FOAMPRO®

A Safe Fleet Brand

Form 903
Rev. 8/19

AccuMax

Single-Point Injection Systems

Models 3020/3040/3060/3090/3150/3300

INSTALLATION AND OPERATION MANUAL

Unit Serial Number _____

All quality FoamPro products are ruggedly designed, accurately machined, carefully assembled, thoroughly inspected and 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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NOTE TO SYSTEM INSTALLERS

IMPORTANT: Please provide a copy of the FoamPro manual to the end user of the equipment. For additional FoamPro manuals, contact by FAX 816-892-3178, web site www.foampro.com, or call 800-533-9511. Request Form No. 903.

1 Safety

Before attempting to install a FoamPro AccuMax System, read all of the following safety precautions and follow carefully.

The following special notices are used to notify and advise the user of this product about procedures that may be dangerous to the user, or result in damage to the product.

NOTE: Notes are used to notify of installation, operation, or maintenance information that is important but not safety related.

CAUTION: Caution is used to indicate the presence of a hazard, which will or can cause minor injury or property damage if the notice is ignored.

WARNING: Warning denotes that a potential hazard exists and indicates procedures that must be followed exactly to either eliminate or reduce the hazard, and to avoid serious personal injury, or prevent future safety problems with the product.

DANGER: Danger is used to indicate the presence of a hazard that will result in severe personal injury, death, or property damage if the notice is ignored.

- Do not pump at pressures higher than the maximum recommended pressure. [300 PSI (20.7 BAR)]
- Do not permanently remove or alter any guarding devices or attempt to operate the system when those guards are temporarily removed.
- Always disconnect the power source before attempting to service any part of the pump.
- Release all pressure within the system before servicing any of its component parts. Slowly loosen the foam pressure line fittings and allow the pressure to escape. Protect face and eyes from any potential spray which may occur.
- Drain all concentrate and water from the discharge system before servicing any of its component parts.
- Check all hoses for weak or worn conditions after each use. Ensure that all connections and fittings are tight and secure.
- Use only pipe, hose, and fittings from the foam pump outlet to the injection point, which are rated at or above 400 PSI (28 BAR) minimum rating, at which the water pump system operates.
- Use only pipe, hose, and fittings from the hydraulic oil pump to the foam pump hydraulic motor, which are rated at least the maximum hydraulic pressure rating of the system shown in Section 15 or better and are approved for mobile hydraulic system use.
- Any electrical system has the potential to cause sparks during service. Take care to eliminate explosive or hazardous environments during service/repair.
- Rotating drive line components can cause injury. Be careful of rotating components when adjusting load sense pump compensator.

CAUTION: Do not attempt to operate the system at or above a temperature of 160ºF (71ºC).

WARNING: Ensure that the electrical source of power for the unit is a 12 or 24 Volt, negative ground DC system. Power and ground lines must come directly from the battery without any connections to other high power devices, such as primer pumps, hose reels, light bars, etc. Power required for the valve driver box on the hydraulic motor-driven foam pump must have a minimum current rating of at least 5 AMPS.

CAUTION: Periodically inspect the pump and the system components. Perform routine preventive maintenance as required. Failure to perform routine maintenance may cause damage to the system. See the maintenance section of this manual for recommended maintenance procedures and intervals between maintenance work.

NOTE: Read and understand these installation instructions before proceeding with the equipment installation.

CAUTION: Use only approved petroleum-based hydraulic fluids meeting the specifications as noted in Section 4. Never mix fluid types. Ensure all hoses and seals are compatible with fluids used. Do not use water or glycol-based fluids. Do not use phosphate ester-type fluids.

CAUTION: Dirt and contaminants are the primary causes of premature wear and failure in any hydraulic system. Use extreme care during assembly and service to keep contaminants out of the system.

WARNING: Always disconnect the ground straps, electrical wires and control cables from the Digital Display Control Module and all other FoamPro equipment before electric arc welding at any point on the apparatus. Failure to do so will result in a power surge through the unit that could cause irreparable damage.

CAUTION: All DOT, SAE or other applicable standards must be followed when installing the hydraulic supply system. Pay close attention to engine and transmission manufacturer drive limitations.

CAUTION: Never attempt to cut or lengthen the molded cables. Doing so will result in RFI/EMI interference. Contact the factory if molded cables of a different length are required.

CAUTION: To ensure the integrity of fitting connections in the hydraulic system, use only SAE JIC 37° flare or equal-type hose connections.

CAUTION: The cables shipped with each FoamPro system are tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.

CAUTION: The foam tank low-level sensor must be utilized to protect the foam pump from dry running. Failure to do so will void warranty.

CAUTION: When pouring foam concentrate directly into the foam pump the inlet strainer is bypassed. Make sure contaminants are not poured into pump chamber. Premature pump wear or damage may result if contaminants are allowed to enter pump chamber.

CAUTION: Do not run the FoamPro system for more than one minute deadheaded against the pressure gauge as the foam pump could be damaged.

CAUTION: When operating the FoamPro in the "Simulated Mode" function, an outlet for the foam concentrate must be provided. Otherwise dangerous excessive pressure may be built up in the apparatus water piping and/or hoses. This outlet for the foam concentrate can be provided by turning the 'CAL/INJECT' valve to the 'CAL' position.

2 A Quick Look at How the System Works

The FoamPro AccuMax Single-Point system is an electronically-controlled, hydraulically-driven, foam concentrate proportioning system designed to provide the wide range of foam concentrate injection rates necessary for both Class A and Class B foam operations.

The FoamPro system will accurately deliver from 0.1% to 10.0% foam concentrate to the foam injection point. The maximum rated concentrate flow rates obtainable are shown in the system specifications in Section 15.

The FoamPro AccuMax SP system is a flow-based proportioning system that measures water flow and then injects the correct proportional amount of foam concentrate to maintain the desired percentage. The basic FoamPro system is shown in Figure 2-1. The flowmeter measures the water flow and sends a signal to the Digital Display Control Module. Another flowmeter in the foam discharge line of the foam pump monitors the foam pump output. Constant comparison of these two information signals by the computer ensures maintenance of the desired proportion of foam concentrate at all times based on water flow rate, independent of any variations in fire pump intake or discharge pressures. As water flow increases or decreases the foam concentrate rate of injection is increased or decreased automatically to correspond to water flow, maintaining the proper concentrate percentage as selected on the Digital Display Control Module.

Foam concentrate is injected directly into the water stream on the discharge side of the water pump. It is then fed as foam solution into a standard fog nozzle, an air-aspirated nozzle, a straight bore nozzle, or into a CAFS system, by the main fire pump.

Since the foam is injected on the discharge side of the fire pump, and check valves are used at installation, contamination of the booster tank, fire pump, and relief valve with foam concentrate is eliminated.

Hydraulic power to operate the foam pump is to be provided by a separate hydraulic pump driven by the apparatus system. Electrical power to operate the foam systems is provided by the apparatus electrical system.

Order optional system components listed in Section 3 to accommodate system design and requirements. The components listed have been tested with the FoamPro systems and provide for optimum system performance.

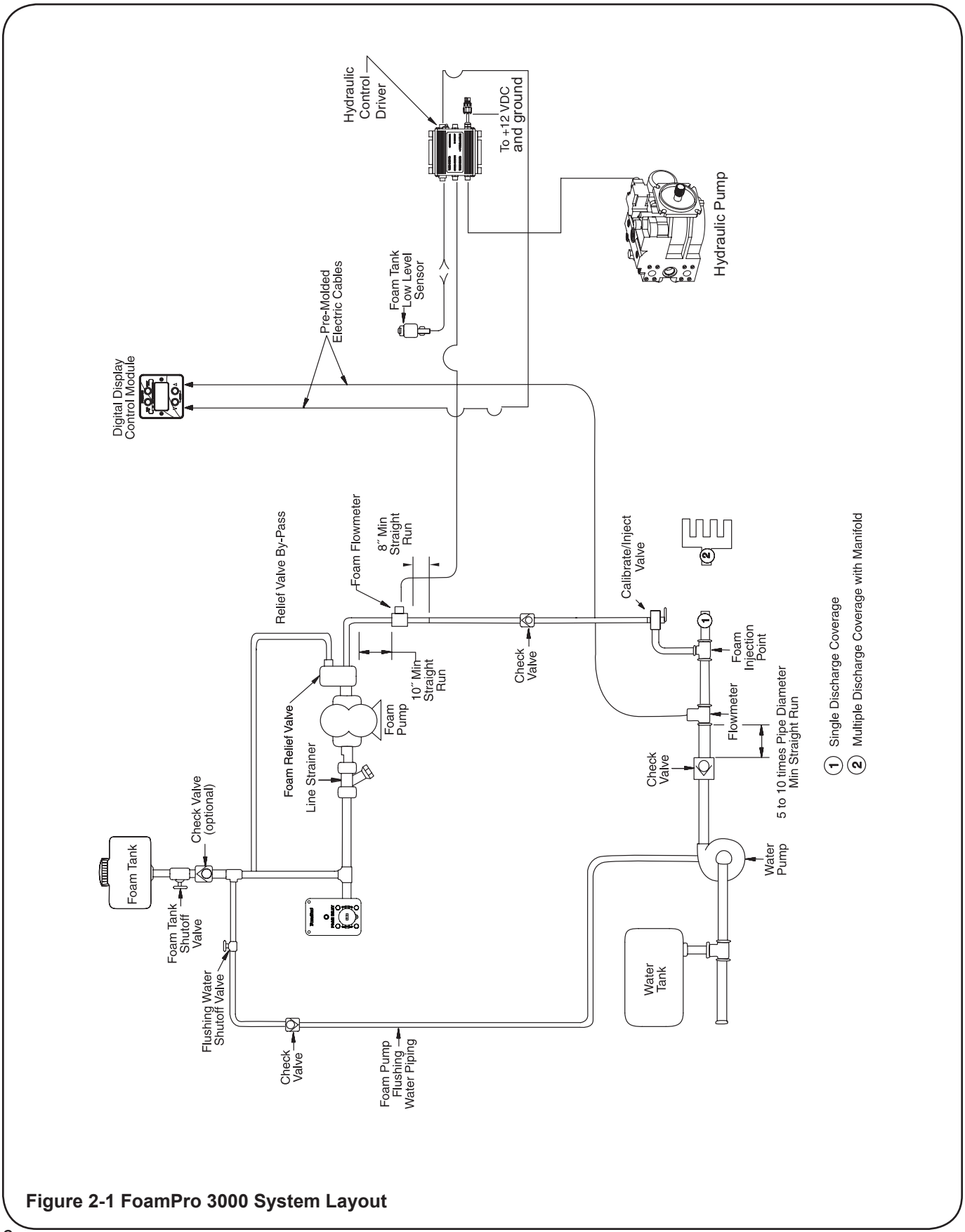
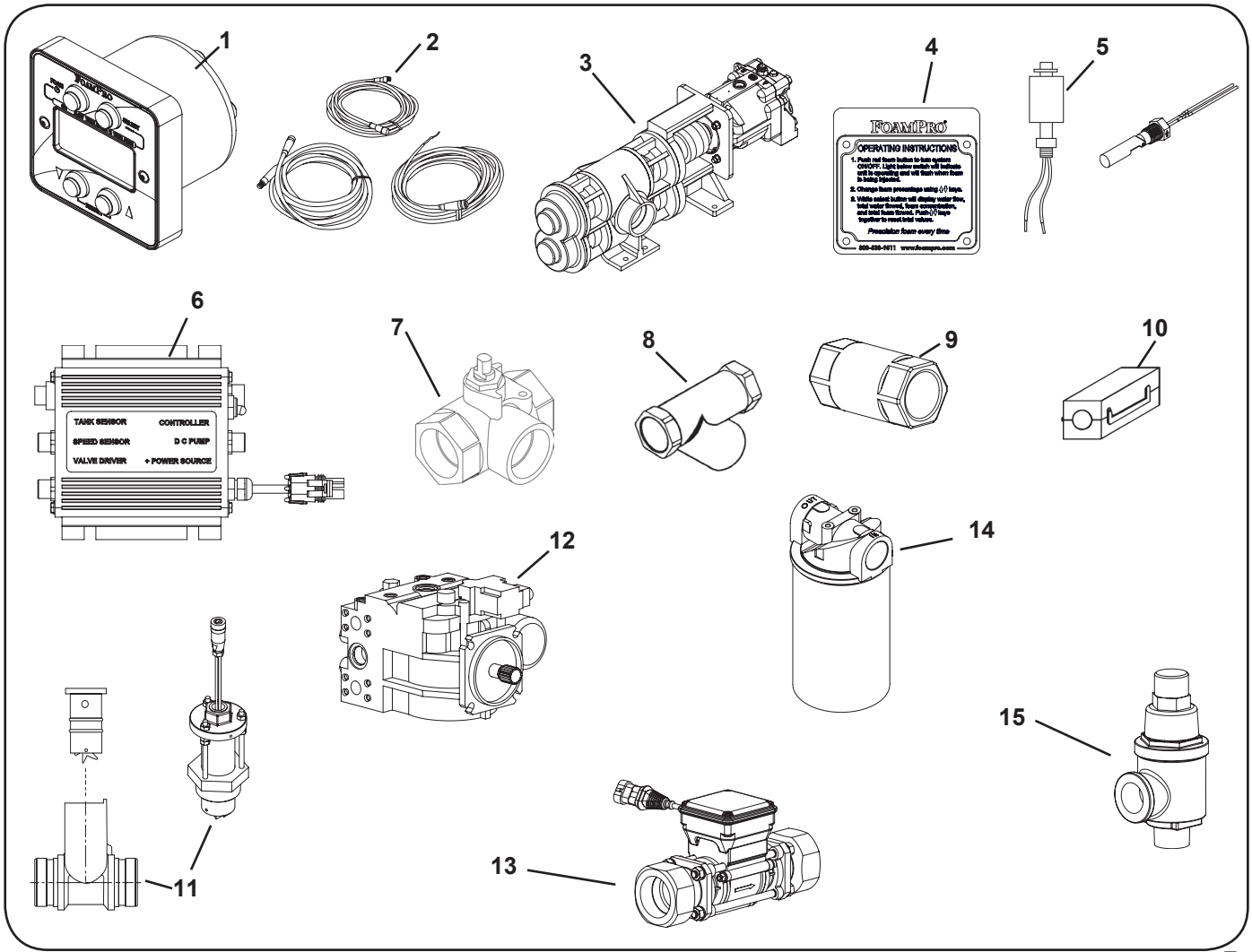


Figure 2-1 FoamPro 3000 System Layout

3 System Component Description

The following components are packaged with the standard FoamPro AccuMax SP system:

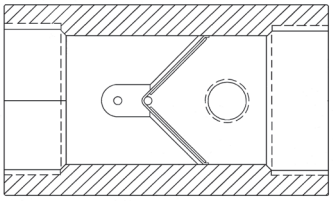
1. **Digital Display Control Module**
2. **Molded Cables**
3. **Foam Pump Assembly**
4. **Instruction Placard**
5. **Low-Tank Level Sensor** (One required. Not packaged with the unit. Order separately.)
6. **Hydraulic Control Driver**
7. **Calibrate/Inject Valve**
8. **Inlet Line Strainer**
9. **Check Valve NPT Foam Injection** This NFPA 1906 (draft) required check valve prevents water back flowing into foam system.
10. **RFI/EMI Suppression Beads**
11. **FoamPro Paddlewheel Flowmeter** (The flowmeter is a required component. The size is specified and ordered under a separate part number when the FoamPro system is ordered. The flowmeters are available with 1-1/2, 2, 2-1/2, 3, and 4-inch NPT threads. All flowmeters have grooved victaulic ends. Part numbers for the various flowmeters can be found in Section 15. Up to four flowmeter sensors can be used with the FoamPro System when a MultiFlo interface is used.)
12. **Hydraulic Pump**
13. **Foam Flowmeter**
14. **Hydraulic Pump Suction Filter (3020 & 3040 Systems Only)**
15. **Foam Pump Relief Valve**



System Accessories Available

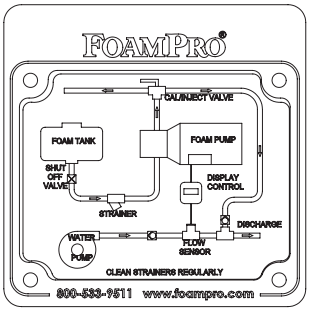
System Specification Placards

System	Part Number
3020	6032-0028
3040	6032-0030
3060	6032-0032
3090	6032-0070
3150	6032-0048
3300	6032-0073

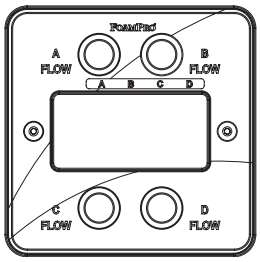


Main Waterway Check Valve with Drain Port

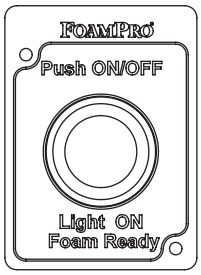
Size/ Thread	All Stainless Steel
1-1/2" NPT	P/N 3320-1001
2" NPT	P/N 3320-1002
2-1/2" NPT	P/N 3320-1003
3" NPT	P/N 3320-1004
4" NPT	P/N 3320-1005



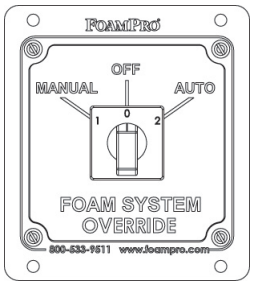
System Placard
Part Number 6032-0015



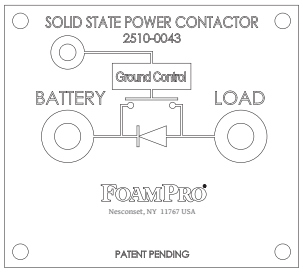
FoamPro MultiFlo Interface
The basic system requires at least one flowmeter to sense water flow in the discharge piping. The FoamPro MultiFlo Interface allows a total of four flowmeters to be used. The display will show the discharge flow on the selected flowmeter.
Part Number 2527-0140



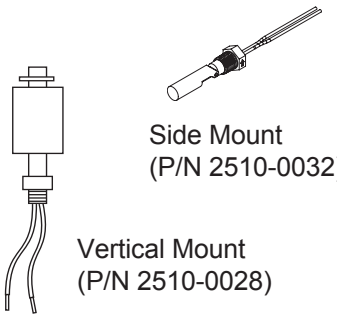
Remote Start/Stop (12 volt DC only)
Part Number 3435-0155



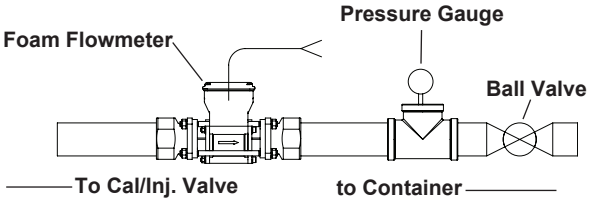
Manual Override
Part Number 3430-0764



Solid State Contactor
Part Number 2510-0043



Low-Tank Level Sensor



AccuMax Calibration Kit
Part Number 3430-0831

4 Installer Supplied Parts

FoamPro AccuMax SP systems are provided with major components and accessories required for installation. Due to differences in chassis and apparatus configurations, the installer must provide, hydraulic coolers, fluids, reservoir, pipe, hoses, tubing, wire and fittings to satisfy installation requirements. The following paragraphs list the specifications for selection of these components. Before beginning system installation, read this section thoroughly to make sure the proper components are selected. For detailed system installation instructions, refer to Sections 5, 6, 7, 8 and 9.

CAUTION: All DOT, SAE or other applicable standards must be followed when installing the hydraulic system. Pay close attention to engine and transmission manufacturer drive limitations.

Hydraulic Pump Drive Selection

The foam pump for the FoamPro AccuMax SP system is powered by hydraulics. Power for the system comes from hydraulic oil supplied by a hydraulic pump attached to the apparatus engine. To obtain optimum performance from the hydraulic motor-driven foam pump, FoamPro has designed the system to use a variable displacement piston hydraulic pump. The FoamPro hydraulic pump provides proper hydraulic fluid flow with reduced heat load, torque, and horsepower requirements.

The FoamPro hydraulic supply pump will provide the correct fluid flow over the widest range of engine speeds. See system specifications for the maximum required pump speed to attain maximum performance levels. By using a PTO ratio greater than 1.0, the minimum engine speed for full system performance could be idle speed.

A transmission PTO should be used to drive the hydraulic supply pump. Transmission PTOs have greater torque capabilities and provide adequate power for the hydraulic pump. Selection of a PTO transmission with a standard SAE mounting pad will allow bolting the hydraulic pump directly to the transmission. The FoamPro hydraulic supply pump has a standard SAE mounting flange and shaft. See Section 15 for flange size and shaft configuration. Other shaft configurations are available. **The shaft rotation of the pump is clockwise when looking at the pump shaft, or counterclockwise when facing the rear of the pump**. Check with the FoamPro factory for other configurations that may be available. See Section 15 for pump dimensions.

Control of the PTO may be provided by a manual shift lever, shift cable, or solenoid. The manual shift-type PTO can be left in gear all the time to circulate oil as soon as the engine is started since the hydraulic pump will draw less than 5 hp when operating in standby mode. The PTO shift can be labeled "**Service Disconnect.**"

When selecting a transmission PTO, it is imperative that consideration be given to frame clearances and the space in which the hydraulic supply pump is to be mounted. For new installations, initial design and planning will eliminate clearance problems. When the FoamPro AccuMax SP system is being installed as a retrofit, all clearances must be taken into account. Consult PTO and chassis manufacturers to determine dimensions and clearances required.

CAUTION: The use of an accessory drive pad is not recommended since adequate torque usually is not available to drive the hydraulic supply pump and accessories.

Oil Reservoir

A hydraulic reservoir will be required to be installed in the apparatus. See Section 15 for minimum recommended reservoir capacity. A larger reservoir may be installed and is recommended if the apparatus is to run at maximum capacity for an extended period of time and to allow air to settle out of the oil.

The reservoir must have a diffuser on the inlet to prevent entrapment of air into the system. A particle screen, of 100-170 mesh, on the oil outlet is recommended to help keep dirt out of the system. A baffle to separate the inlet and outlet sections should be installed in the reservoir. A vented, filtered breather of sufficient size to allow filling of oil is required and an oil drain plug is recommended.

A sight gauge with thermometer is also recommended for easy checking of the oil level and to monitor oil temperature.

The oil reservoir should be mounted away from heat sources, such as exhaust systems, and be in a location that allows easy access for checking and filling the oil.

Oil Cooler

An oil cooler capable of maintaining the temperature of the hydraulic oil at 140° to 180°F (60° to 82°C) is required. Use of an air-to-oil radiator-type heat exchanger mounted in front of the apparatus radiator should provide adequate cooling for the hydraulic system oil. An electric fan attached to the oil cooler permits mounting of the oil cooler anywhere fresh air circulation is available. A thermostat is required to be included for quick warm-up of the oil in cold climates. Check the system specifications page in Section 15 for minimum heat load information to properly size the cooler.

Oil-to-water heat exchangers can be installed, but they present special problems such as sediment accumulation, drainage and overheating when running in standby mode for extended periods without discharging water. If a hydraulic oil-to-water heat exchanger is to be used, proper maintenance, monitoring, and pumping procedures must be followed. The oil-to-water exchangers must be installed per the manufacturer's recommendations and NFPA requirements.

Hydraulic Oil

Ratings and data for the FoamPro AccuMax systems are based on operating with premium hydraulic fluids containing oxidation, rust, and foam inhibitors. These premium fluids include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluids (ATF), Dexron II (ATF) meeting Allison C-3 or Caterpillar TO-2 requirements

The recommended hydraulic fluid operating viscosities are typically 70 to 278 SUS (12 to 60 cSt) within the recommended temperature operating range for optimum performance. The hydraulic oil should have an ISO rating of between 32 to 68 depending on climatic conditions.

Hydraulic Hoses and Fittings

High pressure hydraulic hoses and fittings are to be rated at least at the maximum working pressure of the system. To reduce the potential for leaks at the hydraulic fittings, use SAE 37° flare JIC-type fittings or SAE straight thread O-ring fittings. See the table for required fitting sizes, minimum hose size, and minimum hose pressure ratings for the hydraulic components in Section 15.

Foam Concentrate Suction Lines

Fittings and hoses from the foam tank to the inlet of the foam pump must be supplied. Use the minimum inside diameter or larger clear suction hose shown below for the corresponding system depending on the viscosity of the foam concentrate. Many class B foams are more viscous and will require one size larger inside diameter hoses.

Model	Min. Hose ID
3020/3040	1-1/2"
3060	2"
3090	2-1/2"
3150	3"
3300	4"

Use fittings and components that are rated for 23" Hg (584.2mm) vacuum and 50 PSI (3 BAR) pressure or better. The components used must be compatible with the foam concentrates used. Fittings used must be made of brass or 300 series stainless steel. If a flushing system is to be used, the pressure rating of those components subjected to main water pump pressure are to be rated to 400 PSI (28 BAR) or better.

A drain/air bleed valve should be provided to allow draining of the tank and easier priming of the foam pump.

Foam Concentrate Discharge Lines

Fittings and hoses from the discharge of the foam pump to the foam injection point must be supplied by the installer. Hoses and fittings are to be 3/4" (19mm) for the 3020 and 3040; 1" (25.4mm) for the 3060; 1-1/4" (31.8 mm) minimum for the 3090; 1-1/2" (38.1mm) for the 3150; and 2" (50.8mm) for the 3300 systems inside diameter, rated at or above 400 PSI (28 BAR) working pressure. Fittings and hoses must be compatible with all foam agents to be used with the system. Use fittings of brass or 300 series stainless steel.

WARNING: Do not use air brake tubing for foam systems as the tubing is not compatible with most foam concentrates.

The foam flowmeter supplied with the system is to be installed in the foam concentrate discharge line of the foam pump. This requires a straight length of brass or 300 series stainless steel pipe 10" (254mm) minimum before and 5" (127mm) minimum after the flowmeter. This ensures laminar flow through the flowmeter. Failure to comply with these minimum dimensions will affect the accuracy of the entire foam system.

Foam Concentrate Tank(s)

Foam concentrate tanks must be supplied to suit the capacity required for the apparatus application. The tank(s) should meet NFPA minimum standards for the design capacity, including filler size, vapor pressure venting, and drain facilities.

Check Valves

It is required by NFPA to install a check valve in the foam concentrate injection line to prevent foam concentrate flow from the foam tank to the injection point (at the main waterway) due to static head pressure. The concentrate check valve is included with each system (3/4" NPT with the 3020 and 3040; 1" NPT with the 3060; 1-1/4"' NPT with the 3090; 1-1/2" NPT for the 3150; 2" NPT for the 3300; and a 1/2"' NPT with the “D” sections).

If the system is to be installed in an apparatus where potable water sources may need to be isolated from the possibility of foam contamination, there are a few methods that can be incorporated into the design of the apparatus or on the outside of the apparatus.

One of the methods is to install check valves in all water line locations, such as flush lines, where foam concentrate could drain back into the water pumps or tanks of the fire apparatus, and where the water piping that will supply foam solution connects to the apparatus water pump discharge.

Another method is to install a check valve or other device between the water pump tank and the suction inlets to the water pump, or outlets of the hydrant.

These are just a few of the methods that may be available.

Drain lines must be provided from all water and foam solution piping components to prevent freezing in cold weather. Multiple drain systems that allow individual drain lines to connect with one another may allow foam or water to circumvent the check valves. Care must be taken to avoid this possibility as contamination of the water tank, foam tank, or water pump may result.

Electrical Requirements

Electrical power and wiring must be supplied from the main apparatus electrical system to the AccuMax SP system. The power must be supplied directly from the battery without any connections to other high power devices, such as primer pumps, hose reels, light bars, et., with its own disconnect switch or a switch or contactor actuated by the battery disconnect switch, PTO switch or other device.

The system can be operated with either a 12 VDC or 24 VDC, negative ground, power source. The system should be protected with a 10 AMP fuse for 12 VDC systems and 5 AMP fuse for 24 VDC systems. All system components should all be powered from the same terminal and ground connections should all be common. Use a standard 14 AWG automotive hookup wire.

NOTE: *See "POWER SUPPLY" (page 27) in the Electrical Installation Section for important installation information.*

CAUTION: Always disconnect the ground straps, electrical wires, and control cables from the Digital Display Control Module, the control driver box, and any other FoamPro equipment before electric arc welding at any point on the apparatus. Failure to do so will result in a power surge through the unit causing irreparable damage and is not covered under warranty.

5 Installation Planning

Because of the potential differences in apparatus plumbing and foam system configuration, it is not practical to depict exactly how each FoamPro unit can best be installed onto a particular apparatus. Most of the information contained in the following sections, however, will apply to any situation.

NOTE: It is recommended that you read the following sections thoroughly before beginning installation of the FoamPro AccuMax SP system. It is also recommended that you spend time planning and designing where and how you intend to install this unit in the apparatus before beginning the actual installation.

Determine the locations of the components to be installed such as foam tank(s), foam pump, oil reservoir, oil cooler, foam strainers, tank valves, flowmeter(s) and hydraulic pump. Try to place components in locations that require the least amount of hoses and fittings.

Locate the FoamPro system components in an area that is protected from road debris and excessive heat buildup. Since the master power switch and CAL/INJECT valve are components you may need to access, it is recommended that they be installed in an accessible location in the vicinity of the operator's panel.

