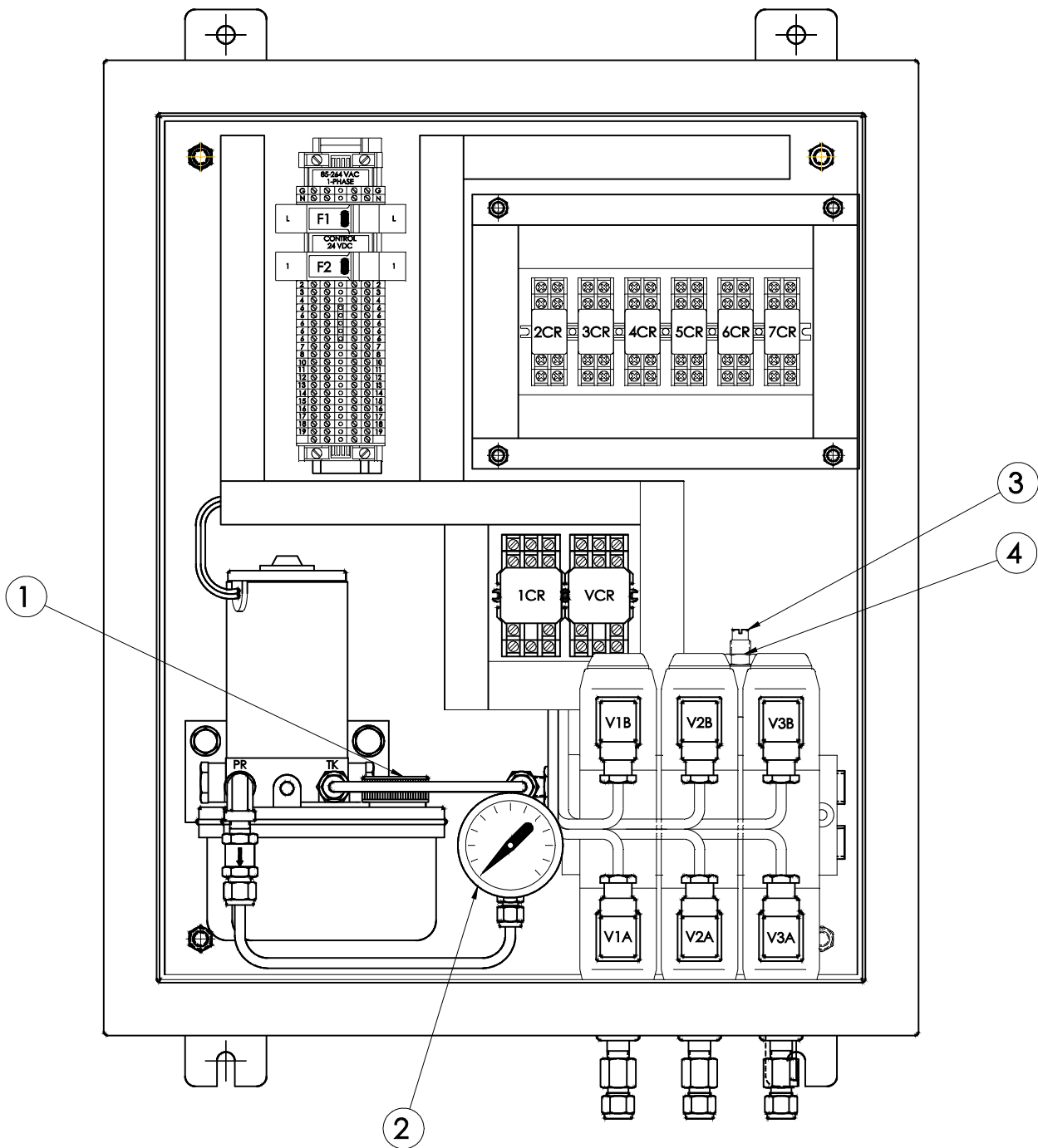
Vertical Actuator Port Control Valve Locations
(Illustration 3)



Horizontal Port Control Valve Locations
(Illustration 4)



Monitor & Nozzle hydraulic connections
(Illustration 5)



1	HYDRAULIC PUMP RESERVOIR FILL CAP
2	HYDRAULIC PUMP PRESSURE GAUGE
3	PRESSURE RELIEF VALVE ADJUSTING SCREW
4	PRESSURE RELIEF VALVE LOCK NUT

Valve & Pump Box Interior
(Illustration 6)

F. Manual Hydraulic Pump Installation Instruction (Optional – if ordered)

1. Place Manual Hydraulic Pump Unit (Elkhart P/N 81235001) at location to be operated. Mount in orientation shown in Illustration 7. (Gauge, valves and filler cap to be on top).
2. Install six 3/8" x 0.035 wall tubes on hydraulic hose assemblies into Swagelok fittings on manual pump, using Swagelok installation instructions to tighten fittings on tubes.
3. Fill manual pump reservoir with 1½ US gallons of hydraulic fluid (Chevron MD-3).
4. Run six flexible hydraulic hoses or 3/8" O.D. x 0.035 wall stainless steel tubing to connections at monitor (Det. 19) see illustration 7.
5. Remove Plug (Det.20) from fitting (Det.19) one at a time. Then install Ferrules and nut on each fitting. Install tube end on hydraulic hose into fitting, tightening fitting nut to Swagelok instructions. Repeat this procedure on all six connections.
6. Fill hydraulic hoses with fluid by moving and hold valve levers for each function and pump fluid into each line until filled.
7. When all six hoses are installed, operate all functions throughout full movement of monitor and nozzle.
8. If monitor movements are hesitant while pumping manual pump, the air in hydraulic lines will have to be purged out per bleeding instructions in section 3.3 (Bleeding air out of system).

