TECHNICAL MANUAL

FOR HALE SMARTATP

125 GPM AND 225 GPM

BY
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MANUAL P/N FSG–MNL–00194 Revision A

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Revision A	18 October 2019	All – Initial Release

Abbreviations And Acronyms

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

AHJ	Authority Having Jurisdiction
ACT	Actuate
ATP	Around The Pump
CCW	Counter Clockwise
COM	Communication
CPU	Central Processing Unit
CW	Clockwise
EVT	Emergency Vehicle Technician
FAST	Factory Authorized Service Team
IAW	In Accordance With
IGN	Ignition
ITL	Intelli-Tank™ [Tank Level Gauge System]
KZCO	KZCO Inc. [Valve Manufacturer]
N/C	No Connection
NLGI	National Lubrication Grease Institute
NPT	American National Standard Taper Pipe Thread
OEM	Original Equipment Manufacturer
OIM	Operation Installation Maintenance [Hale Manual, FSG–MNL–00193]
PPE	Personal Protection Equipment
R&R	Removal and Replacement
SAE	Society of American Engineers
SCR	Symptom, Cause, Remedy [Troubleshooting Table(s)]
SEL	Select
Sol	Solenoid
VIC	Victaulic

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1. SAFETY

This section provides definitions and a listing of the safety headings used in the Parts Manual (FSG–MNL–00195), the OIM (FSG–MNL–00193), and Technical (FSG–MNL–00194) manuals.

The Hale SmartATP 125 GPM (P/N 550–00022) and 225 GPM (P/N 550–00023) models design focuses on optimum safety for its operators and provides reliable and safe foam concentrate proportioning. For added protection and before attempting installation, repair, or operation, please follow the safety guidelines listed in this section and adhere to all cautions, dangers, notices, and warnings found in the manuals.

All operators and maintainers must read the safety section carefully, understand and adhered to it strictly before attempting to install or operate the SmartATP system.

DANGERS, WARNINGS, CAUTIONS, or NOTICES that immediately precede a step apply directly to that step and all sub steps. DANGERS, WARNINGS, CAUTIONS, or NOTICES that precede an entire procedure apply to the entire procedure. DANGERS, WARNINGS, CAUTIONS, and NOTICES consist of two parts: a heading (that identifies possible result if disregarded) and a statement of the hazard (that provides the minimum precautions). The headings used and their definitions are.

ATTENTION ⚠ DANGER

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

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ CAUTION

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

IMPORTANT ⚠ NOTICE

ADDRESSES PRACTICES NOT RELATED TO PERSONAL INJURY.

NOTE

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

1.1. Safety Summary

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

ATTENTION ⚠ DANGER

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

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ WARNING

ALWAYS 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.

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ WARNING

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

ATTENTION ⚠ WARNING

TO PREVENT SYSTEM DAMAGE OR ELECTRICAL SHOCK THE MAIN POWER SUPPLY WIRE IS THE LAST CONNECTION MADE TO THE HALE FOAM CONTROLLER. ALWAYS DISCONNECT THE PRIMARY POWER SOURCE BEFORE ATTEMPTING TO SERVICE ANY PART OF THE HALE FOAM SYSTEM.

ATTENTION ⚠ CAUTION

ALWAYS USE PROPER PPE. FOAM MAY BE TOXIC TO PEOPLE AND/OR THE ENVIRONMENT. CATCH AND DISPOSE OF FOAM PROPERLY. IMPROPER FOAM HANDLING MAY RESULT IN HEALTH RISKS AND/OR LIABILITY.

ATTENTION ⚠ CAUTION

FAILING TO REDUCE SYSTEM PRESSURE BEFORE SYSTEM SHUTDOWN OR FLUSHING COULD RESULT IN WATER HAMMERING.

ATTENTION ⚠ CAUTION

THE SMARTATP SYSTEMS SHIPPING CONTAINER WEIGHS OVER 50 LBS. LIFT THE SHIPPING CONTAINER USING THE APPROPRIATELY LIFTING METHOD. (TWO PERSON RECOMMENDED)

ATTENTION ⚠ CAUTION

TO PREVENT SYSTEM DAMAGE OR ELECTRICAL SHOCK THE MAIN POWER SUPPLY WIRE IS THE LAST CONNECTION MADE TO THE HALE FOAM CONTROLLER. ALWAYS DISCONNECT THE PRIMARY POWER SOURCE BEFORE ATTEMPTING TO SERVICE ANY PART OF THE HALE FOAM SYSTEM.

IMPORTANT ⚠ NOTICE

ALWAYS DISCONNECT THE POWER CABLE, GROUND STRAPS, ELECTRICAL WIRES AND CABLES FROM THE CONTROL UNIT OR OTHER HALE SMARTATP EQUIPMENT BEFORE ELECTRIC ARC WELDING AT ANY POINT ON THE APPARATUS.

IMPORTANT ⚠ NOTICE

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 OR MASTER FLOW METER. HAND HELD PITOT GAUGES ARE USUALLY NOT VERY ACCURATE. MAKE SURE THE SYSTEM IS CALIBRATED WITH AN ACCURATE FLOW MEASURING DEVICE.

IMPORTANT ⚠ NOTICE

CONNECT THE PRIMARY POSITIVE LEAD FROM THE HARNESS TO THE MASTER SWITCH TERMINAL OR RELAY TERMINAL USING MINIMUM 12 AWG TYPE SGX (SAE J1127), CHEMICAL RESISTANT, BATTERY CABLE PROTECT BY WIRE LOOM.

IMPORTANT ⚠ NOTICE

DO NOT ALLOW THREAD SEALANT TO GET INTO THE SENSORS ORIFICE. THREAD SEALANT IN THE ORIFICE MAY CAUSE ERRONEOUS SENSOR READINGS.

IMPORTANT ⚠ NOTICE

DO NOT CONNECT THE MAIN POWER LEAD TO SMALL LEADS THAT ARE SUPPLYING SOME OTHER DEVICE, SUCH AS A LIGHT BAR OR SIREN.

IMPORTANT ⚠ NOTICE

DO NOT RUN THE PRIMER FOR MORE THAN 45 SECONDS. IF PRIME IS NOT ACHIEVED IN 30 - 45 SECONDS, STOP AND LOOK FOR AIR LEAKS OR BLOCKED SUCTION HOSE.

IMPORTANT ⚠ NOTICE

EXCESSIVE LENGTHS OF PIPE AND/OR USE OF MANY ELBOWS IN THE FOAM AND/OR WATER PLUMBING CAN DEGRADE SYSTEMS PERFORMANCE.

IMPORTANT ⚠ NOTICE

FAILING TO REDUCE SYSTEM PRESSURE BEFORE SYSTEM SHUTDOWN OR FLUSHING COULD RESULT IN WATER HAMMERING.

IMPORTANT ⚠ NOTICE

IF THE PUMP LOOSES PRIME AS A RESULT OF PRIMING THE SMARTATP SIMPLY PRIME THE PUMP AGAIN.

IMPORTANT ⚠ NOTICE

NEVER MIX CLASS A AND CLASS B FOAM. MIXING THE FOAMS CAUSES THE FOAM TO SOLIDIFY.

IMPORTANT ⚠ NOTICE

OPENING THE TANK FILL (OR COOLING VALVES) WITH THE FOAM SYSTEM OPERATING CAN PLACE FOAM IN THE WATER TANK.

IMPORTANT ⚠ NOTICE

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

IMPORTANT ⚠ NOTICE

PRIMING THE SMARTATP DISPLACES THE AIR IN THE FOAM SYSTEM WHICH WHEN PASSED THRU THE PUMP MAY CAUSE THE PUMP TO LOOSE PRIME.

IMPORTANT ⚠ NOTICE

SYSTEM SHOULD BE 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 CALIBRATION VERIFICATION.

IMPORTANT ⚠ NOTICE

THE CONTROLLER REQUIRES A 51 MM (2 IN) MINIMUM CLEARANCE AT THE REAR OF THE OPERATOR PANEL TO ALLOW PROPER CONNECTION OF CABLES.

IMPORTANT ⚠ NOTICE

THE CONTROLLER UNIT DEUTSCH CONNECTORS ARE KEYED TO PREVENT INTERCHANGE OR REVERSE DIRECTION INSERTION. DO NOT FORCE A CONNECTOR WITHOUT FIRST VERIFYING THE CONNECTORS ORIENTATION.

IMPORTANT ⚠ NOTICE

THE CONTROLLER UNIT MUST BE MOUNTED IN A DRY ENVIRONMENT AND NOT BE SUBJECTED TO EXCESSIVE HEAT.

IMPORTANT ⚠ NOTICE

THE FOAM CHEMICAL CAN BE HIGHLY CORROSIVE AND POTENTIALLY DAMAGE THE PUMP IF LEFT INSIDE THE PUMP FOR AN EXTENDED PERIOD.

IMPORTANT ⚠ NOTICE

THE PRESSURE AND TANK LEVEL SENSORS APPEAR SIMILAR, DO NOT INSTALL A TANK LEVEL SENSOR IN THE DISCHARGE (OR SUCTION) WATERWAY OF A PUMP. (THE TANK LEVEL SENSOR HAS A BURST PRESSURE OF 15 PSI.)

1.2. PPE

The following is the minimum PPE required when performing maintenance.

- Safety Glasses
- Work Shoes (Steel Toe)
- Safety Gloves
  - General Protection

- Chemical Resistant
- Ear Protection
    - Single Use
    - Ear Muffs

1.3. Environmental Protection

Used foam from the SmartATP system must be properly disposed of in accordance with your local regulations. Dispose of foam through authorized waste disposal contractors, licensed waste disposal sites, or to the waste reclamation trade. If in doubt, contact your Local Environmental Agency for advice regarding disposal policies.

1.4. Training

The Hale SmartATP must ONLY be operated and maintained by trained personnel. Training is available via the Hale Products Inc. website (https://haleproducts.com), Godiva √erified Training (godiva.co.uk), or through your local dealer or vehicle manufacturer. The Hale website provides a description of the course content and general information about the training, including an invitation to register with the EVT Certification Commission (www.evtcc.org) to take one EVT exam at the Hale facility.

NOTE

Be sure to record the contact phone number and contact person's information before completing the form.

Complete the SESSIONS, ORGANIZATION CONTACT INFORMATION, STUDENT CONTACT INFORMATION portions of the form. Check the Captcha (provides the proof of human input) and then click the SUBMIT button at the bottom of the page.

NOTE

Under the FAST buttons select No unless your facility is a FAST center. Do NOT click Yes unless you know for sure you are a FAST member requiring certification or recertification (a certification is valid for 4 years).

When the Thank you for Registering page appears record the halemarketing email address (Add this address to your email address book to prevent your response from being routed to the Junk folder.) and call the contact phone number (recorded earlier) to arrange payment.

NOTE

Due to demand, classes fill far in advance of the scheduled dates. The ONLY way to hold the selected dates is to pay at the time of enrollment submission.

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2. INTRODUCTION

This section provides an overview of the Hale SmartATPs currently in production. The section also provides a reference to the Hale Products website for access to SmartATP specifications and performance charts as well as explaining how to locate (and read) a system ID plate. Additionally, the section provides information about How To Use This Manual and the Principles Of Operation for the around the pump foam system.

2.1. Overview

Hale SmartATP systems are a completely engineered, factory matched foam proportioning systems that provides reliable, consistent foam delivery for Class A and Class B around the pump foam operations. Hale current produces a 125 GPM and a 225 GPM version of the SmartATP.

The SmartATP systems accurately deliver from 0.1% to 10.0% foam concentrate through an eductor directly into the pump suction where it is then fed as a foam solution throughout the entirety of the pump providing an around the pump type foam system. The SmartATP system places foam on the discharge and intake side of the pump (including any relief valves installed) therefore flushing the pump after SmartATP use is recommended. The Hale SmartATP consists of nine major components: a large (or small) eductor, the SmartATP control unit, the display, a metering valve, a water flow sensor, a foam concentrate flow sensor, two pressure sensors, tank(s) level sensor(s), and a check valve. The following subparagraphs (by title) describes each component.

Figure 1 shows a system diagram (layout) for the single foam tank system and Figure 2 shows a system diagram for the dual foam tank system.