The foam pump unit must be mounted below the discharge of the foam tank(s) to provide for gravity feed to the foam pump. Locate the foam tank(s) where the refilling can be easily done with 5 gallon (19 liter) pails and other methods suitable to the end user. Most water tank manufacturers will build foam tanks into the booster tank. When specifying integral foam tank(s), make sure provisions are made for installation of the low-tank level sensor as well as foam suction connections and tank drainage.

Determine a location on the operator panel of the apparatus for the Digital Display Control Module. Consideration must be given for routing the control cable from the Digital Display Control Module to the hydraulic control valve and the main waterway flow meters. If necessary, order longer or shorter cable assemblies to suit the location demands.

CAUTION: Never attempt to cut or lengthen the molded cables. Doing so will result in RFI/EMI interference. Contact the factory if molded cables of a different length are required.

High viscosity foam concentrates (2000 centipoise and higher) or inlet lines longer than 10 feet, will require the foam intake to be one size larger. When larger inlet piping is used, a larger foam strainer is required to reduce the pressure drop.

Like any hydraulic system, the FoamPro AccuMax SP will require cooling and hydraulic fluid filtration. An oil cooler must be provided for the system and consideration must be given to the location. The cooler must be mounted in an area where adequate cool air can flow over the cooler fins. The ideal location for an oil cooler is in front of the apparatus engine radiator. Consult the chassis manufacturer to ensure adequate fan capacity is available to provide the proper air flow. Fluid filtration is vital to a hydraulic system. A suction strainer in the reservoir is required. A filter is provided on the hydraulic pumps on the 3060 thru the 3300 systems. The 3020 and 3040 systems require a separate suction filter as supplied.

When planning the installation, consideration must also be given to the hydraulic supply pump location, drive configuration and hose routing.

6 Foam Pump and Hydraulic Control Valve Installation

Hydraulic-Driven Foam Pump Assembly

The AccuMax systems are designed to be used with various gear type foam pumps currently in use in the industry. The standard foam pump used in the systems are manufactured by Fire Lion. Optional approved gear type foam pumps designed into the system are manufactured by Aurora (Edwards) and Trident (Titan). **Specifications for these options can be found in Section 15**.

The foam pump assembly must be mounted in a horizontal position. The base of the foam pump must be anchored to a surface or structure that is rigid and of adequate strength to withstand the vibration and stresses of apparatus operation. Mounting dimensions for the FoamPro AccuMax SP foam pump and motor assemblies can be found in Section 15.

CAUTION: Flexible hose connections are required between the major FoamPro components and the main water system. Do not hard plumb the system.
Be sure the hydraulic hoses and the foam concentrate hoses can be properly routed to the inlets and outlets on the foam pump. Foam concentrate must gravity feed to the foam pump inlet from the foam tank(s). The foam pump must be mounted in an area to avoid excessive exhaust system heat buildup.

Protection must be provided for the hoses and wiring to prevent chafing and abrasion during operation of the foam system. Protect the foam pump base from excessive road spray and debris. Although the system is sealed and designed to be resistant to the harsh environment of fire fighting apparatus, a protected location with easy operator access is the recommended installation location.

Choosing the Proper PTO

It is important to turn the hydraulic pump at the proper speed to ensure that the correct hydraulic pressure is produced over the full operating range of the foam system. When selecting a PTO to drive the hydraulic pump, compare the maximum RPM for the water pump with the maximum RPM (3,600 RPM) for the hydraulic pump. Then select a PTO that will provide the best performance at a lower RPM.

For Example: the maximum speed you can turn the water pump is 1,800 RPM. For the 3150 system hydraulic pump, the minimum speed is 1,375 RPM, and the maximum speed is 3,600 RPM. It is recommended to choose a PTO with a range of 1 - 1.60 conversion rate (or higher).

According to this example, the following table shows the Engine Speed with the corresponding Hydraulic Pump Speed:

Engine Speed	Hydraulic Speed
800 RPM	1280 RPM
900 RPM	1440 RPM
1000 RPM	1600 RPM
1100 RPM	1760 RPM
1200 RPM	1920 RPM
1300 RPM	2080 RPM
1400 RPM	2240 RPM
1500 RPM	2400 RPM
1600 RPM	2560 RPM
1700 RPM	2720 RPM
1800 RPM	2880 RPM

7 Hydraulic Plumbing Installation

Figure 7-1 provides some recommended guidelines for the location of the hydraulic system components. When making hydraulic component connections ensure all applicable DOT and SAE standards are followed. Use hoses and fittings rated at least the maximum working pressure listed in Section 15 for the hydraulic oil high pressure lines. See Section 15 for required fitting sizes, minimum hose size, and minimum pressure ratings.

The fittings required to connect the hydraulic hoses to the FoamPro AccuMax SP foam pump motor and hydraulic supply pump are SAE ORB (O-Ring Boss) fittings with SAE JIC 37° flare swivel, and SAE Split Flange port connections.

CAUTION: To ensure the integrity of fitting connections in the hydraulic system, use only SAE JIC 37° flare, SAE O-Ring Boss, or SAE Split Flange-type hose connections.

CAUTION: Use only approved petroleum-based hydraulic fluids as described in Section 4. Never mix fluid types. Ensure all hoses and seals are compatible with fluids used. Do not use water or glycol-based fluids. Do not use phosphate ester-type fluids. Other hydraulic fluids such as SAE 10W-40HD motor oil are too viscous for proper pump performance.

Hydraulic Power Source

The hydraulic power for the FoamPro AccuMax SP system is supplied by a hydraulic pump mounted on the fire apparatus engine, transmission, or auxiliary PTO. The hydraulic pump supplied with the system has been chosen to provide the required flow and pressure to drive the FoamPro system.

Refer to Section 4 of this manual for further pump and PTO information and Section 15 for detail dimensions of the pump. See the table in Section 15 for all proper hose sizes, pressure ratings, and fittings for the various hydraulic components supplied by FoamPro.

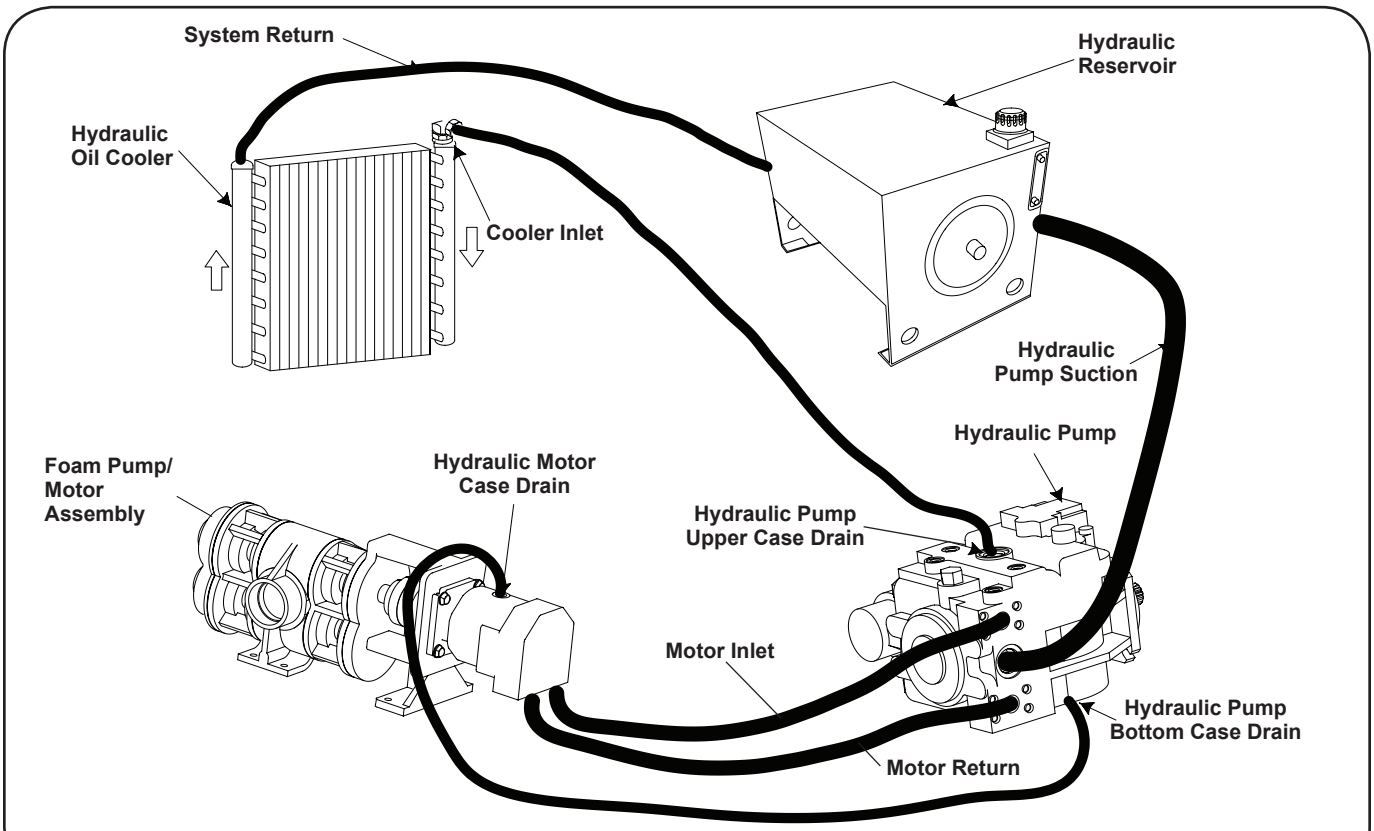


Figure 7-1 FoamPro AccuMax SP Hydraulic System Diagram

Hydraulic Reservoir

The hydraulic reservoir for the system is to conform to the description in Section 4 and to all SAE and DOT standards. See table in Section 15 for minimum reservoir capacity for the unit being installed.

Hydraulic Oil Filtration

Hydraulic fluid filtration is vital to the performance and life of any hydraulic system. The AccuMax systems are no different. A suction strainer of at least 100 to 170 mesh is required in the outlet of the reservoir and should be sized to accommodate the charge pump flow of the system without significant pressure drop.

Models 3060 thru 3300 hydraulic pumps have a spin-on filter already installed for that particular pump's protection. This filter has a Beta 10 rating of 10 to 20.

Models 3020 and 3040 systems require a suction filter with a Beta 10 rating of 10 to 20. The flow rating on the filter should be at least 25 gpm when used for suction. A filter element is supplied with these systems.

CAUTION: Ensure all hydraulic hoses and components are clean and free of debris.

CAUTION: Ensure hydraulic fluid is clean and free from contamination when filling and changing the fluid in the system.

Hydraulic Oil Cooler

An oil cooler is required in the hydraulic system to ensure proper oil temperature for optimum performance and to avoid damage to the hydraulic components. The actual cooler size required will depend on the system requirements, the location of the cooler, and the manufacturer of the cooler. Typical oil-to-air cooler connections are shown in Figure 7-2. The cooling requirements for the system being installed are listed in the table in Section 15.

If an oil-to-water exchanger is used, proper maintenance, mounting, and operating procedures must be maintained. A method to circulate cool fresh water must be provided when the hydraulic pump is engaged. A drain port must also be provided to prevent freezing and to allow flushing.

Hydraulic Supply Pump Connections

After completion of the mounting of all hydraulic system components, hose connections must be made. A table in Section 15 shows the connector and minimum hose sizes and Figure 7-3 shows the connection ports to use for the hydraulic supply pump. Specific pump drawings for each system are found in Section 15. **Always use the uppermost case drain port available.**

Pump Adjustment

The supplied hydraulic pump does not require any adjustment. The pump is adjusted to give you maximum performance throughout the entire operating range and has been tested with your system.

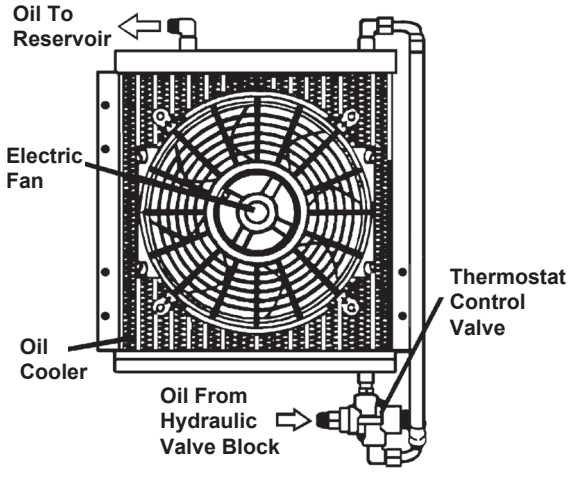
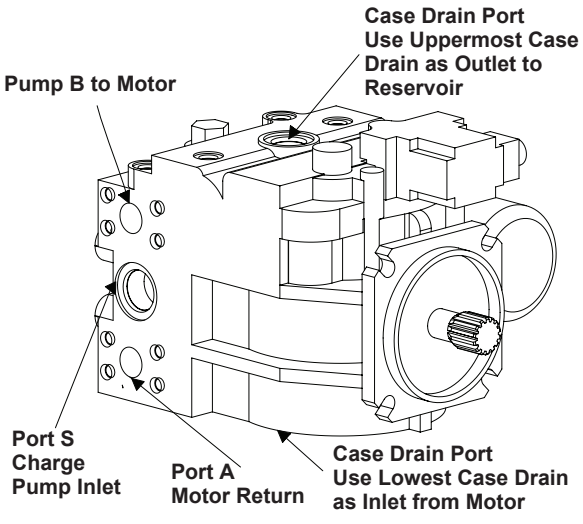


Figure 7-2 Oil Cooler Hose Connections



See Section 15 for port sizes and ratings

Figure 7-3
Hydraulic Supply Pump Connection Ports

8 Water and Foam Plumbing Component Installation

The following diagram (Figure 8-1) provides recommended guidelines for the installation of the system components that handle water, foam concentrate and foam solution. Note that additional options such as dual-tank system, multiple flowmeters, etc., are covered by the individual manuals included with those systems and consideration must be given to potential interferences.

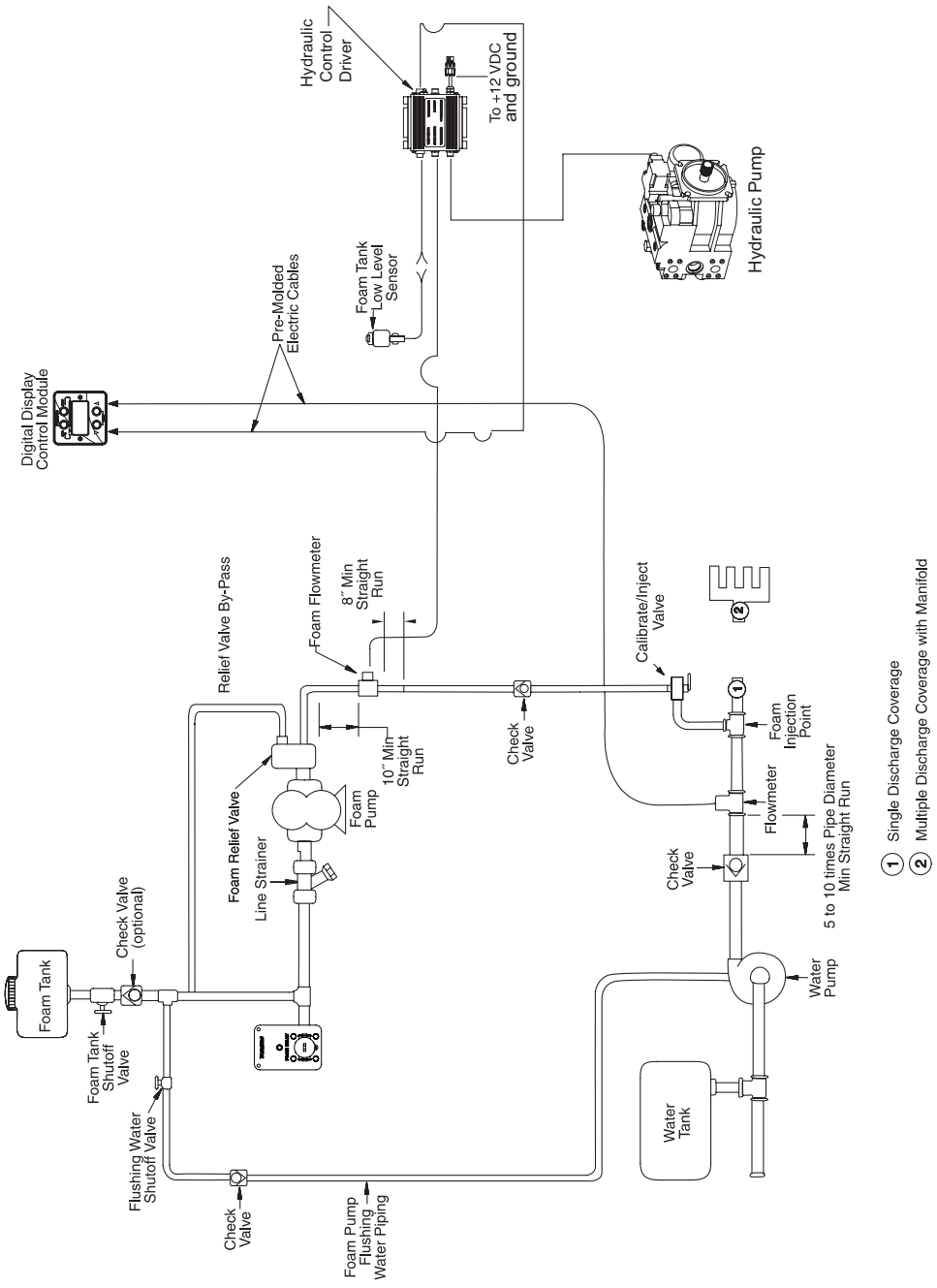


Figure 8-1 FoamPro AccuMax SP System Piping

CAUTION: Flexible hose connections are required between the major FoamPro components and the main water system. Do not hard plumb the system.

Foam Pump Suction

The inlet hose from the foam tank should be a minimum of 1-1/2" (38.1 mm) ID for the 3020 and 3040, 2" (50.8 mm) ID for the 3060, 2-1/2" (63.5 mm) ID for the 3090, 3" (76.2 mm) ID for the 3150, and 4" (101.6 mm) ID for the 3300 and have adequate wall stiffness to withstand the vacuum of the foam pump while it is running without collapsing [23" Hg (584 mm HG)].

Foam Pump Discharge Relief Valve

NOTE: To prevent possible foam cell contamination, if the system is plumbed with an off-board pickup you must plumb the Discharge Relief Valve back to the suction side of the foam pump as per the instructions. The discharge relief valves on the outlet port of the hydraulically-driven foam pump are preset at the factory to ensure optimum performance of the FoamPro AccuMax system. The bypass line from the hydraulically-driven foam pump relief must return to either the foam concentrate tank or a minimum of 5 feet from the inlet port of the foam pump. This will lessen the aerating of the foam in the event of an over-pressurization of the system.

Calibrate/Inject Valve

The calibrate/inject valve is supplied in the fitting kit and is to be positioned as shown in Figure 8-1 in the system. This valve must be accessible by the pump operator during normal operations. The valve is a 3-way directional control valve that selects where the output of the foam system will go.

Check to make sure the valve is installed properly. Look at the ports as you move the selector handle. The flow should go from the center port to each of the end ports.

The hoses to and from the valve should be 3/4" (19 mm) for the 3020 and 3040, 1" (25.4mm) for the 3060, 1-1/4" (31.8mm) minimum for the 3090, 1-1/2" (38.1mm) for the 3150, and 2" (50.8mm) for the 3300 systems inside diameter, rated at or above 400 PSI (28 Bar) working pressure. Fittings are to be the same size as above and made of brass or stainless steel, with the same minimum pressure rating as the hoses.

The hose(s) from the calibrate side of the valve(s) may have a lower pressure rating since it is used for system calibration only and is always vented to the atmosphere. The hose(s) from this port must be long enough to reach a container outside the apparatus and may be coiled for storage when not in use.

Line Strainer

The line strainer(s) provided with the FoamPro AccuMax SP system are sized properly for most applications. See Section 4 for further information. The appropriate strainer is to be installed on the inlet side of the foam pump. The hose from the foam tank should have adequate wall stiffness to withstand the vacuum of the foam pump while it is running without collapsing [23" Hg (584 mm HG)].

CAUTION: If a pressurized water flush system is incorporated, the plumbing exposed to this pressure must be rated at or above the operating pressure or a minimum of 400 PSI (28 BAR).

Main Waterway Flowmeters

The FoamPro AccuMax SP system is designed to accept flow reading signals from the FoamPro paddlewheel-style flowmeter.

Proper flowmeter sizing is critical to system accuracy. Select a flowmeter size based on actual flows required, not standard pipe sizes. Refer to the installation drawing in Section 15 for proper flowmeter sizing.

The flowmeters require that the amount of turbulence in the pipe being monitored is as low as possible. Excessive turbulence produces unstable and inaccurate flow readings. The following installation guidelines will help attain the best readings and maintain accuracy of the FoamPro system when using the FoamPro paddlewheel flowmeter in a tee or in the FoamPro Manifold.

1. A minimum **5 times the pipe diameter** of straight run pipe without any fittings is necessary upstream of the flowmeter. **10 times** is better. The longer the straight run, the lower the turbulence. The following are the recommended straight run lengths for given pipe sizes:

Pipe Size	Recommended Straight Run Pipe
1-1/2" (38 mm)	7-1/2 to 15" (191 to 381 mm)
2" (50 mm)	10 to 20" (254 to 508 mm)
2-1/2" (64 mm)	12-1/2 to 25" (317 to 635 mm)
3" (76 mm)	15 to 30" (381 to 762 mm)
4" (100 mm)	20 to 40" (511 to 1016 mm)

2. The downstream plumbing of the flowmeter is not as critical, but straight runs without fittings help maintain accurate flow readings.
3. **Do not mount a flowmeter directly after or before an elbow or valve**. Valves create severe turbulence when they are "gated down" as shown in Figure 8-2.
4. Try to mount the flowmeters in a position that is accessible for routine inspection and maintenance.

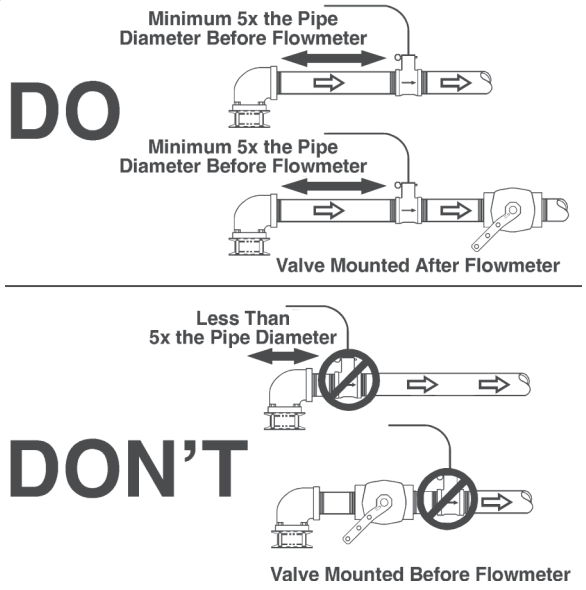


Figure 8-2 Flowmeter Placement

The FoamPro paddlewheel-style flowmeter fittings are specially designed tees that make inspection and maintenance of the flow sensor easy. The threads of the tees are available in NPT with grooved victaulic ends, or BSP with grooved victaulic ends. In horizontal runs the tees should be mounted as close to upright as possible within the range shown in Figure 8-3.

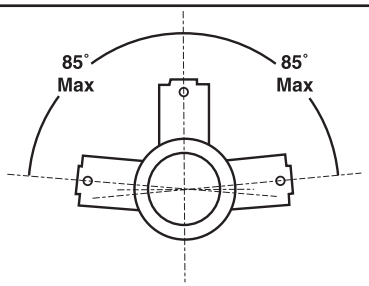


Figure 8-3 Flowmeter Position Range

With the use of a MultiFlo interface, two to four flowmeters may be monitored simultaneously. A single injection point that will supply foam agent to all foam discharge outlets is required. See Form 880, provided with the MultiFlo System, for further information.

Foam Discharge Flowmeters

The foam flowmeters shipped with the unit are designed to give maximum performance and accuracy over the full range of operations for the system. The foam flowmeters are to be mounted in a horizontal position. A straight run of hard piping before and after the flowmeter is required. The following chart specifies the minimum straight run required:

Model	Pipe Size	Minimum Straight Run Pipe Before Flowmeter	Minimum Straight Run Pipe After Flowmeter
3020& 3040	3/4"	8-1/4"(210 mm)	4-1/8"(105mm)
3060	1"	8-1/4"(210 mm)	4-1/8"(105mm)
3090	1-1/4"	8-1/4"(210 mm)	4-1/8"(105mm)
3150	1-1/2"	10-1/4"(260 mm)	5-1/4"(133 mm)
3300	2"	10-1/4"(260 mm)	5-1/4"(133 mm)

Injection Point

The position of the injection point MUST be in a place that is common to all discharges which require foam capability. This position may be before or after the main water flowmeter, but not within the straight run distance required for the flowmeter as previously described. A separate injection point is not possible for each discharge. If multiple flowmeters are used, the injection point must be installed before the flowmeters at the inlet to their common manifold (See Figure 8-4).

Most foam concentrates by nature mix with water very quickly, so each discharge from a manifold will receive equal amounts of foam concentrate if the manifold is properly designed and installed. A static mixer or special mixing considerations may need to be designed into the system, especially when using thicker foam concentrates and those that may not readily mix with water.

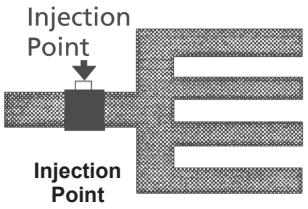


Figure 8-4 Injector Fitting Placement for Multiple Discharge

Foam Concentrate Check Valves

Check valves are provided to prevent foam concentrate flow from the concentrate tank through the injection point and into the main waterway when the system is not in use. This is a NFPA requirement. A check valve of the proper size is supplied for the standard systems. See Figure 8-1 for component placement. The concentrate check valves have a minimum cracking pressure of 4 PSI (0.1 BAR) and are pressure rated to 400 PSI (28 BAR) minimum working pressure. It is a good idea to inject foam concentrate at a horizontal or higher angle to allow water and debris in the water line to drain away from the check valve(s) as shown in Figure 8-5. This will avoid sediment deposits or formation of an ice plug in cold weather applications.

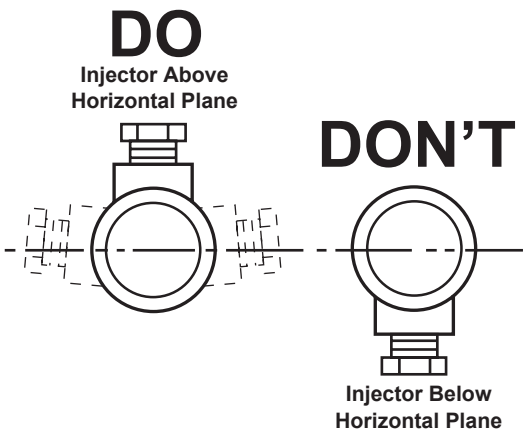


Figure 8-5 Foam Injector Position

Main Waterway Check Valves

If the system is to be installed in an apparatus where potable water sources may need to be isolated from the possibility of foam contamination, there are a few methods that can be incorporated into the design of the apparatus or on the outside of the apparatus.

One of those methods is to install check valves in all water line locations such as flush lines, where foam concentrate could drain back into the water pumps or tanks of the fire apparatus, and where the water piping that will supply foam solution connects to the apparatus water pump discharge.

Another method is to install a check valve or other device between the water pump tank and the suction inlets to the water pump, or outlets of the hydrant.

These are just a few of the methods that may be available.

CAUTION: The usage of check valves or other means of isolation are not to be used as a substitute for proper flushing of apparatus lines after usage.

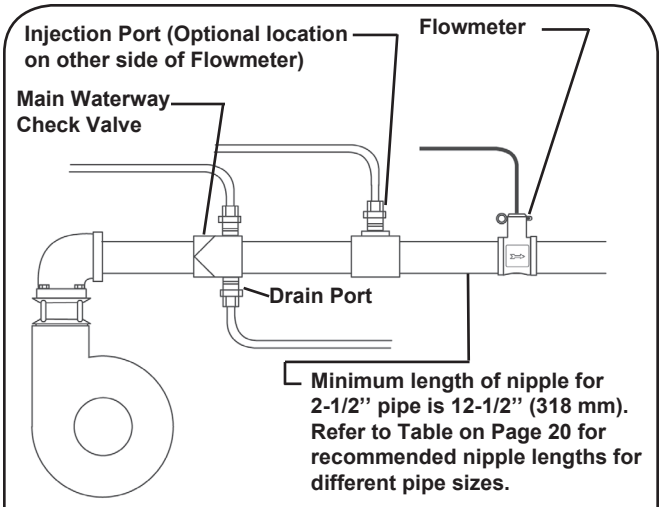


Figure 8-6
Recommended Midship Pump Installation

Flushing System

Depending on the corrosiveness of the foam concentrates used, or when changing foam concentrate types or manufacturers, a flushing system must be installed. Generally all Class B foam concentrates must be flushed from the system after usage with fresh water. Most Class A foam concentrates are less corrosive and do not require flushing after each use. See Figure 8-7 for a typical flushing system plumbing schematic.

