SmartFOAM

Electronic Foam Proportioning Systems

Models:

Class A only – 1.7AHP, 2.1A

Class A/B – 3.3, 5.0, 6.5

Description, Installation, and Operation Manual

FSG-MNL-00158

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IDEX FIRE SUPPRESSION GROUP

GODIVA

APPARATUS INFORMATION

Hale SmartFOAM System Serial Number	
In Service Date	
Fire Department	
Engine Number	

Calibration Factors:

Water Flow – high calibration point	Water flow		Pulses	
Water Flow – low calibration point	Water flow		Pulses	
Class A Foam Factor				

NOTICE!

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

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

REVISION RECORD

REV	Date	Page	Description
A	DEC 2015	All	New Issue

NOTES

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SAFETY

IMPORTANT!

THE HALE SMARTFOAM MODELS 2.1A AND 1.7AHP CLASS "A" ELECTRONIC FOAM PROPORTIONING SYSTEMS ARE DESIGNED FOR OPTIMUM SAFETY OF ITS OPERATORS AND TO PROVIDE RELIABLE AND SAFE FOAM CONCENTRATE INJECTION. FOR ADDED PROTECTION AND BEFORE ATTEMPTING INSTALLATION OR OPERATION PLEASE FOLLOW THE SAFETY GUIDELINES LISTED IN THIS SECTION AND ADHERE TO ALL WARNING, DANGER, CAUTION AND IMPORTANT NOTES FOUND WITHIN THIS GUIDE.

THIS SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND ADHERED TO STRICTLY BY ALL INSTALLERS AND OPERATORS BEFORE ATTEMPTING TO INSTALL OR OPERATE THE SMARTFOAM PROPORTIONING SYSTEM.

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

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

GUIDELINES

READ ALL INSTRUCTIONS THOROUGHLY BEFORE BEGINNING ANY INSTALLATION OR OPERATION PROCESS.

- ❑ Installation should be performed by a trained and qualified installer, or your authorized Hale Products service representative.
- ❑ Be sure the installer has sufficient knowledge, experience and the proper tools before attempting any installation.
- ❑ Make sure proper personal protective equipment is used when operating or servicing apparatus.
- ❑ A foam tank low level sensor must be utilized to protect the Hale Foam proportioner from dry running. *Failure to use a low level sensor with the Hale Foam system voids warranty.*
- ❑ DO NOT permanently remove or alter any guard or insulating devices, or attempt to operate the system when these guards are removed.
- ❑ Make sure all access/service panels and covers are installed, closed and latched tight, where applicable.
- ❑ DO NOT remove or alter any hydraulic or pneumatic connections, electrical devices, etc. DO NOT tamper with or disconnect safety features or modify protective guards (such as covers or doors). DO NOT add or remove structural parts. *Doing so voids the warranty.*

Any of the above could affect system capacity and/or safe operation of the system and is a serious safety violation which could cause personal injury, could weaken the construction of the system or could affect safe operation of the SmartFOAM Proportioning System.

WARNING!

NO MODIFICATIONS OR ADDITIONS MAY BE MADE TO THE SMARTFOAM PORPORTIONING SYSTEM WITHOUT PRIOR WRITTEN PERMISSION FROM:

HALE PRODUCTS, INC
607 NW 27th Avenue
Ocala, Florida 34475 USA
Telephone: 352-629-5020
FAX: 800-533-3569

- All electrical systems have the potential to cause sparks during service. Take care to eliminate explosive or hazardous environments during service and/or repair.
- To prevent electrical shock always disconnect the primary power source before attempting to service any part of the Hale Foam system.
- To prevent system damage or electrical shock the main power supply wire is the last connection made to the Hale Foam motor controller.
- Release all pressure then drain all concentrate and water from the system before servicing any of its component parts.
- Do not operate system at pressures higher than the maximum rated pressure.
- Use only pipe, hose, and fittings from the foam pump outlet to the injector fitting, which are rated at or above the maximum pressure rating at which the water pump system operates.
- Hale Foam proportioning systems are designed for use on negative ground direct current electrical systems only.
- Do not mount radio transmitter or transmitter cables in direct or close contact with the SmartFOAM control unit.
- Before connecting the cord sets and wiring harnesses, inspect the seal washer in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion of the pins and terminals. This could result in possible system failure.
- Always disconnect the power cable, ground straps, electrical wires and control cables from the control unit or other Hale Foam system equipment before electric arc welding at any point on the apparatus Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- DO NOT connect the main power lead to small leads that are supplying some other device, such as a light bar or siren.
- When operating the Hale SmartFOAM in Simulated Flow mode, an outlet for the foam concentrate must be provided to prevent excessive pressure build up in the discharge piping or hoses.
- Make sure the foam tank and foam concentrate suction hoses are clean before making final connection to foam pump. If necessary, flush tank and hoses prior to making connection.
- Check all hoses for weak or worn conditions after each use. Ensure that all connections and fittings are tight and secure.
- Ensure that the electrical source of power for the unit is a negative (–) ground DC system, of correct input voltage, with a reserve minimum current available to drive the system.
- The in-line strainer/valve assembly is a low pressure device and WILL NOT withstand flushing water pressure in excess of 45 PSI (3 BAR).
- When determining the location of Hale Foam system components keep in mind piping runs, cable routing and other interferences that could hinder or interfere with proper system performance.
- Always position the check valve/injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. This avoids the possibility of sediment deposits or the formation of an ice plug.
- The cord sets provided with each Hale Foam system are indexed to ensure correct receptacle installation (they insert one way only). When making cord set connections DO NOT force mismatched connections as damage can result in improper system operation.
- Make sure all connections are sound, and that each connection is correct.
- The cables shipped with each Hale Foam system are 100% tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.
- There are no user serviceable parts inside Hale Foam system electrical/electronic components. *Opening of the motor controller or controller unit voids the warranty.*
- Use mounting hardware that is compatible with all foam concentrates to be used in the system. Use washers, lock washers and cap screws made of brass or 300 series stainless steel.
- When making wire splice connections, make sure they are properly insulated and sealed using an adhesive filled heat shrink tubing.
- ALWAYS connect the primary positive power lead from the terminal block to the master switch terminal or the positive battery terminal.
- Use a minimum 8 AWG type SGX (SAE J1127) chemical resistant battery cable and protect with wire loom.

- ❑ Prevent corrosion of power and ground connections by sealing these connections with silicone sealant provided.
- ❑ Prevent possible short circuit by using the rubber boot provided to insulate the primary power connection at the Hale SmartFOAM motor controller.

SYSTEM OVERVIEW

The Hale SmartFOAM Foam Proportioning Systems are completely engineered, factory matched foam proportioning systems that provides reliable, consistent foam concentrate injection for Class “A” AND Class “B” foam operations. The 1.7AHP and 2.1A systems are for Class “A” only while the 3.3, 5.0, and 6.5 systems can use Class “A” and Class “B”.

Hale SmartFOAM Foam systems accurately deliver from 0.1% to 10.0% (up to the capacity of the foam pump) foam concentrate through a check valve/ injector fitting, directly into the water discharge stream. It is then fed as foam solution into a standard fog nozzle, an air aspirated nozzle, or CAFS equipment, through the apparatus discharge piping. A properly configured and installed foam system with Hale recommended components virtually eliminates contamination of the booster tank, fire pump and relief valve with foam concentrate.

ROTARY PLUNGER PUMP (1.7 AHP, 2.1A)

The heart of the Hale SmartFOAM 2.1A and 1.7AHP systems are an electric motor driven rotary plunger pump. The pump is constructed of anodized aluminum and stainless steel and is compatible with most Class “A” foam concentrates. The pump is close coupled to the electric motor thereby eliminating maintenance of an oil filled gearbox.
A relief valve mounted on the foam pump and constructed of brass, protects the foam pump and foam concentrate discharge hoses from over pressurization and damage.

ROTARY GEAR PUMP (3.3, 5.0, 6.5)

The heart of the Hale SmartFOAM 3.3, 5.0, and 6.5 systems is an electric motor driven rotary gear pump. The pump is constructed of bronze and stainless steel and is compatible with almost all foam concentrates. The pump is close coupled to the electric motor thereby eliminating maintenance of an oil-filled gearbox. A relief valve mounted on the foam pump and constructed of stainless steel, protects the foam pump and foam concentrate discharge hoses from over pressurization and damage.

SMARTFOAM CONTROL UNIT

The control unit, mounted on the operator panel, is the single control point for the SmartFOAM system. Press one of the preset buttons to enable foam concentrate injection once water flow has been established. The 4.5” direct sunlight viewable color display shows:

- ❑ Water flow rate
- ❑ Foam concentrate injection percentage
- ❑ Total water flowed
- ❑ Total foam concentrate used
- ❑ Foam pump capacity

The SmartFOAM control unit also provides plain-text information and warnings as well as tutorials for calibration. The user interface can be configured for the modern SmartFOAM look or the classic FoamLogix look.

WATER FLOW SENSOR

Foam concentrate injection rate is controlled by a computer chip in the control unit for accurate, repeatable, reliable foam concentrate injection. A water flow sensor constantly monitors water flow through the discharge piping. The information from the flow sensor is provided to the control unit by a shielded cable. When the SmartFOAM system is activated at the control unit a signal is sent through the control cable to the motor controller to begin foam concentrate injection. The motor controller then provides power to the electric motor. The electric motor rotates the foam pump and foam concentrate flows through the foam pump discharge to the one piece check valve/injector fitting into the water discharge stream.

Note: *All Hale SmartFOAM Foam systems require a flow sensor for operation.*

FEEDBACK SENSOR

A feedback sensor in the foam pump discharge measures foam concentrate flow. The water flow rate and foam concentrate flow rate are constantly compared by the computer chip in the control unit.
The motor speed is constantly adjusted to maintain the operator selected foam concentrate injection rate. Since the system is flow based, injection rate remains constant regardless of changes in system pressure or the number of discharges that are open (within the limits of the system).
The maximum rated foam concentrate flow, in gallons per minute, is denoted by the model number. Table 1**: Maximum Foam Solution Flows** shows the system capacity at various foam concentrate injection rates for the Hale SmartFOAM systems.

Maximum Foam Solution Flow						
Injection Rate Percent (%)	**Flow rate in GPM [LPM]**					
	1.7AHP	**2.1A**	**3.3**	**5.0**	**6.5**	**Dual 6.5**
0.1	1,700 [6,426]	2,100 [7,949]	3,300 [12,492]	5,000 [18,927]	6,500 [24,606]	13,000 [49,213]
0.2	850 [3,213]	1,050 [3,974]	1,650 [6,245]	2,500 [9,464]	3,250 [12,303]	6,500 [24,606]
0.3	567 [2,143]	700 [2,650]	1,100 [4,164]	1,667 [6,310]	2,167 [8,202]	4,333 [16,404]
0.5	340 [1,285]	420 [1,590]	660 [2,498]	1,000 [3,785]	1,300 [4,921]	2,600 [9,843]
1.0	170 [643]	210 [795]	330 [1,249]	500 [1,893]	650 [2,461]	1,300 [4,921]
3.0			110 [416]	167 [632]	217 [820]	433 [1,640]
6.0			55 [208]	83 [314]	108 [410]	217 [820]

Table 1**: Maximum Foam Solution Flows**

LOW PRESSURE STRAINER

A low pressure foam concentrate strainer is mounted at the inlet of the foam pump. The strainer protects the pump from debris that might accumulate in the foam concentrate tank. The strainer/valve assembly has a composite non-metallic housing with stainless steel mesh strainer element and includes a service shut-off valve.
The valve inlet offers 1/2" NPT (13 mm) threads, with a fitting to connect a 1/2" (13 mm) ID foam concentrate suction hose.
The strainer and valve are low pressure devices and are designed for installations where the strainer IS NOT subject to HIGH pressure flushing water.

HIGH PRESSURE STRAINERS (FS Series)

Hale FS series strainers (FS15 and FS25) are panel mounted with a 500 PSIG (34 BAR) pressure rating, suitable for use where flushing water pressure must pass through the strainer.
The FS15 strainer uses 3/4" (19mm) NPT connection ports and a 1-1/2" NST cap. It is suitable for use with Class "A" and low viscosity Class "B" foam concentrates.
The FS25 strainer uses 1" (25mm) NPT connection ports and a 2-1/2" NST cap. It is suitable for use with both Class "A" and Class "B" foam concentrates.

TANK SELECTOR VALVES

SmartFOAM models 3.3, 5.0, and 6.5 may use dual foam tanks for A and B foam concentrates. Selection of the desired foam concentrate tank with the **ADT** panel mounted toggle switch or **MDT II** selector automatically changes the foam concentrate injection rate to the preset default rate for the selected foam tank. No further operator Intervention is required.

The **ADT**, **MDT II** and **MST** include the check valves and connection points to provide foam pump flushing capabilities.

Air Dual Tank Selector (ADT)

The Air Dual Tank (ADT) valve is an air operated foam tank selector valve that enables selection of foam concentrate dependent on fire ground operational demands.
The ADT is an integral part of the foam pump and provides an electrical interlock for the low tank level sensors and concentrate injection rate. A panel mounted selector toggle switch with indicator lights controls foam concentrate tank selection and shows which foam concentrate tank is in use.

Manual Dual Tank Selector (MDT II)

The Manual Dual Tank (MDT II) selector valve is available for the Hale Foam systems with dual tanks. The MDT II is a panel mounted, manually operated selector that provides selection of foam concentrate dependent on fire ground operational demands.
The MDT II also provides an electrical interlock for the low tank level sensors and concentrate injection rate. The MDT II is not suitable for top mount operator panel installations and some side operator panels due to gravity feed requirements of foam concentrate to the foam pump.

Manual Single Tank (MST)

Single tank foam systems can be configured with a Manual Single Tank (MST) selector, which provides a flush function connection to the foam system electronic controls.

HALE FOAM SYSTEM SPECIFICATIONS

	1.7AHP	2.1A
Foam Pump Type	Piston Pump, Dual Plunger	Piston Pump, Dual Plunger
Maximum Foam Concentrate Output	1.7 GPM (6.5 LPM)	2.1 GPM (8 LPM)
Maximum System Operating Pressure	400 PSI (27.5 BAR)	250 PSI (17 BAR)
Maximum Operating Temperature	160°F (71°C)	160°F (71°C)
Pump Motor	0.44 HP (0.3 Kw), 12 VDC	0.44 HP (0.3 Kw), 12 VDC
Operating Ampere Draw	30 AMPS @ 12 VDC	25 AMPS @ 12 VDC
Maximum Ampere Draw	40 AMPS @ 12 VDC	40 AMPS @ 12 VDC

Table 2**: Specifications – 1.7 and 2.1**

	3.3	5.0	6.5
Foam Pump Type	Rotary Gear Positive Displacement	Rotary Gear Positive Displacement	Rotary Gear Positive Displacement
Maximum Foam Concentrate Output	3.3 GPM (13 LPM)	5.0 GPM (19 LPM)	6.5 GPM (24.6 LPM)
Maximum System Operating Pressure	400 PSI (27.5 BAR)	250 PSI (17 BAR)	200 PSI (13.8 BAR)
Maximum Operating Temperature	160°F (71°C)	160°F (71°C)	160°F (71°C)
Pump Motor	0.75 HP (0.6 Kw), 12 VDC	0.75 HP (0.6 Kw), 12 VDC	1.25 HP (0.9 Kw), 12 VDC
Operating Ampere Draw	30 AMPS @ 12 VDC	30 AMPS @ 12 VDC	40 AMPS @ 12 VDC
Maximum Ampere Draw	60 AMPS @ 12 VDC	60 AMPS @ 12 VDC	80 AMPS @ 12 VDC

Table 3**: Specifications – 3.3, 5.0, and 6.5**

HALE FOAM PUMP DIMENSIONS

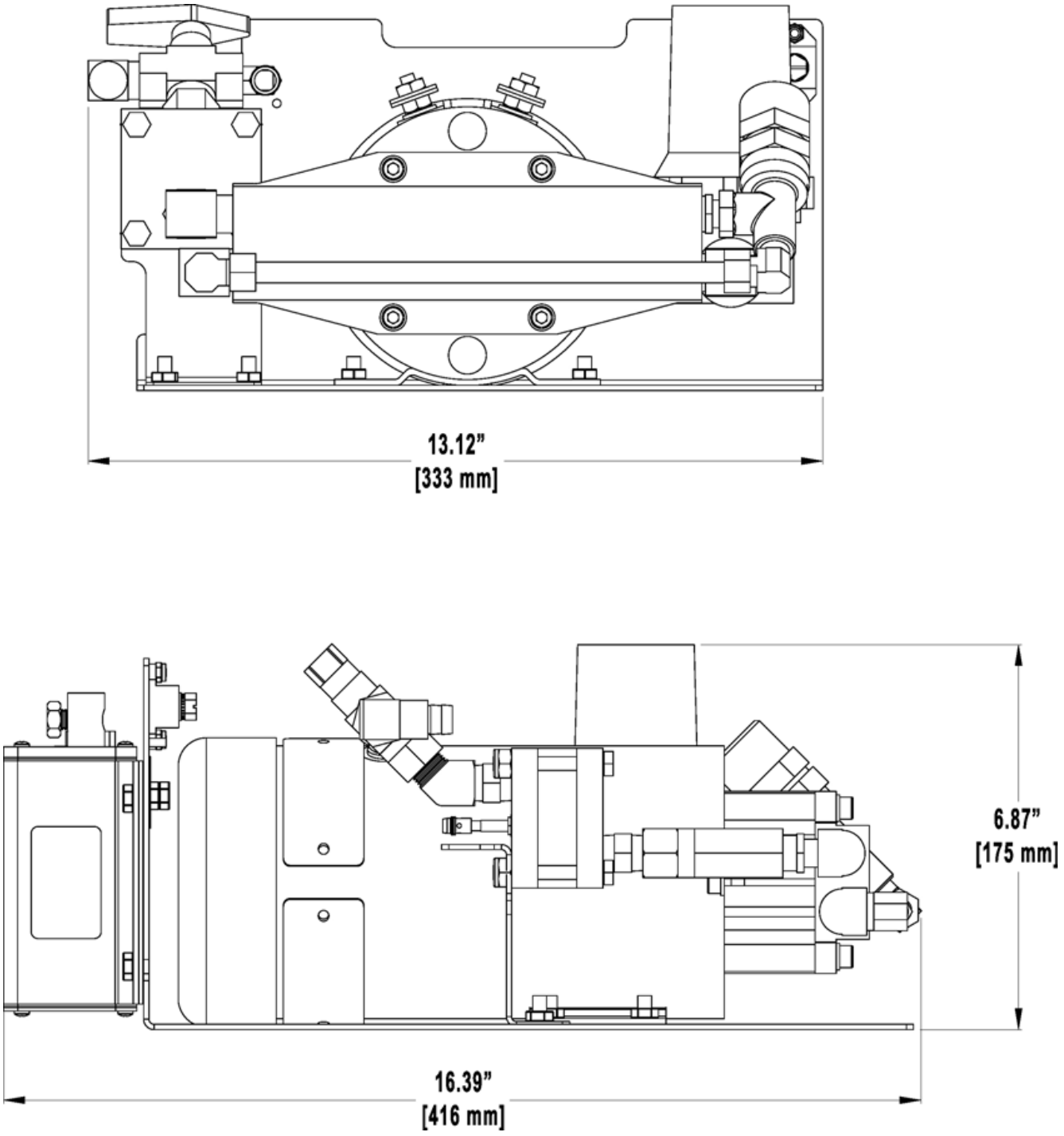


Figure 1**: 1.7 and 2.1 Foam Pump Installation Envelope Dimensions**

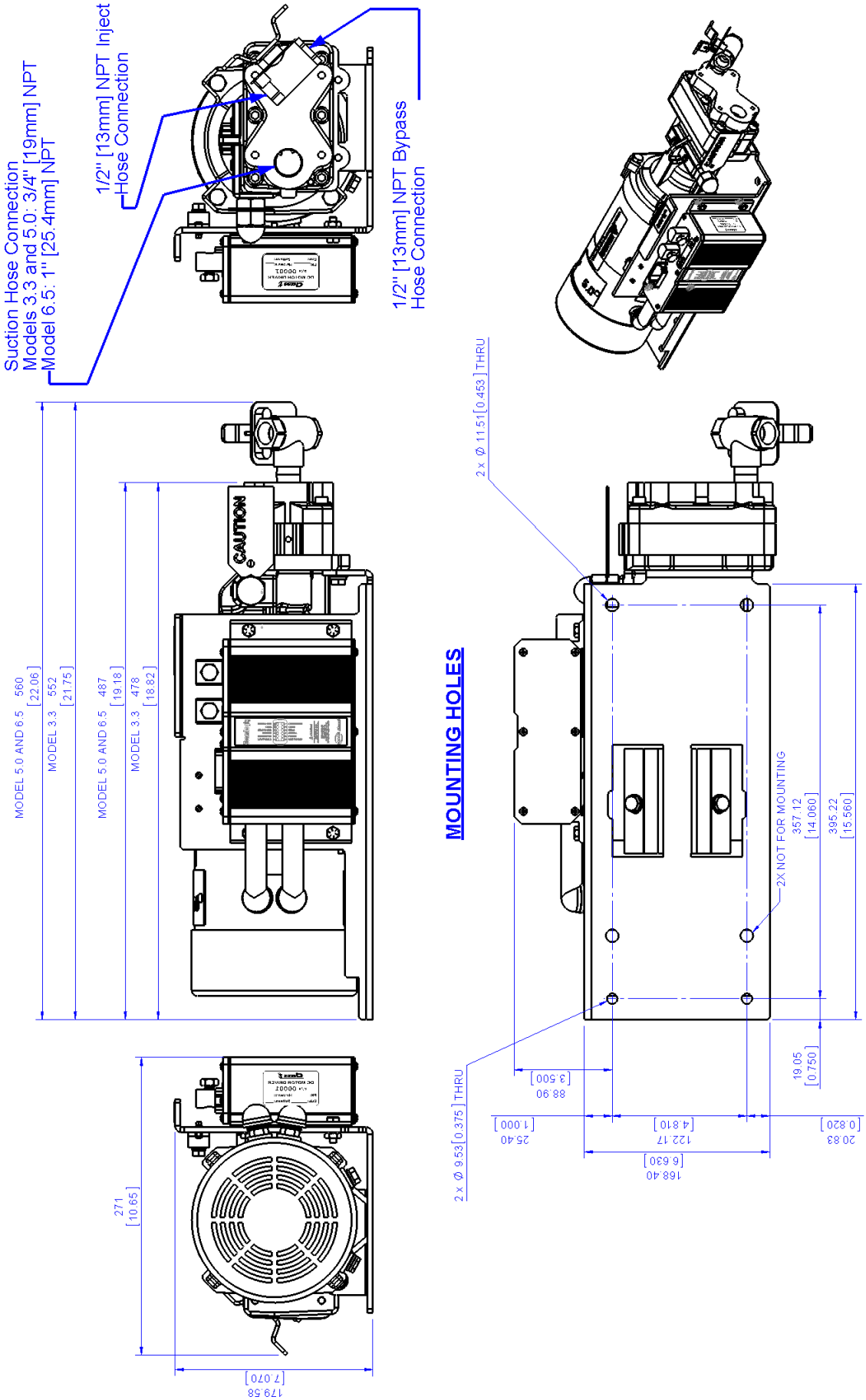


Figure 2**: 3.3 and 5.0 Foam Pump Installation Envelope Dimensions**

SYSTEM DIAGRAM

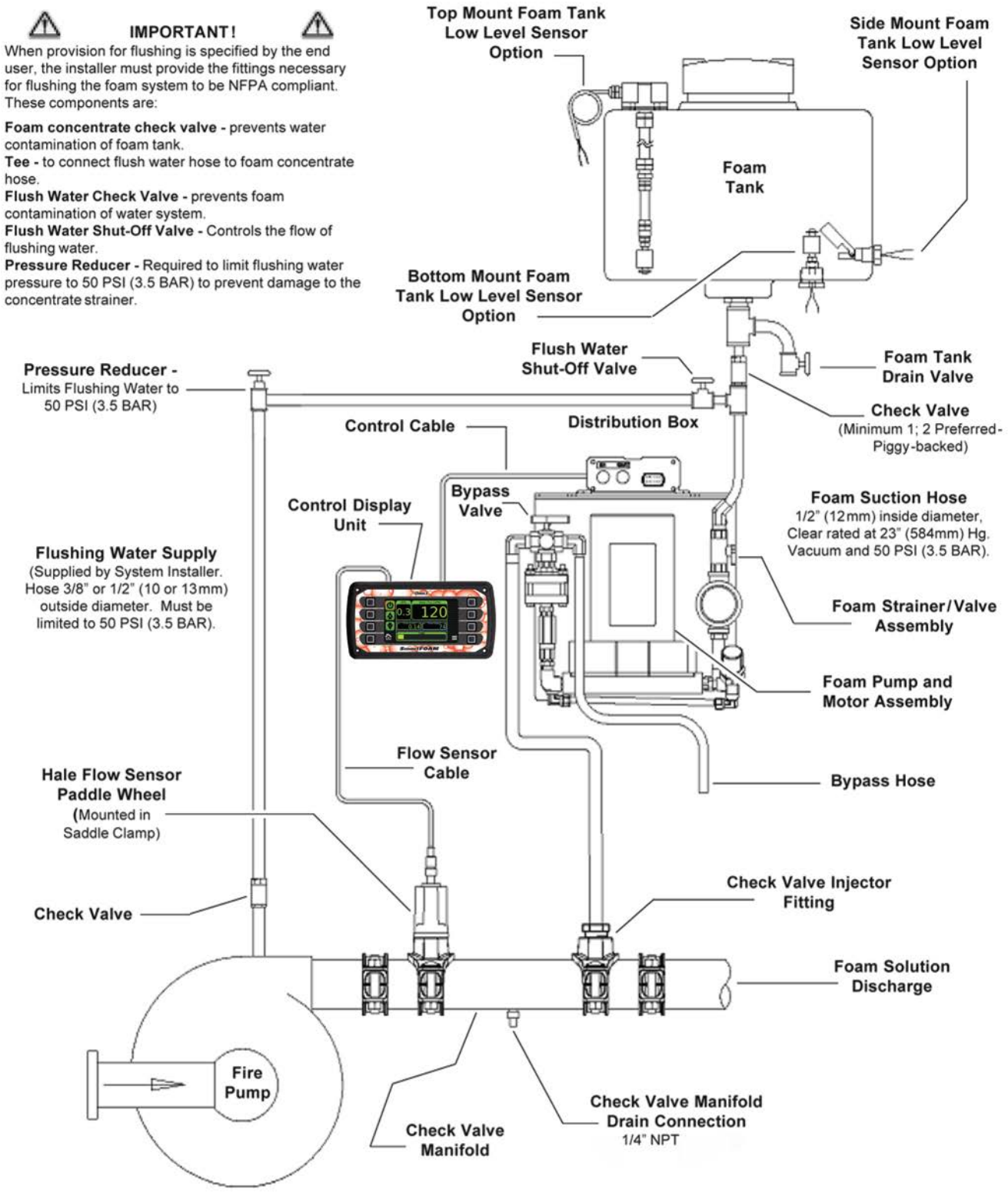


Figure 3**: Typical Hale SmartFOAM 2.1A and 1.7AHP System**

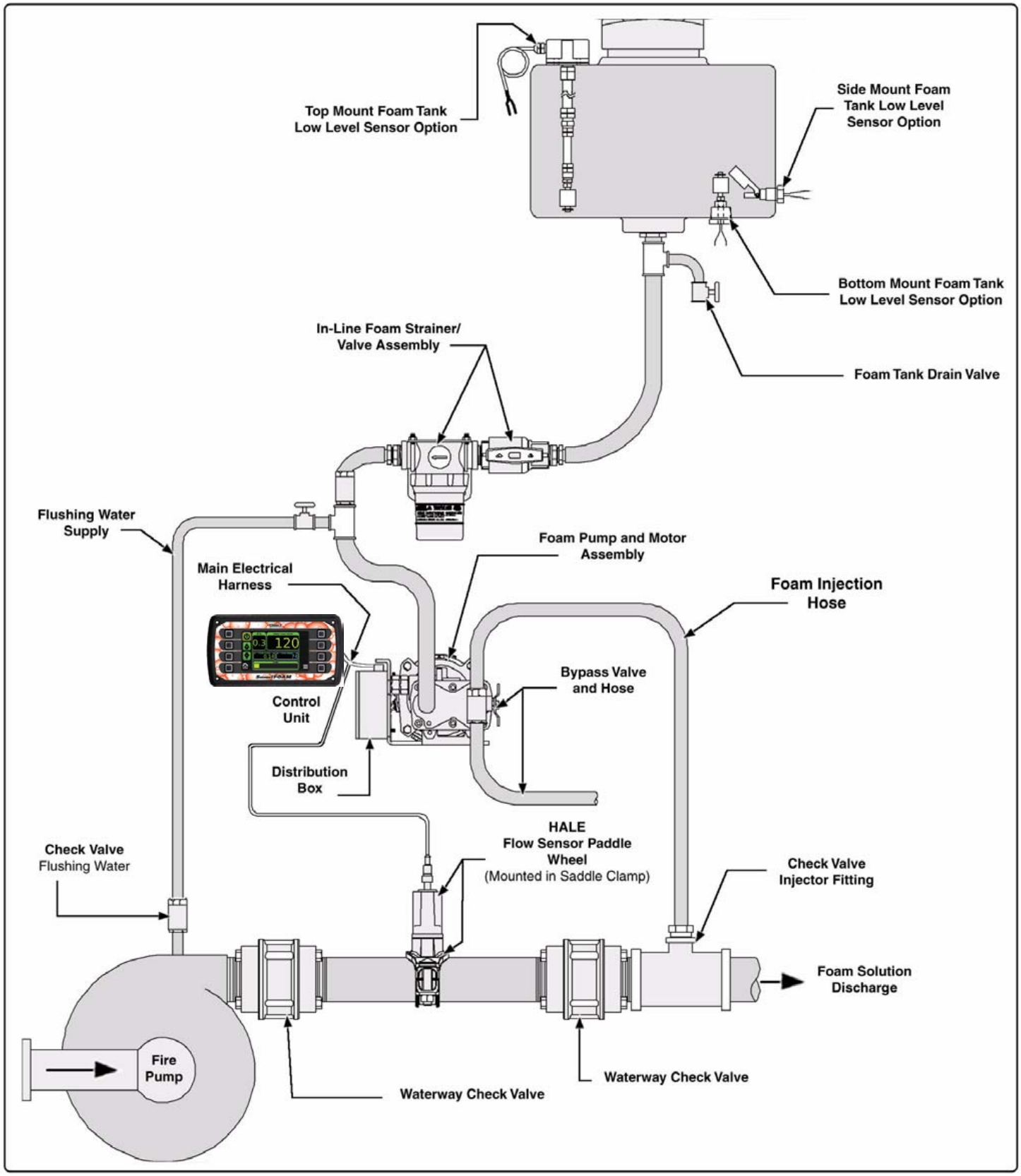


Figure 4**: SmartFOAM 3.3, 5.0, 6.5 Single Tank System with In-line Strainer**

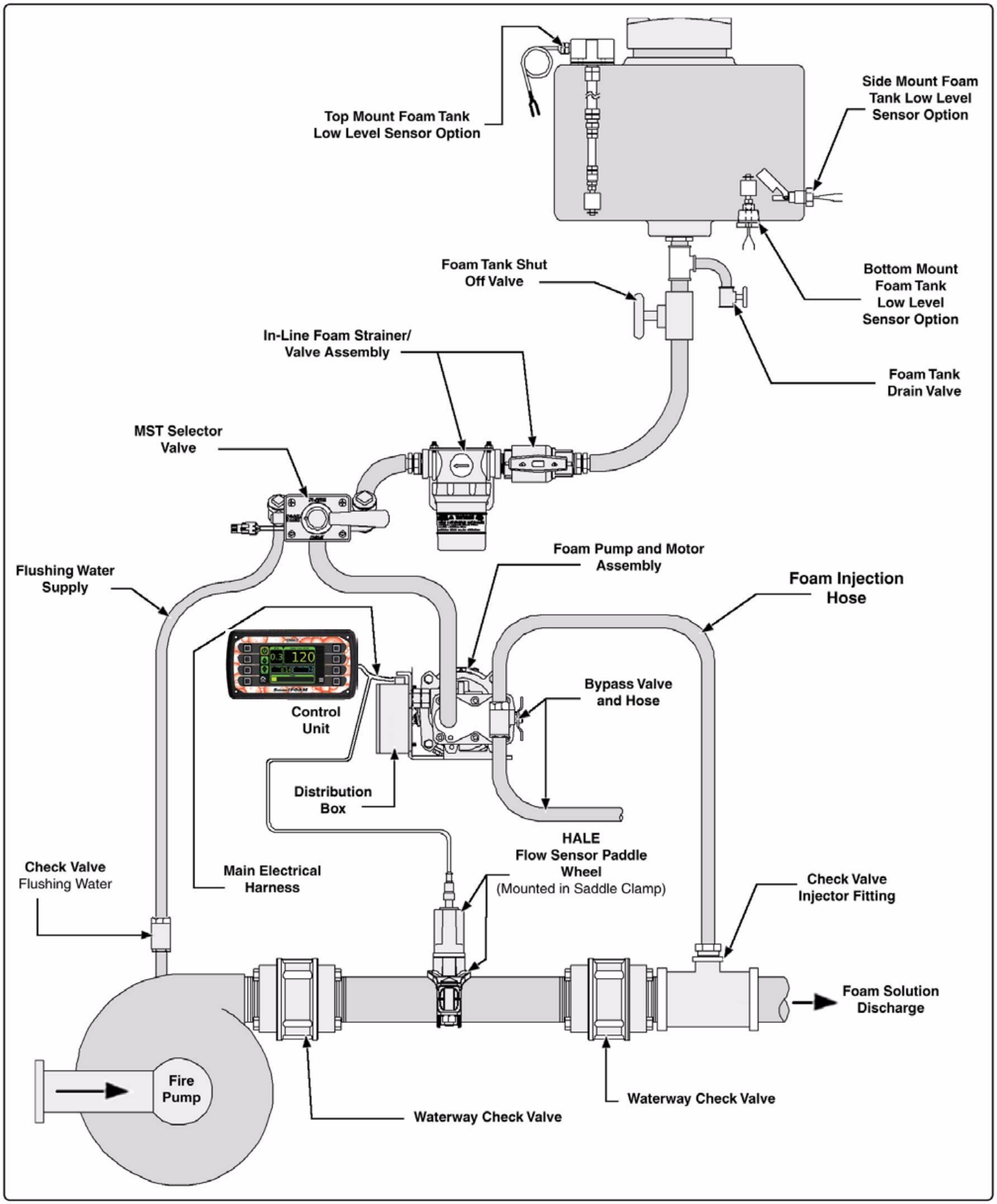


Figure 5**: SmartFOAM 3.3, 5.0, 6.5 Single Tank with MST and In-line Strainer**

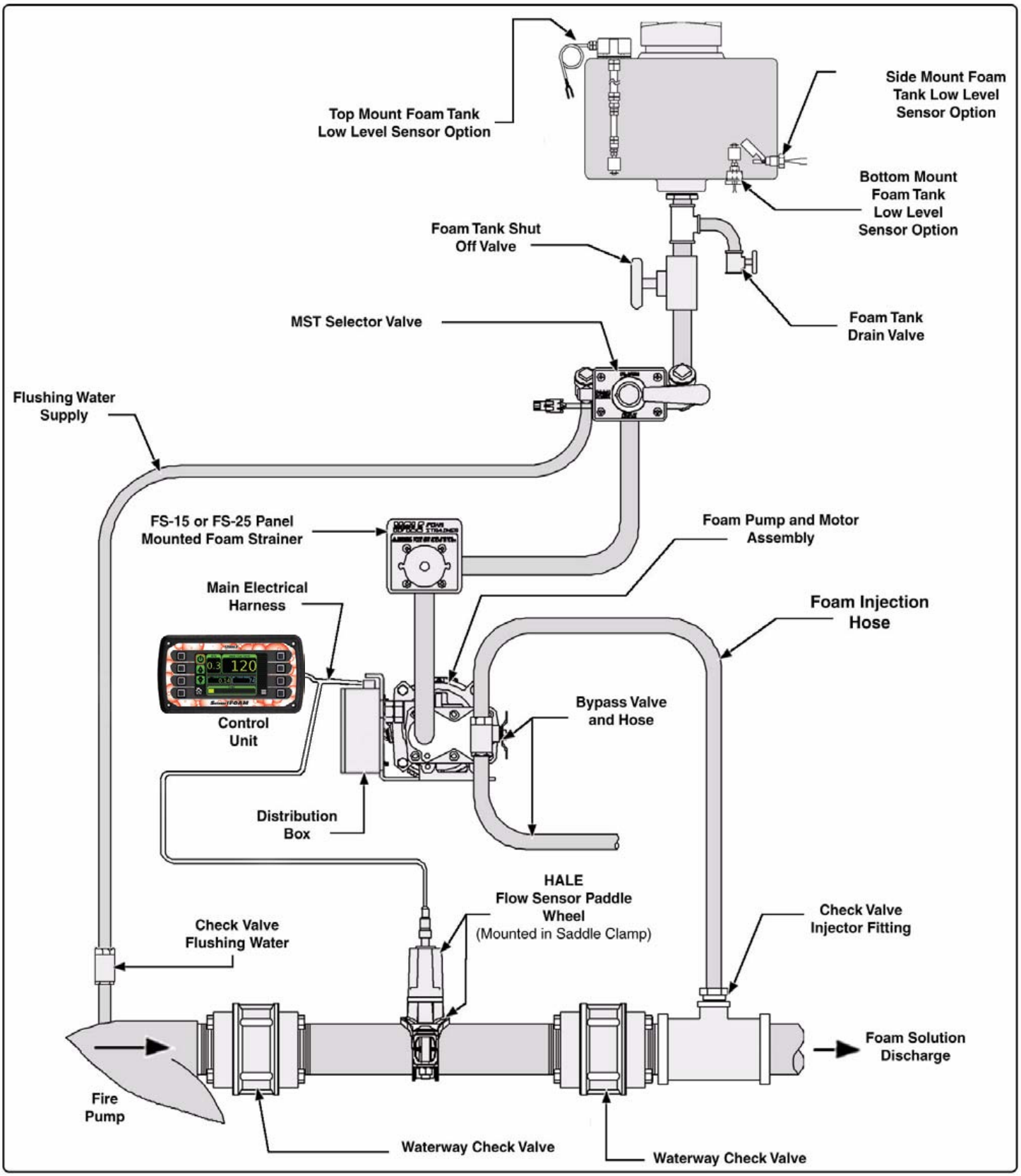


Figure 6**: SmartFOAM 3.3, 5.0, 6.5 Single Tank with MST and FS Series Strainer**