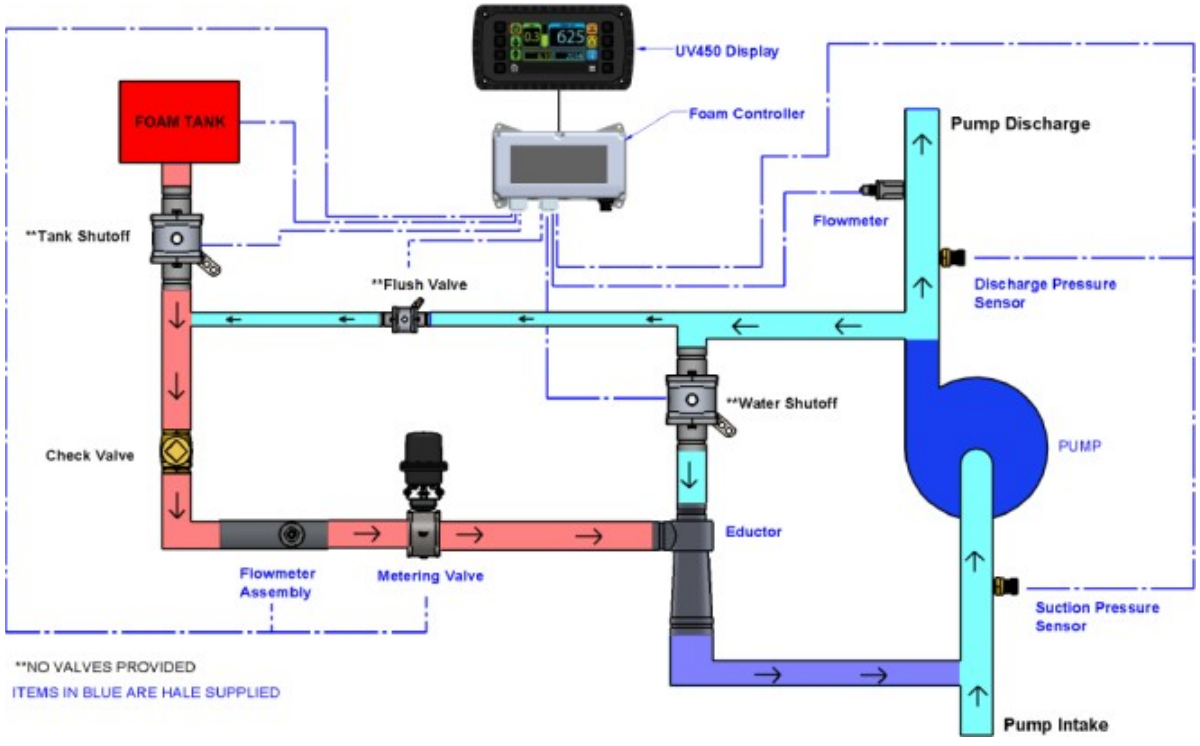


Figure 1. Hale SmartATP Single Tank System Diagram

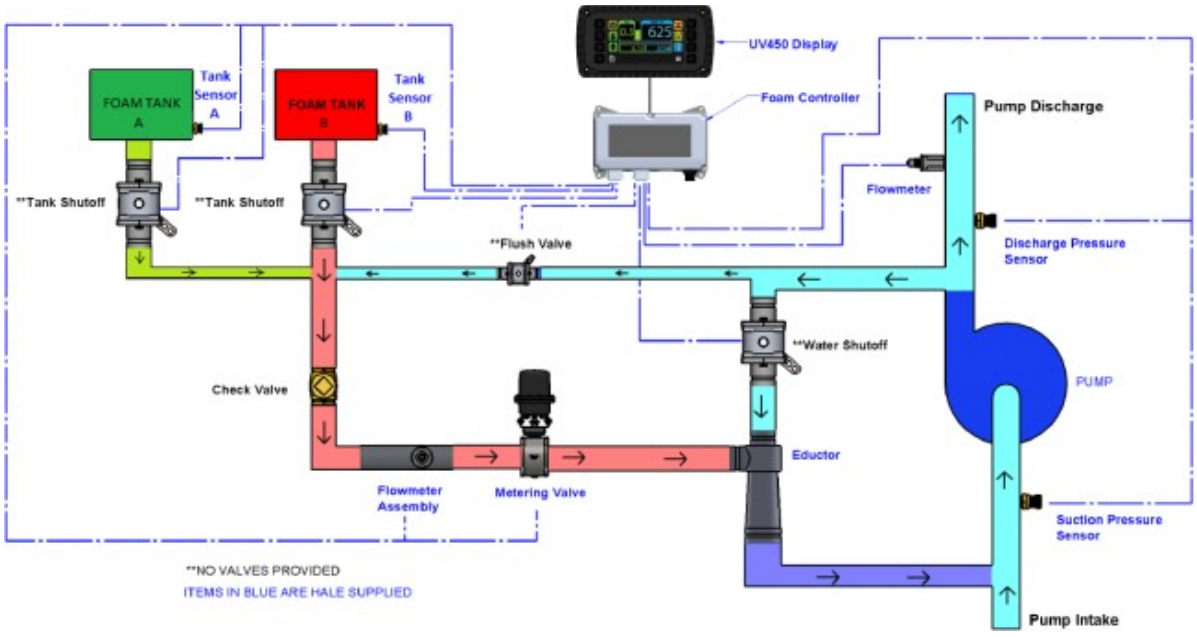


Figure 2. Hale SmartATP Dual Tank System Diagram

When a display input activates the SmartATP system, a signal from the control unit begins foam concentrate injection. The tank shutoff valve opens to allow foam solution to the metering valve and water shutoff valve opens to allow water to flow to the eductor, which provides foam solution to the suction side of the pump.

2.1.1 SmartATP Control Unit

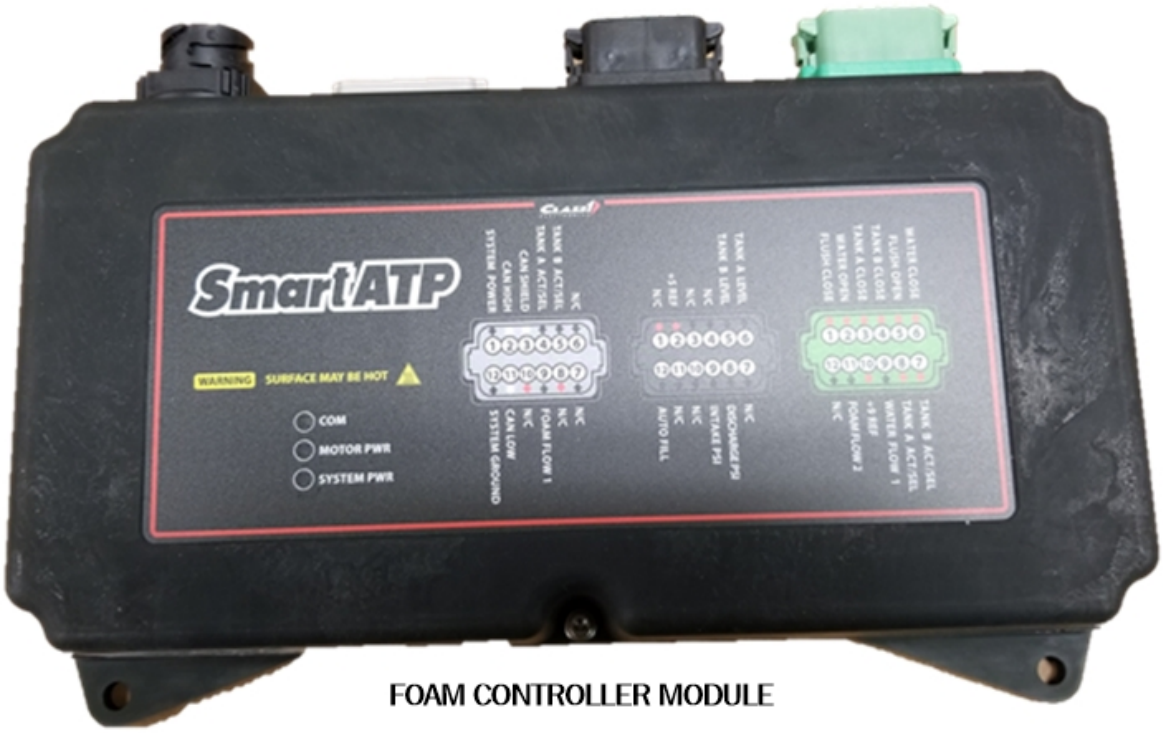
The Hale SmartATP is a CAN bus based system utilizing factory addressed modules and standard/custom CAN communication and messages to provide versatility and expandability. As shown on Figure 3, the control unit consists of the display (UV450) and foam controller modules. The foam controller is a CAN bus/CPU system controller that reads input from the discharge and foam concentrate flow sensors to open or close the metering valve to maintain the desired solution ratio as selected by the user on the display. The control unit supports a 12 or 24 VDC vehicle electrical system (foam controller module requires 9 to 32 VDC) and supplies the appropriate 12 or 24 volts (positive polarity) to operate the foam tank shutoff, water shutoff, and flush valves.

NOTE

When utilizing solenoids with pneumatically controlled valves, the solenoids and valves are installer provided. As an option, Hale provided pneumatically controlled or Akron Brass valves (CAN bus controlled valves) may be purchased to perform these functions.

The display (UV450) provides user input/control, system information (screen displays), and system memory/programming. The display provides selectable plain text information, warnings, and tutorials for calibration to the operator/maintainer. Additionally, the display provides multiple screens and preset scenarios. Selecting the operation or information screen provides the desired data while pressing one of the preset buttons enables the system to use that predetermined foam solution to water ratio on startup. Then the control units CPU constantly compares water flow and foam concentrate flow rates.

DISPLAY MODULE (UV450)



FOAM CONTROLLER MODULE

Figure 3. SmartATP Control Unit

The operation screens show:

- Water flow rate
- Foam concentrate injection percentage
- Total water flowed
- Total foam concentrate used
- Tank level

The information screens show:

- Suction pressure
- Discharge pressure
- Foam flowrate
- Water flow rate
- Metering valve % open

NOTE

If CAN Bus Messaging information is required (remote display), contact Hale Products (or local distributor) for the ATP–E System CAN messaging documentation (P/N 101-00319-000).

2.1.2 Metering Valve

The Hale SmartATP has a CAN controlled metering valve allowing accurate regulation of the foam concentrate injection to the pump. This electrically driven valve is low maintenance and constructed of a corrosion resistant stainless steel that complies with the requirements for use with most types of foam. The metering valve control signal constantly adjusts the injection rate of foam concentrate to maintain the operator selected preset or discrete foam solution request.

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).

2.1.3 Eductor (125 GPM Or 225 GPM)

The Hale SmartATP utilizes two versions of the eductor; the small eductor supports the 125 GPM systems and the larger eductor supports the 225 GPM systems. Both eductors construction is brass and they are compatible with most Class A and Class B foam concentrates. The pump discharge water drives the eductor (via Venturi effect) with water as the motive fluid that mixes the foam concentrate and water and routes the foam solution into the suction side of the pump.

NOTE

The omission of moving parts in the eductor results in a reliable and low maintenance product.

2.1.4 Water Flow Sensor

A water flow sensor constantly monitors the water flow rate through the discharge piping. When a single flow sensor is used, the sensor provides analog information to the control unit via a shielded cable.

When multiple sensors are used, one (or more) dual analog input to CAN module(s) is added to the system and the additional sensor data (each module supports two sensors) is routed to the controller via the CAN bus.

2.1.5 Foam Flow Sensor

The foam flow sensor (located in line with the metering valve) measures foam concentrate flow. The flow sensor provides analog information to the control unit via a shielded cable.

2.1.6 Pressure Sensors

Hale supplies two pressure transducers: one to install on the suction side of the pump and one to install on the discharge side of the pump. The two sensors monitor the pressure on both sides of the pump because the SmartATP requires a large pressure differential between the inlet and outlet side of the pump and a low suction pressure to function properly. Constantly monitoring the pressure allows a warning display if system pressure goes outside of the required limits.

2.1.7 Tank Level Sensor(s)

Install a pressure type sensor near the bottom of the (or each) foam tank to monitor the tank level. The UV450 display uses the data from the sensor(s) to provide a visual display of the tank(s) level. A warning pops up on the display when the foam tank is low.

2.1.8 Check Valve

The provided swing style bronze check valve installs in a manner that prevents backflow if the suction pressure exceeds the Hale recommendations.

2.2. SmartATP Specifications And Numbering

This paragraph describes how to locate a serial number on your SmartATP and provides how to identify the options/characteristics of your SmartATP by its part numbering. Hale SmartATP performance per NFPA 1901 (and/or NFPA 1906 as appropriate) is provided on the Hale Products website (www.haleproducts.com).

2.2.1 Hale SmartATP Identification

A Hale SmartATP identification plate (Figure 4) is shipped loose with the system components for the OEM to attach to the apparatus. The label is printed with a unique serial number followed by a sales order number that define the system purchased.

NOTES

All serial numbers depicted in this manual are placeholders. The actual serial numbers assigned to the SmartATP system are unique.

The –100 following the serial number indicates a foam system.

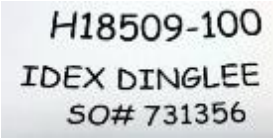


Figure 4. Hale SmartATP Identification Plate

2.2.2 SmartATP Options/Characteristics

The Hale SmartATP characteristics are identified by the model number on the identification plate (currently a 125 GPM or a 225 GPM version of the around the pump foam proportioning system are being produced).

Options for the Hale SmartATP include Autofill, Akron Brass valves, and multiple pressure sensors (includes the required dual analog input modules to support up to 13 sensors). Each option requires a unique Hale wiring harness and OEM system program setting manipulation.

2.3. How To Use This Manual

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

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

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

Notice that the use of this manual also requires maintenance personnel to have received Hale training prior to using it. Use Hale Training Academy (Pumping And Maintenance) training

(see paragraph 1.4, Training – page 5) and the two Maintenance sections for all aspects of maintaining the SmartATP system. These include:

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

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

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

Within the Maintenance section, parts identification is provided by a reference to the applicable assembly/installation drawing(s) for each model of SmartATP (125 GPM or 225 GPM).

2.4. Disclaimer

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

2.5. Principles Of Operation

This section provides the principles of operation and an explanation of terms (also see paragraph 2.1.1 thru paragraph 2.1.8 for a description of the key SmartATP components) for maintainers to use when communicating with an OEM/apparatus manufacturer or a Hale Customer Support representative.

2.5.1 Basic Foam Operations

The proper proportioning of foam concentrate is a critical piece in the foam application process. The goal is to mix the foam concentrate with the water in the proper ratio so that after it leaves the nozzle(s) it will offer a protective barrier to separate fuel from the air and absorb heat. To provide this mixture to every discharge port on the apparatus, the SmartATP utilizes an eductor, a metering valve, and multiple flow and pressure sensors.

NOTES

Due to the Venturi principle it is not efficient/feasible to use the SmartATP system with positive input pressure at the pump, since limited or no suction can be generated for the foam concentrate. Adding the Hale Autofill option provides a solution allowing the water source to be from a hydrant or from a relay pump.

The Venturi effect (draft) is created by the pressure of a water stream flowing through a restricted orifice to induct foam concentrate into the water stream.

The Hale eductor works on the Venturi principle, where the eductor picks up concentrate (measured by the metering valve) and adds it directly to the pumps suction port. The Hale eductors have two ratings of how much foam solution they flow at the proper pressure (125 and 225 GPM) and can use class A or class B foam concentrate to provide a mix of both water and concentrate at the proper ratio. The metering valve is controlled by the foam controller (over the CAN bus) to provide 0.1 % to 10 % foam.