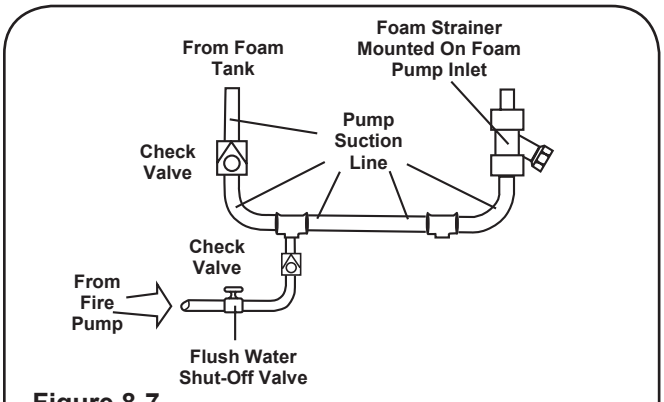


Figure 8-7
Foam Concentrate Flushing System Diagram

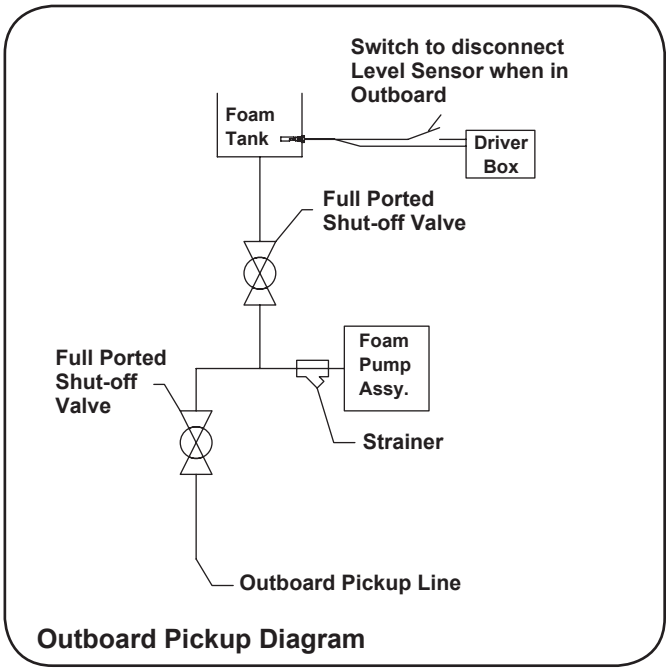
Drain Lines

On apparatus with multiple drain lines, the drains from the foam solution discharge line should not be piped into a multi-drain system before the check valves. The standard multi-drain system from most manufacturers will allow cross talk between the drain lines and the apparatus water tank, resulting in contamination of the water tank with foam. A separate drain system should be provided for the foam solution piping to prevent contamination of the water tank and fire pump.

Outboard Pickup

An outboard pickup may be adapted to the foam pump inlet. The pickup should be positioned between the foam tank shut-off valve and the foam inlet line strainer. A tee the same size as the tank to pump line may be placed in the suction line with the side leg of the tee going to the outboard pickup shut-off valve at the panel. A sealed quick connect-type fitting may be mounted to the panel for easy access. The outboard pickup line should not exceed 10 feet and the same line size and specifications as the tank to pump line should be utilized. The shut-off valves must be full ported valves and be air tight. A switch must be provided to disengage the low level sensor when using the outboard pickup. This switch may be a separate panel mount or one that is tied into the pickup valve actuator.

NOTE: The tank shut-off valve must be closed before opening the outboard valve when switching to the offboard pickup. The offboard pickup valve must be closed before opening the tank valve when switching to the foam tank operation.



Outboard Pickup Diagram

9 Electrical Equipment Installation

Electrical Connections

Follow the system electrical diagram (Figure 9-1) for proper hookup of each of the electrical components. Complete molded cable sets are provided with each FoamPro system to make all the necessary connections. The cables are color coded and "indexed" so they can only go in one way. **DO NOT force mismatched connections.** The system can only perform when the electrical connections are sound, so make sure each one is right.

Some Things to Keep in Mind

- Do not hook up the main power cables until all connections are made to each of the electrical components. The last connection should be the power cable to foam pump/motor base assemblies.

Warning: The electric motor-driven foam pump contains a capacitor on the input power. Connect leads with battery off or disconnected. Current will flow even with the master circuit breaker off.

CAUTION: Never attempt to cut or lengthen the molded cables. Doing so will result in RFI/EMI interference. Contact the factory if molded cables of a different length are required.

- The FoamPro AccuMax SP requires two separate electrical connections. The connection for the valve driver box on the hydraulic-drive foam pump requires 5 amps minimum. It is recommended to install a 10 amp fuse to the + power line to the valve driver.

- This system is designed for use on 12-volt or 24-volt negative ground systems only.

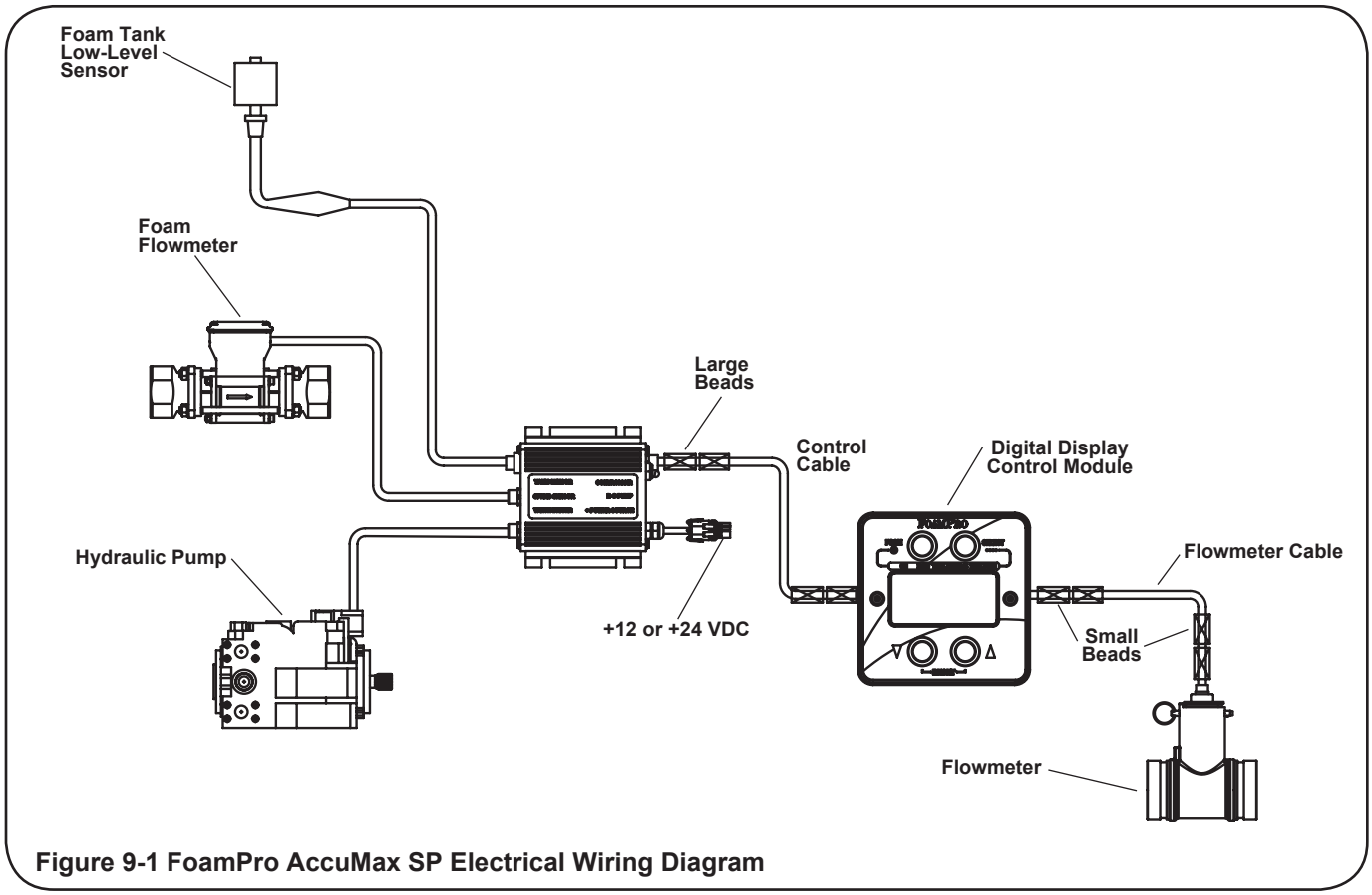


Figure 9-1 FoamPro AccuMax SP Electrical Wiring Diagram

NOTE: Do not mount radio transmitter or transmitter cables in direct or close contact with the FoamPro units.

- Use care when installing molded cables. Count pins or check color codes before connecting. Bent pins caused by improper hookup can prevent proper operation even when cables are reattached properly.

- Before connecting the molded cables, inspect the seal washer in the female connector. If the seal washer is missing or damaged water can enter the connector and cause corrosion of the pins and terminals that will cause system failure.

CAUTION: The cables shipped with each FoamPro system are tested at the factory with that unit. Improper handling and forcing connections can damage these cables and could result in other system damage.

CAUTION: Always disconnect the ground straps, electrical wires and control cables from the Digital Display Control Module and other FoamPro equipment BEFORE electric arc welding at any point on the apparatus. Failure to do so will result in a power surge through the unit that could cause irreparable damage.

Digital Display/Control Module

The Digital Display Control Module is designed to be mounted in the operator panel of the apparatus. The cutout that will be needed in the operator panel is a 3-7/8 inch (98 mm) diameter hole [(the same as a 3-1/2 inch (89 mm) pressure gauge]. The display is secured with four #10 studs on the back of the front plate (see Section 15 for a mounting template). The display requires 5 inches (127 mm) minimum clearance from the back of the operator panel to clear wires and connectors. Make sure there is enough clearance behind the operator's panel for the cables. Once the Digital Display Control Module is mounted, connect the control cable (red coded cable ends) from the hydraulic pump valve driver box terminal (See Figure 9-2) to the 5-pin connector on the back of the Digital Display Control Module (See Figure 9-3). A color-coded decal on the valve driver box identifies each cable connection.

NOTE: Ensure that the panel where the Digital Display Control Module is mounted has an adequate ground. For stainless steel and vinyl-coated panels, a ground strap must be attached from one of the four screws holding the Digital Display Control Module in place to the frame of the fire truck to ensure adequate grounding (See Figure 9-3).

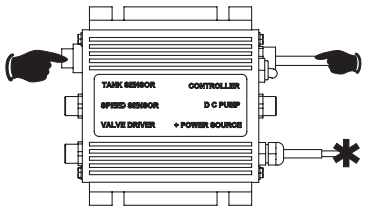


Figure 9-2 Valve Driver Box Connections

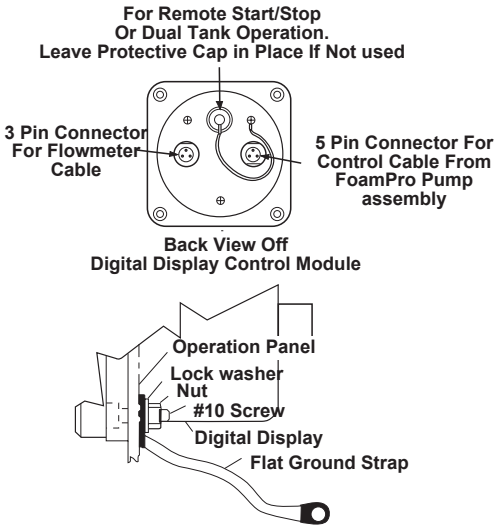


Figure 9-3
Digital Display Control Module Cable Connections

Flowmeter Connections

FoamPro Flowmeter

If a single FoamPro paddlewheel-type flowmeter is to be used, a molded cable is supplied which connects from the flowmeter sensor to the 3-pin connector on the Digital Display Control Module (See Figure 9-3).

MultiFlo Flowmeter Interface Modules

Refer to the MultiFlo Interface instructions for installations requiring multiple FoamPro Flowmeters. Figure 9-4 shows the connection of the flowmeters and MultiFlo Interface with the Digital Display Control Module.

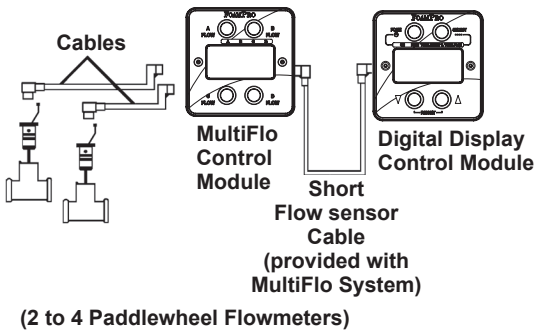


Figure 9-4
MultiFlo and Flowmeter Connections

Foam Tank Low-Level Sensor

The foam level sensor must be mounted in the foam to monitor low foam concentrate level. Figure 9-5 shows the optimal mounting positions for the foam tank low level sensors. The standard top or bottom mount switch has 1/8" NPT threads. Mount the sensor in the bottom of the foam tank in an upright position. Use suitable sealant to prevent concentrate leakage.

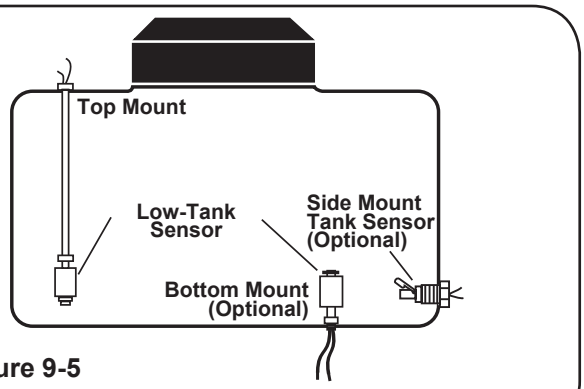


Figure 9-5
Foam Tank Low-Level Sensor Mounting Options

NOTE: There must be space under the tank for the cable to be routed to the hydraulic valve driver box.

Do not remove the float from the shaft on the sensor assembly. If it is installed in the reverse position **LO CON** and **NO CON** will appear on the Digital Display Control Module and the system will automatically shut down, even if there is foam in the tank.

When the bottom of the tank is not accessible, the foam tank low-level sensor can be hung from a long pipe nipple attached to the top of the tank. Ensure the pipe nipple is rigid enough to withstand the force of the sloshing foam when the vehicle is in motion.

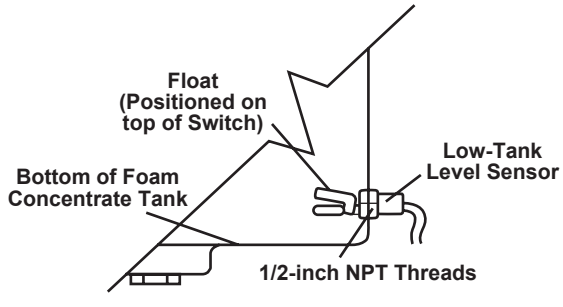
Make sure the low-level sensor does not contact the side of the foam tank when the vehicle is in motion. Because the wire connections must be made inside the pipe nipple, a 3/8" NPT pipe nipple with a 3/8" by 1/8" NPT reducer at the lower end is the minimum size recommended. When the foam tank low-level sensor is suspended for the top of the tank the float must be reversed for proper operation.

CAUTION: The foam tank low-level sensor must be utilized to protect the foam pump from dry running. Failure to do so will void the warranty.

CAUTION: Do not mount the low-level sensor near the inlet or discharge of the tank, especially when used with high viscosity foams. The resulting foam flow may cause false readings on the sensor.

Using a powered test light, check the foam tank low-level sensor operation after installation. With no foam in the tank, the light should be on. If this is not the case, remove the clip from the end of the sensor; then remove the float and reinstall it 180° out of position. Reinstall the clip.

Connect the sensor wires to the low tank sensor cable. The low-tank switch sensor cable may be shortened. It has pigtails at both ends and is not polarity sensitive. Connect the other cable end (blue-coded cable end) to the hydraulic valve driver box on the hydraulic valve assembly as shown in Figure 9-2.



NOTE: Distance from bottom of foam tank to center of switch should allow sufficient foam concentrate volume for two minutes of pump run time.

Figure 9-6 Side-Mount Foam Tank Low-Level Sensor Installation

A side-mount foam tank low-level sensor is available to be used if both the top and bottom of the is not accessible. The side-mount foam tank low-level sensor has 1/2" NPT threads. The float must be positioned on top of the switch to move up and down (arrow on side of switch). The distance from the bottom of the foam tank to the center of the switch should allow sufficient foam concentrate volume for two minutes of pump run time (See Figure 9-6).

The side-mount foam tank low-level sensor must be sealed with a suitable sealant to prevent concentrate leakage. After installation, check operation of the side mount foam tank low-level sensor with a powered test light. With no foam in the tank, the light should be on. If the light does not come on, rotate the side mount low level sensor until the test light is on. The float should be allowed to swing up and down freely.

NOTE: When the foam tank low-level sensor senses a low concentrate condition, the system will operate for two minutes before shutting down, unless the concentrate level is restored.

When locating the foam tank low-level sensor in the foam tank, sufficient foam volume must be present for two minutes of operation. This determination will be made using the most frequent foam concentrate injection rate and water flow.

Power Supply

Electrical devices can be damaged, or operate intermittently when powered by a weak or erratic power supply. The FoamPro AccuMax system is not any different – the better the power supply, the better the system will perform. Following the instructions below will ensure the AccuMax system will perform at its best.

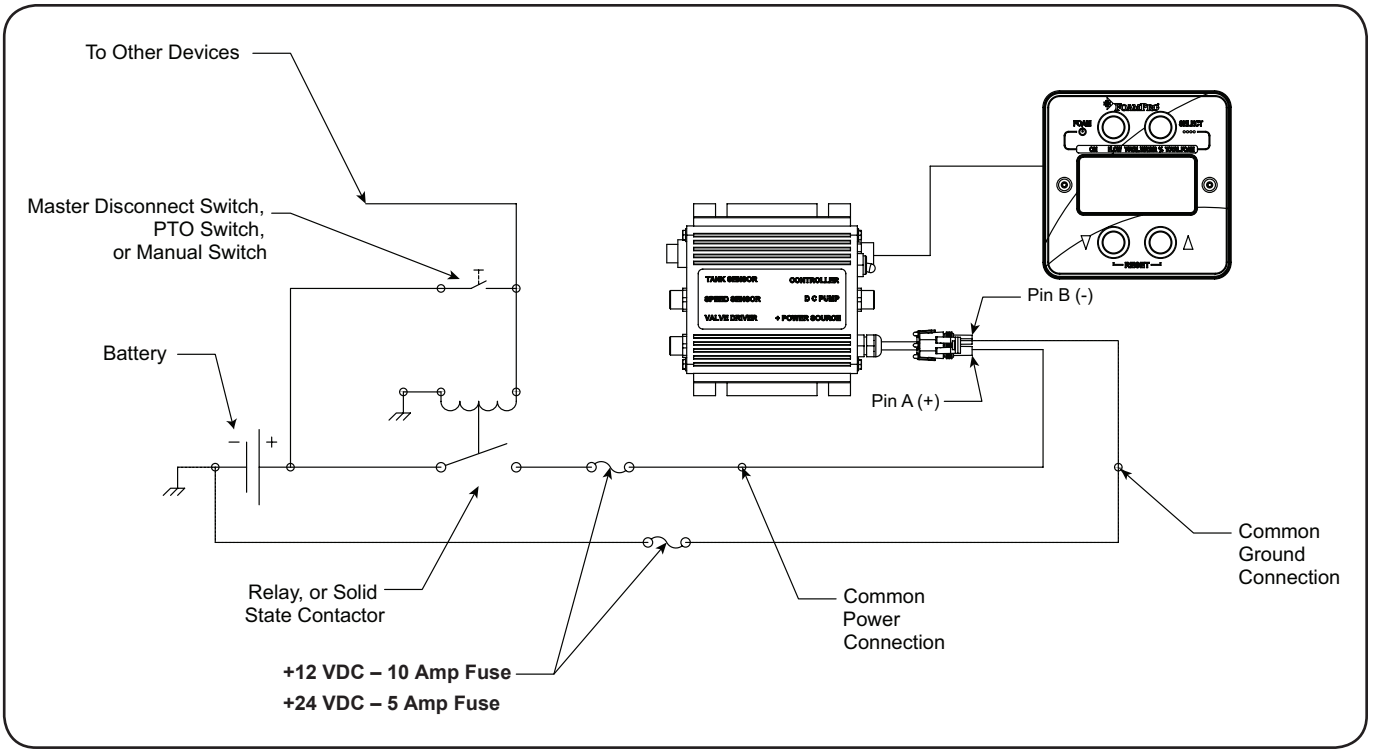
The power connection supplied is a 2-Pin Weatherpack connector and the mating end is supplied with the unit and should be used. Pin A is to be connected to the + power supply, and pin B is to be connected to ground.

Power and ground for the system must come directly from the battery without any connections to other high power devices such as primer pumps, hose reels, sirens, light bars, etc., with its own disconnect switch, Solid State Contactor, or a switch or contactor actuated by the master disconnect switch, PTO switch, or other device.

CAUTION: Connecting other high power devices to the power or ground supply to the FoamPro system will cause component damage.

The system will draw an approximate maximum of 5 Amperes and must be protected with a 10 Amp fuse in the main power line to the system and provides enough power and protection for the display, driver, and associated components. It is also recommended to install a 10 Amp fuse on the main ground lead. All component power and ground connections must be common for all AccuMax components. ***See the diagram on the next page.***

- **Always** connect the primary 12 or 24 VDC positive (+) lead for the system directly back to the battery or power relay using 14 or 16 AWG chemical resistant wire protected with a wire loom. Install a 10 amp fuse in the line that supplied the main power to the system.
- **It is recommended** to connect the ground lead (-) for the system directly back to the battery using 14 or 16 AWG chemical resistant wire protected with a wire loom. Install a 10 amp fuse in the line that supplies the ground to the system.
- **Never** connect the main power or ground leads to other leads connected to high power components such as primer pumps, hose reels, etc.
- **Always** make the connection to the primary power supply the last step.
- **Always** use the Weatherpack connectors supplied for a positive solid connection with power and ground. Ensure the connections are sound and tight to avoid erratic or poor power and ground connections to the components.
- **Always** make sure the Control Display and the Control Driver are grounded to the chassis. Use ¼" (6 mm) wide flat ground straps instead of battery cables to reduce potential RFI emitted by these connections.



RFI/EMI

The following steps on grounding will help limit radio interference cause by the unit. In addition to adequate grounding, make sure radio cables and hardware are not located in the immediate area where the FoamPro equipment is mounted.

RFI/EMI beads supplied with the FoamPro AccuMax SP components must be mounted on the control cables and flowmeter cables. An RFI/EMI suppression kit is supplied with the FoamPro AccuMax SP. Install the clamp-on beads at the locations indicated in Figure 9-7. Silicone caulk, electrical tape, plastic wire ties, or heat shrink tubing may be used to ensure the beads do not move after installation. Two clamp-on beads are required at each connector, and they must be slid as close as possible to the connector.

Making round coils of extra control and flowmeter cables in the pump compartment can act as an antenna. While the flowmeter and control cables cannot be shortened, various lengths of premolded cable are available to minimize the “extra” cable in the truck. Refer to the parts list in Section 15 for part numbers of different size control and flowmeter cables.

When routing control and flowmeter cables, take care to avoid routing them next to antenna cables, radio power lines, and radio components. When there is extra cable, double the cable back on itself and secure it with plastic wire ties in a flat bundle instead of making a round coil (See Figure 9-8).

Installation and Operation Manual

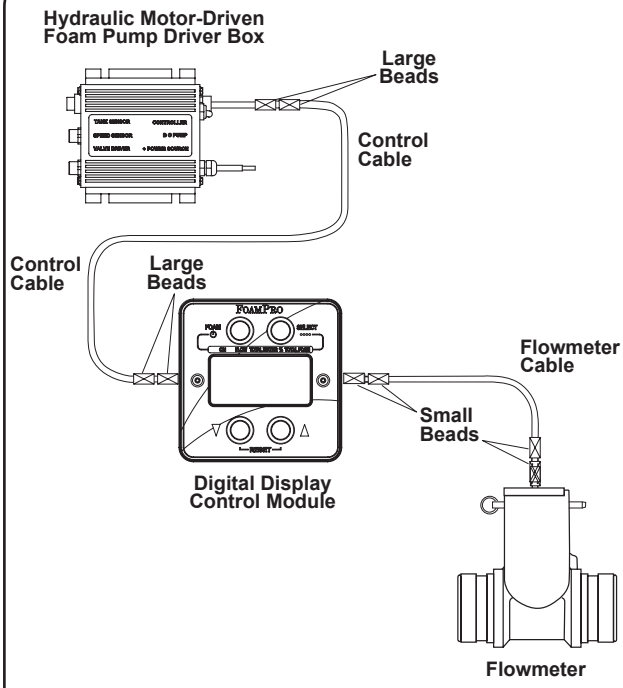


Figure 9-7 RFI/EMI Bead Installation

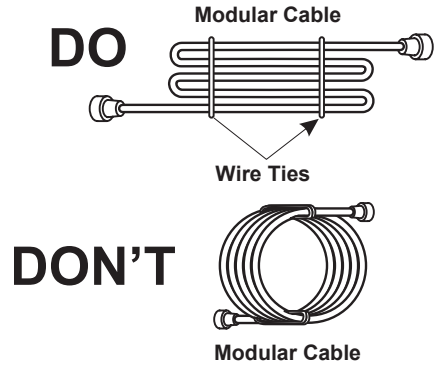


Figure 9-8 Extra Cable Storage

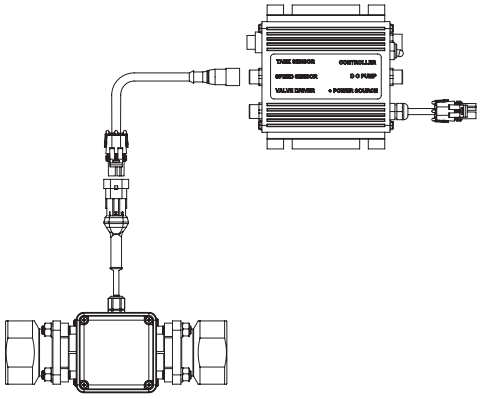


Figure 9-9 3020 thru 3150 Foam Flowmeter Connections

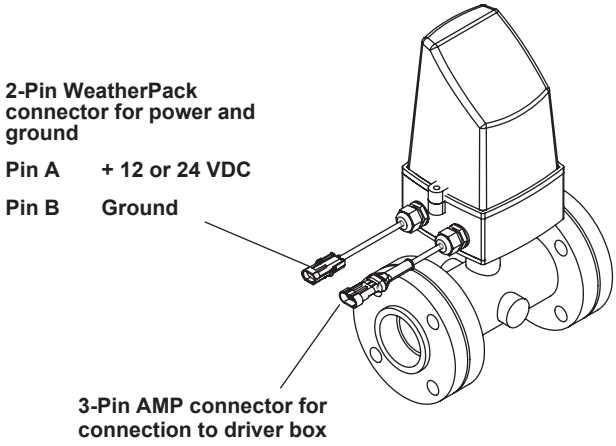


Figure 9-10 3300 Foam Flowmeter Connections

Foam Discharge Flowmeters

The system foam flowmeters used on the AccuMax single point systems are to be installed per the instructions on page 21.

The electrical connections for the 3020 thru the 3150 systems are shown in Fig 9-9. The 3-pin molded end connects to the hydraulic driver box in the “SPEED SENSOR” position. The other end with the AMP connector attaches to the flowmeter.

The connections for the foam flowmeter used on the 3300 system are shown in Fig 9-10. The 3-pin molded end connects to the hydraulic driver box in the “SPEED SENSOR” position. The other end with the AMP connector attaches to the flowmeter. This foam flowmeter will also need a separate power and ground line that will connect with the 2-pin Weatherpak connector as shown in Fig 9-10. The wiring on the power connection is: PIN A to + power, PIN B to ground. Be sure to install a 5 amp fuse to the + power supply.

Manual Override (Optional)

The Manual Override option allows the operator to disengage the automatic proportioning system and control the foam pump manually. The manual override will allow the usage of the hydraulically-driven foam pump to deliver foam to the water lines. The metering of the foam, however, will need to be done manually.

The system works in the following way. When switching from 'AUTO' mode to 'OFF' mode, the electrical power to the AccuMax display and drivers is cut off via a relay (not supplied) connected to the 2520-0131 cable. This will cause the AccuMax display to go blank.

When switching from the 'OFF' position to the 'MANUAL' position, the foam pump will start to pump foam into the foam manifold until the pressure in the manifold is maintained at 218 PSI (15 BAR). If foam is drained from the manifold, the foam pump will run to ensure the pressure is maintained. The foam pump will maintain the set pressure in the manifold until the system is switched to the 'OFF' position.

Installation is very simple and the following schematic in Fig. 9-11 should be followed. It should be noted that any foam discharge off of the foam pump should not be plumbed into the foam discharge line until after the pressure relief valve, pressure transducers, and foam flowmeter. Failure to follow this could cause damage to the system.