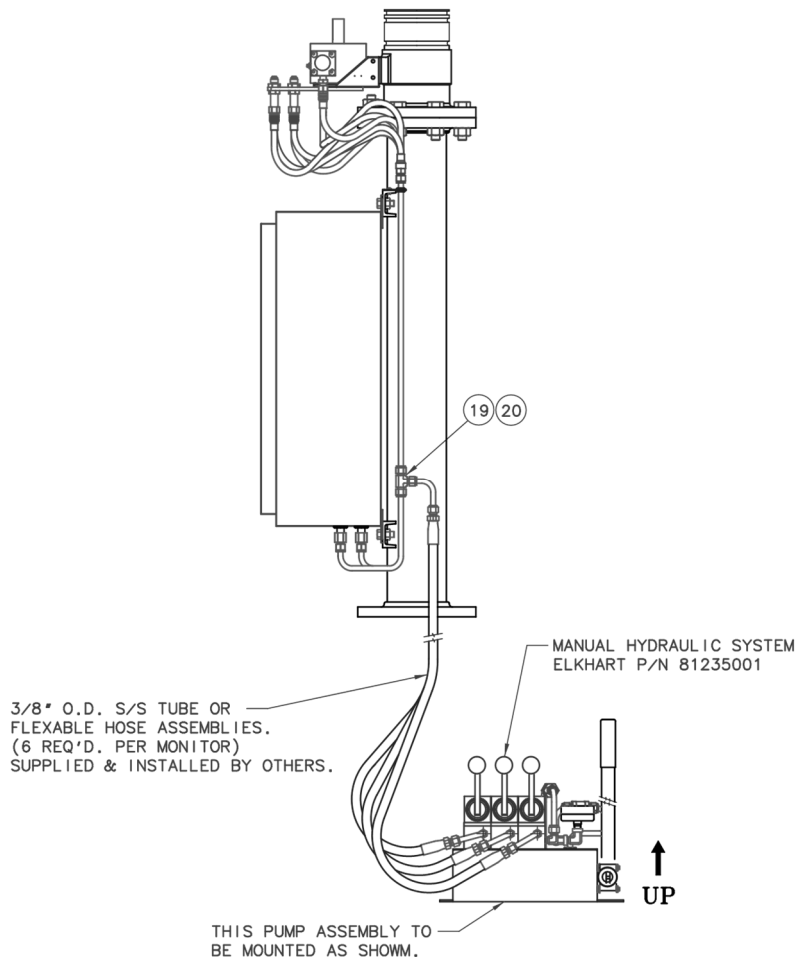


Illustration 7
Manual Pump Installation

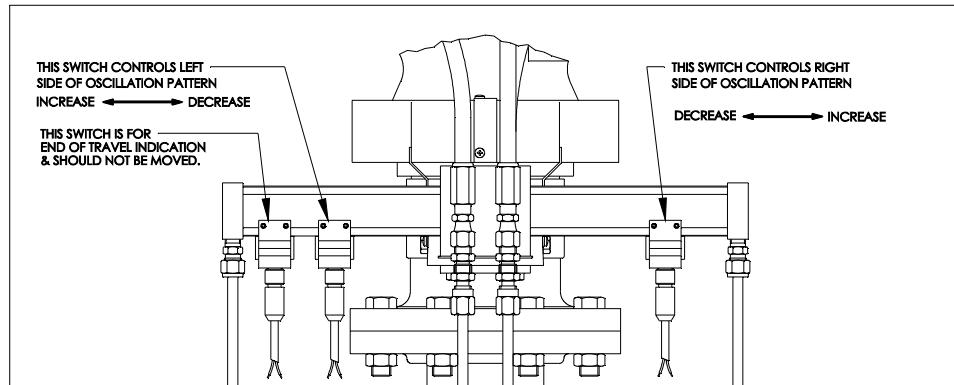
IV. OPERATING INSTRUCTIONS

A. Monitor control function operation

1. Manual control operation:
 - a) “**SYSTEM ON**” push button switch will turn on power to all control circuits and can be activated at any control box. This will enable all monitor controls.
 - b) “**SYSTEM STANDBY**” push button switch will disconnect power from all monitor functions at any control panel.
 - c) Water valve “**OPEN**” & “**CLOSE**” push button switches are momentary contact switches that operate a latching relay in Valve & Pump Box. Control power has to be on for either one of these functions to switch. If power is lost on monitor, valve will maintain last position set.
 - d) Monitor “**LEFT**” & “**RIGHT**” switch controls horizontal position of monitor & nozzle. Hold switch in direction desired, until nozzle discharge position is reached. Then release switch to stop movement.
 - e) Monitor “**UP**” & “**DOWN**” switch controls vertical movement of monitor & nozzle. Hold switch in direction of vertical movement required, until nozzle discharge position is reached, then release switch to stop.
 - f) Nozzle “**STRT**” & “**FOG**” switch controls stream pattern of nozzle and will adjust from straight stream to wide fog. Tip movement can be stopped at any position by releasing switch.
 - g) Note: On NEMA #4X control boxes “UP”, “DOWN”, “LEFT”, & “RIGHT” functions are combined into one switch (4 way joystick switch).
2. Monitor control panel pilot lights:
 - a) “**POWER ON**” pilot light is located on each control panel. This indicates 24 Volts D.C. control power is available at each Valve & Pump Box.
 - b) WATER VALVE “**OPEN**” pilot light indicates that water valve relay located in the Valve & Pump Box is switched to the “open” position.
 - c) Horizontal “**OSCILLATION**” switch (Optional) controls Horizontal Oscillation mode, automatic or manual.

B. Automatic Horizontal Oscillation Operation (Optional)

1. Horizontal sweep switch will activate either automatic or manual horizontal sweep. The position of switch will be indicated by pilot lights on control box, either “manual” or “Automatic”. When in “AUTO” mode, monitor will automatically oscillate horizontal movement within the perimeters of the limit switches that are mounted on the horizontal actuator. Loosening set screws on reed switch brackets and moving them along cylinder until desired oscillation pattern is reached can change these perimeters. Then tighten set screws to lock switch into place (see illustration 8).



Horizontal Actuator with Limit Switches Installed
(Illustration 8)

C. Manual Hydraulic Pump Operation Instructions (OPTIONAL)

1. The hydraulic manual pump (Illustration 9) has 3 directional valves with levers. There is one hand pump with handle
2. Each of the 3 levers control one valve each. The valves are spring return to closed (center) position. The levers need to be pulled or pushed as shown (Illustration 10). Each lever has 20° movement from center. The lever allows the valve to route the oil under pressure to the correct port opening (Illustration 9).
3. The hand shaft is used to pump the oil. Pump should be operated until required movement of the monitor is achieved. Pressure gauge is installed at the outlet of the hand pump. Normal operation of the monitor movements is achieved at pressure range between 200 to 500 psi.
4. Once the hydraulic lines are connected from the manual emergency pump to the monitor, monitor movements are to be verified. This is accomplished by moving one lever at a time to open a particular port. For example – to open port V2B for up, lever should be pushed in towards the port. This opens the valve pressure path to port V2B. While holding the lever in that position, hand pump shaft needs to be pumped to move monitor upward.
5. Lever operation in any direction allows the oil from the opposite side to be returned to the reservoir. To operate the monitor movements, the hand shaft should be operated holding the lever in straight, fog, up, down, left or right position. Hand shaft pumping action should be done until the desired position is achieved. The lever is spring returned causing all ports to be closed when valve lever is released maintaining the last position.

