INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER ACCU/LINE™ INJECTION SYSTEM
WITH XL4 CONTROLLER

DRAWING NUMBERS
0E160VS
0E161VS
0E162VS.124
0E162VS.624
0E163VS
0E163VS.624
0E164VS
0E165VS
0E166VS.124
0E170VS.224
0E172VS.124
0E173VS.624
0E400VS

MANUAL NUMBER
IOM-216

REVISION
Rev. A, 08/25/2020

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IMPORTANT SAFETY INFORMATION
READ ALL INSTRUCTIONS

Notes emphasize information and/or provide additional information to assist the user.

Caution messages appear before procedures that could result in damage to equipment if not observed.

Warning messages appear before procedures that could result in personal injury if not observed.

This manual is intended to be used as a basic installation and operation guide for the Welker OdorEyes Accu/Line™ Injection System With XL4 Controller. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker OdorEyes equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT – Save these instructions for local inspector's use.

IMPORTANT – Observe all governing codes and ordinances.

Note to Installer – Leave these instructions with the end user.

Note to End User – Keep these instructions for future reference.

Installation of this Accu/Line™ Injection System is of a mechanical and electrical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Accu/Line™ Injection System, please contact a Welker representative immediately.

Phone: 281.491.2331
Address: 13839 West Bellfort Street
Sugar Land, TX 77498

SECTION 1: PRODUCT INFORMATION

1.1 Introduction

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance* (IOM) *Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.*

If you have any questions, please call Welker at 1-281-491-2331.

**The following procedures have been written for use with standard Welker OdorEyes parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker OdorEyes *Accu/Line™ Injection System With XL4 Controller* is designed to inject liquid odorant proportional to flow into a natural gas pipeline. This skid-mounted automatic injection system has three (3) primary components: the touch screen controller, the pump cabinet, and the odorant supply tank. Each primary component plays an integral role in the operation of the Accu/Line™ and can be customized to better suit each application.

The touch screen controller serves as the system's brain. It continuously receives feedback from the customer's gas flow meter and the odorant flow meter in the pump cabinet, allowing the system to respond to changing flow conditions. As pipeline conditions change, the controller increases or decreases the injection rate so that the Accu/Line™ continues injecting proportional to flow. On-site and remote troubleshooting and monitoring are made easier by time- and date-stamped audit data detailing system performance, alarm history, and odorant tank level.

The pump cabinet contains one (1) or two (2) Welker OdorEyes BIP Bellows Injection Pumps, Welker SSO-9 Sample/Injection Pumps, or Welker Vanishing Chamber™ Injection Pumps, which inject the liquid odorant into the pipeline. Having two (2) pumps allows the Accu/Line™ to better respond to and accommodate varying flow rates and limits interruption to operation for pump maintenance. To prolong the operational life of the injection pumps, the Welker F-9 Filter removes particles from the liquid odorant and the Welker F-5 Filter Dryer conditions the pneumatic supply. The odorant flow meter communicates the injection volume to the controller, which in turn actuates the solenoid(s) for proportional to flow odorization.

Each odorant supply tank is equipped with a tank fill inlet, vent port, blanket pressure inlet, and level gauge. For added automation, an electronic level transmitter can be installed to communicate tank level to the controller. Regardless of volume and orientation, every odorant supply tank comes with 110% containment that is sloped to the drain port for easy draining.

Welker may custom design the Accu/Line™ Injection System With XL4 Controller to suit the particular application and specifications of each customer.

1.3 Safety Warning

Wherever hazardous gases or vapor-producing liquids are used, transported, or stored, the potential for an accidental leak exists. Continuous monitoring of these hazards is essential to ensure personnel safety.

1.4 Specifications

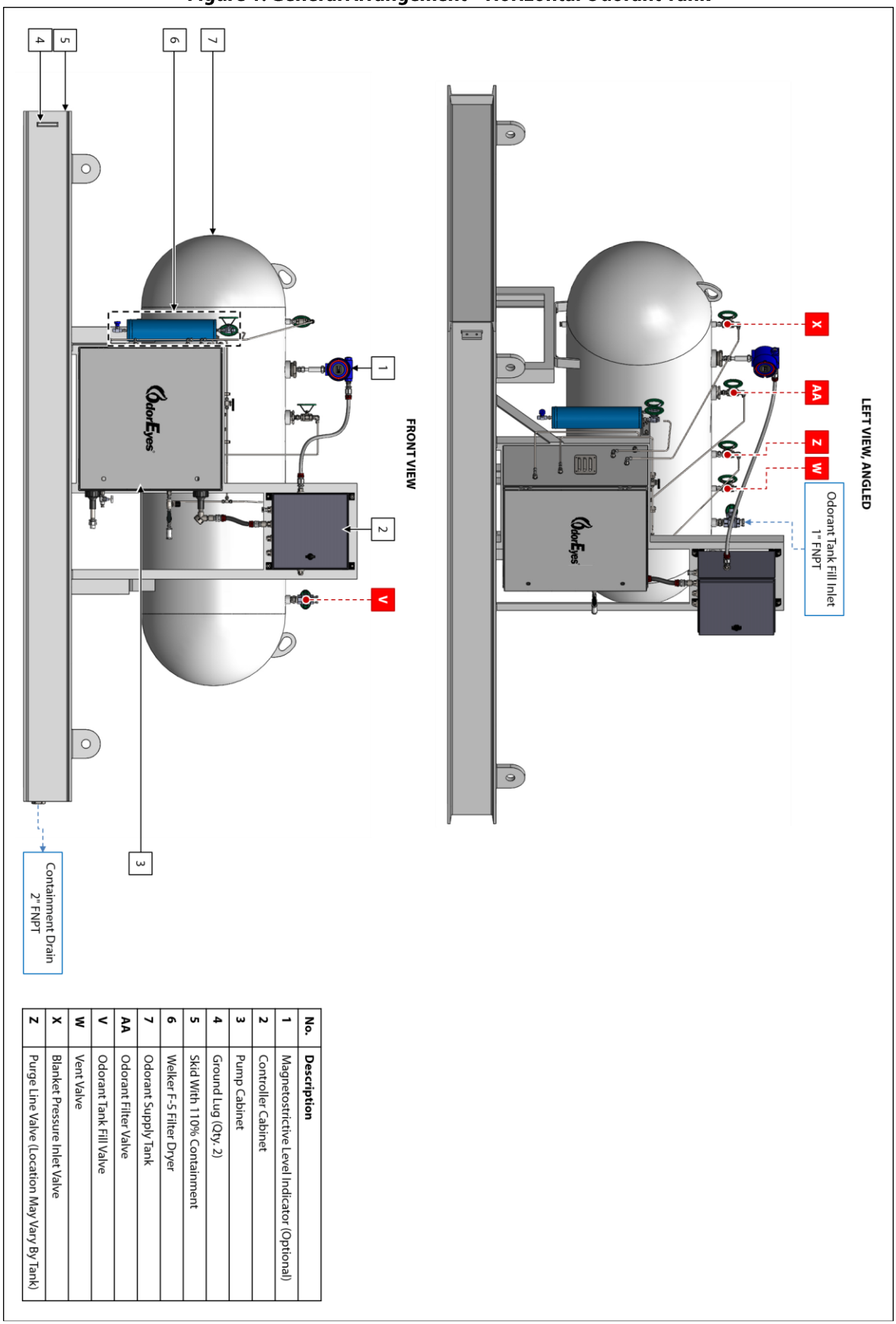
The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: Accu/Line™ Specifications	
Application	Liquid Odorant Injection
Utility Requirements	Pneumatic Supply to Operate Injection Pump(s)
Electrical Connections	**Controller:** AC 120 V **Flow Meter and Solenoid:** DC 12 V or DC 24 V
Odorant Tank Volume	20 US Gallons 100 US Gallons 250 US Gallons 500 US Gallons Others Available
Features	Odorant Tank Level Gauge Pump Cabinet (See *Table 2*) Skid With 110% Containment Touch Screen Controller

Table 2: Pump Cabinet Specifications	
Materials of Construction	**BIP-3:** 303 Stainless Steel, 316/316L Stainless Steel, Anodized Aluminum, Buna, Kalrez®, Polyurethane, PTFE, and Teflon® **SSO-9:** 316/316L Stainless Steel, Anodized Aluminum, Kalrez®, and PTFE **VCIP:** 316/316L Stainless Steel, Anodized Aluminum, Kalrez®, PTFE, and Viton®
Maximum Allowable Injection Pressure	**BIP-3:** 2160 psig @ -20 °F to 100 °F (*148 barg @ -28 °C to 37 °C*) **SSO-9:** 1800 psig @ -20 °F to 120 °F (*124 barg @ -28 °C to 48 °C*) **VCIP:** 2160 psig @ -20 °F to 120 °F (*148 barg @ -28 °C to 48 °C*)
Injection Volume	**Accu/Line™ Lo:** 0.06 cc, 0.2 cc, or 0.5 cc **Accu/Line™ Standard:** 0.5–10 cc **Accu/Line™ Hi:** 10–50 cc
Operation	**BIP-3:** Bellows-Operated **SSO-9:** Piston-Operated **VCIP:** Bellows-Operated
Features	Regulator for Pneumatic Supply Welker F-5 Filter Dryer for Pneumatic Supply Welker F-9 Filter for Odorant Supply
Options	Flow Meter Heater and Insulation NEMA 4 or NEMA 4X Enclosure Pneumatic Timer Purge System Regulator for Blanket Pressure Welker OdorEyes AEF-1 Atmospheric Exhaust Filter

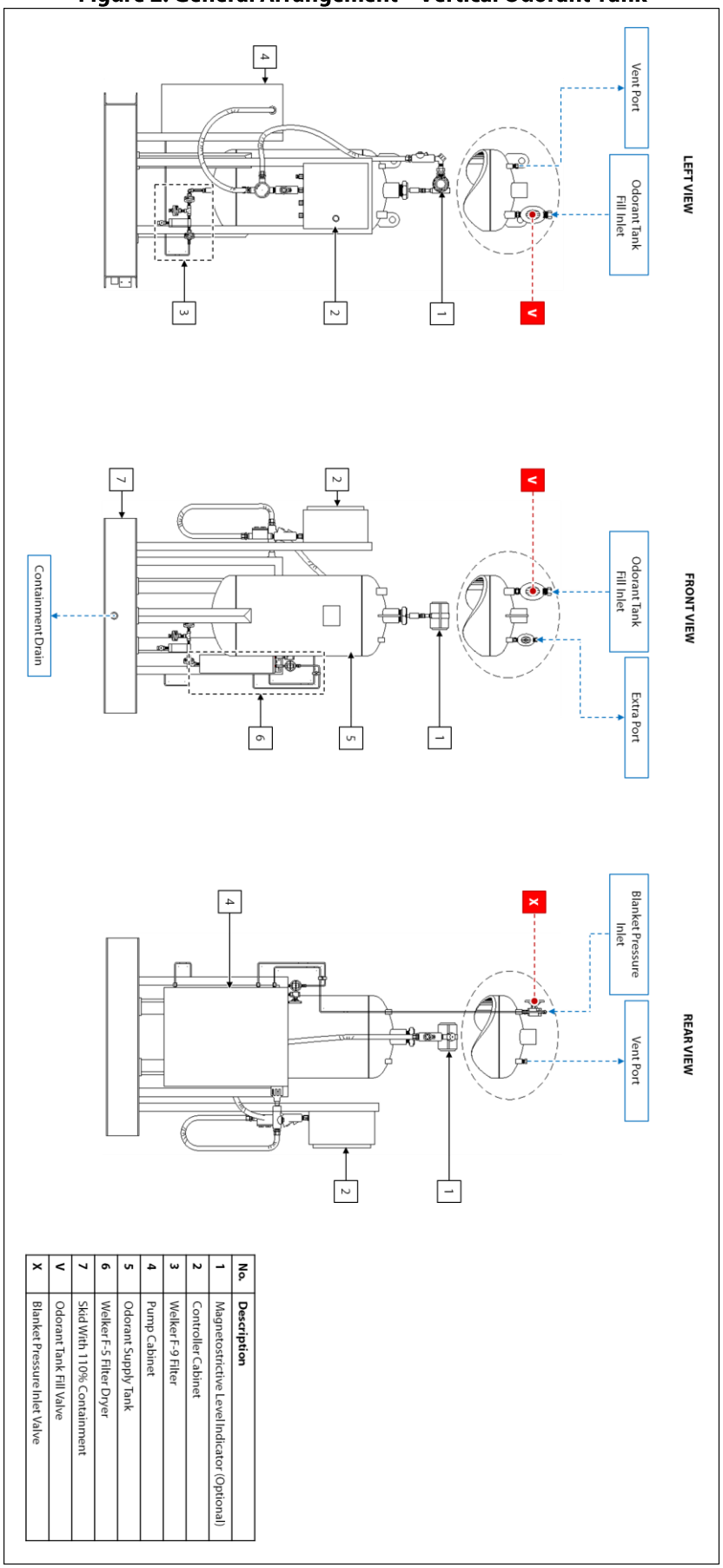
1.5 Equipment Diagrams

Figure 1: General Arrangement – Horizontal Odorant Tank



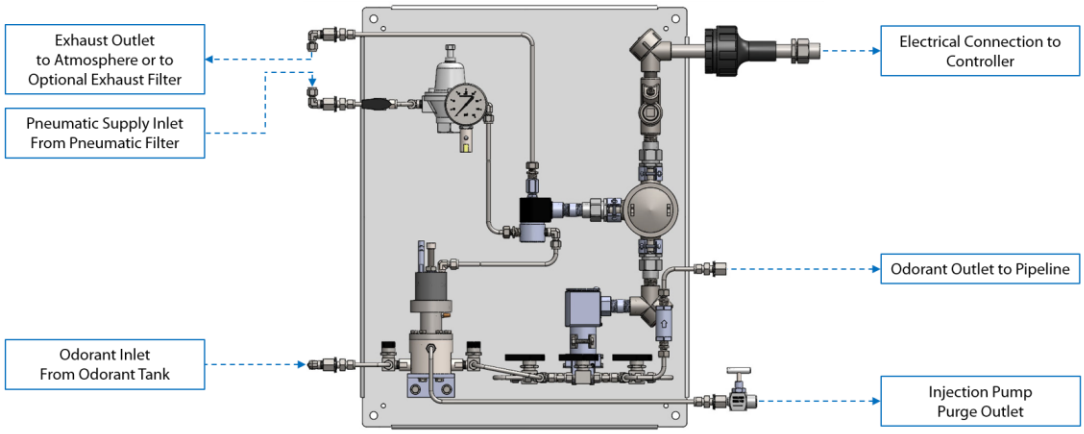
No.	Description
1	Magnetostrictive Level Indicator (Optional)
2	Controller Cabinet
3	Pump Cabinet
4	Ground Lug (Qty. 2)
5	Skid With 110% Containment
6	Welker F-5 Filter Dryer
7	Odorant Supply Tank
AA	Odorant Filter Valve
V	Odorant Tank Fill Valve
W	Vent Valve
X	Blanket Pressure Inlet Valve
Z	Purge Line Valve (Location May Vary By Tank)

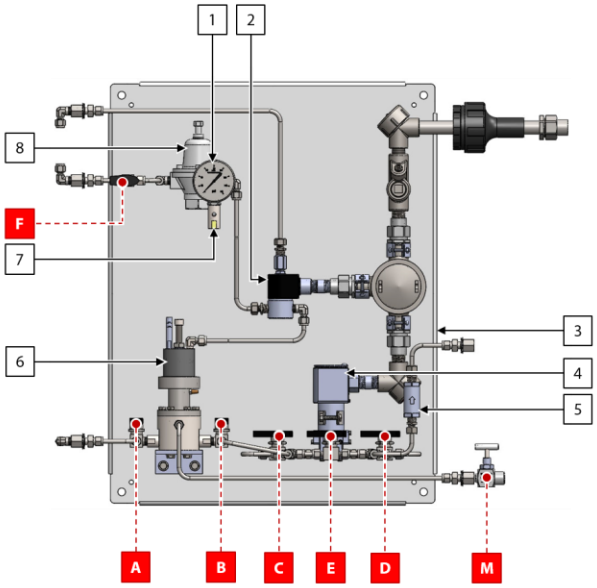
Figure 2: General Arrangement – Vertical Odorant Tank