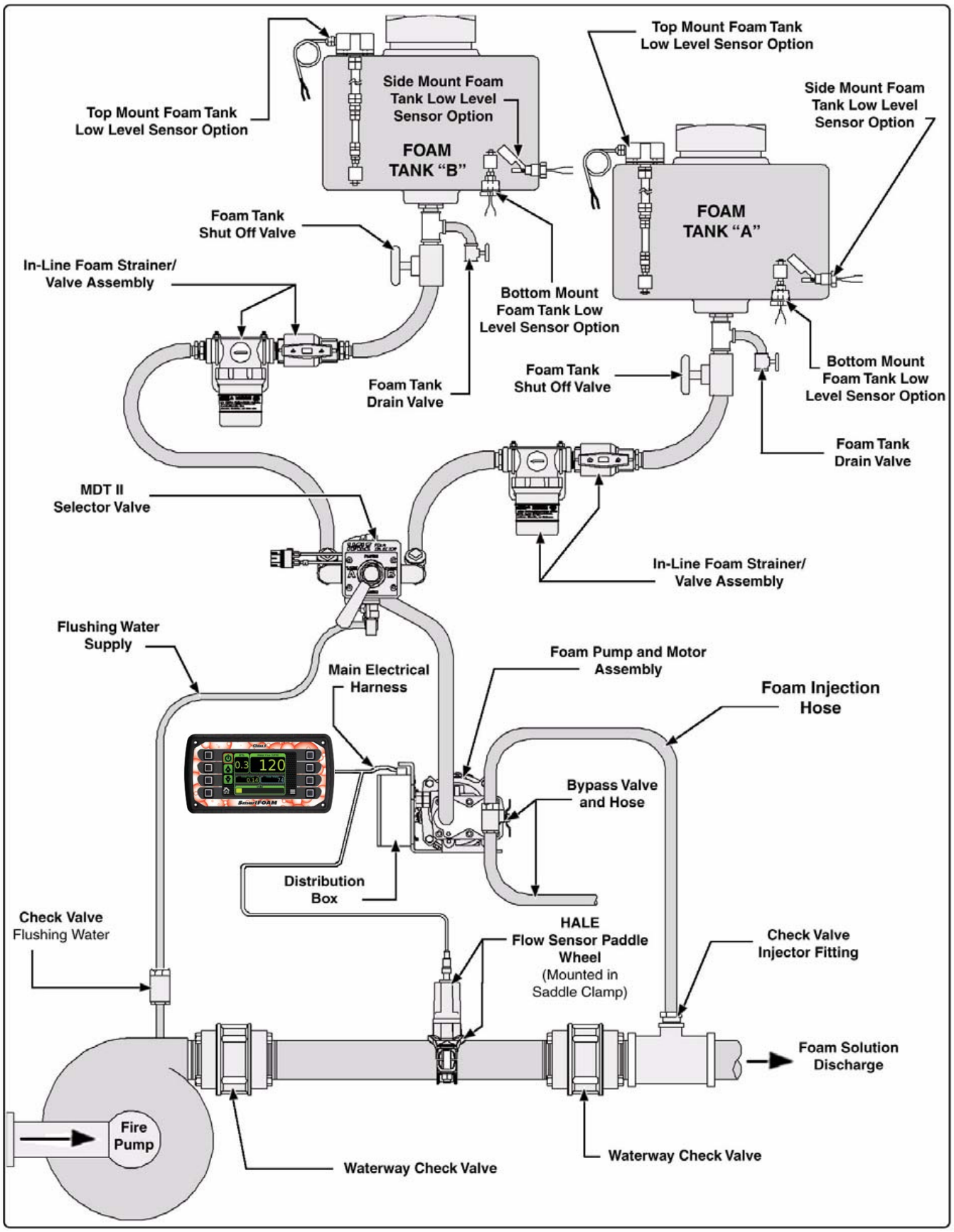


Figure 7**: SmartFOAM 3.3, 5.0, 6.5 Dual Tank with MDTII and In-line Strainer**

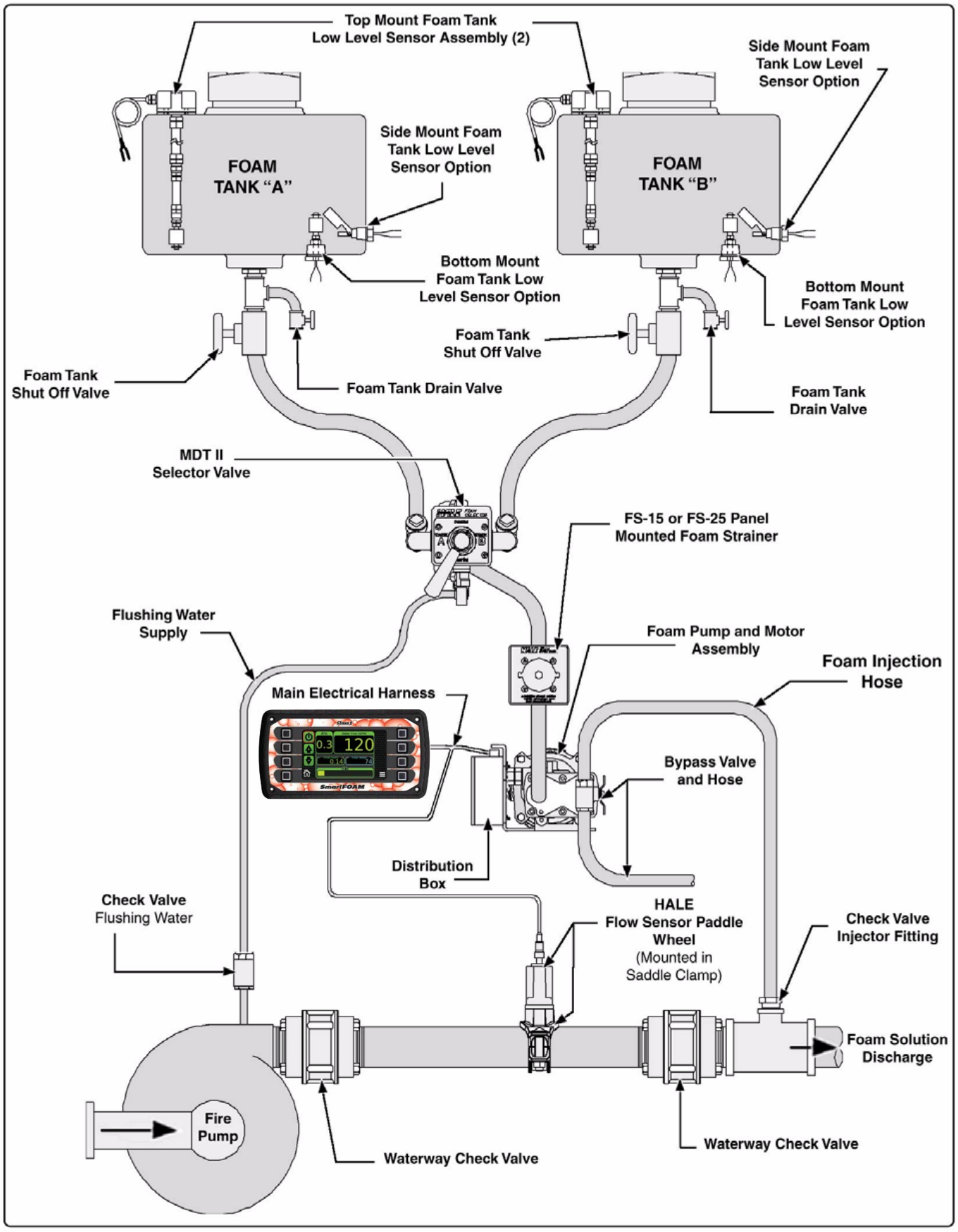


Figure 8**: SmartFOAM 3.3, 5.0, 6.5 Dual Tank with MDTII and FS Series Strainer**

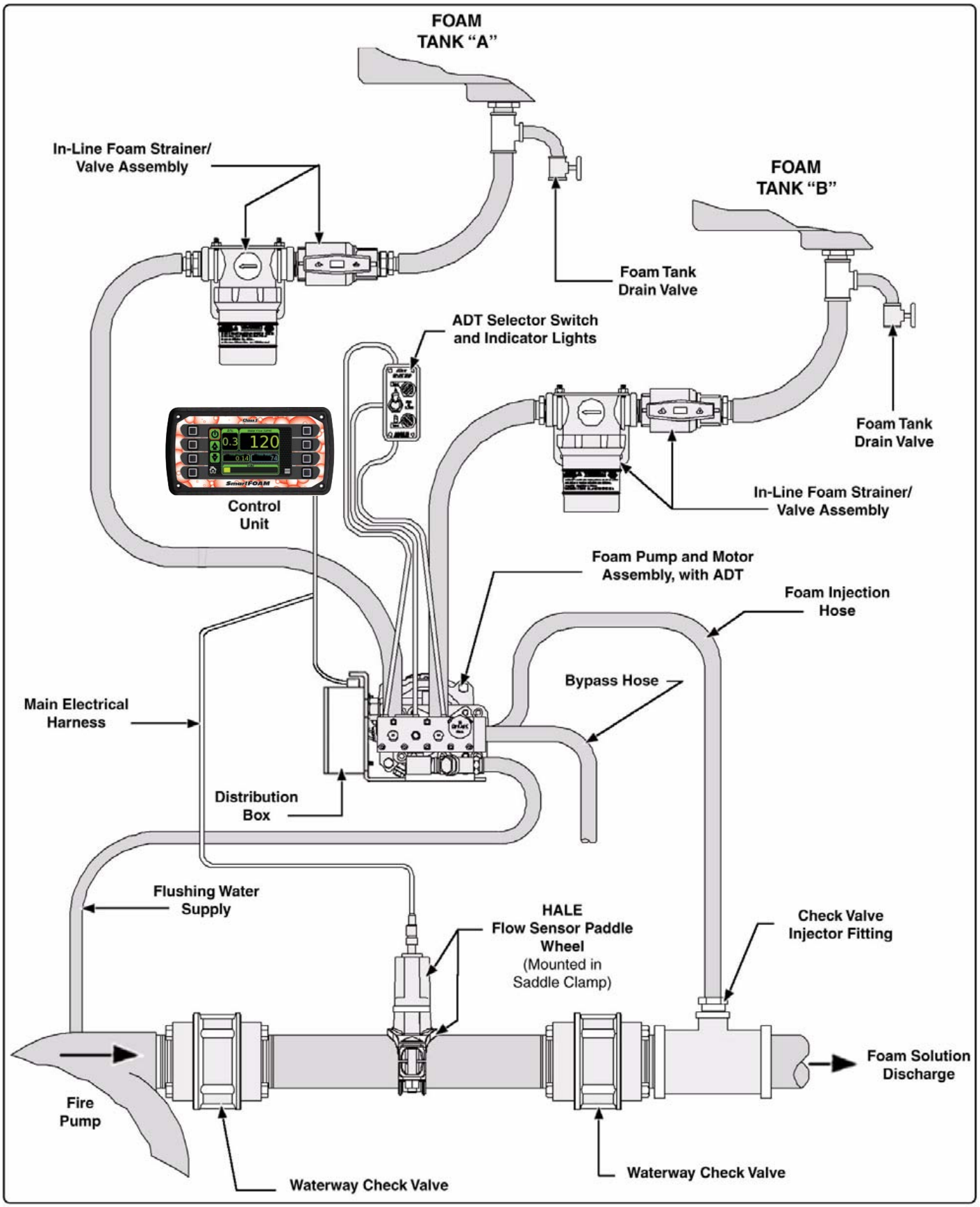


Figure 9**: SmartFOAM 3.3, 5.0, 6.5 Dual Tank with ADT and In-line Strainer**

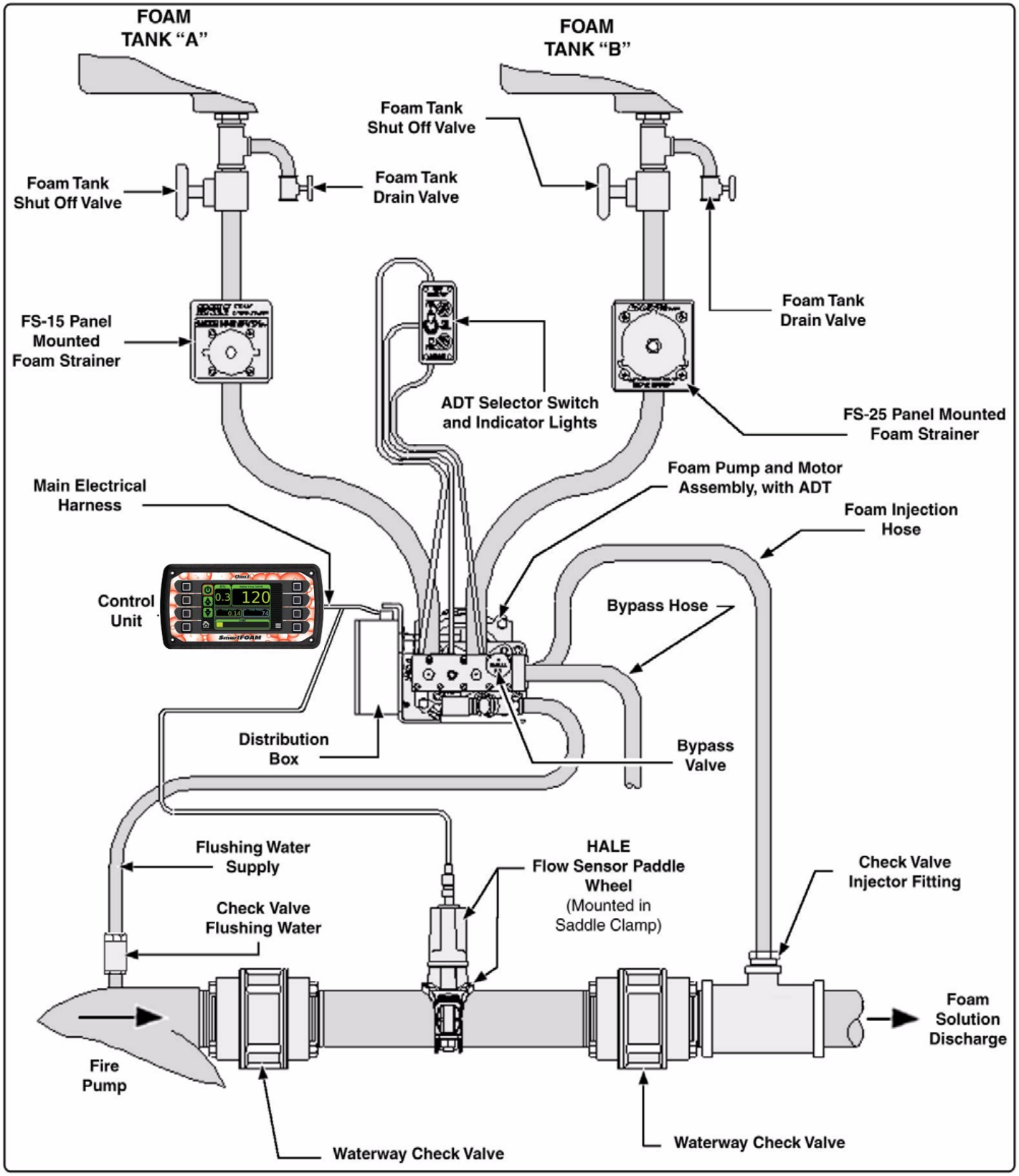


Figure 10**: SmartFOAM 3.3, 5.0, 6.5 Dual Tank with ADT and FS Series Strainer**

CONTROLLER AND BASE PUMP

SmartFOAM controller
610-00039

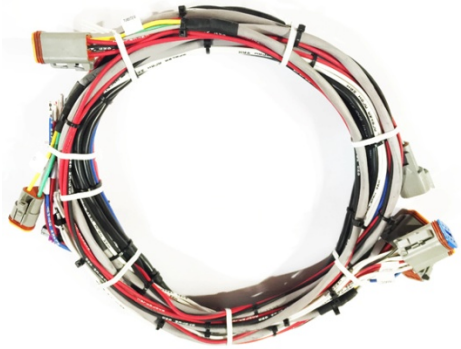
SmartFOAM Base Unit, Foam Pump/Motor Assembly
2.1A – 12V: 115498
2.1A – 24V: 115499
1.7AHP – 12V: 119276
1.7AHP – 24V: 119277

SmartFOAM Base Unit, Foam Pump/Motor Assembly
3.3 – 12V: 501-3120-05-0
3.3 – 24V: 501-3120-06-0
5.0 – 12V: 501-3130-05-0
5.0 – 24V: 501-3130-06-0
6.5 – 24V: 501-4480-04-0

Water Flow sensor input module
610-00033

Check valve / Injector fitting
038-1790-00-0

1.7, 2.1 Foam system placard
101-1630-70-0



SmartFOAM controller harness
Single pump (10'x14')
513-00101-000
Single pump (15'x19')
513-00101-001
Dual pump
513-00074-000

3.3, 5.0, 6.5 Foam system placard
Inline strainer - 101-1630-58-0
MST and FS strainer – 101-1631-12-0
MDTII and FS strainer – 101-1631-07-0

SINGLE CONCENTRATE TANK OPTIONS

MST (Manual Single Tank)
538-1490-12-0

MST harness extension (6 feet)
513-0320-07-0

DUAL CONCENTRATE TANK OPTIONS

ADT (Air Dual Tank)
12V – 538-1640-05-0
24V – 538-1640-06-0

MDTII (Manual Dual Tank)
538-1490-14-0

ADT color-coded air tubing extension
507-0380-00-0

MDTII harness extension (6 feet)
513-0320-02-0

STRAINER OPTIONS

In-line strainer/valve assembly
510-0190-01-0

(Do not use if subject to flushing water pressure)

FS panel mount strainers
FS-15 – 510-0150-00-0
¾" NPT threads

FS-25 – 510-0180-00-0
1" NPT threads

LOW TANK SENSOR OPTIONS

Side mount (1/2 inch NPT)
200-2110-02-0

½ inch NPT threaded bushing to mount from outside foam tank.

Bottom mount (1 inch NPT)
200-2100-04-0

1 inch NPT threaded bushing to mount from outside foam tank

Top mount
200-2110-06-0

Extends from 2.5 feet to 5 feet – may be cut shorter if required.

FLOW SENSOR OPTIONS

Each Hale foam system requires a flow sensor for operation. Pipe size must be selected based on the minimum and maximum water flow in the foam capable discharge. Following is a list of pipe size and rated flow ranges, along with flow sensor saddle clamp part number. In all instances, a weld fitting may be substituted for the saddle clamp.

Pipe Size vs. Flow Range		
Pipe size	**Flow Range**	
	GPM	**LPM**
1.5”	10 – 350	38 – 1,219
2.0”	20 – 550	76 – 2,082
2.5”	30 – 800	114 – 3,028
3.0”	50 – 1,250	189 – 4,731
4.0”	75 – 1,800	284 – 6,813
3” Single Check Valve (SCV)	30 - 750	114 – 2,839
3” Dual Check Valve (DCV)	30 - 750	114 – 2,839

Table 4**: Pipe Size versus Flow Range**

Flow sensor paddlewheel
102714

Flow sensor saddle clamp
2.0 inch – 4842010
2.5 inch – 4843010
3.0 inch – 4844010
4.0 inch – 4846010

Flow sensor weld fitting
Stainless steel – 082-3060-00-0
Steel – 309020
Aluminum - 309010

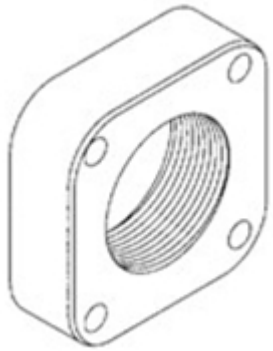
CHECK VALVE MANIFOLDS, FLANGES AND GASKETS

The check valve manifolds include flow sensor, check valve/injector fitting and a single or dual waterway check valve flappers. End connections for the manifolds are 3 inch Victaulic.

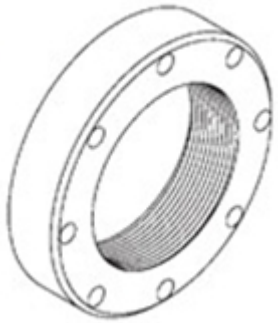
Single Check Valve (SCV)
3.0” 538-1850-00-0

Dual Check Valve (DCV)
3.0” 538-1840-00-0

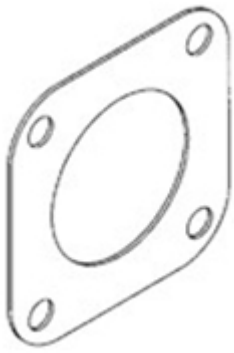
Wafer Check Valve
3.0” 038-1570-06-0
4.0” 038-1570-08-0



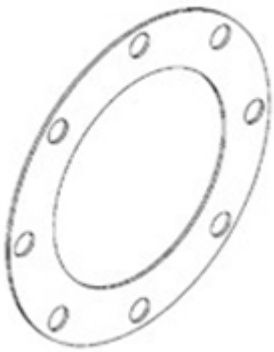
Type 115 Flange
3.0” NPT 115-0080-00-0
2.5” NPT 115-0070-00-0
2.0” NPT 115-0060-00-0
BLANK 115-0050-00-0



Type 2433D Flange
4.0” NPT 115-0040-00-0
3.0” NPT 115-0030-00-0
2.5” NPT 115-0020-00-0
BLANK 115-0010-00-0

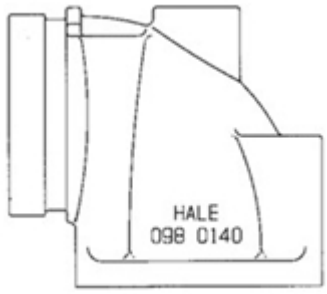


115 Flange Gasket
046-0050-00-0



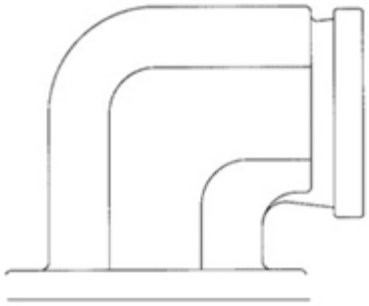
2433D Flange Gasket
046-0040-00-0

ELBOWS AND MANIFOLDS



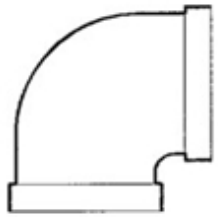
Close Fit Flanged Elbow
098-0140-00-0

115 flange inlet with 3” Victaulic output



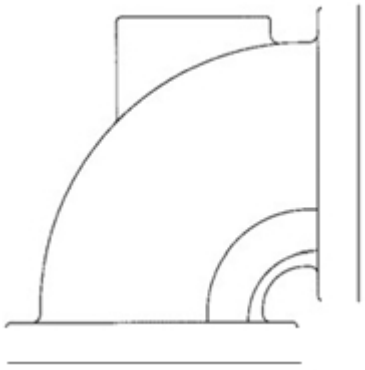
Close Fit Flanged Elbow
098-0190-00-0

2433D flange inlet with 3” NPT female and 4” Victaulic output



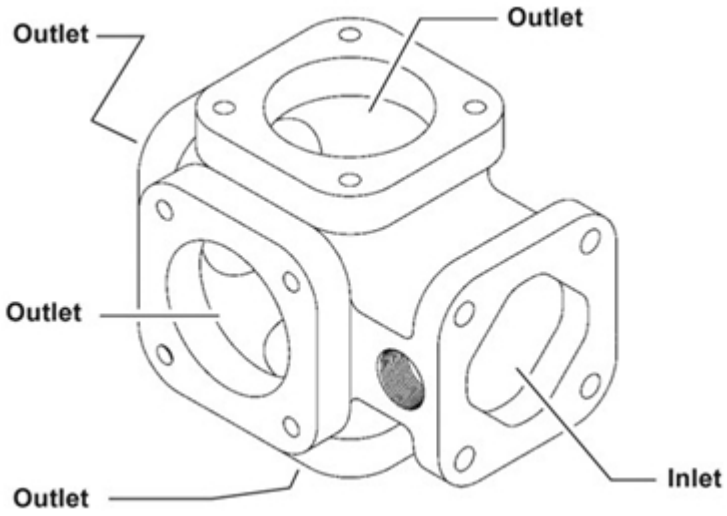
Close Fit Flanged Elbow
098-0050-00-0

115 flange inlet with 2.5” NPT female output



Close Fit Flanged Elbow
098-0020-00-0

115 flange inlet with 115 flange output



Mini-Manifold
178-0320-02-0

REMOTE START OPTION

Switch with indicator
513-0330-01-0

Harness
513-0680-00-0

INSTALLATION

The following guidelines are offered to assist the system installer with a complete system installation.
Carefully review the procedures that follow to ensure the system is properly designed. This section lists components that have been tested with Hale SmartFOAM and provide the best system performance. Use of the recommended materials and specified parts ensures a virtually maintenance free installation.
Differences in apparatus plumbing and foam system configuration make it impractical to show exactly how the Hale SmartFOAM systems are installed on a particular apparatus.
The information contained in this section, however, applies to most situations and should be used when designing and installing Hale SmartFOAM systems. A system plumbing and electrical diagram is provided at the end of this section to assist with installation.
Before proceeding with system installation, carefully review the procedures that follow to ensure the system is properly designed.

The Hale SmartFOAM system is supplied with five major components that must be located on the apparatus:

- ❑ Foam pump motor and assembly
- ❑ Control unit
- ❑ Instructions/system diagram placard
- ❑ Flow sensor
- ❑ Check valve injector fitting

Notes: *The flow sensor and check valve injector fitting may be pre-mounted, if a manifold or pre-configured package is ordered.*

Optional components that require mounting on the apparatus include:

- ❑ Mini manifold
- ❑ Flanged elbows
- ❑ Manual Single Tank (MST) selector valve
- ❑ Manual Dual Tank (MDTII) selector valve
- ❑ Air Dual Tank (ADT) operating switches and indicator lights
- ❑ Foam tank(s)
- ❑ FS Series panel mounted foam strainers
- ❑ Remote activation switch and indicator

IMPORTANT!

WHEN DETERMINING THE LOCATIONS OF HALE SMARTFOAM COMPONENTS BEING INSTALLED KEEP IN MIND PIPING RUNS, CABLE ROUTING AND OTHER INTERFERENCES THAT COULD HINDER OR INTERFERE WITH PROPER SYSTEM PERFORMANCE.

FOAM PUMP AND MOTOR ASSEMBLY

The foam pump and motor assembly must be located in an area that is protected from road debris and excessive heat build-up. The back of a compartment or a compartment shelf is often an ideal location. The foam system, bypass valve, strainer and shut-off valve are located on the foam pump and motor assembly and access to these components must be provided.
The foam pump and motor assembly must be mounted below the discharge of the foam tank to provide for gravity feed to the foam pump. The foam tank must be located where refilling can be easily accomplished with 5 gallon (19 liters) pails and other methods suitable to the end user. Most water tank manufacturers build the foam tank into the booster tank.
When specifying a foam tank, make sure provisions are made for:

- ❑ Installation of the low tank level sensor
- ❑ Foam suction connections
- ❑ Tank drainage
- ❑ Proper fill openings, per NFPA requirements

In addition, a foam tank refill system may be required. See Hale EZFill system for installation requirements.

FOAM CONCENTRATE STRAINER

Determine a location on the apparatus to mount the foam strainer.

CAUTION!

THE IN-LINE STRAINER/VALVE ASSEMBLY IS A LOW PRESSURE DEVICE THAT WILL NOT WITHSTAND FLUSHING WATER PRESSURE. WHEN INSTALLING THE IN-LINE STRAINER IN SYSTEMS EQUIPPED WITH HALE "MDT II" OR HALE "MST," MAKE SURE THE IN-LINE STRAINER/VALVE ASSEMBLY IS IN THE HOSE ON THE INLET SIDE OF THE VALVE.
IF THE STRAINER IS SUBJECT TO FLUSHING WATER PRESSURE, USE HALE "FS" SERIES STRAINERS.

Mount the in-line foam strainer/valve assembly in the foam concentrate hose from the foam tank to the foam pump suction connection, ADT, MDT II or MST.

If panel mounted FS series strainers are installed, mount the strainer in the foam concentrate hose that supplies concentrate to the ADT, MDT II or MST. The FS series strainer may also be mounted in the outlet hose of the MDT II or MST.

IMPORTANT!

WHEN DETERMINING THE STRAINER LOCATION KEEP IN MIND THE REQUIREMENT FOR GRAVITY FEED OF FOAM CONCENTRATE TO THE FOAM PUMP THROUGH THE STRAINER AND AVOID AIR TRAPS IN THE HOSES. ALSO, CLEARANCE MUST BE PROVIDED TO ALLOW REMOVAL OF THE BOWL ASSEMBLY TO CLEAN THE STAINLESS STEEL MESH, TO MAKE HOSE CONNECTIONS TO THE STRAINER AND FOR OPERATION OF THE SERVICE VALVE.

The installer must provide a strainer service isolation valve in the foam concentrate hose to prevent spillage during service. An MST or MDT II can serve this purpose.

CONTROL UNIT AND INSTRUCTION / SYSTEM DIAGRAM PLACARD

Determine a location on the operator panel of the apparatus for the control unit and instruction/ system diagram placard, if provided. These components must be located at the main pump operator position in close proximity to each other. Consideration must be given for routing the control cable from the control unit to the motor controller on the foam pump and motor assembly. If necessary, order longer or shorter cable assemblies to suit the location demands.

INSTALLER SUPPLIED COMPONENTS

Due to the many differences in apparatus configurations and design requirements the Hale SmartFOAM system installer must supply components such as:

- ❑ Mounting brackets
- ❑ Piping
- ❑ Hoses
- ❑ Fittings
- ❑ Electrical wiring
- ❑ Foam tank(s)

The following guidelines are recommendations for selection of additional components for a complete system installation. These recommendations reflect materials and components that are tested extensively with Hale SmartFOAM systems and provide proven reliable performance.

FOAM CONCENTRATE SUCTION HOSE

SmartFOAM 2.1A and 1.7 AHP Foam systems

These systems are provided with 15' (4.6 meters) of 1/2" (13mm) ID reinforced PVC foam concentrate suction hose. The system installer may need to supply additional fittings and hose from the foam tank to the inlet of the foam pump. All components selected transfer foam concentrate; therefore they must be compatible with the foam concentrates being used in the system.

SmartFOAM 3.3, 5.0, and 6.5 Foam systems

Hoses for Class "A" foam concentrates have minimum 3/4" (19mm) inside diameter. Hoses for Class "B" foam concentrates must have a minimum 1" (25.4mm) inside diameter due to higher viscosity of the concentrate.

***Note**: Certain types of Class "B" AFFF-ARC or ATC concentrates require a 1-1/4" or 1-1/2" (32mm or 38mm) ID foam concentrate supply line.*

Hoses for the foam concentrate suction that are not subject to high pressure, i.e. flushing water or foam concentrate discharge, must have a rating of 23" (584.2mm) Hg vacuum and 50 PSI (3.5 BAR) pressure or greater.

***Note:** NFPA requires that foam concentrate suction hose be clear to observe foam concentrate flow during foam pump operation.*

Recommended components

Hose: PVC, Kuriyama Kuri-Tec K3130 or K7130 series.
Fittings: Hose Barb Type; Brass, Stainless Steel or Nylon.

Foam concentrate suction hose subjected to flushing water pressure must be rated for 23 in (584.2mm) Hg vacuum and the maximum discharge pressure of the fire pump (500 PSI [34 BAR] minimum). These hoses include the hose from the outlet of the MDT II or MST to the foam pump inlet.

Recommended components

Hose: Aeroquip 2580 series or Equivalent Reinforced Hydraulic Hose.
Fittings: Brass or Stainless Steel Hose End Crimp or Reusable Type (Aeroquip 412 series or Equivalent).

A foam tank shut-off valve and drain valve should be provided in the foam tank suction hose to allow strainer service, tank drainage and easier priming.
These components are subject to the same material characteristics and pressure ratings as stated above. When the In-line strainer/valve assembly option is installed the shut-off valve is included. A separate valve is not required.

FOAM CONCENTRATE DISCHARGE HOSE

The system installer must supply fittings and hoses from the foam pump inject connection to the check valve/injector fitting inlet. All components selected transfer foam concentrate, therefore they must be compatible with the foam concentrates being used in the system.
The foam pump discharge connection is a 1/2" (13 mm) compression fitting. The check valve injector fitting connection has 1/2" NPT threads. Hoses and fittings of 1/2" minimum diameter rated at 500 PSI (34.5 BAR) working pressure or maximum discharge pressure of the fire pump must be used. Fittings and hoses must be compatible with all foam agents to be used.

Recommended components

Hose: Aeroquip 2580-8 or Equivalent Reinforced Hydraulic Hose.
Fittings: Brass or Stainless Steel Hose End Crimp or Reusable Type (Aeroquip 412-9-8 or Equivalent).

Note: *Although air brake tubing has been used for foam concentrate discharge hose, it is not as flexible as the hydraulic hose and readily kinks during installation. Additionally, the air brake tubing may not meet NFPA 500 PSI (34 BAR) test requirements.*

FOAM CONCENTRATE BYPASS HOSE

The foam concentrate bypass hose connection is a 1/2" (13mm) hose barb connection. Hoses and fittings of nominal 1/2" diameter must be used as bypass hose. Since the bypass hose is used for calibration and draining the system it does not see high operating pressures; therefore, a hose with a lower pressure rating than the inject hose may be used.
Fittings and hoses used must be compatible with all foam agents expected to be used. Use fittings made of brass or 300 series stainless steel compatible with all foam concentrates.

Recommended components

Hose: Low Pressure Hydraulic Hose or Air Brake Tubing.
Fittings: Brass or Stainless Steel.