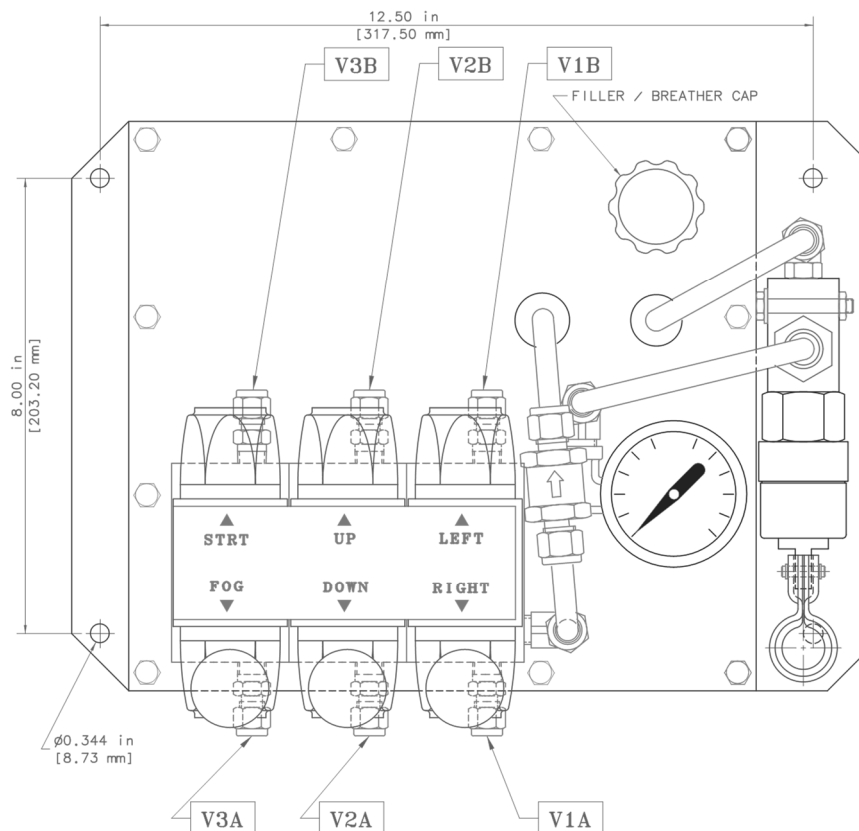


Illustration 9 (Top View)
Manual pump port locations

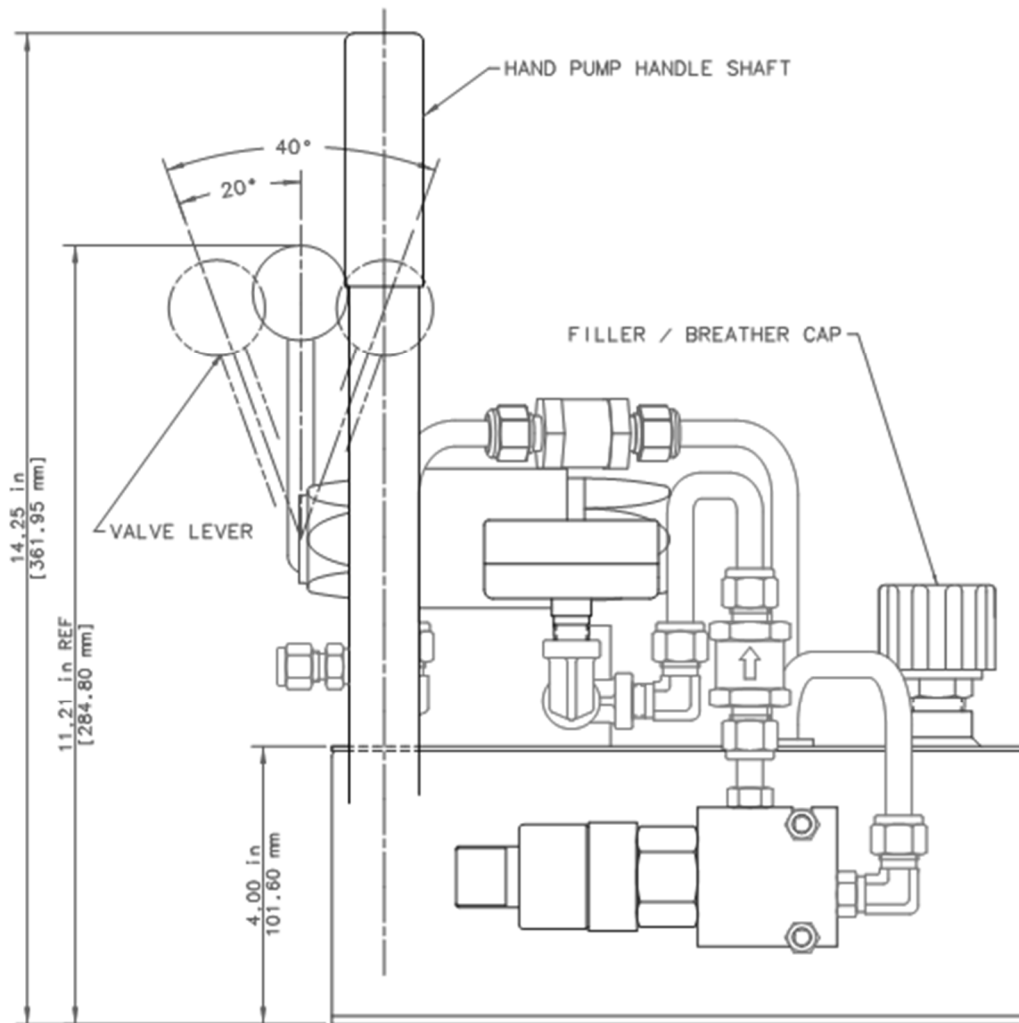


Illustration 10 (Right View)
 Lever movement of the 4-way directional valves

V. MAINTENANCE INSTRUCTIONS

- A. Monthly inspection and maintenance:
 - 1. Check all indicator lights and replace bulbs if not operating correctly.
 - 2. Check hydraulic pump reservoir for fluid level.
 - 3. Operate all functions on system to insure proper working condition.
 - 4. Operate all monitor and nozzle functions several times, to activate solenoid valves in Valve & Pump Box. This will clean any residue from spools and keep them from sticking.
- B. Six month inspection and maintenance:
 - 1. Grease monitor ball races through grease fittings located at each swivel joint. Use a good grade waterproof lithium grease.
 - 2. Check flexible hydraulic hoses at monitor for cracks and deterioration.
 - 3. Check all hydraulic connections at rigid lines and in valve & pump box for leaks. Repair as needed.
 - 4. Check all painted surfaces for chips or scratches and repaint as required.
 - 5. Visually check all electrical equipment in control boxes and valve & pump boxes.
- C. Refer to individual manuals for valves, nozzles, and any other associated equipment for their individual maintenance requirements.