No.	Description
1	Magnetostrictive Level Indicator (Optional)
2	Controller Cabinet
3	Welker F-9 Filter
4	Pump Cabinet
5	Odorant Supply Tank
6	Welker F-5 Filter Dryer
7	Skid With 110% Containment
V	Odorant Tank Fill Valve
X	Blanket Pressure Inlet Valve

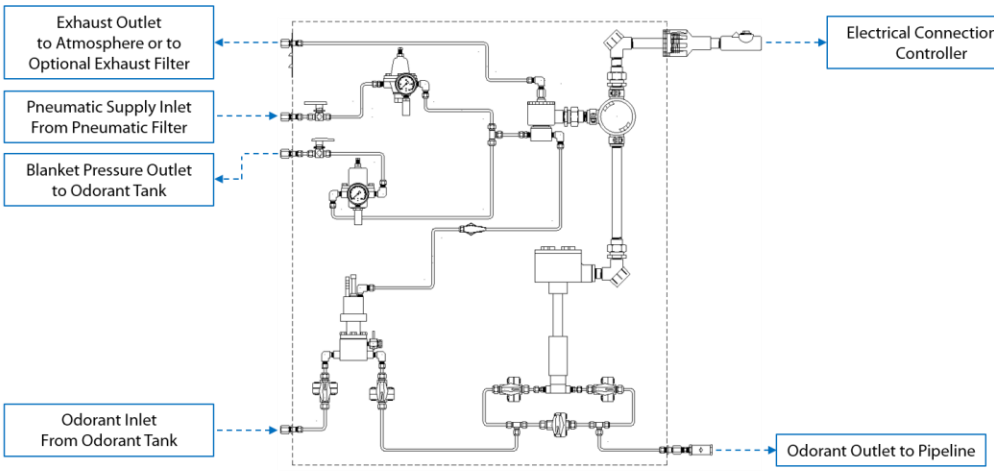
Figure 3: Pump Cabinet – Single BIP Injection Pump

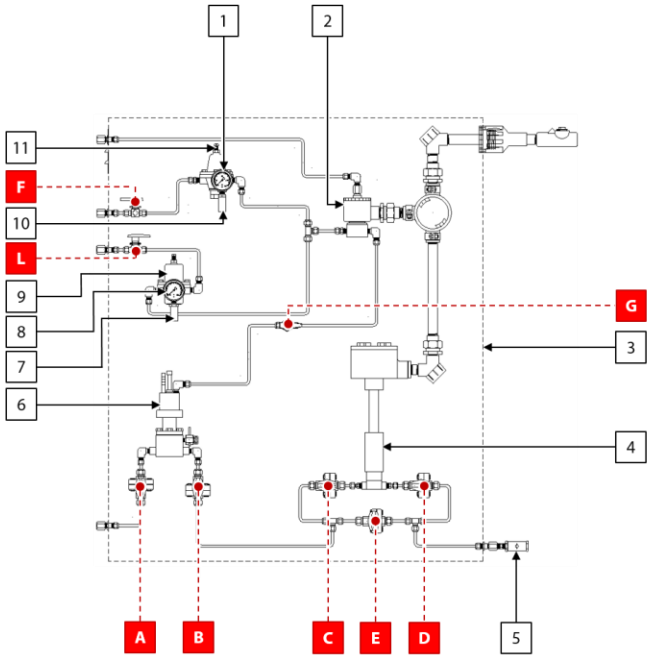




No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Injection Pump
3	Enclosure Back Panel
4	Odorant Flow Meter
5	Outlet Check Valve
6	Welker OdorEyes BIP Injection Pump
7	Welker RV-1 Relief Valve
8	Pressure Regulator, Pneumatic Supply
A	Injection Pump Inlet Valve
B	Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
M	Injection Pump Purge Outlet Valve
Enclosure Not Shown for Clarity	

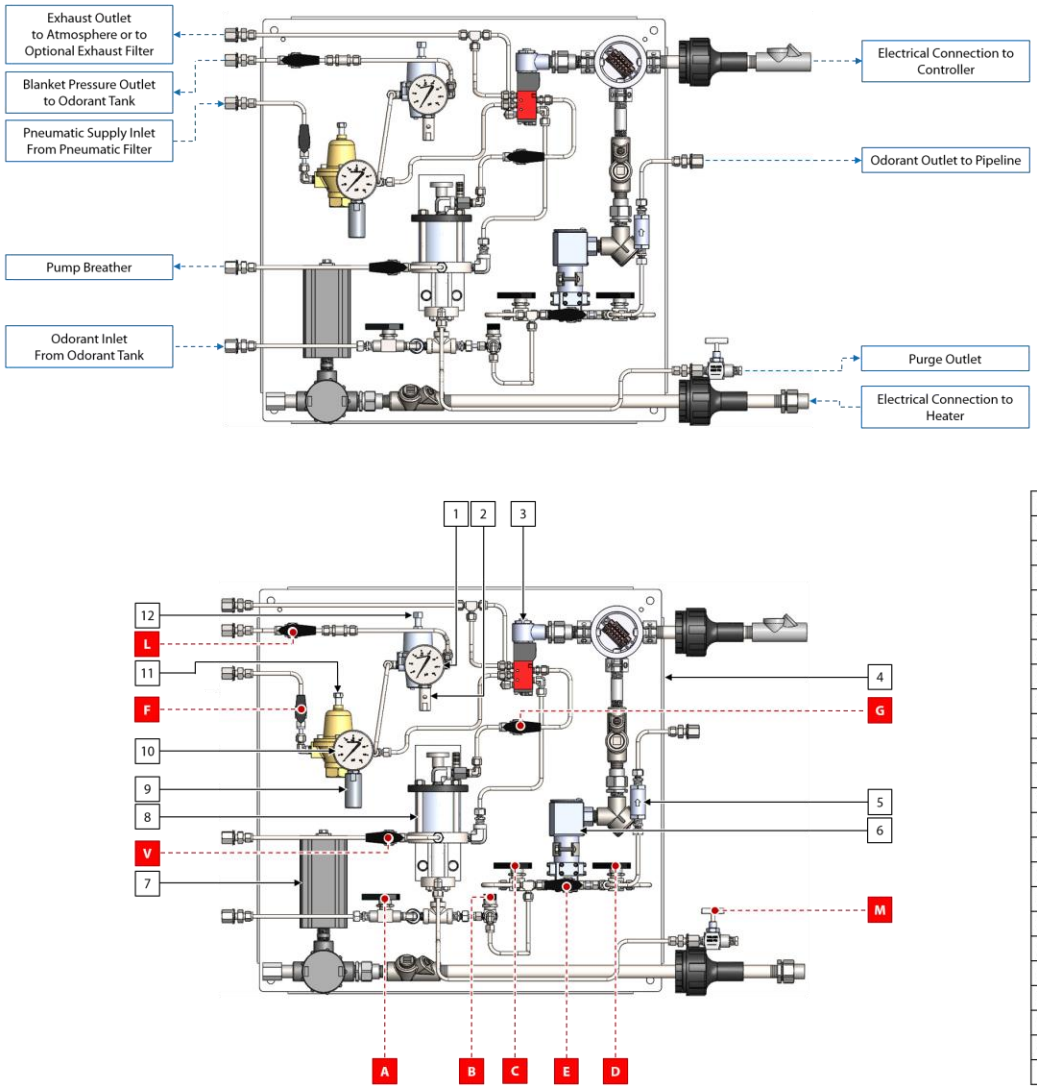
Figure 4: Pump Cabinet – Single BIP Injection Pump With Blanket Pressure Regulator





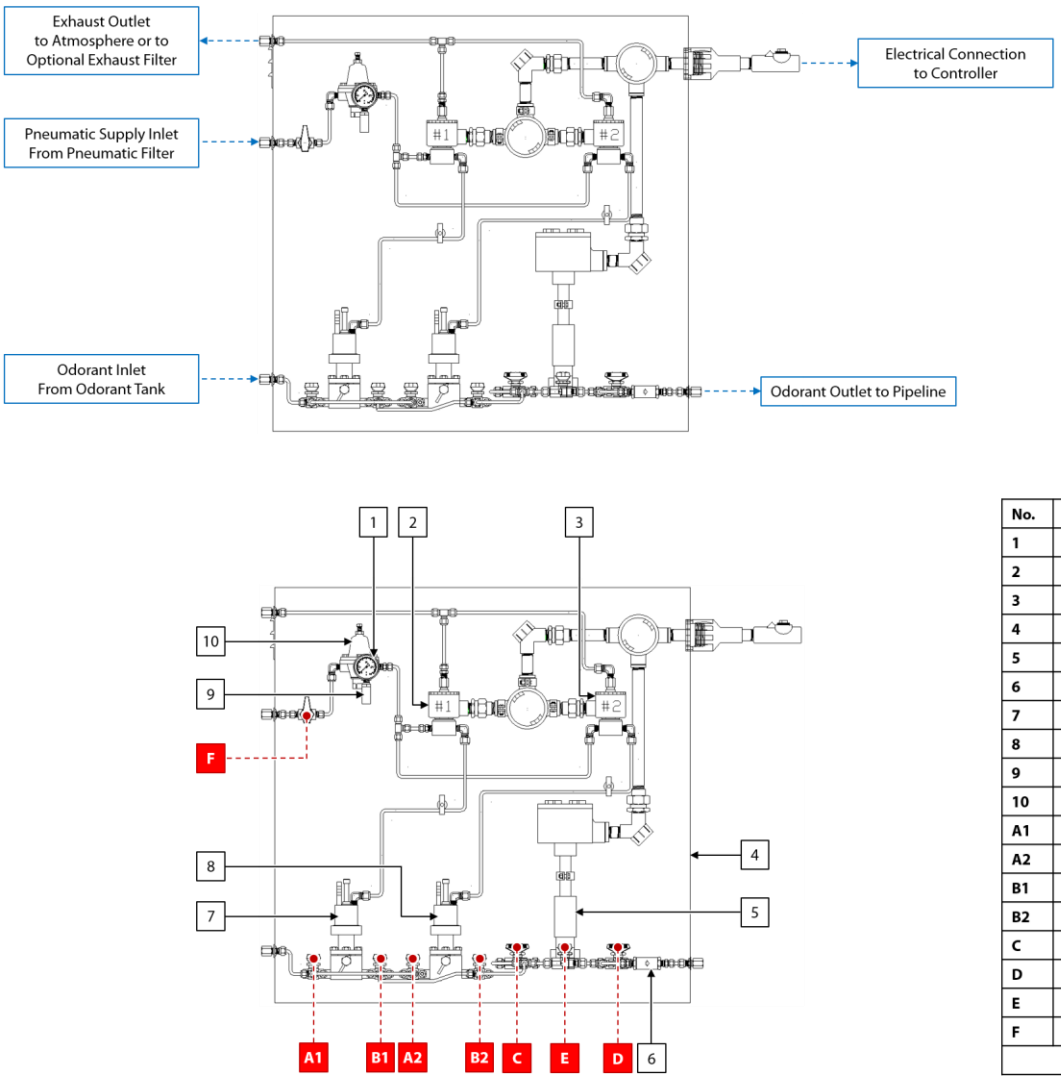
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Injection Pump
3	Enclosure Back Panel
4	Odorant Flow Meter
5	Outlet Check Valve
6	Welker OdorEyes BIP Injection Pump
7	Welker RV-1 Relief Valve
8	Pressure Gauge, Blanket Pressure
9	Pressure Regulator, Blanket Pressure
10	Welker RV-1 Relief Valve
11	Pressure Regulator, Pneumatic Supply
A	Injection Pump Inlet Valve
B	Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Injection Pump Actuation Valve
L	Blanket Pressure Outlet Valve
Enclosure Not Shown for Clarity	

Figure 5: Pump Cabinet – Single SSO-9 Injection Pump With Blanket Pressure Regulator and Heater



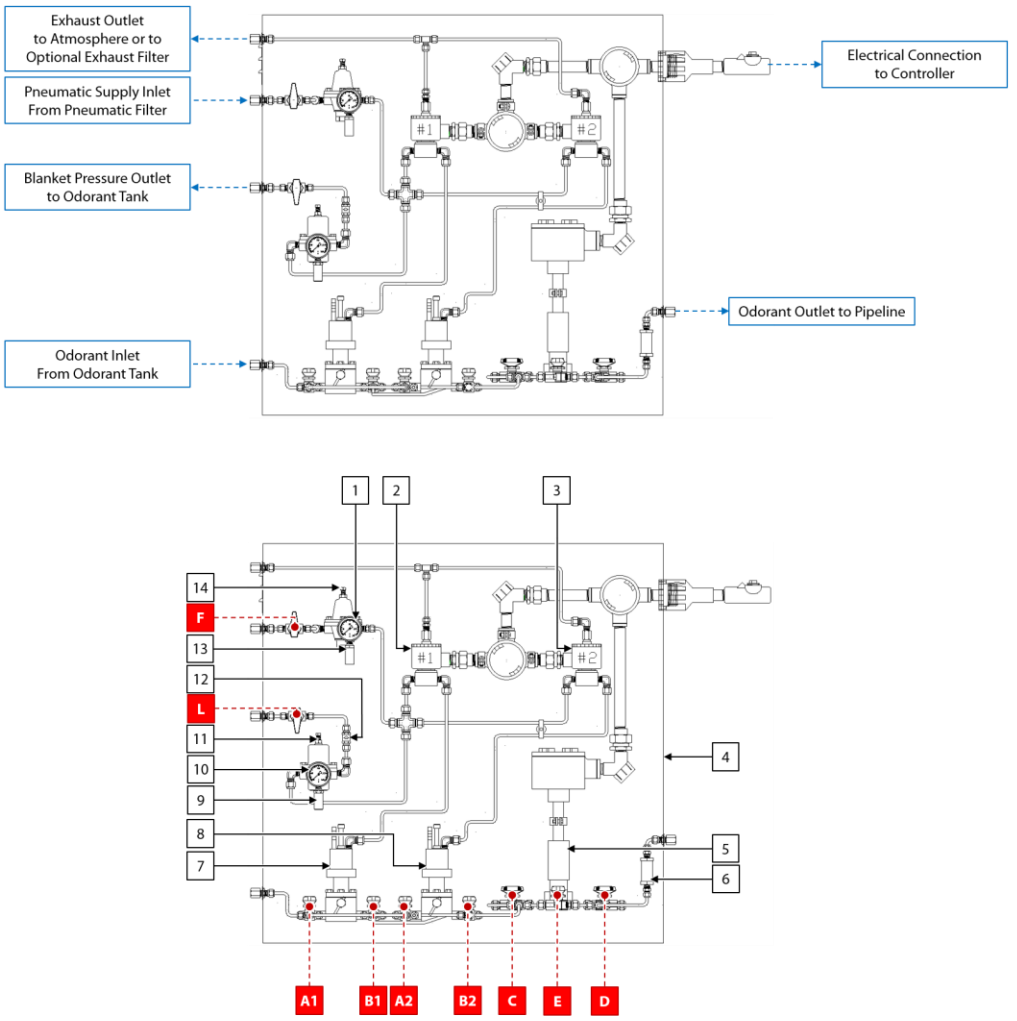
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	Welker RV-1 Relief Valve
3	3-Way Solenoid Valve, Injection Pump
4	Enclosure Back Panel
5	Outlet Check Valve
6	Odorant Flow Meter
7	Heater
8	Welker SSO-9 Injection Pump With Check Valves
9	Welker RV-1 Relief Valve
10	Pressure Gauge, Blanket Pressure
11	Pressure Regulator, Blanket Pressure
12	Pressure Regulator, Pneumatic Supply
A	Injection Pump Inlet Valve
B	Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Injection Pump Actuation Valve
L	Blanket Pressure Outlet Valve
M	Injection Pump Purge Outlet Valve
V	Injection Pump Breather Valve
Enclosure Not Shown for Clarity	