It is recommended that the foam concentrate bypass hose be long enough to extend past the apparatus running board to reach five (5) gallon (19 liter) containers, making foam pump setup and calibration simpler.

CHECK VALVES

Check valves must be installed on the apparatus with foam systems to prevent contamination of the foam concentrate with water and contamination of the fresh water tank with foam. When a Hale SmartFOAM foam Injection system and related components are properly installed the required check valves are integral parts of the system.
NFPA standards require a check valve in the foam concentrate injection line at the injection point. The Hale part number 038-1790-00-0 Integral Check Valve/ Injector Fitting, a standard component included with the Hale SmartFOAM system and installed when a manifold kit is ordered, meets these requirements and threads directly into the foam injection port on Hale manifolds.
Check valves must be installed in all water piping locations where foam concentrate could drain back into pumps or other components of the fire apparatus.
As a minimum one check valve must be installed where the water piping that supplies foam solution connects to the fire pump discharge. To more effectively keep foam contamination out of the fire pump and water tank, double check valves are recommended.
Separate two check valves by at least 6" to 8" (152 to 203mm) of piping to form a dead zone between the check valves. Individual drain lines should be used on each check valve. The waterway check valves must be rated for 500 PSIG (34.5 BAR) test pressure.

FLUSHING WATER HOSE

Flushing water connections for the Hale ADT, MDT II or MST require using 1/2" (13mm) inside diameter tubing and appropriate fittings. The tubing and fittings used must be capable of withstanding the maximum fire pump discharge pressure (500 PSI [34 BAR] minimum) and must be compatible with foam concentrates being used in the system.
When the ADT, MDT II or MST is installed, a check valve is used integral to the flushing water line connection. This provides protection against water system contamination with foam concentrate.

Note: *The installer/builder should provide an additional check valve and shut-off valve where the flushing water hose connects to the water pump.*

Hale recommends the use of one of the above selector options to provide foam system flushing capabilities. However, if the Hale SmartFOAM system is ordered with the "no tank" option the system installer must maintain NFPA compliance.

To be NFPA compliant, when flushing is required, the system installer must provide proper:

- ❑ Hoses
- ❑ Shut-off valves
- ❑ Check valves
- ❑ Reducer/regulator
- ❑ Connections for flushing water for the system

FOAM DISCHARGE DRAINS

Drains must be provided from foam capable discharge piping components to prevent freezing in cold weather. When designing the drain system care must be taken to prevent contamination of the water system with foam and the foam concentrate with water. Some multiple drain systems that allow individual drain lines to communicate also allow foam to bypass the installed check valves causing contamination of fire pump and the water or foam concentrate storage tanks.
Hale offers an optional manual or air-operated 6-port drain valve, Class1 Model MMD6 (p/n: 104961). The valve provides individual drains with a single control and is use for applications where a single point for multiple drains is required. If a Hale MMD6 drain valve is not used, individual drain lines and valves for foam capable discharge piping is recommended.

APPARATUS DESIGN/BUILD FOR COLD WEATHER (BELOW FREEZING) DUTY

If the end-user will use the fire apparatus in sub- freezing temperatures, the onus is on the fire truck builder to build into the apparatus design an appropriate ambient temperature operating environment for the envelope where the SmartFOAM system will be located. This routinely takes on the form and function of mounting the SmartFOAM system in a limited ventilation area that is served by an appropriate pump house auxiliary heater. Simply, the fire truck builder must keep ambient air temperature above 32°F (0°C) in the envelope around the SmartFOAM hardware, including the base foam pump unit, foam strainer, foam concentrate injection line, etc. There are several best practices in the fire industry that can be employed to meet this criteria and the fire truck builder/designer can choose the best choice for their specific installation. Note that there must be ventilation available to cool the area around the unit also, to prevent electric motor overheating when the unit is operating in high temperature ambient environments.

ELECTRICAL REQUIREMENTS

The system installer must provide the primary power wire and a ground strap for the Hale SmartFOAM system. Primary power must be supplied from the main apparatus battery to the motor controller box on the foam pump and motor assembly. The Hale SmartFOAM 2.1A and 1.7AHP systems require a minimum of a 40 AMP electrical service. The Hale SmartFOAM 3.3 and 5.0 systems require a minimum of a 60 AMP electrical service. The Hale SmartFOAM 6.5 system requires a minimum of a 80 AMP electrical service
Primary electrical power must be supplied directly from the battery, the battery master disconnect switch, or solenoids to the Hale SmartFOAM system.

IMPORTANT!

OTHER ELECTRICAL COMPONENTS MUST NOT BE SUPPLIED FROM THIS WIRE. DO NOT CONNECT THE PRIMER AND HALE SMARTFOAM TO THE SAME POWER WIRE.

The primary power connection must be made so that power is supplied to the Hale SmartFOAM when the main apparatus electrical system is energized and the pump is in gear. Use of a solenoid with a 150 AMP peak, 85 AMP continuous rating is recommended. Figure 11**: Recommended Relay Wiring Schematic** shows the recommended wiring for this relay.

Note: *This ensures immediate operation when the operator places the apparatus in PUMP mode, and to prevent battery power drain when the apparatus is not running.*

Make certain that the recommended wire gage is selected for the primary power connection based on the run length (see Table 5**: Recommended Primary Power Cable Sizes**). Use solder lugs on cable ends with a 5/16" (8mm) diameter hole.

Models 1.7 and 2.1	**Maximum length**
8 AWG (8.4mm^2)	6 ft (1.8M) or less
4 AWG (21.2mm^2)	6 ft (1.8M) to 15 ft (4.6M)
0 AWG (53.5mm^2)	15 ft (4.8M) or Longer
Models 3.3, 5.0, 6.5	**Maximum length**
4 AWG (21.2mm^2)	6 ft (1.8M) or less
0 AWG (53.5mm^2)	6 ft (1.8M) to 15 ft (4.6M)
00 AWG (67.5mm^2)	15 ft (4.8M) or Longer

Table 5**: Recommended Primary Power Cable Sizes**

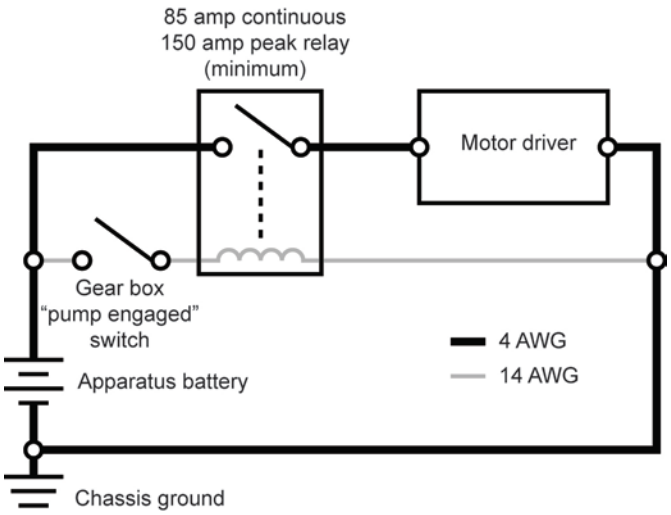


Figure 11**: Recommended Relay Wiring Schematic**

When planning cable runs make sure the primary wires are routed by the shortest most direct route.

A braided flat ground strap connected to the apparatus chassis is recommended for the ground connection.

This limits the RFI/EMI interference encountered with radios, computers or other sensitive electronic equipment. The ground strap should be a minimum of 1-1/4" (32mm) wide and no longer than 18" (457mm). It must have soldered flat lug ends with 3/8" (10mm) diameter holes. If the ground strap length exceeds 18" (457mm), a wider ground strap should be used or use a double thickness of 1-1/4" (32mm) wide ground strap. The ground strap must be connected to the chassis. Use minimum 5/16" (8 mm) diameter bolt or mounting to secure the strap.

Power and ground must also be provided for the display unit using the 2 pin Packard connector. The power must be a minimum 5 amp dedicated and fused circuit. The ground must be connected to the chassis ground stud and protected from corrosion. Make sure the ground is attached directly to the chassis frame and not to the apparatus body work.

IMPORTANT!

BEFORE MAKING GROUND CONNECTIONS REMOVE ALL PAINT, GREASE AND COATINGS FROM THE CONNECTION AREA. AFTER MAKING CONNECTION, SEAL AGAINST CORROSION. WHEN A FLAT GROUND STRAP IS NOT AVAILABLE USE A BATTERY CABLE ONE SIZE LARGER THAN THE POWER CABLE USED.

FOAM CONCENTRATE TANK

A foam concentrate tank must be supplied to suit the capacity required for the apparatus application. The tank must meet NFPA minimum standards for its design capacity, including:

- ❑ Filler size
- ❑ Vapor pressure venting
- ❑ Baffling
- ❑ Drain facilities

FOAM PUMP MOUNTING

Position the foam pump and motor assembly in the desired location on the apparatus. When installing the foam pump and motor assembly, the assembly should be kept in a HORIZONTAL position with the base plate on the bottom (See Figure 12**: SmartFOAM Piston Pump Installation**).

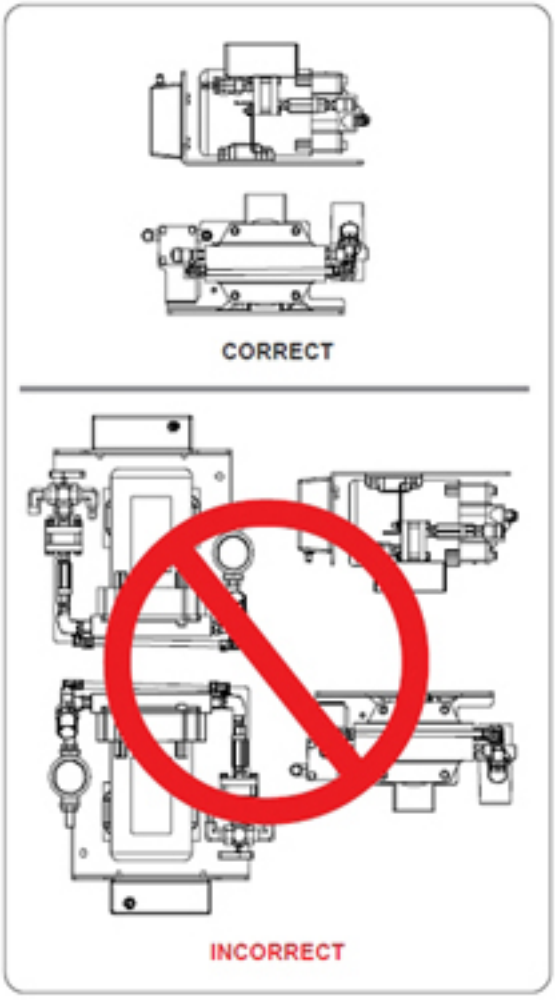


Figure 12**: SmartFOAM Piston Pump Installation**

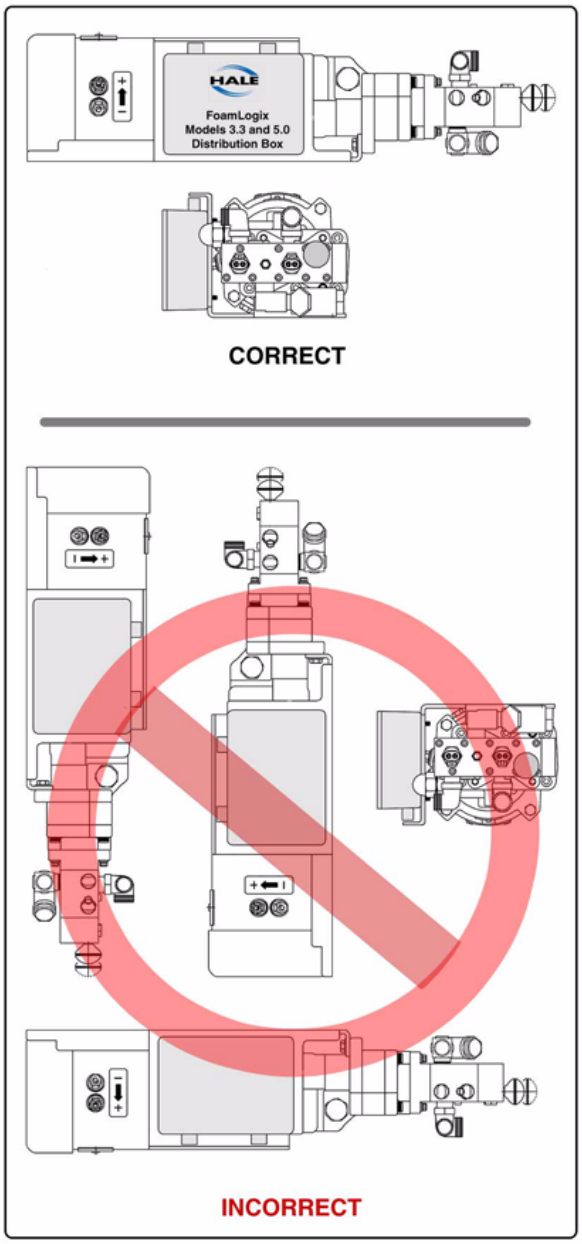


Figure 13**: SmartFOAM Gear Pump Installation**

Although the system is sealed and designed to be resistant to the harsh environment of fire-fighting apparatus, a compartment with easy operator access is recommended.

The base plate of the foam pump and motor assembly must be anchored to a surface or structure that is rigid and of adequate strength to withstand the vibration and stresses of apparatus operation.

The base of the foam pump and motor assembly includes 5/16” (8mm) diameter predrilled mounting holes. The apparatus mounting location must to be drilled accordingly. The base plate may be used as a template to mark mounting hole locations.

Figure 14**: Base Plate Mounting Hole Locations – 1.7 and 2.1** provides the mounting base dimensions for the SmartFOAM 1.7AHP and 2.1A foam pump and motor assembly.

Figure 15**: Base Plate Mounting Hole Locations – 3.3, 5.0, and 6.5** provides the mounting base dimensions for the SmartFOAM 3.3, 5.0, and 6.5 foam pump and motor assembly.

Make sure the foam concentrate hoses are properly routed to the inlet and outlet 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 engine exhaust system heat or accessory heat build-up.

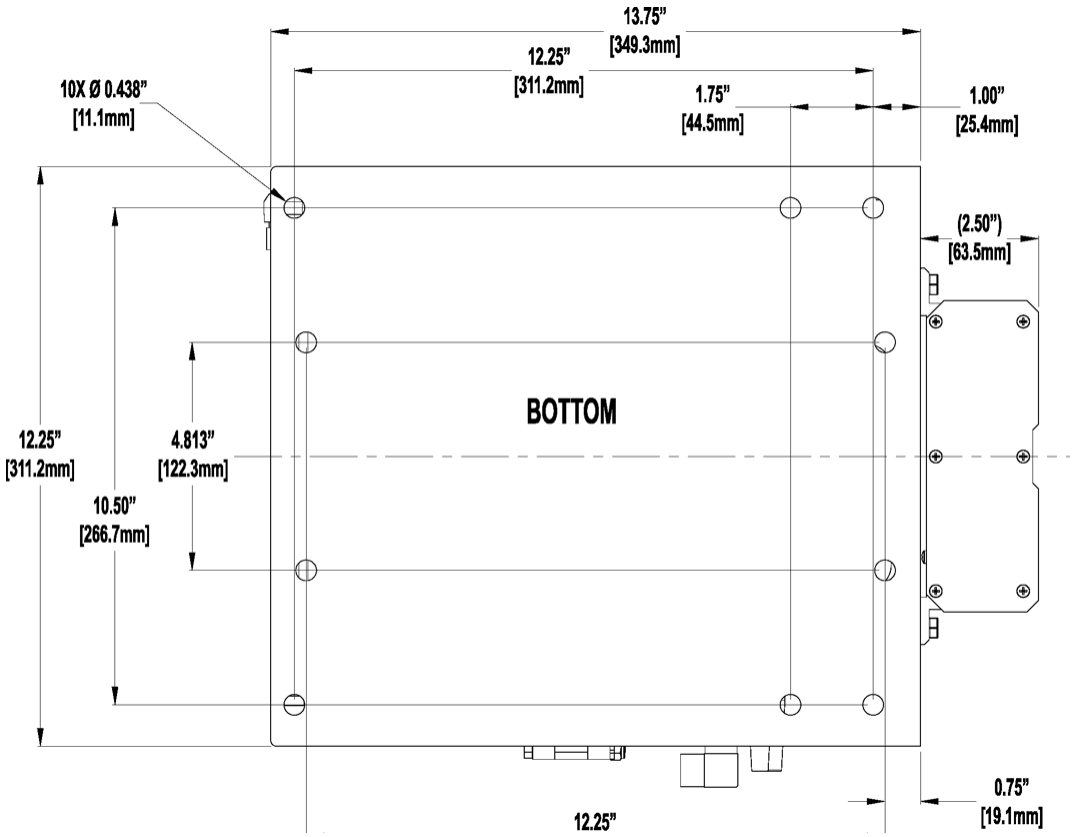


Figure 14**: Base Plate Mounting Hole Locations – 1.7 and 2.1**

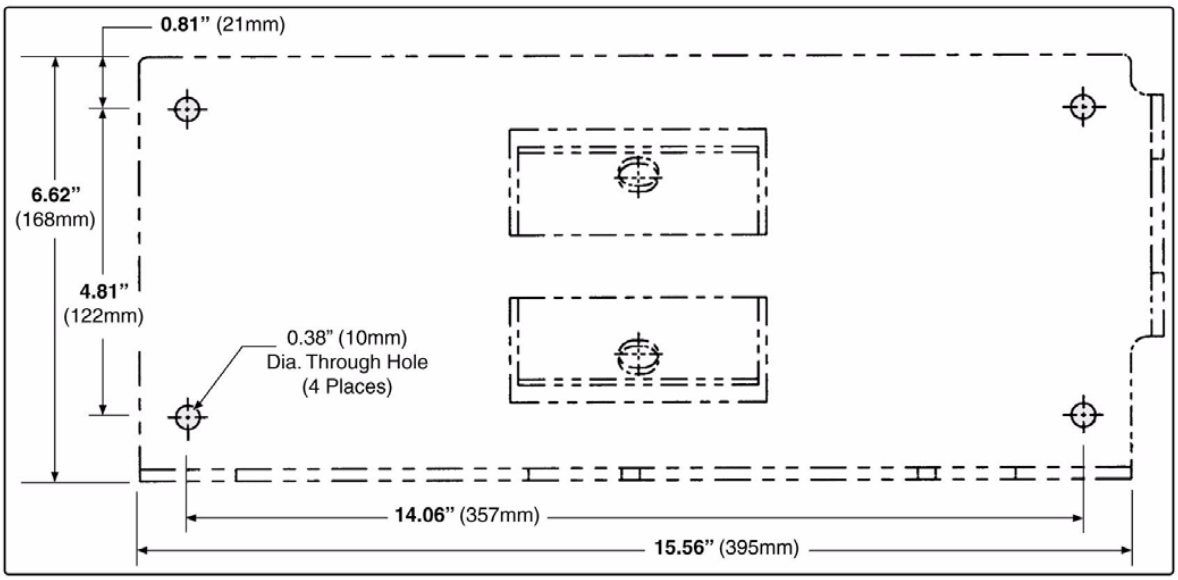


Figure 15**: Base Plate Mounting Hole Locations – 3.3, 5.0, and 6.5**

PLUMBING INSTALLATION

Hale SmartFOAM System plumbing diagram is located below. The diagram provides recommended guidelines for the installation of system components that handle water, foam concentrate and foam solution. The sequence in which the plumbing installation is completed depends on your individual installation requirements.

IMPORTANT!

AFTER INSTALLATION, MAKE SURE ALL PIPES, HOSES AND TUBES ARE PROPERLY SUPPORTED USING THE BEST INDUSTRY PRACTICES. USE A SUITABLE PIPE SEALING COMPOUND AT ALL JOINTS.

WATER AND FOAM SOLUTION PLUMBING

Use best industry practices when installing the water and foam solution piping runs. Use a suitable pipe sealing compound at all joints.

CHECK VALVE MANIFOLD

Hale pre-made stainless steel foam manifolds are recommended. The manifolds are available in kits and eliminate the extra labor and leaks from large pipe thread connections. The manifolds use 3” (76mm) Victaulic connections and are available in single or dual check valve configurations. Figure 16**: Check Valve Manifold Installation** shows a typical check valve manifold installation.

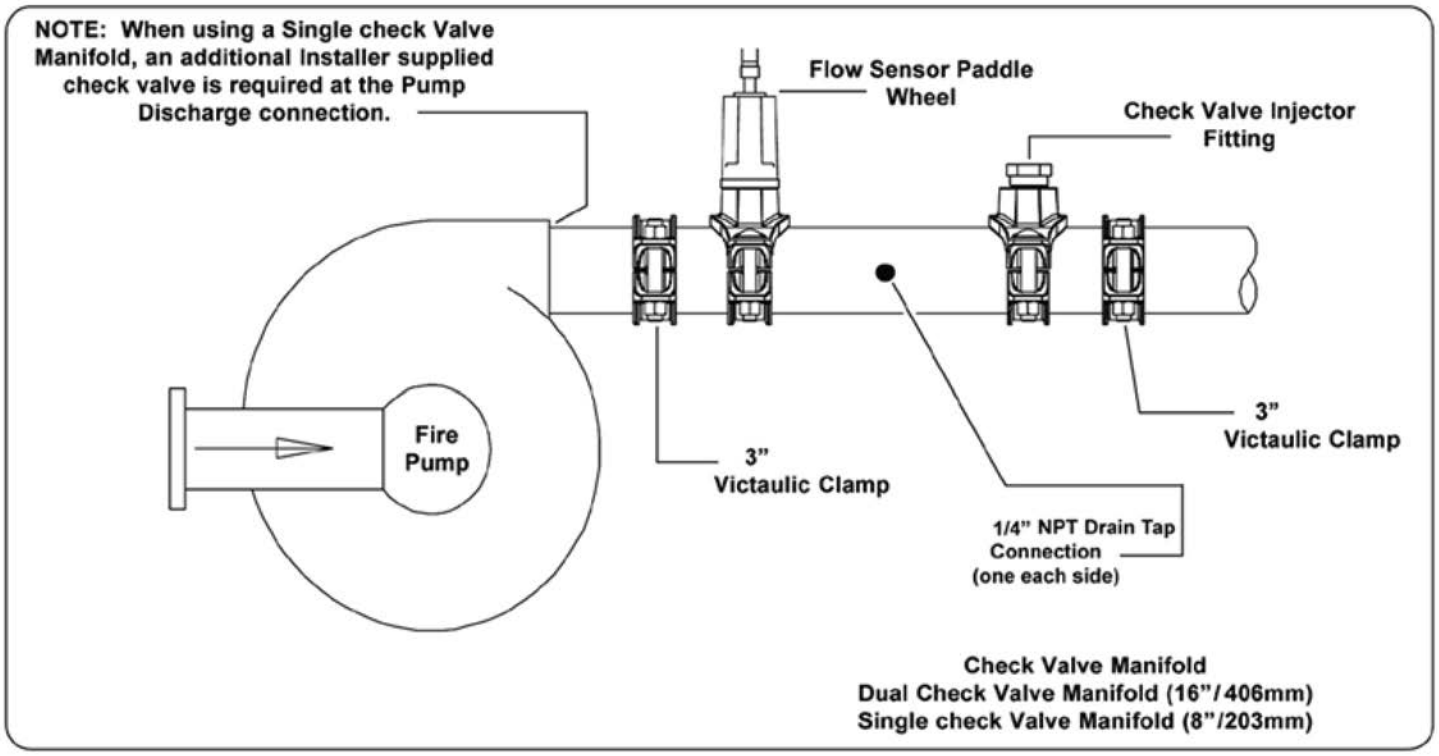


Figure 16**: Check Valve Manifold Installation**

Note: When the manifold is installed the drain tap that must be placed in the “down” position and plumbed to an individual drain.

When properly mounted, the flow sensor and check valve/injector fitting are on the side of the manifold and one of the drain ports is on the bottom. The flow sensor should point upwards slightly to allow drainage of water and sediment. See Figure 19**: Flow Sensor Tee Position Range**.

OPTIONAL HALE PIPING COMPONENTS

Hale piping components, such as 3" (76mm) and 4" (102mm) wafer-type check valves, 115 and 2433 series flanges, mini manifold, etc. are available to simplify installation of water and foam solution discharge piping. The arrangement shown in Figure 17**: Typical Midship Pump Installation** provides accurate proportioning across a wide range for up to four discharges from the mini manifold.

The Hale mini manifold provides a 1" NPT tap for installation of the check valve/injector fitting.

The Hale mini manifold and elbow components offer 4-3/8" diameter bolt circles and minimize fabrication and pipe work. After installation, make sure all pipes, hoses and tubes are supported using the best industry practices.

Figure 18**: Typical 4 Inch Check Valve Installation (Midship Pump)** shows a suggested installation arrangement using Hale 4" (102mm) check valves, pipe and Hale 2433 flanges.

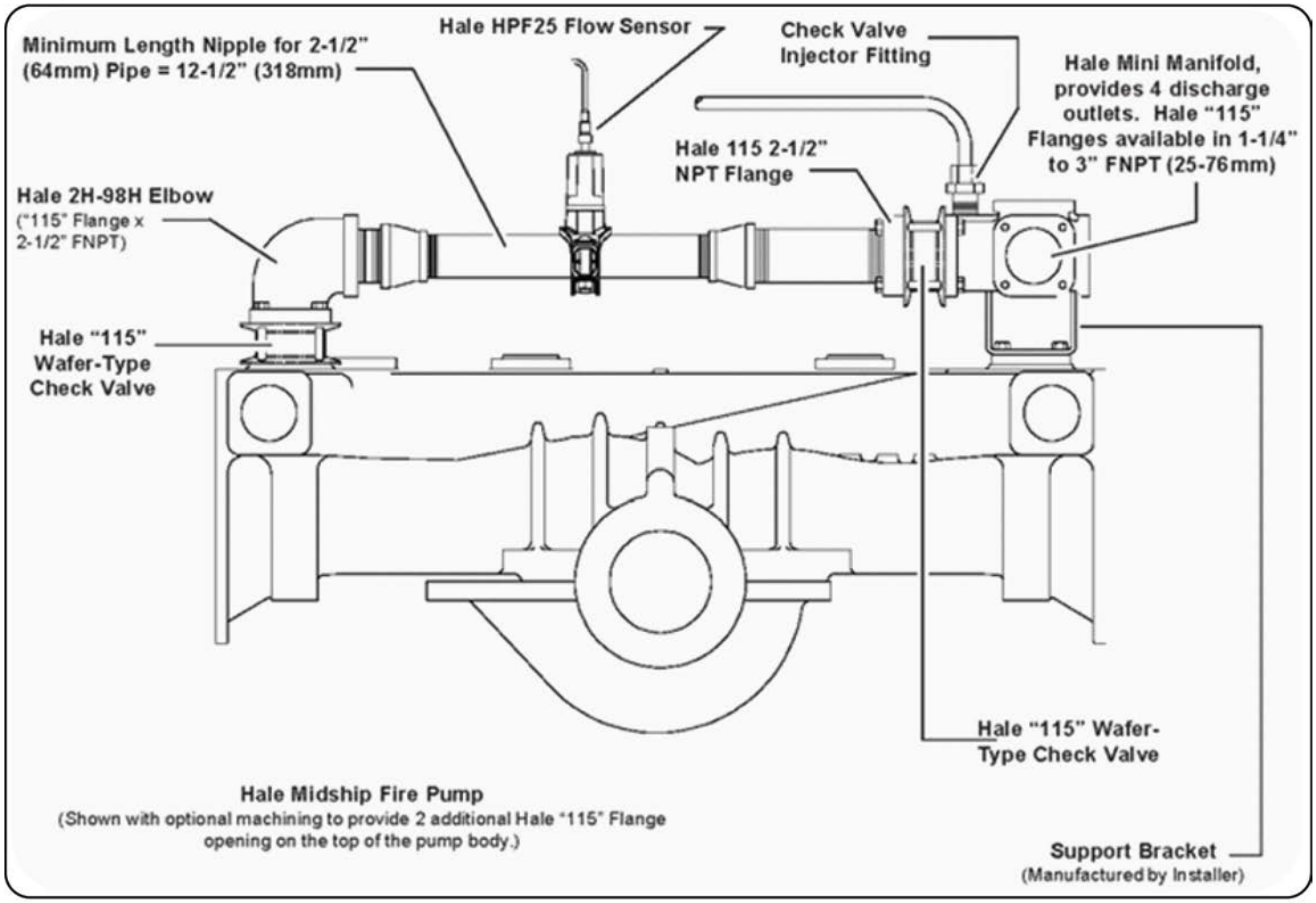


Figure 17**: Typical Midship Pump Installation**

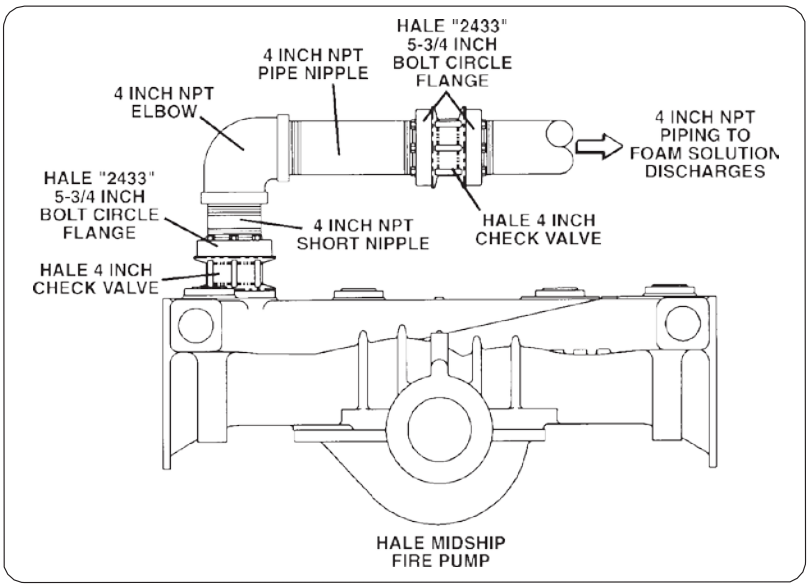


Figure 18**: Typical 4 Inch Check Valve Installation (Midship Pump)**

WATERWAY CHECK VALVES

Check valves in the waterway, rated at 500 PSI (34.5 BAR), are required to keep foam solution out of the main pump and allow pump priming without drawing foam into the piping.

Using double check valves, separated by at least 6" to 8" (152 to 203mm) of pipe before the foam injection point, ensures that the pump and tank water remain uncontaminated.

FLOW SENSOR

The Hale SmartFOAM flow sensor is specially designed to enable quick and easy sensor inspection and maintenance. The flow sensor paddle wheel is installed on a saddle clamp or weld fitting to the foam-capable discharge piping of the apparatus.

In horizontal piping runs, the flow sensor is mounted within the range shown in Figure 19**: Flow Sensor Tee Position Range**.

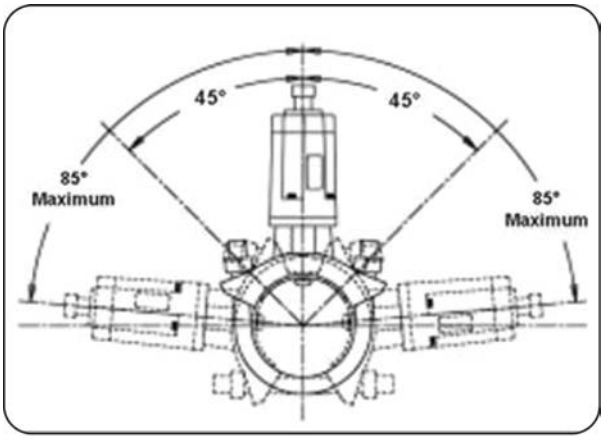


Figure 19**: Flow Sensor Tee Position Range**

When selecting a flow sensor, it is important to consider the minimum and maximum flow requirements during operation. Refer to the Table 4**: Pipe Size versus Flow Range**, for the proper pipe size for flow range desired.

The flow sensor is installed in the piping before the foam concentrate injection point.

This is true in applications where the foam system needs to supply a 3" (76mm) deck gun, as well as a 1" (25.4mm) booster line.

Pipe Size	Minimum Recommended Straight Run Pipe
1-1/2 in (38.1 mm)	9 in (228.6 mm)
2 in (50.8 mm)	12 in (304.8 mm)
2-1/2 in (63.5 mm)	15 in (381 mm)
3 in (76.2 mm)	18 in (457.2 mm)
4 in (101.6 mm)	24 in (609.6 mm)

Table 6**: Pipe Size versus Minimum Straight Run**

Pipe size for flow sensor mounting must be selected to provide accuracy at the lowest flow rate. Mounting the flow sensor in a short section of pipe, one pipe size smaller (e.g., 4" to 3"; 3" to 2-1/2", etc.), provides better accuracy at the lower flows.

Refer to the Table 13: "Pipe Size vs. Minimum Straight Run" for pipe size. Selecting the next smaller pipe permits reducing the straight pipe run the required distance prior to the flow sensor paddle wheel.

In the short length of reduced pipe pressure loss is minimal and there is minimal pressure loss through elbows and fittings. See Figure 20**: Typical Reduced Size Sensor Piping Arrangement**.

Excessive turbulence in the flow sensor may produce unstable and inaccurate flow readings. The length of straight pipe prior to the flow sensor must be sufficient to reduce any turbulence in the pipe.

The following guidelines help attain the best readings, and maintain Hale SmartFOAM system accuracy.

1. A minimum of **6 times the pipe diameter** of straight run pipe without any fittings is necessary prior to the flow sensor paddle wheel. (See Figure 21**: Flow Sensor Placement**).
2. The downstream piping length is not as critical, but there must be a short length of straight pipe with no fittings or valves immediately after the flow sensor paddlewheel. Two to three times the pipe diameter is recommended.
3. Do not mount a flow sensor directly after an elbow or valve. Valves create severe turbulence when they are "Gated".