For example, if the 125 GPM SmartATP is in operation (with the required pressure) and a 6% foam concentrate is required, then the foam solution available for discharge consists of approximately 60.0 GPM of concentrate and 1000 GPM of water.

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3. PREVENTIVE MAINTENANCE

Hale Products recommends the preventive maintenance and inspections listed in Table 1.

Table 1. Recommended Preventive Maintenance

Interval	Check/Test	Action Required	Item(s) Required
After Each Use			
	Flush	Flush pump thoroughly with clean water.	Supply of clean water
	Connections	Inspect wiring, flow sensors and connections for tightness, corrosion, leaks and/or damage.	None
Bimonthly (Every 2 Months)			
	Operate System	Operate foam system to move the foam concentrate and prevent gelling.	Supply of clean water Acceptable Foam
	Paddlewheel Check	Inspect and clean paddlewheels to maintain accuracy. (See paragraph 7.3.2, Flowmeter Check, in the OIM manual [FSG–MNL–0186].)	Soft bristle detailers brush O-ring lubricant
Annually (Every 12 Months)			
	Calibrate	Verify foam flow calibration and water flow calibration. (See section 7.4.1, Flow Calibration, in the OIM manual [FSG–MNL–0186].)	Supply of clean water Acceptable Foam Flowmeter

NOTE: Refer to Operation Installation Maintenance Manual (FSG–MNL–00193), Preventive Maintenance for instructions to perform preventive maintenance tasks.

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4. CORRECTIVE MAINTENANCE

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

- Eductor
- Valve
- Flowmeter
- Check Valve
- Tank Level Sensor
- UltraView Display
- Foam Controller
- Pressure Sensor
- Harness Connectors

4.1. General Repair Guidelines

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

NOTE

Unless otherwise indicated, these instructions apply to all Hale SmartATP systems.

4.1.1 Recommended Tools

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

- Allen Wrenches (or Hex Key Socket Set)
- Dental Pick Set
- Hydraulic (or Arbor) Press
- Pipe Wrench
- Pusher (Rod/Tube)
  (a small section of heavy metal rod or tubing used to press an item into or out of an assembly)
- Ratchet(s), Sockets, and Wrenches
- Shop Rags
- Strap Wrench
- Torque Wrench(s) Or Torque Limiting Socket(s) (Capable of 0.6 – 1.1 Nm)
- Wire Cutter
- Wire Tags

4.1.2 Recommended Cleaners

Hale recommends the following:

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

4.1.3 Recommended Lubricants

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

- Dow Corning BR2-PLUS
- Lubriplate Fiske #3000
- Shell Super Duty Grease
- Imperial #777
- Mobil Grease Special
- Sunoco Moly #2EP

The lubricant listed in Table 2 is recommended to protect the O-ring from damage, speeds up assembly, and to ensure continued service and operation.

Table 2. Recommended O-ring Lubricant

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

Note 1/ Or equivalent lubricant.

4.1.4 Thread Lock And Sealant Compounds

Loctite™ (or suitable equivalent/substitute thread locker, bonding compound, or sealant) shall be used when directed. Reference the procedures associated list of tools and/or consumables for the specific thread locker/bonding or sealant required. Loctite™ (242/270) and sealant (580) was used during factory assembly for all fasteners/hardware and fittings requiring the use of a thread lock, bonding, or sealant compound. Remnant compound ALWAYS causes false torque reading when installing old and/or new fasteners/hardware. See paragraph 4.1.2 Recommended Cleaners, for thread lock or bonding compound cleaning information. The Loctite™ compounds listed in Table 3 may be used for thread lock or bonding compounds.

Table 3. Recommended Thread Lock And Sealant Compounds

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

4.2. Cleaning And Inspection Guidelines

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

A. Inspect all components for excessive or abnormal wear.

B. Wherever a requirement for new parts is indicated, obtain new components from Hale Products Inc.

C. Wherever procedures call for removal of gaskets, gasket should be replaced. Clean all gasket mating surfaces before installing new gaskets.

D. Bearings and other components should be cleaned using only recommended solvents.

E. Bearings and seals should be inspected whenever parts are disassembled. Look for signs of excessive wear or heat on bearings. Look for hardening, cracking, distortion (or out-of-round), or evidence of bypass/leakage for seals.

F. Replace any hardware that shows signs of excessive wear, corrosion, or bolts/screws that are torqued to greater than 100 ft-lb with new hardware.

4.2.1 Cleaning Required For Thread Lock Compounds

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

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

4.2.2 Cleaning Required For Bonding Compounds

Always clean the housing bore for removed clearance rings and oil seals as remnant bonding compound causes excessive pressing force or binding when installing the new rings or seals.

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

4.3. Removal And Replacement Guidelines

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

The bench procedures are written to typically provide three layers of detail. The “A” steps provide an experienced technician (who is very familiar with a Hale SmartATP) a Top Level View of the steps required to R&R the titled component. The “A” steps along with the “1” steps provide an experienced technician (who is NOT familiar with a Hale SmartATP but is familiar with foam systems in general) a more detailed set of steps to R&R the titled component. Using all three levels of the steps provides an inexperienced technician (training is require for all who work on the foam systems) very detailed steps to perform the task.

4.3.1 Match Mark Or Note Component Orientation

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

4.4. Troubleshooting

To troubleshoot the system, locate the SCR table (Table 4) listing the indicated SYMPTOM, verify the associated CAUSE (verify ALL if multiple are listed) and perform the associated REMEDY.

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

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

Table 4. Hale SmartATP System Level SCR Table

SYMPTOM	CAUSE	REMEDY
Error Message Displayed At Power On (Foam Tank X is LOW !)	Foam Tank X is empty (X can be Tank A or Tank B)	Fill foam tank(s)
	Prime lost	Prime foam system until foam comes out of discharge(s)
	Foam Tank NOT calibrated	Perform foam tank calibration (refer to OIM Manual FSG–MNL–00193, paragraph 6.4.6)
Error Message Displayed (Metering Valve Increasing to Regain Prime)	Foam tank X is empty (X can be Tank A or Tank B)	Fill foam tank(s)
	Metering Valve NOT opening	T/S Metering Valve (see Section 4.4.2.4)
Error Message Displayed (Metering Valve Lost Prime)	Foam tank X is empty (X can be Tank A or Tank B)	Fill foam tank(s)
	Prime lost	Prime foam system until foam comes out of discharge(s)
	Metering Valve NOT opening	T/S Metering Valve (see Section 4.4.2.4)
Error Message Displayed (Metering Valve Open 100% but desired foam percentage not achieved)	Desired Percentage is not obtainable at operating water flowrate	Lower water flow to reach desired foam percentage
Error Message Displayed (Communication Loss)	Terminating resistor unplugged	T/S CAN Bus (see paragraph 4.4.1)
	Harness damaged	Damaged Harness Refer to SmartATP Parts Manual (FSG–MNL-00195) for the harness replacement part number
	CAN Bus failed	Foam Controller/UltraView Display failed Refer to SmartATP Parts Manual (FSG–MNL-00195) for the controller and/or display replacement part number
Error Message Displayed (No Foam Tank X)	Foam tank X is empty (X can be Tank A or Tank B)	Fill foam tank(s)
	Foam Tank NOT calibrated	Perform foam tank calibration (refer to OIM, FSG–MNL–00193, paragraph 6.4.6)

Table 4. Hale SmartATP System Level SCR Table – CONTINUED

SYMPTOM	CAUSE	REMEDY
Error Message Displayed (No Water flow)	Verify water flow connections	Check pump for: valve positions (suction and discharge sides), water source, loss of prime, etc.
	Water flow NOT calibrated	Perform water flow calibration(s) (refer to OIM, FSG–MNL–00193, paragraph 6.4.3 or paragraph 6.4.4)
Error Message Displayed (Desired foam flow rate below minimum of system)	Desired Percentage is not obtainable at operating water flowrate	Increase water flow to reach desired foam percentage
Error Message Displayed (Suction Pressure Too High)	Suction Pressure is too high to run system	Decrease suction pressure to run system
	Pressure sensor values NOT accurate	Perform water pressure calibration(s) (refer to OIM, FSG–MNL–00193, section 6.4.7)
Error Message Displayed (Discharge Pressure Too High)	Discharge pressure is too high to safely run system	Decrease discharge pressure to run system
	Pressure sensor values NOT accurate	Perform water pressure calibration(s) (refer to OIM, FSG–MNL–00193, section 6.4.7)
Error Message Displayed (Discharge Pressure Too Low)	Discharge Pressure is too low to operate system	Increase discharge pressure to run system
	Pressure sensor values NOT accurate	Perform water pressure calibration(s) (refer to OIM, FSG–MNL–00193, section 6.4.7)
Error Message Displayed (Autofill Level is below Desired)	Tank Level is significantly below desired level	Reduce water flow (using water faster than filling the tank)
	Tank level pressure sensor (0 – 5 psi) values NOT accurate	Calibrate ITL (refer to Intelli–Tank Operation Manual [P/N 118253] Section 3.3, Calibration)
No Foam Flow	System not primed	Prime foam system until foam comes out of discharge
	Check valve installed incorrectly	Install valve with arrow in direction of foam flow
	Eductor installed incorrectly	Install eductor with arrow in direction of water flow
	Metering Valve stuck closed	Verify system programming
		Verify harness connections/wiring Replace Metering Valve
		Verify system programming

Table 4. Hale SmartATP System Level SCR Table – CONTINUED

SYMPTOM	CAUSE	REMEDY
No Foam Flow – CONTINUED	Water Shutoff/Tank A (or B) Solenoid stuck closed	If solenoid and pneumatic valves: Verify air supply – check completely
		If Akron Brass valves: Verify CAN programming and check CAN data for additional T/S information
		Verify harness connections and wiring
		Perform 4.4.2.5.1, 4.4.2.5.2, and 4.4.2.5.3 T/S procedures
		Replace failed component
	Water Shutoff/Tank Solenoid closing when system on/opening when system off	Swap associated open and close solenoid connectors See 4.4.2.6
	No foam in foam tank	Verify error message displayed (T/S system if no message)
		Fill foam tank
No Foam Flow Reading (But foam is being distributed)	Foam Sensor improperly installed	Verify system programming
		Verify harness/wiring connections
		Verify Foam Sensor installed with arrow in direction of foam flow
		Replace Foam Sensor
Erroneous Flow Readings (Water/Foam)	Turbulence in flow	Verify that all guidelines were followed in Section 5 of the OIM Manual (FSG–MNL-00193)
	Bad Calibration	Calibrate flow sensors See Section 6.4 of OIM Manual (FSG–MNL-00193)
	Residue build up on sensor	Clean paddlewheel If on-going problem, increase flush sequence time
No Water Flow Reading (But pump is flowing)	Water Flow Sensor	Verify system programming
		Verify harness/wiring connections
		Verify sensor is in main waterway
		Verify water flow sensor installed with arrow in direction as water flow

Table 4. Hale SmartATP System Level SCR Table – CONTINUED

SYMPTOM	CAUSE	REMEDY
Poor System Maximum Performance	Suction lift is too high	Reduce lift to < 1.2 m (4 FT) See Table 4, page 29 in OIM Manual (FSG–MNL–00193)
	Hydro/Air Leak in eductor plumbing	Locate and repair leak
	Inefficient plumbing	Minimize piping length and amount of elbows. (Class 1 hose can be utilized to accomplish this)
	Flush Valve stuck open	Verify harness/wiring connections
		Verify air supply – check completely
	Check Valve Stick	Flush and/or clean Check Valve
Erroneous Tank A (or B) Level Reading	Bad Calibration	Perform Foam Flow Calibrate See Section 6.4.5 in the OIM Manual (FSG–MNL-00193)
	Dirt in tank	Clean the tank
No Tank A (or B) Level Reading	Tank A (or B) Level Sensor	Verify Harness connection
		Verify Sensor installed properly See paragraph 5.11 in OIM Manual (FSG–MNL–00193)
Erroneous Pressure Reading	Bad Pressure Calibration	Perform Pressure Sensor Calibration (see Section 6.4, User Calibration, of the OIM manual [FSG–MNL-00193])
	Sensor(s) installed backwards	Verify discharge pressure sensor is installed on discharge side of pump and suction pressure sensor is installed on suction side of pump
No Pressure Reading	Pressure Sensor malfunction	Verify harness/wiring connections
		Verify sensor is properly installed
		Replace sensor
Display does NOT turn on	Source power not on	Verify power supply on and fuse is not failed
	Display improperly installed	Verify harness/wiring connections

4.4.1 General SmartATP Troubleshooting

- ❑ Verify all connectors are secure and correct.
- ❑ Verify the system is receiving adequate power. Look at the top of the foam controller, verify the SYSTEM PWR indicator is on and steady.

NOTE

The NEMA CAN Bus (connector C) on the UltraView display ONLY receives power and ground; no other CAN connections (bus or terminators) are required/used.

❑ Verify the CAN communication is functioning. Look at the top of the foam controller, verify the COM indicator is on and steady. If the indicator is flashing, verify there are no missing/unplugged terminating resistors (Figure 5).

Figure 5. Terminating Resistor

❑ Verify that there is an adequate supply of foam

❑ Verify that there is an adequate supply of water and pressure (150 psi minimum) Verify valves are actuating correctly (Password 5050 to test)

❑ Verify that flow is going in direction of arrows on the check valve and the eductor

4.4.2 Troubleshooting No Foam Flow

There are several potential reasons for no foam flow, the following subparagraphs provide additional troubleshooting information for use when the system will not flow foam.

4.4.2.1 System Not Primed

If the plumbing in the SmartATP system has not been primed (evacuated of air), then the SmartATP will not introduce foam into the pump.

To prime the system, hold the  button until foam comes out of the pump discharge.

NOTE

Due to the amount of air in the foam system (depends on component and plumbing volume), priming the foam system may cause the pump to loose prime. If this occurs, prime the pump, then prime the foam system again.