Figure 6: Pump Cabinet – Dual BIP Injection Pumps



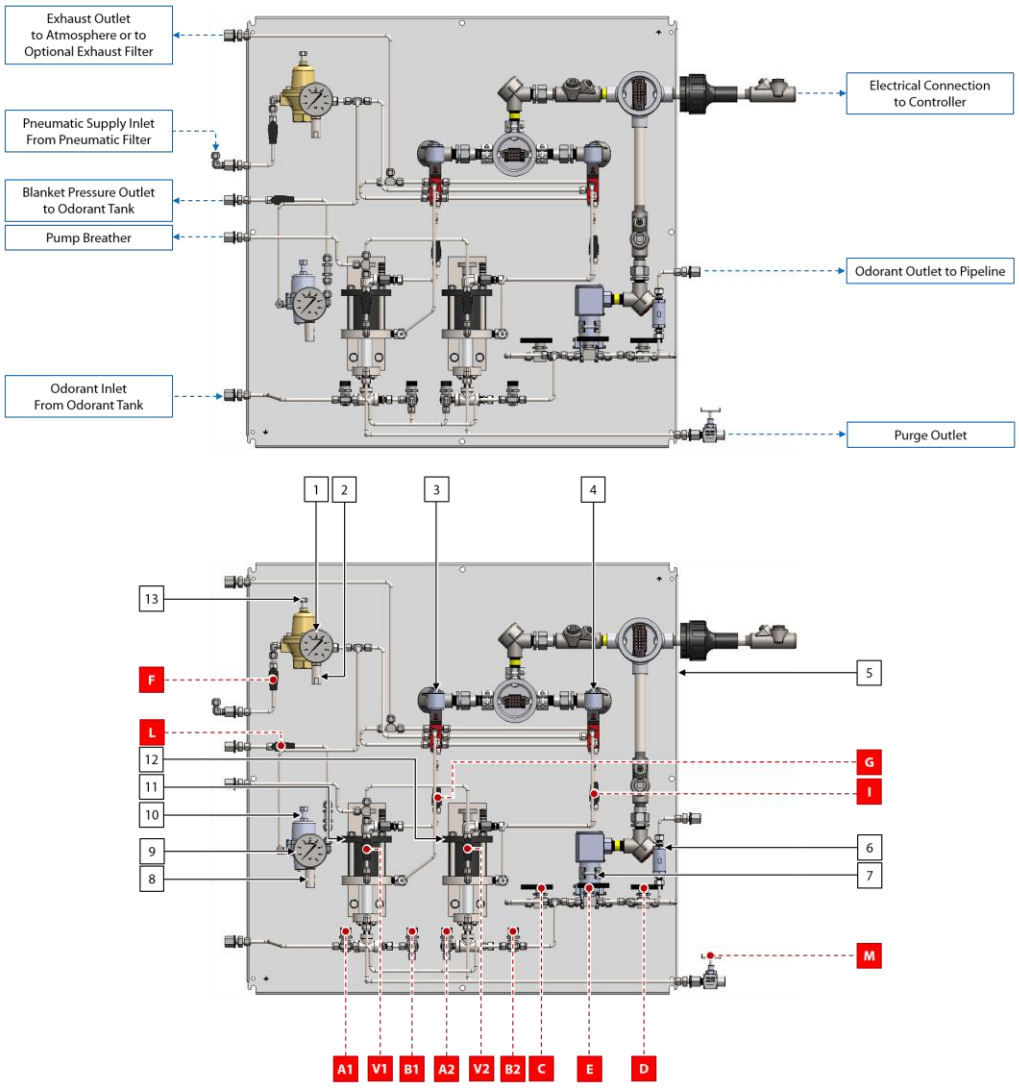
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Odorant Flow Meter
6	Outlet Check Valve
7	Welker OdorEyes BIP Injection Pump, Primary
8	Welker OdorEyes BIP Injection Pump, Backup
9	Welker RV-1 Relief Valve
10	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
Enclosure Not Shown for Clarity	

Figure 7: Pump Cabinet – Dual BIP Injection Pumps With Blanket Pressure Regulator



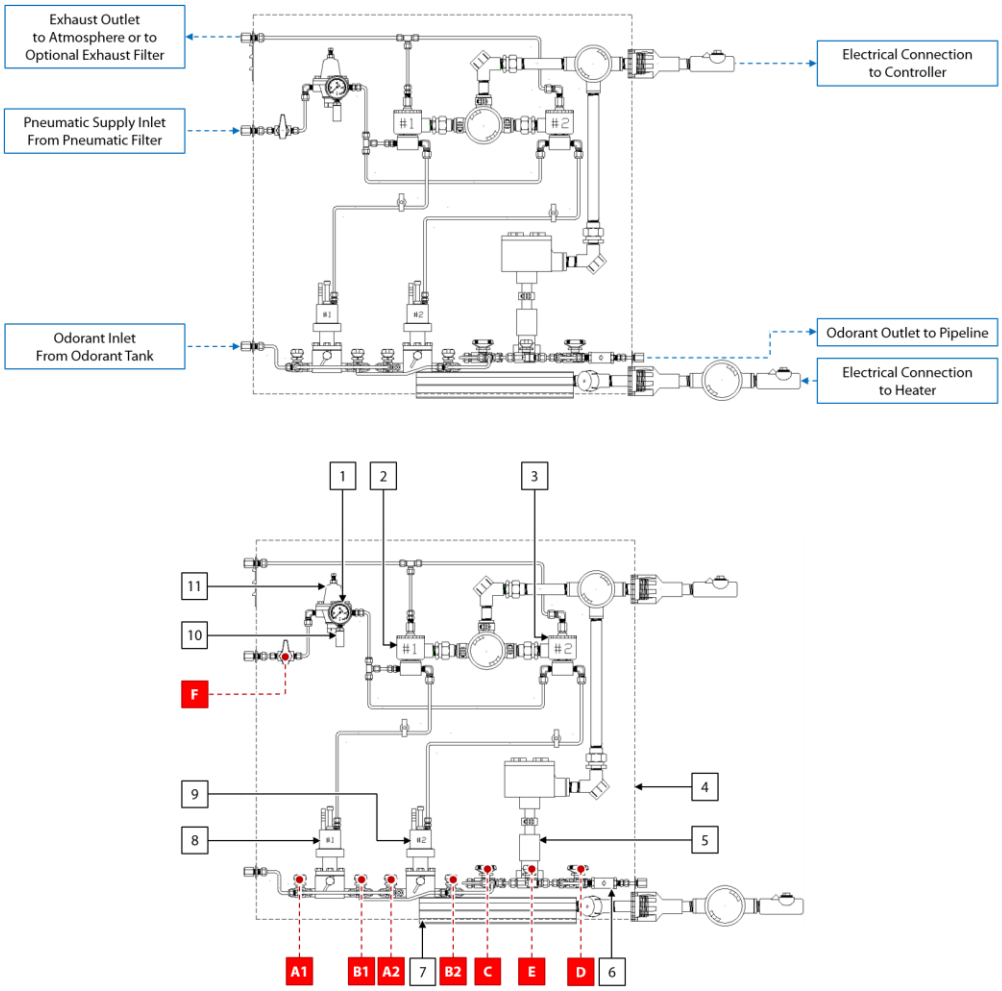
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Odorant Flow Meter
6	Outlet Check Valve
7	Welker OdorEyes BIP Injection Pump, Primary
8	Welker OdorEyes BIP Injection Pump, Backup
9	Welker RV-1 Relief Valve
10	Pressure Gauge, Blanket Pressure
11	Pressure Regulator, Blanket Pressure
12	Blanket Pressure Outlet Check Valve
13	Welker RV-1 Relief Valve
14	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
L	Blanket Pressure Outlet Valve
Enclosure Not Shown for Clarity	

Figure 8: Pump Cabinet – Dual SSO-9 Injection Pumps With Blanket Pressure Regulator



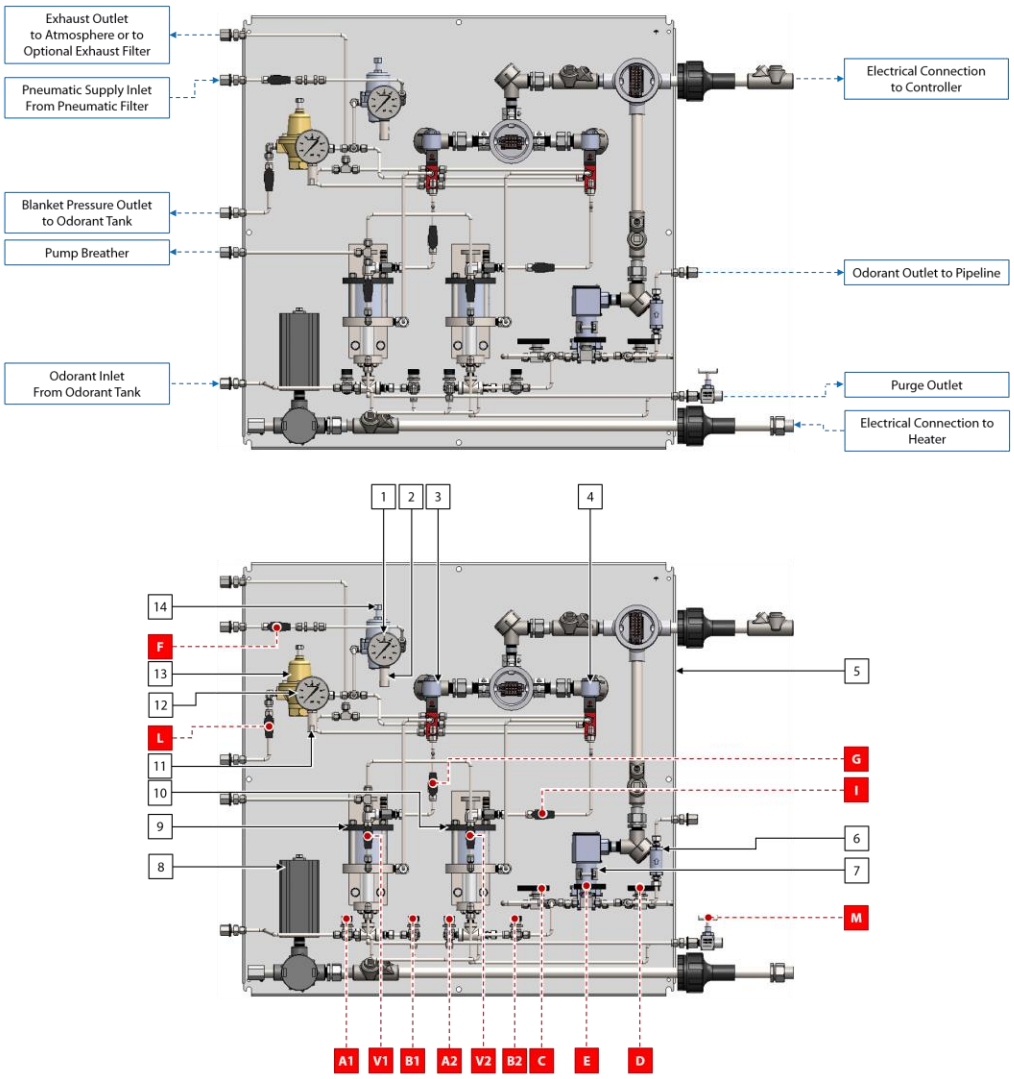
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	Welker RV-1 Relief Valve
3	3-Way Solenoid Valve, Primary Injection Pump
4	3-Way Solenoid Valve, Backup Injection Pump
5	Enclosure Back Panel
6	Outlet Check Valve
7	Odorant Flow Meter
8	Welker RV-1 Relief Valve
9	Pressure Gauge, Blanket Pressure
10	Pressure Regulator, Blanket Pressure
11	Welker SSO-9 Injection Pump, Primary
12	Welker SSO-9 Injection Pump, Backup
13	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve
I	Backup Injection Pump Actuation Valve
L	Blanket Pressure Outlet Valve
M	Injection Pump Purge Outlet Valve
V1	Primary Injection Pump Breather Valve
V2	Backup Injection Pump Breather Valve
Enclosure Not Shown for Clarity	

Figure 9: Pump Cabinet – Dual BIP Injection Pumps With Heater



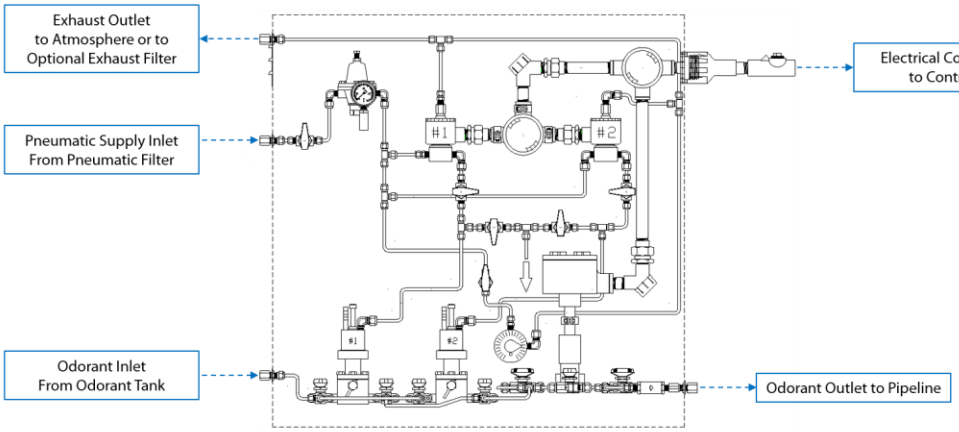
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Odorant Flow Meter
6	Outlet Check Valve
7	Heater
8	Welker OdorEyes BIP Injection Pump, Primary
9	Welker OdorEyes BIP Injection Pump, Backup
10	Welker RV-1 Relief Valve
11	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
Enclosure Not Shown for Clarity	

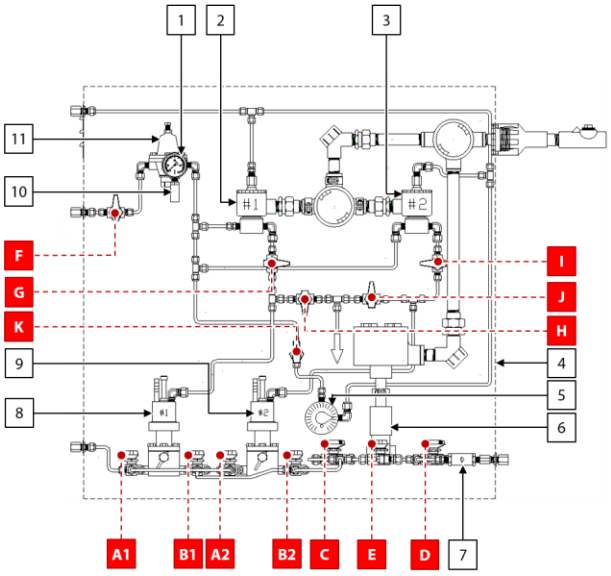
Figure 10: Pump Cabinet – Dual SSO-9 Injection Pumps With Blanket Pressure Regulator and Heater



No.	Description
1	Pressure Gauge, Pneumatic Supply
2	Welker RV-1 Relief Valve
3	3-Way Solenoid Valve, Primary Injection Pump
4	3-Way Solenoid Valve, Backup Injection Pump
5	Enclosure Back Panel
6	Outlet Check Valve
7	Odorant Flow Meter
8	Heater
9	Welker SSO-9 Injection Pump, Primary
10	Welker SSO-9 Injection Pump, Backup
11	Welker RV-1 Relief Valve
12	Pressure Gauge, Blanket Pressure
13	Pressure Regulator, Blanket Pressure
14	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve
I	Backup Injection Pump Actuation Valve
L	Blanket Pressure Outlet Valve
M	Injection Pump Purge Outlet Valve
V1	Primary Injection Pump Breather Valve
V2	Backup Injection Pump Breather Valve
Enclosure Not Shown for Clarity	