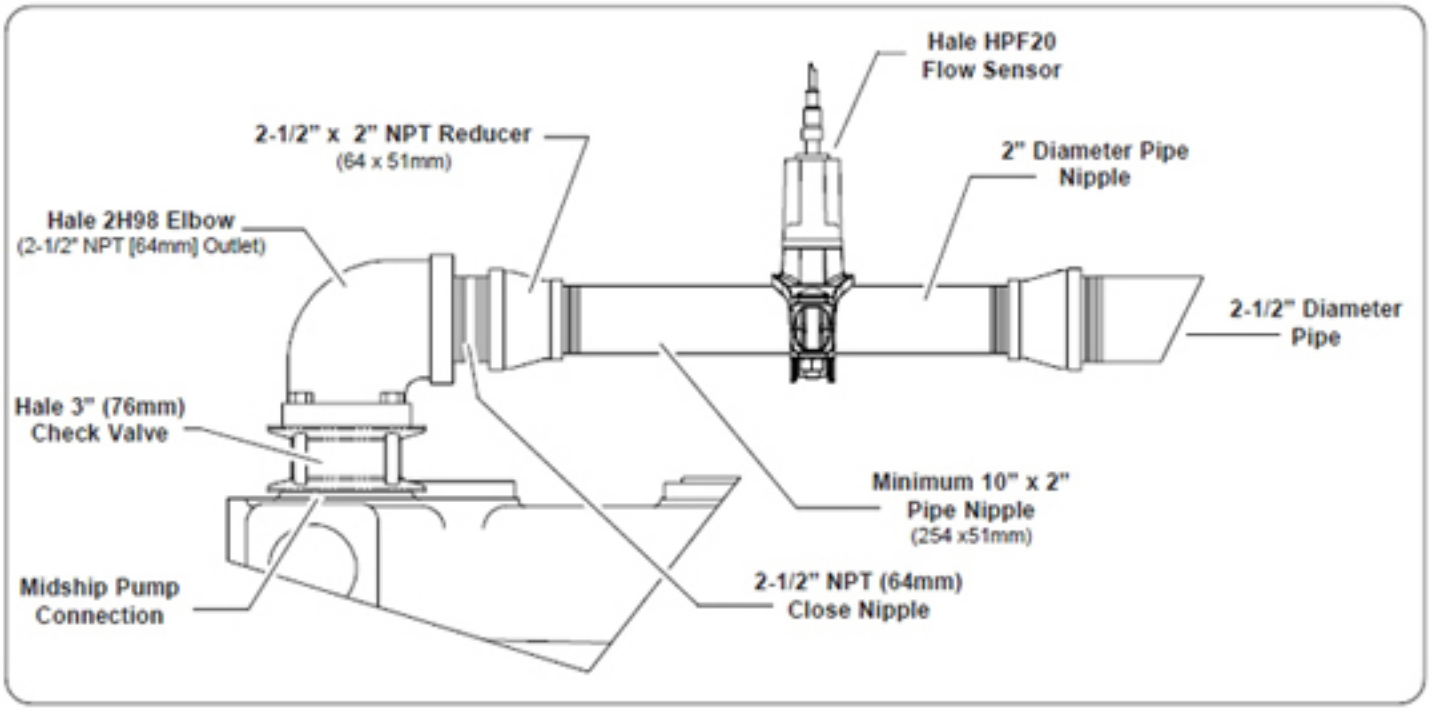


Figure 20**: Typical Reduced Size Sensor Piping Arrangement**

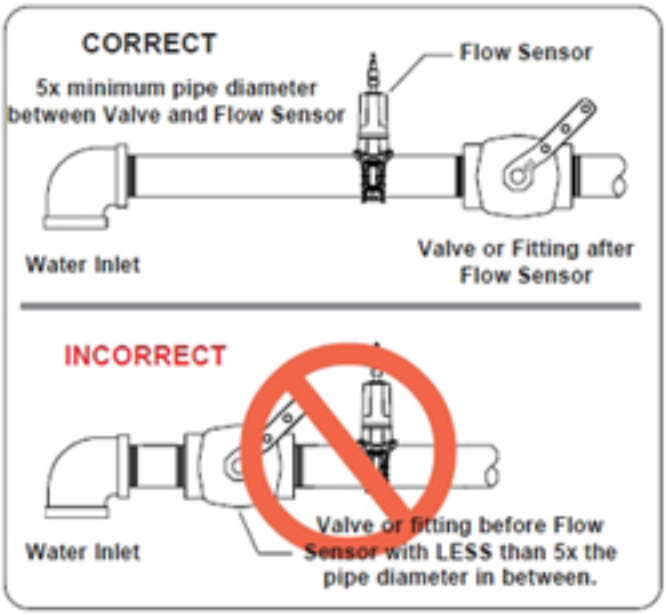


Figure 21**: Flow Sensor Placement**

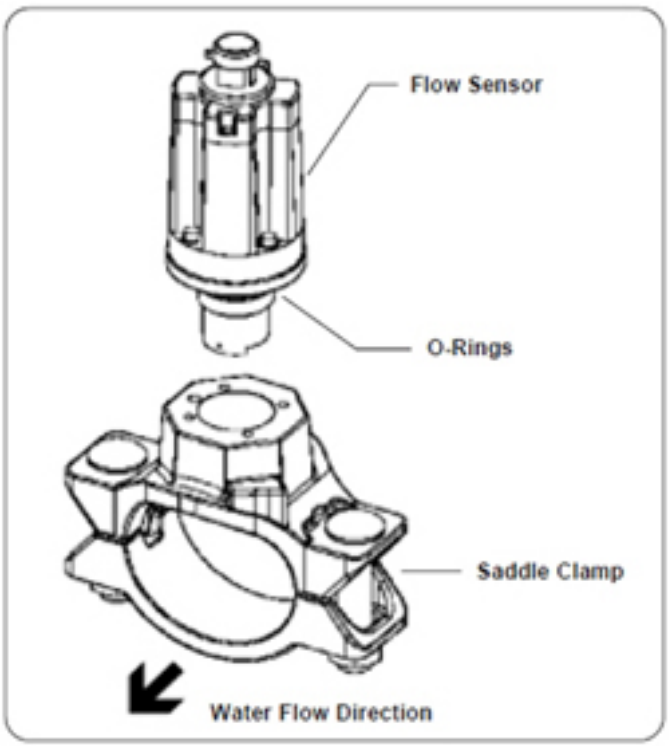


Figure 22**: Flow Sensor/Saddle Clamp Installation**

SADDLE CLAMP INSALLATION

See Figure 22**: Flow Sensor/Saddle Clamp Installation**.
Installation of the paddlewheel flow sensor using a saddle clamp requires a 1.385/1.390 inch (35/35.3 mm) bored hole in the pipe.

A minimum of six times the pipe diameter of straight run pipe without any fittings is necessary prior to the position of this hole.

The flow sensor requires a spacer and eight stainless steel internal hex head screws. These are supplied with the sensor.

Four 6-32 x1/2 inch screws attach the spacer to the saddle clamp mount and four 6-32 x 3/4 inch screws with lock washers attach the paddlewheel to the spacer.

Align the indexing pin of the saddle clamp to the indexing hole of the spacer to align the saddle clamp mount.
Secure with four 1/2" machine screws, no lock washers. Torque to 8.5 in.-lbs. (1.0 N-m).
Align the paddle wheel indexing pin to the indexing hole in the spacer and secure using four 3/4" screws and lock washers. Torque to 7.5 in.-lbs. (0.9 N-m).
Apply a small amount of grease to the saddle clamp gasket before the final installation of the assembly onto the pipe. Firmly tighten the saddle clamp onto the pipe.

FOAM PUMP FLUSH SYSTEM

Dual Tank System
Flushing water must be provided to flush the system of foam concentrate after each use. This prevents adverse reactions of some foam concentrates should they mix together. The Hale ADT and MDT II each have provisions for connecting flushing water to the foam concentrate injection system.

Single Tank System
The Hale MST provides a selector valve and gives the system flush capabilities for NFPA compliance. A fitting provided on the Hale MST simplifies the flushing water connection.

No Tank Option
The system installer must provide a flushing water supply to comply with NFPA standards.
The flushing water hose must be a minimum of 1/2" (12 mm) inside diameter and capable of withstanding the maximum fire pump discharge pressure, 500 PSI (34 BAR) minimum. The flush water supply should be provided from one of the pressure taps on the discharge of the fire pump.

It is recommended that a check valve be installed at the pressure tap to prevent contamination. Flush water thread connections are:

- ❑ ADT - 1/2" (13mm) NPT
- ❑ MDT II and MST - 1/4" (6.4mm) NPT

The system installer must provide proper fittings for these connections.

FOAM CONCENRATE PLUMBING

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENRATE SUCTION HOSES ARE CLEAN BEFORE MAKING A FINAL CONNECTION TO FOAM PUMP. FLUSH TANK(S) AND HOSES PRIOR TO MAKING CONNECTIONS. MAKE SURE THE FOAM CONCENRATE IS GRAVITY FED FROM THE TANK TO THE PUMP.
Foam concentrate plumbing consists of:

- ❑ Foam concentrate suction hose
- ❑ Foam strainer
- ❑ Foam concentrate discharge hose
- ❑ Check valve/injector fitting

FOAM STRAINER CONNECTION

CAUTION!

THE FOAM CONCENTRATE STRAINER ASSEMBLY, MOUNTED ON THE FOAM PUMP INLET, IS A LOW PRESSURE DEVICE. IT WILL NOT WITHSTAND FLUSHING WATER PRESSURE. IF FLUSHING WATER IS TO BE PROVIDED THE PRESSURE MUST BE LIMITED TO 50 PSI (3.5 BAR).

The strainer/valve assembly has 1/2" (12mm) NPT female threaded ports. A 1/2" hose barb fitting is supplied to connect the 1/2" ID hose, provided with the Hale SmartFOAM 2.1A installation kit.

The hose from the foam tank to the strainer must have adequate wall stiffness to withstand the vacuum of the foam pump while it is operating (23" [584 mm] Hg and 50 PSI [3 BAR], Kuriyama, Kuri-tec K-3130 or K-7130 series or equal).

After the foam pump is mounted on the apparatus, connect the PVC hose provided to the strainer inlet.

Install the clear plastic hose from the foam tank outlet to the inlet of the strainer/valve assembly. The inlet is on the valve end. Wetting the ends of the hose and fittings makes the installation on the hose fittings easier.

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTION.

IN-LINE STRAINER VALVE

CAUTION!

THE IN-LINE STRAINER/VALVE ASSEMBLY, MOUNTED ON THE FOAM PUMP INLET, IS A LOW PRESSURE DEVICE. IT CANNOT WITHSTAND FLUSHING WATER PRESSURE. WHEN INSTALLING THE IN-LINE STRAINER EQUIPPED WITH HALE MDT II OR MST, MAKE SURE THE IN-LINE STRAINER/VALVE ASSEMBLY IS IN THE HOSE ON THE INLET SIDE OF THE VALVE. IF THE STRAINER IS SUBJECT TO FLUSHING WATER PRESSURE, USE HALE FS SERIES STRAINERS.

The strainer/valve assembly has 1-1/4" (32mm) NPT female threaded ports. Fittings are supplied for connection to the following inside diameter hose, depending on the viscosity of foam concentrates used. (See Figure 3-14: "In-Line Strainer/Valve Installation," on page 67.)

- ❑ 3/4" (19mm)
- ❑ 1.00" (25mm)
- ❑ 1-1/4" (32mm)

Use 3/4" (19mm) inside diameter hose for Class "A" foam and a 1.00" (25mm) inside diameter hose for Class "B" foams. For high viscosity Class "B" foam concentrates use 1-1/4" (32mm) or 1-1/2" (38mm) inside diameter hose. (See Figure 23**: In-Line Strainer/Valve Installation**). A bracket is included to permit installation on the apparatus.

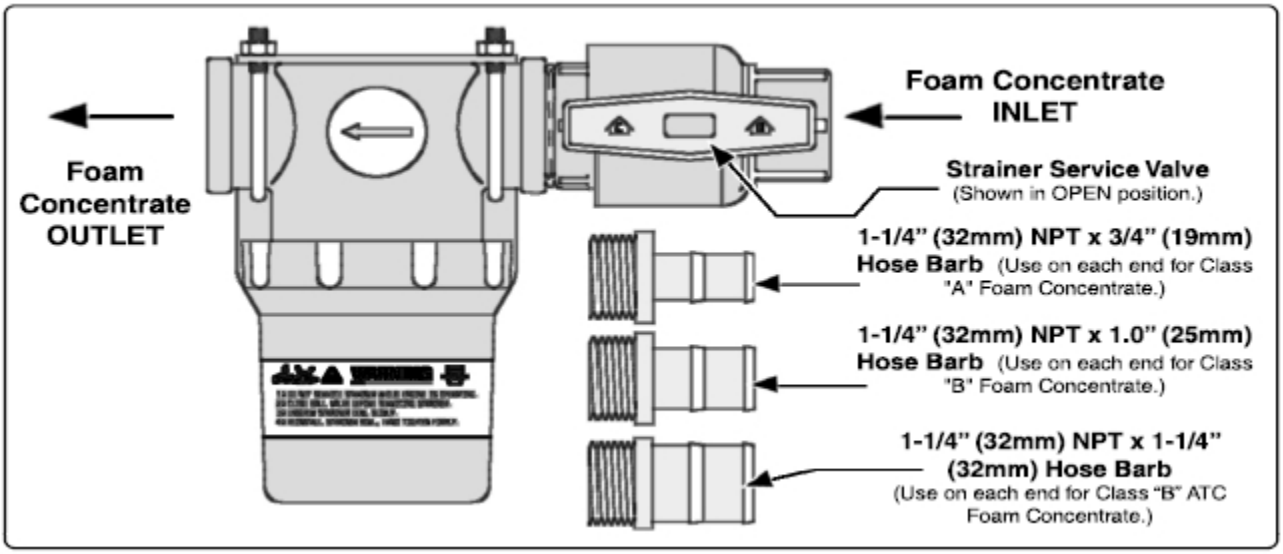


Figure 23**: In-Line Strainer/Valve Installation**

To Install the In-Line Strainer/Valve Assembly

1. Choose a location on the apparatus that allows gravity feed from the foam tank to the strainer inlet *and* from the strainer outlet to the foam pump suction connection.

Notes: *When selecting the strainer location, make sure there is sufficient space above and below the strainer.*

- ❑ *A minimum of 5" (127 mm) below for removal of the strainer basket and screen for cleaning*
- ❑ *2" (51 mm) above to permit operation of the service valve*

2. Mark 4 holes to mount the foam strainer bracket. Drill tapped holes for 1/4"-20 UNC screws (#7 drill for ¼-20 UNC tap)...or...drill clearance holes for 9/32" (7 mm) for 1/4"-20 UNC screws. (See Figure 24**: In-Line Strainer Mounting Bracket**).

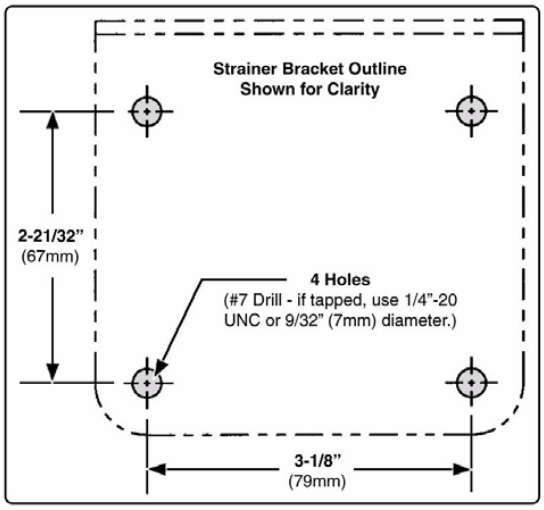


Figure 24**: In-Line Strainer Mounting Bracket**

3. Secure the bracket and strainer/valve assembly to the apparatus.
4. Select the appropriate fittings from the bag attached to the strainer assembly. Two of each fitting are included with the strainer assembly. For fitting selection vs. type of foam concentrate (see Figure 23**: In-Line Strainer/Valve Installation**).
5. Coat all fitting threads with Permatex #80724 (or equal) plastic pipe thread sealant. Install the fittings into the strainer/valve assembly ends and tighten.
6. Install the clear plastic hose from the foam tank outlet to the inlet of the strainer/valve assembly. (Figure 23**: In-Line Strainer/Valve Installation**). Wet the ends of the hose and fittings to make the installation easier.

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY, FLUSH THE TANK AND HOSES PRIOR TO MAKING THE CONNECTION.

7. Install the clear plastic hose from the in-line strainer/valve assembly outlet to the inlet of the Hale MDT II, Hale MST, foam concentrate pump, or the correct fitting on Hale ADT.

FS SERIES STRAINER

When a pressurized water flush is provided to the strainer from one of the discharges, Hale FS series strainers are required. The plumbing exposed to the flush water pressure must be rated at or above the operating pressure of all other discharge plumbing components (500 PSI/34 BAR minimum).

To Install FS Series Strainers

1. Choose a location on the apparatus that allows gravity feed from the foam tank to the strainer inlet and from the strainer outlet to the foam pump suction connection.
2. When selecting the strainer location make sure there is sufficient space behind the pump panel to attach hoses and fittings. Also make sure the inlet connection port is oriented correctly. (See Figure 25**: FS Strainer Orientation**).

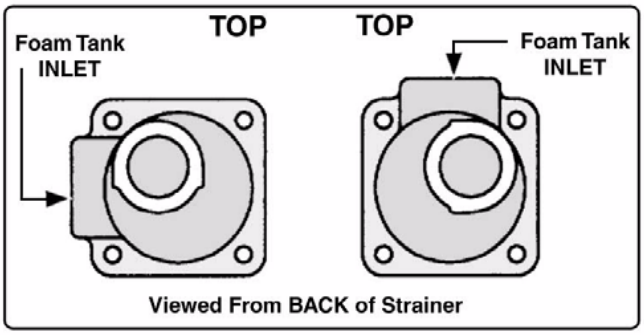


Figure 25**: FS Strainer Orientation**

3. Remove the strainer cap, mounting screws and nameplate from the strainer assembly.
4. Mark holes for mounting the foam strainer by using the nameplate as a guide, or see Figure 26**: FS Strainer Mounting Dimensions**.
5. Select the appropriate fittings to attach the hoses to the strainer. Two of each fitting are included with the strainer assembly. The fittings and hoses must be capable of withstanding the vacuum generated by the foam pump (23 inches [584 mm] Hg) and the maximum flushing water pressure (500 PSI [34 BAR]).
6. For FS-15 strainers use 3/4" (19mm) NPT x 3/4" hose fittings. For FS-25 strainers use 1" (25mm) NPT x 1" hose fittings.
7. Coat all fitting threads with a suitable thread sealant. DO NO USE Teflon Tape. Install the fittings into the strainer/valve assembly ends and tighten.

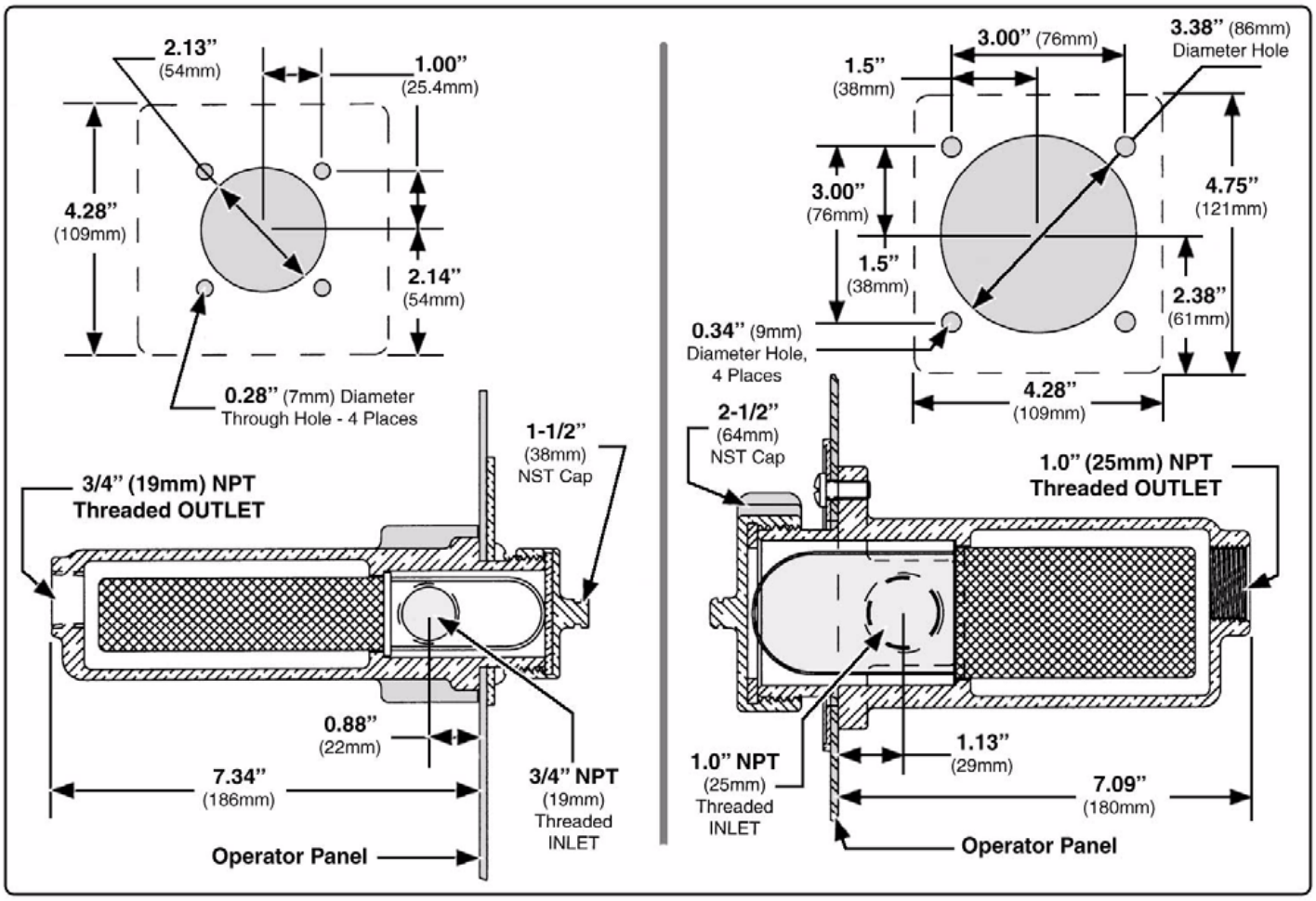


Figure 26**: FS Strainer Mounting Dimensions**

8. Make sure the strainer is properly oriented (see Figure 25**: FS Strainer Orientation**). Apply Loctite #242 Threadlock Compound (or equal) to the screws then secure the strainer body and nameplate to the apparatus. Install the strainer cap.
9. Install the clear plastic hose from the foam tank outlet to the inlet of the strainer. Wet the ends of the hose and fittings to make the installation easier.

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY, FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTION.

10. Install the clear plastic hose from the strainer outlet to the inlet of the Hale SmartFOAM foam pump, or the selector valve.

CHECK VALVE / INJECTOR FITTING

The Hale check valve/injector fitting, supplied with the Hale SmartFOAM system, meets NFPA requirements for a non-return device in the foam injection system. It prevents back flow of water into the foam concentrate tank.

When properly installed the brass and stainless steel construction check valve/injector fitting ensures foam concentrate is injected into the center of the water flow for better mixing.

Note: *Always position the check valve/ injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. (See Figure 27****: Check Valve Injector Fitting Installation****). This avoids sediment deposits or the formation of an ice plug.*

The check valve/injector fitting MUST be mounted in a location that is common to all discharges which require foam concentrate. (See Figure 28**: Injection and Bypass Hose Connections**).

The Hale SmartFOAM system DOES NOT permit a separate injection point for each foam capable discharge.

The check valve/injector fitting has – 1” NPT (25.4mm) threads on the outside, to fit into the 1” NPT threaded connection on the Hale mini manifold a pipe tee, or a 1” NPT weld fitting installed in the discharge piping of the fire pump. (See Figure 27**: Check Valve Injector Fitting Installation**).

The inlet connection of the check valve/ injector fitting uses a 1/2” NPT female thread.

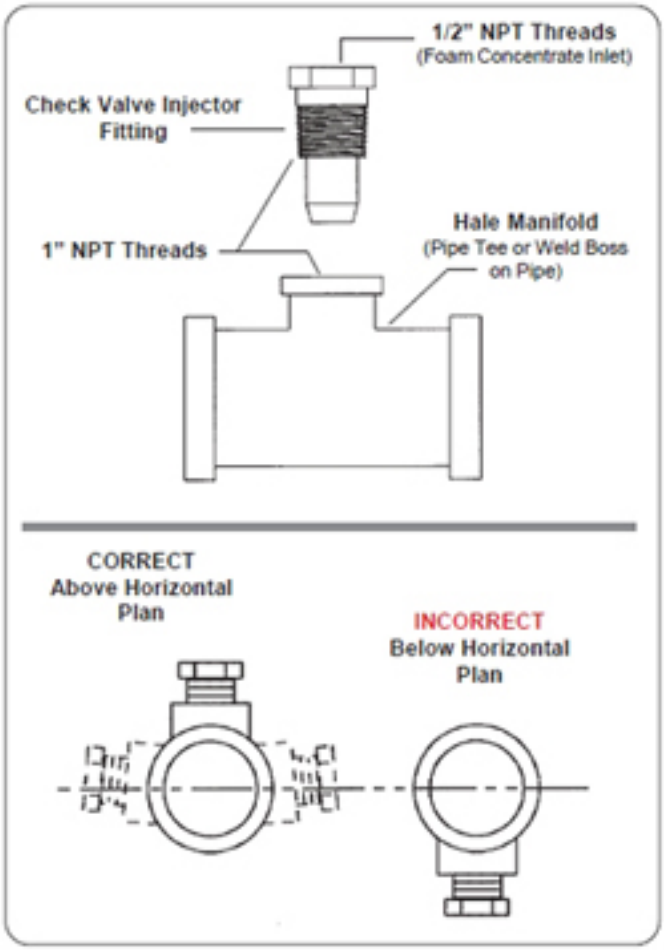


Figure 27**: Check Valve Injector Fitting Installation**

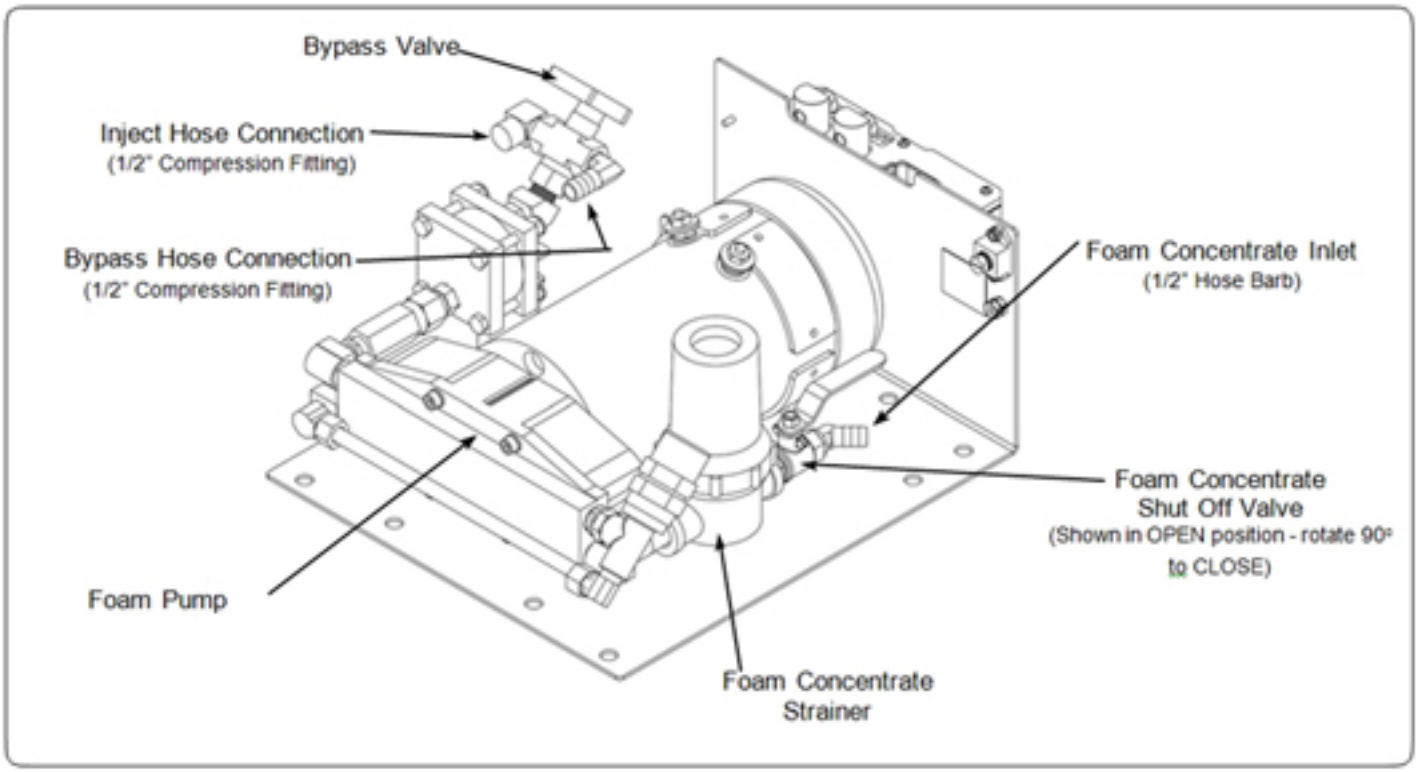


Figure 28**: Injection and Bypass Hose Connections (1.7 and 2.1)**

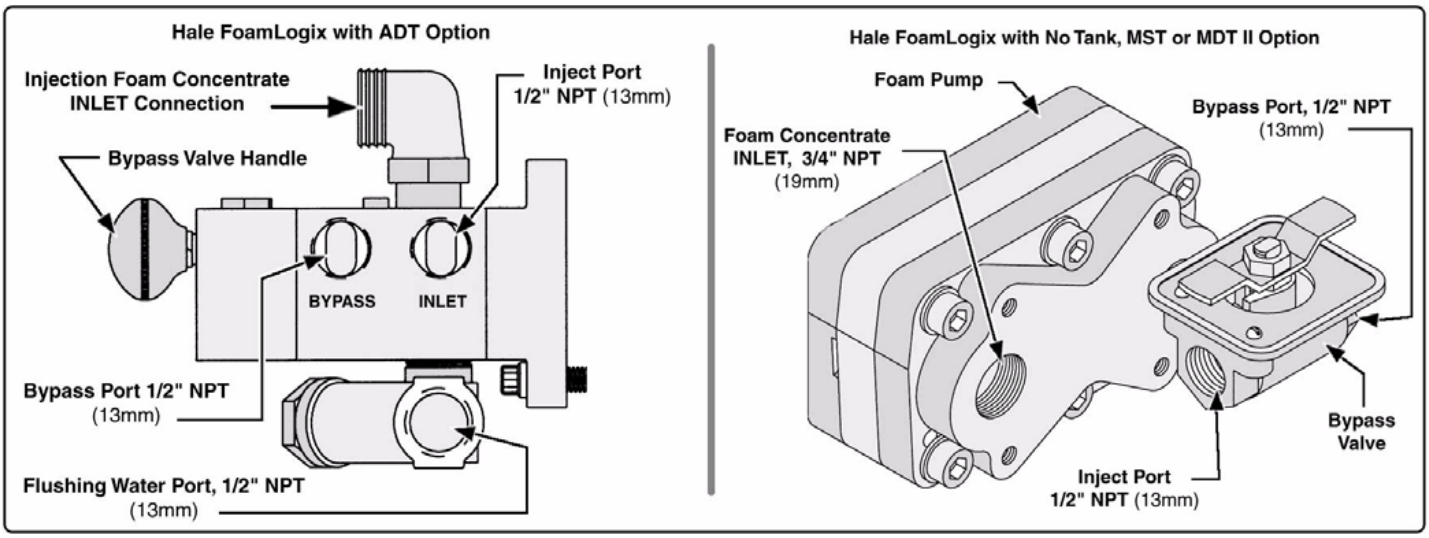


Figure 29**: Injection and Bypass Hose Connections (3.3, 5.0, and 6.5)**

FOAM CONCENTRATE INJECTION HOSE

Connect a hose from the foam pump inject port to the inlet of the check valve injector fitting. (See Figure 28**: Injection and Bypass Hose Connections** or Figure 29**: Injection and Bypass Hose Connections (3.3, 5.0, and 6.5)**).

The hose and fittings from the INJECT port to the check valve injector fitting should have minimum 1/2" (13 mm) outside diameter and be rated at 500 PSI (34 BAR) working pressure (Aeroquip 2580-10 or equal).

BYPASS HOSE CONNECTION

Models 1.7AHP and 2.1A

A bypass valve is mounted on the discharge of the foam pump. The bypass handle must be accessible by the pump operator during normal operations.
The bypass is a 3-way directional valve. Determine which port is the INJECT port and which port is the BYPASS. (See Figure 28**: Injection and Bypass Hose Connections**).

Bypass hose connections are 1/2". Hose fittings compatible with all foam concentrates must be provided. The hose from the BYPASS port is plumbed to the atmosphere.

This hose is used for calibrating the foam pump, pumping the concentrate into a container to empty the foam tank or to assist in priming of the foam pump. The hose from the BYPASS port must be long enough to reach a container outside the truck.

Models 3.3, 5.0, and 6.5

A bypass port is provided on the discharge side of the ADT, or a 1/4 turn bypass valve is mounted on the discharge of the foam pump when the ADT option is not installed. (See Figure 30**: Bypass Valve Assembly**).
The bypass handle must be accessible by the pump operator during normal operations. (See Figure 29**: Injection and Bypass Hose Connections (3.3, 5.0, and 6.5)**).
The bypass is a 3-way directional valve. Determine which port is the INJECT port and which port is the BYPASS. (See Figure 30**: Bypass Valve Assembly**). Bypass hose connections are 1/2" (13mm). Hose fittings compatible with all foam concentrates must be provided. The hose from the BYPASS port is plumbed to the atmosphere and should not receive HIGH pressure.
This hose is used for calibrating the foam pump, pumping the concentrate into a container to empty the foam tank or to assist in priming of the foam pump. The hose from the BYPASS port must be long enough to reach a container outside the truck.

Note**: If the handle or placard is removed from the bypass valve for repairs or to facilitate remote mounting make sure they are installed on the valve correctly. Make sure the tang on the handle engages the cast stops. (See* Figure 30**: Bypass Valve Assembly).*

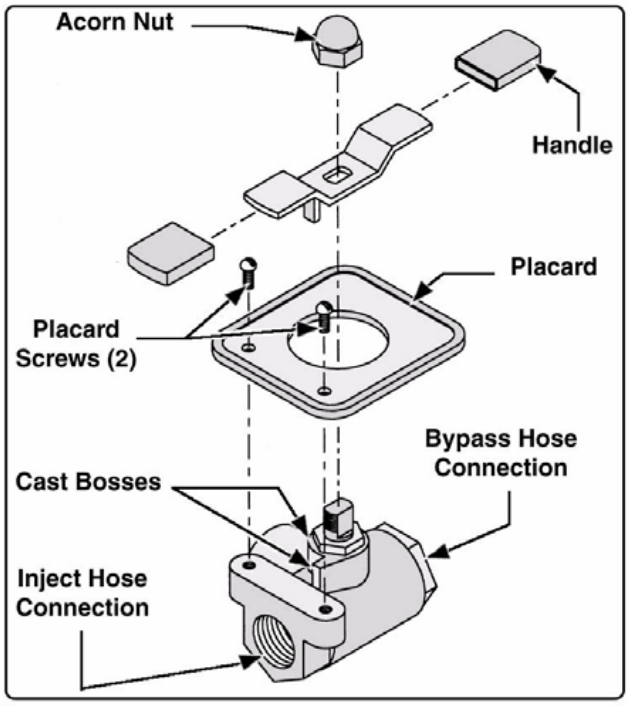


Figure 30**: Bypass Valve Assembly**

ADT OPTION AIR CONNECTIONS

If the ADT option is used, install the operating switch and indicator light placard on the apparatus operator panel. A mounting cutout diagram is provided (see Figure 31**: ADT Option Panel Placard Layout Dimensions**).

After mounting the placard assembly install the air hoses from the ADT to the placard assembly. Make sure proper connections are made at the placard assembly (see Figure 32**: ADT Air Hose Connection, Part 1**).

A color coded decal attached to the ADT valve assembly along with an optional color coded air hose harness simplifies air hose connections. If the optional air hose harness is not used, 1/4" (6mm) inside diameter air brake tubing can be substituted. Make sure the air brake tubing selected has the proper DOT approval (see Figure 32**: ADT Air Hose Connection, Part 1** and Figure 33**: ADT Option Air Hose Connections, Part 2**).

When cutting the air harness or air brake tubing to size make sure the ends are square using a tubing cutter or razor knife.