Releasing the button allows the SmartATP system to begin proportioning foam accurately, if the foam system is primed.

If the pump loses prime, release the  button immediately and prime the pump.

IMPORTANT ⚠ NOTICE

DO NOT RUN THE PUMP PRIMER FOR MORE THAN 45 SECONDS. IF PUMP PRIME IS NOT ACHIEVED IN 30 - 45 SECONDS, STOP AND LOOK FOR AIR LEAKS OR A BLOCKED SUCTION HOSE.

If you have primed the pump for more than 30 seconds without any foam being introduced; the issue may be found in one of the OEM Requirements in Section 5.1 of the SmartATP OIM manual (P/N FSG–MNL–00193).

4.4.2.2 Check Valve Incorrectly Installed

If the check valve is installed backwards it will not allow foam to flow. Verify the mounting of the check valve is upright and in the direction of foam flow as shown on Figure 6.

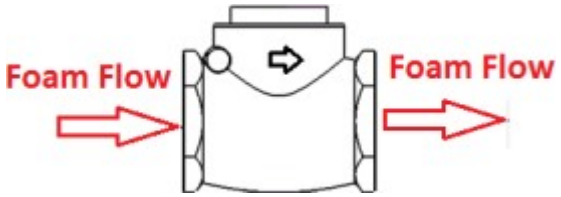

Figure 6. Proper Check Valve Installation

4.4.2.3 Eductor Incorrectly Installed

If the eductor is installed incorrectly, it will not create the suction required to allow foam flow. Verify eductor is installed with the water flow in the same direction as the arrow on the eductor as shown on Figure 7.

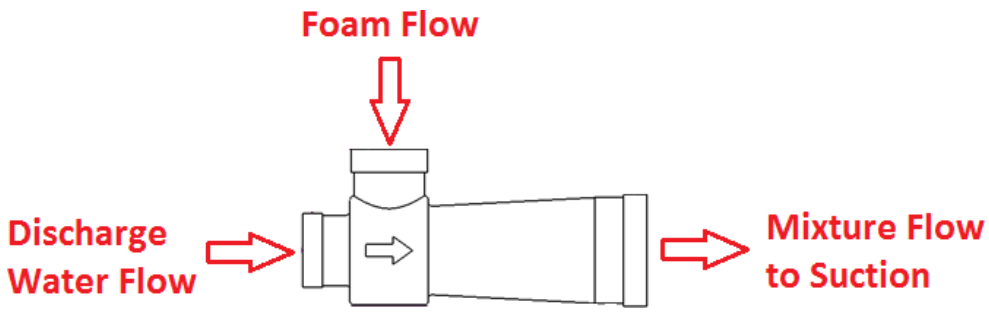

Figure 7. Eductor Installation

4.4.2.4 Metering Valve Stuck Closed

The metering valve will not allow foam flow if is stuck closed.

IMPORTANT ⚠ NOTICE

IF THE METERING VALVE IS STUCK CLOSED DURING OPERATION, USE THE MANUAL OVERRIDE HANDLE TO CONTINUE OPERATION. PRIOR TO USING METERING VALVE AGAIN, HAVE THE VALVE SERVICED.

One or more of the following could cause the metering valve to stick closed.

- Unplugged/incorrect connection
- Loss of CAN communication
- Damaged harness/controller
- Mechanical failure/blockage
- Damaged motor

To test the metering valve, go to the troubleshoot menu (enter password 5050) and manually actuate the valve.

4.4.2.4.1 Metering Valve Unplugged/Incorrect Connection

Verify the metering valve is connected to the harness correctly. (Harness connector is tagged as 7-Metering Valve.)

Figure 8. Harness Label for 7-Metering Valve

- Verify the pins are seated inside the connectors. (If NOT seated, use a small flathead screwdriver to push the pin(s) back into place.)
- Verify Connection 2A is complete and secure. (See Figure 3, Hale SmartATP Connection Diagram, in the SmartATP Parts Manual [FSG–MNL–000188]).

To test the metering valve function enter password 5050 and manually actuate the valve.

4.4.2.4.2 Damaged Harness/Controller/Metering Valve

A damaged harness could result in the motor not receiving power or signal. To determine if the metering valve is receiving power, use a multimeter to measure the voltage from pin 4 to pin 1 on connector 7. (See Figure 24 for the metering valve connector pinout.) If the voltage reads 12 VDC (or 24 volts for a 24 VDC electrical system), the controller and harness are functioning.

However, if the reading is low (below 12/24 VDC or no reading) there is damage to the harness or the controller. To determine if there is harness damage, disconnect both ends of the harness, then using Table 5 and a multimeter, perform a continuity check.

Table 5. Metering Valve Cable Continuity List

Metering Valve Pin (Connector 7)	Controller Pin (Connector 2A)
1	12
2	11
3	2
4	1

NOTE: See Figure 21 for the 12 pin DEUTSCH connector pinout (Connector 2A) and Figure 24 for the 4 pin DEUTSCH connector pinout (Connector 7).

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the metering valve. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely mechanical or the motor in the valve is damaged. Reference the Parts Manual (FSG–MNL–00195) for the valve's replacement part number.

4.4.2.4.3 Mechanical Failure/Blockage (Metering Valve)

If there is a mechanical failure or blockage the valve may not allow foam to flow.

- If you can NOT open the valve (with the override handle) there is most likely blockage. Examine the valve for an obvious blockage that is preventing the valve from opening. Correct the blockage and test valve actuation.
- If the electric motor is running (without mechanically opening the valve), there is most likely a mechanical failure between the motor and the valve stem. Verify the stem or stem adapter is not broken and/or missing. If there is a broken or missing part, reference the SmartATP Parts Manual (FSG–MNL–00195) for replacement part numbers.

4.4.2.4.4 Damaged Motor (Metering Valve)

If harness damage or mechanical failure/blockage does NOT exist, the motor is most likely damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the metering valve's replacement part number.

4.4.2.5 Water Shutoff Or Tank Shutoff Valve Stuck Closed

If a Water Shutoff or Tank Shutoff valves is stuck closed, the system can NOT produce foam. One or more of the following could cause the valve to stick closed.

- Unplugged/incorrect connection
- Damaged harness/controller
- Mechanical failure/blockage

To test the shutoff valves enter password 5050 (goes to the troubleshoot menu) and manually actuate the valve (or valves).

4.4.2.5.1 Unplugged Connector/Incorrect Connection (Shutoff Valves)

Verify that the valve connection is correct. See Figure 3, Hale SmartATP Connection Diagram, in the SmartATP Parts Manual (P/N FSG–MNL–00195).

- Verify the water shutoff valve (open) solenoid, connected to connector 8A.
- Verify the water shutoff valve (close) solenoid, connected to connector 8B.
- Verify the Tank shutoff valve (open) solenoid, connected to connector 9A for Foam A.
- Verify the Tank shutoff valve (open) solenoid, connected to connector 10A for Foam B.

- Verify the Tank shutoff valve (close) solenoid, connected to connector 9B for Foam A.
- Verify the Tank shutoff valve (close) solenoid, connected to connector 10B for Foam B.
- Verify pins seated inside the connectors.
  (If NOT seated, use a small flathead screwdriver to push the pin back into place.)

The valve will not open if the connections are NOT seated (or are incorrect). To test the valve, enter password 5050 and test each individual valve function.

4.4.2.5.2 Damaged Harness/Controller/Shutoff Valve

A damaged harness could result in the solenoid controlling the valve not receiving power (signal). To determine if the solenoid is receiving power, unplug the connector at the solenoid and use a multimeter to measure the voltage across pin A and pin B of the solenoid connector. (See Figure 25 for the solenoid connector pinout.) The voltage reading for any pair of solenoids (one open, one closed for Water, Tank A, or Tank B) needs to be 12 volts for the active solenoid and 0.5 volts for the other solenoid. For example: The initial state of the system is all vales closed; which would place 12 VDC on the Closed solenoid connectors and 0.5 VDC on the Open solenoid connectors.

However, if the readings are NOT correct, there is damage to the harness or the controller. To determine if there is harness damage disconnect both ends of the harness, then using a multi-meter and Table 6, perform a continuity check.

Table 6. Solenoid Valve Cable Continuity List

Solenoid Connector/Pin	Controller Connector/Pin
Water Solenoid Open (8A)	
A	Connector 2C Pin 2
B	Connector 2A Pin 12
Water Solenoid Closed (8B)	
A	Connector 2C Pin 6
B	Connector 2A Pin 12
Tank A Open (9A)	
A	Connector 2C Pin 8
B	Connector 2A Pin 12
Tank A Closed (9B)	
A	Connector 2C Pin 3
B	Connector 2A Pin 12
Tank B Open (10A)	
A	Connector 2C Pin 7
B	Connector 2A Pin 12
Tank B Closed (10B)	
A	Connector 2C Pin 4
B	Connector 2A Pin 12

NOTE: See Figure 21 for the 12 pin DEUTSCH connector pinout (Connector 2A) and Figure 23 for Connector 2C.

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the SmartATP Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) With the controller in the initial state the Water, Tank A, and Tank B Closed solenoid outputs measure 12 VDC (or 24 VDC for a 24 V electrical system) and the associated Open solenoids measure 0.5 VDC. Otherwise, replace the failed controller. Reference the Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If connecting the solenoid causes the output voltage to change significantly (or go away); or if the air supply is present at the solenoid but NOT at the valve actuator; the solenoid is most likely damaged. Reference the OEM documentation for the solenoid's replacement part number.

If the air pressure supplied to the valve actuator is correct (for both the open and close side of the actuator), the valve (or mechanical linkage) is most likely stuck or damaged. Reference the OEM documentation for the valve's replacement part number.

If the system is utilizing the optional Akron Brass shutoff valves, verify the CAN bus functionality as follows. If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the shutoff valves. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in. Also verify all the valves are correctly programmed in the controller.)

If there is no issue with the controller or CAN communication, the issue is most likely mechanical or the motor in the valve is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the valve's replacement part number.

4.4.2.5.3 Mechanical Failure/Blockage (Shutoff Valves)

If there is a mechanical failure or blockage then the valve may not allow foam to flow through it.

- Check/ensure the air supply is adequate. If not, then correct the air supply and test valve.
- Check/ensure there are no leaks in the air supply line. If there are, then fix supply line and retest valve.
- Inspect the valve for obvious blockage. If present, correct the blockage and test valve.
- If blockage is NOT the issue, there could be a mechanical failure. Reference the OEM documentation for the valve's replacement part number.

To test the valve, enter password 5050 and test each individual valve function.

4.4.2.6 No Foam Flow Due to Erroneous Valve Actuation

If the Water/Tank valves are closing when system on and opening when system off, then no foam flow could occur. If this is the case, examine the solenoid connectors because the harness open and closed solenoid connections are reversed. Reference Figure 3, Hale SmartATP Connection Diagram, in the SmartATP Parts Manual (FSG–MNL–00195). Swap the connections and test the valves. (Enter password 5050 and then test each individual valve function.)

4.4.2.7 Foam Tank Empty

An empty foam tank always results in no foam flow. Check the SmartATP UltraView display for a low foam warning. Also, manually check the tank (or tanks) to verify foam concentrate is present.

4.4.3 Troubleshooting Foam Flow Without A Foam Flow Display Reading

If foam discharge is present, but the SmartATP display is reading no foam flow, verify and correct the following.

- There are unplugged or incorrect harness connections
- The harness and/or controller is damaged/failed
- Flowmeter 6A or 6B is damaged/failed

4.4.3.1 Flowmeter 6A or 6B Damage

Note that the system operates with only one functional foam flowmeter. For accuracy and redundancy the Controller averages the two inputs when both are present; however, if only one input is present the Controller uses that single input (the Controller does not care which is present as long as one is present). Therefore, both flowmeters would have to fail for the system to fail to display foam flow. This scenario makes flowmeter inspection for damage or buildup (foam/hard water residue) very important. If there is buildup, clean the flowmeter.

Note also that both flowmeters have to be functional for the system to be calibrated.

Test both flowmeters often (disconnect each flowmeter separately) and verify the foam flow reading is NOT significantly changed with one (then the other) flowmeter disconnected. If with clean paddlewheels, the displayed foam flow reading drops significantly (with only one flowmeter connected), or no reading is displayed (with both flowmeters connected), order replacement flowmeters. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the flowmeter's replacement part number.

4.4.3.2 Unplugged Or Incorrect Harness Connections

Verify that connections 6A and 6B are correct (connectors and flowmeter are factor labeled – maintain labeling after performing any maintenance tasks) and secure. If they are loose or NOT secured, seat the harness connector(s) and check foam flow reading. Figure 9 shows the proper connections.

Figure 9. Foam Flowmeter Connections

To verify the connections, check that the pins are seated inside each connector and each connector is seated on the flowmeter. If unseated pins are found, use a small flat blade screwdriver to push each pin back into place.

4.4.3.3 Damaged Foam Flowmeter Harness

A damaged harness/controller could result in the flowmeter not receiving power or the signal not being received/processed by the controller. To determine if the sensor is receiving power, unplug the connector at the flowmeter and use a multimeter to measure the voltage across pin A and pin B of the flowmeter connector. (See Figure 26 for the flowmeter connector pinout.) If the voltage reads 9 VDC the controller and harness are functioning.

However, if there is no voltage reading there is damage to the harness or the controller. To determine if the harness is damaged disconnect both ends of the harness, then using Table 6 and a multimeter, perform a continuity check.

Table 7. Foam Flowmeter Cable Continuity List

Solenoid Connector/Pin	Controller Connector/Pin
Foam Flowmeter 1 (Connector 6A)	
A	Connector 2A Pin 12
B	Connector 2C Pin 10
C	Connector 2A Pin 9
Foam Flowmeter 2 (Connector 6B)	
A	Connector 2A Pin 12
B	Connector 2C Pin 10
C	Connector 2A Pin 11

NOTE: Reference Figure 21 for the 12 pin DEUTSCH connector 2A and Figure 23 for the 2C connector pinout.