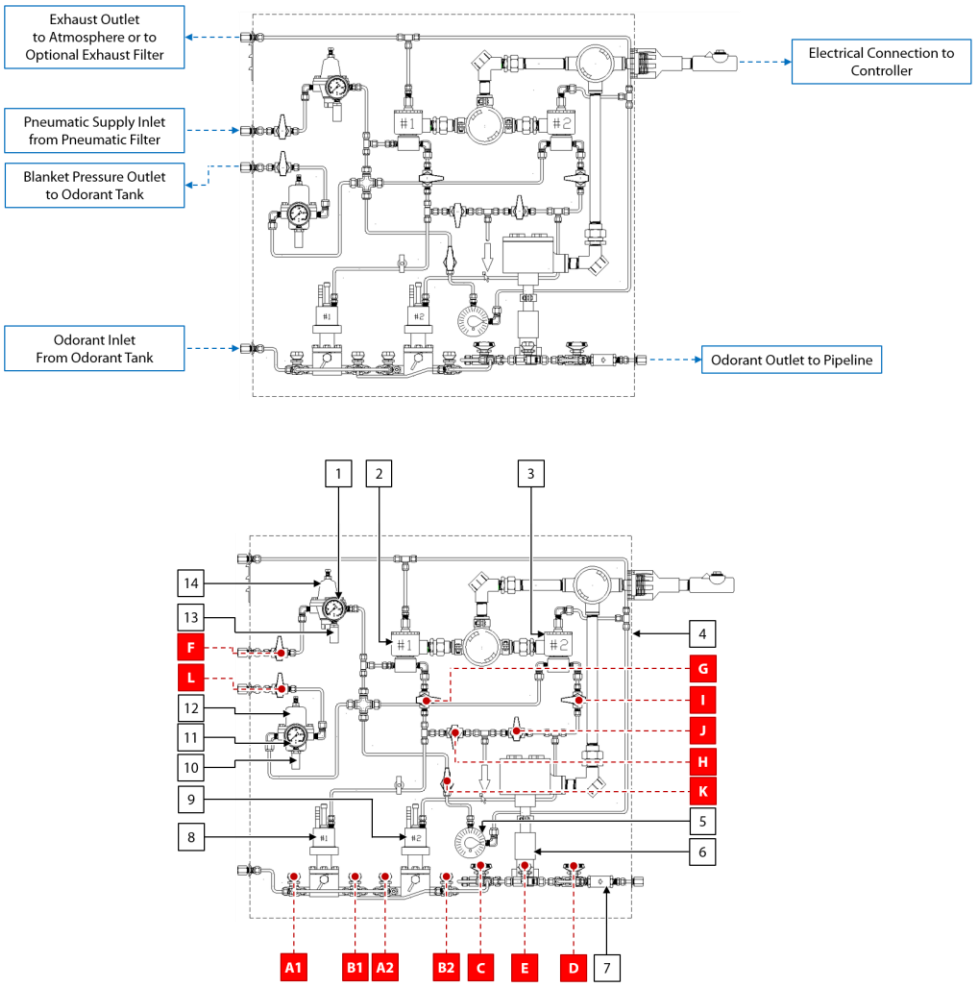
Figure 11: Pump Cabinet – Dual BIP Injection Pumps With Pneumatic Timer





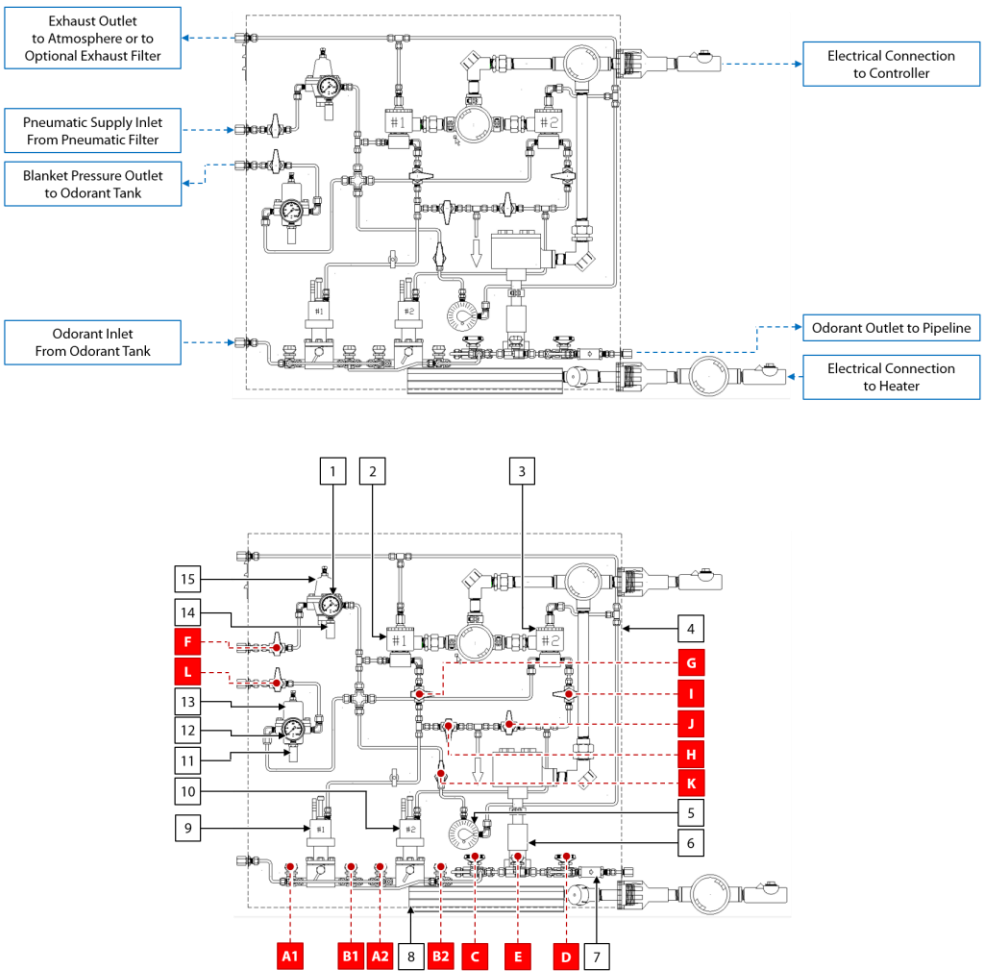
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Pneumatic Timer
6	Odorant Flow Meter
7	Outlet Check Valve
8	Welker OdorEyes BIP Injection Pump, Primary
9	Welker OdorEyes BIP Injection Pump, Backup
10	Welker RV-1 Relief Valve
11	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve (Normal Operation)
H	Primary Injection Pump Actuation Valve (Pneumatic Timer)
I	Backup Injection Pump Actuation Valve (Normal Operation)
J	Backup Injection Pump Actuation Valve (Pneumatic Timer)
K	Pneumatic Timer Isolation Valve
Enclosure Not Shown for Clarity	

Figure 12: Pump Cabinet – Dual BIP Injection Pumps With Pneumatic Timer and Blanket Pressure Regulator



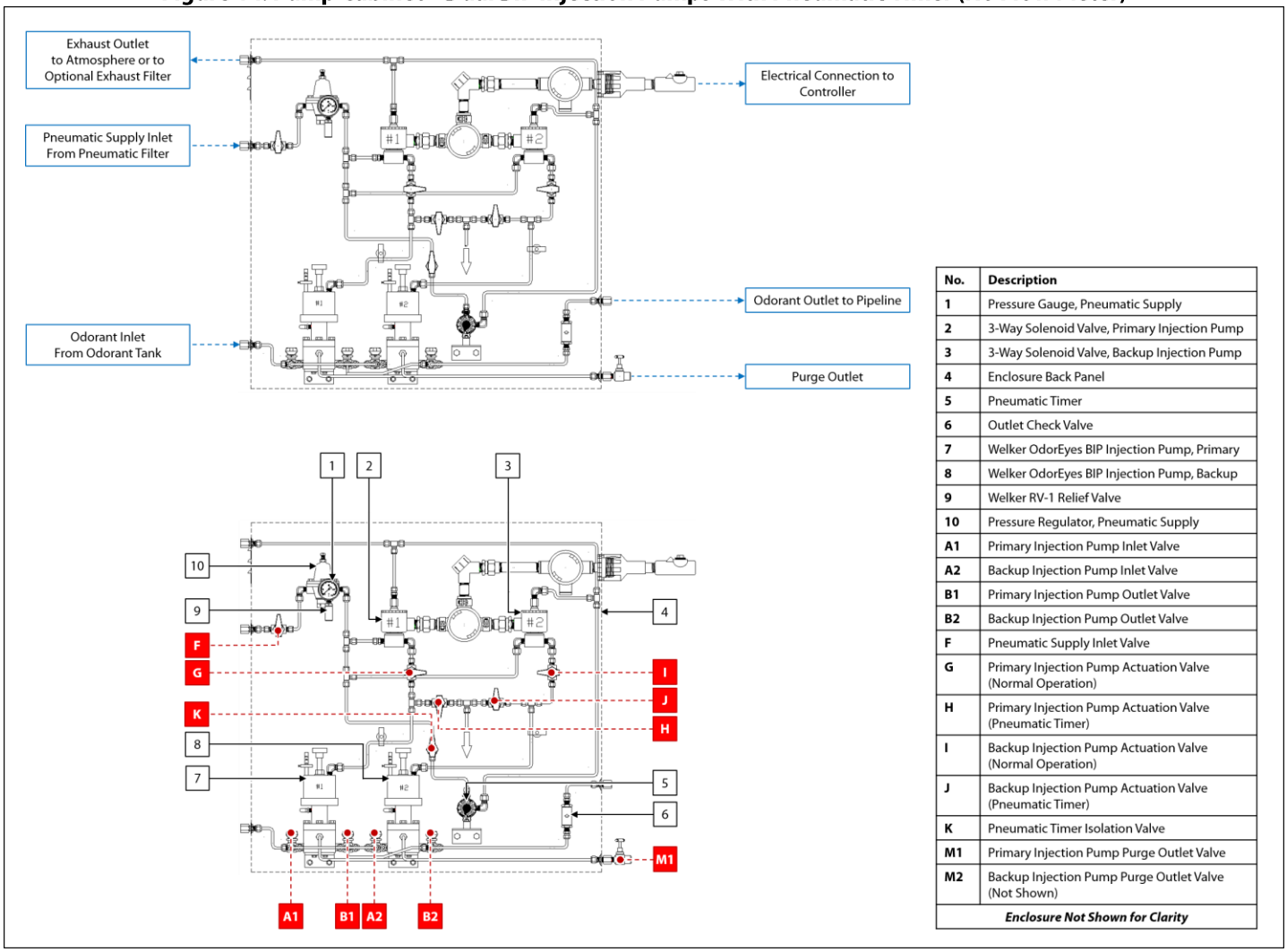
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Pneumatic Timer
6	Odorant Flow Meter
7	Outlet Check Valve
8	Welker OdorEyes BIP Injection Pump, Primary
9	Welker OdorEyes BIP Injection Pump, Backup
10	Welker RV-1 Relief Valve
11	Pressure Gauge, Blanket Pressure
12	Pressure Regulator, Blanket Pressure
13	Welker RV-1 Relief Valve
14	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve (Normal Operation)
H	Primary Injection Pump Actuation Valve (Pneumatic Timer)
I	Backup Injection Pump Actuation Valve (Normal Operation)
J	Backup Injection Pump Actuation Valve (Pneumatic Timer)
K	Pneumatic Timer Isolation Valve
L	Blanket Pressure Outlet Valve
Enclosure Not Shown for Clarity	

Figure 13: Pump Cabinet – Dual BIP Injection Pumps With Pneumatic Timer, Blanket Pressure Regulator, and Heater



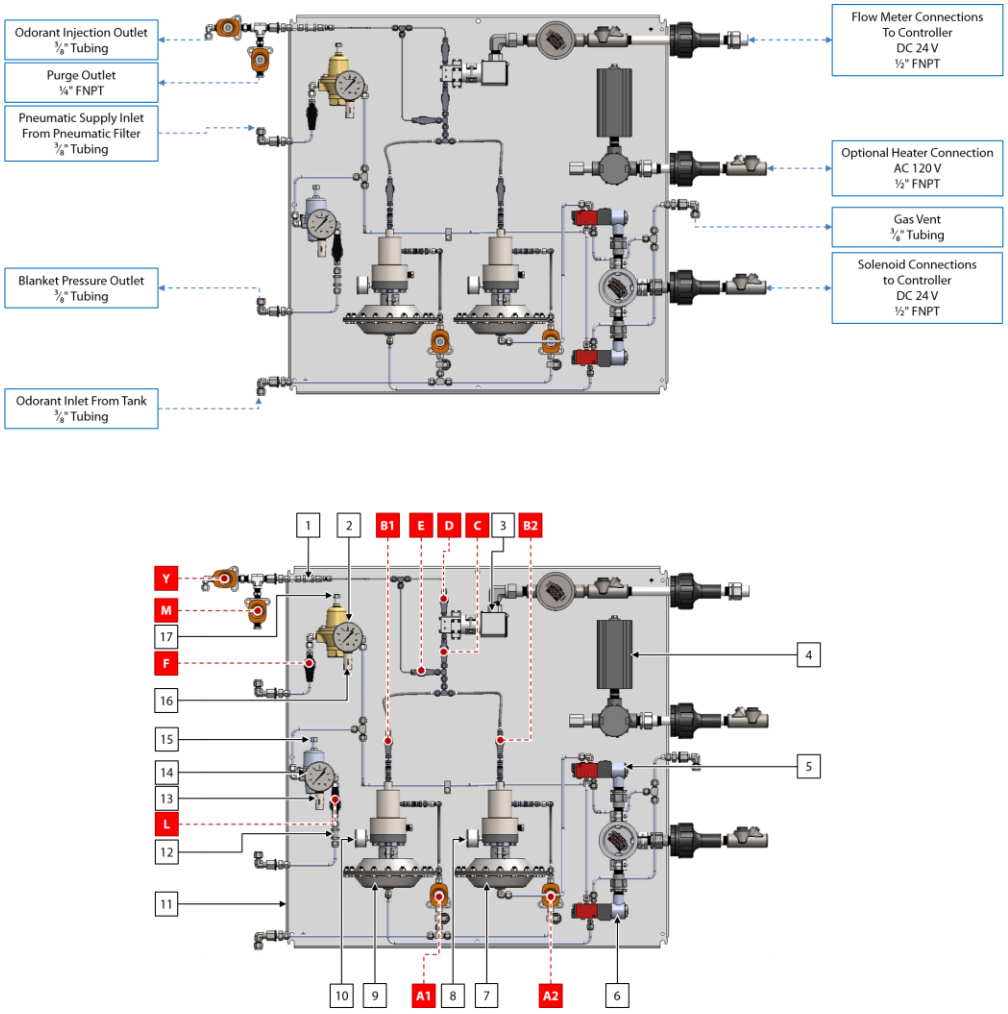
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Pneumatic Timer
6	Odorant Flow Meter
7	Outlet Check Valve
8	Heater
9	Welker OdorEyes BIP Injection Pump, Primary
10	Welker OdorEyes BIP Injection Pump, Backup
11	Welker RV-1 Relief Valve
12	Pressure Gauge, Blanket Pressure
13	Pressure Regulator, Blanket Pressure
14	Welker RV-1 Relief Valve
15	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve (Normal Operation)
H	Primary Injection Pump Actuation Valve (Pneumatic Timer)
I	Backup Injection Pump Actuation Valve (Normal Operation)
J	Backup Injection Pump Actuation Valve (Pneumatic Timer)
K	Pneumatic Timer Isolation Valve
L	Blanket Pressure Outlet Valve
Enclosure Not Shown for Clarity	

Figure 14: Pump Cabinet – Dual BIP Injection Pumps With Pneumatic Timer (No Flow Meter)