VI. TROUBLESHOOTING

A. Electrical Checks

1. Is the problem isolated to a particular function (Left/Right, Up/Down, Straight/Fog)
2. If the problem is repeatedly only on a particular function it indicates that the issue is less likely to be hydraulic and more likely to be with the electrical controls or connections.
3. Even if it is isolated to one particular function it is still possible to be a hydraulic issue.
4. Verify that all terminal screws for both internal and external functions are tight.
5. Frequently interconnection wires do not get tightened at the job site.
6. Sometimes the wires work loose from shipping and handling.
7. Proper torque should be 4.5 – 7.1 in-lbs. (0.508 – 0.802 Nm).
8. Confirm solenoid operation by sound or feel while operating it from the controls.
 - a) Functions are as follows:
 - (1) 2CR –Up
 - (2) 3CR –Down
 - (3) 4CR –Left
 - (4) 5CR –Right
 - (5) 6CR – Nozzle Straight Stream
 - (6) 7CR – Nozzle Wide Fog
 - b) If exchanging these relays causes the problem to move from one function to another this indicates that the relay is not operating correctly.
9. Verify the response of the Valve & Pump box (V&P) to input signals.
 - a) The system operates on 24 VDC signals.
 - b) Terminal assignments are as follows:
 - (1) 1 – 24 VDC
 - (2) 10 – Water valve open (CAUTION, Read Below)
 - (a) Terminal 10 will open the water valve if it is powered. This could pose a physical hazard to others.
 - (3) 11 – Water valve closed
 - (4) 12 – Up
 - (5) 13 – Down
 - (6) 14 – Left
 - (7) 15 – Right
 - (8) 16 – Straight
 - (9) 17 – Fog
 - c) A piece of jumper wire can be used to apply those signals for testing. A 24VDC source can be used from terminal 1 to the terminal of the function being tested.

CAUTION – There are some things to be careful of in performing this test.

 - (1) **Never** come into contact with terminals labeled L, L1, L2, or L3 or similar as these carry the mains voltage and are **extremely dangerous**.
 - (2) Mains voltage is present at the terminals of the power switch. **Do not touch** them.
 - d) Does the monitor respond correctly to the input signals?
 - (1) Does the hydraulic pressure rise to approximately 1000 PSI on pressure gauge when function is activated against the end of stroke?
 - (a) This indicates that the pump is operating correctly.
 - (b) See manual for regulator adjusting procedures.
 - e) Verify that the pump stops when the signal is removed.
 - (1) Does the hydraulic pressure drop to 0-25 PSI on pressure gauge when function is released?

10. Is the correct signal being sent to the Valve & Pump box from the control panel?
 - a) Verify that for each function there is the appropriate 24 VDC signal at the correct terminal.
 - b) The signal must be constant and not intermittent when applied.
 - c) Terminal assignments for operation are listed above.