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the metering valve. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely mechanical (clean the paddlewheels) or the flowmeter is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the flowmeter's replacement part number. Hale recommends replacing both flowmeters at the same time.

4.4.4 Troubleshooting Erroneous Water/Foam Flow Readings

The following could cause erroneous flow readings.

- Turbulence in flow
- Residue buildup on sensor
- Bad calibration
- Flush Valve stuck open

4.4.4.1 Erroneous Readings From Turbulence

Poor selection of eductor outlet location/plumbing may cause turbulence. Locating the foam solution injection point to close to the pump impeller (volute style pumps are mainly affected). To minimize turbulence, if utilizing a Q Series pump, use one of the auxiliary suction ports (U, V, W, or X; reference Midship Muscle Pump Manual – P/N 029–0020–63–0) to inject the foam solution and if utilizing a volute style pump, Hale recommends a 6D distance from the impeller to the injection point.

Verify all SmartATP OIM manual (FSG–MNL–00193) Section 5.1 and 5.11 guidelines were followed. If guidelines were not followed, correct the system installation using the guidelines. If system installation correction is not possible, increasing the buffer rate setting to stabilize the flow readings. (Enter password 57643 and change factory setting.)

4.4.4.2 Erroneous Readings From Buildup On Sensor

Residue buildup on sensor paddlewheel can cause erroneous readings. To resolve this issue, perform the Flowmeter Check procedure. (Reference paragraph 7.3.2 in the SmartATP OIM manual [FSG–MNL–00193].)

4.4.4.3 Erroneous Readings From Failed Calibration

If there are erroneous readings without turbulence or buildup, the water/foam flow requires calibration. Calibrate the flow sensors according to the instruction in the SmartATP OIM manual (FSG–MNL–00193) paragraph 6.4.3 or 6.4.4.

4.4.4.4 Flush Valve Stuck

The flush valve stuck open causes erroneous foam flow since water running through the foam line gives a false foam reading. When this occurs the actual foam concentrate flow is less (potentially zero) than the system reads. One or more of the following could cause the flush valve to stick open.

- Unplugged/incorrect connection
- Damaged harness/controller
- Mechanical failure/blockage

To test the flush valve go to the troubleshoot menu (password 5050) and manually actuate the valve.

4.4.4.4.1 Unplugged Connector/Incorrect Connection (Flush Valve)

Verify that the valve connection is correct. See APPENDIX A, Section A.3 (page A–4).

- Verify the flush valve (open) solenoid connection is 11A
- Verify the flush valve (close) solenoid connection is 11B
- Verify all connector pins are seated. (If NOT seated, use a small flathead screwdriver to push the pin back into place.)

Loose or incorrect connections cause the valve not to open. If the flush valve opens when it is supposed to close and closes when it is supposed to open, reverse the switch connectors. To test the connections enter password 5050 and test each individual valve function.

4.4.4.4.2 Damaged Harness/Controller (Flush Valve)

A damaged harness could result in the solenoid controlling the valve not receiving power (signal). To determine if the solenoid is receiving power, unplug the connector at the solenoid and use a multimeter to measure the voltage across pin A and pin B of the solenoid connector. (See Figure 25 for the solenoid connector pinout.) The voltage reading for any pair of solenoids (one open, one closed) needs to be 12 volts for the active solenoid and 0.5 volts for the other solenoid.

However, if the readings are NOT correct, there is damage to the harness or the controller. To determine if there is harness damage disconnect both ends of the harness, then using a multimeter and Table 8 perform a continuity check.

Table 8. Flush Valve Cable Continuity Lis

Connector/Pin	Controller Connector/Pin
Flush Open (Connector 11A)	
A	Connector 2C Pin 5
B	Connector 2A Pin 12
Flush Closed (Connector 11B)	
A	Connector 2C Pin 1
B	Connector 2A Pin 12

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the SmartATP Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) With the controller in the initial state the Closed solenoid measures 12 VDC (or 24 VDC for a 24 V electrical system) and the associated Open solenoid measures 0.5 VDC. Otherwise, replace the failed controller. Reference the Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

4.4.4.4.3 Mechanical Failure/Blockage (Flush Valve)

If there is a mechanical failure or blockage then the valve may not allow foam to flow through it.

- Check/ensure the air supply is adequate. If not, then correct the air supply and test valve.
- Check/ensure there are no leaks in the air supply line. If there are, then fix supply line and retest valve.
- Inspect the valve for obvious blockage. If present, correct the blockage and test valve.
- If blockage is NOT the issue, there could be a mechanical failure. Reference the OEM documentation for the valve's replacement part number.

To test the valve, enter password 5050 and test each individual valve function.

4.4.5 Troubleshooting No Water Flow Reading But Pump Is Flowing

If water is coming out of the discharge, but the SmartATP display is reading no water flow one of the following is the problem.

- Unplugged/incorrect connection
- Damaged harness/controller
- Flowmeter is not placed in waterway
- Flowmeter (connector 5) is damaged

4.4.5.1 No Water Flow Reading Due To Unplugged Connector/Incorrect Connection

Verify that connector 5 is correct and secure. If connector is loose, seat connector and test water flow reading. Figure 10 shows the proper connection.

Figure 10. Water Flowmeter Connection

Verify the pins inside the connector are seated. (If NOT seated, use a small flathead screwdriver to push the pin back into place.)

4.4.5.2 Damaged Water Flowmeter Harness/Controller

A damaged harness/controller could result in the flowmeter not receiving power or the signal not being received/processed by the controller. To determine if the sensor is receiving power, unplug the connector at the flowmeter and use a multimeter to measure the voltage across pin A and pin B of the flowmeter connector. (See Figure 26 for the flowmeter connector pinout.) If the voltage reads 9 VDC the controller and harness are functioning.

However, if there is no voltage reading there is damage to the harness or the controller. To determine if the harness is damaged disconnect both ends of the harness, then using Table 9 and a multimeter, perform a continuity check.

Table 9. Water Flowmeter Cable Continuity List

Water Flowmeter (Connector 5) Pin	Controller/Pin
A	Connector 2A Pin 12
B	Connector 2C Pin 10
C	Connector 2C Pin 9

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If

none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the metering valve. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely mechanical (clean the paddlewheels) or the flowmeter is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the flowmeter's replacement part number.

4.4.5.3 Flowmeter Not Placed In Waterway

Verify the water flowmeter is placed in the pumps main waterway. Do NOT place the flowmeter in plumbing that does not always see water when the pump is running.

4.4.5.4 Flowmeter Connector 5 Damaged

Remove and inspect the flowmeter for damage or foam/hard water buildup that prevents the paddlewheel from rotating. If there is buildup, clean the flowmeter, otherwise, replace the flowmeter.

4.4.6 Troubleshooting Poor System Performance

The SmartATP moves a maximum of 125 GPM or 225 GPM foam solution depending on the model. If maximum performance is degraded/deficient check for the following:

- Hydro/suction leak in eductor plumbing
- Inefficient plumbing
- Excessive suction lift
- Stuck check valve
- Excessive intake pressure

4.4.6.1 Hydro/Suction Leak In Eductor Plumbing

A leak in the suction line results in a loss in performance. Hydrostatically test the plumbing (up to 200 psi) to identify any leaks. Correct any leaks and test maximum performance.

4.4.6.2 Inefficient Plumbing

Inefficient plumbing causes frictional losses that result in a decrease in performance. Minimize piping length and the amount of elbows to maximize efficiency. Use class 1 flexible hose to minimize the number of elbows and reduce the overall length.

4.4.6.3 Excessive Suction Lift

The SmartATP systems foam concentrate tank(s) should feed by gravity; however, the system can lift foam concentrate from ground totes. Ensure the foam concentrate lift is NOT excessive which results in a loss in system maximum performance. Mount the SmartATP system as low as possible to maximize performance.

4.4.6.4 Check Valve Sticking

Failing to flush the check valve allows residue to build up. This buildup causes the check valve to stick reducing performance. If there is check valve buildup use a soft bristle detailers brush to remove the buildup. If inspection requires opening (or removing) the plumbing, hydrostatically test the plumbing (up to 200 psi) to verify no leaks is present.

4.4.6.5 Excessive Intake Pressure

The SmartATP system performs at maximum efficiency when the pumps intake pressure is zero (pumping from draft or pumping from tank). As the pumps intake pressure increases the maximum foam flow decreases. If experiencing poor system maximum performance verify the pumps intake pressure does not exceed the recommended pressure. (Refer to Table 4 in the SmartATP OIM manual [FSG–MNL–00193].)

4.4.7 Troubleshooting Erroneous Tank Level Readings

An incorrect tank level calibration causes erroneous tank level reading. To correct the problem, calibrate the tank level sensor by following the procedures in Section 6.4, User Calibration, in the SmartATP OIM manual (FSG–MNL–00193)

4.4.8 Troubleshooting No Tank Level Reading

The following causes no tank level reading.

- No foam in tank
- Poor sensor installation
- No harness connection
- Damaged harness/controller
- Damaged sensor

4.4.8.1 Foam Tank Empty

If there is no foam concentrate in the foam tank the reading will be zero. Verify there is foam in the tank. If the tank is empty, fill tank and check the display for a tank level reading.

4.4.8.2 Poor Tank Level Sensor Installation

Mounting the sensor incorrectly could cause no tank level readings. Verify the tank level sensor installation complies with the installation guidelines in Section 5.11, Foam Tank Level Sensor Installation, in the SmartATP OIM manual (FSG–MNL–00193). If mounted incorrectly, install the tank level sensor according to the tank level sensor guidelines and then perform a calibration.

4.4.8.3 No Tank Level Sensor Harness Connection

Verify the tank level sensor (or both sensors for a two tank system) are plugged into the corresponding harness connection (4A and/or 4B). If not, connect the harness to the sensor and check reading. See Figure 11 for the proper connection.

Figure 11. Tank Level Sensor Connection

Verify the pins inside the connector(s) are seated correctly. (If NOT seated, use a small flathead screwdriver to push the pin back into place.) See pinout in the section below for pin locations.

4.4.8.4 Damaged Harness/Controller (Tank Level)

A damaged harness/controller could result in the tank level sensor not receiving power or the signal not being received/processed by the controller. To determine if the sensor is receiving power, unplug the connector at the tank level sensor and use a multimeter to measure the voltage across pin A and pin B of the tank level sensor connector. (See Figure 24 for the tank level sensor connector pinout.) If the voltage reads 5 VDC the controller and harness are functioning.

However, if there is no voltage reading there is damage to the harness or the controller. To determine if the harness is damaged disconnect both ends of the harness, then using Table 9 and a multimeter, perform a continuity check.

Table 10. Tank Level Sensor Cable Continuity List

Connector/Pin	Controller Connector/Pin
Tank A Level Sensor (Connector 9A)	
A	Connector 2B Pin 2
B	Connector 2A Pin 12
C	Connector 2B Pin 6
Tank B Level Sensor (Connector 9B)	
A	Connector 2B Pin 2
B	Connector 2A Pin 12
C	Connector 2B Pin 5

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the SmartATP Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the metering valve. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely the tank level sensor is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the tank level sensors replacement part number.

4.4.8.5 Damaged Sensor (Tank Level)

If the sensor is damaged, reference the SmartATP Parts Manual (FSG–MNL–00195) for the replacement sensor part number.

NOTE

The operating pressure of the tank level sensor is 5 psi. (Additionally, the sensor has a burst pressure of 15 psi.)

4.4.9 Troubleshooting Erroneous Pressure Readings

The following cause erroneous pressure readings.

- Improper pressure sensor installation
- Pressure sensor calibration

4.4.9.1 Pressure Sensors Installed Incorrectly

Installing the discharge and suction pressure sensors incorrectly results in erroneous pressure readings. For Hale pumps, refer to the pump manual for pressure sensor mounting locations. Verify the suction pressure sensor is installed on the suction side of the pump and the discharge sensor is installed on the discharge side of the pump. If they are not installed on the proper pump locations then that would result in erroneous readings.

IMPORTANT ⚠ NOTICE

THE PRESSURE AND TANK LEVEL SENSORS APPEAR SIMILAR, DO NOT INSTALL A TANK LEVEL SENSOR IN THE DISCHARGE (OR SUCTION) WATERWAY OF A PUMP. (THE TANK LEVEL SENSOR HAS A BURST PRESSURE OF 15 PSI.)

4.4.10 Troubleshooting No Pressure Reading

When there is no pressure reading, check the following.

- Incorrect sensor installation
- Damaged harness
- Damaged sensor

4.4.10.1 Incorrect Sensor Installation Causing No Pressure Reading

Installing the pressure sensors incorrectly could result in pressure readings of zero. Verify the suction and discharge sensors are installed in the main suction and discharge waterways. Then verify harness connectors 3A and 3B are properly connected as shown on Figure 12.

Figure 12. Pressure Sensor Connections

4.4.10.2 Damaged Harness/Controller Causing No Pressure Reading

A damaged harness/controller could result in the pressure sensor not receiving power or the signal not being received/processed by the controller. To determine if the sensor is receiving power, unplug the connector at the pressure sensor and use a multimeter to measure the voltage across pin A and pin B of the pressure sensor connector. (See Figure 26 for the pressure sensor connector pinout.) If the voltage reads 5 VDC the controller and harness are functioning.

However, if there is no voltage reading there is damage to the harness or the controller. To determine if the harness is damaged disconnect both ends of the harness, then using Table 11 and a multimeter, perform a continuity check.

Table 11. Pressure Sensor Cable Continuity List

Connector/Pin	Controller Connector/Pin
Discharge Pressure (Connector 3A) Pin	
A	Connector 2A Pin 12
B	Connector 2B Pin 2
C	Connector 2B Pin 8
Suction Pressure (Connector 3B) Pin	
A	Connector 2A Pin 12
B	Connector 2B Pin 2
C	Connector 2B Pin 9

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the SmartATP Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely the pressure sensor is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the pressure sensors replacement part number.