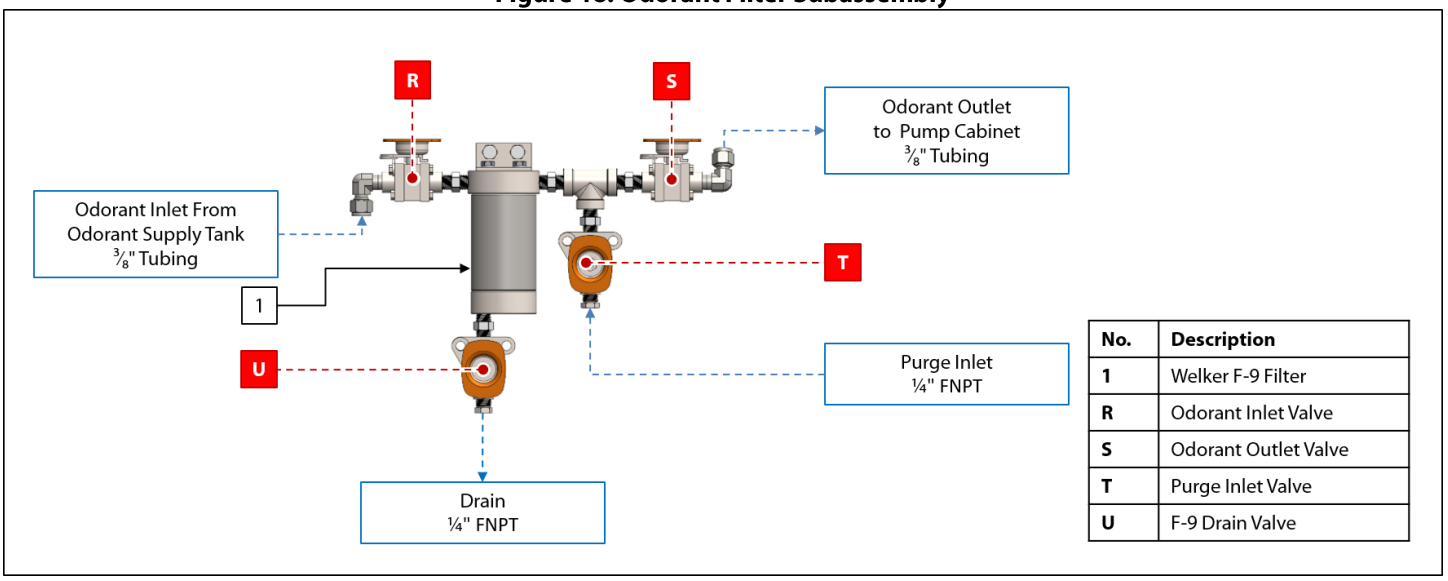
No.	Description
1	Pressure Gauge, Pneumatic Supply
2	3-Way Solenoid Valve, Primary Injection Pump
3	3-Way Solenoid Valve, Backup Injection Pump
4	Enclosure Back Panel
5	Pneumatic Timer
6	Outlet Check Valve
7	Welker OdorEyes BIP Injection Pump, Primary
8	Welker OdorEyes BIP Injection Pump, Backup
9	Welker RV-1 Relief Valve
10	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
F	Pneumatic Supply Inlet Valve
G	Primary Injection Pump Actuation Valve (Normal Operation)
H	Primary Injection Pump Actuation Valve (Pneumatic Timer)
I	Backup Injection Pump Actuation Valve (Normal Operation)
J	Backup Injection Pump Actuation Valve (Pneumatic Timer)
K	Pneumatic Timer Isolation Valve
M1	Primary Injection Pump Purge Outlet Valve
M2	Backup Injection Pump Purge Outlet Valve (Not Shown)
Enclosure Not Shown for Clarity	

Figure 15: Pump Cabinet – Dual VCIP Injection Pumps With Blanket Pressure Regulator and Heater



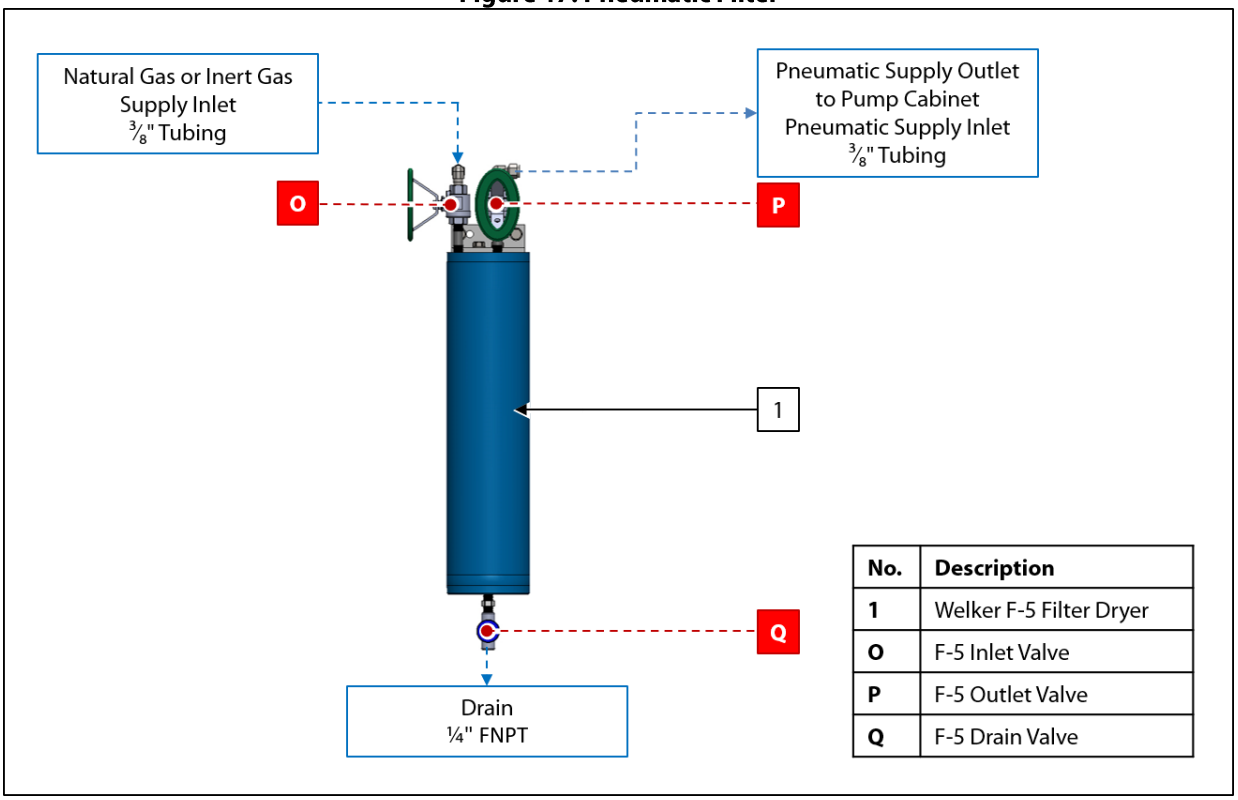
No.	Description
1	Check Valve
2	Pressure Gauge, Pneumatic Supply
3	Odorant Flow Meter
4	Heater
5	3-Way Solenoid Valve, Backup Injection Pump
6	3-Way Solenoid Valve, Primary Injection Pump
7	Welker Vanishing Chamber™ Injection Pump, Backup
8	Pressure Gauge, Backup Injection Pump
9	Welker Vanishing Chamber™ Injection Pump, Primary
10	Pressure Gauge, Primary Injection Pump
11	Enclosure Back Panel
12	Check Valve
13	Welker RV-1 Relief Valve
14	Pressure Gauge, Blanket Pressure
15	Pressure Regulator, Blanket Pressure
16	Welker RV-1 Relief Valve
17	Pressure Regulator, Pneumatic Supply
A1	Primary Injection Pump Inlet Valve
A2	Backup Injection Pump Inlet Valve
B1	Primary Injection Pump Outlet Valve
B2	Backup Injection Pump Outlet Valve
C	Odorant Flow Meter Inlet Valve
D	Odorant Flow Meter Outlet Valve
E	Odorant Flow Meter Bypass Valve
F	Pneumatic Supply Inlet Valve
L	Blanket Pressure Outlet Valve
M	Purge Outlet Valve
Y	Odorant Injection Outlet Valve

Figure 16: Odorant Filter Subassembly



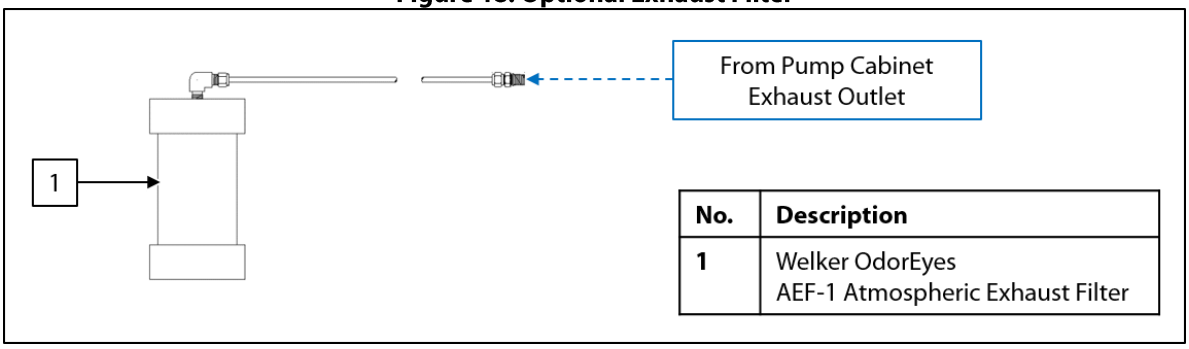
No.	Description
1	Welker F-9 Filter
R	Odorant Inlet Valve
S	Odorant Outlet Valve
T	Purge Inlet Valve
U	F-9 Drain Valve

Figure 17: Pneumatic Filter



No.	Description
1	Welker F-5 Filter Dryer
O	F-5 Inlet Valve
P	F-5 Outlet Valve
Q	F-5 Drain Valve

Figure 18: Optional Exhaust Filter



No.	Description
1	Welker OdorEyes AEF-1 Atmospheric Exhaust Filter

2.1 Before You Begin

After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.

When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

The Accu/Line™ Injection System will ship skid-mounted and "hard-tube" connected with manufacturer-supplied fittings and hardware. However, the customer will need to supply some tubing and fittings in order to complete the installation of the system.

2.2 Installation

Pipeline Injection Point

1. If the Accu/Line™ will be connected to a Welker OdorEyesSFA Sight Flow Assembly at the pipeline, install the SFA to the desired injection point. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the SFA for installation instructions.
2. If the Accu/Line™ will be connected to a Welker SP-DP Diffusing Probe at the pipeline, install the SP-DP to the desired injection point. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the SP-DP for installation instructions.

System Skid

3. Mount the skid to a flat, level surface, such as a concrete slab.
4. Connect a grounding wire to the ground lug on the skid to safely ground the system.
5. Connect the skid drain port(s) to an appropriate draining location.

System Connections

6. Using appropriately sized customer-supplied tubing, connect from the odorant outlet on the pump cabinet to the inlet of the SFA or SP-DP (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, or *Figure 15*).

Welker recommends using stainless steel tubing for all natural gas process lines, as plastic tubing can absorb odorant from the gas.

Welker recommends installing a valve between the system odorant outlet and the injection point.

7. As necessary, connect a customer-supplied unodorized natural gas or inert gas supply to the inlet of the Welker F-5 Filter Dryer (*Figure 16*).
8. Ensure that all valves on the system are closed.
9. Ensure that all fittings, connections, and bolts are tightened.

Electrical Connections

Turn OFF the electrical supply prior to making electrical connections.

10. Connect an AC 120 V electrical supply to the controller. Refer to the industry standards for appropriate electrical connections to interface with the PLC.

For systems used in hazardous locations, sealing compound is required to seal all fittings to restrict the passage of gases, vapors, or flames.

11. Connect the customer gas flow signal device to the termination block.

The controller can accept analog, pulse, or Modbus input.

12. If the Accu/Line™ is not equipped with the optional flag tracker level indicator, installation is now complete; proceed to *Section 2.3, Start-Up Procedures*. If the Accu/Line™ is equipped with the optional flag tracker level indicator, continue to step 13.

Flag Tracker Level Indicator (Optional)

The float and gasket must be installed to the flag tracker level indicator prior to filling the odorant supply tank.

The float and gasket are packaged separately for shipment.

13. Remove the bottom drain flange from the base of the level indicator.
14. Install the float to the spring on the bottom drain flange. The top of the float should point up.

The top of the float is marked to ensure proper orientation.

The spring attached to the bottom drain flange cushions the float when the odorant supply tank is empty.

15. Replace the shipping gasket with the provided gasket.
16. Install the bottom drain flange with float to the level indicator.

2.3 Start-Up Procedures

Odorant Supply Tank

1. Fill the odorant supply tank in accordance with company policy and procedure, taking care not to exceed 80% of the total volume of the supply tank.

Never fill the odorant supply tank above 80% of its capacity. Allow at least 20% for product expansion, should the tank be exposed to increased temperatures.

2. Check the odorant supply tank for leaks and repair as necessary.

Pneumatic Supply Regulator

3. Open F-5 inlet valve O and F-5 outlet valve P (*Figure 16*).
4. Apply pneumatic supply pressure to the pump cabinet.
5. Open pneumatic supply inlet valve F to pressurize the pneumatic supply regulator (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14* or *Figure 15*).
6. The pneumatic supply regulator is factory-set to the setting required to stroke the pump(s) located inside the pump cabinet according to the recommended settings in Table 3.

Table 3: Injection Pump Pressure Regulator Settings

Injection Pressure	Approximate Regulator Set Point, BIP	Approximate Regulator Set Point, SSO-9	Approximate Regulator Set Point, VCIP
0–400 psig	30 psig	50 psig	20 psig
401–800 psig	50 psig	100 psig	35 psig
801–1200 psig	80 psig	150 psig	50 psig
1201–1800 psig	–	225 psig	60 psig
1801–2160 psig	100 psig	–	70 psig

Blanket Pressure Regulator

7. Open blanket pressure inlet valve X (*Figure 1* or *Figure 2*).
8. Open blanket pressure outlet valve L or open the regulated external blanket pressure supply source (*Figure 4*, *Figure 5*, *Figure 7*, *Figure 8*, *Figure 10*, *Figure 12*, *Figure 13*, or *Figure 15*).
9. Check the blanket pressure connections for leaks and repair as necessary.

Valve Configuration

10. Slowly open the valves indicated in Table 4.

Table 4: Start-Up Valve Orientation

Valve Letter	Valve Description	Reference Figure(s)
R	Odorant Inlet	16
S	Odorant Outlet	16
A (A1 and A2)	Injection Pump Inlet	3–15
B (B1 and B2)	Injection Pump Outlet	3–15
E	Odorant Flow Meter Bypass	3–13, 15

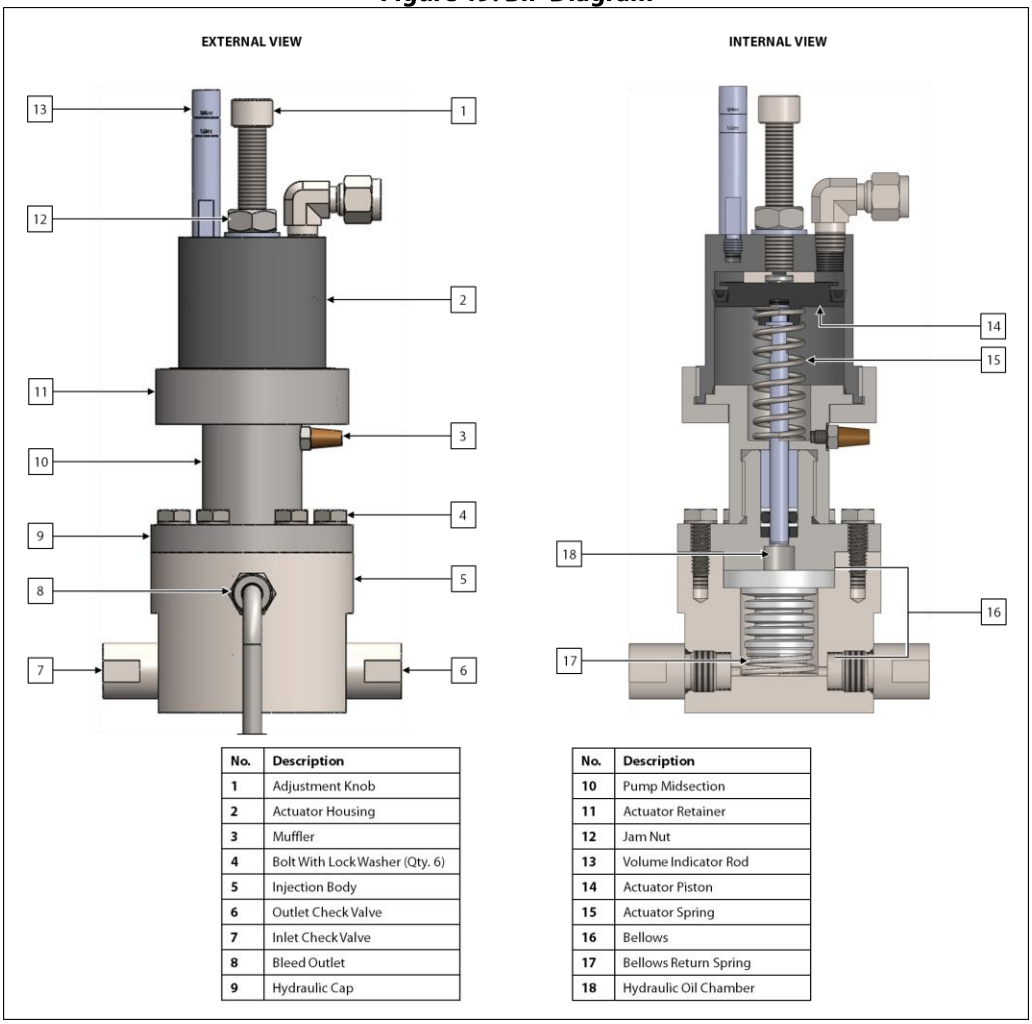
11. If the Accu/Line™ is connected to an SFA or SP-DP at the pipeline, slowly open any valves between the odorant outlet on the pump cabinet and the SFA or SP-DP.
12. Check for leaks and repair as necessary.