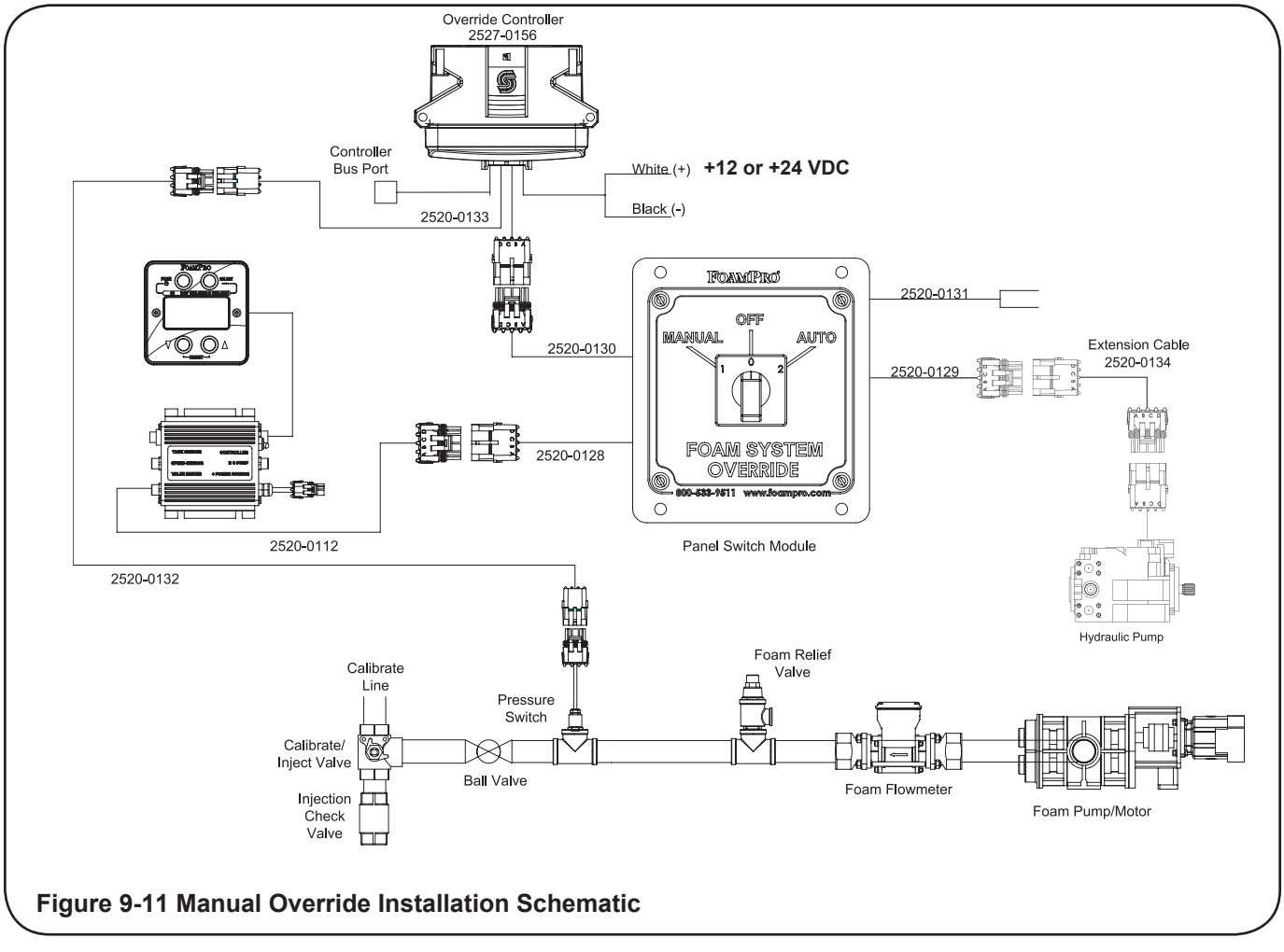


Figure 9-11 Manual Override Installation Schematic

The following procedure should be used when engaging this operation:

1. Turn off AccuMax Display Controller.
2. Turn the Manual Override switch to the ‘OFF’ position. The AccuMax displays should not be illuminated.
3. Close the 2-way manual foam control valve (not supplied) feeding the discharge line being used until it is about 1/4 of the way open.
4. Turn the Override switch from ‘OFF’ to ‘MANUAL’.
5. The foam pump will deliver foam to the override manifold and injection line. The foam pump will deliver enough foam to maintain a maximum of 218 PSI (15 BAR).
6. Manually adjust the 2-way valve feeding the discharge to deliver the amount of foam required.
7. When finished, turn the Manual Override switch to the ‘OFF’ position and open the 2-way manual foam control valve all the way open.

Note: The manual control valve must be in the FULL OPEN position when operating the system in the Automatic mode.

10 Make Sure Everything Is Working Right

Hydraulic Supply (Refer to Sections 4 and 7)

- Hydraulic pump is properly mounted to the PTO.
- Hydraulic oil lines are properly routed and tight.
- Filter(s) are installed and tight.
- Oil reservoir is filled with correct fluid.
- Oil primed to hydraulic pump.
- Adequate oil cooler reservoir capacity.

Electrical (Refer to Section 9)

- Tank level sensor is connected and connections are sealed from moisture.
- Digital Display Control Module connections are correct and tight.
- Cable connections at valve drive box are correct and tight.
- Flowmeter cable(s) are properly connected to the Digital Display Control Module as required.
- All cables are secured and protected with loom from damage during operation.
- RFI/EMI beads are installed; control and flowmeter cables are properly folded and secured; radio antennas, power lines, and equipment are away from control cables and flowmeter cables.
- All components, Digital Display Control Module, Flowmeter Tee, and Pump Base are properly grounded using flat ground straps.
- Adequate current is available; 5 AMP minimum.
- Circuit breaker on the valve driver box is in the ON position.

Liquid (Refer to Section 8)

- Water flowmeter is mounted with flow arrow in the correct direction for water flow.
- Check valves are properly mounted in water and foam concentrate lines.
- Strainer is properly mounted for direction of concentrate flow in the foam tank and pump line.
- Foam tank to foam pump valve is in place and open.
- Injector fitting lines are properly sized and connections are tight.
- CAL/INJECT valve is properly mounted and oriented for direction of concentrate flow.
- Foam concentrate is gravity fed to foam pump.
- Foam concentrate flowmeter is properly installed with the flow arrow in the correct direction.

Foam Pump (Refer to Section 6)

- Foam pump inlet and discharge ports are properly sized and installed.

System Power Check

Turn the main power switches on the Hydraulic Valve Driver and Motor Driver Modules to **ON** and check the digital display readout. **FRC** *or* **HYPRO** should appear for a few seconds while the computer checks itself; then a **0** should appear on the digital readout (See Figure 10-1). If the **0** does not appear on the digital readout, refer to Troubleshooting (Section 14) for possible causes and solutions.

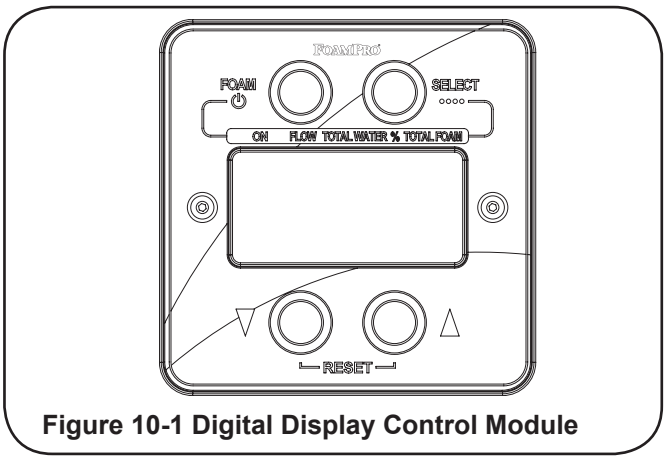


Figure 10-1 Digital Display Control Module

Foam Pump Priming Check

Turn the **CAL/INJECT** valves on both foam pumps to the **CALIBRATE** or **FLUSH** position. Provide containers to collect the output that will be coming from the foam pumps.

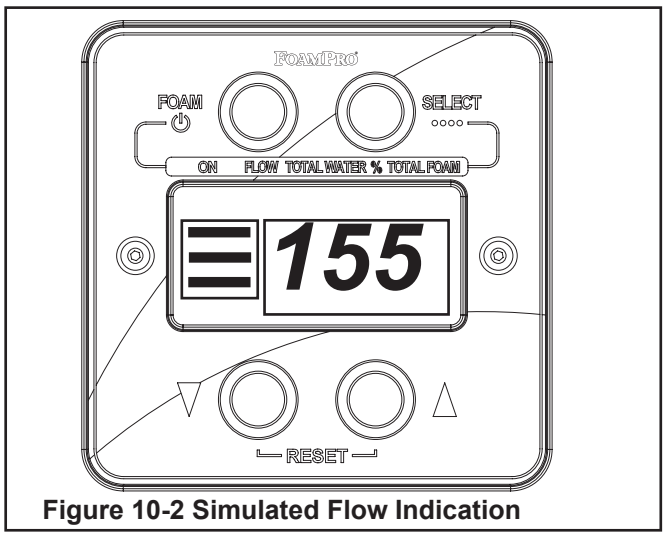


Figure 10-2 Simulated Flow Indication

- Operate the fire truck engine so that hydraulic oil pressure is available. Put the system in "Simulated Flow Mode" by selecting the **FLOW** display and depressing **RESET**, (both UP and DOWN buttons simultaneously). Increase simulated flow by pressing the UP button to permit easier priming (above 250). The display will show Ξ to indicate the simulated flow (See Figure 10-2).

- Engage the FoamPro system by pressing the red **FOAM** button.

- The hydraulic motor-driven foam pump should begin to operate and foam concentrate should begin flowing into the container. If concentrate is not being pumped, first check to make sure the hydraulic motor driven foam pump is running. If the pump is running, but no concentrate is being delivered, the pump probably is not completely primed. If the pump does not prime within 20 to 30 seconds, the system will shut down.

- If the system has been properly installed, foam concentrate should flow readily to the pump. Look at the clear foam suction line to see if foam is flowing.

- Once foam flow is established through both foam pumps, turn the system off and turn the CAL/INJECT valves back to the inject position.

- If you are still having difficulty priming one or both of the foam pumps in your FoamPro system, do the following:

  1. Make sure the foam concentrate tank shut-off valve is open.

  2. Check that there are no restrictions from the concentrate tank(s) to the inlet of the foam pumps.

  3. Make sure there are no leaks in the plumbing that could allow air to enter the foam pumps.

- Perform Steps **1** through **3** to wet the foam pumps to speed the priming operation.

    1. Remove the pipe plug from the top of the gear pump.

    2. Fill the pump with concentrate.

    3. Replace the pipe plug.

CAUTION: When pouring foam concentrate directly into the foam pump, the inlet strainer is bypassed. Make sure contaminates are not poured into the pump chamber. Premature pump wear or damage may result if contaminants are allowed to enter the pump chamber.

Proceed to Calibration, Section 11, as the System must be recalibrated.

11 Calibration and Setup

System Setup Procedures

FoamPro systems permit easy calibration of the foam proportioning unit to assure accurate operation. The calibration process will make adjustments to the flowmeter(s) and foam pump display readings.

NOTE: FoamPro systems can be calibrated to any unit of measure, i.e., U.S., Metric, Imperial, etc. It is necessary to use the same unit of measure throughout the calibration process to ensure proper proportioning by the system.

NOTE: Both the foam pump and flow meter readings must be calibrated as part of the initial setup after installation.

Recalibration should only need to be done after major repairs or changes to the foam system.

Setup for Dual-Tank Operation

The FoamPro controller is factory defaulted to the dual tank option. If you are installing a remote start/stop system, you must change the default setting for proper system operation. The procedure for this new setting starting from the operation mode is as follows:

- Remove the Cover Screws and O-rings to enter the setup and diagnostic modes (See Figure 11-1).
- Enter the setup mode by pressing the internal button on the left side of the controller.
- Enter the diagnostics mode by pressing the internal button on the right side of the controller.
- The display will flash **CONF** and **DUAL.T** alternately.
- Press the DOWN button once. The display will now flash **CONF** and **RSTART**.
- Press the left internal button once. This puts you back into the operational mode.
- Replace Cover Screws and O-rings.

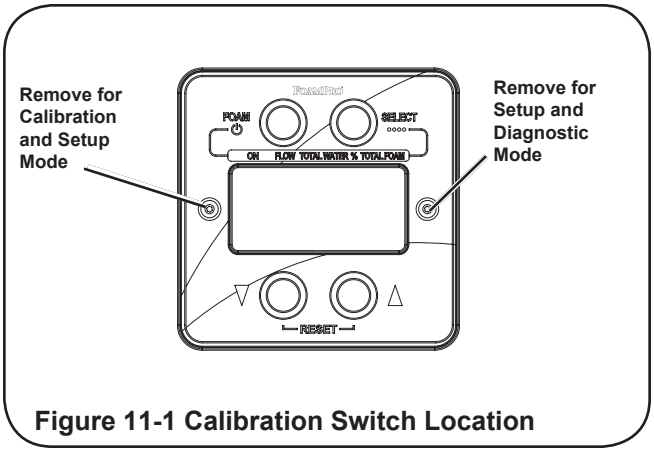


Figure 11-1 Calibration Switch Location

Calibration and Setup Mode

Calibration and Setup is done by using the Digital Display Control Module function buttons. To enter or exit the Calibration and Setup Mode, use a 3/32" Allen wrench to remove the Cover Screw and O-ring to left of the Display Readout Panel on the Digital Display Control Module (See Figure 11-1).

To enter the Calibration and Setup Mode, use the Allen wrench to depress and release the switch inside the screw opening. The display will show **Hyd Setup** until any function button is pressed.

Exit from Calibration and Setup Mode by pressing and releasing the switch inside the screw opening again. The word **HYPro** will appear followed several seconds later by a **0**. Replace the O-ring and Cover Screw when finished.

CAUTION: Always replace the O-ring and Cover Screw to keep dirt and water from entering the Digital Display Control Module, or serious damage to the components may occur.

Flowmeter Calibration

NOTE: It is critical that an accurate flow measuring device be used to measure water flow to calibrate the flowmeter(s). Use a suitable size smooth-bore nozzle and an accurate Pitot Gauge instrument. Hand-held Pitot gauges are usually not very accurate. At the first available opportunity, make sure the system is calibrated with an accurate flow measuring device. Determine the water flow normally expected from that flowmeter discharge outlet. For example, actually establish a flow of 150 gpm (568 L/min.) of water through a nozzle and Pitot system.

Enter Calibration and Setup mode using the method previously described. Press the **SELECT** button and Illuminate the light under **FLOW**. The current water flow rate will be displayed. Press the UP or DOWN button to set the reading to match the actual flow calculated from the Pitot Gauge reading. Decrease fire pump pressure by approximately 1/2 and recalculate water flow rate. Verify that reading on the Digital Display Control Module is the same as the calculated value. Stop the water flow when the reading adjustments are completed.

To lock the settings, exit Calibration and Setup mode by depressing and releasing the switch inside the cover screw opening. The display will show a **0** until any function button is pressed.

Simulated Flow

The default Simulated Flow value should be adjusted while operating in Calibration and Setup mode. Enter Calibration and Setup Mode using the method previously described. Press the **SELECT** button until the light under **FLOW** is illuminated. Pressing both the UP and DOWN buttons simultaneously will display the default simulated flow reading. Adjust the setting by pressing the UP or DOWN buttons to set the desired rate, i.e., **100**. After the rate has been set, press the UP and DOWN buttons simultaneously again to return to Calibration and Setup mode. This setting will remain in the computer memory and be the default rate for all future Simulated Flow operations.

Exit Calibration and Setup mode as previously described.

Foam Concentrate Injection Rate

When power is supplied to the FoamPro AccuMax SP system, the foam concentrate injection rate in memory will be the default injection rate setting. The default concentrate injection rate can be adjusted by entering Calibration and Setup Mode as previously described.

Use the **SELECT** button to illuminate the lamp below **%.** The display will show the current default concentrate injection rate stored in the computer memory as **PC x.x**. The UP and DOWN buttons can be used to set the desired concentrate injection rate. Set this rate to the foam concentrate injection rate used most frequently in operations.

Exit Calibration and Setup mode as previously described.

Foam Pump Calibration

The following procedures explain how to calibrate each foam pump.

NOTE: The viscosity of different foam concentrates may have an effect on the amount of foam concentrate that is injected into the water stream. When calibrating the foam pump, use the foam concentrate that will be used most frequently during normal operations. When different viscosity foam concentrates are used, the actual concentrate injection may vary by as much as 15%.

Hydraulic Motor-Driven Foam Pump Calibration

Make sure the apparatus engine is energized and hydraulic power is available to operate the system. Enter Calibration and Setup mode using the method previously described. Press the **SELECT** button to illuminate the light below **TOTAL FOAM** on the Digital Display Control Module.

The display should alternately flash **HYDR** and **0.00**. If the display shows a reading other than **0.00,** reset the value to **0.00** by pressing both the UP and DOWN buttons simultaneously.

Turn the **CAL/INJECT** valve on the hydraulic motor-driven foam pump to the Cal/Flush position. Connect a hose with a pressure gauge and ball valve to the Cal/Flush port on the Cal/Inject Valve. Set the ball valve to an open position to yield a 50 to 80 PSI (3.5 to 5.5 BAR) back pressure on the foam pump. Place the outlet from this line into a graduated container that can contain the expected volume of foam concentrate, which should be approximately 200% of the full flow rating of the system (See Figure 11-2). If an accurate calibrated container is not available, a scale can be used to weigh the foam concentrate pumped. The total volume of foam concentrate pumped can then be calculated from this weight and the density of the foam concentrate from the MSDS sheet.

A calibrated flowmeter with a totalizer can also be used in-line to directly measure the foam being pumped and is available by ordering Part No. 3430-0831.

Start the FoamPro hydraulic motor-driven foam pump by pressing the red **FOAM** button. The foam pump will operate and pump foam concentrate into the container. Adjust the back pressure accordingly. Stop the hydraulic motor-driven foam pump and measure precisely the amount of foam concentrate collected in the container. Adjust the reading on the Digital Display Control Module to the measured volume by pressing the UP or DOWN button. Repeat this procedure as often as required to yield the accuracy desired.

Turn the **CAL/INJECT** valve back to the **INJECT** position. Exit Calibration and Setup mode as previously described. The hydraulic motor-driven foam pump is now calibrated to the actual foam concentrate flow.

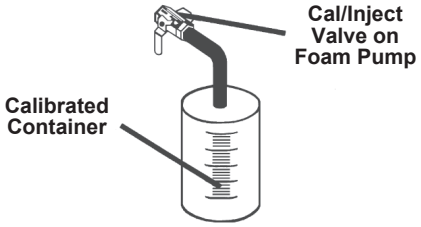


Figure 11-2 Foam Concentrate Collection

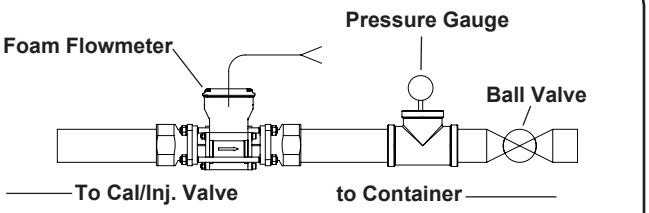


Figure 11-3 AccuMax Calibration Kit (3430-0831)

System Reset

During calibration procedures, it may be necessary to return the system to the original factory default settings if errors are made and the system locks up. To return to the factory default values, enter calibration and setup mode as previously described. Immediately after entry into calibration and setup mode, prior to pressing any other button, depress the UP and DOWN buttons simultaneously. This action will return the system to the factory default settings. Proceed with calibration and setup after performing this reset.

These Setup and Calibration procedures complete the adjustment of the system. The FoamPro system is now ready to be placed in service.

If this system is installed and calibrated by an apparatus manufacturer or dealer, the end user may wish to adjust the default Foam Concentrate Injection Rate and/or Simulated Flow Rate to their special needs. These changes can be made without altering the calibration by using the procedures described for those functions only.

12 Operation Instructions

Normal System Operation

Once the system has been set up and calibrated, operation is very simple and is controlled by the buttons on the Digital Display Control Module (See Figure 12-1). For setup and calibration instructions, see Section 11.

When the **FOAM** button is pressed, the **ON** status lamp will illuminate, indicating that the system is ready. The **ON** status lamp will **flash** when foam is being injected. The FoamPro system will monitor the water flows and control foam injection at the specified concentrate injection rate. The system responds to variations in water flow by increasing or decreasing the speed of the foam pump. When the **FOAM** button is again pressed, the **ON** status lamp will extinguish, indicating that the system is in Standby mode and the foam pump will stop, but other system monitoring functions will continue. Even when there's no foam concentrate being injected, the water flowmeter will display the current flow rate of the water.

If water flow requirements exceed the capacity of the pump to deliver foam concentrate, the pump will run at maximum rate and **HI.FLO** will flash on the digital display so that the operator realizes that the system capacity is being exceeded and is running **lean** on foam concentrate percentage.

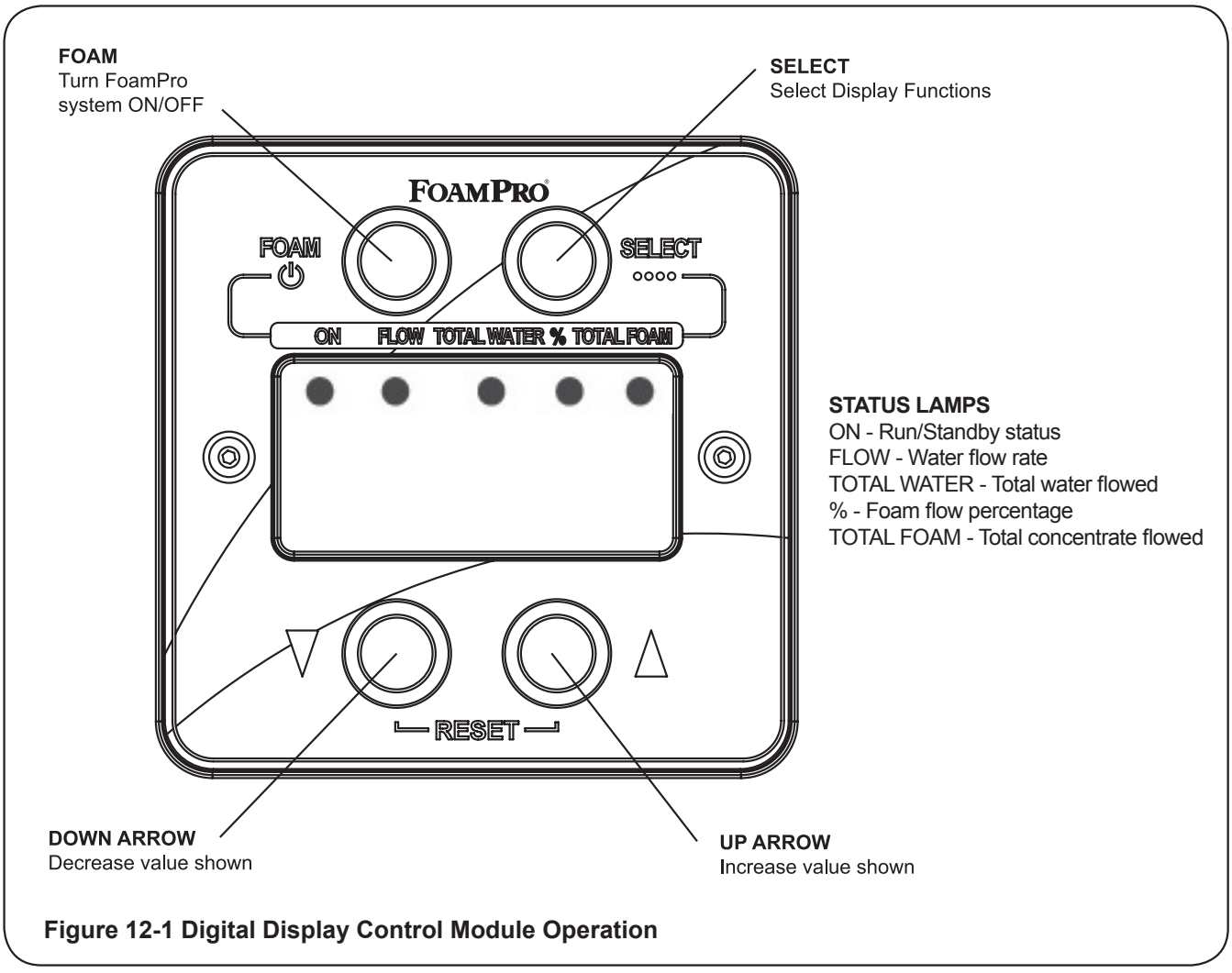


Figure 12-1 Digital Display Control Module Operation

If the flow decreases so the required injection rate is less than the lowest rating of the pump, the pump will run at its minimum rate and **LO.FLO** will flash on the display to let the operator know the system is running "rich" on foam percentage.

Display Information

The five-digit display on the Digital Display Control Module shows the value of the selected display function or provides warnings to the operator when the system is operating. A function is selected by pressing the grey **SELECT** button in the upper right-hand corner of the Digital Display Control Module. Each time the button is pressed, a new function mode is selected and displayed. A LED lamp above the digital display denotes which function is being displayed. Pressing the **SELECT** button changes the value displayed but does not alter system operation.

The Display Functions include:

Flow
The display shows the current flow rate of water per minute.

Total Water
The display shows the total amounts of water or foam solution pumped. This totalized value may be reset, see "Reset Functions" paragraph.

% (Percent)
The display will show the foam concentrate injection rate setting in the % mode.

Total Foam
The display shows the total amount of foam concentrate pumped. The value will be in the same unit of measure as the water flow. This totalized value may be reset, see "Reset Functions" paragraph.

Reset Functions
The totalized values for water and foam concentrate pumped can be cleared from memory by performing a **RESET** function. Using the **SELECT** button, select either **TOTAL WATER** or **TOTAL FOAM**. By pressing and holding both the UP and DOWN buttons at the same time, the value shown is cleared and displayed as **zero**. This may be utilized to keep a record of how many units of water and/or foam is used per incident.

Foam Percentage (%)
When the concentrate percentage (**%**) is selected, the up and down buttons will respectively increase or decrease foam concentrate percentage. The percentage can be changed anytime during normal operation. Whenever the UP or DOWN buttons are momentarily pressed, the display will switch to the **%** display and show the current percentage that is set, in any display mode. If either button is held down for a period of two seconds, the value will increase or decrease accordingly. Once released, the display will return to the last selected display. When a reset is performed in the **%** display mode (pressing both the UP and DOWN buttons at the same time), the foam concentrate injection rate is returned to the default value.

Display Messages

Several safety features are provided to protect the foam concentrate pump and the hydraulic drive system.

Low-Foam Tank Level
The foam pump is interlocked with the foam concentrate tank level switch. If the tank is empty, the pump will not run for more than two minutes. A low-foam concentrate tank level is denoted by **LO.CON** blinking on the display. This code will alternate with the normal display value shown. If two consecutive minutes of low concentrate level is detected, the display will show **NO.CON**, the pump will stop, and the system will go to standby mode until the foam level is restored and the on button is depressed.

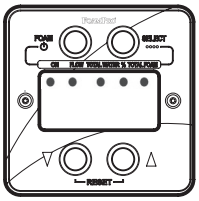
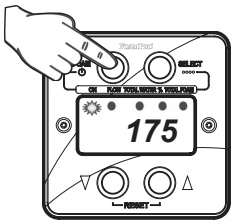
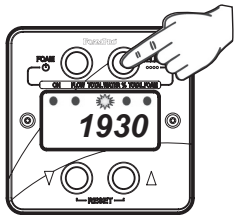
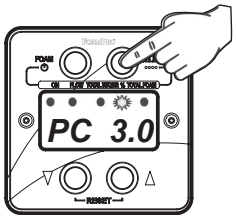
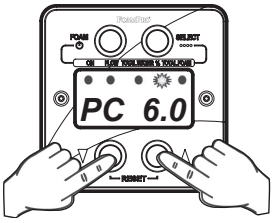
Pump Error
Motor stall protection is provided. In the event the pump stalls for 10 seconds, the display will show **ERR.HY** to indicate the foam pump is producing no feedback to the control signal. The system will return to the foam off status.

High/Low Flow Condition
Whenever the foam pump cannot reach the selected level, an indication of the status will blink in the background as:

LO.FLO - Foam delivery rate is below foam pump capability.

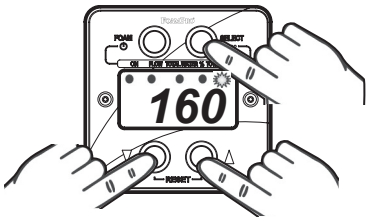
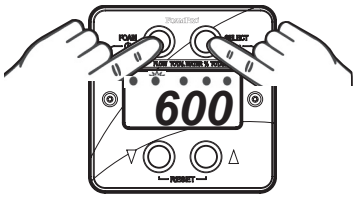
HI.FLO - Foam delivery rate is above foam pump capability.