4.4.10.3 Damaged Sensor Causing No Pressure Reading

If a sensor is damaged, reference the SmartATP Parts Manual (FSG–MNL–00195) for the pressure sensor part number. The pressure sensor operates up to 300 psi.

4.4.11 Troubleshooting Display Not Turning On

When the display will NOT turn on, check the following.

- Incorrect harness installation
- Damaged harness
- Improper power supply
- Damaged display

4.4.11.1 Incorrect Harness Installation Causing Display Not Turning On

Verify connectors 1B and 1C on the harness are plugged into the display 1B and 1C connections on the display as shown in Figure 13.

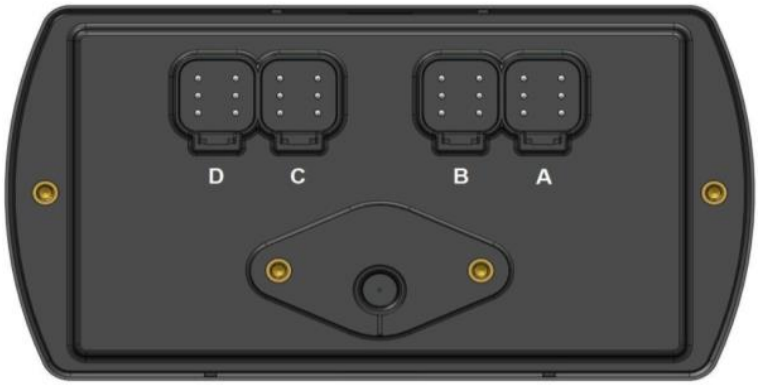

Figure 13. Display Connections

The connectors are keyed to preclude transposition and/or reverse orientation; however, excessive force does allow misconnections. Mating the connectors improperly results in the display not turning on.

4.4.11.2 Damaged Harness/Controller Causing Display Not Turning On

A damaged harness/controller could result in the display not receiving power or the ignition signal not being received/processed by the controller. To determine if the display is receiving power, unplug the connector at the display and use a multimeter to measure the voltage across pin 1 and pin 6 of the display connector. (See Figure 28 for the display connector pin out.) If the voltage reads 12 VDC (24 VDC for an apparatus with a 24 volt electrical system) the controller and harness are functioning. Additionally, determine if the sensor is receiving power, unplug the connector at the display and use a multimeter to measure the voltage across pin 1 and pin 6 of the display connector.

However, if there is no voltage reading there is damage to the harness or the controller. To determine if the harness is damaged disconnect both ends of the harness, then using Table 12 and a multimeter, perform continuity checks.

Table 12. Display Cable Continuity List

Connector 1B Pin	Controller (Connector 2A) Pin
1	1
2	2
3	11
4	N/A
5	See Note 1/
6	12

NOTE 1/ This pin does NOT go to the Controller, it goes to the IGN (ignition) wire at Connection 13 (Refer to Figure 3, Hale Smart ATP Connection Diagram, in the SmartATP Parts Manual [FSG–MNL–00195].)

4.4.11.3 Power Supply Causing Display Not To Turn On

Ensure the SmartATP system receives the correct power (12 VDC @ 10 A or 24 VDC @ 5 A) or the display will not turn on. The SmartATP system requires a minimum of 10/5 AMPs to operate; anything less and the display may not turn on.

4.4.11.4 Display Damaged

If the display is receiving the correct power and still does not turn on the display is damaged. Reference the SmartATP Parts Manual (FSG–MNL–00195) for display part number.

4.4.12 Troubleshooting Autofill

To troubleshoot autofill, locate the SCR table (Table 13) listing the indicated SYMPTOM, verify the associated CAUSE (verify ALL if multiple are listed) and perform the associated REMEDY.

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

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

Table 13. Autofill SCR Table

Symptom	Cause	Remedy
Tank does NOT fill (KZCO valve is NOT actuating)	Autofill NOT enabled	Autofill not enabled in SmartATP software. Enable in autofill scree (password 2020)
	Harness connection(s)	Harness not plugged in, verify all connections are secure
	Harness damaged	Verify continuity and voltage supply (see paragraph 4.4.12.1, Damaged Harness/ Controller/ Autofill Valve, or 4.4.12.2, Troubleshooting Autofill Intake Pressure Sensor)
		Damaged Harness Refer to Parts Manual (FSG–MNL–00195) for the harness replacement part number
	Terminating resistor unplugged	T/S CAN Bus (Verify 60 Ohm CAN bus) (see paragraph 4.4.1)
	Valve NOT Addressed correctly	Set valve to Address 1 (see paragraph 4.5.5)
	CAN communication failed	Verify COM indicator on foam controller is on steady
		Foam Controller/UltraView Display failed Refer to SmartATP Parts Manual (FSG–MNL–00195) for the controller and/or display replacement part number

Table 13. Autofill SCR Table – CONTINUED

Symptom	Cause	Remedy
Tank does NOT fill – CONTINUED	Pressure Sensor	Debris build up over sensor, clean sensor
		Intake pressure less than 7 psi Increase water source pressure
		Verify harness and connection
		Pressure sensor failed Refer to SmartATP Parts Manual (FSG–MNL–00195) for the pressure sensor replacement part number
Autofill is functioning but tank is still being drained	Pump is pumping more water than is being supplied	Increase intake flow (add another water source)(Preferred Remedy)
		Decrease discharge flow
Tank is empty but ITL shows a level	ITL	Calibrate ITL (calibrate ILT IAW Operation Manual, 118253)
		Verify the following for the ITL level sensor: • Plugged in (Secure connector) • Clogged (Clean sensor) • Failed (Replace sensor)
Autofill is functioning but tank is overflowing	ITL	Verify ITL is connected to CAN bus without COM failure
		Calibrate ITL (calibrate ILT IAW Operation Manual, 118253)
		Verify the following for the ITL level sensor: • Plugged in (Secure connector) • Clogged (Clean sensor) • Failed (Replace sensor)

4.4.12.1 Damaged Harness/Controller/Autofill Valve

A damaged harness could result in the motor not receiving power or signal. To determine if the autofill valve is receiving power, use a multimeter to measure the voltage from pin 4 to pin 1 on autofill connector C1. (See Figure 24 for the autofill valve connector pinout.) If the voltage reads 12 VDC (or 24 volts for a 24 VDC electrical system), the controller and harness are functioning.

However, if the reading is low (below 12/24 VDC or no reading) there is damage to the harness or the controller. To determine if there is harness damage, disconnect both ends of the harness, then using Table 14 and a multimeter, perform a continuity check.

Table 14. Autofill Valve Cable Continuity List

Autofill Valve Pin (Connector C1)	Controller Pin (Connector 2A)
1	12
2	11
3	2
4	1

NOTE: See Figure 21 for the 12 pin DEUTSCH connector pinout (Connector 2A) and Figure 24 for the 4 pin DEUTSCH connector pinout (Autofill Connector C1).

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the controller requires checking. If the harness continuity is not correct, reference the Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or CAN communication, the issue is most likely mechanical or the motor in the valve is damaged. Reference the Parts Manual (FSG–MNL–00195) for the valve's replacement part number.

4.4.12.2 Troubleshooting Autofill Intake Pressure Sensor

A damaged harness could result in the pressure switch not receiving power (or sending signal). To determine if the autofill valve is receiving power, use a multimeter to measure the voltage from pin A to system ground on autofill connector C4. (See Figure 29 for the autofill pressure switch connector pinout.) If the voltage reads 12 VDC (or 24 volts for a 24 VDC electrical system), the fuse and harness are functioning.

However, if the reading is low (below 12/24 VDC or no reading) there is damage to the harness or the fuse is failed. To determine if there is harness damage, disconnect both ends of the harness, then using Table 15 and a multimeter, perform a continuity check.

Table 15. Autofill Pressure Switch Cable Continuity List

Autofill Valve Pin (Connector C4)	Controller Pin (Connector 2A)
Autofill Intake Pressure (Autofill Connector C4) Pin	
A	1/
B	Connector 2B Pin 12

Note 1/ Wired to system power (+) via the 10A fuse.

If the harness continuity is correct, and there are no short circuits, there is no wire damage to repair and the fuse requires checking. If the harness continuity is not correct, reference the Parts Manual (FSG–MNL–00195) for the harness's replacement part number.

To verify the controller is working correctly, verify the SYSTEM PWR and the COM indicators (on the top of the controller) are illuminated and the MOTOR PWR indicator is NOT illuminated. If none of the indicators are illuminated, the controller is not receiving power. (Check the fuse and power source.) Otherwise, replace the failed controller. Reference the SmartATP Parts Manual (FSG–MNL–00195) for the controller's replacement part number.

If the SYSTEM PWR indicator is illuminated and the COM indicator is flashing, there is an error in the CAN network. (The CAN network controls the metering valve. To quickly check the CAN network, verify there are two terminating resistors in the network and that they are securely plugged in.)

If there is no issue with the controller or fuse, the issue is most likely mechanical (physical blockage or debris build up and cleaning is required) or the pressure switch is damaged. (Note the switch activates at approximately 13 psi and connects system power to the foam controller input while active.) Reference the Parts Manual (FSG–MNL–00195) for the valve's replacement part number.

4.5. SmartATP Component Bench Procedures

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

NOTE

When replacing the entire eductor, ensure the drain (requires a fitting/plug) on the new eductor is NOT left open.

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

4.5.1 Eductor Bench Procedures

The Hale eductor (125 GPM version) bench procedure consists of the nozzle replacement; otherwise, the whole assembly needs replaced. Perform the following to replace a damaged eductor nozzle. See Figure 14.

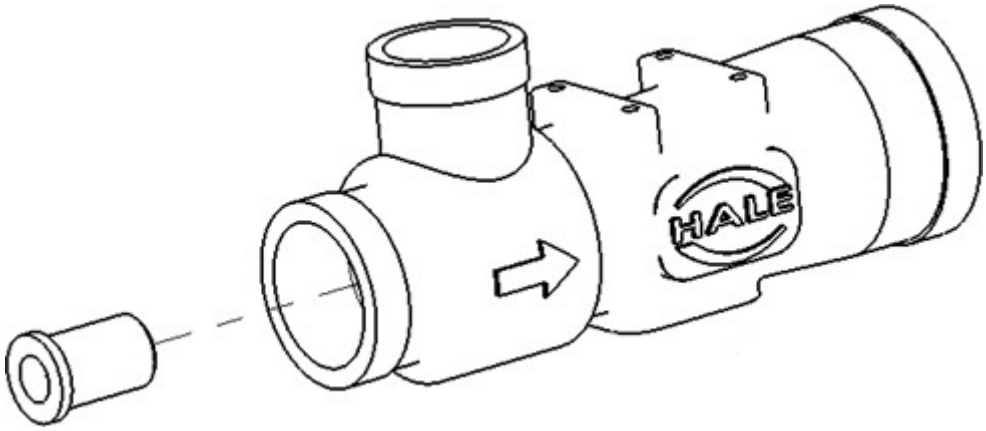

Figure 14. Pressing An Eductor Nozzle In/Out

4.5.1.1 Nozzle Replacement

NOTES

For a 125 GPM eductor nozzle, use a 1–in (25 mm) X 10-in (355 mm) long brass rod to remove the nozzle and a 1 3/8–in (34.9 mm) X 4-in (102 mm) long brass rod to install the nozzle.

For a 225 GPM nozzle, use a 1 5/16–in (33 mm) X 22-in (560 mm) long brass rod (pusher) to remove the nozzle and a 1 3/4–in (44 mm) X 4-in (102 mm) long brass rod to install the nozzle.

To reduce the length of the pusher, remove the eductor outlet when pressing the nozzle out of the eductor. Removing the eductor outlet requires O-ring replacement.

A. Using applicable brass rod, press nozzle out of eductor.
   1. Place eductor on press with outlet end upward.
   2. Place brass rod into eductor and align with nozzle.
   3. Press nozzle out of eductor.

B. Using applicable brass rod, press nozzle into eductor.
   1. Place eductor on press with inlet end upward.
   2. Lubricate nozzle shaft and eductor bore with grease. (Eases assembly.)
   3. Place nozzle into eductor bore. (Verify bore and shaft alignment.)
   4. Using applicable brass rod, press nozzle into eductor.

C. Using appropriate VIC couplings, install eductor into foam system plumbing.

D. Hydrostatic test plumbing to 200 psi to check for leaks.

4.5.1.2 225 GPM Eductor Outlet Removal

If the 225 GPM eductor outlet requires replacement or if the outlet is being removed to facilitate nozzle replacement, perform the following procedure. See Figure 15.

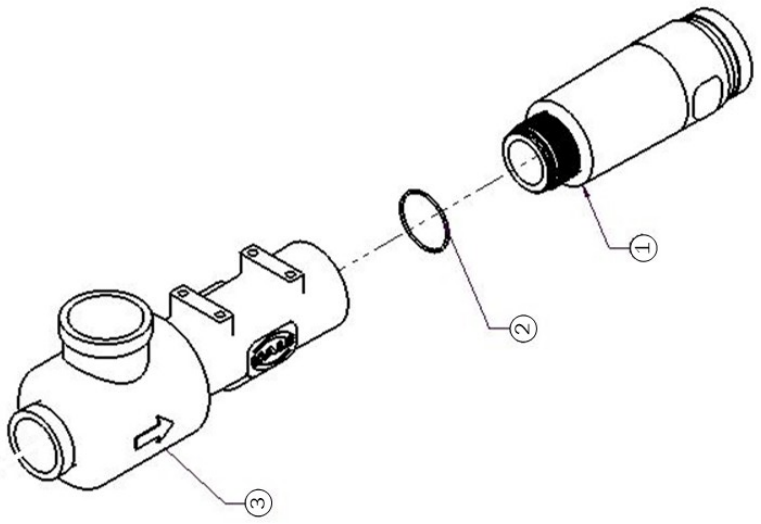

Figure 15. 225 GPM Eductor Assembly

IMPORTANT ⚠ NOTICE

DO NOT APPLY EXCESSIVE PRESSURE ON THE EDUCTOR. IT IS POSSIBLE TO DISTORT OR BREAK THE EDUCTOR.