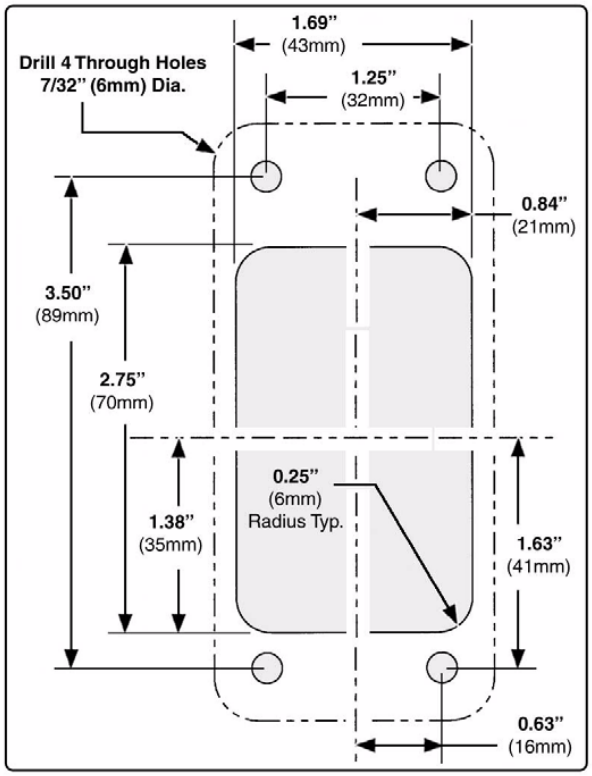


Figure 31**: ADT Option Panel Placard Layout Dimensions**

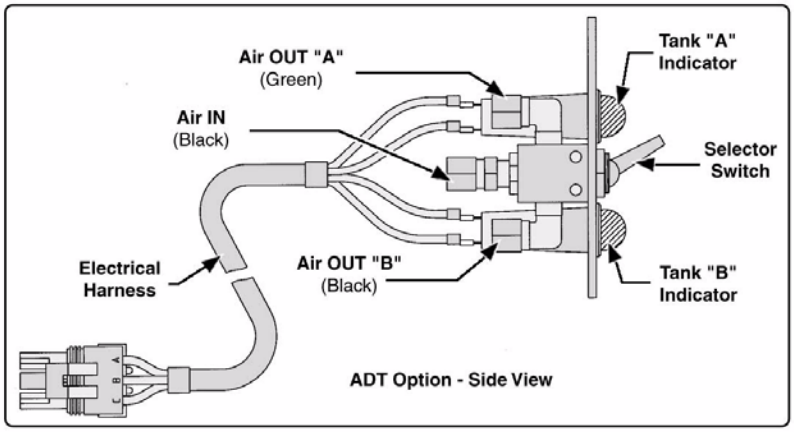


Figure 32**: ADT Air Hose Connection, Part 1**

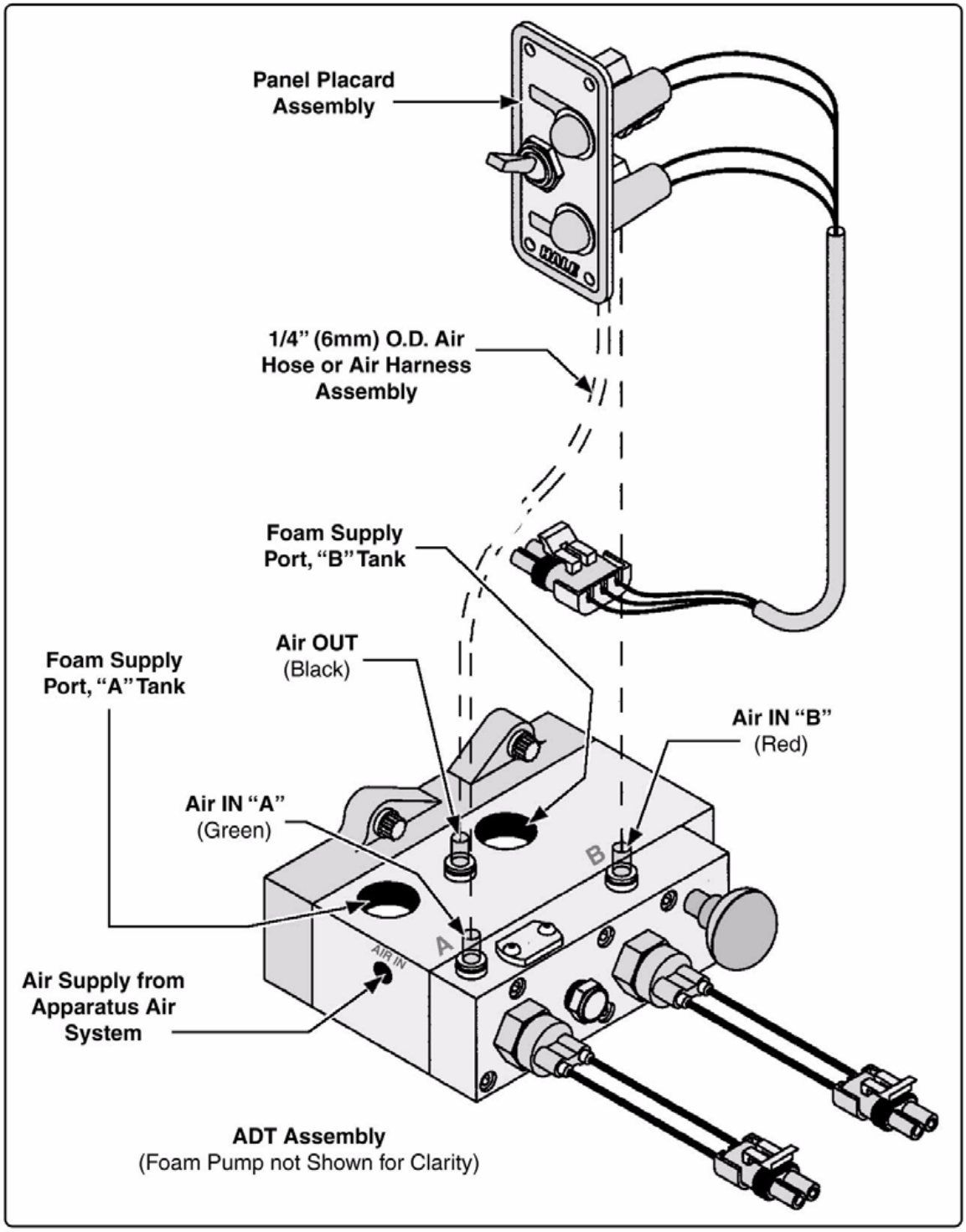


Figure 33**: ADT Option Air Hose Connections, Part 2**

ELECTRICAL CONNECTIONS

Complete harness electrical diagrams are provided - see Figure 35**: SmartFOAM Harness Connections**. Refer to these diagrams for proper installation of each of the electrical components.

The Hale SmartFOAM system is designed to be installed with a minimum of electrical connections. Cables are provided with each Hale SmartFOAM system to make the flow sensor, control unit and motor controller connections.

The system installer must supply primary power wire, low tank level sensor wire and flat braided ground straps.

CAUTION!

Review the "Safety" section of this manual in its entirety before proceeding with electrical connections.

- ❑ To prevent system damage or electrical shock the main power supply wire must be the last connection made to the Hale SmartFOAM motor controller.
- ❑ The cables provided with each Hale SmartFOAM system contain shielded assemblies.
- ❑ NEVER attempt to shorten or lengthen the shielded cables. If necessary order
- ❑ longer or shorter cables from Hale Products to suit the particular installation.
- ❑ The cables are indexed so they connect to the correct receptacle one way only. When making cable connections DO NOT force mismatched connections as damage can result, causing improper system operation.
- ❑ The cables shipped with each Hale SmartFOAM are tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.
- ❑ The system can only perform when the electrical connections are sound. Make sure each electrical connection is correct.
- ❑ Hale SmartFOAM systems are designed for use on direct current, negative (–) ground apparatus electrical systems only.
- ❑ Do not mount radio transmitter or transmitter cables in direct or close contact with the Hale SmartFOAM unit.
- ❑ Before connecting the cables, inspect the O-ring seal in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion of the pins and terminals resulting in possible system failure.
- ❑ The ground strap must be a minimum of 1-1/4" (32mm) wide and no longer than 18" (457mm).
- ❑ A longer ground strap must be wider or a double thickness strap must be used. Make sure the ground strap is attached to the chassis frame. Grounding to the body IS NOT acceptable.
- ❑ Always disconnect the power cable, ground straps, electrical wires and cables from the control unit or other Hale SmartFOAM equipment before electric arc welding at any point on the apparatus. Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- ❑ There are no user serviceable parts inside Hale SmartFOAM system electrical/ electronic components. Opening of these components (distribution box or controller unit) voids the warranty.

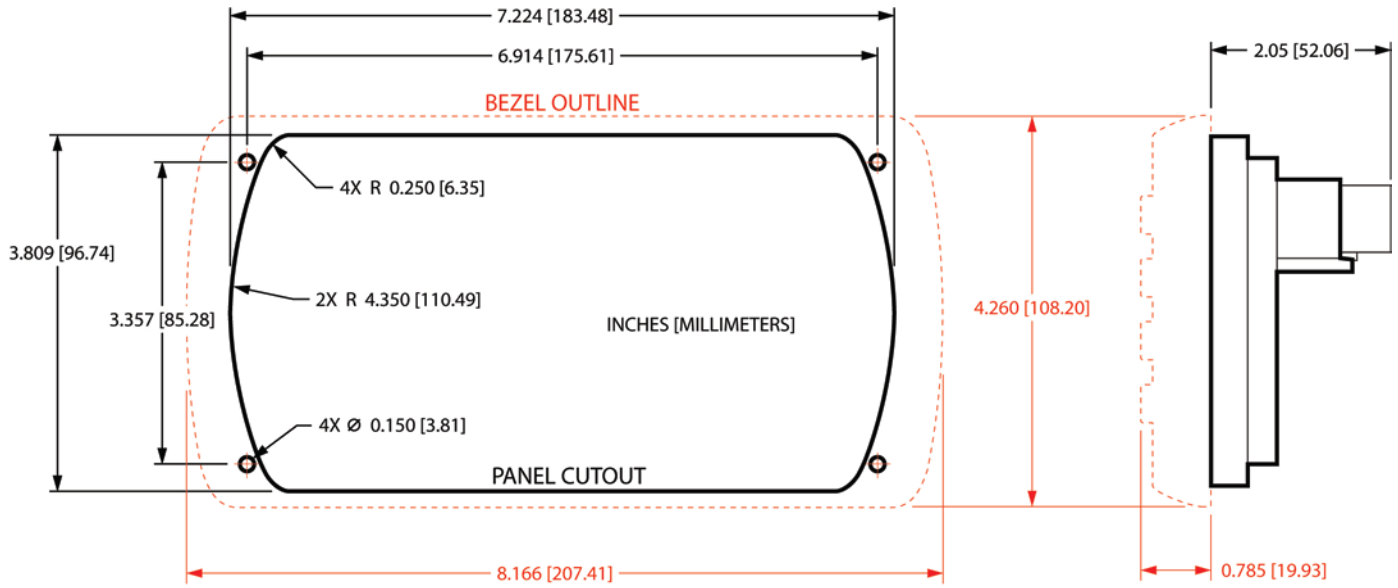


Figure 34**: SmartFOAM Controller Unit Mounting Dimensions**

CONTROLLER UNIT

The controller unit mounts in the operator panel of the apparatus. The display is secured with four #6 pan head screws and nuts (see Figure 34**: SmartFOAM Controller Unit Mounting Dimensions**).
The controller requires a 2.0" (52mm) minimum clearance from the back of the operator panel to allow proper connection of cables.

Single tank models refer to Figure 35**: SmartFOAM Harness Connections – Single Tank**

- ❑ Connect C1 of the controller harness to the "B" connector on the rear of the controller unit.
- ❑ Connect C6 of the controller harness to the "C" connector on the rear of the controller unit.
- ❑ Connect C13 on the controller harness to C14 of the pump harness.
- ❑ Connect C7 of the controller harness to the water flow sensor input module.
- ❑ Connect C3 of the controller harness to the water flow sensor (paddlewheel).
- ❑ Connect C10 of the pump harness to the low foam sensor.
- ❑ C2 and C4 of the controller harness are used for options (remote start stop and CAN communication respectively).
- ❑ C6, C7, C8, C15, and C16 of the pump harness are pre-connected by Hale Products at the factory.

Dual tank models refer to Figure 36**: SmartFOAM Harness Connections – Dual Tank**

- ❑ Connect C1 of the controller harness to the "B" connector on the rear of the controller unit.
- ❑ Connect C6 of the controller harness to the "C" connector on the rear of the controller unit.
- ❑ Connect C13 on the controller harness to C14 of the pump harness.
- ❑ Connect C7 of the controller harness to the water flow sensor input module.
- ❑ Connect C3 of the controller harness to the water flow sensor (paddlewheel).
- ❑ Connect C8 of the pump harness to the tank A selector.
- ❑ Connect C9 of the pump harness to the tank B selector.
- ❑ Connect C10 of the pump harness to the tank A low foam sensor.
- ❑ Connect C11 of the pump harness to the tank B low foam sensor.
- ❑ C2 and C4 of the controller harness are used for options (remote start stop and CAN communication respectively).
- ❑ C6, C7, C15, and C16 of the pump harness are pre-connected by Hale Products at the factory.

Notes:
Allow a service loop on the controller unit's harness connections to prevent "pulling" of the wires or connectors during body and frame flex.

CONTROLLER UNIT POWER AND GROUND CONNECTIONS

Power must be connected directly to the controller unit. The power connection is the 2-pin Packard connector (C5) of the controller harness (see Figure 35**: SmartFOAM Harness Connections – Single Tank** or Figure 36**: SmartFOAM Harness Connections – Dual Tank**). The mating harness provided is approximately 18" (457mm) long. If additional wire length is required, use minimum 16 AWG type SXL, or GXL (SAE J1128) wire.

Connect the black (B) wire to a chassis ground stud. Protect the ground connection from corrosion.

Connect the red (A) wire to the power supply. It is recommended to connect the power wire to a minimum 5 AMP, fused, dedicated circuit. If a dedicated circuit is not available, the power lead may be connected to a terminal where there is not a HIGH current load. Acceptable additional components powered from this terminal include ENFO IV, Governor, Tank Level Gauge, etc.

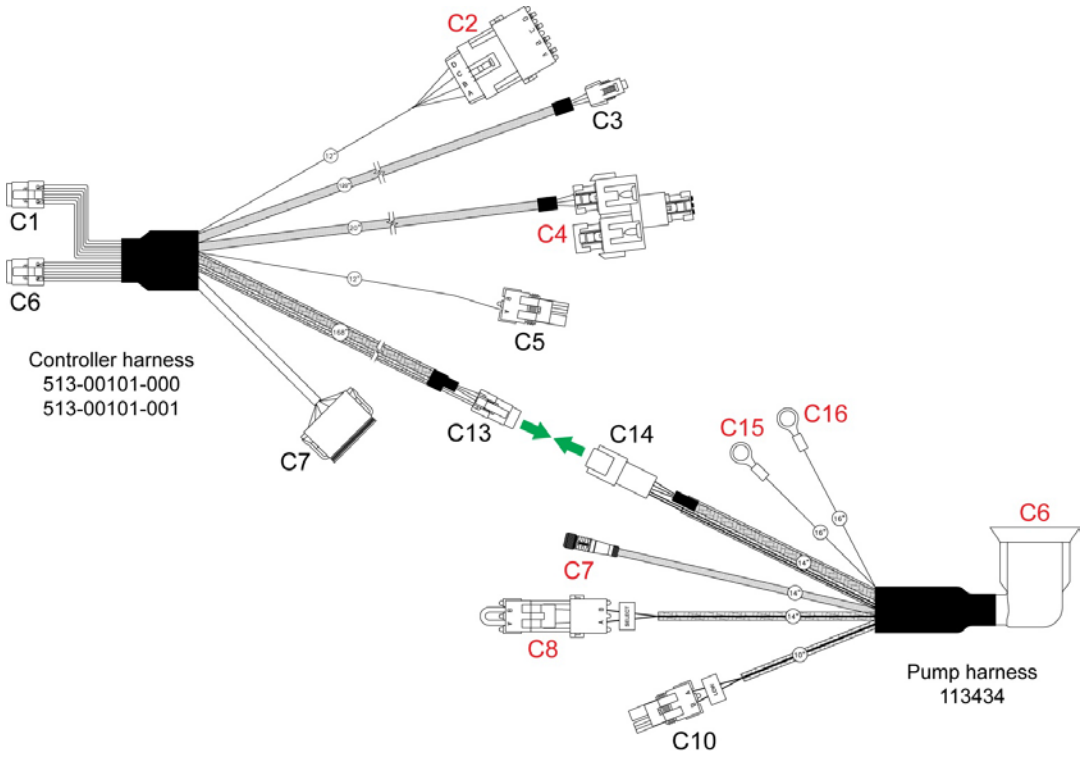


Figure 35**: SmartFOAM Harness Connections – Single Tank**

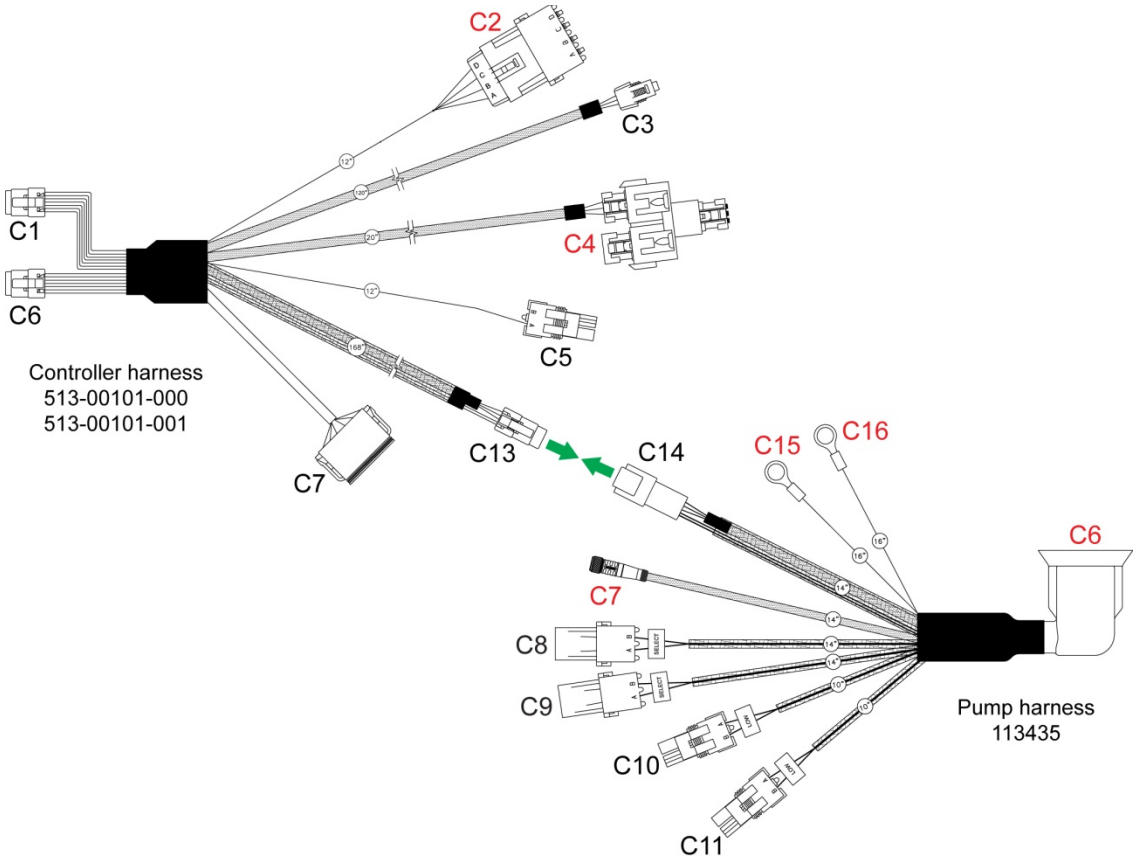


Figure 36**: SmartFOAM Harness Connections – Dual Tank**

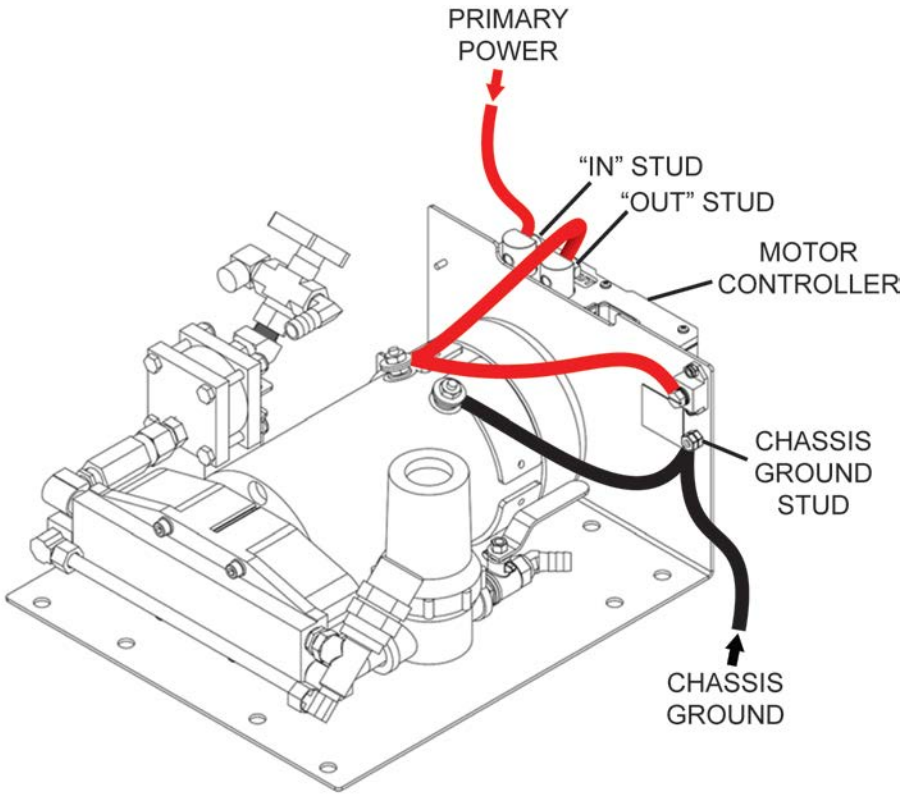


Figure 37**: SmartFOAM Power and Ground Connections (1.7, 2.1)**

MOTOR GROUND / PRIMARY POWER

CAUTION!

CONNECT THE PRIMARY POSITIVE LEAD FROM THE TERMINAL BLOCK TO THE MASTER SWITCH TERMINAL OR RELAY TERMINAL USING MINIMUM 8 AWG TYPE SGX (SAE J1127), CHEMICAL RESISTANT, BATTERY CABLE AND PROTECT WITH WIRE LOOM.

PREVENT CORROSION OF POWER AND GROUND CONNECTIONS BY SEALING THESE CONNECTIONS WITH THE SILICONE SEALANT PROVIDED.

GROUND CONNECTION

Be sure the Hale SmartFOAM system is grounded to the chassis. Use a short length of wide flat ground strap at least 1-1/4" (32 mm) wide and less than 18" (457 mm) long to reduce the potential of RFI emitted by this connection.

A stud is located on the mounting base to attach the chassis ground strap to the Hale SmartFOAM system. (See Figure 37**: SmartFOAM Power and Ground Connections (1.7, 2.1)**).

When making the ground strap connections make sure lugs are soldered to the strap ends for trouble free connections. Seal all connection against corrosion.

When the length of the ground strap exceeds 18" (457 mm) use a wider strap or a double thick strap.

CAUTION!

DO NOT CONNECT THE MAIN POWER LEAD TO SMALL LEADS THAT ARE SUPPLYING SOME OTHER DEVICE, SUCH AS A LIGHT BAR OR SIREN. THE HALE SMARTFOAM MODELS 2.1A AND 1.7AHP REQUIRE 40 AMP MINIMUM CURRENT.

PRIMARY POWER SUPPLY CONNECTION

Make sure adequate switched electrical power from the battery positive (+) terminal to the "IN" connection stud on the motor controller is provided. (See Table 6: "Recommended Primary Power Cable Sizes".)

Use 8 AWG minimum type SGX (SAE J1127) battery cable directly to the battery, battery switch or solenoids for cable runs up to 6' (1.8 meters) long. Longer wire runs may require larger battery cable for proper operation. DO NOT connect power to the same connection as the pump primer.

RFI / EMI

Proper installation of system components and cables along with proper grounding will limit radio interference caused by the Hale SmartFOAM system. Additionally, make sure radio cables and hardware are not located in the immediate area where Hale SmartFOAM equipment is mounted.

Making round coils of extra control and flow sensor cables in the pump compartment can act as an antenna. While the control and flow sensor cables cannot be shortened, various lengths of cable are available to minimize the "extra" cable in the truck.

When routing control and flow sensor cables take care to avoid routing them next to antenna wires, radio power lines and radio components. When there is extra cable, double the cable back on itself and secure with plastic wire ties in a flat bundle instead of making a round coil. (See Figure 38**: Extra Cable Storage**).

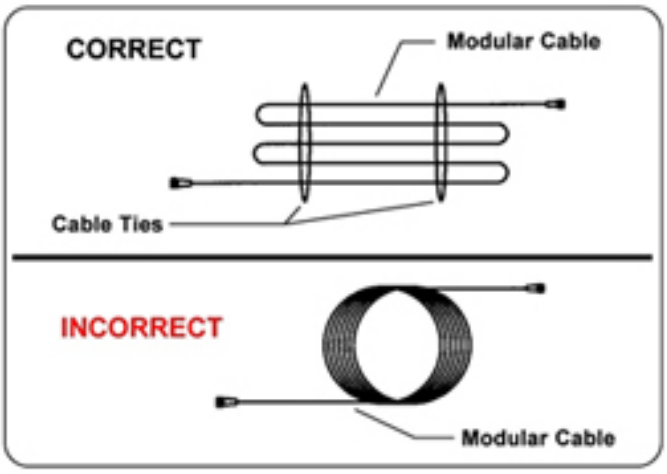


Figure 38**: Extra Cable Storage**

FOAM TANK LOW LEVEL SENSOR INSTALLATION

The foam low tank level sensor(s) must be installed and wired to monitor the foam concentrate level (see Figure 39**: Low Level Sensor Mounting Options**).

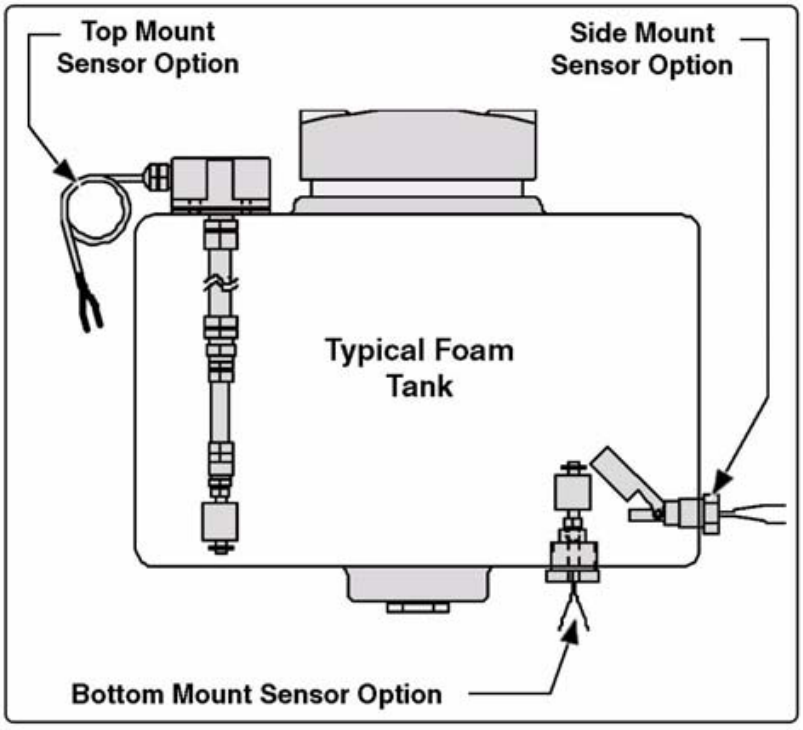


Figure 39**: Low Level Sensor Mounting Options**

CAUTION!

FOAM TANK LOW LEVEL SENSORS MUST BE USED TO PROTECT THE HALE SMARTFOAM FROM DRY RUNNING. FAILURE TO USE LOW LEVEL SENSORS WITH THE HALE SMARTFOAM SYSTEM VOIDS THE WARRANTY.

Side Mount Installation

A side mount low tank level sensor is used if the bottom of the foam tank is not accessible.

1. The sensor has 1/2" (13mm) NPT threads. If tank design and construction allows, the side mount sensor is threaded directly into the side of the tank at the proper height (see Figure 40**: Side Mount Sensor Location Dimensions**). Also, the sensor can be mounted on the foam tank using a 1/2" x 1" (13x 25mm) NPT bushing and a bulkhead fitting with 1" (25mm) FNPT threads.
2. The center of the switch must be located at least 1-½ to 2 inches (38 to 51 mm) from the bottom of the foam tank with the float positioned on top of the switch to allow up and down movement.

   ***Note**: When the side mount low level sensor senses a low concentrate condition the system operates for an additional one minute unless the foam concentrate level is restored. If the foam concentrate level is not restored the system SHUTS DOWN. When locating the side mount low tank level sensor on the tank sufficient foam concentrate should be present for one minute of operation at the rated flow.*
3. Coat the threads of the sensor with a suitable sealant and insert into tank fitting. Tighten sensor making sure the float is on the top of the sensor (see Figure 39**: Low Level Sensor Mounting Options**).
4. After installation, check operation of the side mount low tank level sensor with a powered test light. With no foam in the tank, the light should be ON. If light does not illuminate, rotate the side mount low tank level sensor until the test light is ON.

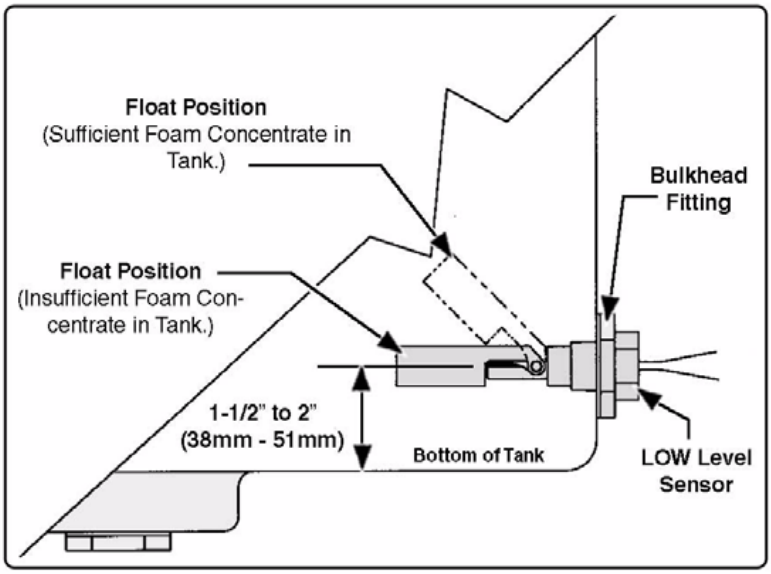


Figure 40**: Side Mount Sensor Location Dimensions**

Top Mount Installation

The top mount low level sensor assembly is available for installations where the sides or bottom of the foam tank are not accessible or sensor service is required without draining the foam tank.

The sensor assembly is flange mounted in an access hole at the top of the foam tank. The two section telescoping assembly permits adjustment of the low tank level sensor position for various foam tank depths from 31- 1/2" to 60" (800mm to 1,524mm).

Flange cut-out dimensions are shown in Figure 41**: Top Mount Sensor Dimensions**. The flange gasket can also be used as a template to mark hole location.

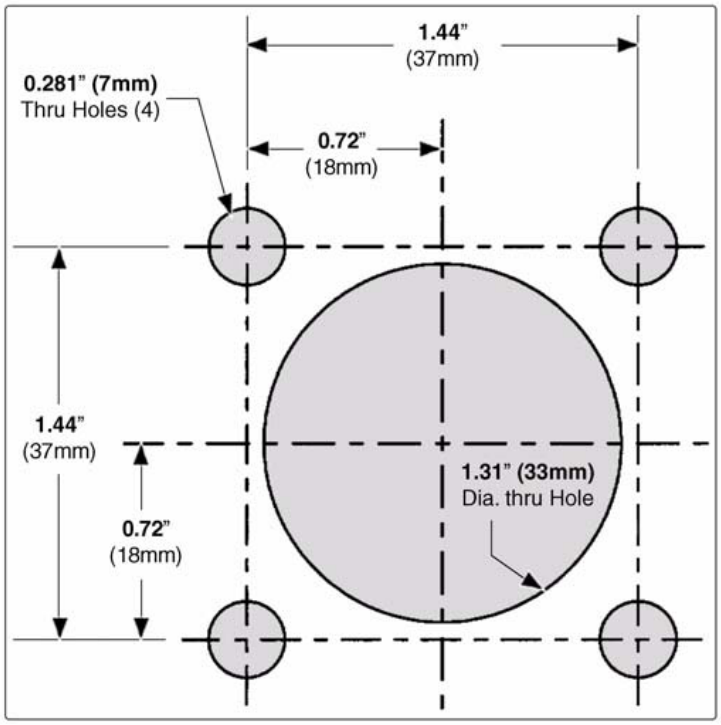


Figure 41**: Top Mount Sensor Dimensions**

1. Layout and drill holes in the top of the foam tank (see Figure 41**: Top Mount Sensor Dimensions**).
2. The center of the sensor should be located at least 1-1/2" to 2" (38 to 51mm) from the sides of the foam tank.

   ***Note**: The minimum depth of the foam tank for installation of the top mount sensor is 31-1/2" (800mm). If the tank depth is less than 31-1/2" (800mm) cut the tubing accordingly. (See heading "**Resizing the Top Mount Low Level Sensor**").*

3. Determine the approximate length of the low tank sensor extension by measuring from the top of the foam tank at the flange opening to the bottom of the tank.
4. When properly installed the center of the sensor float should be 1-1/2" to 2" (38 to 51mm) above the bottom of the foam tank.
5. Loosen the strain relief gland nut to allow the sensor wire to slide through the strain relief.
6. Adjust the telescoping section until the desired length is achieved as measured from the bottom of the flange to the bottom of the sensor. Tighten the compression fittings on the union to lock length setting (see Figure 42**: Top Mount Low Level Sensor Assembly**).
7. Tighten the strain relief around the sensor wire.

CAUTION!

USE MOUNTING HARDWARE THAT IS COMPATIBLE WITH ALL FOAM CONCENTRATES BEING USED IN THE SYSTEM. USE WASHERS, LOCK WASHERS AND CAP SCREWS MADE OF BRASS OR 300 SERIES STAINLESS STEEL.

8. Insert the sensor assembly through the 1.31" (33mm) hole and align the screw holes on the flange and gasket with the holes on the tank. Secure the assembly in place using four 1/4-20 UNC x 1" (25mm) long cap screws, 1/4" (7mm) washers and lock washers.

Resizing the Top Mount Low Level Sensor

Certain applications may require the top mounted sensor to be shorter than factory length (see Figure 42**: Top Mount Low Level Sensor Assembly**).

To resize:

1. Loosen and remove the strain relief gland nut and strain relief from the top of the sensor assembly.
2. Loosen and remove the 1/4" (6mm) FNPT x 1/2" (13mm) tube compression fitting from the bottom of the assembly.
3. Slide the sensor assembly out from the bottom being careful not to damage the wiring as it is pulled from the assembly. DO NOT separate the 1/2" inch tube from the 5/8" tube.
4. Loosen the compression nut from the 1/2" (13mm) FNPT x 5/8" (16mm) tube compression fitting at the top of the assembly.
5. Using a tubing cutter, remove an "equal" amount from the end of each tube (5/8" and 1/2"). You must cut off the ferrule from both ends. Deburr the cuts using a fine emery paper.
6. Install a new 1/2" (13mm) compression ferrule on the end of the 1/2" O.D. tube. Carefully thread the sensor wire through the tube assembly.
7. Attach the 1/4" (6mm) FNPT x 1/2" (13mm) tube compression fitting, with sensor attached, to the end of the tube.
8. Install and tighten the 1/2" compression nut (see Figure 42**: Top Mount Low Level Sensor Assembly**).
9. Install a new 5/8" (16mm) compression ferrule on the end of the 5/8" O.D. tube. Carefully thread the sensor wire through the flange and gasket assembly and install strain relief and strain relief gland nut. DO NOT tighten.
10. Install and tighten the 5/8" (16mm) tube compression nut.

11. Slide the 1/2” diameter tube in the 5/8” (16mm) diameter tube and adjust the telescoping section until the desired length is achieved, as measured from the bottom of the flange to the bottom of the sensor. Tighten the compression fittings on the union to lock length setting.
12. Tighten the strain relief gland nut and strain relief.