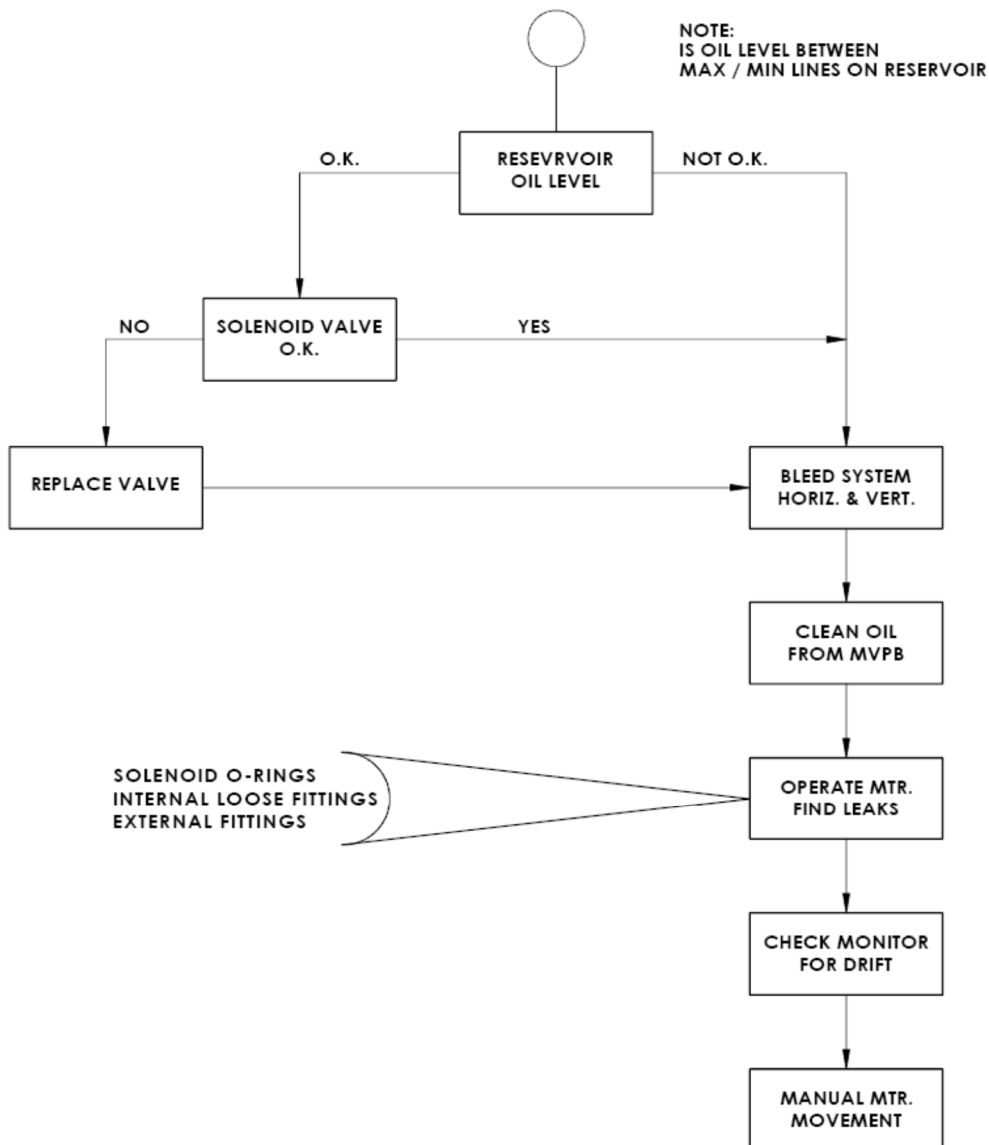
B. Hydraulic checks

1. Verify the oil level in the reservoir
 - a) It should be between the Max and Min marks on the side of the reservoir
 - (1) If the oil level becomes too low it will allow air to be introduced into the system causing functional problems. From a practical perspective the oil pump intake will not be uncovered until the oil is below approximately 0.5 inches (13 mm), but we do not recommend operation below the minimum level.
 - b) If the oil level is low it will be necessary to determine if there is a leak.
 - (1) Does oil repeatedly need to be added to maintain the level?
 - (2) Is the leak inside the panel, or outside? Similar detection techniques apply and are described below.
2. If the oil level is very low, or if air leakage into the system is suspected, it will be necessary to bleed the hydraulics (horizontal, vertical and nozzle) according to the manual.
 - a) Indications of air in the system are:
 - (1) Erratic or no operation even though the relays are energizing properly
 - (2) The monitor position is not rigid and can be moved manually by grasping the nozzle and pulling the monitor left/right or up/down.
3. Is there oil in the bottom of the enclosure:
 - a) How much oil is present?
 - (1) The reservoir can allow for a significant amount of oil to be lost and still operate.
 - b) What area (location) in the enclosure is the oil observed?
 - (1) The location the oil first strikes the bottom indicates where it is dripping from. This may or may not be directly from the leak but helps to locate it and define what is not leaking.
 - c) Can a source be located? It may help to:
 - (1) Use a clean tissue to wipe around each fitting. The leaking one should show a red oily residue on the tissue. Fittings below the leaking one may also show the same residue due to the leak above.
 - (2) Wipe up the oil in the cabinet.
 - (3) Place a white paper or a rag on the bottom of the enclosure.
 - (4) Wrap tissue around suspect fittings.
 - (5) Close the panel and operate the monitors and nozzles periodically looking for leaks.
 - (6) This will apply pressure to the hydraulics.
 - (7) The leak may be insufficient to present itself immediately.
 - (8) Check back later (maybe even the next day) to see if a leak has occurred or if a source can be located.
 - (9) Periodic operation will help to insure the leak occurs.
 - (10) If a fitting connection is leaking it is possible to tighten it up, but proceed with caution as it is also possible to over tighten them. No more than 1/8 turn should be required (probably much less) unless they are only finger tight. Fittings are tightened up according to dimension and not by torque. Detailed procedure can be found at <http://www.swagelok.com/downloads/webcatalogs/EN/MS-13-151.PDF>.
 - (11) A similar process to that described in the steps above can be used on external connections as well.

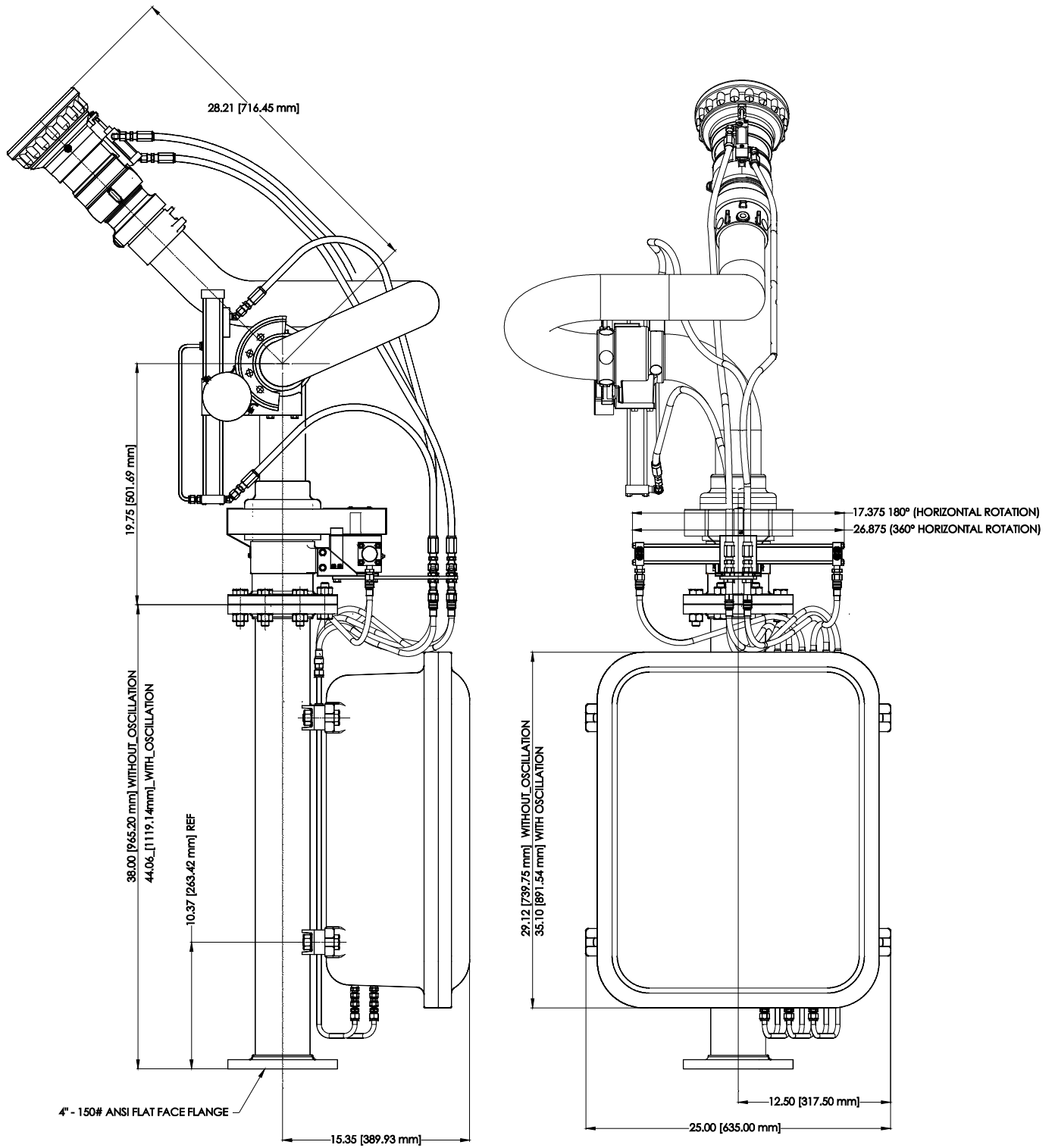
4. Are the port control valves on horizontal actuators improperly adjusted?
 - a) The port control valves are used to adjust the travel speed of the monitor.
 - b) Adjusting them almost closed can lead to operational variability and problems.
 - c) Reference the manual for more details on adjusting.
5. Allow monitor to set overnight and look for position drift
 - a) If the monitor drifts down it indicates a leaking Pilot Check Valve, allowing fluid to flow in the system under the weight of gravity.
 - (a) **No maintenance or adjustment is provided for on the pilot check valve.**