Purging the Injection Pump

13. If equipped, open injection pump purge outlet valve M to purge the injection chamber of any trapped air (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
14. Once all air has been purged from the injection chamber, close injection pump purge outlet valve M (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
15. If available, adjust the injection volume of the injection pump.

Loosen the jam nut on the adjustment screw.
To increase the injection volume, turn the adjustment knob counterclockwise.
To decrease the injection volume, turn the adjustment knob clockwise.
Tighten the jam nut on the adjusting screw to secure the adjusting screw at the desired volume.

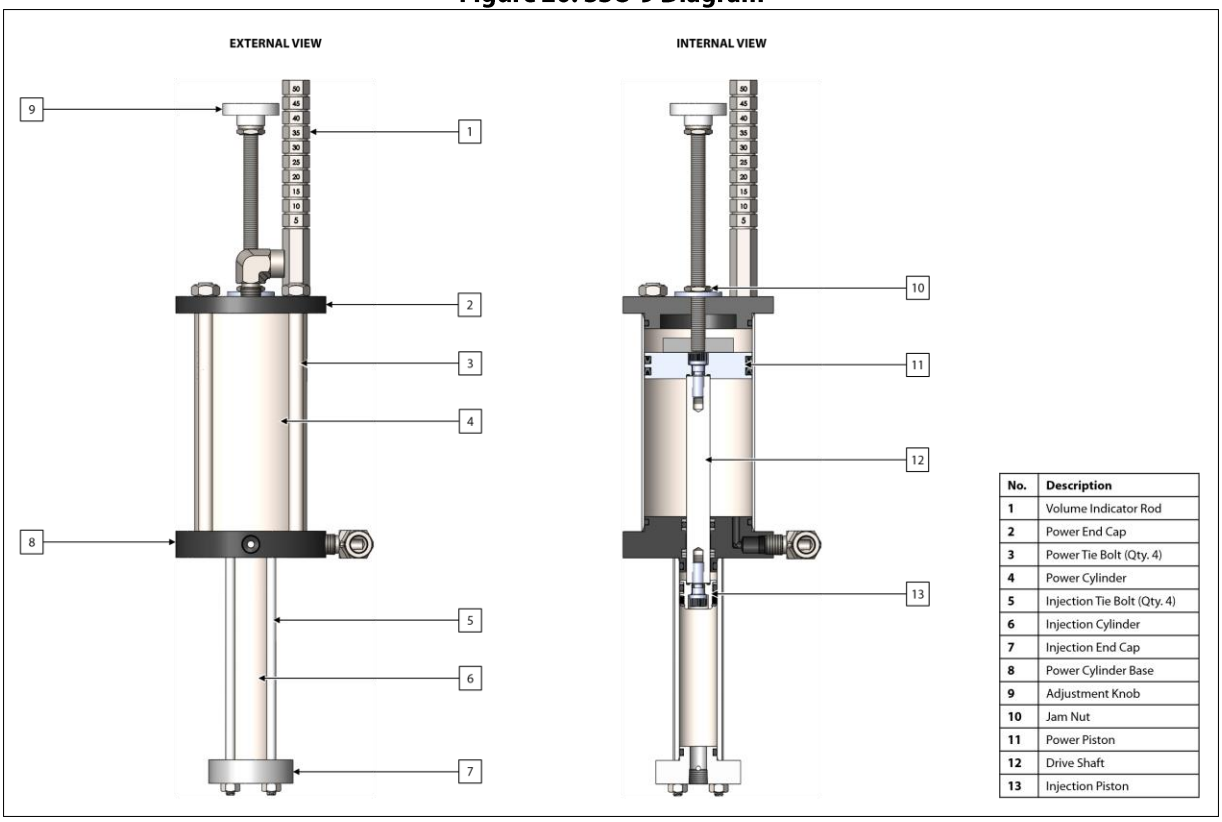
Figure 19: BIP Diagram



No.	Description
1	Adjustment Knob
2	Actuator Housing
3	Muffler
4	Bolt With Lock Washer (Qty. 6)
5	Injection Body
6	Outlet Check Valve
7	Inlet Check Valve
8	Bleed Outlet
9	Hydraulic Cap

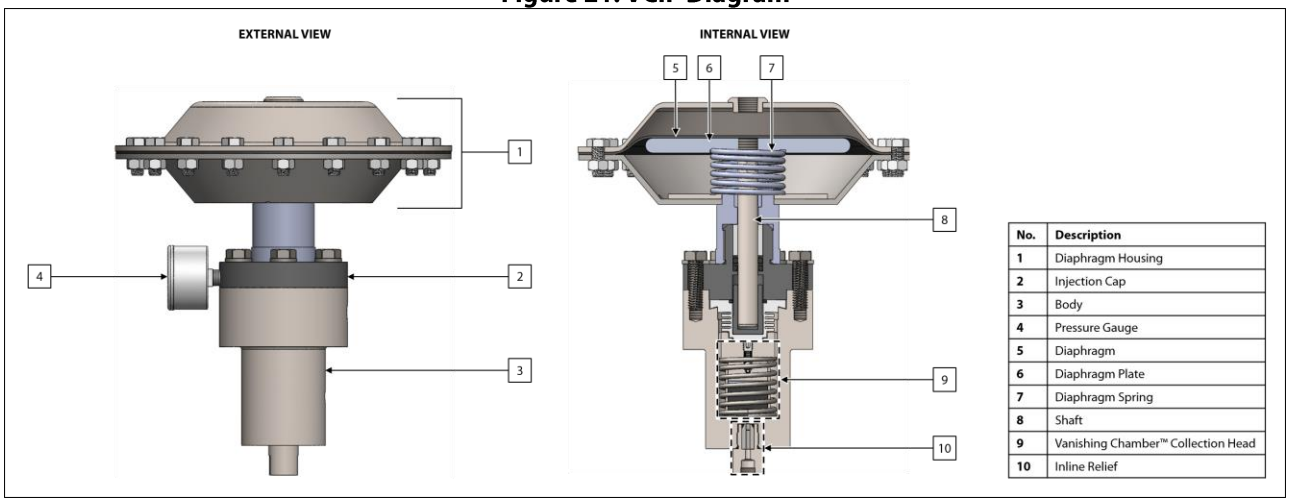
No.	Description
10	Pump Midsection
11	Actuator Retainer
12	Jam Nut
13	Volume Indicator Rod
14	Actuator Piston
15	Actuator Spring
16	Bellows
17	Bellows Return Spring
18	Hydraulic Oil Chamber

Figure 20: SSO-9 Diagram



No.	Description
1	Volume Indicator Rod
2	Power End Cap
3	Power Tie Bolt (Qty. 4)
4	Power Cylinder
5	Injection Tie Bolt (Qty. 4)
6	Injection Cylinder
7	Injection End Cap
8	Power Cylinder Base
9	Adjustment Knob
10	Jam Nut
11	Power Piston
12	Drive Shaft
13	Injection Piston

Figure 21: VCIP Diagram



No.	Description
1	Diaphragm Housing
2	Injection Cap
3	Body
4	Pressure Gauge
5	Diaphragm
6	Diaphragm Plate
7	Diaphragm Spring
8	Shaft
9	Vanishing Chamber™ Collection Head
10	Inline Relief

16. As necessary, repeat steps 13–15 for the backup injection pump (*Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, or *Figure 15*).
17. **Slowly** open flow meter outlet valve D and flow meter inlet valve C, and then close flow meter bypass valve E (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
18. Open the valve on the inlet of the SFA or SP-DP, if applicable, or any valve(s) restricting the flow of odorant from the Accu/Line™ to the pipeline.

Verifying Pump Operation

Pump operation can be verified using the optional pneumatic timer or using the controller.
To verify pump operation using the optional pneumatic timer, continue to step 19.
To verify pump operation using the controller, proceed to step 32.

Using the Optional Pneumatic Timer

19. Close primary injection pump actuation valve G (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
20. Open pneumatic timer isolation valve K (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
21. Open primary injection pump actuation valve H (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
22. Turn the dial on the front of the pneumatic timer to set the stroke frequency of the primary injection pump.

To get a full stroke of the injection pump, do not set the stroke frequency faster than every six (6) seconds.

23. As the injection pump strokes, verify liquid odorant is being injected into the pipeline.

Welker recommends a minimum of ten (10) actuations to verify injection.

The injection of liquid odorant into the pipeline can be verified a number of ways.

- If an SFA is used, product flow can be observed by visually examining the incorporated Welker SG-4 Sight Glass.
- If an SP-DP is used, product flow can be indicated by a sight glass or pressure gauge. If the SP-DP is equipped with a Welker SG-4 Sight Glass, the Visual Flow Indicator (a.k.a. Spinner Wheel) should spin. If a pressure gauge is installed upstream of the inlet check valve, the pressure gauge will spike as pressure builds to overcome the check valve.

24. Once the collection and injection of the primary injection pump have been verified, prepare to verify the collection and injection of the backup injection pump.
25. Open primary injection pump actuation valve G (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
26. Close primary injection pump actuation valve H (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
27. Close backup injection pump actuation valve I (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
28. Open backup injection pump actuation valve J (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14*).
29. As necessary, turn the dial on the front of the pneumatic timer to set the stroke frequency of the backup injection pump.

To get a full stroke of the injection pump, do not set the stroke frequency faster than every six (6) seconds.

30. As the injection pump strokes, verify liquid odorant is being injected into the pipeline.

Welker recommends a minimum of ten (10) actuations to verify injection.

The injection of liquid odorant into the pipeline can be verified a number of ways.

- If an SFA is used, product flow can be observed by visually examining the incorporated Welker SG-4 Sight Glass.
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31. Once injection of liquid odorant has been verified, proceed to step 42.

Using the Controller

32. As necessary, ensure that (primary) injection pump actuation valve G is open (*Figure 4*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14)*.
33. As necessary, ensure that primary injection pump actuation valve H and pneumatic timer isolation valve K are closed (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14)*.
34. Set the controller gas flow signal to fixed rate. Use the gas flow meter on the customer pipeline to obtain a current flow rate, and then use this value to set the fixed rate gas flow (*Figure 49*). Set the fixed mode to "enabled" (*Figure 49*). See *Section 3.3, Navigating the Setup Menus,* for instructions on changing numeric and text values in the Setup submenus.
35. From the controller, stroke the primary pump. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Pump Setup menu, select Pump 1 Manual Stroke (*Figure 36*). The Manual Stroke field will highlight just before the controller strokes the pump (*Figure 36*).
36. As the injection pump strokes, verify liquid odorant is being injected into the pipeline.

Welker recommends a minimum of ten (10) actuations to verify injection.

The injection of liquid odorant into the pipeline can be verified a number of ways.

- If an SFA is used, product flow can be observed by visually examining the incorporated Welker SG-4 Sight Glass.
- If an SP-DP is used, product flow can be indicated by a sight glass or pressure gauge. If the SP-DP is equipped with a Welker SG-4 Sight Glass, the Visual Flow Indicator (a.k.a. Spinner Wheel) should spin. If a pressure gauge is installed upstream of the inlet check valve, the pressure gauge will spike as pressure builds to overcome the check valve.
- Readout from the flow meter.

37. Once the collection and injection of the primary injection pump have been verified, prepare to verify the collection and injection of the backup injection pump. If the Accu/Line™ is not equipped with a backup injection pump, proceed to step 42.
38. As necessary, ensure that backup injection pump actuation valve I is open (*Figure 8, Figure 10, Figure 11*, or *Figure 14*).
39. As necessary, ensure that backup injection pump actuation valve J and pneumatic timer isolation valve K are closed (*Figure 11*, *Figure 12*, *Figure 13*, or *Figure 14)*.
40. From the controller, stroke the backup injection pump. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Pump Setup menu, select Pump 2 Manual Stroke (*Figure 36*). The Manual Stroke field will highlight just before the controller strokes the pump (*Figure 36*).
41. As the injection pump strokes, verify liquid odorant is being injected into the pipeline.

Welker recommends a minimum of ten (10) actuations to verify injection.

The injection of liquid odorant into the pipeline can be verified a number of ways.

- If an SFA is used, product flow can be observed by visually examining the incorporated Welker SG-4 Sight Glass.
- If an SP-DP is used, product flow can be indicated by a sight glass or pressure gauge. If the SP-DP is equipped with a Welker SG-4 Sight Glass, the Visual Flow Indicator (a.k.a. Spinner Wheel) should spin. If a pressure gauge is installed upstream of the inlet check valve, the pressure gauge will spike as pressure builds to overcome the check valve.
- Readout from the flow meter.

Controller Configuration

42. Verify that the customer set points have been correctly set by the manufacturer.
43. Once the collection and injection of liquid odorant have been confirmed, the Accu/Line™ is operational.

3.1 Understanding the Display

The touch screen controller is used to modify system parameters and view current system information and current alarm status.

The touch screen controller is a menu-driven system. The Home screen is the top screen in the menu tree (*Figure 22*).

Figure 22: Home Screen

Monitor
Takes you to the monitoring screens where you can view current information about the operation of the odorizer.

Setup
Takes you to the setup screens where you can change any set point values in the odorizer.

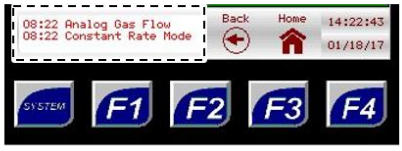
From the Home screen, the user can access three (3) types of screens:

- **Menu**-from this type of screen, the user can access submenus.
- **Informational**-from this type of screen, the user can monitor the odorizer and view current operating conditions.
- **Setup**-from this type of screen, numeric and/or text values that affect the setup of the odorizer can be changed.

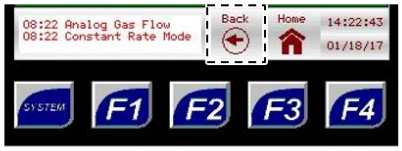
Navigating the Display

Figure 23: Toolbar and Function Keys

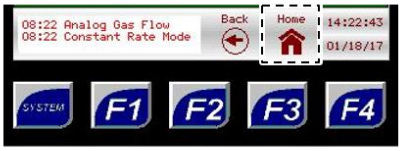
TOOLBAR



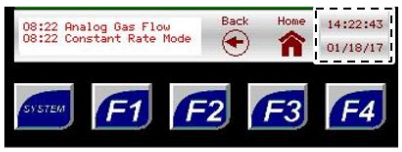
Alarms
View any active alarms.



Back Button
Takes you back one (1) level in the menu tree to the previous screen.

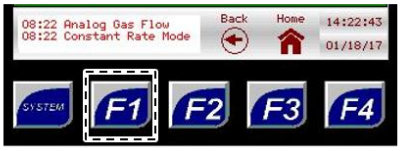


Home Button
Takes you to the **Home** screen.

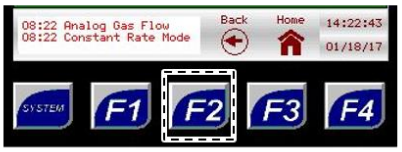


Current Date and Time
This is the current date and time in the odorizer. It can be changed from any screen.

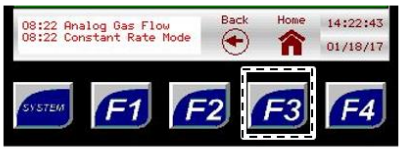
FUNCTION KEYS



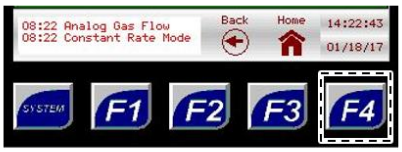
F1 Key
Takes you to the **Home** screen.



F2 Key
Takes you to the **Current Alarms** screen.



F3 Key
Takes you to the **Logging Setup** screen.



F4 Key
Starts and stops the auto scroll function.

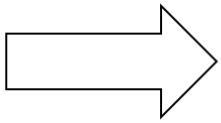
The toolbar appears on every screen except the Home screen.

If nothing on the screen is pressed for a certain amount of time, the sleep function will cause the backlight on the screen to turn off. To wake up the controller, press anywhere on the screen or press one of the function keys.

Viewing the Current Alarms

From any screen, press the F2 function key to go to the Current Alarms screen (*Figure 22*).