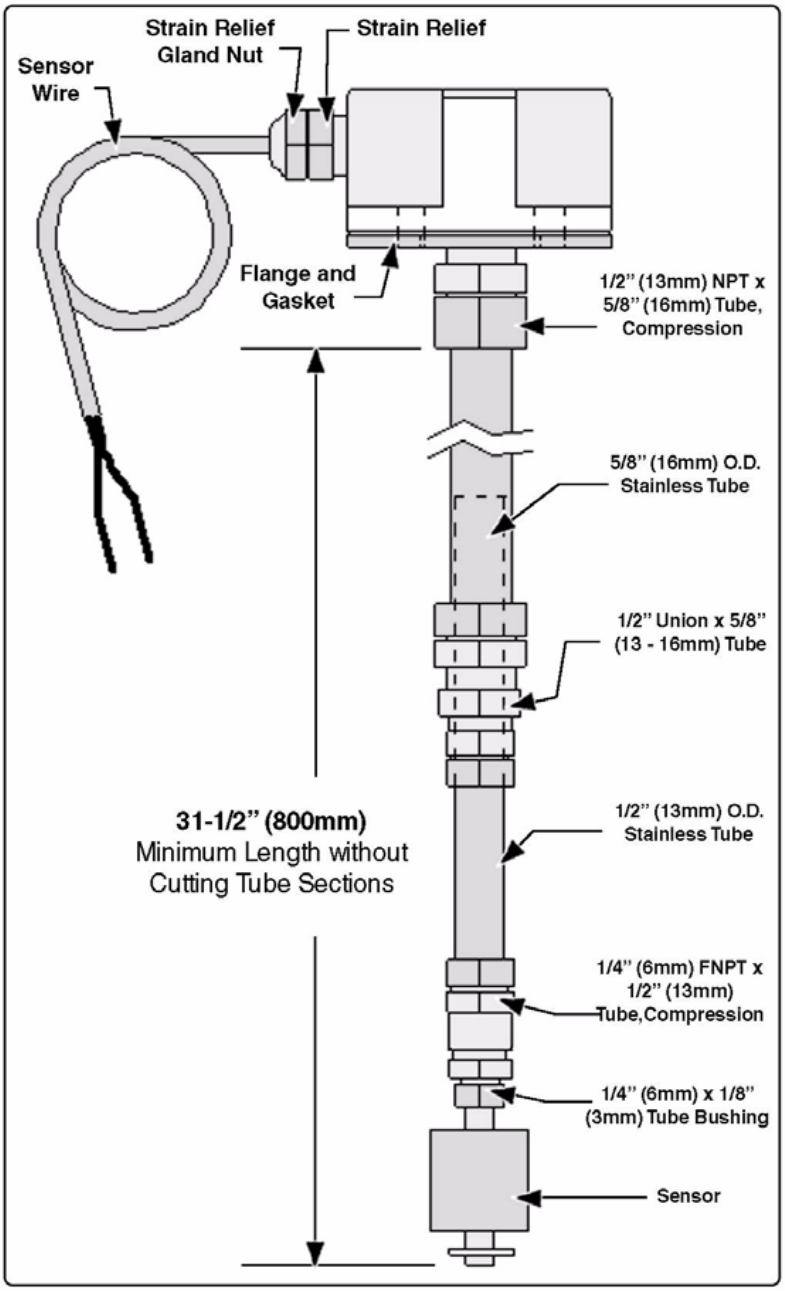


Figure 42**: Top Mount Low Level Sensor Assembly**

FOAM TANK LOW LEVEL SENSOR WIRING

CAUTION!

WHEN EXTENDING THE LOW TANK SENSOR WIRES MAKE SURE THE SPLICES ARE PROPERLY SEALED USING AN ADHESIVE FILLED HEAT SHRINK TUBING.

Single Foam Tank System

See Figure 35**: SmartFOAM Harness Connections – Single Tank**.

Use a minimum 16 AWG type SXL or GXL (SAE J1128) wire to extend the low tank sensor wire to the 2-pin Packard WeatherPack connector C10 of the main cable harness. Low tank level sensors are not polarity sensitive therefore terminal connections are not specific.

When splicing wires make sure the splices are sealed using an adhesive filled heat shrink tubing. Where two wires exit the heat shrink tubing pinch the tubing while heating the it to make sure the adhesive seals around both wires.

CAUTION!

USE THE SILICONE SEALER PROVIDED TO INSULATE AND PREVENT CORROSION.

A connector kit (Hale p/n: 546-1780-00-0) is available that contains a Packard WeatherPack 2-contact shroud half, two (2) 14-16 gauge male terminals and two (2) 14-16 gauge cable seals. Assemble these components to the end of the low tank sensor wires.

Snap the two halves of the WeatherPack connector together making sure they are sealed.

***Note**: If a Hale MST is not used, install the tank select jumper plug, Hale p/n: 513-0320-23-0, to connector C8.*

Dual Foam Tank System

See Figure 36**: SmartFOAM Harness Connections – Dual Tank**.

CAUTION!

BEFORE RUNNING WIRES FROM THE LOW TANK SWITCHES TO THE MAIN CABLE HARNESS MAKE SURE THE WIRES FROM TANK "A" ARE IDENTIFIED AND PROPERLY LABELED.

Use a minimum 16 AWG type SXL or GXL (SAE J1128) wire to extend the low tank sensor wires to the 2-pin Packard WeatherPack the following connectors of the main cable harness:

- ❑ Tank "A" - C10
- ❑ Tank "B" - C11

Low tank level sensors are not polarity sensitive therefore terminal connections are not specific.

When splicing wires make sure the splices are sealed using an adhesive filled heat shrink tubing. Where two wires exit the heat shrink tubing pinch the tubing while heating it to make sure the adhesive seals around both wires.

CAUTION!

USE THE SILICONE SEALER PROVIDED TO INSULATE AND PREVENT CORROSION.

A connector kit (Hale p/n: 546-1780-00-0) is available that contains a Packard WeatherPack 2-contact shroud half, two (2) 14-16 gauge male terminals and two (2) 14-16 gauge cable seals. Assemble these components to the end of the low tank sensor wires.

Snap the two halves of the WeatherPack connector together making sure they are sealed.

REMOTE ACTIVATION SWITCH OPTION

Choose a location in the apparatus personnel compartment for mounting the remote activation switch. Make sure the switch is accessible to the operator without interfering with other controls on the apparatus.

Install the remote activation switch as follows:

1. Cutout the panel and drill the four 0.203 inch (5mm) diameter through holes (see Figure 43**: Remote Activation Switch Installation Dimensions**).
2. Insert switch assembly through the panel cutout and secure to using the #10-24 UNC x 1/2" (13mm) screws and nuts provided.

Note: When making cable connections, make sure the cable is routed by the shortest most direct route. A maximum of 40 feet (12 meters) of remote cable may be used.

3. Connect the remote activation switch cable from the main cable harness connector C2 (see Figure 35**: SmartFOAM Harness Connections – Single Tank** or Figure 36**: SmartFOAM Harness Connections – Dual Tank**).

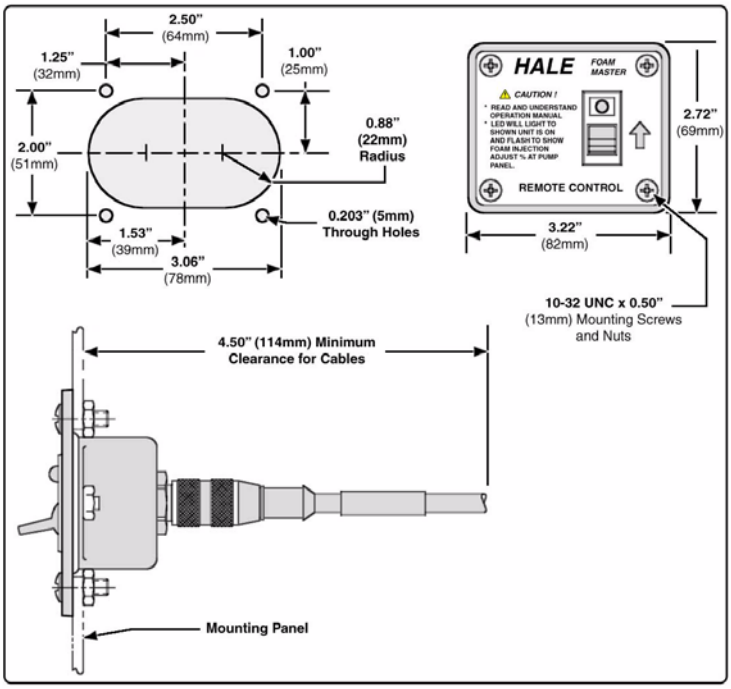


Figure 43**: Remote Activation Switch Installation Dimensions**

START-UP CHECKLIST

Before energizing the apparatus and Hale SmartFOAM system for the first time, make sure the following items are checked:

ELECTRICAL

- ❑ Tank level sensor wires connected to distribution box and sealed from moisture.
- ❑ Tank level sensor functions properly.
- ❑ Control cable connection at distribution box correct and tight.
- ❑ Flow sensor cable properly connected.
- ❑ All cables and wires are secured and protected from damage during operation.
- ❑ Control and flow sensor cables properly folded and secured; radio antennas, power lines and equipment away from cables.
- ❑ Foam pump and motor assembly properly grounded using flat ground strap.
- ❑ Correct voltage provided. Direct current, negative (–) ground.
- ❑ Adequate current available (see Table 2**: Specifications – 1.7 and 2.1** or Table 3**: Specifications – 3.3, 5.0, and 6.5**). Main power direct to battery, battery switch or solenoid without primer or other accessories tied in.
- ❑ Primary electrical and ground connections tight and protected from corrosion with silicone sealant.
- ❑ Splices in wires sealed from moisture using adhesive filled heat shrink tubing.

LIQUID

- ❑ Flow sensor mounted with flow arrow in the correct direction for water flow.
- ❑ Check valves are properly mounted in water and foam concentrate lines.
- ❑ Strainer mounted for proper concentrate flow direction in foam tank to pump hose.
- ❑ Foam tank to foam pump valve is in place and open.
- ❑ Check valve/injector fitting lines are proper size and connections are tight.
- ❑ Bypass valve is properly mounted and oriented for direction of concentrate flow.
- ❑ Foam concentrate gravity feeds to foam pump from foam concentrate tank.
- ❑ All hoses free of kinks and sharp bends.
- ❑ No sharp bends that can trap air exist in system.
- ❑ Flush water connections correct and tight.
- ❑ Discharge piping hydro tested in accordance with NFPA/UL requirements.
- ❑ Bypass valve handle is in the INJECT position.

FOAM PUMP

- ❑ Foam pump and motor assembly mounted in horizontal position with base plate down.
- ❑ Foam pump and motor assembly properly secured using proper mounting hardware.
- ❑ Foam pump suction and discharge hoses connected to proper ports.
- ❑ Foam pump suction and discharge hose fittings tight.

SYSTEM INSTALLER START-UP

On initial power-up of the Hale SmartFOAM system at the installer facility, the following procedures must be followed.

INITIAL SYSTEM POWER CHECK

Watch the display on the controller unit as the apparatus electrical system is turned ON. Check the controller unit readout for:

- ❑ SmartFOAM booting screen is shown for three seconds.
- ❑ SmartFOAM splash screen is shown for three seconds.
- ❑ SmartFOAM version screen is shown for two seconds.
- ❑ SmartFOAM preset screen is shown (default) **OR** SmartFOAM classic FoamLogix screen is shown. (The screen shown depends on the “display format” chosen in the user menu).

(See Figure 44**: Controller Unit Initialization**).

If a default display does not appear, refer to the TROUBLESHOOTING section for possible WARM-UP/ SYSTEM CHECKING causes and solutions.

INITIAL SYSTEM CHECK

After initial system power-up the low tank level sensor operation, foam pump operation, and flow sensor calibration must be checked per the following:

CAUTION!

WATER IS USED AT THE SYSTEM INSTALLER FACILITY TO VERIFY LOW TANK LEVEL SENSOR SYSTEM READY OPERATION AND FOAM PUMP OPERATION AS THE END USER SPECIFIED FOAM CONCENTRATES MAY NOT BE READILY AVAILABLE.

DO NOT PUMP WATER WITH THE HALE FOAM-LOGIX FOAM PUMP FOR MORE THAN ONE (1) MINUTE. DO NOT ATTEMPT TO CALIBRATE FOAM PUMP FEEDBACK SENSOR WITH OTHER THAN END USER SPECIFIED FOAM CONCENTRATE.

MAKE SURE THE BYPASS VALVE IS IN THE BYPASS POSITION WHEN PUMPING WATER WITH THE FOAM PUMP.

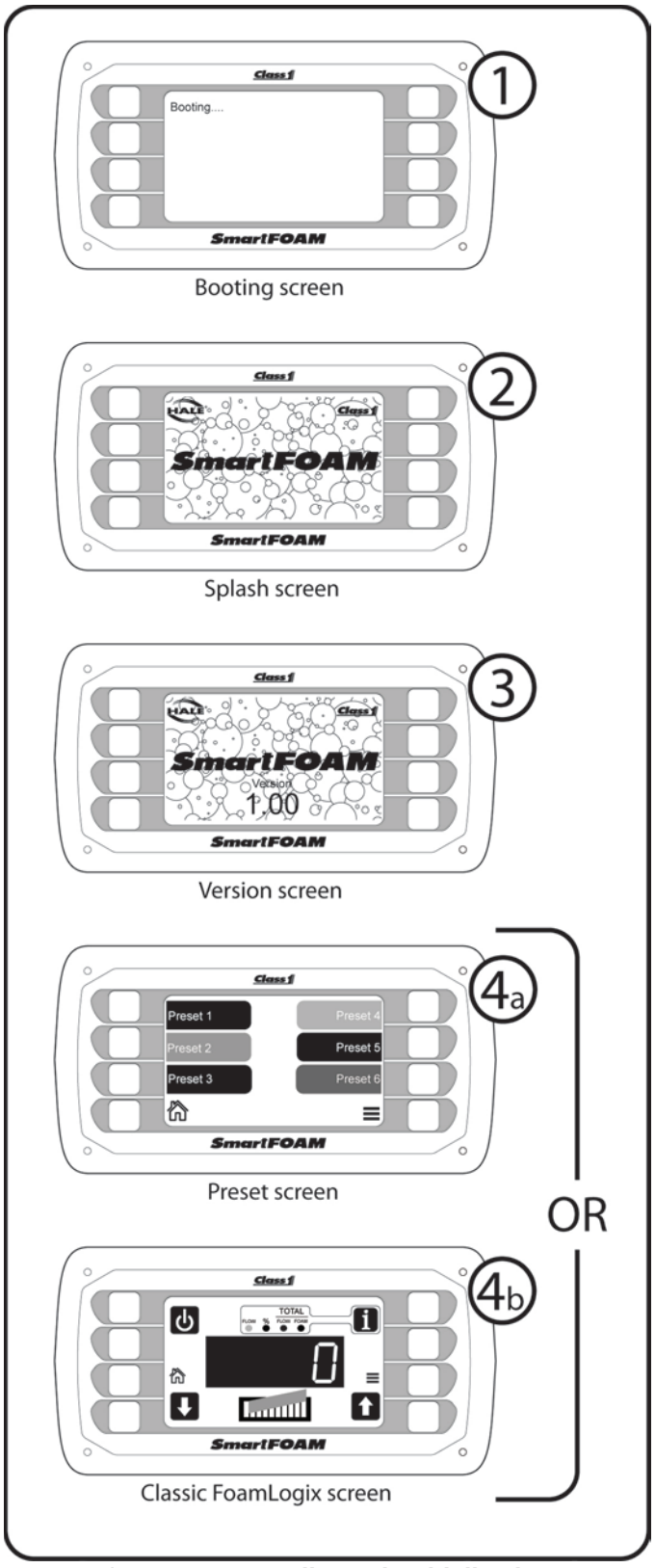


Figure 44**: Controller Unit Initialization**

Upon initial power-up with the foam tanks empty, the display on the controller unit will display a warning bar indicating that the foam tank is low.

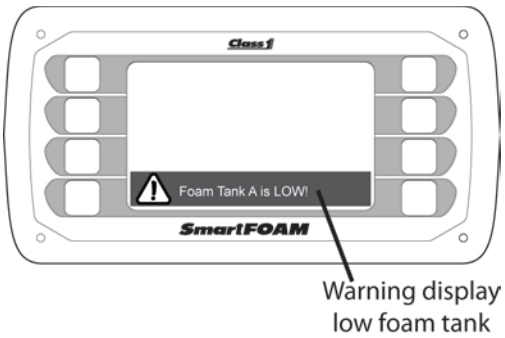


Figure 45**: Low Foam Tank Warning**

1. Fill the foam concentrate tank with WATER. The **"**low foam tank" warning indication clears from the display indicating the low tank level sensor is operating properly.
2. Place the bypass valve's handle to the **BYPASS** position to check the foam pump operation. Place a calibrated five gallon container at the discharge end of the bypass hose.
3. Place the system in simulated flow mode:
    a. Press the MENU button.
    b. In the menu select the "simulated water flow" button.
    c. In the simulated water flow screen press the ON/OFF button to toggle simulated water flow. The icon indicates the current state.
    d. Set the simulated flow to 100 GPM by using the INCR/DECR buttons.
    e. Press the MENU button to return to the menu.
    f. Press the RETURN button to return to the operation screen.

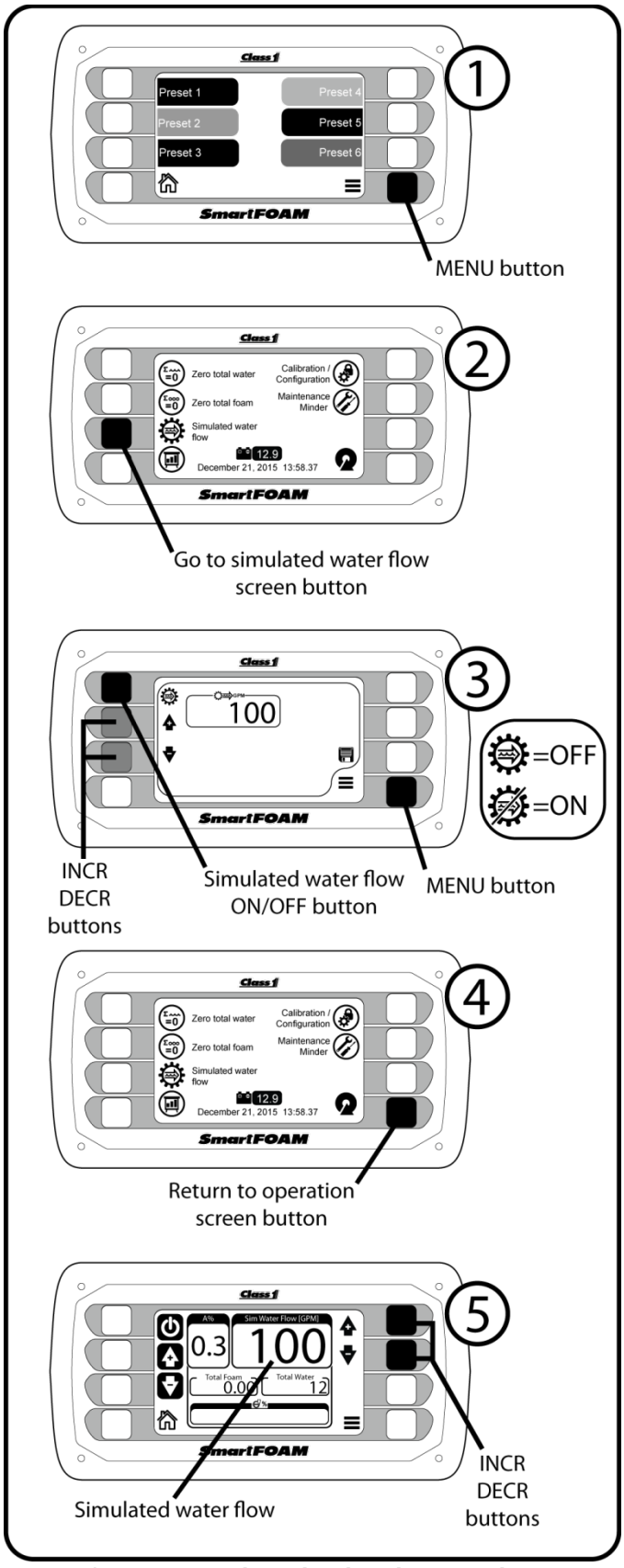


Figure 46**: Setting Simulated Water Flow**

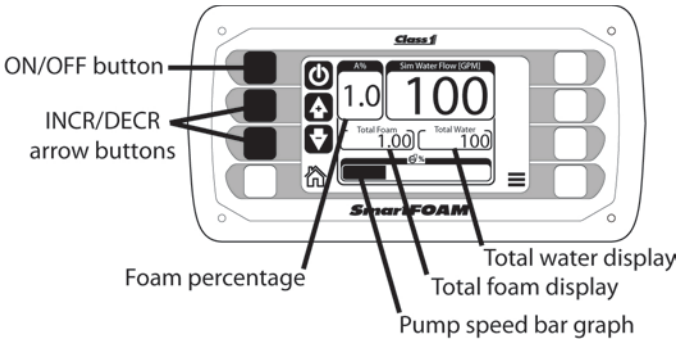


Figure 47**: SmartFOAM Buttons and Indicators**

4. Set the foam injection rate to 1.0% by pressing the INCR or DECR arrow buttons.
5. Press the ON/OFF button to energize the Hale SmartFOAM system.
    a. The Pump Speed bar graph will increase to indicate the motor is running.
    b. Observe the discharge at the bypass hose to make sure the foam pump is operating.
6. After one minute press the ON/OFF button again to stop the foam pump. Approximately one gallon (3.8 liters) of water should discharges into the container. The TOTAL FOAM display reads approximately 1.00.
7. Exit simulated water flow. Use the steps described in step 3 and Figure 46**: Setting Simulated Water Flow**.
8. Drain water from the foam tank and concentrate lines and return the bypass valve's handle to the **INJECT** position.
9. Verify operation of the flow sensor. Also calibrate the flow sensor using the calibration procedures. See "User Calibration".

This completes the Hale SmartFOAM system operation checks accomplished at the system installer facility.

Foam pump feedback calibration along with setting of user specified default simulated flow and concentrate injection rates should be accomplished upon delivery to the end user using actual end user specified foam concentrates and default values.

INSTALLATION AND DELIVERY CHECKLIST

After the Hale SmartFOAM system is installed, use the following check list to verify installation and ensure proper system setup when the apparatus is delivered to the end user.

INSTALLATION

Date	Initials	Checklist item
		❑ System properly installed. (“Start-Up Check List”)
		❑ Tank level sensor function verified. (“System Installer Start-Up”)
		❑ Foam pump operation checked. (“System Installer Start-Up”)
		❑ Foam tank and hoses drained of water. (“System Installer Start-Up”)
		❑ Flow sensor function checked and calibrated. (“User Calibration”)

DELIVERY

Date	Initials	Checklist item
		❑ Foam tank filled with user specified foam concentrate. (Complies with Hale approved concentrate compatibility list.)
		❑ Foam pump priming checked.
		❑ Water flow sensor calibration verified with Pitot and smooth bore nozzle.
		❑ Default simulated water flow value set to end user specification.
		❑ Foam preset text and injection rates set to end user specification.
		❑ Foam concentrate feedback value verified and calibrated with end user specified foam.
		❑ Proper Hale SmartFOAM system operation demonstrated to end user in accordance with manual procedures.
		❑ End user trained in proper operation of Hale SmartFOAM system in accordance with manual procedures.
		❑ Warranty registration card filled out by end user and mailed to Hale Products.
		❑ Two copies of Description, Installation, and Operation manual provided to end user.

NOTES

USER CALIBRATION

The complete Hale SmartFOAM System's foam pump and motor assembly, controller unit and flow sensor is tested at the factory before shipping to the installer. If the Hale SmartFOAM system is properly installed, further calibration IS NOT necessary until delivery to customer.

The system permits easy checking of component calibration to assure accurate operation. The calibration process verifies component calibration and allows adjustments to the flow sensor and feedback sensor display readings to allow for variations in apparatus piping configurations and end user selected foam concentrate.

Default values for simulated flow and foam concentrate injection rate may be set to end user specifications while in the calibration mode.

The SmartFOAM controller allows up to 6 user preset foam injection rates. Each preset allows for custom text and color for easy identification.

Note: The Hale SmartFOAM system is calibrated at the factory to U.S. measurement (GPM, PSI, GALLONS, etc.) units. The system may be set to Metric units (see heading "English to Metric Units"). However, the same unit of measurement must be used throughout the calibration process to ensure proper proportioning by the system.

Recalibration of the system may be required ONLY after major repairs or component changes are made to the Hale SmartFOAM foam system. Different viscosity foam concentrates may also required recalibration.

ENTERING PASSWORDS

System calibration and configuration is accomplished by accessing screens which are protected via passwords. To enter a password:

1. Press the MENU button to go to the system menu.
2. Press the Calibration/Configuration button on the system menu screen.
3. Use the touch screen keypad to enter the desired password.
    a. Press the "Enter" touch screen button to submit the password.
    b. Press the "Delete last digit" touch screen button to erase the last digit entered.
    c. Press the "Delete all digits" touch screen button to erase all of the digits entered.

When a valid password is submitted the screen will automatically change to the screen dictated by the password's value.

If an invalid password is submitted the display will show an "X" across the password window for two seconds.

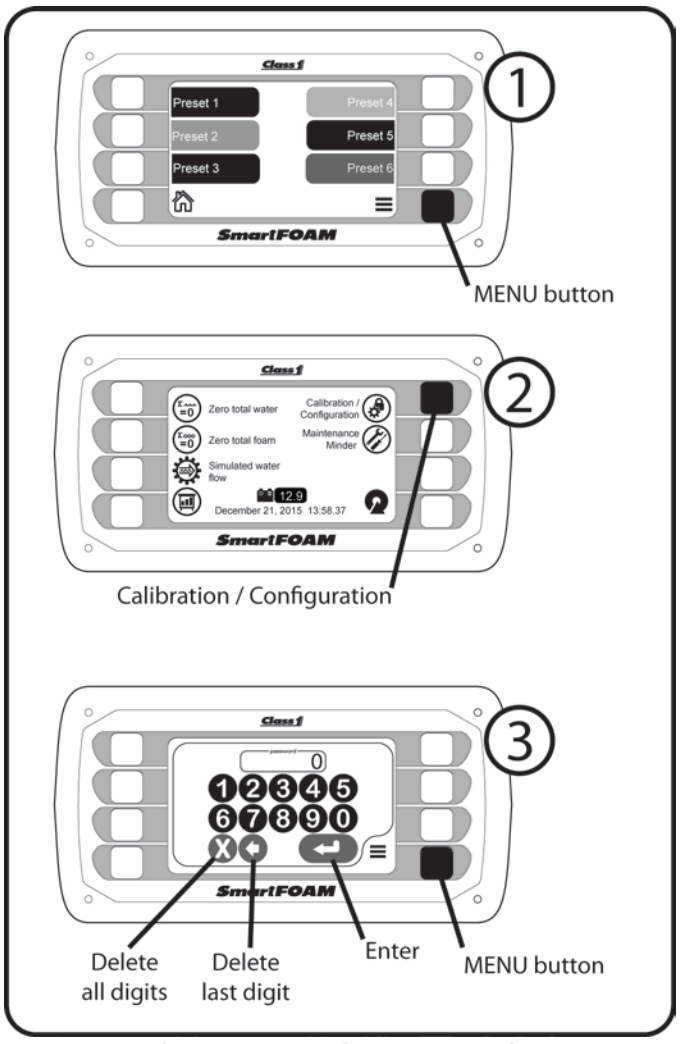


Figure 48**: Entering Passwords**

WATER FLOW CALIBRATION

IMPORTANT!

AN ACCURATE FLOW MEASURING DEVICE MUST BE USED TO MEASURE THE WATER FLOW WHEN CALIBRATING THE FLOW SENSOR. USE A SUITABLE SIZE, SMOOTH BORE, NOZZLE AND AN ACCURATE AND CALIBRATED PITOT GAUGE INSTRUMENT. HAND HELD PITOT GAUGES ARE USUALLY NOT VERY ACCURATE. MAKE SURE THE SYSTEM IS CALIBRATED WITH AN ACCURATE FLOW MEASURING DEVICE.

Enter the password "6679". The controller will show the water flow calibration screen.

Water flow calibration requires setting two calibration points: one at a high rate of flow and the second at a lower rate of flow.

These flow points are arbitrary and can be selected at any two points within the operation range of the discharge.

1. Determine the desired high rate water flow normally expected from the discharge outlet and establish flow.
    a. Make sure the water flow established is within the range of the flow sensor monitoring the discharge.

    For example, establish a flow rate of 150 GPM (568 LPM) of water through a nozzle and Pitot system. Compare the calculated flow value to the value shown on the control unit display.
2. Press the INCR/DECR buttons to set the displayed high flow value to match the actual flow through the discharge.
3. Press the SET button to associate the water flow sensor's (paddlewheel) pulse rate with the high flow value.
4. Determine the desired low rate water flow normally expected from the discharge outlet and establish flow.
5. Press the INCR/DECR buttons to set the displayed low flow value to match the actual flow through the discharge.
6. Press the SET button to associate the water flow sensor's (paddlewheel) pulse rate with the low flow value.
7. Press the SAVE button to save the flow values into non-volatile memory.

Record the calibrated values in the section below. These values can be entered manually if the controller unit ever needs to be replaced.

	Flow Rate	Flow Pulses
High rate cal		
Low rate cal		

FOAM FLOW CALIBRATION

IMPORTANT!

FOAM PUMP FEEDBACK IS CALIBRATED AFTER INSTALLATION TO VERIFY VALUES WITH THE ACTUAL FOAM CONCENTRATE BEING USED. ONLY CALIBRATE USING ACTUAL FOAM CONCENTRATES.

DO NOT USE WATER, TRAINING OR TEST FOAMS FOR FEEDBACK CALIBRATION VERIFICATION.

Enter the password "1560". The controller will show the foam flow calibration screen.

1. Set the bypass valve's handle to **BYPASS**.

2. Place a graduated measure container at the outlet of the bypass hose capable of containing the expected volume of foam concentrate: 5 gallons (19 liters) minimum.
3. Start the Hale SmartFOAM foam pump by pressing the ON/OFF button.
4. Watch the level of foam in the graduated measure container and stop the foam pump when at the desired level by pressing the ON/OFF button again.
5. Adjust the reading on the display to match the actual volume by using the INCR and DECR arrow buttons.
6. Press the SAVE button.
7. Repeat the procedure to verify that the setting is correct.
    a. Press the SAVE button again if the value was modified.
8. Set the bypass valve's handle back to **INJECT**.

Record the calibrated values in the section below.

Foam factor	

SETTING PRESETS

The SmartFOAM controller allows the department to configure up to six foam presets. Each preset allows for a different foam concentrate rate and foam tank.

Enter the password “1023”. The controller will show the preset to configure selection screen.

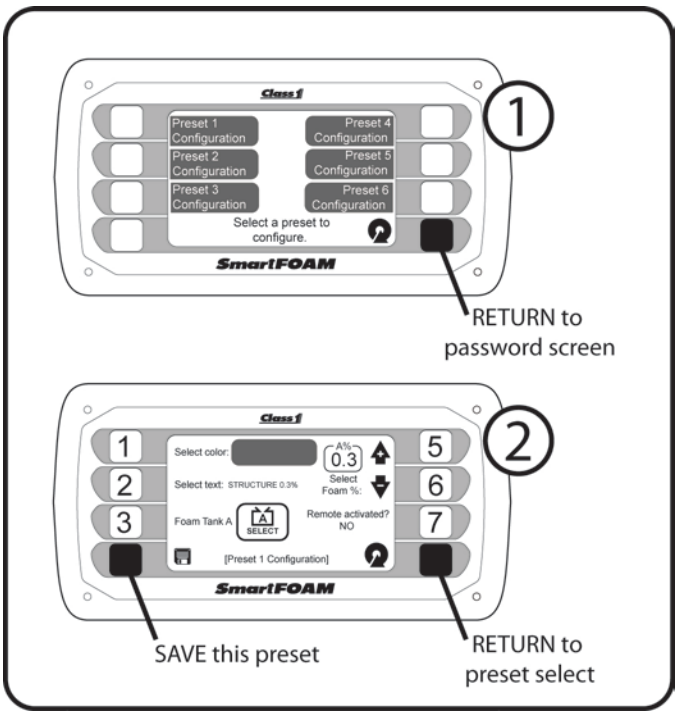


Figure 49**: Preset Configuration**

Press the button next to the preset to configure (presets 1 through 6) and the display will show the preset’s configuration screen.

- Button 1 changes the color of the preset’s bar (green, red, orange, purple, blue, or “DISABLED”).
  - “DISABLED” turns the preset OFF and it will not visible on the preset screen.
- Button 2 pops-up the onscreen keyboard so that the preset’s text can be changed.
- Button 3 toggles the preset’s foam tank (tank A or B).
- Button 5 increases the preset’s foam concentrate percentage value.
- Button 6 decreases the preset’s foam concentrate percentage value.
- Button 7 toggles the “remote activated” value (YES or NO).
  - The SmartFOAM system can be remotely activated / deactivated with an external switch. When the system is remotely activated it will use the foam concentrate percentage of the preset which has set the “remote activated?” value to “YES”. Only one preset is able to be selected for remote activation.
- The SAVE button saves the preset’s configuration items to memory.
- The RETURN button moves back to the preset to configure selection screen.

UNIT OF MEASURE

The SmartFOAM controller offers both English and Metric readouts.

The Hale SmartFOAM system is calibrated at the factory to U.S. measurement (English) units.

The unit of measure is changed within the USER menu. Enter the password “1849” to go to the USER menu.

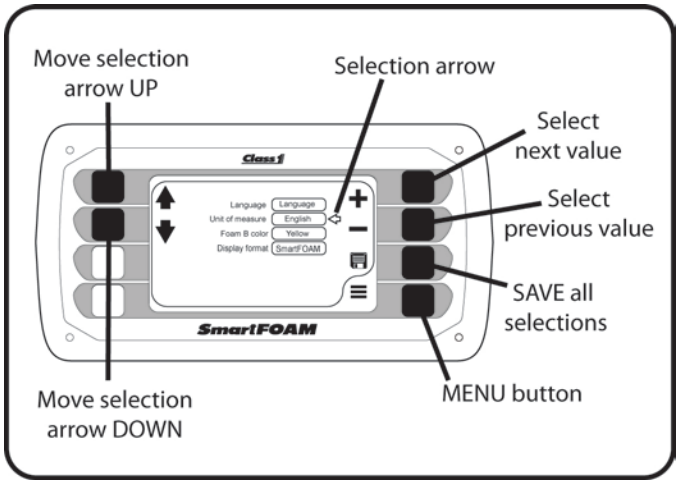


Figure 50**: User Menu**

There are four items in the USER menu: language, unit of measure, foam B color, and display format.

1. Move the selection arrow next to the “unit of measure” box by using the “move selection arrow” UP/DOWN buttons.
2. Use the “select next value” or “select previous value” buttons to change the unit of measure (English or Metric).
3. Press the “SAVE” button to save the selection to memory.
4. Press the MENU button to return to the main menu.

RELIEF VALVE

Models 1.7AHP and 2.1A
The pressure relief valve is factory tested and set to 300 PSI (21 BAR) see Figure 51**: Relief Valve - 1.7 and 2.1**.

Model 3.3
The pressure relief valve is factory tested and set to 300 PSI (21 BAR) see Figure 52**: Relief Valve – 3.3, 5.0, and 6.5**.

Model 5.0 and 6.5
The pressure relief valve is factory tested and set to 400 PSI (28 BAR) see Figure 52**: Relief Valve – 3.3, 5.0, and 6.5**.

During normal installation and operation, the relief valve does not require adjustment.

If adjustment is necessary during field installation, contact Hale Products Inc. at 610-825-6300 for Relief Valve Service information.