Based on the steps above the problem area, if not the problem component itself, will be identified. Systems of this design have been found over many years of production to be very reliable and most problems can be traced and simple to resolve.

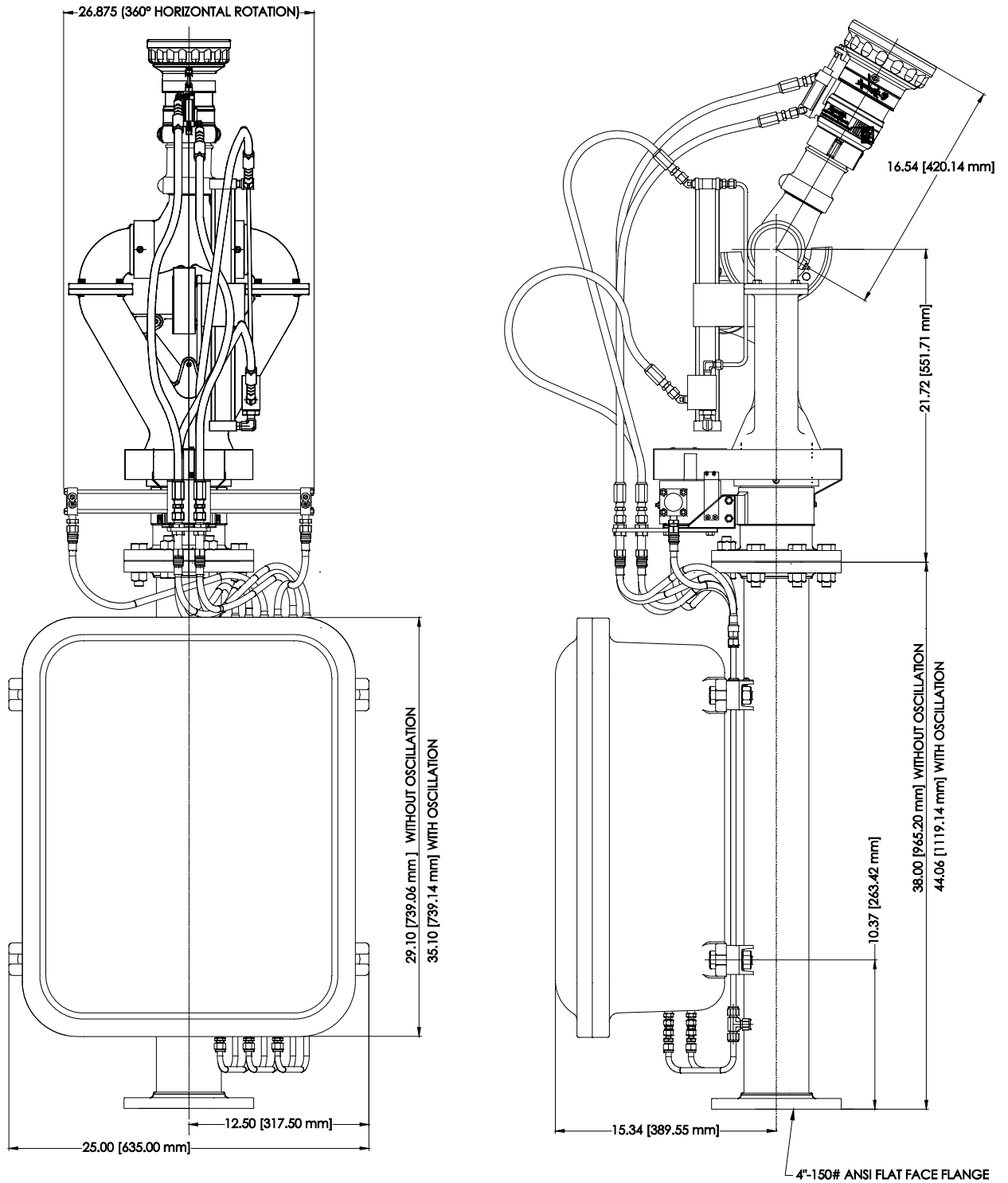
C. Troubleshooting decision flow diagram