Figure 24: Current Alarms Screen



Current Alarms
Active alarms are **red** and are labeled "ACT."

Active alarms that have been acknowledged are **purple** and are labeled "ACK."

Normal (i.e., inactive) alarms are **green** and are labeled "RTN."

Table 5: Current Alarms

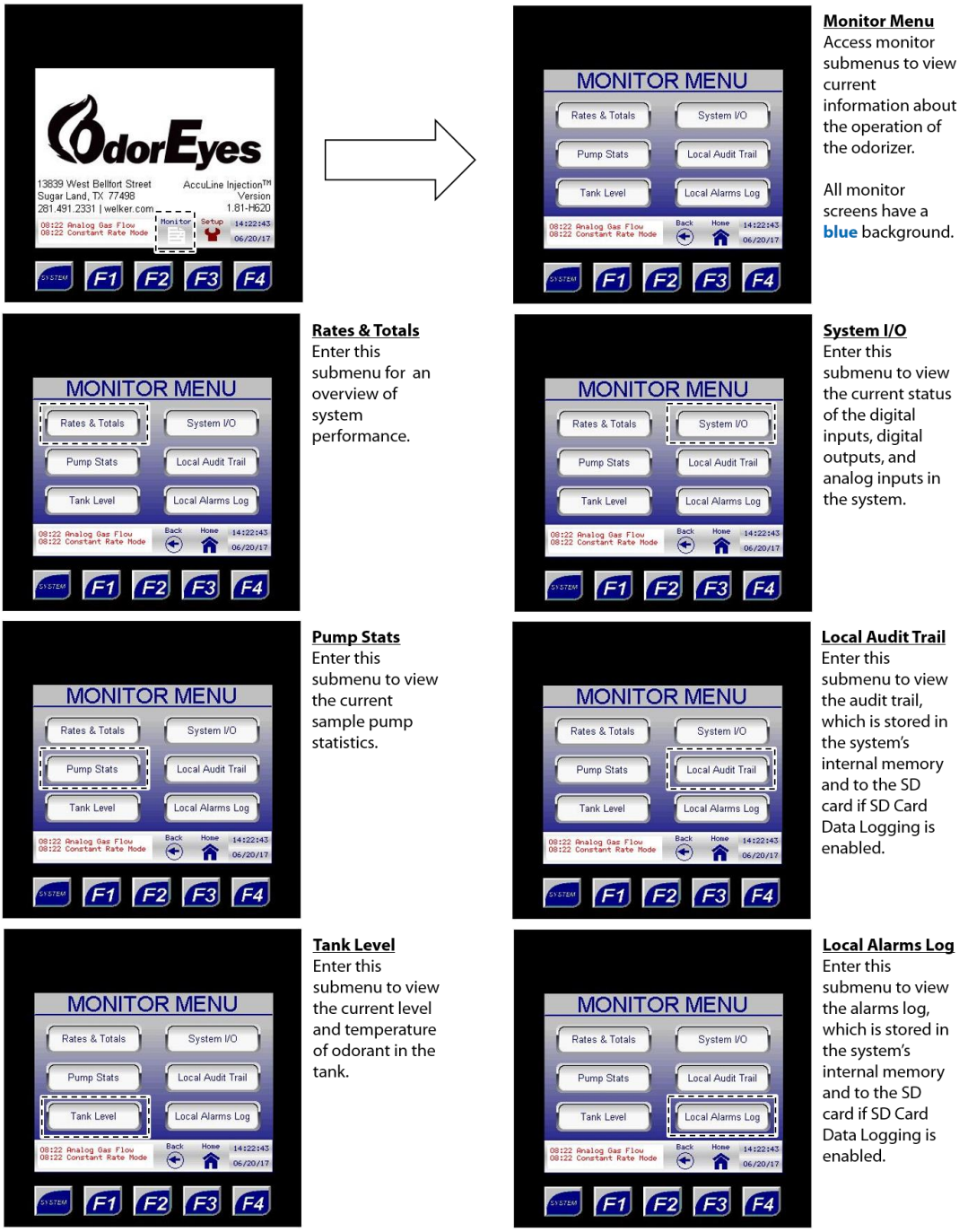
Analog Flow	Can only be active if Analog Input method is selected.
Pulse Flow	Can only be active if Pulse Input method is selected.
Constant Rate	Can only be active if Constant Rate mode is specified as the desired fail mode. The controller will enter this gas flow fail mode when there is a gas flow signal loss.
Shutdown Mode	Can only be active if Shutdown Mode is specified as the desired fail mode. The controller will enter this gas flow fail mode when there is a gas flow signal loss.
Fixed Rate	Can only be active if Fixed mode is enabled.
Tank Level	Can only be active if an electronic level transmitter is used to track the odorant tank level and the controller loses the 4–20 mA signal from the transmitter. **NOTE:** If this alarm is active, the controller will automatically switch to the odorant flow method to track the odorant tank level. The controller will use the value of odorant in the tank and subtract the appropriate volume with each stroke.
Tank Low Level	Active if the odorant tank level has dropped below the specified value.
P1(2) Overflow	Active if the pump output for the last ten (10) strokes exceeds the allowable average deviation.
P1(2) Low Flow	Active if the pump output for the last ten (10) strokes is below the allowable average deviation.
P1(2) No Flow	Active if after ten (10) strokes there is no output from the pump.
Dual Pump Mode	Indicates the odorizer is currently actuating both pumps.
SD Card Error	Active if SD Card Data Logging is enabled but no micro SD card is installed.

3.2 Navigating the Monitor Menus

Through the Monitor menu, the user can access the Rates & Totals, Pump Stats, Tank Level, System I/O, Local Audit Trail, and Local Alarms Log to view current information for the odorizer.

Monitor screens are information screens: no values can be changed from these screens.

Figure 25: Monitor Menu Submenus



Monitor Menu
Access monitor submenus to view current information about the operation of the odorizer.

All monitor screens have a **blue** background.

Rates & Totals
Enter this submenu for an overview of system performance.

System I/O
Enter this submenu to view the current status of the digital inputs, digital outputs, and analog inputs in the system.

Pump Stats
Enter this submenu to view the current sample pump statistics.

Local Audit Trail
Enter this submenu to view the audit trail, which is stored in the system's internal memory and to the SD card if SD Card Data Logging is enabled.

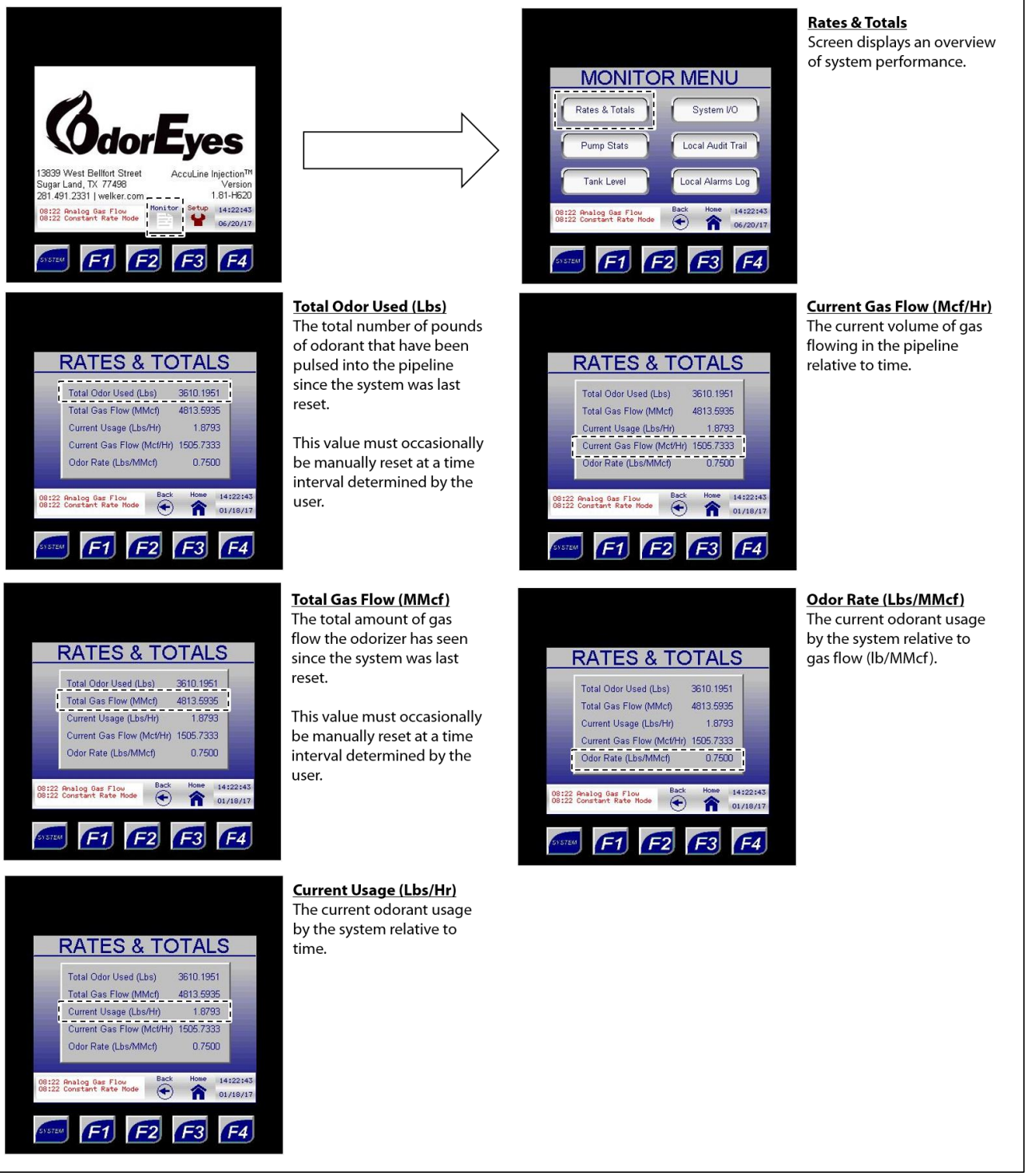
Tank Level
Enter this submenu to view the current level and temperature of odorant in the tank.

Local Alarms Log
Enter this submenu to view the alarms log, which is stored in the system's internal memory and to the SD card if SD Card Data Logging is enabled.

Rates & Totals

The Rates & Totals submenu provides the user with an overview of system performance.

Figure 26: Monitor Menu – Rates & Totals



Rates & Totals
Screen displays an overview of system performance.

Total Odor Used (Lbs)
The total number of pounds of odorant that have been pulsed into the pipeline since the system was last reset.

This value must occasionally be manually reset at a time interval determined by the user.

Current Gas Flow (Mcf/Hr)
The current volume of gas flowing in the pipeline relative to time.

Total Gas Flow (MMcf)
The total amount of gas flow the odorizer has seen since the system was last reset.

This value must occasionally be manually reset at a time interval determined by the user.

Odor Rate (Lbs/MMcf)
The current odorant usage by the system relative to gas flow (lb/MMcf).

Current Usage (Lbs/Hr)
The current odorant usage by the system relative to time.

If the system status totals are used to track system performance, they should be periodically reset through the System Control submenu (*Figure 32*).

Pump Stats

Figure 27: Monitor Menu – Pump Stats

Pump Stats
Screen displays an overview of the current sample pump statistics.

Pump In Service
This indicates which pump is currently injecting odorant into the pipeline.

Pump
The (1) column displays statistics for the first pump.

The (2) column displays statistics for the second pump.

Pump Cycle Time
This indicates the current cycle time (in seconds) of the currently operating pump.

CC
The volume of odorant the pump injected on its last stroke. The volume is given in cubic centimeters (cc).

Next Pump Stroke In
This is a countdown timer until the next stroke of the currently operating pump. The countdown time is given in seconds.

% Dev
The 10-stroke average deviation of the pump from the user's set point.

If the pump is below its set point, it will show a negative percentage.

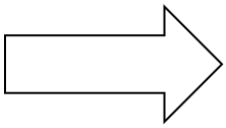
If the pump is above its set point, it will show a positive percentage.

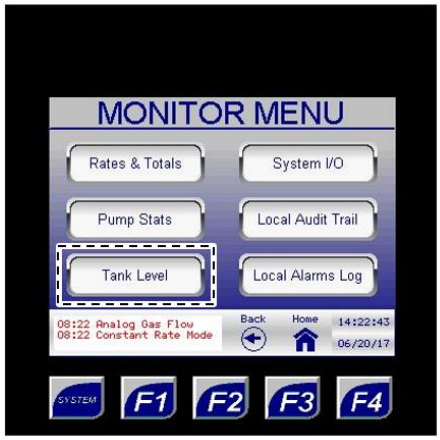
T Strks
The total number of strokes for the pump since the system was last reset by the user.

This should be reset after performing pump maintenance.

Odorant Tank Level

Figure 28: Monitor Menu – Tank Level





Tank Level
Enter this submenu to view the current level and temperature of odorant in the tank.

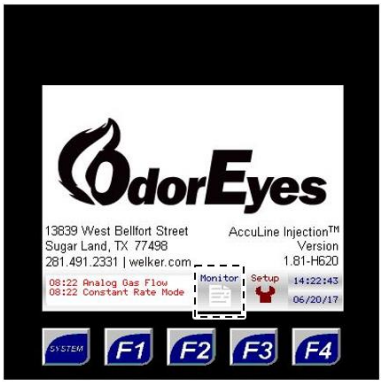
This screen displays the amount of odorant remaining in the odorant supply tank in inches, US gallons, and pounds.

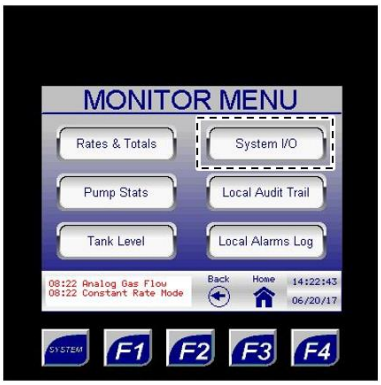
These values will either be from a transmitter or a calculation based on odorant usage.

SYSTEM I/O

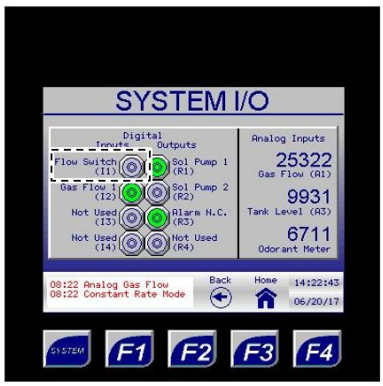
The System I/O submenu provides the user with an overview of the current status of digital inputs, digital outputs, and analog inputs in the system.

Figure 29: Monitor Menu – System I/O, 1 of 2

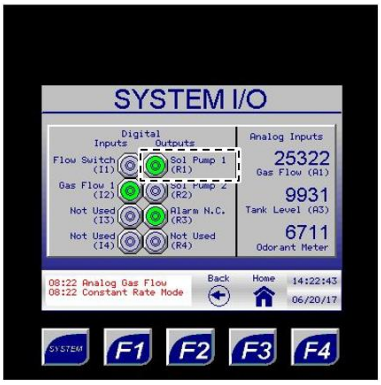




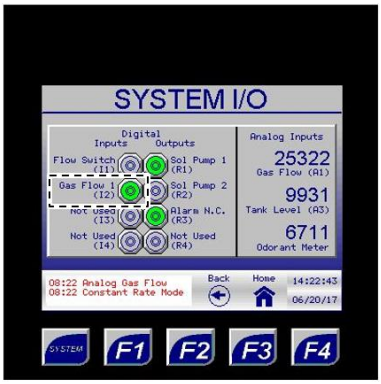
System I/O
Enter this submenu to view the current status of the digital inputs, digital outputs, and analog inputs in the system.



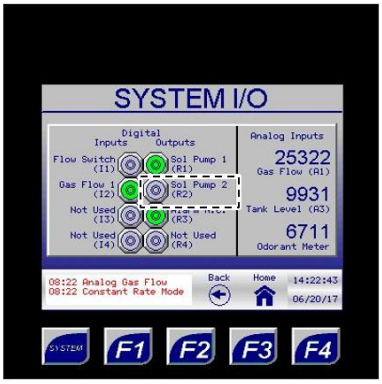
This will close when the flow switch solenoid opens.