A. Mount eductor in a large vice.

B. Using a strap (or pipe) wrench, loosen outlet. (Turn outlet CCW.)

C. Remove outlet.

D. Remove O-ring.

E. Perform O-ring Replacement. (See paragraph 4.5.1.3.)

4.5.1.3 O-Ring Replacement

If the joint between the Eductor and the outlet leaks or outlet removal occurs, the O-ring requires replacement. Perform the following procedure to replace the O-ring.

A. If outlet (item 1) is installed, perform 225 GPM Eductor Outlet Removal. (See paragraph 4.5.1.2.)

B. Install new O-ring (item 2) as follows. (Reference Table 2, Eductor Assembly Breakdown, in the SmartATP Parts Manual, FSG–MNL–00195, for the O-ring part number.)

   1. Lubricate new O-ring. (See Table 2.)
   2. Install O-ring in groove on threaded end of eductor outlet (item 1).

C. Perform 225 GPM Eductor Outlet Installation. (See paragraph 4.5.1.4.)

4.5.1.4 225 GPM Eductor Outlet Installation

If the 225 GPM eductor outlet was removed, install the outlet as follows. See Figure 15.

A. Perform O-Ring Replacement. (See paragraph 4.5.1.3.)

B. Apply Loctite 270 to threads on item 1.

NOTE

Use care NOT to let the O-ring catch on any of the threads.

C. Hand start threads on item 1 into item 3.

D. Using appropriate VIC couplings, install eductor into foam system plumbing.

E. Hydrostatic test plumbing to 200 psi to verify no leaks.

4.5.2 Flowmeter Bench Procedure

Reference Class 1 Valve Manual (P/N 119138) for instructions for valve repairs or replacement.

4.5.3 Flowmeter Bench Procedure

The flowmeter bench procedure consists of replacing the whole flowmeter. Perform the following to replace a damaged flowmeter. See Figure 16.

A. Tag and disconnect wiring.

B. Match mark or note flowmeter orientation (specifically - direction of flow indicator). See Figure 15.

C. Using a 7/64-in Allen wrench, remove four (4) flowmeter mounting screws.

D. Remove flowmeter from piping/manifold/spacer. Discard failed flowmeter.

Install a new flowmeter(s) as follows. (Reference Table 4, Flowmeter Assembly Breakdown, in the SmartATP Parts Manual, FSG–MNL–00195, for the part number.) See Figure 16.

A. Using a 7/64-in Allen wrench, remove four (4) flowmeter mounting screws.

B. Separate spacer and flowmeter.

C. Inspect existing spacer for damage (cracking, distortion, correct orientation, etc.).

NOTE

If a leak (air or water) is involved, ALWAYS replace the spacer.

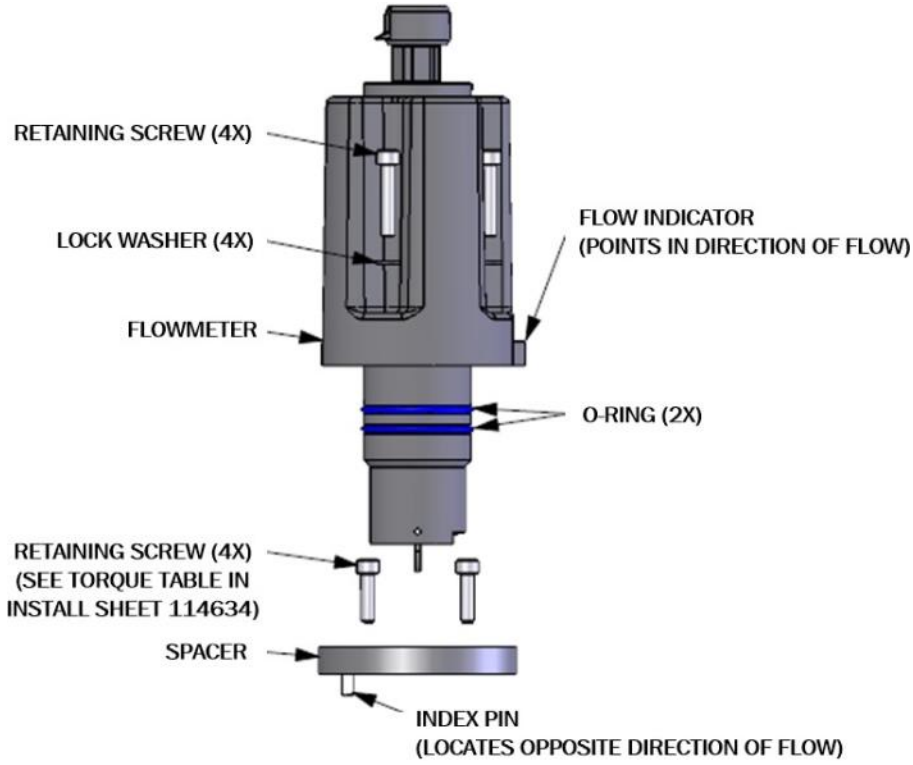

Figure 16. Flowmeter Bench Procedure

D. If replacing spacer:

1. Using 7/64-in Allen wrench, remove four (4) spacer mounting screws from piping/manifold.
2. Remove spacer from piping/ manifold.
3. Discard failed spacer and mounting screws.
4. Install new spacer.
5. Align indexing pin and screw holes with piping/manifold.
6. Install four (4) spacer mounting screws.
7. Torque screws IAW Torque Table on Installation Sheet P/N 114634.

E. Lubricate flowmeter O-rings. (See Table 2.)

F. Install new flowmeter. (Orient the flowmeter so arrow [on label] and notch [on flowmeter] point in the direction of flow.)

Perform the applicable calibration IAW Section 6.4, User Calibration, of the SmartATP OIM manual (FSG–MNL–00193).

4.5.4 Bench Procedure For Optional Input Module

If a dual analog to CAN with accelerometer module (P/N 610–00033) requires replacement, the module requires addressing/programming before it can function in the SmartATP system. Follow the instructions to address and setup a replacement module to support up to two additional water flowmeters. Figure 17 shows the Input Module layout. Refer to the dual analog to CAN with accelerometer modules operation manual (FSG–MNL–00106) for detailed information.

Figure 17. Input Module Layout

4.5.4.1 Enter Setup Mode

Entering setup mode allows password entry. The password entered determines the menu/ parameters available for selection/modification. A magnet is required to utilize the two magnetic switches (Switch 0 and Switch 1) to enter the required password. Place the magnet near Switch 0 to enter a 0 or place the magnet near Switch 1 to enter a 1 until the password has been entered. See Figure 18.

NOTE

When the magnet activates either switch, the address LEDs illuminate to indicate the switch activated. Switch 0 will activate ADD 1 and Switch 1 will activate all the ADD LEDs. If a password is entered incorrectly or a password is entered that is NOT in the password list, the ADD LEDs will alternate On and OFF to indicate an invalid password was entered.

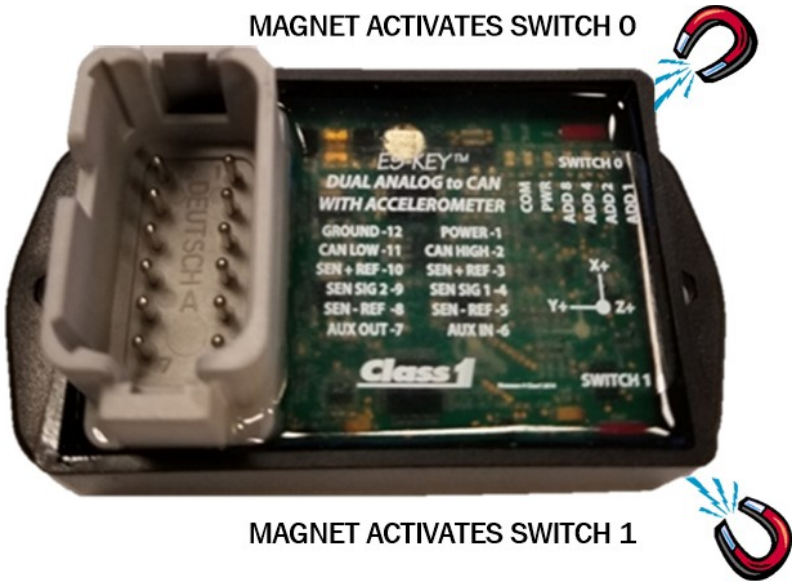

Figure 18. Input Module Setup

4.5.4.1.1 Channel 0/Channel 1 Analog Input Setup

Enter the password 1000 1000, to select the function of channel 0 or enter the password 1000 1001 to select the function of channel 1 (ADD LED 2 and ADD LED 4 flash to acknowledge the entry). After the password acknowledgement indication, the four ADD LEDs (see Table 16) show the current mode. Activate Switch 0 to change the mode until that channel is set to accept a frequency input. Once the frequency mode indication is displayed, activate Switch 1 to save the setting. All the ADD LEDs flash to indicate the mode setting was saved.

Table 16. Set Analog Input To Frequency

Mode	Indication
0 – 5 Volts	ADD 1
4 – 20 mA	ADD 2
Thermistor	ADD 4
Frequency	ADD 8
0 – 30 Volts	ADD 1, ADD 4
Battery Monitor	ADD 2, ADD 4
Temperature Sensor	ADD 1, ADD 2, ADD 4

4.5.4.1.2 Set Module Address

Enter the password 1001 0000. After the password acknowledgement indication, the current address is displayed. Activate Switch 0 to increase the address by 1 every time the switch is activated. Once the desired address is displayed, activate Switch 1 to save the address and all the ADD LEDs flash to indicate the address was saved. Set the module address according to the number of flowmeters are attached to the system. See Table 17.

Table 17. Flow Meter Addresses

# Of Water Flowmeters	Address #
1	No module needed.
2 – 3	1
4 – 5	2
6 – 7	3
8 – 9	4
10 – 11	5
12 – 13	6

4.5.4.2 Show Device Address

Enter the password 1001 0001. After the password acknowledgement indication, the device address displays for 5 seconds. The address is represented by the four ADD LEDs in a binary number format as shown in Table 18.

NOTE

Address 0 flashes all the LEDs. Address 0 is NOT used for an Input Module.

Table 18. Show The Current Address

Address #	ADD 8 Indication	ADD 4 Indication	ADD 2 Indication	ADD 1 Indication
0 *	Flash	Flash	Flash	Flash
1	Off	Off	Off	On
2	Off	Off	Off	Off
3	Off	Off	Off	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
10	On	Off	On	Off
11	On	Off	On	On
12	On	On	Off	Off
13	On	On	Off	On
14	On	On	On	Off
15	On	On	On	On

* Do NOT use Address 0 for an Input Module in the Smart ATP system.

4.5.5 Bench Procedure For Optional Autofill KZCO Valve

If a KZCO valve (autofill valve) requires replacement, the valve requires addressing before it can function in the SmartATP system. The valve will NOT function in the system because the default address is 0 (which causes a conflict on the CAN bus). The valves addressed must be set to 1 to function in the system. Follow the instructions provided below, to address a replacement valve to function on the CAN bus.

NOTE

If the valve came as a complete autofill assembly, the address is already set. ONLY perform this procedure for a replacement valve ordered separately.

A. Place new valve on stable work surface with bottom of control head accessible.

B. Using a 3/4-in wrench (or socket and ratchet), remove threaded cap (black plug) located next to control cable (wiring). See Figure 19.

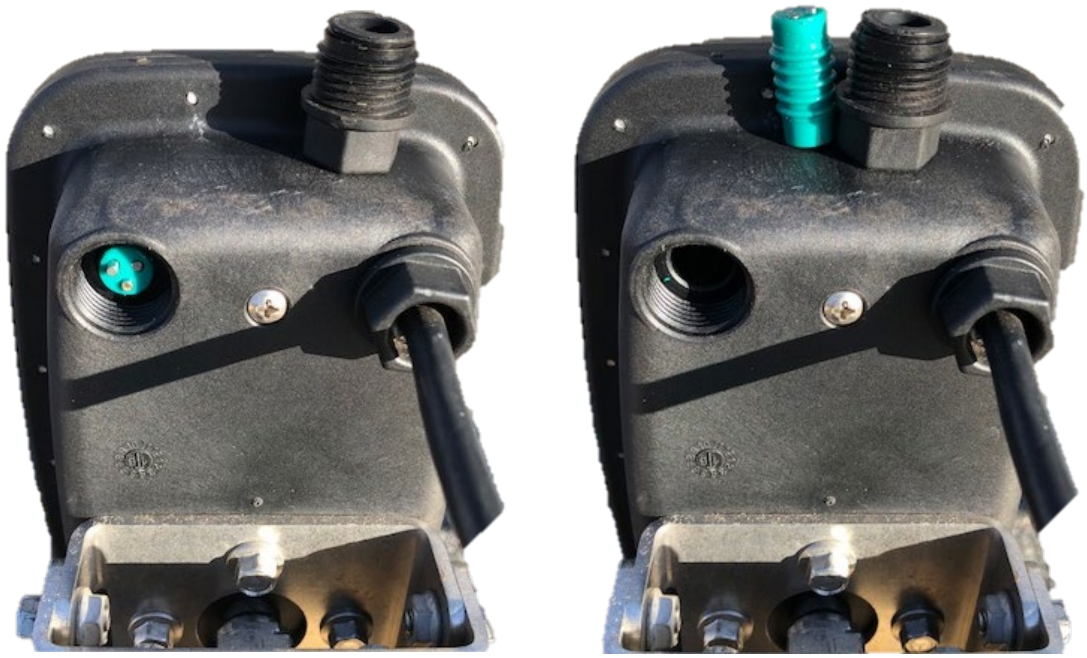

Figure 19. Access KZCO Valve Address Switch

C. Remove green plug (unscrew plug, turns CCW). See Figure 19.

D. Using a small straight bladed screwdriver, turn switch to address position 1. Figure 20 shows the address switch.

NOTE

The switch perimeter is marked 0 thru F. Rotate the switch using the thinner slot to point the arrow (center of switch) to the desired position (1). Typically the switch will already be pointing to address positon 0, 1, or 4.