VII. MOUNTING DIMENSIONS AND REFERENCE DIAGRAMS

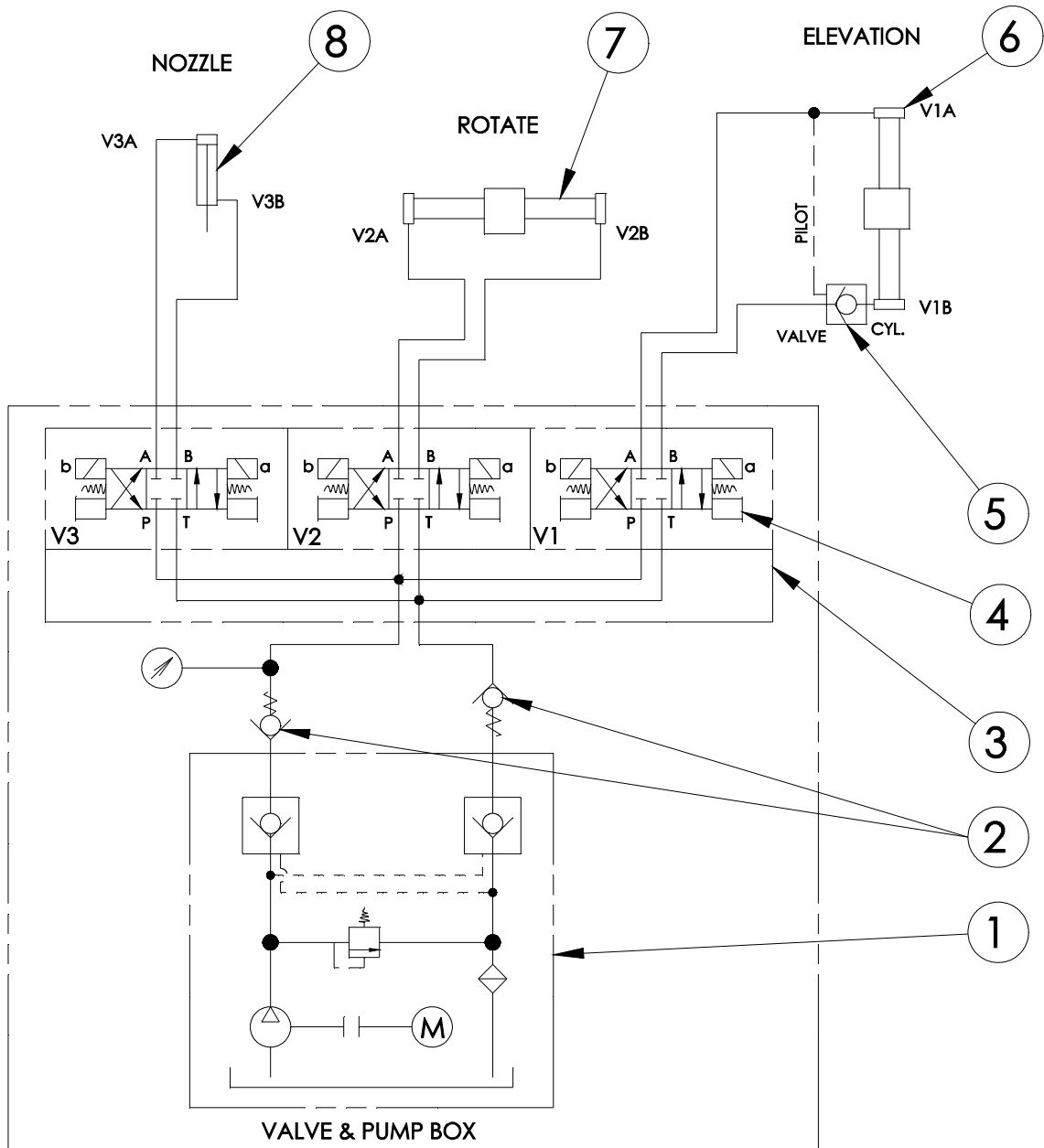


299-20 XHC
Mounted on Spool with Valve and Pump Box



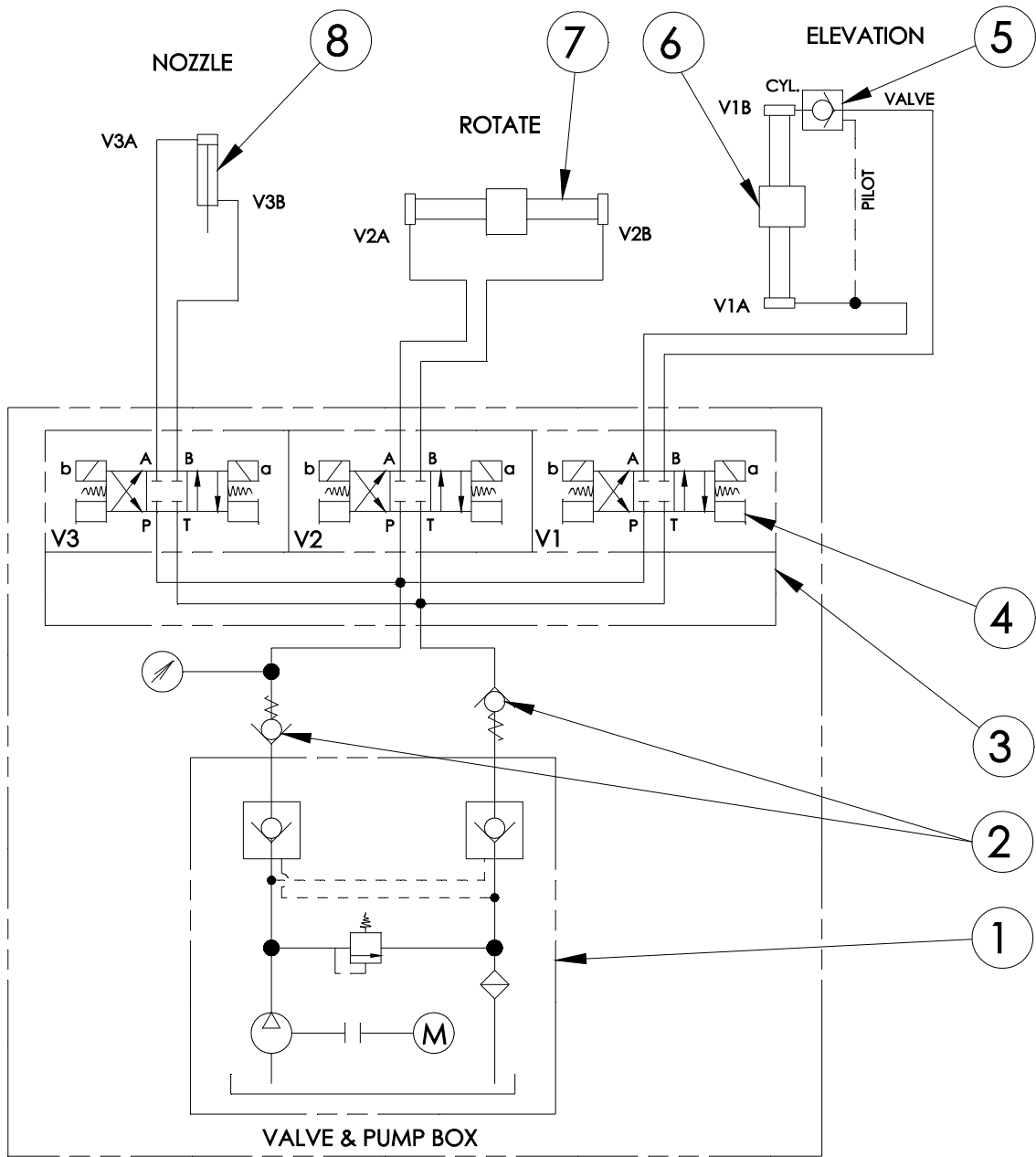
294-11 XBHC
Mounted on Spool with Valve and Pump Box