Normal Operation Summary

How to	Display	Action
1. Turn FoamPro system on.		1. Operate the apparatus engine to develop hydraulic pressure. Turn the FoamPro Main Power circuit breaker switch on. **HYPRO** will appear on the display momentarily.
2. Make foam solution.		2. Establish water flow to the foam capable discharge. The Digital Display Control Module will indicate the water flow rate. Press the **FOAM** button (red upper-left button). The LED lamps below the **ON** and **FLOW** labels will illuminate and the lamp below the **ON** label will flash. The rate of water flow will be displayed in units per minute.
3. Read the total amount of water flowed during the operation.		3. Press the **SELECT** button (white upper-right button) until the LED lamp below the **TOTAL WATER** label is illuminated. The total amount of water will be displayed. Reset this value to zero by pressing the UP and DOWN buttons at the same time.
4. Read % of concentrate.		4. Press the **SELECT** button (white upper-right button) until the LED lamp below the **%** label is illuminated. The display will read percentage of foam concentration. Foam will continue to be injected.
5. Change the % of concentrate.		5. Press the button beside the UP or DOWN. The display will show the new concentrate injection rate chosen. The proportion of concentrate injected will change immediately.

Normal Operation Summary Continued on Next Page

Normal Operation Summary

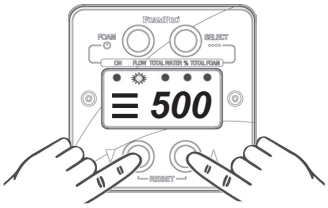
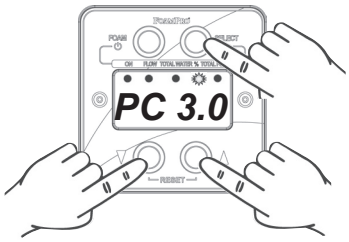
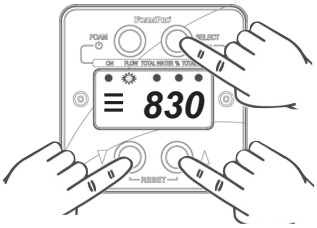
How to	Display	Action
6. Read the total amount of foam concentrate used.		6. Press the **SELECT** button (white upper-right button) until the LED lamp below the **TOTAL FOAM** label is illuminated. The total amount of foam concentrate used will be displayed. Reset this value to zero by pressing the UP and DOWN buttons at the same time.
7. Read water flow without foam injection.		7. If on, press the **FOAM** button, the foam injection will stop. Press the **SELECT** button (white upper-right button) until the LED lamp below **FLOW** is illuminated. The water flow rate through the foam discharge(s) will be displayed whether foam is being pumped or not.
8. Turn the FoamPro system off.		8. Turn the apparatus Master or Battery switch off. The system can also be turned off by using the circuit breaker switch on the valve driver box. **NOTE: Any of these changes can be made at anytime during, before, or after water is flowing.**

Simulated Flow Operation

The Simulated Flow function of the system allows the operator to control the foam pump manually. The water flow rate and the concentrate injection percentage rate can be set by using the display readout and the rate adjustment buttons on the Digital Display Control Module. This function provides the manual control requirement of NFPA. This function also allows the operator to empty the foam concentrate tank for cleaning or changing foam types. It also provides a means of checking the operation of the foam pump at all normal rates of flow and injection without running the water pump.

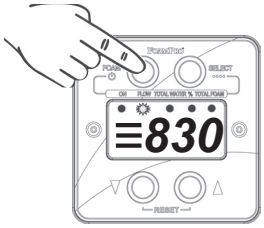
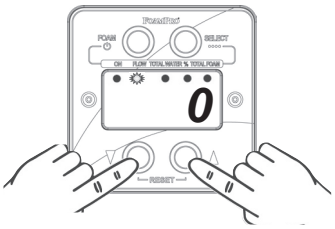
Warning: When operating the FoamPro in the Simulated Flow function, an outlet for the foam concentrate injection must be provided. Otherwise, dangerous excessive pressure may be built up in the apparatus water piping and or hoses. This outlet for the foam concentrate can be provided by turning the CAL/INJECT valve to the CAL position. A suitable container must be provided to collect the foam concentrate.

Simulated Flow Operation Summary

How to	Display	Action
1. Begin Simulated Flow Function. **CAUTION: Be certain that an outlet is provided for the foam concentrate when the foam pump is started.**		1. Make sure the lamp below **FLOW** is illuminated. Press both the UP and DOWN buttons at the same time. The FoamPro Display will read three BARs (≡) to the left of the flow, meaning the system will "simulate" the displayed water flow rate. (The default value of flow may be set to any value, see Section 11.)
2. Change the injection rate while in Simulated Flow Function.		2. Press the **SELECT** button (grey upper-right button) until the LED lamp below the **%** label is illuminated. The display will read the current percent setting. Press the UP or DOWN buttons to select the desired injection rate. The FoamPro will respond and immediately begin injecting concentrate at the new rate.
3. Change the Simulated Flow Rate while in the Simulated Flow Function.		3. Press the **SELECT** button (grey upper-right button) until the LED lamp below the **FLOW** label is illuminated. The display will show ≡ and current flow rate. Press the UP or DOWN to select the desired simulated water flow rate. The FoamPro will respond and immediately begin operating at the new flow rate.

Simulated Flow Operation Summary Continued on Next Page

Simulated Flow Operation Summary

How to	Display	Action
4. Empty the Foam Tank.		4. Place a suitable container under the CAL/FLUSH outlet tube. Place the CAL/INJECT valve in the CAL/FLUSH position. Press the **FOAM** button. The foam pump will operate and foam concentrate will be discharged from the outlet tube. **NOTE: FoamPro must be in Simulated Flow Mode**.
5. Turn the Simulated Flow Function off and return to automatic operation.		5. Press both rate adjustment buttons at the same time. The Ξ symbol will leave the display and the FoamPro will operate automatically from the flow sensor signal. Turning the apparatus Master or Battery switch off will also turn off the Simulated Flow Function. The next time the power is turned on, the FoamPro will return to the original automatic default settings.

Flushing Foam Pumps

When returning the apparatus to ready condition after foam operations, the FoamPro foam pumps should be flushed with fresh water. The following procedures can be used to flush the foam pumps. Refer to Figure 12-4 and do the following:

1. Energize apparatus and establish water flow through foam solution discharge.
2. Close foam concentrate tank shut-off valve and open flush water supply valve.
3. Energize FoamPro AccuMax SP and allow hydraulic motor-driven foam pump to run until discharge is clear.
4. Shut off FoamPro system by depressing the FOAM button on the Digital Display Control Module. Close flushing water supply valve.
5. Close foam solution discharge and shut down apparatus.
6. Open foam concentrate tank shut-off valve.
7. Perform required maintenance checks on the FoamPro AccuMax SP.

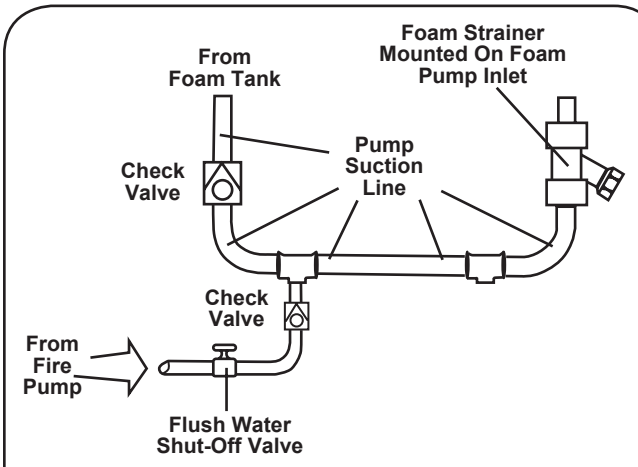


Figure 12-4
Foam Concentrate Flushing System Diagram

Priming the Foam Pump When Foam Tank Has Run Dry

In some instances, the foam tank may run dry while operating the FoamPro AccuMax SP system. The foam pumps are designed to pump liquid. When the fire pump is running, the foam pumps cannot pump air efficiently against 100 to 150 PSI (7 to 10 BAR) back pressure. To re-establish foam concentrate flow quickly, the following procedure can be used:

1. Turn the CAL/INJECT valve on the foam pump that was running when the foam tank ran dry to the CAL/INJECT position.
2. With the fire pump flowing water from the foam discharge and the FoamPro system energized, make sure the proper foam pump is running.
3. Observe the hose from the CAL/INJECT valve.
4. When foam concentrate flows from the hose, turn the CAL/INJECT valve back to the INJECT position. The pump is now primed and ready for normal operation.
5. If the fire pump is not running, place the FoamPro system into the simulated flow mode and proceed with above steps.

13 Maintenance

Maintenance Procedures

1. After each use: It is recommended as good practice to flush the FoamPro AccuMax 3000 system foam pump after each use. The system is compatible with most foam concentrates and will not significantly damage the pump or system components if left in the system. Some concentrates, however, can gel or solidify if left in the system for extended periods of time.

2. **After Each Use**: Remove and clean the foam strainer screen(s). Flush as required.

3. **Monthly**: Inspect wiring, hoses, flowmeters, and connections for tightness, corrosion, leaks and/or damage.

4. **Monthly:** Check and top off the hydraulic oil reservoir as needed.

NOTE: The hydraulic oil should not require refilling. If the system requires oil regularly, an undetected leak is present in the system.

5. **Monthly**: Ensure oil cooler intake and cooler surface is free of obstructions.

6. **Bi-Annually**: Drain and refill the hydraulic oil reservoir with proper hydraulic oil as noted in Section 4.

⚠ **CAUTION: Use only approved petroleum base hydraulic fluids meeting the specifications as noted in Section 4. Never mix fluid types. Ensure all hoses and seals are compatible with fluids used. Do not use water or glycol-based fluids. Do not use phosphate ester-type fluids.**

7. **Bi-Annually**: Change hydraulic oil filter.

3040 Filter	3800-0100
3060 thru 3300	3800-0101

8. **Annually**: Grease bearings and seals in foam pump. **(Required only on the Edwards and Trident foam pump products.)**

NOTE: Dirt is the "enemy" of any hydraulic system. Use care when installing and maintaining system to keep dirt particles from entering the hydraulic system.

WARNING: Release all pressure within the system before servicing any of its components.

14 Troubleshooting

Entering Diagnostic Mode

Diagnostic mode is entered by removing the Cover Screw and O-ring on the right-hand side of the Digital Display Control Module (See Figure 14-1) using a 3/32'' Allen wrench. Once the screw is removed, press and release the button located under the screw. The word **HELLO** will appear on the display.

Figure 14-1
Diagnostic Switch Location

Exit from diagnostic mode is accomplished by pressing and releasing the switch again. The word **HYPRO** will appear on the display followed by a zero after several seconds. **Replace the Cover Screw and O-ring when done.**

NOTE: Always replace the Cover Screw and O-ring to keep water and dirt from entering the Digital Display Control Module as it may cause serious damage to the components.

The system will provide a full complement of diagnostic functions to enable verification of all sub-systems. See electrical diagram in Figure 14-2.

Diagnostic Mode Functions

On entry to diagnostic mode, the display will be illuminated. **SELECT** will select the various modes, each indicated by the status indicator light by the label. These diagnostic modes include:

None

Pressing down will illuminate all display segments and status indicator lights.

Flow

The value shown is the current number of flow pulses being received each second. If no water is flowing, the value should be zero. This is a function test for the flowmeter. Removing the flowmeter sensor from its tee and spinning the paddlewheel should produce a reading other than zero on the display.

Total Water

The value shown reflects the level of the liquid foam concentrate in the tank.
Lo.Con indicates that the tank is empty.
Hi.Con indicates a satisfactory level for operation. This is a test of the low-tank level sensor and wiring.

% (Percent)

The value shown reflects the duty cycle to run the foam pumps. When diagnostic mode is first entered, the duty cycle will be for the electric motor-driven foam pump. If **FOAM** is pressed, the electric motor-driven foam pump will run at the selected rate and the **ON** status indicator lamp will be illuminated. The value may be altered with UP or DOWN. This is a test of the electric motor-driven foam pump driver box and pump hook-up. Depressing the down button will increase pump speed which should be audible and visible on the **TOTAL FOAM** display.

Total Foam

The value shown is the current number of foam flowmeter pulses being received each second. If the foam pump is not running, the value should be zero. Increasing motor speed in **%** mode should increase the displayed value. This is a test of the foam flowmeter sensor and wiring of the hydraulic motor-driven foam pump.

Depressing the **FOAM** button will start the hydraulic motor-driven foam pump. By pressing down or up, the display will show the duty cycle at which the pump is running. The duty cycle value can be changed by pressing and holding the up or down, and the speed of the hydraulic motor-driven foam pump should change accordingly. When the down or up button is released, the display will show the value at which the hydraulic motor-driven foam pump is turning.

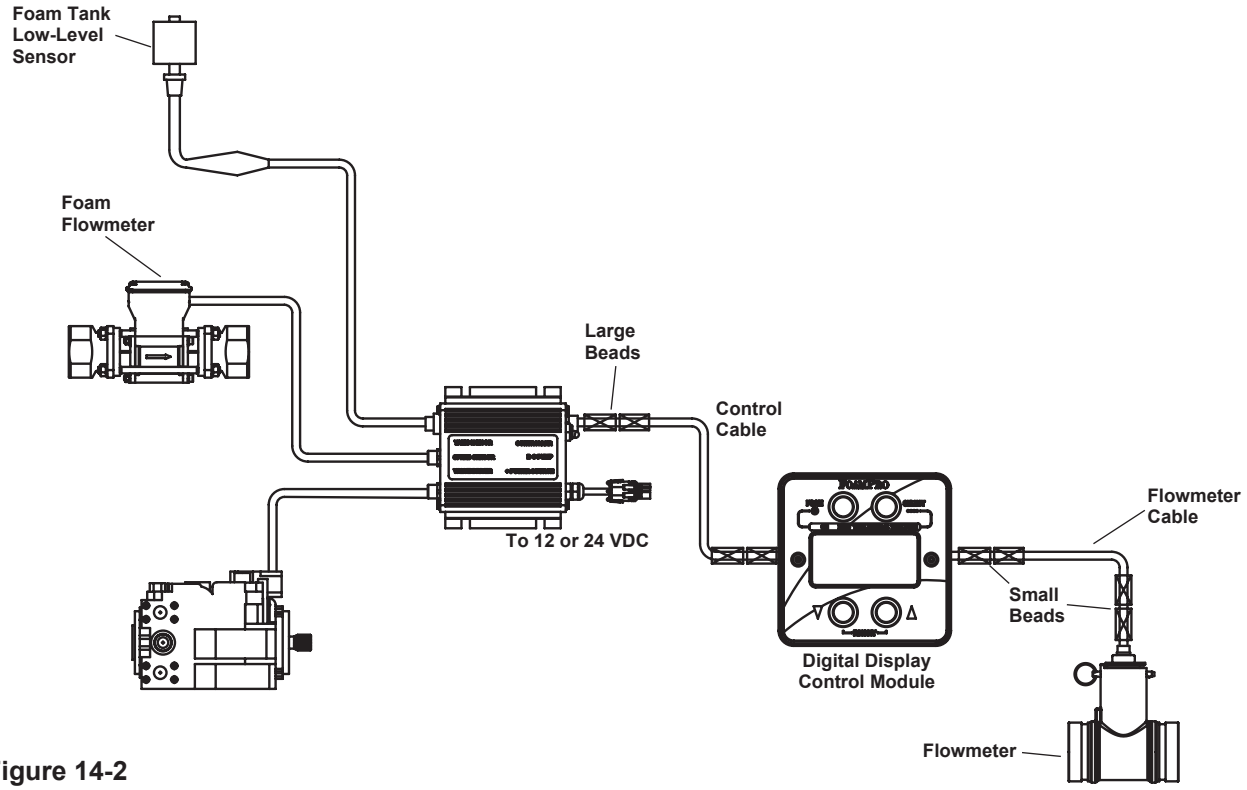


Figure 14-2
Electrical Wiring Diagram

Symptom	Probable Cause(s)	Corrective Action
Pump does not run. **ERR.HY** display.	Hydraulic pump not properly connected to driver box.	Check and attach cables to pump and driver box.
	Truck hydraulics not running.	Engage hydraulic PTO.
Pump runs but produces no flow.	Pump is not primed.	See Foam Pump Priming procedures in Section 10.
Pump loses prime, chattering noise, pressure fluctuates.	Air leak in suction hose or inlet fittings.	Remove suction hose and test for leaks by pressurizing hose with water. Make sure thread sealant has been used on all fittings.
	Suction line is blocked, collapsed.	Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose.
	Clogged suction strainer.	Clean strainer.
Pump runs for 8 to 10 seconds then shuts down. **ERR.HY** may be flashed on display.	Defective control cable or bent pins.	Replace control cable.

Troubleshooting Continued on Next Page

Symptom	Probable Cause(s)	Corrective Action
Pump runs for 8 to 10 seconds then shuts down. **ERR**.**HY** may be flashed on display.	Foam Flowmeter sensor circuit open.	Inspect wiring and connection to foam flowmeter.
	Foam Flowmeter positioned incorrect.	Check to ensure that the flowmeter is properly inserted into the foam injection line. The arrow on the flowmeter should point in the direction of injected flow.
	Foam Flowmeter not functioning.	Replace flowmeter.
Pump runs full speed whenever the circuit breaker switch is **ON**.	Poor ground to valve driver box.	Make sure screws are tight and a good ground is maintained.
No characters are displayed on the digital display.	The main power switch is not **ON**.	Turn on the main power switch on the valve driver box.
	Cables not correctly connected.	Inspect and secure connections. Check for bent pins in control cable connections.
	Defective control cable or bent pins.	Replace control cable.
	Digital display has been damaged.	Replace the digital display.
	Poor ground on system or controller.	Make sure screws are tight and a good ground is maintained.
System is powered up and the **FOAM** button has been pressed, but the foam pump does not run.	No water is flowing in any of the foam discharges.	Flow water.
	Flowmeter wiring not correct.	Inspect wiring & connection to flowmeter.
	Flowmeter obstructed.	Clear flowmeter of debris.
	Float is on plunger wrong, indicating tank is low.	Remove snap ring at the top of plunger and remove float. Turn it over, reinstall.
	Float stuck on plunger, indicating tank is low.	Inspect and clean float switch.
	Truck hydraulics not running.	Engage hydraulic PTO.
System returns to standby mode while pumping or **HYPRO** appears momentarily while pumping.	Low electric power.	Ensure proper voltage is available.

Troubleshooting Continued on Next Page

Symptom	Probable Cause(s)	Corrective Action
System returns to standby mode while pumping or **HYPRO** appears momentarily while pumping.	Poor ground to valve driver box.	Make sure screws are tight and a good ground is maintained.
	Low hydraulic oil pressure.	Clean or replace filters.
	Low hydraulic oil level.	Refill the reservoir and check for oil leaks.
Lo Con appears on display.	Concentrate level in tank is low.	Fill concentrate tank.
	Low-tank level sensor or wiring is inoperative.	Repair or replace defective components.
Err.Su on power up.	Setup parameter memory is not functioning.	Contact FoamPro for replacement. **NOTE: This unit will continue to operate using factory set-up values**.
Display shows **?** for flow.	Flowmeter is sensing water flow, but the flow rate is too low for precise proportioning.	Check flowmeter.
		Check flowmeter calibration.
Foam pump capacity below rating.	Inlet strainer obstructed.	Remove and clean inlet strainer.
	Inlet plumbing obstructed.	Check all piping, valves and hoses for debris, such as wire ties that can obstruct flow.
	Foam does not gravity feed to pump.	Open drain/air bleed valve on foam pump suction. If foam does not flow freely, modification of piping and pump position is required.
	Foam too viscous.	Above 2000 centipoise increase suction on electric-driven foam pump is required.
		Increase strainer size and pump inlet line size to allow for less pressure drop and better flow.
	Inadequate hydraulic pump speed.	Increase engine RPM.
CAL/INJECT valve is leaking.	Valve seat is loose.	Remove hose and fitting from inject port of valve and tighten seat. Reconnect fitting and hose.

Troubleshooting Continued on Next Page

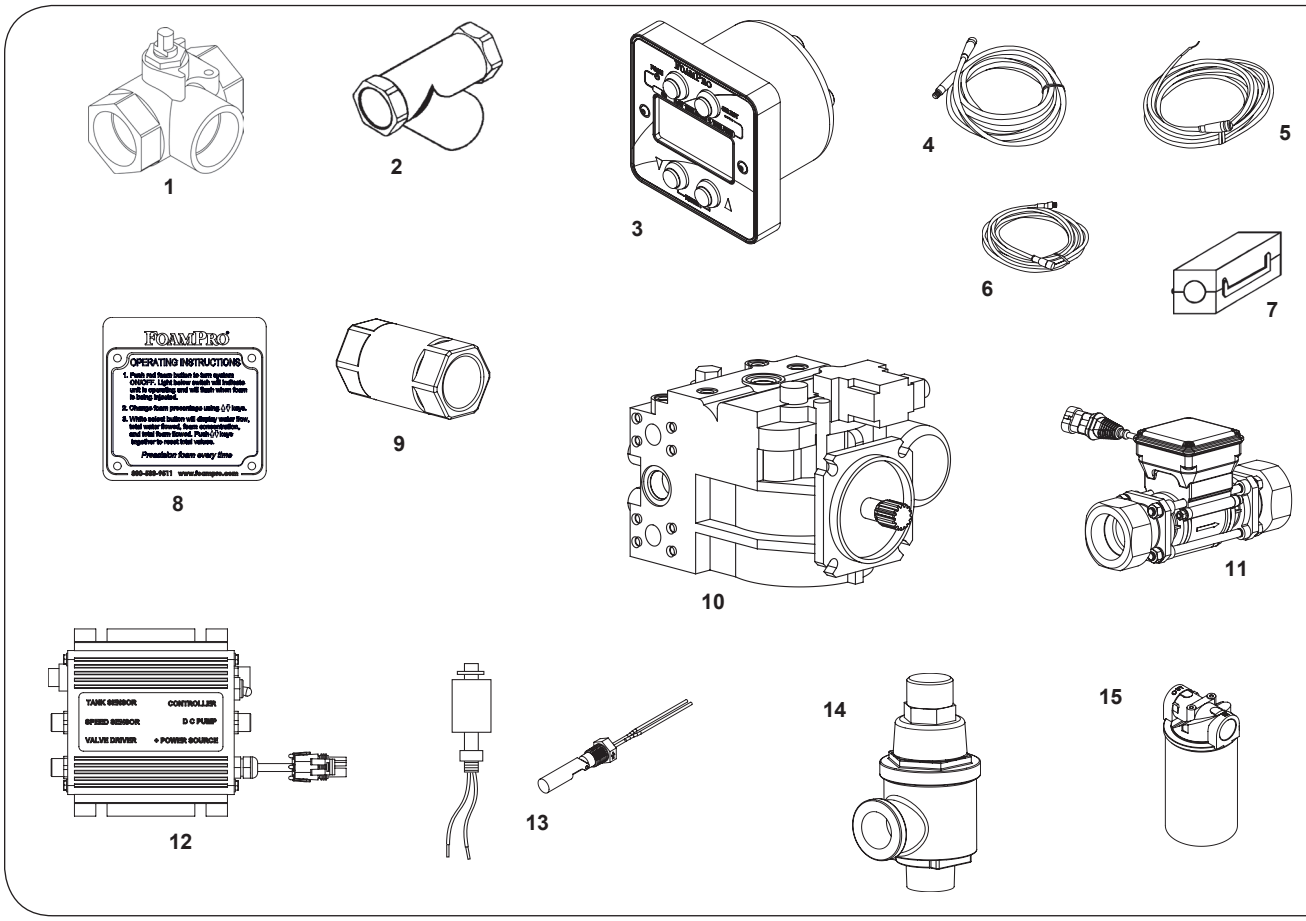
Symptom	Probable Cause(s)	Corrective Action
System cannot be calibrated.	Calibration values selected are out of range of system or setup memory is full.	Perform system reset as described in Calibration Section and recalibrate.
Cannot enter Calibration Mode.	Truck hydraulics and hydraulic valve driver is not turned on.	Make sure hydraulic system is operable and the valve driver switch is in the **ON** position.

15 Specifications

Specifications Contents

The following section includes:

Miscellaneous Standard Components

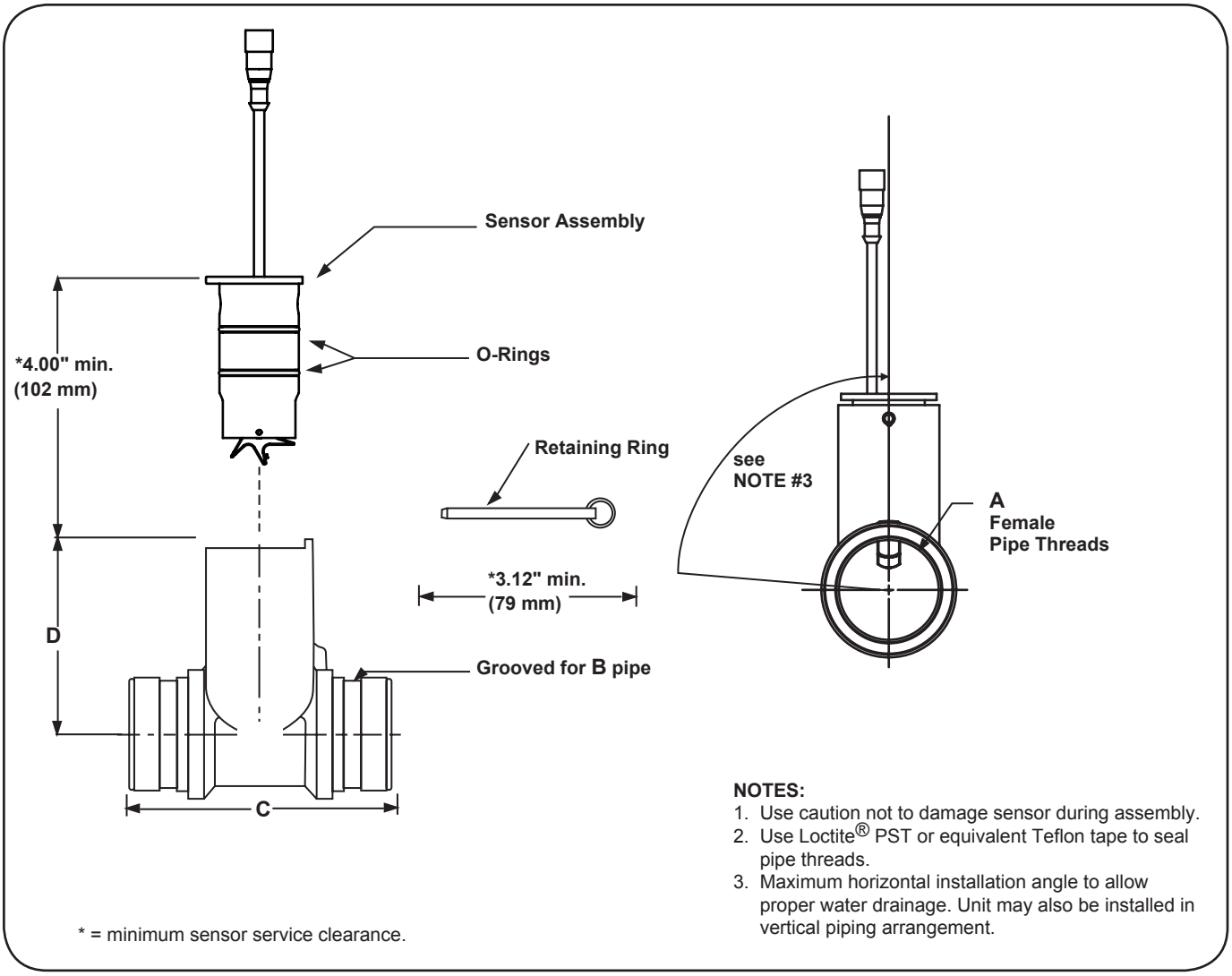


Ref.	Part No.	Description
1	3304-0027	Calibrate/Inject Valve 3020 - 3060
	3304-0026	Calibrate/Inject Valve 3090
	3304-0029	Calibrate/Inject Valve 3150
	3304-0030	Calibrate/Inject Valve 3300
2	3350-0145	Inlet Line Strainer 1-1/2" NPT
	3350-0146	Inlet Line Strainer 2" NPT
	3350-0147	Inlet Line Strainer 3" NPT
	3350-1000	Inlet Line Strainer 6" Flange (*150 class*)
3	2527-0139	Digital Display Control
4	2520-0048	Control Cable [6 ft (2 m)]
	2520-0049	Control Cable [12 ft (3 m)] Std.
	2520-0050	Control Cable [20 ft (5 m)]
5	2520-0042	Tank Level Sensor Cable
6	2520-0045	Flowmeter Cable [6 ft (2 m)]
	2520-0046	Flowmeter Cable [12 ft (3 m)] Std.
	2520-0047	Flowmeter Cable [20 ft (5 m)]
7	3430-0351	RFI Kit for Controller
	3430-0353	RFI Kit for Flowmeter
8	6032-0012	Instruction Placard

Ref.	Part No.	Description
9	3320-0046	Check Valve 3020, 3040
	3320-0041	Check Valve 3060
	3320-0047	Check Valve 3090
	3320-0048	Check Valve 3150
	3320-0050	Check Valve 3300
10	2500-0071	Hydraulic Pump 3020, 3040
	2500-0063	Hydraulic Pump-3060
	2500-0030	Hydraulic Pump- 3090, 3150
	2500-0133	Hydraulic Pump- 3300
11	2660-0040	Foam Flowmeter - 3020, 3040
	2660-0041	Foam Flowmeter - 3060
	2660-0042	Foam Flowmeter - 3090
	2660-0043	Foam Flowmeter - 3150
	2660-0038	Foam Flowmeter - 3300
	*2520-0111	Foam Flowmeter Cable
12	2527-0136	System Driver Box
13	2510-0028	Low-Tank Sensor Vertical
	2510-0032	Low-Tank Sensor Horizontal
14	3300-0101	Relief Valve
15	3350-0178	Hydraulic Filter (3020, 3040 only)
	*2520-0112	Hydraulic Pump Control Cable

*Not Shown

Flowmeter Specifications



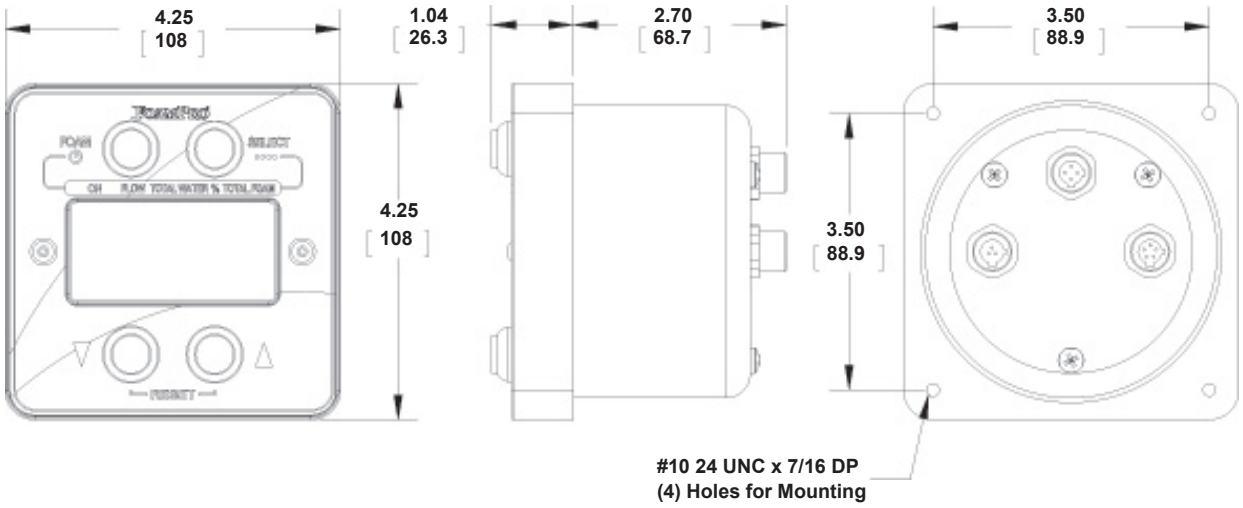
* = minimum sensor service clearance.