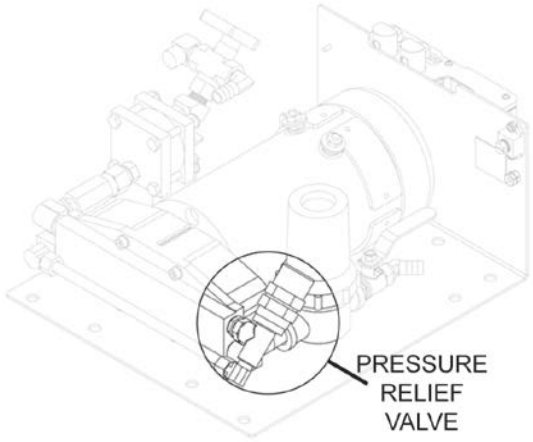


Figure 51**: Relief Valve - 1.7 and 2.1**

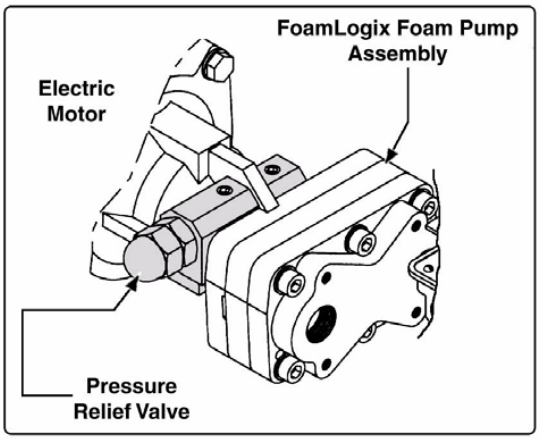


Figure 52**: Relief Valve – 3.3, 5.0, and 6.5**

OPERATION

DESCRIPTION

Operation of Hale SmartFOAM systems is controlled by the UltraView SmartFOAM controller display. The Hale SmartFOAM system constantly monitors water and foam concentrate flow values, maintaining 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.

On initial power up of the apparatus, the Hale SmartFOAM system begins a brief self-diagnostic routine (see Figure 44**: Controller Unit Initialization**). When completed, the system enters the preset screen and waits for operator action.

PRESET SCREEN

The SmartFOAM system initializes to the preset screen. The preset screen allows the operator to choose any one of the six presets to start the system and show the operation screen. The HOME button goes to the operation screen. The MENU button goes to the main menu.

OPERATION SCREEN

The operation screen shows all of the pertinent operating parameters: foam concentrate percentage, water flow rate, total foam flowed, total water flowed, and motor percent effort bar graph. The operation screen also allows the operator to turn the system ON/OFF with the ON/OFF button and to change the foam concentrate percentage with the INCREASE/DECREASE foam percent buttons. The HOME button goes back to the preset screen. The MENU button goes to the main menu.

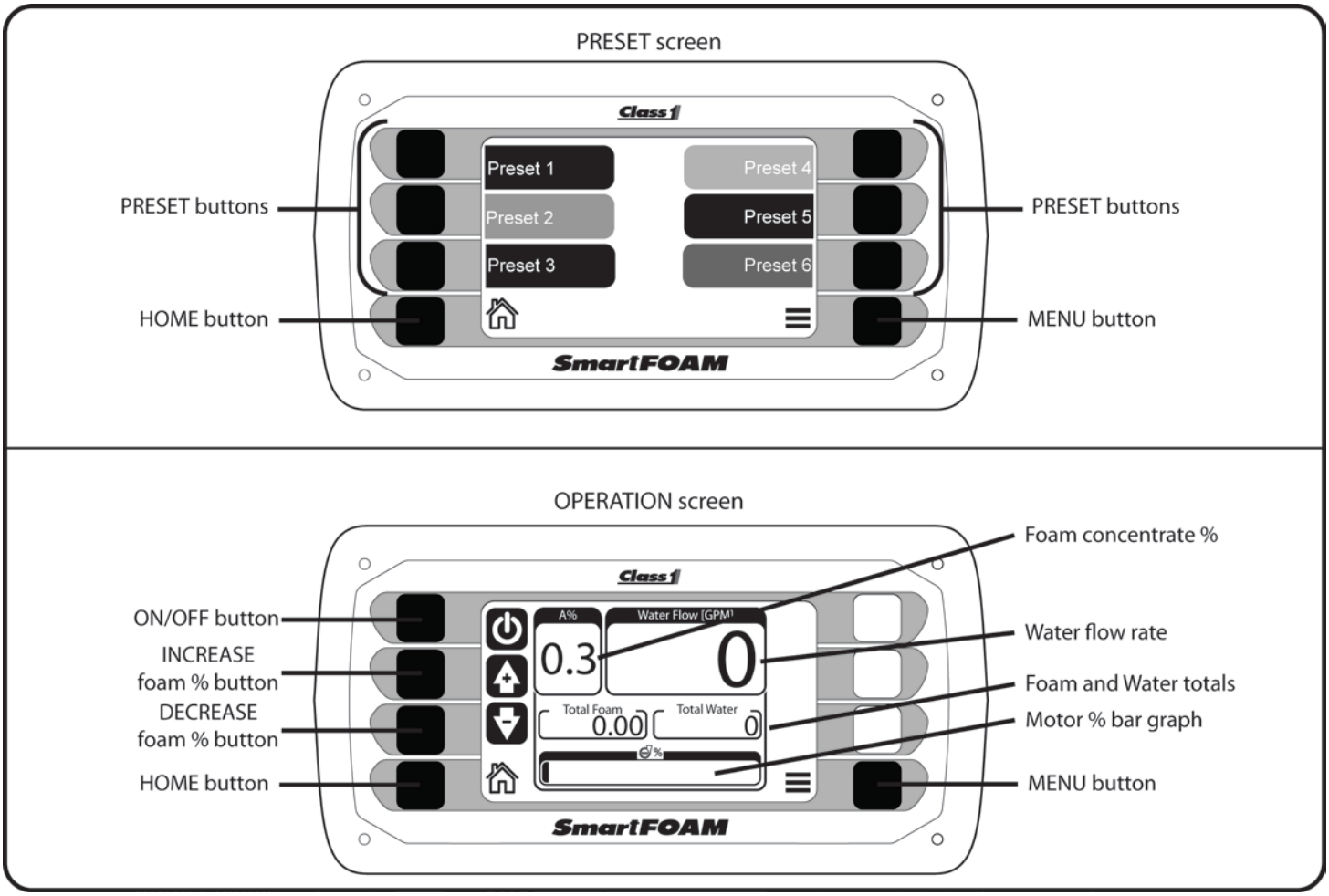


Figure 53**: Preset and Operation Screens**

The display's border color on the operation screen indicates the system's power condition and the foam concentrate tank currently selected.

Gray - the system is currently OFF.
Green - the system is currently ON and foam tank A is selected.
Yellow - the system is currently ON and foam tank B is selected (the foam B color is selectable in the USER menu to be either red or yellow).
Red - the system is currently ON and foam tank B is selected (the foam B color is selectable in the USER menu to be either red or yellow).

When the ON/OFF button is pressed the border color will change from gray to green (or yellow/red). If water flow is present the foam pump starts and injects foam concentrate into the discharge stream.

Note: If the operation screen was entered by pressing one of the preset buttons then the foam system will be ON.

The bar graph lights when foam is being injected and indicates system capacity.

When the ON/OFF button is pressed again the border color will change to gray indicating that the system is in STANDBY mode and the foam pump STOPS. However, other system monitoring functions continue (water flow rate, total water flowed).

DISPLAYED INFORMATION

Water Flow
The water flow display shows the current flow rate of water of foam solution per minute in the Hale flow sensor monitored discharges. The flow rate is determined by the paddlewheel flow sensor rate and the water flow calibration factor.

Foam Concentrate Percent
The foam concentrate percent display shows the foam concentrate injection rate setting (0.1% to 9.9%).

Total Water Flow
The total water flow display shows the total amount of water or foam solution pumped through the flow sensor monitored discharges. This totalized value may be reset in the main menu. It is also reset any time the SmartFOAM controller power is disrupted.

Total Foam Flow
The total foam flow display shows the total amount of foam concentrate pumped for the currently selected foam tank. This totalized value may be reset in the main menu. It is also reset any time the SmartFOAM distribution box power is disrupted.

Motor Percent Bar Graph
The bar graph indicates what capacity of the motor is currently being used to inject the foam concentrate from 0% to 100%. The bar graph fills from the left (0%) to the right (100%).

When water is flowing the bar graph begins showing to indicate foam concentrate is being injected. The amount of bar graph showing provides an indication of the approximate pump capacity being used.

RESET WATER/FOAM TOTALS

The totalized values for water and foam concentrate pumped are cleared from memory by using the Reset (Zero) Total buttons in the main menu.

Enter the main menu by pressing the MENU button from the preset or operation screen.
Press the Reset Total Water and/or Reset Total Foam buttons.

Note: These totals are also automatically reset any time the system power is disrupted.

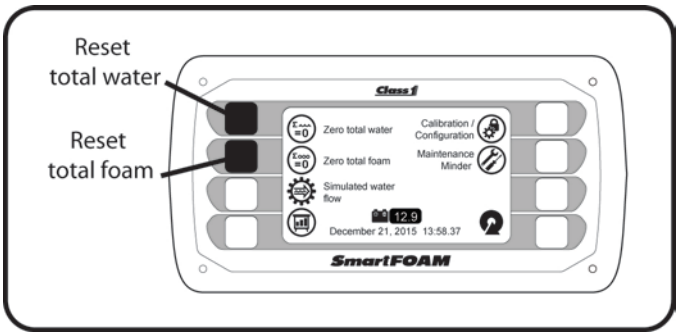


Figure 54**: Reset Water/Foam Totals**

FOAM CONCENTRATE INJECTION RATE

The foam concentrate injection rate can be changed by pressing the HOME button to go back to the preset screen and select another preset OR by pressing the INCREASE/DECREASE foam percent buttons on the operation screen.

WARNING MESSAGES

Several safety features are incorporated into the Hale SmartFOAM system to protect the foam concentrate pump, electric motor and apparatus wiring while maintaining personnel safety.
Messages appearing on the display alert the operator to adverse conditions that could cause damage to Hale SmartFOAM system components, the apparatus, or which could cause personnel injury.
The messages appear on a colored warning ribbon (red or blue) at the bottom of the screen.

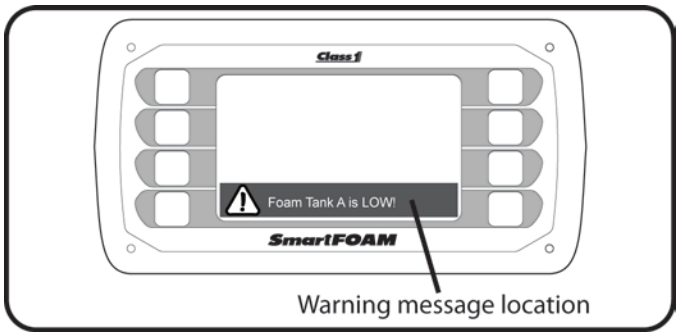


Figure 55**: Warning Message Location**

This warning ribbon also contains an icon to inform the operator of the severity of the warning.

Informational

Caution

Operation Halted

The warning ribbon will contain text informing the operator of what has happened, what will happen, or what the operator needs to do.

A warning message may be dismissed by pressing the screen anywhere on the warning ribbon. If the warning is still active the warning message will appear again after the inhibit time has expired (default is 60 seconds – configurable in the OEM menu).

Low Foam Tank Level

The Hale SmartFOAM foam pump is interlocked with the foam concentrate tank level switch. When the low level switch is activated (foam tank is empty) the low tank caution message will be shown and the foam pump will continue to run for 60 seconds. At the 60 second limit the system and pump will be forced OFF and the foam is empty operation halted message will be displayed.
If the ON button is pressed before refilling the foam tank, the system runs for 30 seconds before shutting down again and showing the foam is empty operation halted message.

Foam Priming Error

In the event there is no foam feedback signal being received when the foam pump starts (indicating a lack of foam concentrate flow) the foam pump motor ramps up to full speed attempting to establish foam concentrate flow. The attempting to prime caution message will appear informing the operator how many seconds the system will continue to run before shutting down due to loss of foam prime.

If the system operates for a period of 35 seconds (configurable in the Factory menu) without a feedback signal the system turns itself OFF and shows the loss of prime operation halted message.

PRIMING THE FOAM PUMP

In some instances, the foam tank may run dry while operating the Hale SmartFOAM system. The foam pump is designed to pump liquid. When the fire pump is running the foam pump may not pump efficiently against 100 to 150 PSI (7 to 10 BAR) back pressure. To re-establish foam concentrate flow quickly the following procedure is used.

1. Turn the bypass valve to the BYPASS position.
2. With the fire pump flowing water from foam discharge and the Hale SmartFOAM ON, observe the hose from the bypass valve.
3. When foam concentrate flows from the hose turn the bypass valve back to the INJECT position.
4. The pump is now primed and ready for normal operation.

NORMAL OPERATION SUMMARY

Refer to Figure 53**: Preset and Operation Screens** for images of the preset and operation screens and their associated buttons.

1. Energize the system.
    a. Apply power to the apparatus. The SmartFOAM controller initializes and shows the preset screen.
2. Select foam tank (excluding 1.7AHP and 2.1A systems).
    a. If the system is equipped with dual foam tanks, place the selector to the desired tank.
3. Begin foam injection.
    a. Establish water flow and then press one of the preset buttons on the preset screen. Operation may also be started by pressing the HOME button to go to the operation screen and then press the ON button.
4. Change injection rates.
    a. Use the INCREASE/DECREASE buttons on the operation screen OR press the HOME

button to go back to the preset screen and choose another preset.

5. Read total water/foam usage.
    a. Read the total displays on the operation page.
6. Reset totalized values.
    a. Press the MENU button to go to the main menu and press the reset water/foam total button(s).
7. End foam injection.
    a. Press the OFF button on the operation screen. The system will stop the foam pump and the display borders will change to gray to indicate the system is OFF.

SIMULATED FLOW OPERATION

The Simulated Flow mode of the Hale SmartFOAM system allows operation of the foam pump without discharging water through a foam capable discharge or when the flow sensor is not functioning.
The simulated flow mode is used for draining the foam tank for:

- ❑ Cleaning
- ❑ Checking calibration of the feedback sensor
- ❑ Verifying foam pump operation
- ❑ Manually controlling foam injection if the flow sensor malfunctions.

The factory default simulated flow rate is 150 GPM (568 LPM). The foam concentrate injection percentage rate is set by the rate adjustment buttons on operation screen of the SmartFOAM controller.

The simulated flow function provides manual operation of the foam injection system required by NFPA standards.

CAUTION!

WHEN OPERATING THE HALE SMARTFOAM IN SIMULATED FLOW MODE AN OUTLET FOR THE FOAM CONCENTRATE MUST BE PROVIDED TO PREVENT EXCESSIVE PRESSURE BUILDUP IN DISCHARGE PIPING OR HOSES.

SIMULATED FLOW SEQUENCE

Refer to Figure 46**: Setting Simulated Water Flow** for image steps of how to start simulated water flow.

1. Uncoil and place the end of the bypass hose into a suitable container to collect the foam concentrate.
2. Place the BYPASS valve in the **BYPASS** position.
3. Energize the apparatus electrical system.

4. Place the system in simulated flow mode:
    a. Press the MENU button.
    b. In the menu select the “simulated water flow” button.
    c. In the simulated water flow screen press the ON/OFF button to toggle simulated water flow. The icon indicates the current state.
    d. Set the simulated flow to the desired rate by using the INCR/DECR buttons.
    e. Press the MENU button to return to the menu.
    f. Press the RETURN button to return to the operation screen.
5. Press the ON button on the operation screen. The SmartFOAM system begins operation and the display border change from gray to green, yellow, or red (depending on the tank selected).
6. Foam concentrate flows out of the end of the bypass hose.

TO END SIMULATED FLOW

1. First press the OFF button on the operation screen to STOP the foam pump.
2. Take the system out of simulated flow mode:
    a. Press the MENU button.
    b. In the menu select the “simulated water flow” button.
    c. In the simulated water flow screen press the ON/OFF button to toggle simulated water flow. The icon indicates the current state.
    d. Press the MENU button to return to the menu.
    e. Press the RETURN button to return to the operation screen.
3. De-energize the apparatus electrical system.
4. Place the bypass valve to the INJECT position.
5. Secure bypass hose in the appropriate compartment.
6. Return apparatus to normal ready condition.

DUAL TANK SYSTEM SELECTION

The following procedures are provided for operation with the Hale ADT or MDT II Selectors.

CAUTION!

UNLESS ENGAGED IN CLASS "B" FOAM OPERATIONS, THE HALE SMARTFOAM ADT TOGGLE SWITCH OR HALE SMARTFOAM MDT II SELECTOR HANDLE MUST BE IN THE TANK "A" POSITION. IF THE TOGGLE SWITCH OR SELECTOR HANDLE IS IN THE FLUSH POSITION WHEN THE FOAM PUMP IS STARTED, THE FOAM PUMP RUNS FOR ONLY TWENTY (20) SECONDS, THEN SHUTS DOWN.

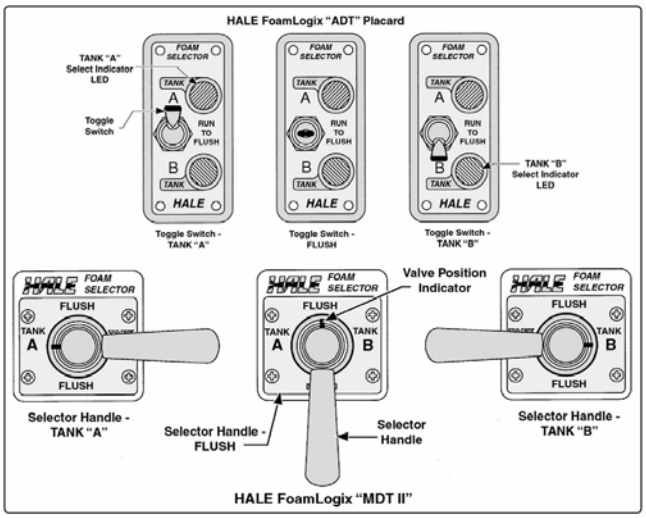


Figure 56**: Dual Tank Selector Operating Positions**

Make sure the Hale SmartFOAM is operating and foam solution is being discharged (see Figure 56**: Dual Tank Selector Operating Positions**).

1. Set the Hale ADT toggle to the desired TANK, or turn the Hale SmartFOAM MDT II handle until the indicator points toward the desired TANK.
2. When changing toggle switch or selector handle position, move smoothly from the TANK **"**A" position through the FLUSH position to TANK "B" position in one motion without stopping. With the fire pump discharging water and the Hale SmartFOAM operating, a small volume of water is provided to separate the two foam types helping to prevent possible adverse reactions.
3. After completion of Class "B" foam operations, briefly FLUSH the foam pump and return the Hale SmartFOAM to the ready condition by returning to the TANK "A" position and flowing a small amount of Class "A" foam concentrate.

IMPORTANT!

MAKE SURE THE HALE SMARTFOAM DUAL TANK SYSTEM IS IN THE TANK "A" POSITION WHEN APPARATUS IS PLACED IN THE READY CONDITION.

The SmartFOAM controller keeps track of which foam has been selected via the selector handle and if that foam has been run through the pump (see Figure 57**: SmartFOAM Foam in Pump Indicator**). The small round icon in the bar graph indicates what foam is currently in the pump: A, B, or CLR.

The SmartFOAM will display a warning message indicating that a FLUSH operation must be performed if the operator switches from one tank to the other without first FLUSHING. The SmartFOAM controller will not allow operation of the new tank until a FLUSH operation is performed.

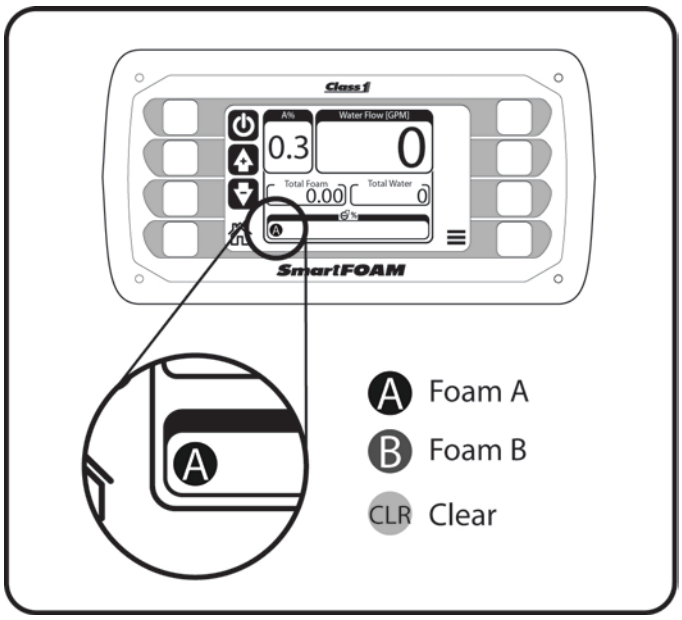


Figure 57**: SmartFOAM Foam in Pump Indicator**

FLUSHING THE SMARTFOAM SYSTEM

When returning the apparatus to the ready condition after foam operations using Class “B” foam, the Hale SmartFOAM foam pump must be FLUSHED. Some Class “B” foam concentrates deteriorate rapidly and residue cannot be left in the lines.

***Note**: Approved Class “A” foam concentrates do not deteriorate rapidly like Class “B” concentrates. As long as an approved Class “A” foam concentrate is used and the system is operated within 10-12 weeks no flushing is required. When Class “B” foam concentrate is used, always FLUSH the system, then switch back to Class “A” (see Figure 56**: Dual Tank Selector Operating Positions** and Figure 58**: Hale MST Selector Operation**).*

1. Energize the apparatus and establish water flow through a foam capable discharge. Set the fire pump for a LOW discharge pressure, 50 to 75 PSI (3.4 to 5.2 BAR).
2. Energize the Hale SmartFOAM by pressing the ON button, allowing foam solution to discharge.

   ***Note**: When the Hale ADT, MDTII or MST is in the FLUSH position the Hale SmartFOAM foam injection system runs for about twenty (20) second.*

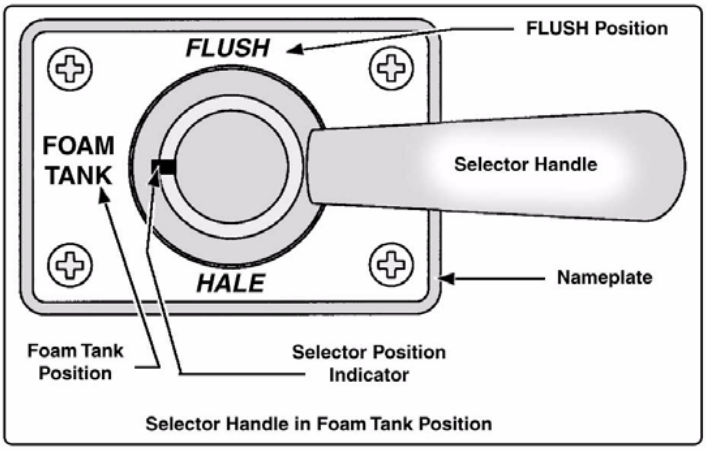


Figure 58**: Hale MST Selector Operation**

3. Place the Hale ADT, MDT II or MST to the FLUSH position (see Figure 58**: Hale MST Selector Operation**).
4. Observe the discharge hose and allow Hale SmartFOAM and discharge to run for several seconds.
5. After several seconds place the Hale ADT or MDT II to the TANK “A” position and allow the system to run until all foam solution is discharged through the foam capable hose line.

   ***Note**: When the Hale MST is used for Class “B” foam concentrates DO NOT allow the foam pump to run in the FOAM TANK position after flushing foam pump.*
6. Place the Hale MST to the FOAM TANK position and allow Hale SmartFOAM to run until Class “A” foam solution is discharged through the foam capable hose line. If Class “B” foam concentrate is used, shut down Hale SmartFOAM immediately after switching to the FOAM TANK position.
7. Shut down Hale SmartFOAM allowing the foam capable discharge to continue to flush out the fire pump discharge manifold as required. Once clear water flows, close foam capable discharge and shut down the apparatus.
8. Perform required maintenance checks on the Hale SmartFOAM and apparatus to return the apparatus to the ready condition.

IMPORTANT!

MAKE SURE THE HALE ADT OR MDT II IS IN THE TANK “A” POSITION AND THE HALE MST IS IN THE FOAM TANK POSITION WHEN APPARATUS IS PLACED IN THE READY CONDITION.

REMOTE ON/OFF SWITCH OPERATION

The remote ON/OFF switch is used to activate the Hale SmartFOAM system from the driver compartment or a location other than the SmartFOAM controller display. The switch activates and deactivates the Hale SmartFOAM system. It does not permit adjustment of the injection rate.

The SmartFOAM system will use the injection rate of the preset set for “remote activattion” (see the **SETTING PRESETS** section). If no preset has the “remote activation” enabled then the injection rate used will be the current set rate on the SmartFOAM controller.

See Figure 43**: Remote Activation Switch Installation Dimensions**.

To operate:

1. Press the switch down and release to activate. The LED turns ON SOLID, indicating the Hale SmartFOAM is in the STANDBY mode (see Figure 59**: Remote Activation Switch**).

2. When the foam capable discharge nozzle is opened the LED BLINKS, indicating foam concentrate is being injected. When the nozzle is closed, the LED stops blinking and again turns ON SOLID.

3. Pressing the switch again deactivates the Hale SmartFOAM system and the LED turns OFF.

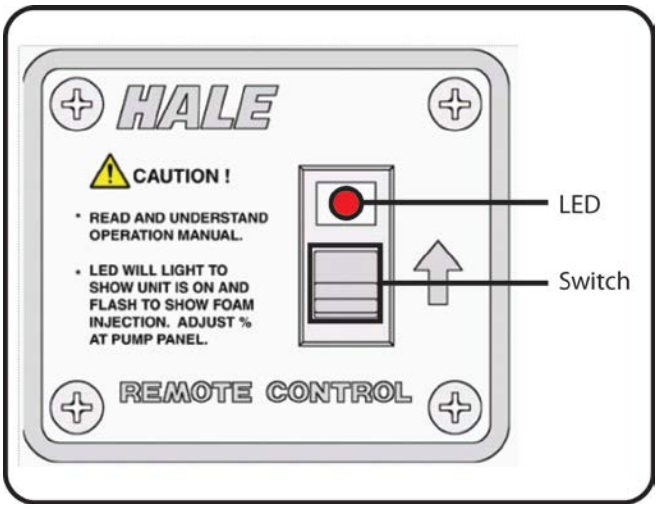


Figure 59**: Remote Activation Switch**

LED indications:

ON SOLID - The SmartFOAM system is enabled but waiting for water flow before injecting foam.

BLINKING - The SmartFOAM system is enabled and currently injecting foam.

OFF - The SmartFOAM system is disabled.

NOTES

MAINTENANCE

MAINTENANCE PROCEDURES

- ❑ **After each use**
  Inspect wiring, hoses, flow sensors and connections for tightness, corrosion, leaks and/or damage.
  Flush foam pump if a non-approved foam concentrate is used. (Refer to the "Hale Foam Concentrate Compatibility" document for a list of tested and approved foam concentrates).

- ❑ **Monthly**
  Remove and clean the foam strainer screen. Flush as required.

- ❑ **Monthly**
  Verify water flow calibration.

- ❑ **Every two (2) months**
  If an approved foam concentrate has been left in the system, operate foam system to remove the foam concentrate and prevent gelling.

- ❑ **Annually**
  Verify foam feedback calibration.

ON-SCREEN MAINTENANCE MINDER

The SmartFOAM controller keeps track of the maintenance intervals automatically through the on-screen maintenance minder. The maintenance minder can be viewed by going to the main menu and then selecting the "Maintenance Minder" button.

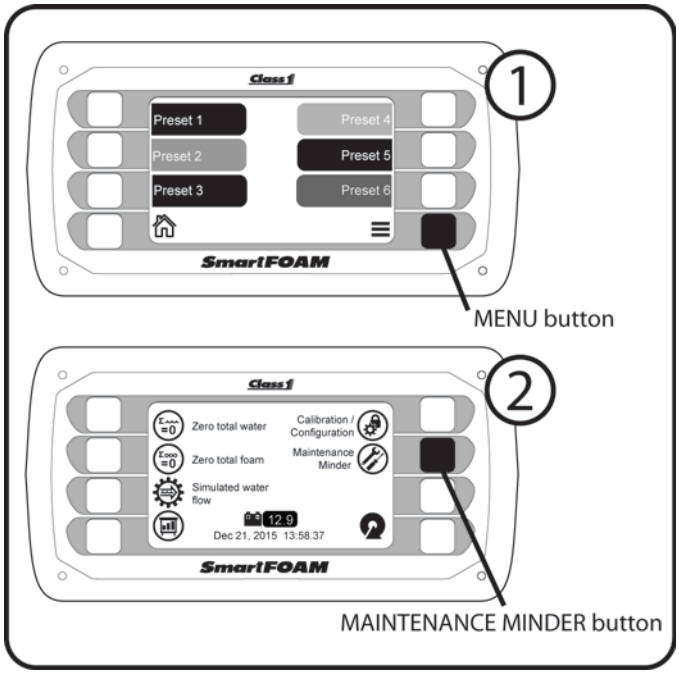


Figure 60**: Navigate To Maintenance Minder Screen**

The Maintenance Minder screen contains three intervals: one month, 2 months, and 12 months. The screen shows the due date of each interval and a pie chart for a visual indication of how much time is remaining before the interval maintenance is due.

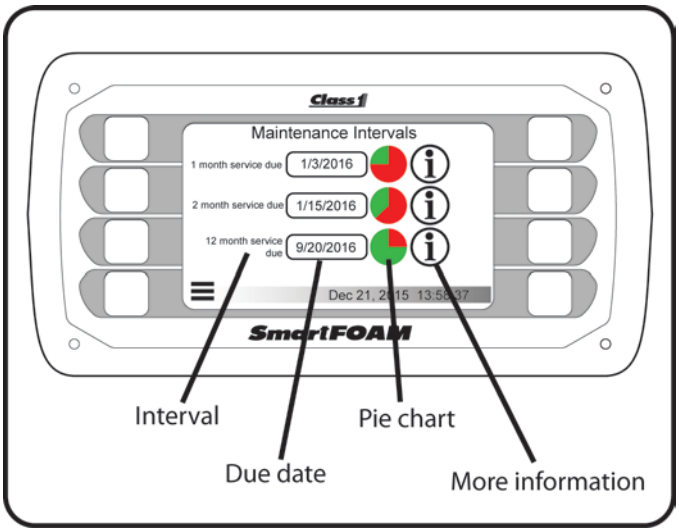


Figure 61**: Maintenance Minder Screen**

Maintenance Due Indication

When interval maintenance is due the due date will show the word "DUE" and its pie chart will be entirely red. Touch the "i" icon of a maintenance interval to see what maintenance is required.

The SmartFOAM controller will display a full screen message if maintenance is due when the system is energized. This is just a reminder to check the maintenance minder page and complete the required maintenance. Touch anywhere on the screen or any button to dismiss this message (it will not appear again until the system is re-energized).

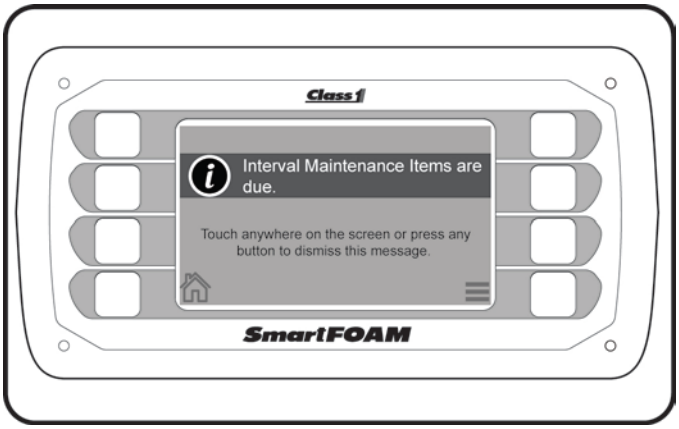


Figure 62**: Maintenance Minder Warning**

Resetting Maintenance Interval Due Dates

Maintenance intervals are reset by entering the password "9999" in the password entry screen (Calibration/Configuration button in the main menu) and then the SmartFOAM controller will show the maintenance minder screen with the maintenance reset icons present. Touch the Maintenance Reset icon next to the maintenance interval desired and the date will be updated.

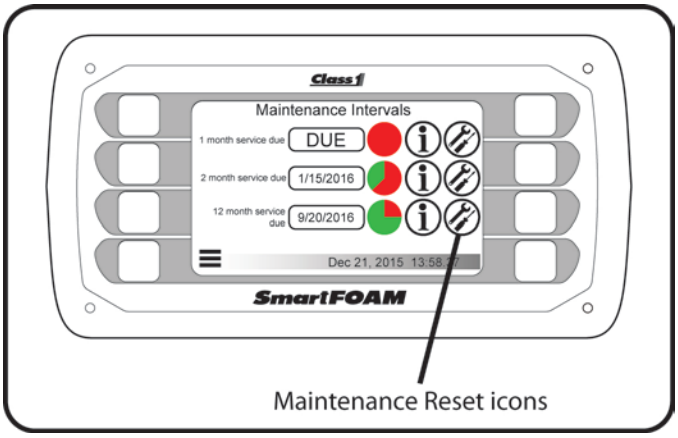


Figure 63**: Maintenance Reset Icons**

FREEZE PROTECTION

Cold weather transport and cold weather storage of SmartFOAM systems:

When transporting the completed fire apparatus from the OEM to the dealer, and the dealer to the end-user, or, when the end- user decides to store the finished apparatus in an unheated area subject to below freezing temperatures, a SmartFOAM winterization process must be used.

Any water and/or foam concentrate that is in the foam concentrate reservoir, foam concentrate pump, and associated foam system piping/tubing will freeze and then break system components when the system is subjected to subfreezing temperatures commonly found in over-the-road driving during fire truck delivery and transport. The following precautions must also be taken by OEMs, end-users, re-sellers, fire truck dealers, transport agencies, etc., that will be transporting and/or storing the apparatus in below freezing temperatures:

1. Drain the foam concentrate storage reservoir in accordance with safe foam concentrate handling practices as outlined by the foam concentrate manufacturer. If the foam reservoir is filled with only water, completely drain the storage compartment of water. After empty, close all drain valves.

2. Pour in five gallons (18.93L) of an appropriate antifreeze solution in the foam concentrate reservoir. Consider using an environmentally friendly biodegradable formulation.
3. Follow the Installation and operation manual procedure to "prime" the foam pump.
4. With the apparatus fire pump in gear, a water supply established, and a discharge hose and nozzle attached to the discharge side of the fire pump, discharge over 100 GPM (380 LPM) from a foam capable discharge.
5. Turn the SmartFOAM system ON.
6. Set the foam proportioning rate to 3.0%.
7. Continue to discharge water out of the discharge hose for one-minute.
8. Shut the SmartFOAM system OFF.
9. Shut off the discharge valve and shut the fire pump down. Remove the water supply connection to the fire pump.
10. Drain the fire pump, valves and fire pump system accessories.

The foam system is now winterized and ready for cold weather duty transport and/or cold weather storage.

After transport, prior to the placing the unit in service:

1. Drain the foam concentrate reservoir of antifreeze in an environmentally friendly fashion.
2. Shut all foam reservoir drain valves.
3. Fill the foam reservoir with a Hale approved compatible Class A foam concentrate.
4. Establish a water supply to the fire pump and install a discharge hose and nozzle.
5. Operate the fire pump and discharge 100 GPM (380 LPM) of water from a foam capable apparatus discharge. Be sure to collect the discharge in an area, to be cleaned-up later, to mitigate any environmental impact that the anti-freeze / foam solution may cause.
6. Turn the foam system ON.
7. Set the foam injection rate to 3.0%.
8. Operate the discharge hose for one minute.
9. Shut the foam system OFF. Turn the fire pump OFF. Remove the hose and nozzle. Disconnect the water supply.
10. The unit is now ready for service.

TROUBLESHOOTING

USER DIAGNOSTICS

Diagnostic LED indicators are provided on the distribution box and on the feedback sensor. The LED on the feedback sensor flashes when the sensor is receiving pulses from the flow sensor rotor targets. These LEDs help to ease tracing of power supply faults and eliminates some of the guesswork in troubleshooting. If the system malfunctions make sure the following conditions are checked:

- ❑ All hose connections are correct and tight (Refer to appropriate system plumbing diagram in the INSTALLATION section).
- ❑ All electrical connections are correct and tight (Refer to appropriate system electrical diagram in the INSTALLATION section).
- ❑ Apparatus electrical system energized with power supplied to pump panel and Hale SmartFOAM controller.

Once the above conditions are met, proceed to the system troubleshooting section to determine the cause of the malfunction.

Hale SmartFOAM systems consist of individual subsystems working together to provide finished foam solution at the proper percentage. Also see the SYSTEM OVERVIEW section.

The system is designed using modular components making troubleshooting and repair easier. Each subsystem has its own set of troubleshooting procedures. The procedures that follow provide a logical flow path to isolate and correct a system failure.