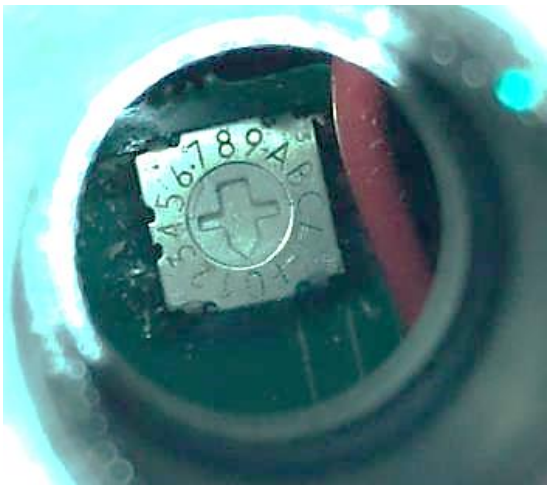

Figure 20. KZCO Valve Address Switch

E. Install green plug (screws in, turns CW). See Figure 19.

F. Install threaded cap (black plug) See Figure 19.

G. Using a 3/4-in wrench (or socket and ratchet), tighten cap.

4.5.6 Tank Level Sensor Bench Procedure

The tank level sensor bench procedure consists of replacing the sensor. Perform the following to replace a damaged/failed tank level sensor.

ATTENTION ⚠ CAUTION

ALWAYS USE PROPER PPE. FOAM MAY BE TOXIC TO PEOPLE AND/OR THE ENVIRONMENT. CATCH AND DISPOSE OF FOAM PROPERLY. IMPROPER FOAM HANDLING MAY RESULT IN HEALTH RISKS AND/OR LIABILITY.

A. Drain applicable foam concentrate tank.

B. Tag and disconnect wiring.

C. Using a 15/16-in wrench, loosen tank level sensor.

IMPORTANT ⚠ NOTICE

DO NOT ALLOW THREAD SEALANT TO GET INTO THE SENSORS ORIFICE. THREAD SEALANT IN THE ORIFICE MAY CAUSE ERRONEOUS SENSOR READINGS.

D. Apply thread sealant (ONLY) to male threads on sensor.

E. Install new tank level sensor.

F. Using a 15/16-in wrench, tighten tank level sensor.

G. Connect wiring according to tags.

Perform the applicable calibration IAW Section 6.4, User Calibration, of the SmartATP OIM manual (FSG–MNL–00193)

4.5.7 Display Bench Procedure

If the UltraView display requires replacement, reference the OEM documentation for the removal and replacement instructions and then perform the following.

A. Perform water flow calibration (for single or dual as applicable) IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

B. Perform foam flow calibration IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

C. Perform pressure sensor calibration IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

D. Perform foam tank calibration IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

4.5.8 Pressure Sensor Bench Procedure

If the suction or discharge pressure sensors require replacement, reference the OEM documentation for the removal and replacement instructions and then perform the following.

A. Perform pressure sensor calibration for suction side of pump IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

B. Perform pressure sensor calibration for discharge side of pump IAW Section 6.4, User Calibration, of the OIM manual (FSG–MNL–00193).

4.5.9 Harness Replacement

If the harness requires replacement, reference the OEM documentation for the removal and replacement instructions and then make all connections according to Figure 3, Hale SmartATP Connection Diagram, and if applicable, Figure 2, Autofill Connection Diagram, of the SmartATP Parts Manual (FSG–MNL–00195).

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APPENDIX A.
CONNECTOR PINOUTS

A.1 Foam Controller Connectors

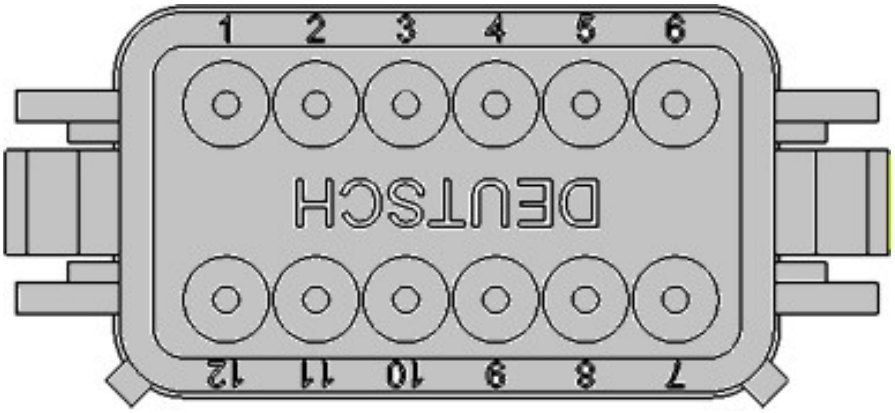

Figure 21. Foam Controller Connector 2A Pinout

Table 19. Foam Controller Connector 2A Pinout

Pin #	Circuit	Color	Wire/Gauge
1	System Power	Red	16GXL
2	ESKEY CAN High	Yellow	103349
3	ESKEY CAN Shield	Black	18GXL
4	Tank A ACT.SEL	Green	16GXL
5	Tank B ACT.SEL	Green	16GXL
6	114017 Plug	N/C	N/C
7	114017 Plug	N/C	N/C
8	114017 Plug	N/C	N/C
9	Foam Flow 1	White	Bel9364
10	114017 Plug	N/C	N/C
11	ESKEY CAN Low	Green	103349
12	System Ground	Black	16GXL

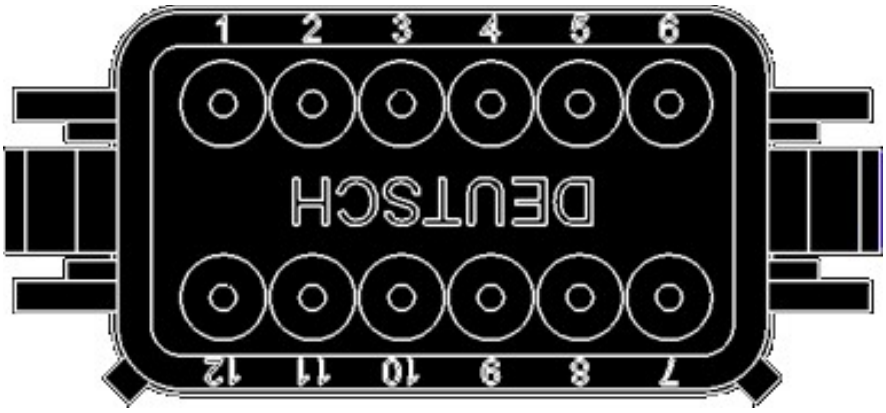

Figure 22. Foam Controller Connector 2B Pinout

Table 20. Foam Controller Connector 2B Pinout

Pin #	Circuit	Color
1	114017 Plug	N/C
2	+ 5 V Ref	Red
3	114017 Plug	N/C
4	114017 Plug	N/C
5	Tank B Level	White
6	Tank A Level	White
7	114017 Plug	N/C
8	Discharge PSI	White
9	Intake PSI	White
10	114017 Plug	N/C
11	114017 Plug	N/C
12	114017 Plug *	N/C *
* With Autofill	Autofill	White

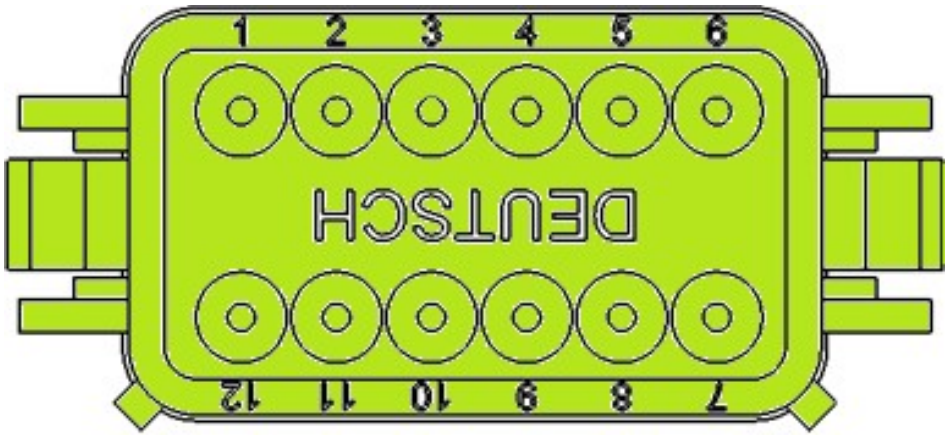

Figure 23. Foam Controller Connector 2C Pinout

Table 21. Foam Controller Connector 2C Pinout

Pin #	Circuit	Color
1	Flush Sol Close	Red
2	Water Sol Open	Green
3	Tank A Sol Close	Red
4	Tank B Sol Close	Red
5	Flush Sol Open	Green
6	Water Sol Close	Red
7	Tank B ACT/SEL	Green
8	Tank A ACT/SEL	Green
9	Water Flow 1	White
10	+ 9 V Ref	Red
11	Foam Flow 2	White
12	114017 Plug	N/C

A.2 Metering Valve Connector (Same as Autofill Connector C1)

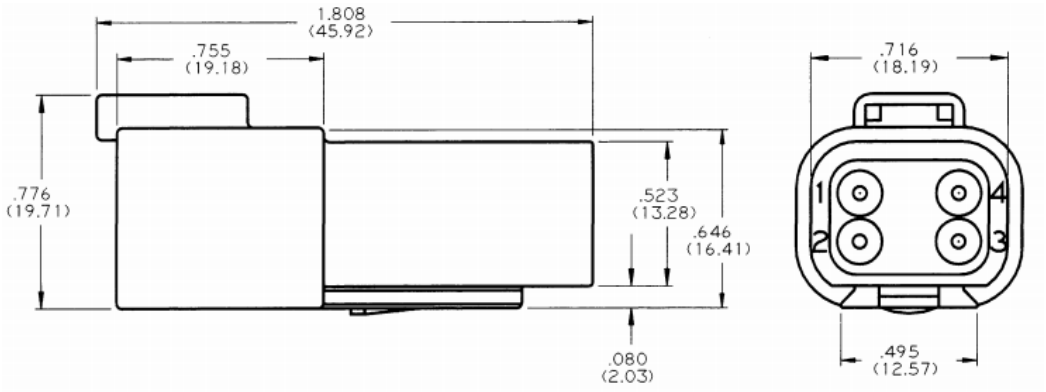

Figure 24. Metering Valve Connector 4 Pinout

Table 22. Metering Valve Connector 4 Pinout

Pin #	Circuit	Color
1	Ground	Black
2	CAN Low	Green
3	CAN High	Yellow
4	System Power	Red

A.3 All Valve Solenoid Connectors

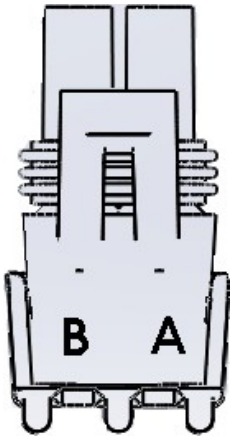

Figure 25. Solenoid Connector Pinout

Table 23. Solenoid Connector Pinout

Pin #	Circuit	Color
A	Solenoid Actuation (See Color)	Green (Open) Red (Closed)
B	Ground	Black

A.4 Flowmeter/Pressure Sensor Connector

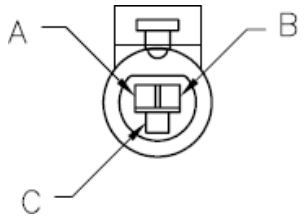

Figure 26. Flowmeter/Pressure Sensor Connector Pinout

Table 24. Flowmeter Connector Pinout

Pin #	Circuit
A	Ground
B	+9 V
C	Signal

Table 25. Pressure Sensor Connector Pinout

Pin #	Circuit
A	Return
B	+5 V
C	Signal

A.5 Tank Level Sensor Connectors

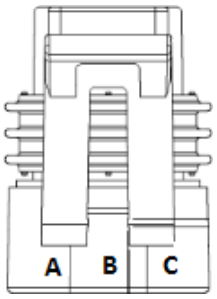

Figure 27. Tank Level Sensor Connector Pinout

Table 26. Tank Level Sensor Connector Pinout

Pin #	Circuit
A	+5 V
B	Ground
C	Signal

A.6 UltraView Display Connector

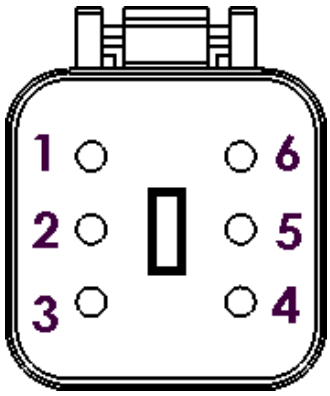

Figure 28. Display Connector Pinout

Table 27. Display Connector Pinout

Connector 1B Pin	Circuit	Connector 1C Pin	Circuit
1	System Power	1	Power
2	CAN High	2	Plug
3	CAN Low	3	Plug
4	Plug	4	Plug
5	Ignition	5	Power
6	System Ground	6	Ground

A.7 Autofill Pressure Switch Connector

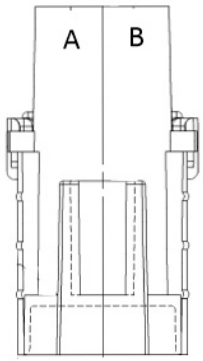

Figure 29. Autofill Pressure Switch Connector Pinout

Table 28. Autofill Pressure Switch Connector Pinout

Pin #	Circuit
A	System Power (+)
B	Signal

APPENDIX B.
MANUFACTURER'S INFORMATION

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

Additionally, included herein is warranty information.

B.1. MANUFACTURER'S INFORMATION

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

B.2. WARRANTY

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