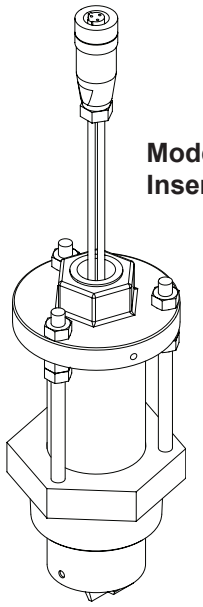
NOTES:
1. Use caution not to damage sensor during assembly.
2. Use Loctite® PST or equivalent Teflon tape to seal pipe threads.
3. Maximum horizontal installation angle to allow proper water drainage. Unit may also be installed in vertical piping arrangement.

Assy. Part Number	A	B	C	D	Max. Accuracy Flow Range (GPM)	Max. Operating Flow Range (GPM)
2660-0031	1-1/2"—11-1/2" NPT	2" Pipe	5-3/8" (137 mm)	4-1/8" (105 mm)	10-320	3-380
2660-0031B	1-1/2"—11" BSP	2" Pipe	5-3/8" (137 mm)	4-1/8" (105 mm)	10-320	3-380
2660-0032	2"—11-1/2" NPT	2-1/2" Pipe	5-3/8" (137 mm)	4-3/8" (111 mm)	15-520	5-625
2660-0032B	2"—11" BSP	2-1/2" Pipe	5-3/8" (137 mm)	4-3/8" (111 mm)	15-520	5-625
2660-0033	2-1/2"—8" NPT	3" Pipe	5-3/8" (137 mm)	4-9/16" (116 mm)	20-750	8-900
2660-0033B	2-1/2"—11" BSP	3" Pipe	5-3/8" (137 mm)	4-9/16" (116 mm)	20-750	8-900
2660-0034	3"—8" NPT	4" Pipe	5-1/2" (140 mm)	4-7/8" (124 mm)	30-1150	12-1380
2660-0034B	3"—11" BSP	4" Pipe	5-1/2" (140 mm)	4-7/8" (124 mm)	30-1150	12-1380
2660-0035	4"—8" NPT	5" Pipe	5-1/2" (140 mm)	5-3/8" (137 mm)	55-1980	20-2380
2660-0035B	4"—11" BSP	5" Pipe	5-1/2" (140 mm)	5-3/8" (137 mm)	55-1980	20-2380

Cutout Dimensions for Display Control Module

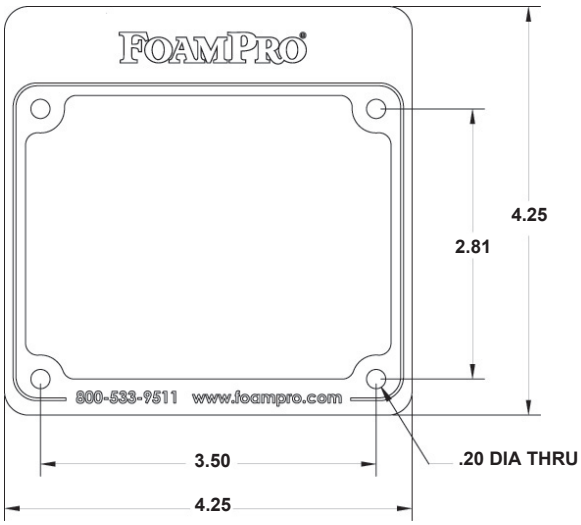
Display Requires 3-7/8" (98 mm) Diameter Hole





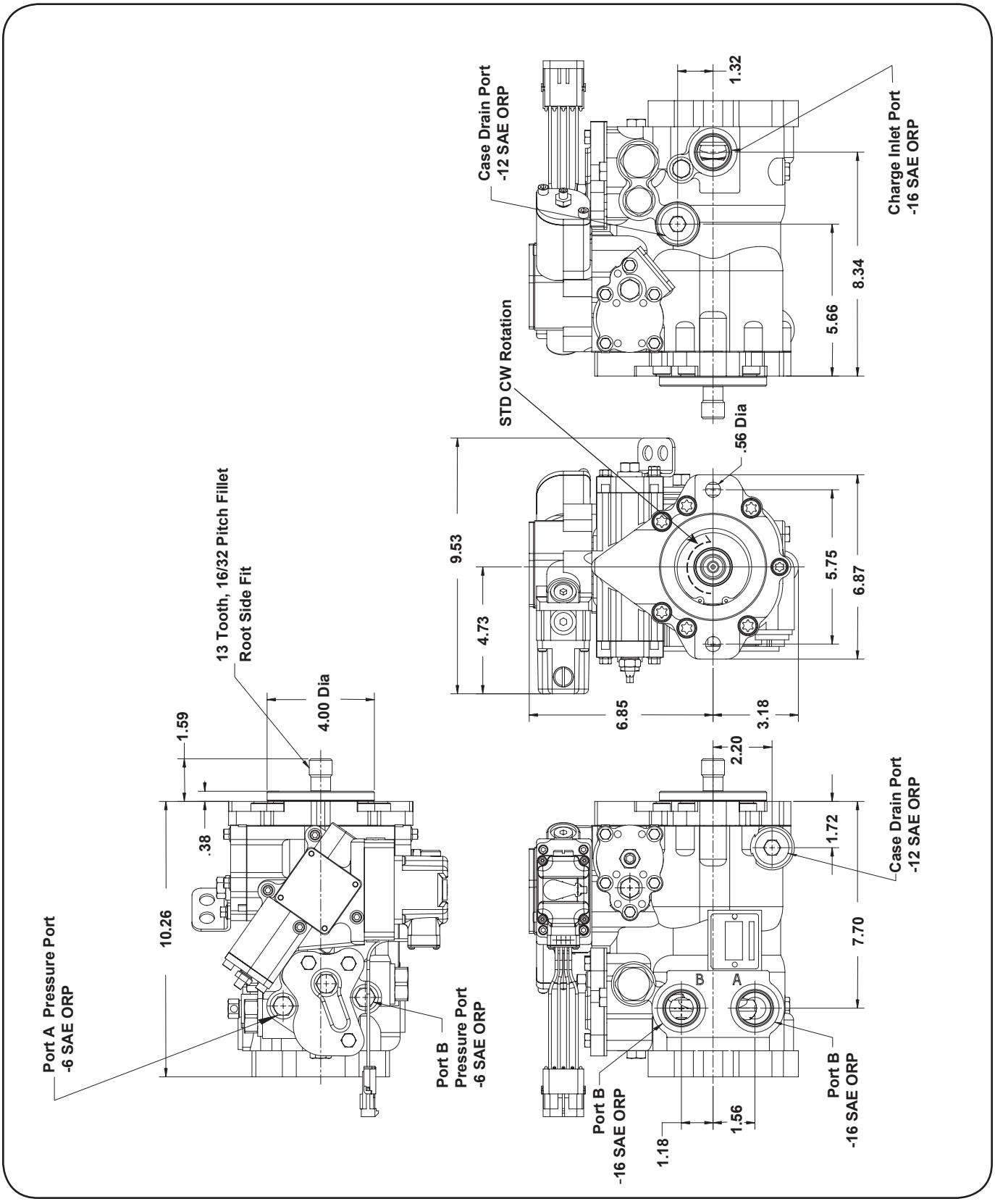
Model 2660-0044
Insertion Flowmeter

Cutout Dimensions for Instruction, System, System Spec. Placards

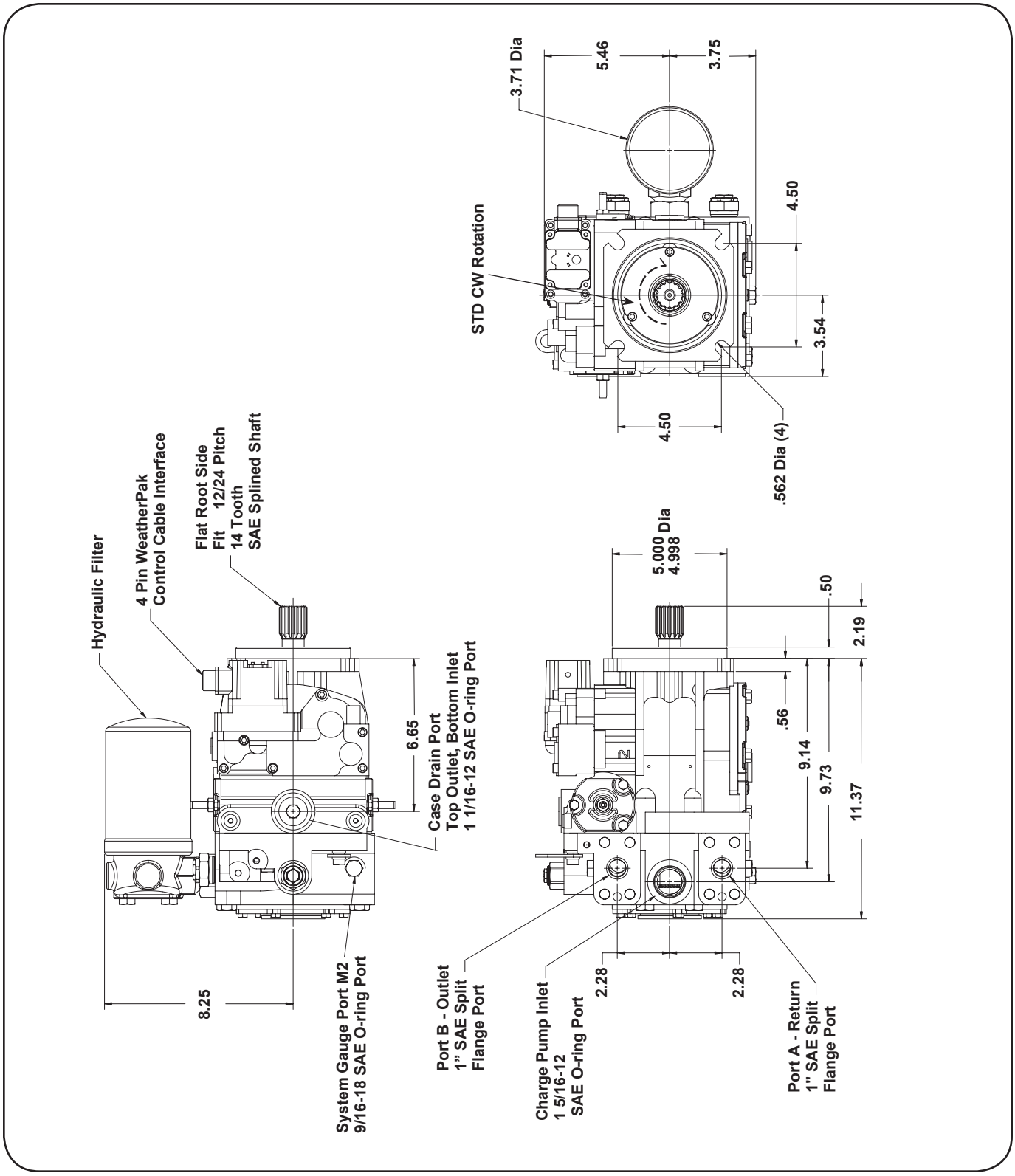


Pipe Size	Maximum Accuracy Flow Range	Maximum Operating Flow Range
5"	80 - 3050 gpm (303 - 11546 Lpm)	60 - 3670 gpm (227 - 13893 Lpm)
6"	117 - 4500 gpm (443 - 17035 Lpm)	90 - 5400 gpm (340 - 20441 Lpm)
8"	200 - 7800 gpm (757 - 29526 Lpm)	155 - 9360 gpm (587 - 35431 Lpm)

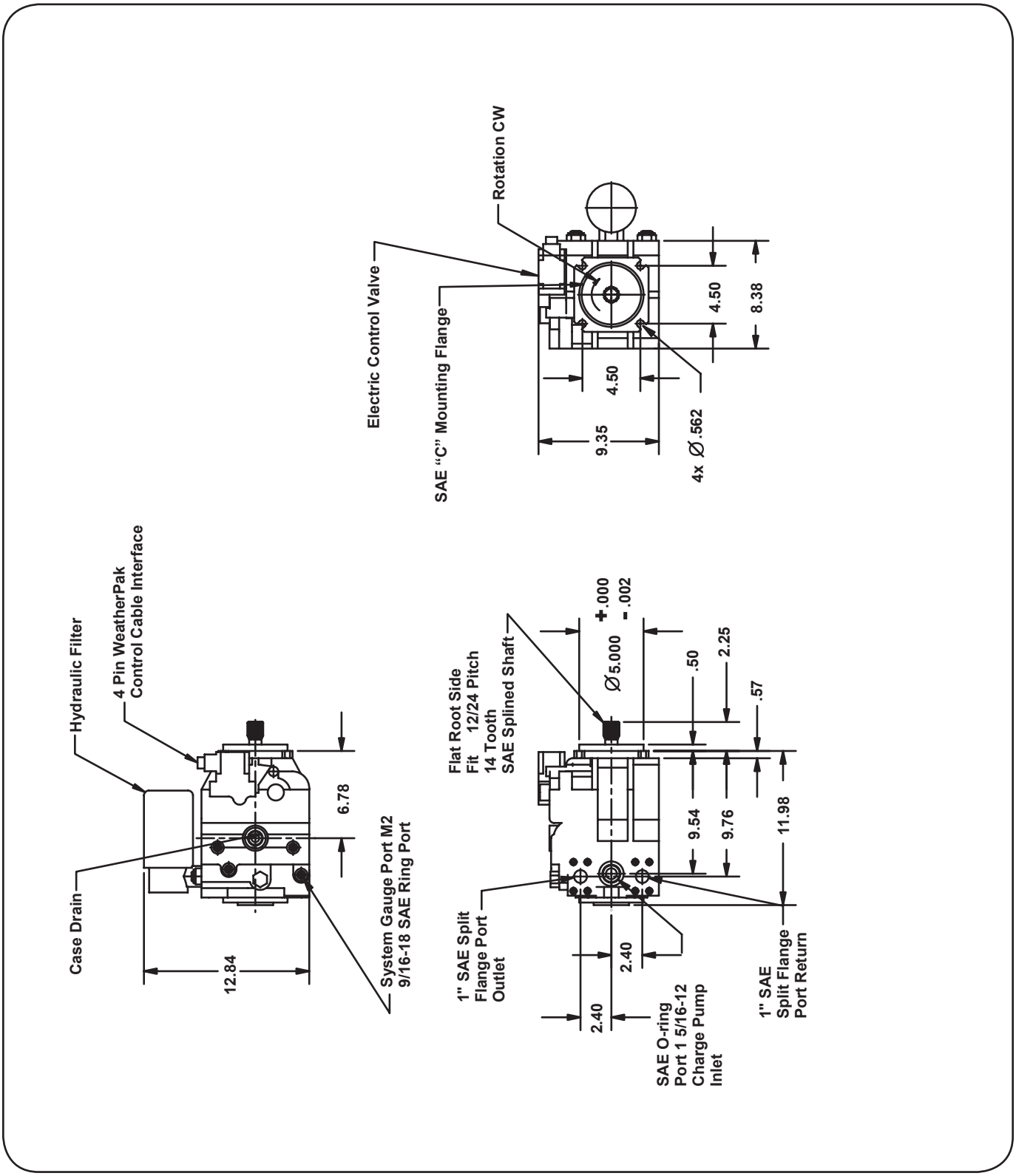
Hydraulic Pump 3020 & 3040



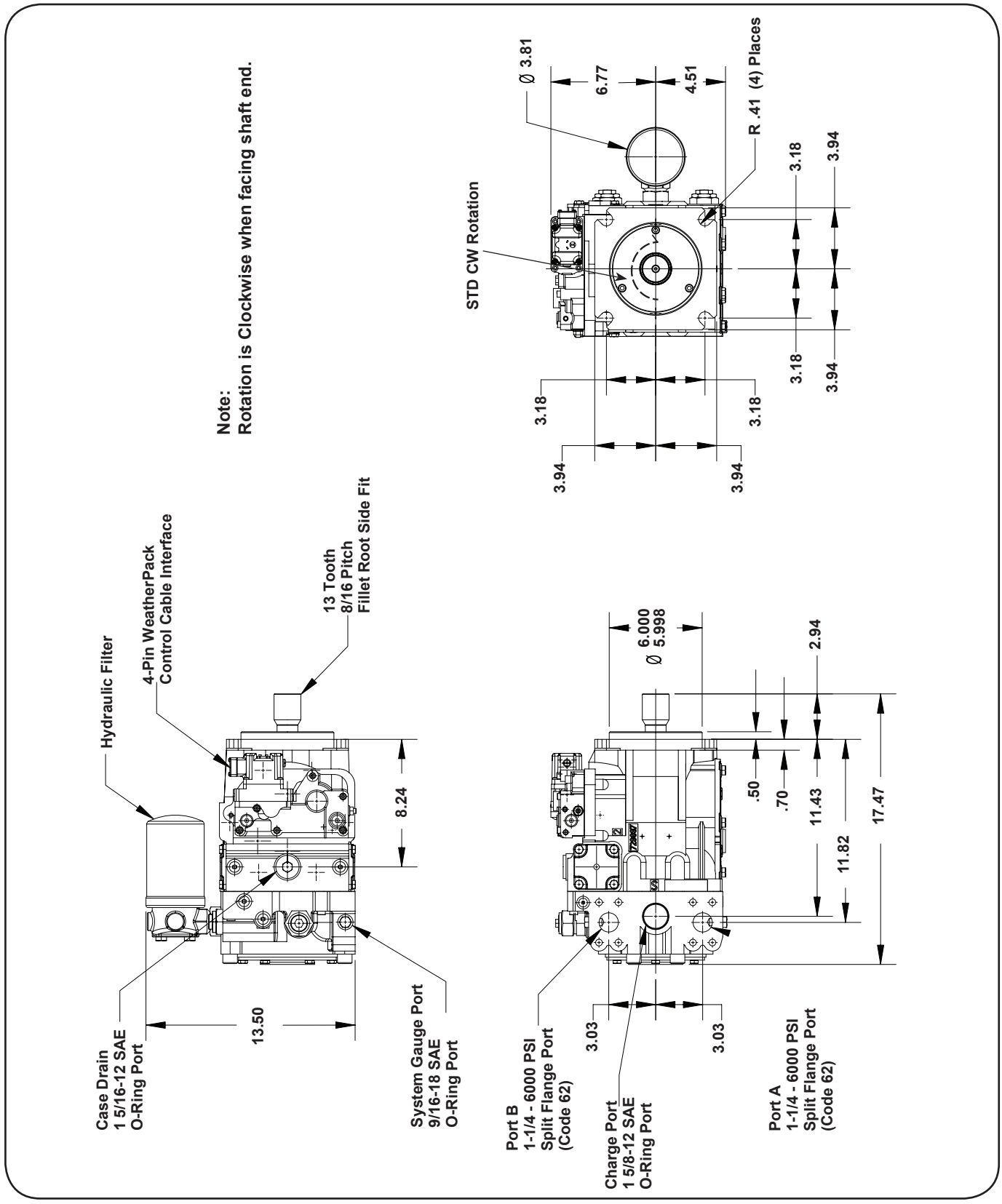
Hydraulic Pump 3060



Hydraulic Pump 3090, 3150



Hydraulic Pump 3300



Specifications for Fire Lion Pump Systems

System Capacity	Maximum Water Flow GPM (LPM)					
Foam Concentrate Rate	**3020**	**3040**	**3060**	**3090**	**3150**	**3300**
1%	2,000 (7571)	4,000 (15,142)	6,000 (22,712)	9,000 (34,069)	15,000 (56,781)	30,000 (113,563)
3%	667 (2525)	1,333 (5046)	2,000 (7,571)	3,000 (11,356)	5,000 (18,927)	10,000 (37,854)
6%	333 (1261)	667 (2525)	1,000 (3,785)	1,500 (5,678)	2,500 (9,464)	5,000 (18,927)
System Specifications						
Max. Foam Output GPM (LPM)	20 (75.7)	40 (151.4)	60 (227.1)	90 (340.7)	150 (567.8)	300 (1,135.6)
Max. Operating Pressure PSI (BAR)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)
Max. Operating Temp. F (C)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)
Max. Hydraulic Oil Pressure PSI (BAR)	2,284 (157.5)	2,931 (202.1)	3,624 (249.9)	3,923 (270.5)	5,522 (380.8)	5,819 (401.2)
Max. Hydraulic Oil Flow GPM (LPM)	14.8(56.0)	17.4 (65.9)	20.6 (78.0)	24.3 (92.0)	27.3(103.4)	40.7 (154.1)
PTO Pump RPM for Min. Performance RPM	1,216	1,432	1,418	1,221	1,375	1,185
PTO HP–HP (kW) at Max. Performance	22.8 (17.0)	34 (25.4)	49.6 (37.0)	62.9 (46.9)	99.1 (73.9)	155.1 (115.7)
PTO Torque at Max. Performance Lbf-ft (Nm)	98.0 (132.9)	124.6(169.0)	182.9 (248.0)	270.2 (366.4)	378.3 (512.9)	688 (932.8)
Hyd. Pump Mounting Flange	SAE 'B' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'D' Flange
Hyd. Pump Input Shaft	13 Tooth 16/32 Pitch	13 Tooth 16/32 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	13 Tooth 8/16 Pitch
Max. PTO Speed RPM	4,000	4,000	3,600	3,600	3,600	3,100
Minimum Hydraulic Reservoir Size Gal. (Liter)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	15 (56.8)
Minimum Hydraulic Cooler Heat Load BTU/Min. @ Minimum Return Line Flow GPM (LPM)	282 4.5(17.1)	425 5.3 (20)	620 5.2 (20)	792 5.5 (20.8)	1,252 6.2 (23.5)	1,966 8.2 (31.1)
Maximum Hydraulic Oil Temp. F (C)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)
Maximum Amp Draw	5	5	5	5	5	5

Fire Lion Hydraulic Fittings and Hose Specifications

Connection	Model	Minimum Hose ID	Pump Port Fitting & Pressure Rating	Motor Port Fitting & Type
Hydraulic Reservoir to Hydraulic Charge Pump Inlet	3020/3040	1" Suction	#16 SAE O-Ring	N/A
	3060	1" Suction	#16 SAE O-Ring	N/A
	3090	1" Suction	#16 SAE O-Ring	N/A
	3150	1" Suction	#16 SAE O-Ring	N/A
	3300	1-1/4" Suction	#20 SAE O-Ring	N/A
Hydraulic Pump Port B to Motor Port A	3020/3040	3/4" - 3000 PSI	#16 SAE O-Ring	#12 SAE O-Ring
Hydraulic Pump Port B to Motor Port B	3060	1" - 3600 PSI	1" SAE Split Flange	#12 SAE O-Ring
	3090	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3150	1"- 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Pump Port A to Motor Port B	3020/3040	3/4" - 3000 PSI	#16 SAE O-Ring	#12 SAE O-Ring
Hydraulic Pump Port A to Motor Port A	3060	1" - 3600 PSI	1" SAE Split Flange	#12 SAE O-Ring
	3090	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3150	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Motor Case Drain to Hydraulic Pump Case Drain	3020/3040	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3060	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3090	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	#10 SAE O-Ring
Hydraulic Motor Case Drain to Hydraulic Cooler	3020/3040	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3060	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3090	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	N/A

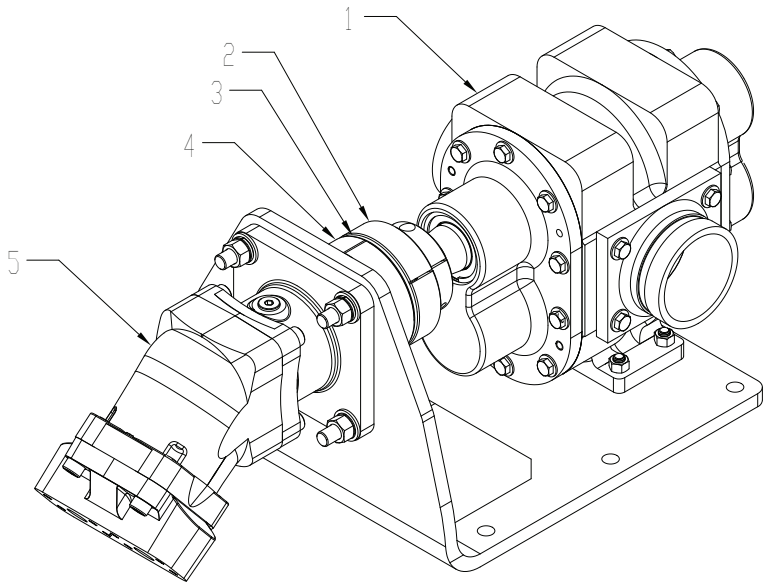
Notes:

SAE O-Ring Ports are per SAE J514

SAE Split Flange Ports are to SAE J518 code 62

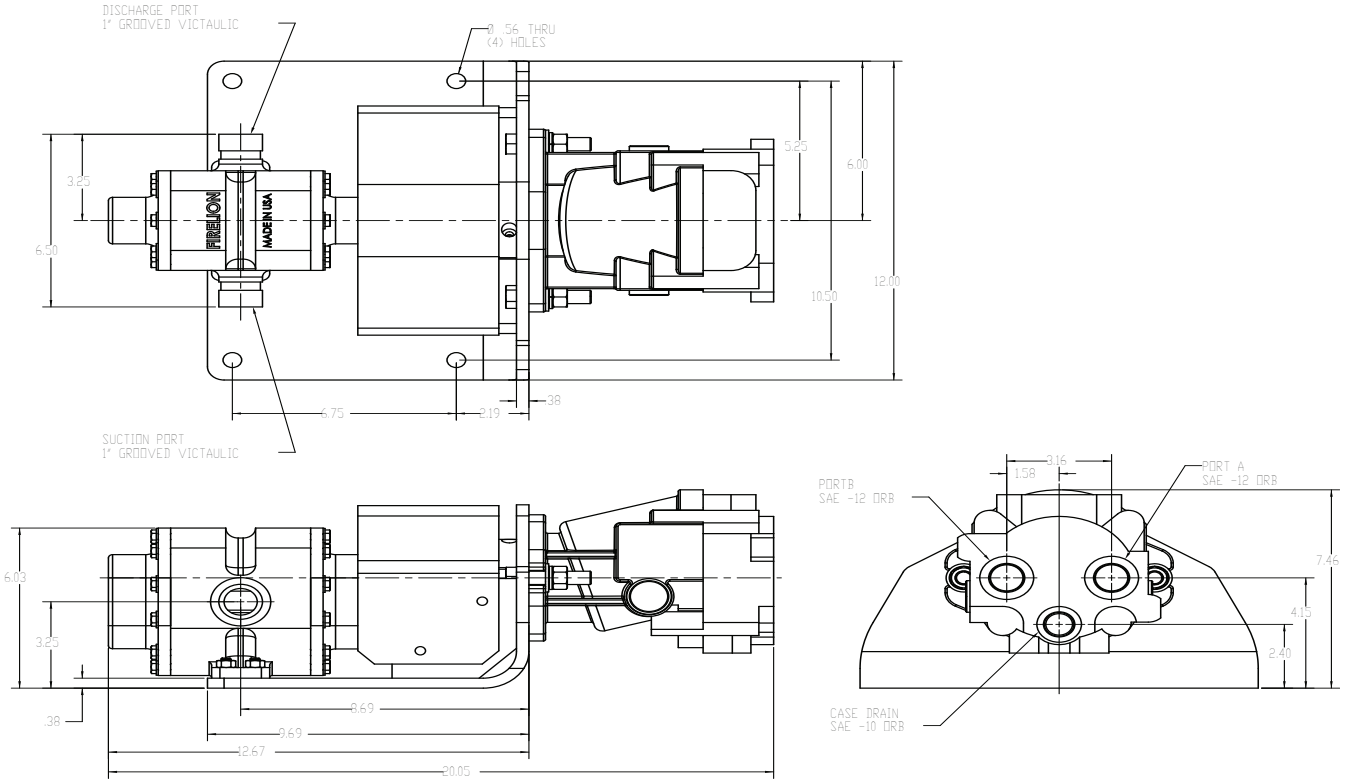
Hydraulic pump inlet hose to conform to SAE 100R4