Note: *Hale SmartFOAM system electronic components have no user serviceable components inside and are replaced as a unit. Opening of Hale SmartFOAM electronic components voids the manufacturer warranty.*

System Overview

The SmartFOAM proportioner is a closed-loop system. The "brain" behind the system is the computer-controlled SmartFOAM Controller Display. A basic understanding of how the system functions makes troubleshooting easier (refer to Figure 64**: Closed Loop Control Diagram** while reading the following control steps).

1. Water flows through the discharge manifold and past the water flow sensor spinning its paddlewheel.
2. The water flow sensor sends the raw digital pulses to the water flow sensor module.
3. The water flow sensor module transmits the raw water flow rate to the SmartFOAM controller display via CAN communication.
4. The SmartFOAM controller display calculates the desired foam flow rate based on the water flow rate and the currently set foam concentrate percentage. The SmartFOAM controller display transmits a requested motor rate (0% to 100%) to the distribution box via CAN communication.
5. The distribution box sends pulse-width-modulated control voltage (0% to 100%) to the motor which turns the pump at the desired speed.
6. The pump begins discharging foam concentrate into the discharge manifold where it mixes with the water.
7. The foam sensor detects the foam concentrate flowing past the target rotors and sends the raw digital pulses to the distribution box.
8. The distribution box sends the foam flow rate to the SmartFOAM controller display where it is evaluated and the process starts again at step 1.

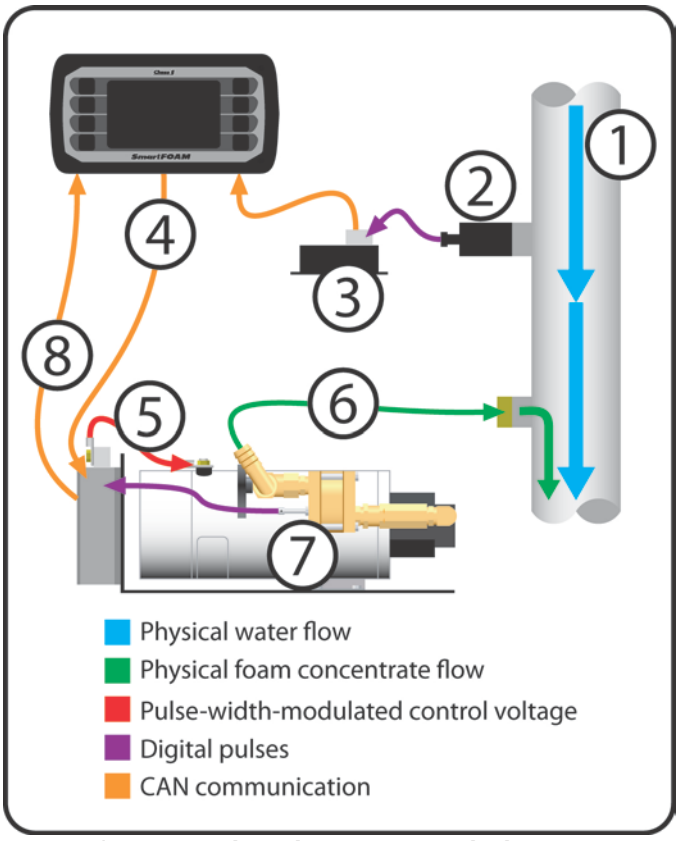


Figure 64**: Closed Loop Control Diagram**

Note: *The SmartFOAM system has a simulated flow function described in the SIMULATED FLOW OPERATION section. This allows troubleshooting without flowing water yet simulates an actual water flow.*

Distribution Box

The Distribution Box (part of the pump/motor assembly) controls the speed of the pump/motor based on commands from the SmartFOAM controller display. The distribution box also receives the signal from the foam feedback sensor, low tank sensor(s), and tank selector and relays that information back to the SmartFOAM controller display.

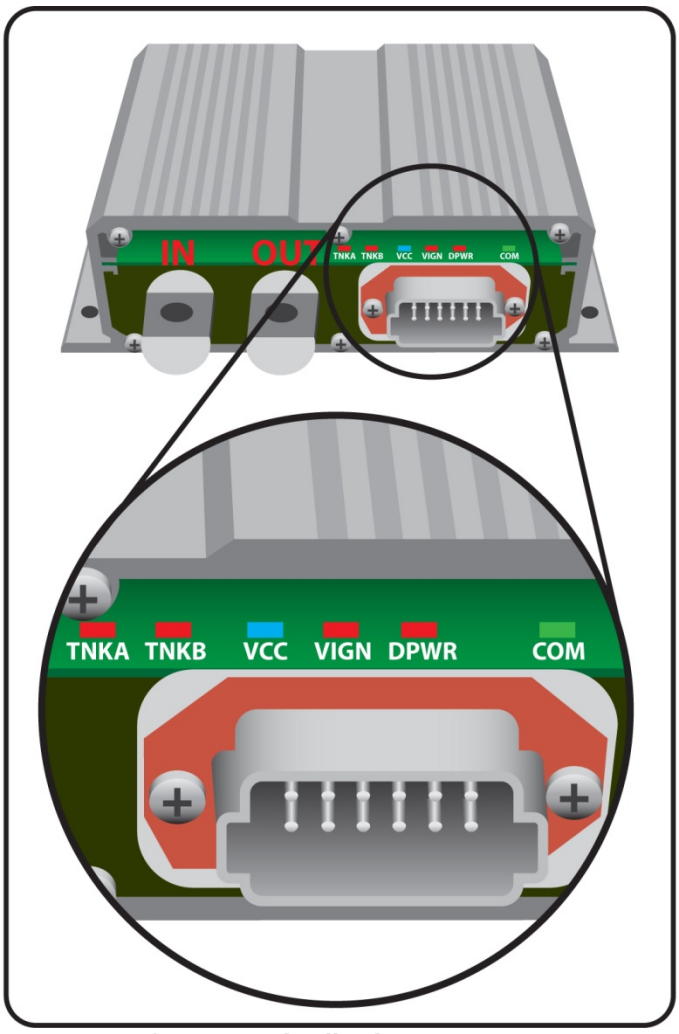


Figure 65**: Distribution Box LEDs**

The distribution box contains six internal LEDs to help with diagnostics (refer to Figure 65**: Distribution Box LEDs**).

- **TNKA** is illuminated when the tank selector is set to "tank A". This is based on a physical input into pin 4 of the gray connector on the front of the distribution box. *(When the TNKA and TNKB LEDs are OFF the system is in FLUSH mode).*
- **TNKB** is illuminated when the tank selector is set to "tank B". This is based on a physical input into pin 5 of the gray connector on the front of the distribution box. *(When the TNKA and TNKB LEDs are OFF the system is in FLUSH mode).*
- **VCC** is illuminated when power and ground are applied to the distribution box's pins 1 and 12. This indicates that the internal 5 volt regulator is functioning for the internal components.
- **VIGN** is illuminated when power and ground are applied to the distribution box's pins 1 and 12. This indicates that system power and ground are recognized within the unit.
- **DPWR** is illuminated when the "IN" power stud is energized with system voltage. This power is required to drive the motor attached to the pump.
- **COM** is illuminated when the distribution box is communicating with the SmartFOAM controller display via the CAN. This LED with be flashing if there is a CAN communication problem and it cannot communicate with the SmartFOAM controller display.

If no tank selector (MST, MDTII, ADT) is used a connector plug is installed to connector C8 to lock the system in the Tank A mode. (See Figure 35**: SmartFOAM Harness Connections**). Removing this plug or disconnecting the tank selector cable places the system in the FLUSH mode.

Pump/Motor

The discharge of the foam pump directs foam to the rotary lobe flow meter. The rotors are a composite material containing small stainless steel targets. As the foam is being pumped these targets are detected by the inductive sensor which sends pulses to the distribution box. An LED indicator on the inductive sensor flashes as a target passes the tip of the sensor. The speed of the foam being pumped determines how quickly the rotors are turning and how quickly the inductive sensor's LED flashes (which could be so fast that the indicator light actually appears to be constant).

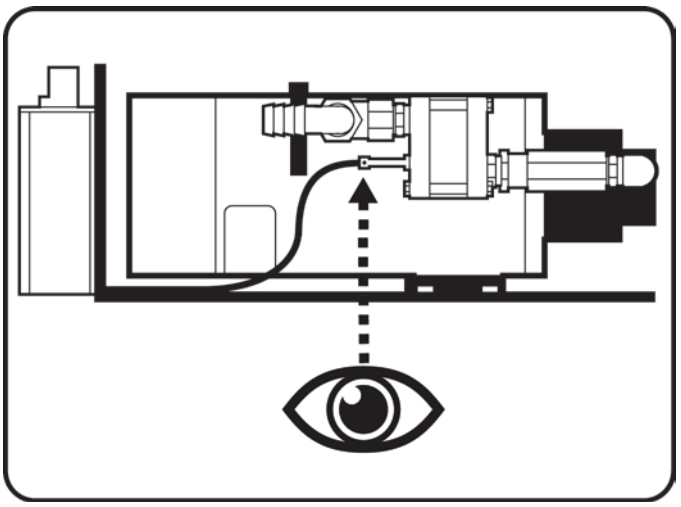


Figure 66**: Inductive Sensor Indicator LED**

SmartFOAM Controller Bar Graph

The bar graph on the SmatyFOAM controller display indicates the system capacity and is a good troubleshooting tool.

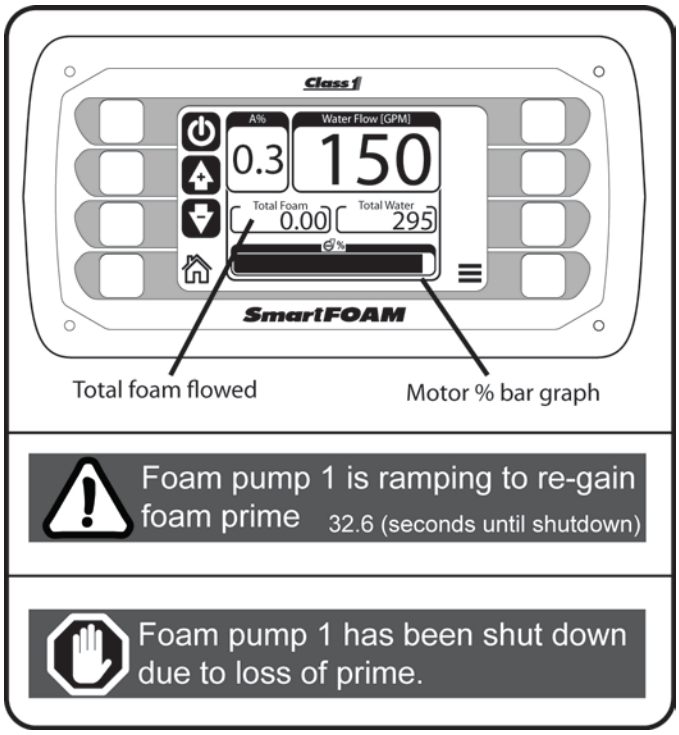


Figure 67**: Bar Graph and Warning Messages**

If the SmartFOAM controller display does not see foam feedback data indicating that foam is being pumped, the bar graph will increase to 100% (full scale) because the controller is commanding the pump to turn fast in an attempt to prime it and achieve the proper foam concentrate flow.

If the display does not receive data that foam concentrate is flowing, it displays “ramping to re-gain foam prime” caution message. This message also displays the number of seconds until the pump will be turned OFF if prime is not established. If the timer times out then the “foam pump shut down” operation halted message will appear. Pressing ON button starts the cycle again.

The Total Foam flow display is useful in this scenario to determine if the foam sensor is detecting any foam flow.

PROBLEM ISOLATION

SmartFOAM replacement parts are “plug and play” type devices that do not require specialized equipment to service. Normal water flow and foam calibration is usually necessary after a major component service.

The first step in troubleshooting is to determine which subsystem caused the system failure. To make this determination operate the apparatus and Hale SmartFOAM system in accordance with standard operating procedures and isolate where the problem occurs.

1. Setup the apparatus for normal operation.
2. Power-up the apparatus and energize the pump operator panel. Take notice of the Hale SmartFOAM control unit. If the display is NOT illuminated check for power and ground voltage on the SmartFOAM controller’s “B” connector.
3. If the Hale SmartFOAM controller is illuminated, engage the apparatus water pump and establish discharge. If water flow CANNOT be established, troubleshoot the water pump system.
4. If there is no indication of water flow on the control unit display troubleshoot the water flow sensor.
5. If water flow is established, turn the Hale SmartFOAM system ON to flow foam.
6. Observe foam pump discharge. If foam is NOT flowing troubleshoot the foam pump.
7. If foam is flowing, check the status of the total foam flow display. If the foam total is NOT incrementing troubleshoot the foam flow sensor.
8. If the foam flow is registering on the total foam display but the accuracy is not correct (too little foam / too much foam) check accuracy of system using calibration procedures in the OPERATION section of this manual making adjustments as required.

ILLUSTRATED PARTS BREAKDOWN

GENERAL

This section contains drawings and the parts breakdown for the serviceable assemblies, components and most commonly used options for the SmartFOAM Electronic Foam Proportioning System.

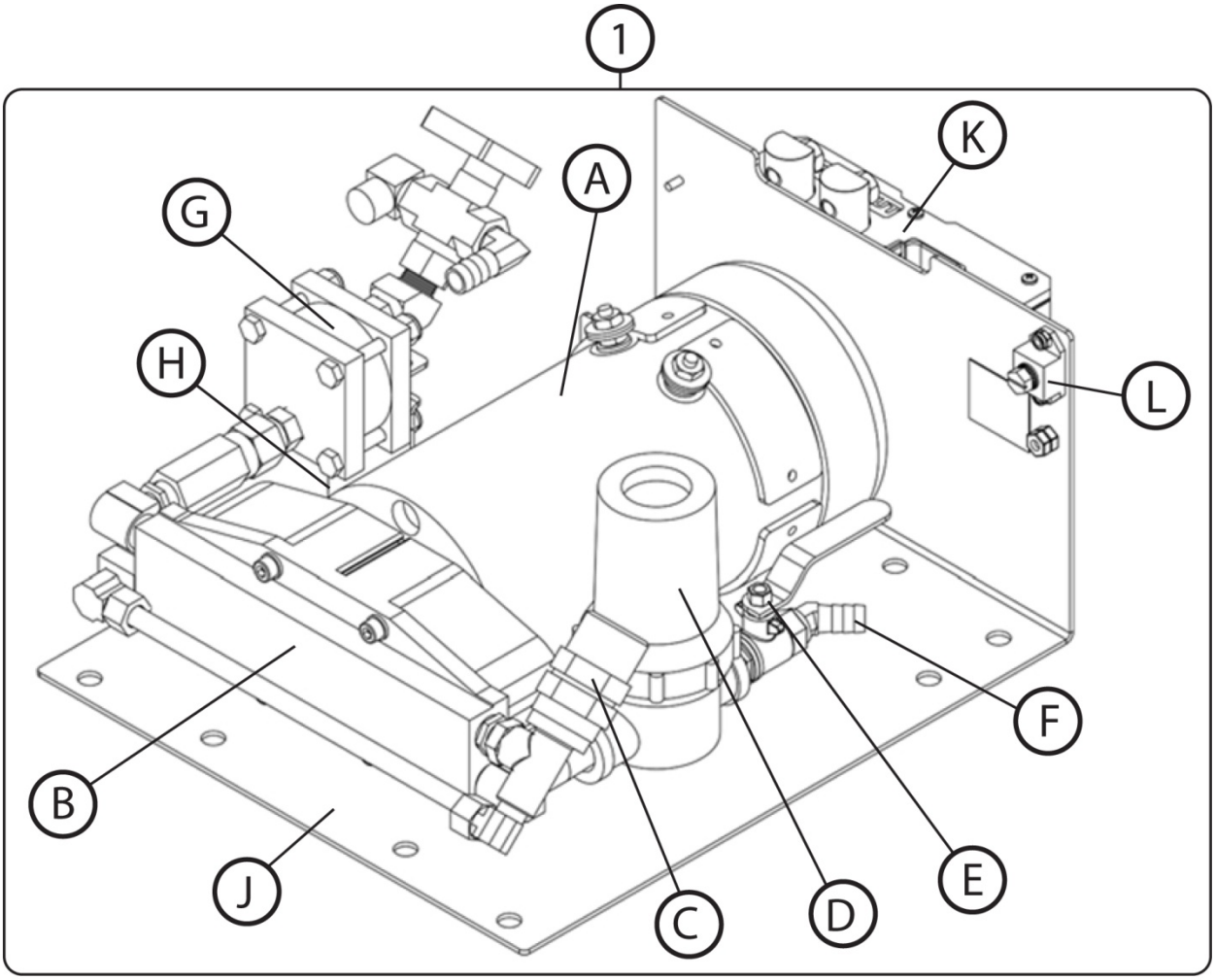
ABBREVIATIONS

The following abbreviations may be used in this Illustrated Parts Breakdown:

A/R..... As required
Cm..... Centimeters
Ext. ..... External
Fwd..... Forward
Ga..... Gauge
Grd, Gr..... Grade – when hardware lists a grade rating, it is imperative to maintain that rating when replacing parts.
HS ..... Hardened Steel
Hex ..... Hexagonal
Id, ID..... Inner diameter
IPB..... Illustrated Parts Breakdown
JIC ..... Joint Industry Conference – an industry standard used to describe a fitting.
Lh, LH..... Left Hand
MM..... Millimeters
Mtg ..... Mounting
n/s ..... Not Shown – parts that are not shown but are servicable.
No..... Number
NPT ..... National Pipe thread
NPTF ..... National Pipe Thread, Fine
OD ..... Outer diameter
p/n ..... Part number
Ref..... Reference
Rev..... Reverse Rh
RH ..... Right hand
Str..... Straight – usually to describe a hydraulic or pneumatic fitting (vs. elbow)

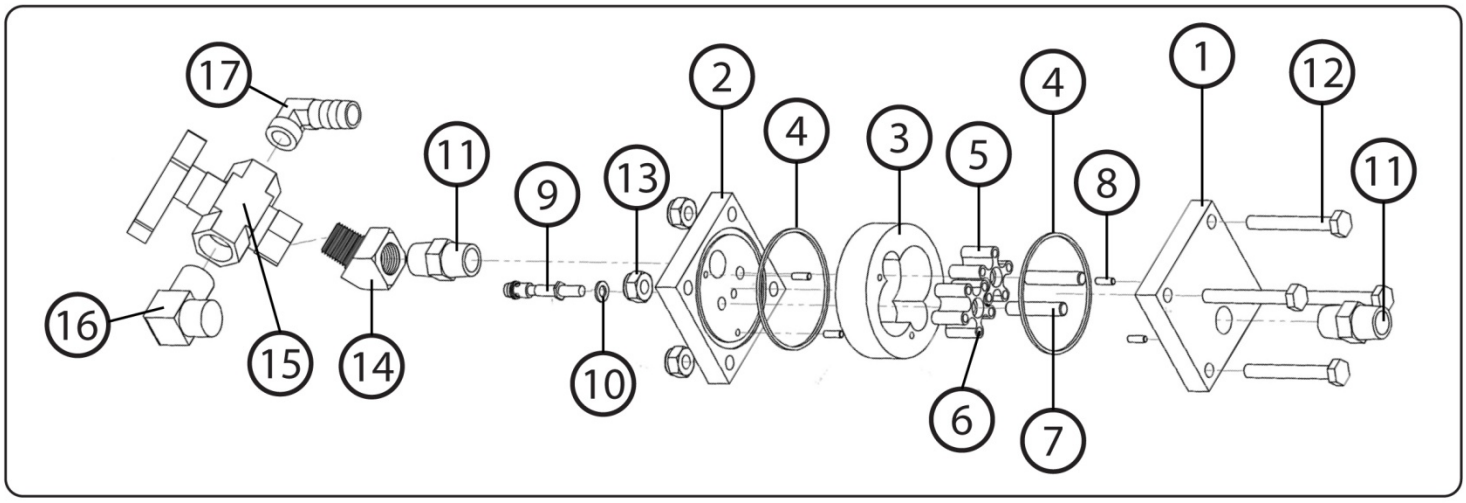
FOAM PUMP ASSEMBLY – 1.7AHP AND 2.1A

Item	Part number	Qty	Description
1.	114034	1	Motor/Pump Assembly - 2.1A - 12 Volt
	114035	1	Motor/Pump Assembly - 2.1A - 24 Volt
	119274	1	Motor/Pump Assembly - 1.7AHP - 12 Volt
	119275	1	Motor/Pump Assembly - 1.7AHP - 24 Volt
A.	110521	1	Motor 1/2 HP - 2.1A/1.7AHP - 12 Volt
	110393	1	Motor 1/2 HP - 2.1A/1.7AHP - 24 Volt
B.	110522	1	Pump Assembly (without motor) - 2.1A
	119345	1	Pump Assembly (without motor) - 1.7AHP
C.	538-1750-01-0	1	Relief Valve - 2.1A - 250 PSI
	119346	1	Relief Valve - 1.7AHP - 400 PSI
D.	510-0200-02-0	1	Strainer Assembly
E.	119266	1	Ball Valve 3/8” MNPT x FNPT with Handle
F.	082-0328-02-0	1	Elbow 45° 3/8” MNPT x Hose Barb
G.	115497	1	Flowmeter Assembly (see next page for parts list)
H.	019-3770-00-0	1	Flowmeter Mounting Bracket
J.	110618	1	Mounting Base
K.	110586	1	Motor Controller
L.	122609	1	Diode 45V 240A



FLOW METER ASSEMBLY – 1.7AHP AND 2.1A (115497)

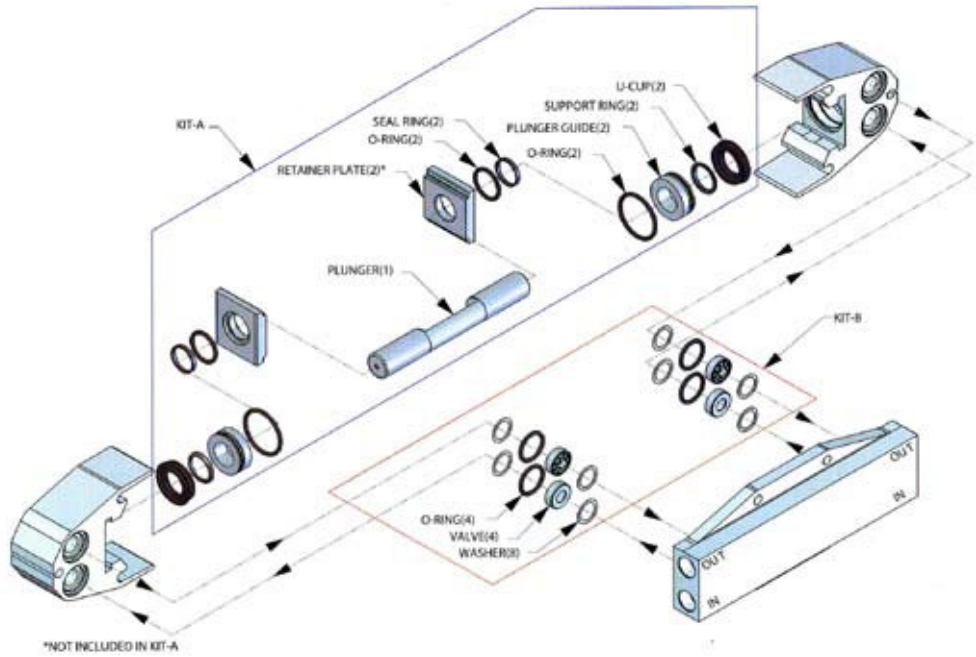
Item	Part number	Qty	Description
1.	044-1920-01-0	1	Flowmeter Right Cover
2.	044-1920-00-0	1	Flowmeter Left Cover
3.	062-0910-00-0	1	Flowmeter Housing
4.	040-0340-00-0	2	O-ring 2-034 Buna-N 70 Durometer
5.	016-1010-00-0	2	Flowmeter Rotor
6.	064-6390-00-0	10	Sensor Target for Flowmeter Rotor
7.	064-6680-00-0	2	Dowel Pin Ø0.25” x 1.25” SST
8.	064-6260-01-0	4	Dowel Pin Ø0.13” x 0.38” SST
9.	200-2483-00-0	1	Speed Sensor
10.	097-1971-00-0	1	Sealing Washer #10
11.	082-0364-02-0	2	Hex Adapter 2X 3/8” MNPT
12.	018-1220-12-0	4	Hex Head Bolt 1/4-20 x 2.00” SST
13.	110-1206-02-0	4	Nut Nylock 1/4-20
14.	116964	1	Street Elbow 45° 3/8” NPT
15.	038-2220-00-0	1	Ball Valve 3/8” FNPT 3-way
16.	082-0317-02-0	1	Elbow 90o 3/8” MNPT x 1/2” Tube
17.	082-0327-02-0	1	Elbow 90o 3/8” MNPT x 1/2” Hose Barb



Speed sensor replacement kit – part number 119348 includes:

Item	Part number	Qty	Description
9.	200-2483-00-0	1	Speed Sensor
4.	040-0340-00-0	2	O-ring 2-034 Buna-N 70 Durometer
10.	097-1971-00-0	1	Sealing Washer #10

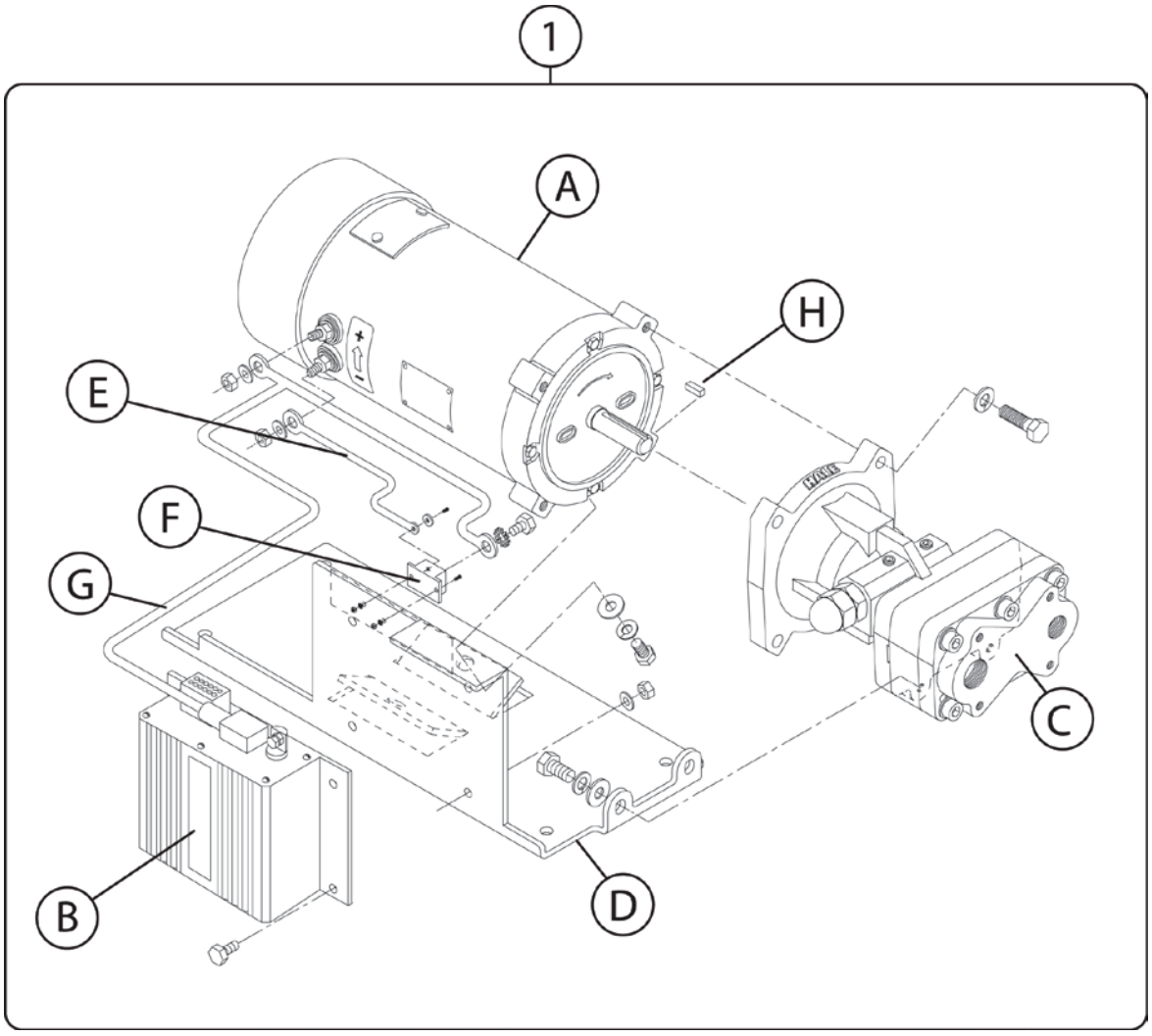
PUMP REPAIR KIT – 1.7AHP AND 2.1A



Item	Part number	Qty	Description
Kit A	117495	1	Plunger and Seals
Kit B	117496	1	Valve and Seals
Kit C	117497	1	Cam Bearing

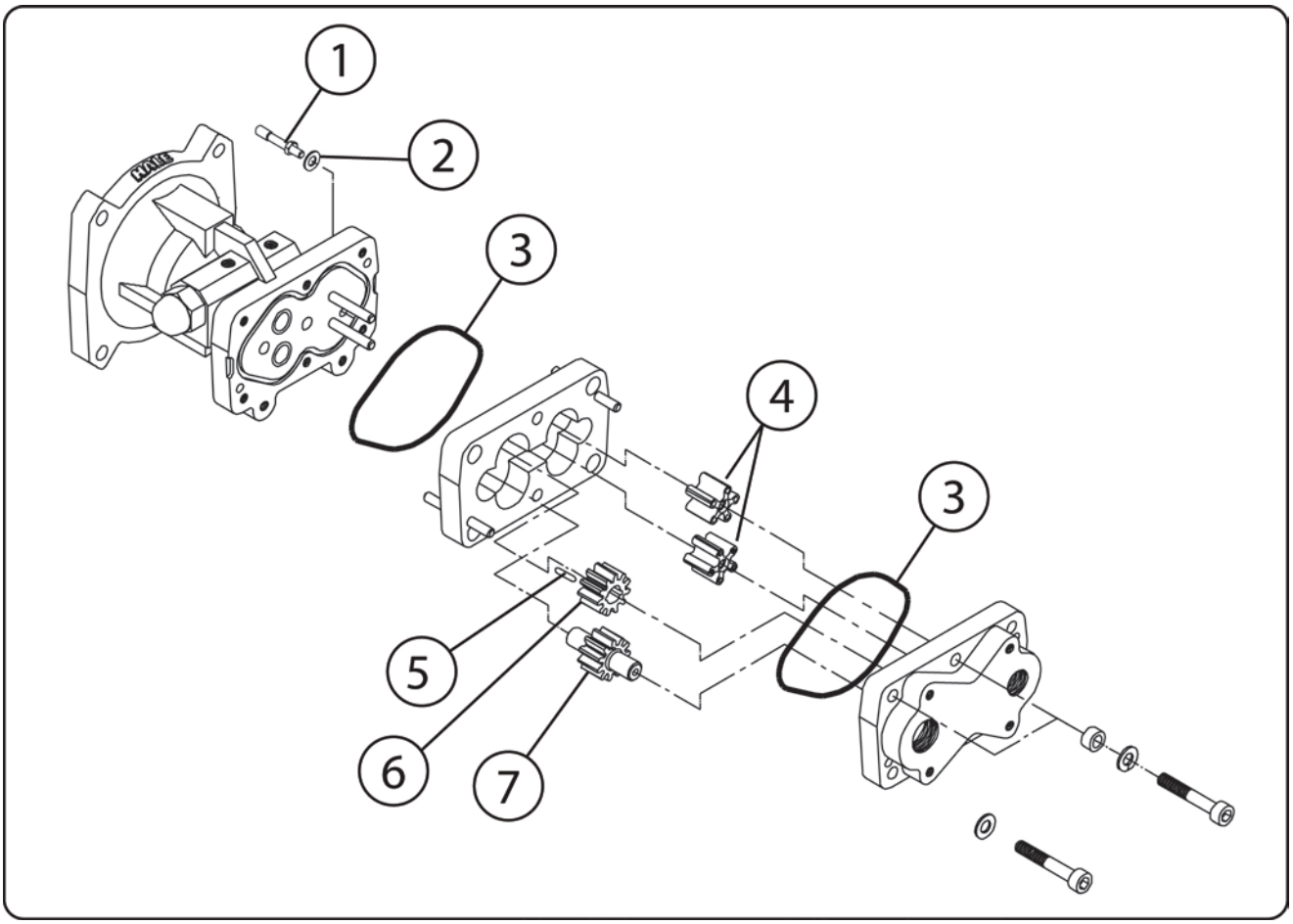
FOAM PUMP ASSEMBLY – 3.3, 5.0, and 6.5

Item	Part number	Qty	Description
1.	501-3120-05-0	1	Motor/Pump Assembly – 3.3 - 12 Volt
	501-3120-06-0	1	Motor/Pump Assembly – 3.3 - 24 Volt
	501-3130-05-0	1	Motor/Pump Assembly – 5.0 - 12 Volt
	501-3130-06-0	1	Motor/Pump Assembly – 5.0 - 24 Volt
	501-4480-04-0	1	Motor/Pump Assembly – 6.5 - 24 Volt
A.	045-0770-00-0	1	Motor 3/4 HP – 3.3/5.0 - 12 Volt
	045-0770-01-0	1	Motor 3/4 HP – 3.3/5.0 - 24 Volt
	045-0770-02-0	1	Motor 1-1/4 HP – 6.5 - 24 Volt
B.	110586	1	Motor Controller
C.	501-3110-00-0	1	Pump – 3.3
	501-3130-00-0	1	Pump – 5.0
	501-4480-00-0	1	Pump – 6.5
D.	019-3021-00-0	1	Mounting Base
E.	513-0770-00-0	1	Ground wire – 6 AWG
F.	122609	1	Diode 45V 240A
G.	513-0780-00-0	1	Power wire assembly – 4 AWG
H.	017-0680-00-0	1	FPG drive key



FLOW METER ASSEMBLY – 3.3, 5.0, and 6.5

Item	Part number	Qty	Description
1.	200-2481-00-0	1	Speed Sensor
2.	097-1971-00-0	1	Sealing Washer #10
3.	040-1540-00-0	2	O-ring 2-154 Buna-N 70 Durometer
4.	516-0220-00-0	2	Rotor assembly – 3.3, 5.0
	516-0220-01-0	2	Rotor assembly – 6.5
5.	064-5380-00-0	1	Drive pin – 3.3, 5.0
	064-5380-01-0	1	Drive pin – 6.5
6.	031-1270-00-0	1	Drive gear – 3.3
	031-1270-02-0	1	Drive gear – 5.0, 6.5
7.	037-1980-00-0	1	Idler gear shaft – 3.3
	037-1980-02-0	1	Idler gear shaft – 5.0, 6.5



Speed sensor replacement kit – part number 546-3240-00-0 includes:

Item	Part number	Qty	Description
1.	200-2481-00-0	1	Speed Sensor
2.	097-1971-00-0	1	Sealing Washer #10
3.	040-1540-00-0	2	O-ring 2-154 Buna-N 70 Durometer

EXPRESS WARRANTY

EXPRESS WARRANTY: Hale Products, Inc ("Hale") hereby warrants to the original buyer that products manufactured by it are free of defects in material and workmanship for one (1) year. The "Warranty Period" commences on the date the original buyer takes delivery of the product from the manufacturer.

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

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

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

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

- Any notice to HALE must be in writing, identifying the Product (or component) claimed defective and circumstances surrounding its failure.
- HALE reserves the right to physically inspect the Product and require Buyer to return same to HALE's plant or other authorized service provider.
- In such event, Buyer must notify HALE for a Returned Goods Authorization ("RGA") number and Buyer must return the Product F.O.B. to HALE.
- If determined defective, HALE shall, at its option, repair or replace the Product, or refund the purchase price (less allowance for depreciation).
- Absent proper notice within the warranty Period, HALE shall have no further liability or obligation to Buyer therefore.

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