294-11XBHC MONITOR WITH SM-1250HB NOZZLE



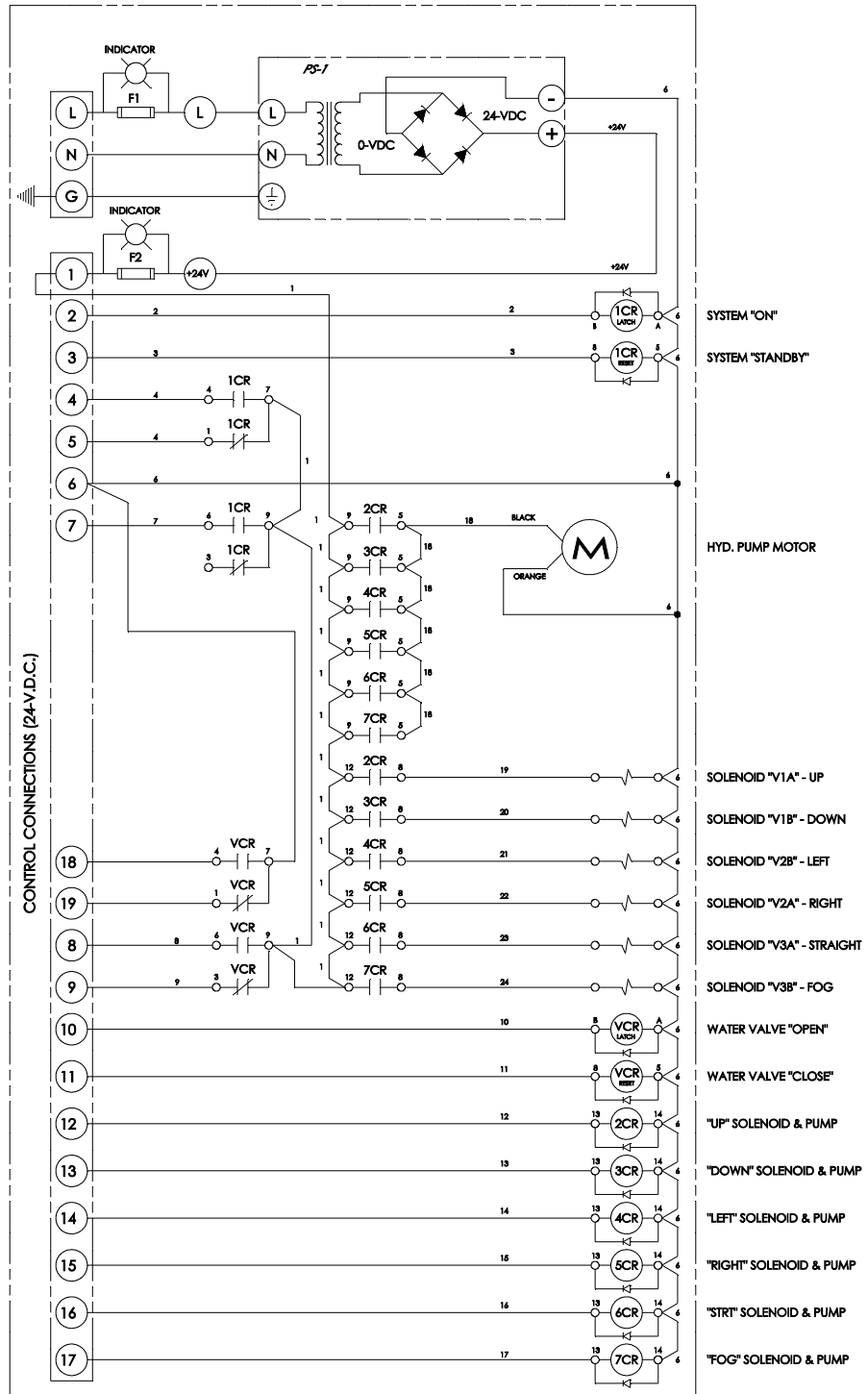
8	241 52000	NOZZLE PISTON CYLINDER	1
7	PER ORDER	HORIZONTAL ACTUATOR	1
6	46095000	VERTICAL ACTUATOR	1
5	70073000	PILOT CHECK VALVE	1
4	70089000	SOLENOID VALVE	3
3	17682000	3 STATION MANIFOLD	1
2	70127000	CHECK VALVE (25 PSI CRACK)	2
1	52204000	HYDRAULIC P/M/T ASS'Y.	1
NO.	PART NO.	PART NAME	REQ.

299-20XHC MONITOR WITH SM-2000HB NOZZLE



8	24152000	NOZZLE PISTON CYLINDER	1
7	PER ORDER	HORIZONTAL ACTUATOR	1
6	46095000	VERTICAL ACTUATOR	1
5	70073000	PILOT CHECK VALVE	1
4	70089000	SOLENOID VALVE	3
3	17682000	3 STATION MANIFOLD	1
2	70127000	CHECK VALVE (25 PSI CRACK)	2
1	52204000	HYDRAULIC P/M/T ASS'Y.	1
NO.	PART NO.	PART NAME	REQ.

UNIVERSAL POWER SOURCE
85 - 264 VAC, 50/60 Hz., 1-Ph
7.0 AMP MAX. CURRENT



Typical Valve and Pump Box Wiring

VIII. SPARES

The following list of spares are not necessarily required but may be desired to keep on hand depending on the environment and need for quick service. The regular maintenance schedule is a recommended practice that influences both the life of the equipment and the need for component replacement as it directly defines the environment the equipment must live in.

IX. CHANGE REVISION EXPLANATIONS



Elkhardt Brass Mfg. Co. Inc.

Elkhardt, Indiana, USA

Shipping address

1302 West Beardsley Ave.
Elkhardt, Indiana 46514

Mailing address

P.O. Box 1127
Elkhardt, Indiana 46515

Phone: (574) 295-8330

(800) 346-0250

Fax: (574) 293-9914