Fire Lion Pump/Motor Assembly Parts

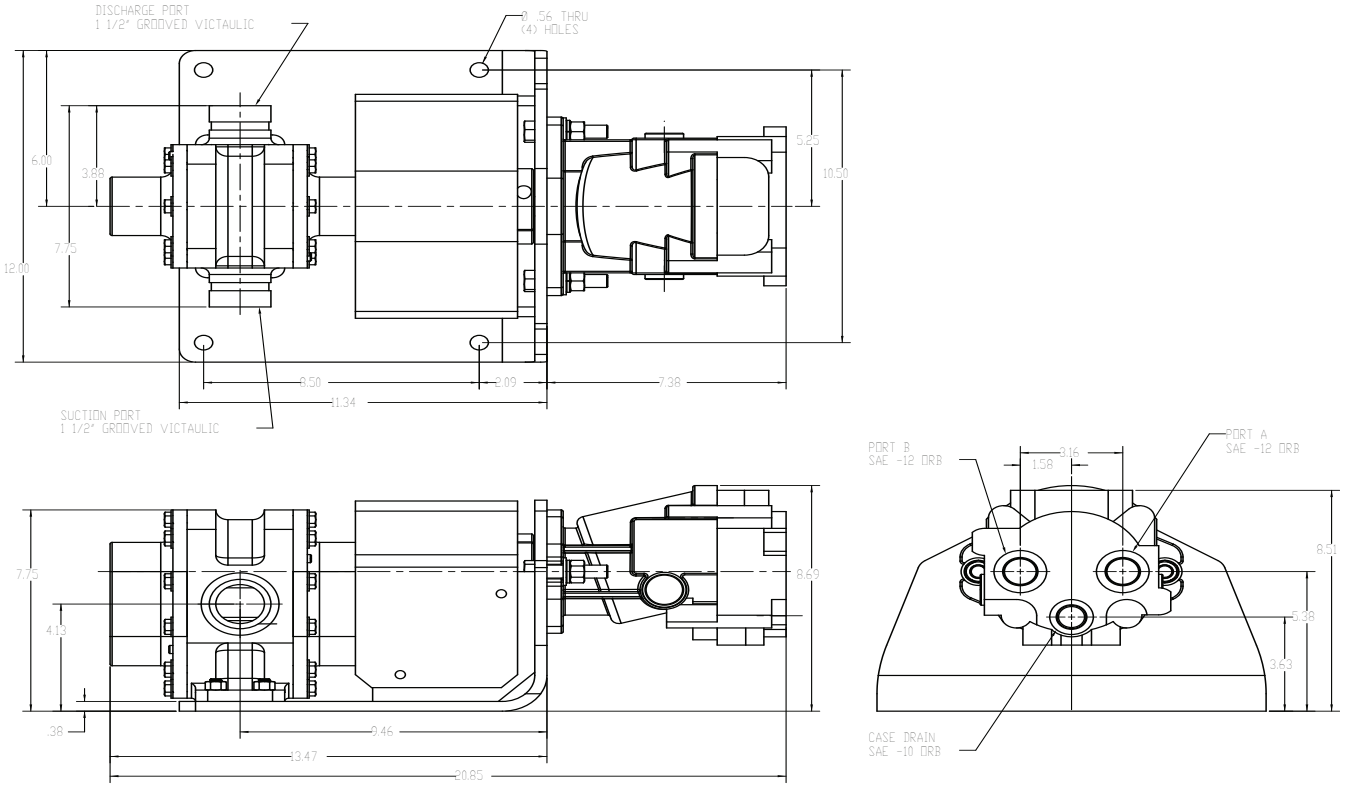


ITEM	Part No.	Description	Qty.
1	8000-1010	Foam Pump - 3020	1
	8000-1011	Foam Pump - 3040	
	8000-1012	Foam Pump - 3060	1
	8000-1013	Foam Pump - 3090	1
	8000-1014	Foam Pump - 3150	1
	8000-1015	Foam Pump - 3300	1
2	2740-1007	Coupling Half - 3020 Pump	1
	2740-1002	Coupling Half - 3040 & 3060 Pump	
	2740-1004	Coupling Half - 3090 & 3150 Pump	1
	2740-1006	Coupling Half - 3300 Pump	1
3	2729-1002	Coupling Insert - 3020, 3040 & 3060	1
	2729-1003	Coupling Insert - 3090 & 3150	1
	2729-1004	Coupling Insert - 3300	1
4	2740-1001	Coupling Half - 3020, 3040 & 3060 Hyd Motor	1
	2740-1003	Coupling Half - 3090 & 3150 Hyd Motor	1
	2740-1005	Coupling Half - 3300 Hyd Motor	1
5	2500-0026	Hyd Motor - 3020 & 3040	1
	2500-0064	Hyd Motor - 3060	1
	2500-1004	Hyd Motor - 3090 & 3150	1
	2500-1005	Hyd Motor - 3300	1

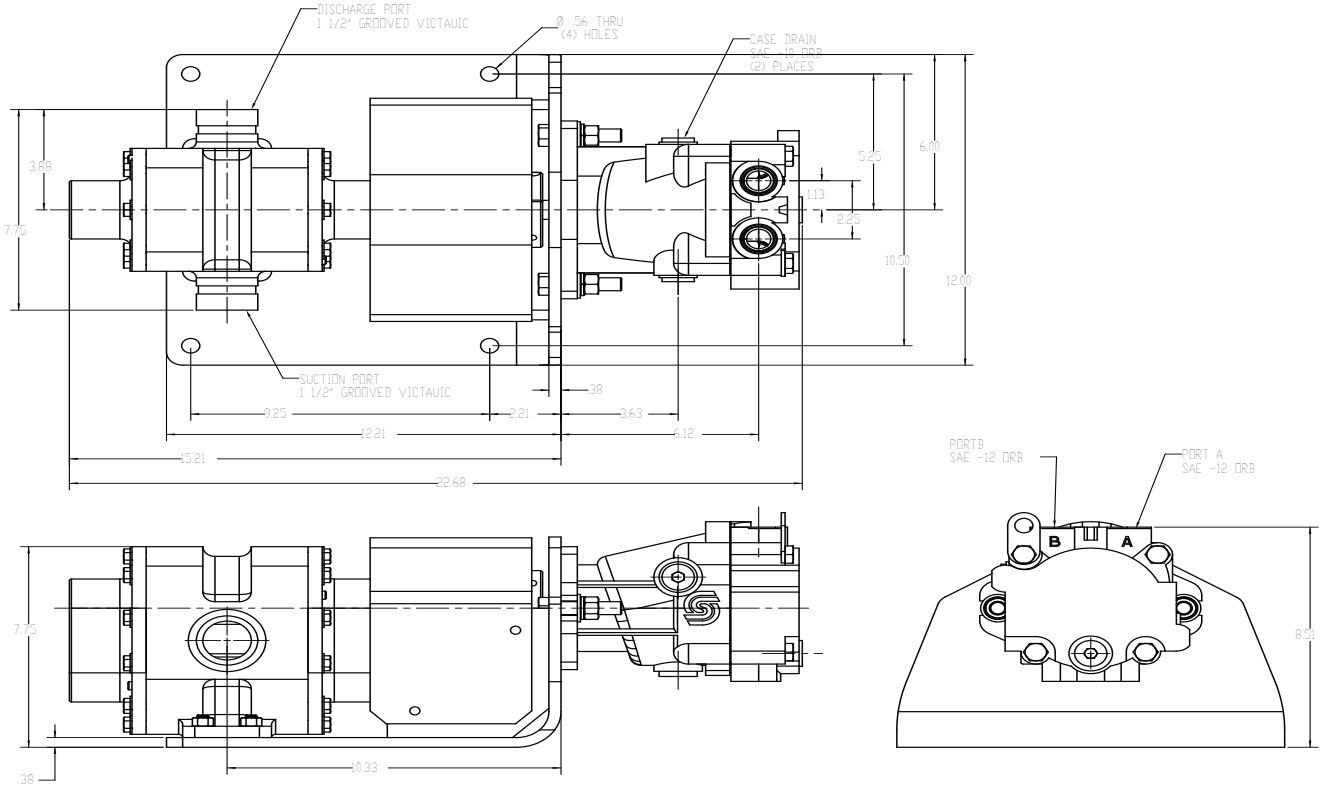
3020 – Fire Lion Pump/Motor Assembly (P/N 3450-1035)



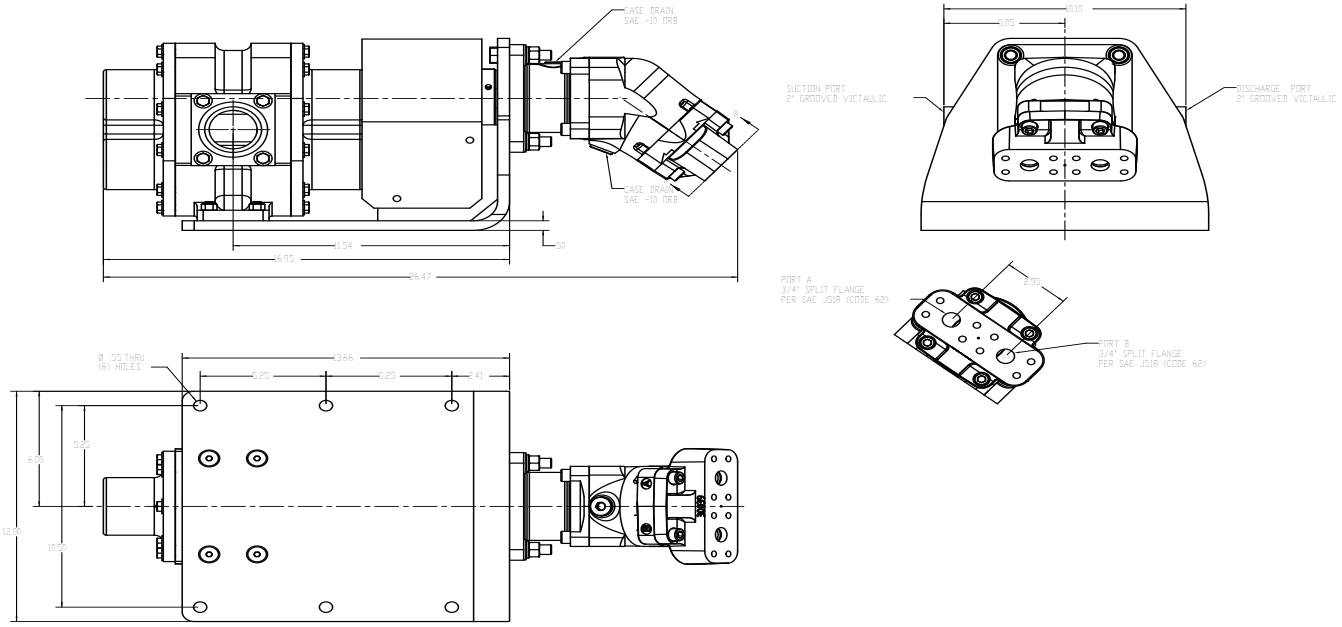
3040 – Fire Lion Pump/Motor Assembly (P/N 3450-1036)



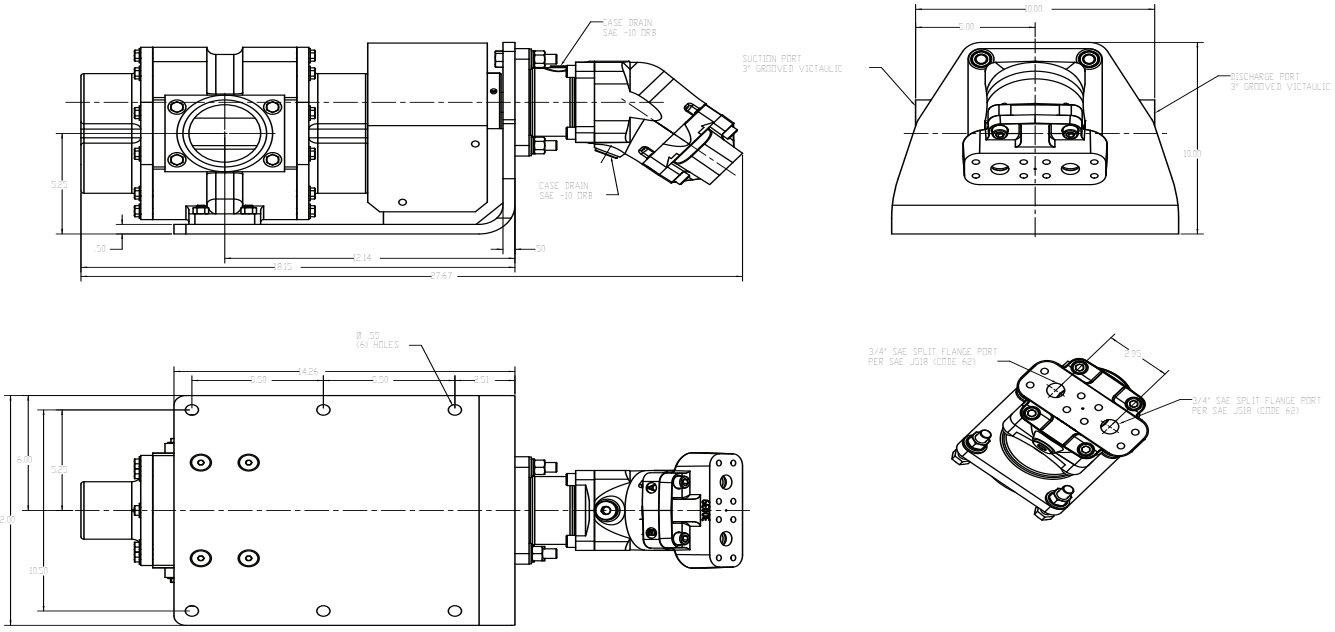
3060 – Fire Lion Pump/Motor Assembly (P/N 3450-1037)



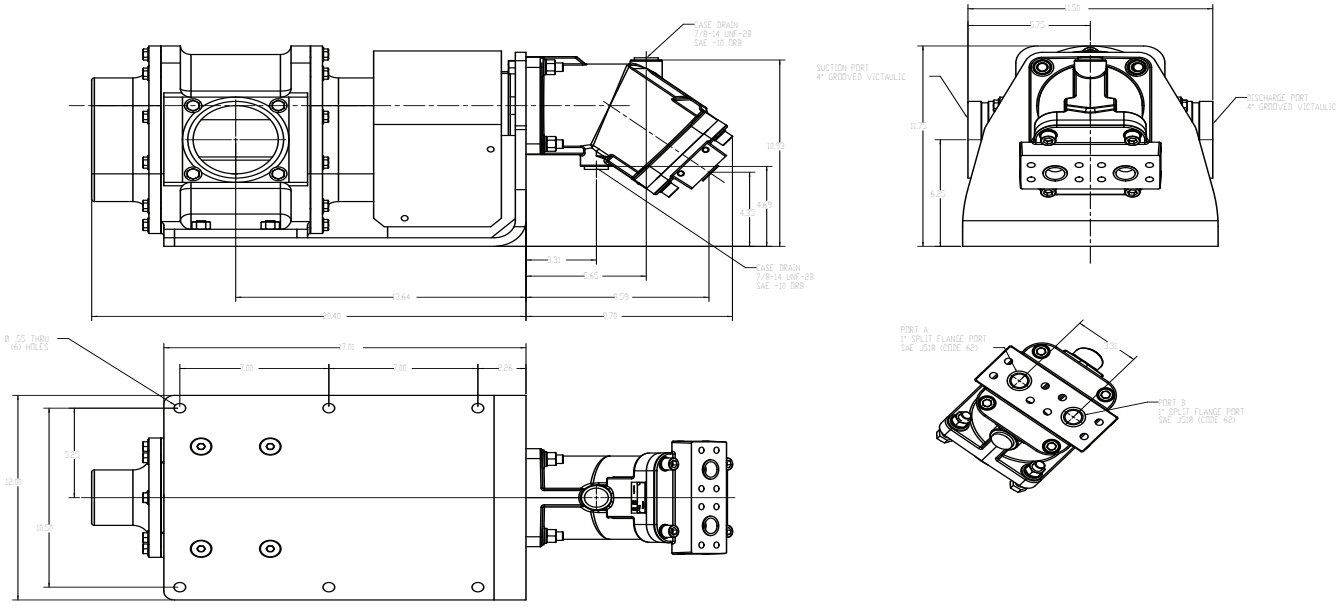
3090 – Fire Lion Pump/Motor Assembly (P/N 3450-1038)



3150 – Fire Lion Pump/Motor Assembly (P/N 3450-1039)



3300 – Fire Lion Pump/Motor Assembly (P/N 3450-1040)



Specifications for Edwards Pump Systems

System Capacity	Maximum Water Flow GPM (LPM)					
Foam Concentrate Rate	**3020**	**3040**	**3060**	**3090**	**3150**	**3300**
1%	2,000 (7,571)	4,000 (15,142)	6,000 (22,712)	9,000 (34,069)	15,000 (56,781)	30,000 (113,563)
3%	667 (2,525)	1,333 (5,046)	2,000 (7,571)	3,000 (11,356)	5,000 (18,927)	10,000 (37,854)
6%	333 (1,261)	667 (2,525)	1,000 (3,785)	1,500 (5,678)	2,500 (9,464)	5,000 (18,927)
System Specifications						
Max. Foam Output GPM (LPM)	20 (75.7)	40 (151.4)	60 (227.1)	90 (340.7)	150 (567.8)	300 (1,135.6)
Max. Operating Pressure PSI (BAR)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)
Max. Operating Temp. F (C)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)
Max. Hydraulic Oil Pressure PSI (BAR)	1,734(119.6)	2,649 (182.7)	3,484 (240.2)	4,479 (308.8)	4,378 (301.9)	5,873 (405.0)
Max. Hydraulic Oil Flow GPM (LPM)	16.8(63.6)	16.3 (61.7)	22.9 (86.7)	23.7 (89.7)	29.5 (112)	47.4 (180)
PTO Pump RPM for Min. Performance RPM	1381	1,336	1,579	1,200	1,485	1,387
PTO HP HP (kW) at Max. Performance	20.5(15.3)	29.5 (22.0)	53.3 (39.8)	70.5 (52.6)	85.3 (63.6)	185.1 (138.1)
PTO Torque at Max. Performance Lbf-ft (Nm)	78(106)	116 (157.3)	177.3 (240.4)	308.6 (418.4)	301.7 (409.1)	701 (950.1)
Hyd. Pump Mounting Flange	SAE 'B' Flange	SAE 'B' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'D' Flange
Hyd. Pump Input Shaft	13 Tooth 16/32 Pitch	13 Tooth 16/32 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	13 Tooth 8/16 Pitch
Max. PTO Speed RPM	4,000	4,000	3,600	3,600	3,600	3,100
Minimum Hydraulic Reservoir Size Gal. (Liter)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	15 (56.8)
Minimum Hydraulic Cooler Heat Load BTU/Min. @ Minimum Return Line Flow GPM (LPM)	244 5.2(19.7)	359 5.0 (19.0)	663 5.9 (22.3)	886 5.4 (21)	1073 6.7 (25)	2312 9.5 (36)
Maximum Hydraulic Oil Temp. F (C)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)
Maximum Amp Draw	5	5	5	5	5	5

Edwards Hydraulic Fittings and Hose Specifications

Connection	Model	Minimum Hose ID	Pump Port Fitting & Pressure Rating	Motor Port Fitting & Type
Hydraulic Reservoir to Hydraulic Charge Pump Inlet	3020/3040	1" Suction	#16 SAE O-Ring	N/A
	3060	1" Suction	#16 SAE O-Ring	N/A
	3090	1" Suction	#16 SAE O-Ring	N/A
	3150	1" Suction	#16 SAE O-Ring	N/A
	3300	1-1/4" Suction	#20 SAE O-Ring	N/A
Hydraulic Pump Port B to Motor Port A	3020/3040	3/4" - 3000 PSI	#16 SAE O-Ring	#12 SAE O-Ring
Hydraulic Pump Port B to Motor Port B	3060	1" - 3600 PSI	1" SAE Split Flange	1" SAE Split Flange
	3090	1" - 4500 PSI	1" SAE Split Flange	1" SAE Split Flange
	3150	1"- 4500 PSI	1" SAE Split Flange	1" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Pump Port A to Motor Port B	3020/3040	3/4" - 3000 PSI	#16 SAE O-Ring	#12 SAE O-Ring
Hydraulic Pump Port A to Motor Port A	3060	1" - 3600 PSI	1" SAE Split Flange	1" SAE Split Flange
	3090	1" - 4500 PSI	1" SAE Split Flange	1" SAE Split Flange
	3150	1" - 4500 PSI	1" SAE Split Flange	1" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Motor Case Drain to Hydraulic Pump Case Drain	3020/3040	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3060	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3090	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	#12 SAE O-Ring
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	#12 SAE O-Ring
Hydraulic Motor Case Drain to Hydraulic Cooler	3020/3040	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3060	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3090	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	N/A

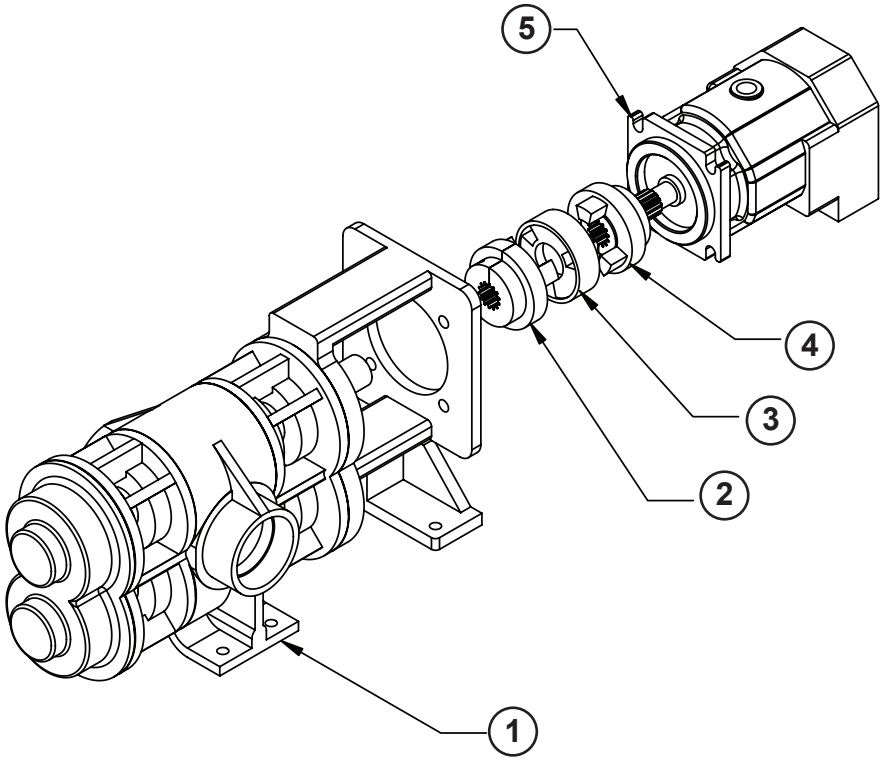
Notes:

SAE O-Ring Ports are per SAE J514

SAE Split Flange Ports are to SAE J518 code 62

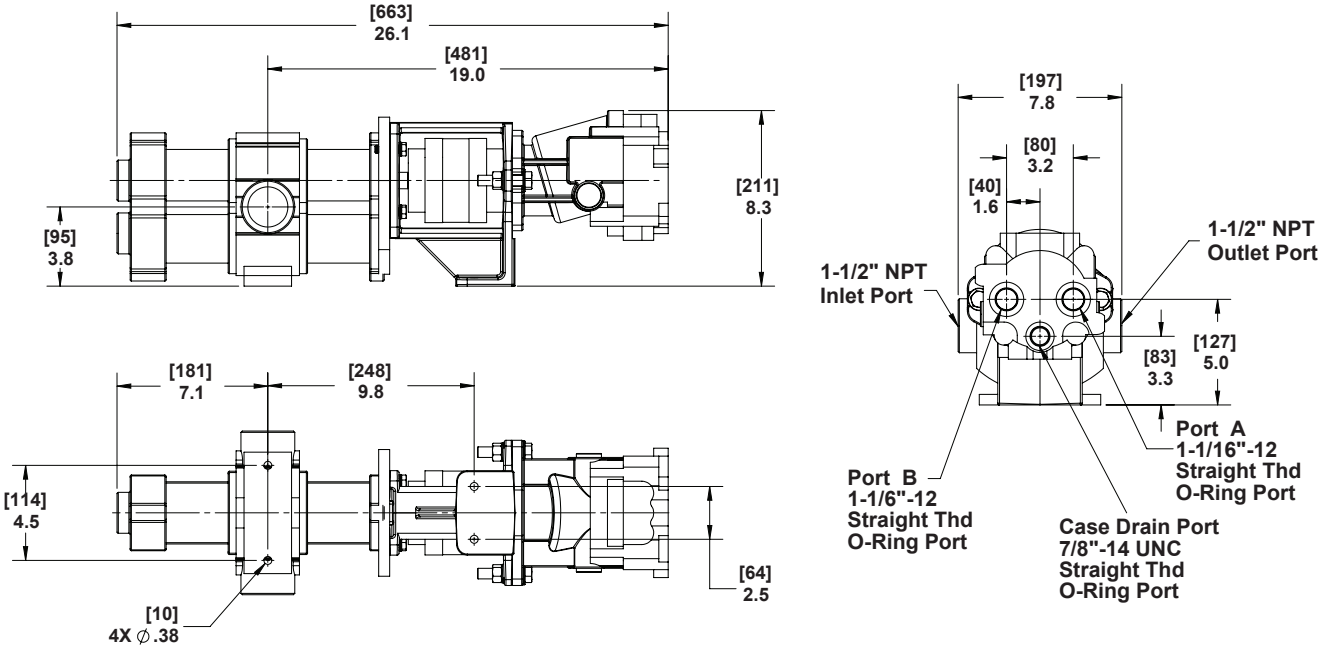
Hydraulic pump inlet hose to conform to SAE 100R4

Edwards Parts Identification Pump/Motor Assembly

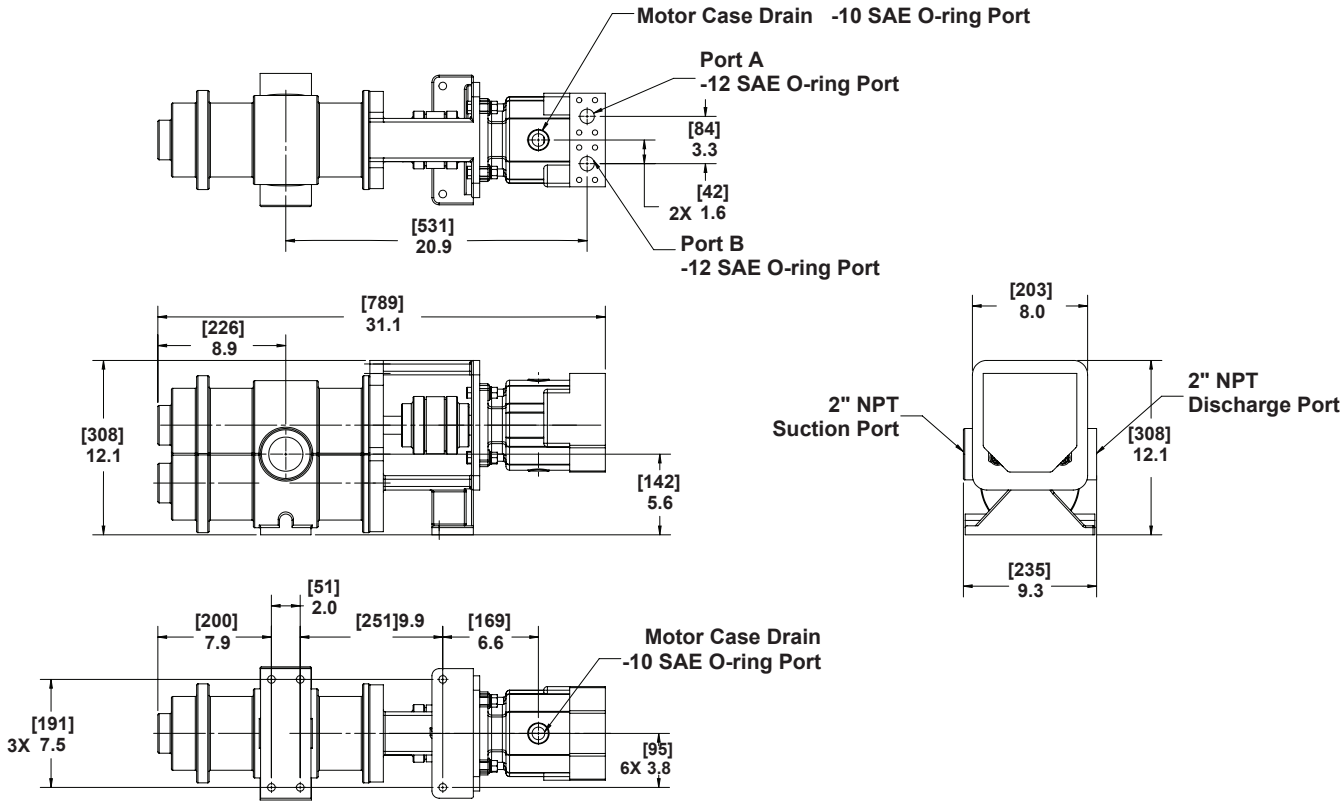


ITEM	Part No.	Description	Qty.
1	8000-0075	Foam Pump - 3020	1
	8000-0076	Foam Pump - 3040	1
	8000-0077	Foam Pump - 3060	1
	8000-0078	Foam Pump - 3090	1
	8000-0079	Foam Pump - 3150	1
	8000-0080	Foam Pump - 3300	1
2	2740-0014	Coupling Half - 3020, 3040 Pump	1
	2740-0008	Coupling Half - 3060 Pump	1
	2740-0012	Coupling Half - 3090, 3150 & 3300 Pump	1
3	2729-0007	Coupling Insert - All	1
4	2740-0013	Coupling Half - 3020, 3040 Hyd Motor	1
	2740-0009	Coupling Half - 3060 & 3090 Hyd Motor	1
	2740-0012	Coupling Half - 3150 & 3300 Hyd Motor	1
5	2500-0026	Hyd Motor - 3020, 3040	1
	2500-0022	Hyd Motor - 3060, 3090	1
	2500-0031	Hyd Motor - 3150, 3300	1

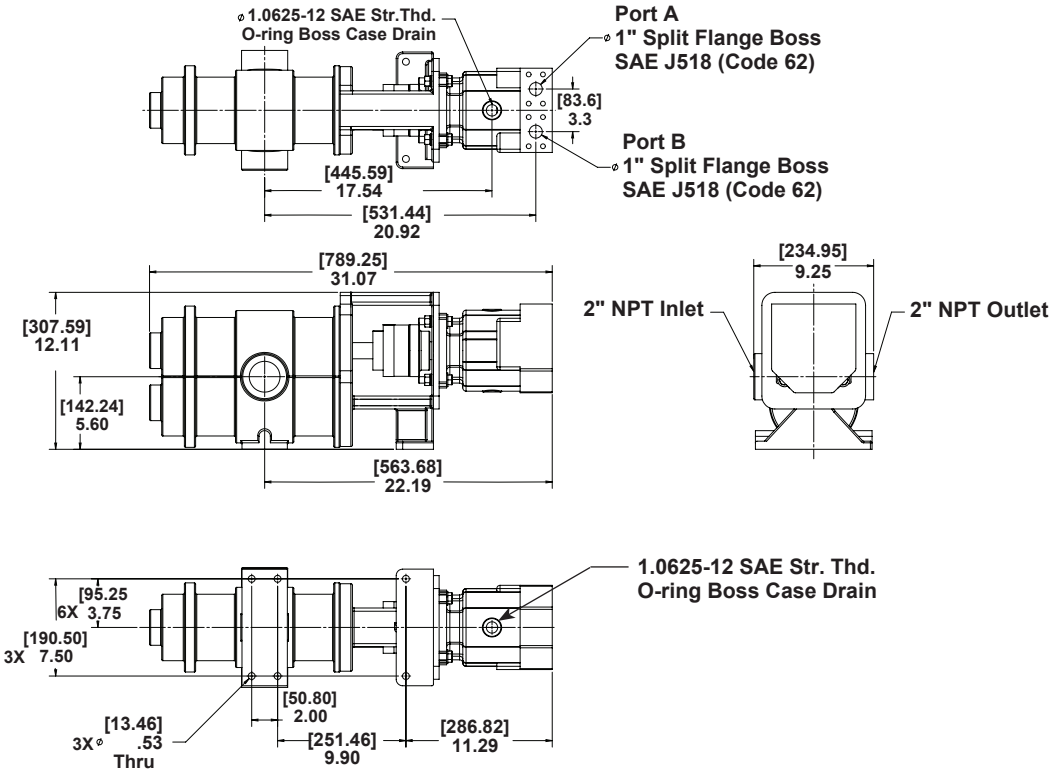
3020 & 3040 – Edwards Pump/Motor Assembly (P/N 3450-0071 & 3450-0072)



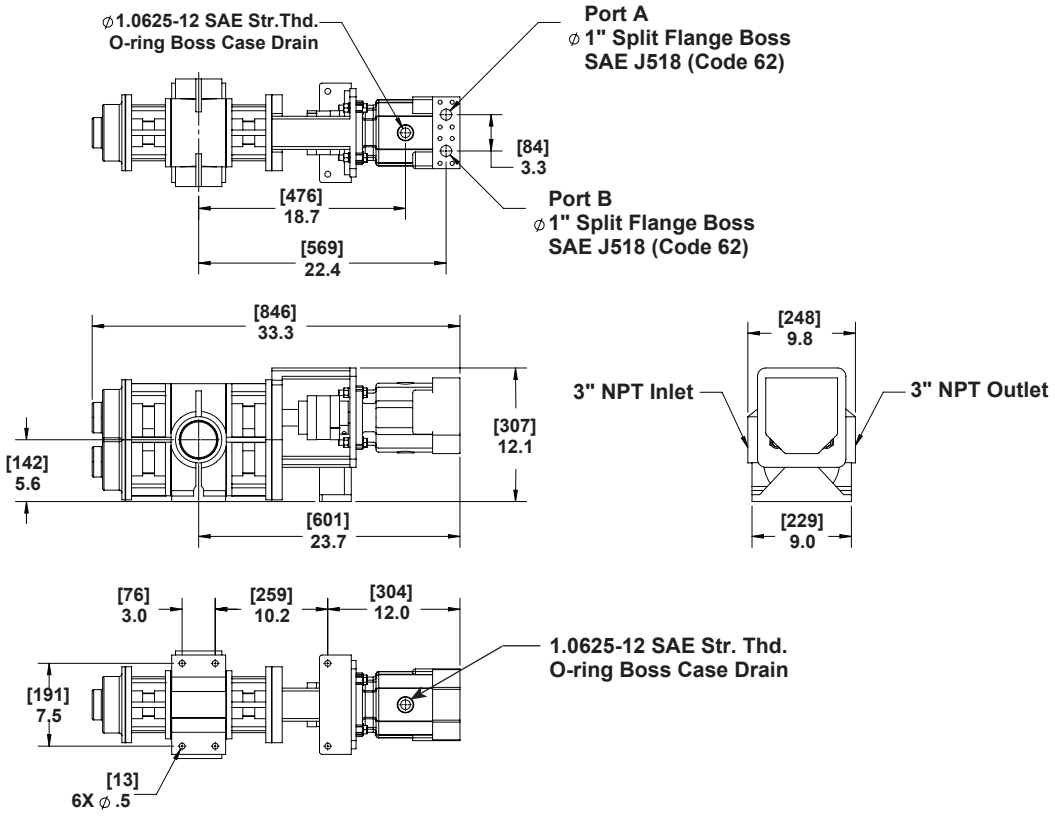
3060 – Edwards Pump/Motor Assembly (P/N 3450-0073)



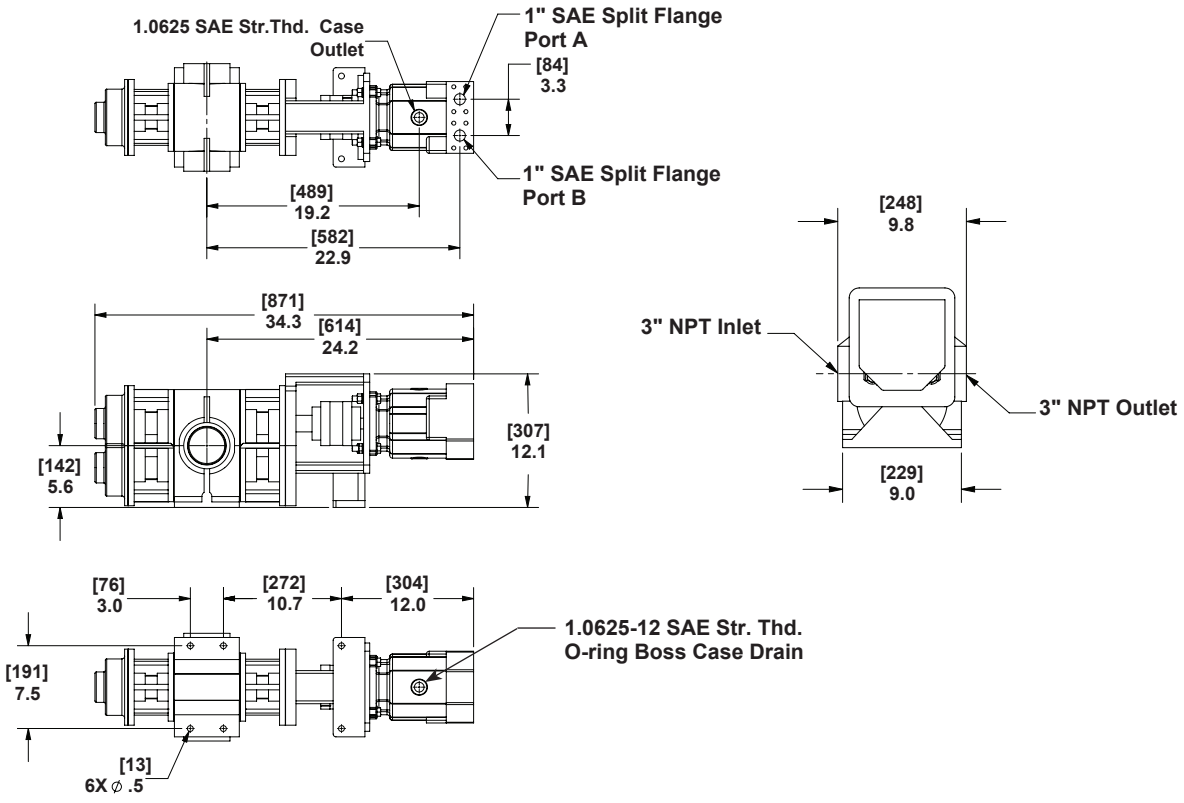
3090 – Edwards Pump/Motor Assembly (P/N 3450-0074)



3150 – Edwards Pump/Motor Assembly (P/N 3450-0075)



3300 – Edwards Pump/Motor Assembly (P/N 3450-0076)



Specifications for Trident Pump Systems

System Capacity	Maximum Water Flow GPM (LPM)					
Foam Concentrate Rate	**3020**	**3040**	**3060**	**3090**	**3150**	**3300**
1%	2,000 (7,571)	4,000 (15,142)	6,000 (22,712)	9,000 (34,069)	15,000 (56,781)	30,000 (113,563)
3%	667 (2,525)	1,333 (5,046)	2,000 (7,571)	3,000 (11,356)	5,000 (18,927)	10,000 (37,854)
6%	333 (1,261)	667 (2,525)	1,000 (3,785)	1,500 (5,678)	2,500 (9,464)	5,000 (18,927)
System Specifications						
Max. Foam Output GPM (LPM)	20 (75.7)	40 (151.4)	60 (227.1)	90 (340.7)	150 (567.8)	300 (1,135.6)
Max. Operating Pressure PSI (BAR)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)	300 (20.7)
Max. Operating Temp. F (C)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)	160 (71)
Max. Hydraulic Oil Pressure PSI (BAR)	2,006 (138)	2,689 (185)	2,711 (187)	3,505 (241.7)	5,374 (370.6)	5,662 (390.4)
Max. Hydraulic Oil Flow GPM (LPM)	10.9 (41.3)	12.4 (46.9)	15.8 (59.8)	27.2 (103)	25.5 (96.6)	41 (156)
PTO Pump RPM for Min. Performance RPM	999	1,136	1,210	1,367	1,283	1,194
PTO HP HP (kW) at Max. Performance	16.7 (12.5)	25 (18.6)	32.1 (23.9)	63 (47)	90 (68)	153 (114)
PTO Torque at Max. Performance Lbf-ft (Nm)	86 (116.6)	115 (156)	138 (187)	242 (328)	369 (501)	670 (909)
Hyd. Pump Mounting Flange	SAE 'B' Flange	SAE 'B' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'C' Flange	SAE 'D' Flange
Hyd. Pump Input Shaft	13 Tooth 16/32 Pitch	13 Tooth 16/32 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	14 Tooth 12/24 Pitch	13 Tooth 8/16 Pitch
Max. PTO Speed RPM	4,000	4,000	3,600	3,600	3,600	3,100
Minimum Hydraulic Reservoir Size Gal. (Liter)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	8 (30.3)	15 (56.8)
Minimum Hydraulic Cooler Heat Load BTU/Min. @ Minimum Return Line Flow GPM (LPM)	N/A	N/A	N/A	792 6.2 (24)	1137 5.8 (22)	1916 8.2 (31)
Maximum Hydraulic Oil Temp. F (C)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)	220 (104)
Maximum Amp Draw	5	5	5	5	5	5

Trident Hydraulic Fittings and Hose Specifications

Connection	Model	Minimum Hose ID	Pump Port Fitting & Pressure Rating	Motor Port Fitting & Type
Hydraulic Reservoir to Hydraulic Charge Pump Inlet	3090	1" Suction	#16 SAE O-Ring	N/A
	3150	1" Suction	#16 SAE O-Ring	N/A
	3300	1-1/4" Suction	#20 SAE O-Ring	N/A
Hydraulic Pump Port B to Motor Port B	3090	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3150	1"- 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Pump Port A to Motor Port A	3090	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3150	1" - 4500 PSI	1" SAE Split Flange	3/4" SAE Split Flange
	3300	1" - 6000 PSI	1-1/4" SAE Split Flange	1" SAE Split Flange
Hydraulic Motor Case Drain to Hydraulic Pump Case Drain	3090	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	#10 SAE O-Ring
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	#10 SAE O-Ring
Hydraulic Pump Case Drain to Hydraulic Cooler	3090	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3150	3/4" - 1500 PSI	#12 SAE O-Ring	N/A
	3300	3/4" - 1500 PSI	#16 SAE O-Ring	N/A

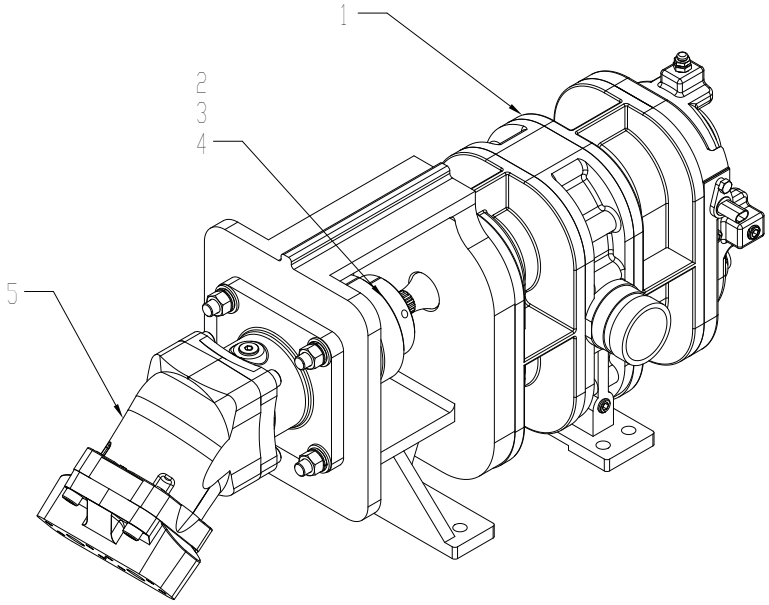
Notes:

SAE O-Ring Ports are per SAE J514

SAE Split Flange Ports are to SAE J518 code 62

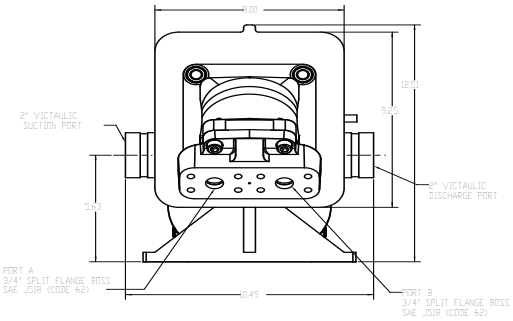
Hydraulic pump inlet hose to conform to SAE 100R4

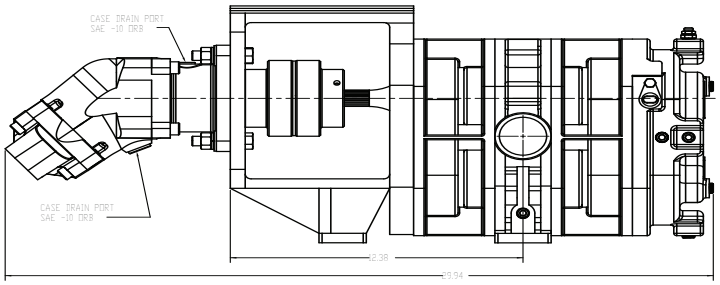
Trident Pump/Motor Assembly Parts

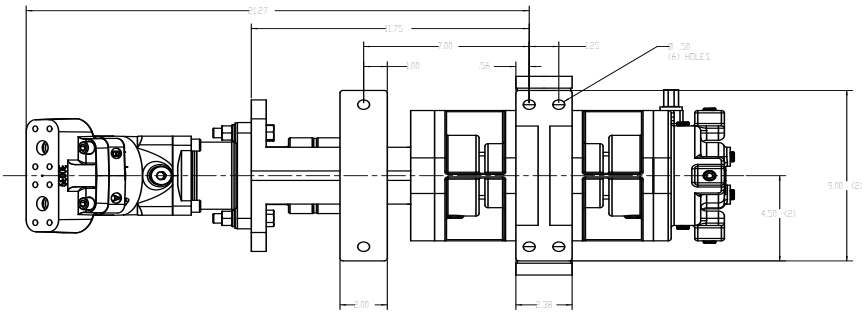


ITEM	Part No.	Description	Qty.
1	8000-1018	Foam Pump - 3020	1
	8000-1019	Foam Pump - 3040	1
	8000-1019	Foam Pump - 3060	1
	8000-1020	Foam Pump - 3090	1
	8000-1021	Foam Pump - 3150	1
	8000-1022	Foam Pump - 3300	1
2	2740-1008	Coupling Half - 3020 Pump	1
	2740-1008	Coupling Half - 3040 & 3060 Pump	1
	2740-1009	Coupling Half - 3090 Pump	1
	2740-1003	Coupling Half - 3150 Pump	1
	2740-1005	Coupling Insert - 3300	1
3	2929-1002	Coupling Insert - 3020, 3040, 3060	1
	2729-1003	Coupling Insert - 3090, 3150	1
	2729-1004	Coupling Insert - 3300	1
4	2740-1001	Coupling Half - 3020, 3040 & 3060 Hyd Motor	
	2740-1003	Coupling Half - 3090 & 3150 Hyd Motor	1
	2740-1005	Coupling Half - 3300 Hyd Motor	1
5	2500-0026	Hyd Motor - 3020	1
	2500-0026	Hyd Motor - 3040	1
	2500-0026	Hyd Motor - 3060	1
	2500-1004	Hyd Motor - 3090 & 3150	1
	2500-1005	Hyd Motor - 3300	1

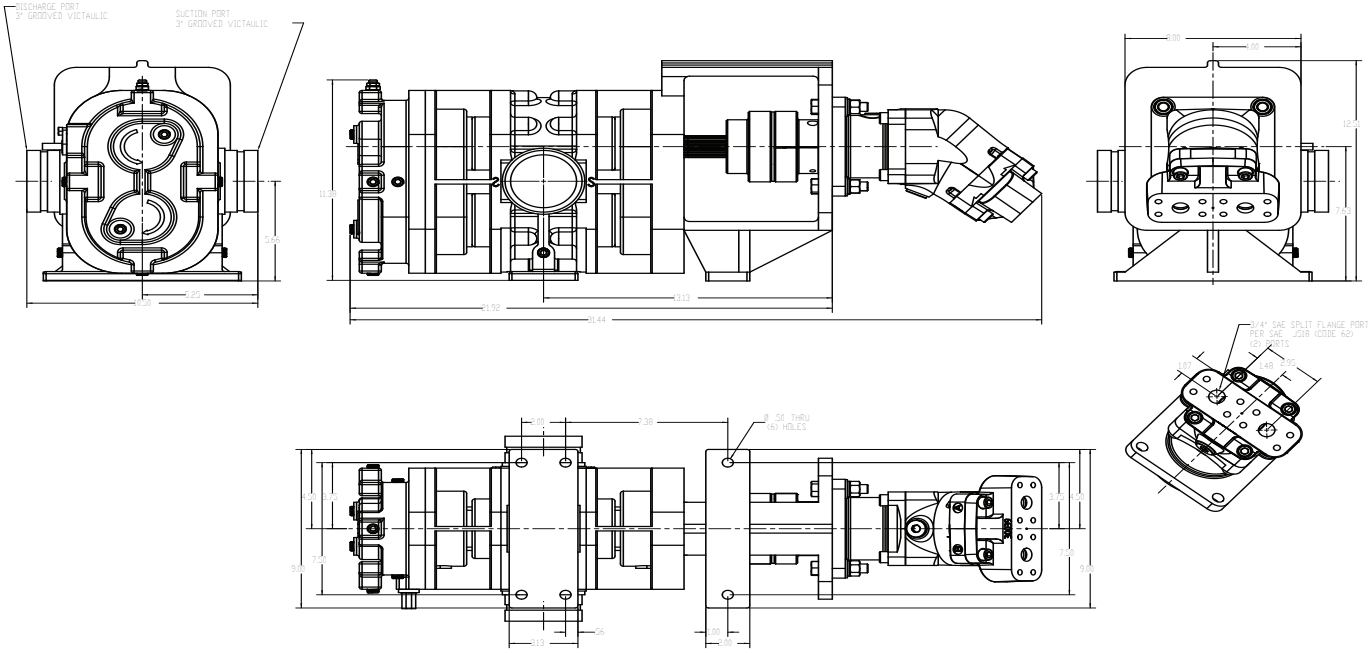
3090 – Trident Pump/Motor Assembly (P/N 3450-1044)



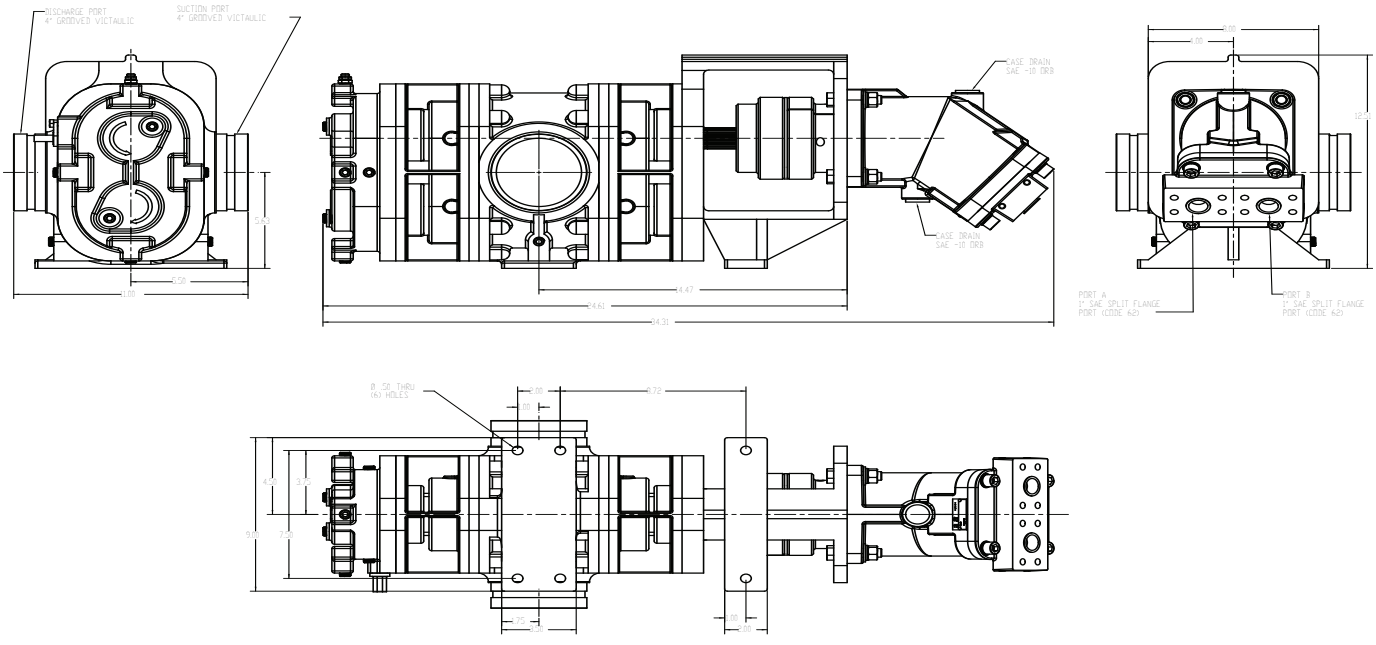




3150 – Trident Pump/Motor Assembly (P/N 3450-1045)



3300 – Trident Pump/Motor Assembly (P/N 3450-1046)



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16 Limited Warranty

Fire Research Corp. (FRC), as supplier of FoamPro, warrants to the original purchaser, each new pump, system or other product of its own manufacture, for a period of two years from the date of shipment from the factory, to be free from defects in material and workmanship under normal use and service. “Normal use and service” means not in excess of recommended maximum speeds, pressures, and temperatures, or handling fluids not compatible with components materials, as noted in applicable FoamPro product catalogs, technical literature, and instructions. This warranty shall not apply to any pump, system or other product which shall have been repaired or altered to adversely affect the performance or reliability of the pump, system or other product.

Neither this warranty nor any implied warranty apply to damage or harm caused by any or all of the following: (1) Freight damage; (2) Freezing damage; (3) Damage caused by parts and/or accessories or components not obtained from or approved by FRC; (4) ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES, OTHER THAN INJURY TO THE PERSON, ARISING FROM THE USE OF ANY PUMP OR OTHER PRODUCT MANUFACTURED BY FRC EXCEPT in states that do not allow the exclusion or limitation of incidental or consequential damages; (5) Damage due to misapplication and/or misuse; (6) Normal wear of moving parts or components affected by moving parts.

The liability of FRC under the foregoing warranty is limited to the repair or replacement at FRC's option without charge for labor or materials of any parts upon return of the entire pump, system or other product or of the particular part to the FRC factory within the warranty period, at the sole expense of the purchaser, which part shall upon examination appear to FRC’s satisfaction to have been defective in material and workmanship. The liability of FRC under any theory of recovery (except any express warranty where the remedy is set forth in the above paragraph) for loss, harm or damage, shall be limited to the lesser of the actual loss, harm or damage or the purchase price of the involved pump, system or other product when sold by FRC to its customer.

FRC expressly warrants its pumps and other products as above stated. THERE ARE NO OTHER EXPRESS WARRANTIES. ANY IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO TWO YEARS FROM THE DATE OF PURCHASE BY THE ORIGINAL PURCHASER EXCEPT in states that do not allow time limitations on implied warranties. THERE IS NO IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY WHEN THIS PRODUCT IS PUT TO RENTAL USE.

No person including any dealer or representative of FoamPro is authorized to make any representation or warranty concerning FRC’s FoamPro products on behalf of FRC, or to assume for FRC the obligations contained in this warranty. FRC reserves the right to make changes in design and other changes and improvements upon its products without imposing any obligations upon itself to install the same, upon its existing products then in process or manufacture.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

IMPORTANT NOTICE

It is imperative to package all FoamPro components properly, before shipment (with Return Goods Authorization attached) back to FRC. The FoamPro contains electronic components that may receive damage from improper shipping procedures! All FoamPro components shipped back to FRC will pass through Quality Control Inspection, and will be photographed after the box is opened. Any shipping damage, such as superficial scratches, nicks, etc., to the unit makes it unusable (even after the internal warranty problem is repaired) and thus must be refinished to “like-new” condition during the warranty process. You are responsible for any physical damage occurring to FoamPro components at your facility and during shipment back to FRC.

Package the FoamPro, complete with all the recommended parts the Customer Service representative requires (i.e., Digital Display control with all premolded wire cables etc.) in its original carton with the Styrofoam and other packaging materials, as it was received at your facility. FRC appreciates your attention in this matter, as we feel it will help us to serve you in a better fashion, while keeping the cost of the FoamPro product competitive. Thank you.

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