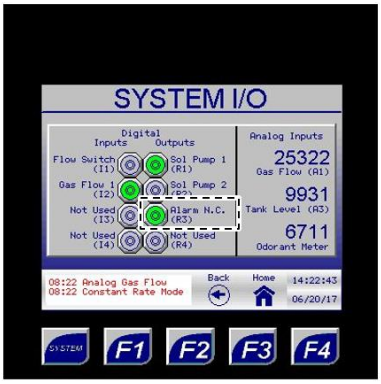
This will close when the primary pump is injecting odorant.



This will close when the first customer meter on the pipeline receives a gas flow signal.



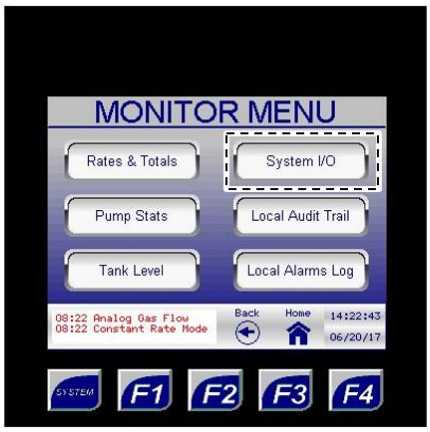
This will close when the backup pump is injecting odorant.

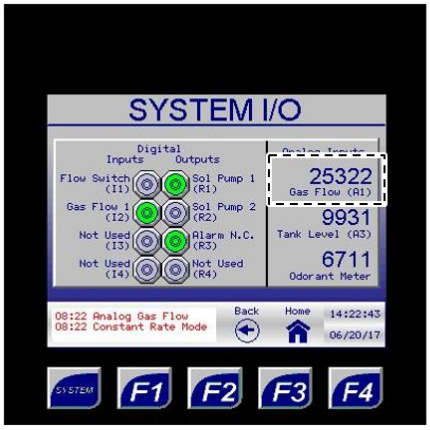


This indicates the alarm status.

The alarm status is normally closed.

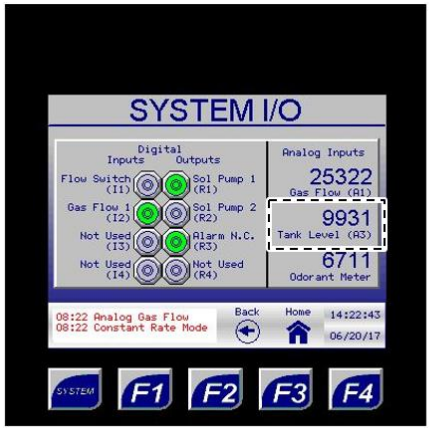
Figure 30: Monitor Menu – System I/O, 2 of 2



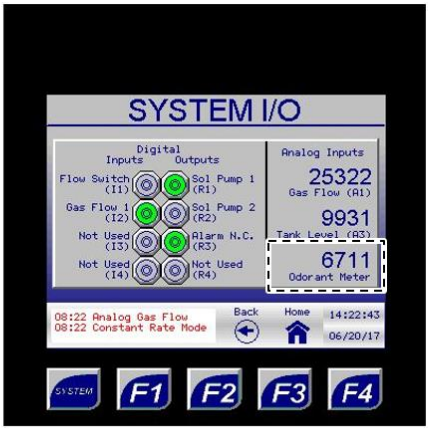


This analog signal is the raw count coming into the odorizer after the signal has been converted from milliamps. This value will vary according to the output from the customer gas flow meter.

Analog Input Conversion	
Signal (mA)	**Raw Count**
4	6400
20	32000



This analog signal is the raw count coming out of the odorizer after the signal has been converted from milliamps. This value will vary according to customer specifications.



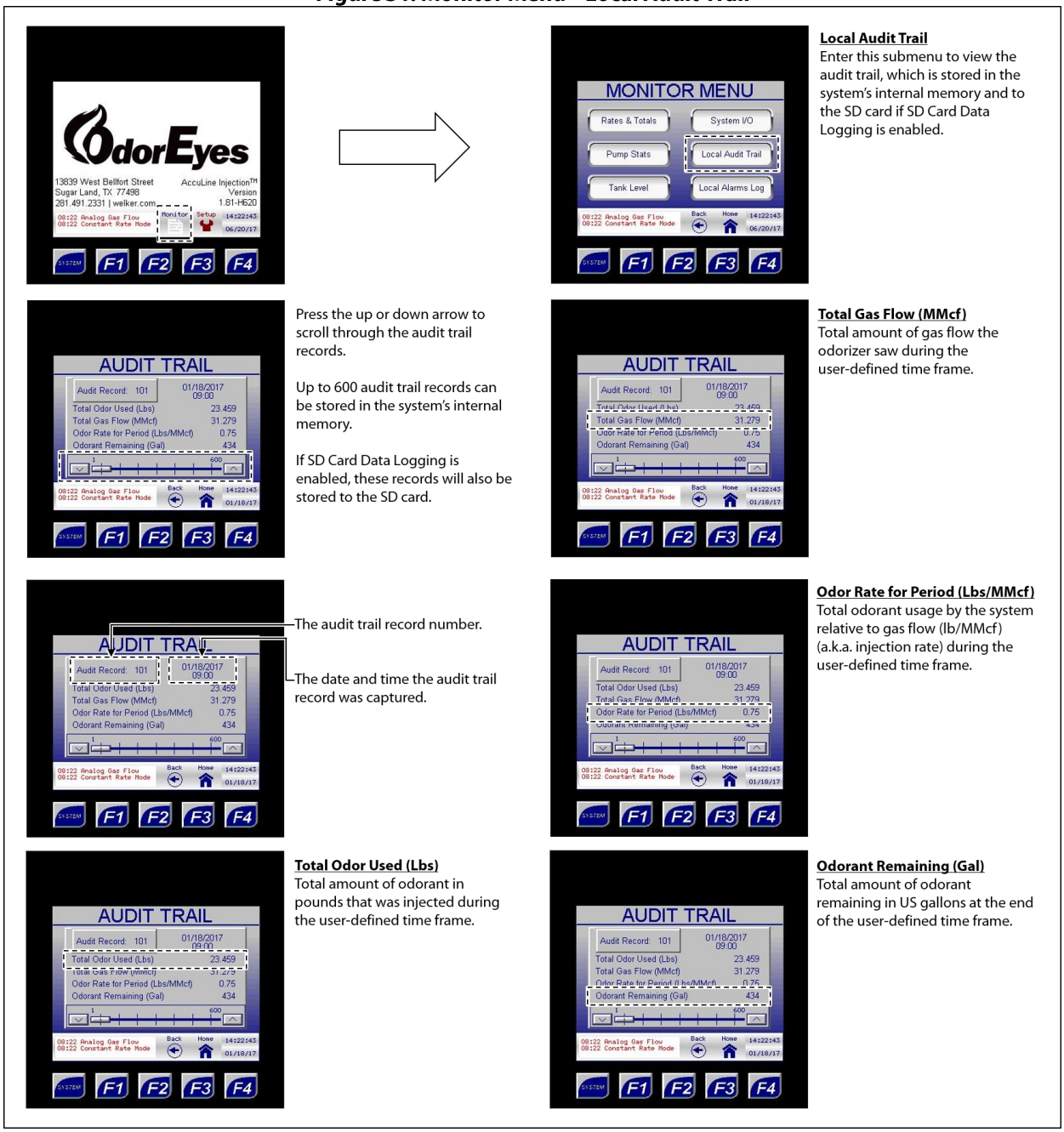
This value indicates how many high-speed pulses were received from the odorant flow meter. This value appears after each pump stroke and reverts to zero (0) after two (2) seconds.

Local Audit Trail

From the Local Audit Trail submenu, the user can access the audit tail records stored on internal memory. Up to 600 audit trail records can be stored and viewed.

If SD Card Data Logging is enabled, the audit trail records will also be stored on the installed micro SD card. The micro SD card is equipped with 8 GB of storage.

Figure 31: Monitor Menu – Local Audit Trail



Local Audit Trail
Enter this submenu to view the audit trail, which is stored in the system's internal memory and to the SD card if SD Card Data Logging is enabled.

Press the up or down arrow to scroll through the audit trail records.

Up to 600 audit trail records can be stored in the system's internal memory.

If SD Card Data Logging is enabled, these records will also be stored to the SD card.

Total Gas Flow (MMcf)
Total amount of gas flow the odorizer saw during the user-defined time frame.

The audit trail record number.

The date and time the audit trail record was captured.

Odor Rate for Period (Lbs/MMcf)
Total odorant usage by the system relative to gas flow (lb/MMcf) (a.k.a. injection rate) during the user-defined time frame.

Total Odor Used (Lbs)
Total amount of odorant in pounds that was injected during the user-defined time frame.

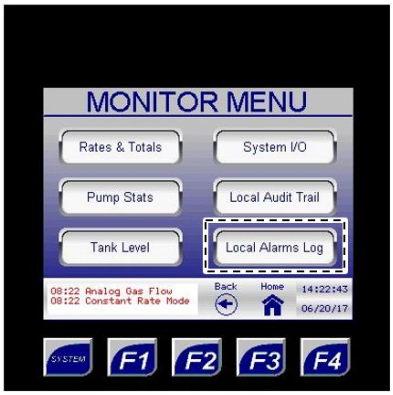
Odorant Remaining (Gal)
Total amount of odorant remaining in US gallons at the end of the user-defined time frame.

Local Alarms Log

From the Local Alarms Log submenu, the user can access the alarm logs stored on internal memory. Up to 428 alarm logs can be stored and viewed.

If SD Card Data Logging is enabled, the alarm logs will also be stored on the installed micro SD card. The micro SD card is equipped with 8 GB of storage.

Figure 32: Monitor Menu – Local Alarms Log



Local Alarms Log
Enter this submenu to view the alarms log, which is stored in the system's internal memory and to the SD card if SD Card Data Logging is enabled.

Press the up or down arrow to scroll through the alarm log records.

Up to 428 alarm log records can be stored in the system's internal memory.

If SD Card Data Logging is enabled, these records will also be stored to the SD card.

The alarm code.

The alarm log record number.

The date and time the alarm occurred or cleared.

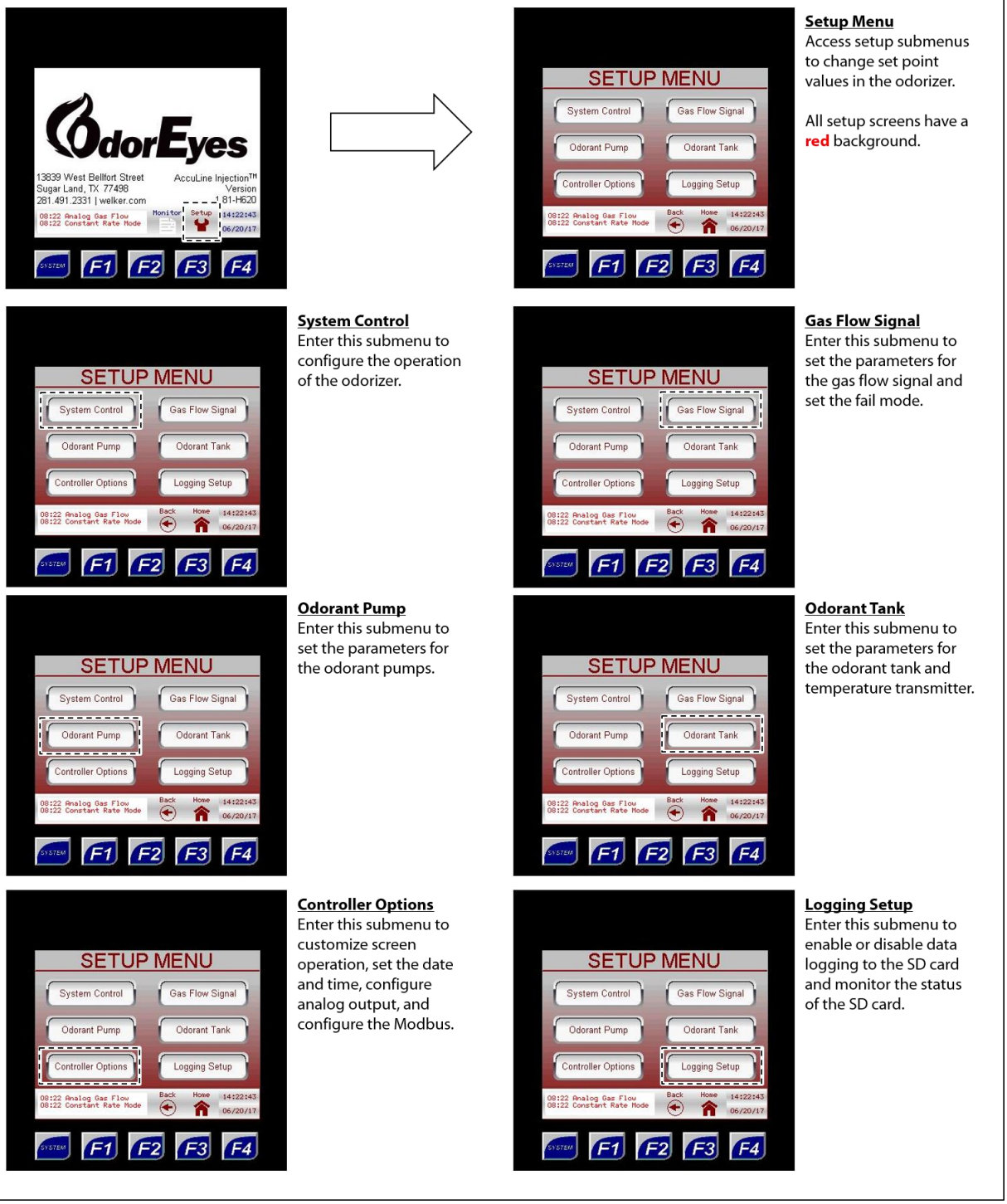
The name of the alarm.

3.3 Navigating the Setup Menus

Through the Setup menu, the user can access the System Control, Odorant Pump, Controller Options, Gas Flow Signal, Odorant Tank, and Logging Setup submenus and change numeric and/or text values that alter the parameters and features of the odorizer.

Changing numeric and/or text values in the Setup submenus will alter how the system operates.

Figure 33: Setup Menu Submenus



Setup Menu
Access setup submenus to change set point values in the odorizer.

All setup screens have a **red** background.

System Control
Enter this submenu to configure the operation of the odorizer.

Gas Flow Signal
Enter this submenu to set the parameters for the gas flow signal and set the fail mode.

Odorant Pump
Enter this submenu to set the parameters for the odorant pumps.

Odorant Tank
Enter this submenu to set the parameters for the odorant tank and temperature transmitter.

Controller Options
Enter this submenu to customize screen operation, set the date and time, configure analog output, and configure the Modbus.

Logging Setup
Enter this submenu to enable or disable data logging to the SD card and monitor the status of the SD card.

Changing Values on Setup Screens

Numeric Values

1. To change a numeric value, press on the value to be changed. A keypad will appear on the screen.
2. Type the new value using the keypad.
3. Once the new numeric value has been entered, press ENTER to save the changes.

If the new value entered is outside the range of allowable values, the value will revert to the previous value once ENTER is pressed. The keypad will stay active, allowing another value to be entered.

Text Values

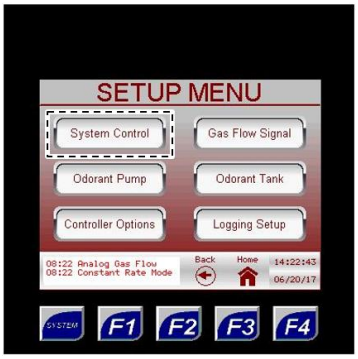
4. To change a text value, press on the value to be changed. A dropdown menu will appear on the screen.
5. Scroll through the value's options using the arrow keys in the dropdown menu.
6. Highlight the desired text value, and then press ENTER to save the changes.

If a mistake is made while entering the new value or if the value does not need to be changed, press the home button to discard the changes and return to the Home screen.

System Control

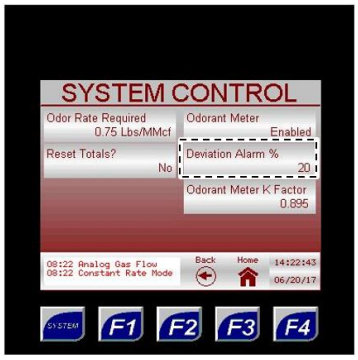
Through the System Control submenu, the user can set the general parameters for the odorizer.

Figure 34: Setup Menu – System Control



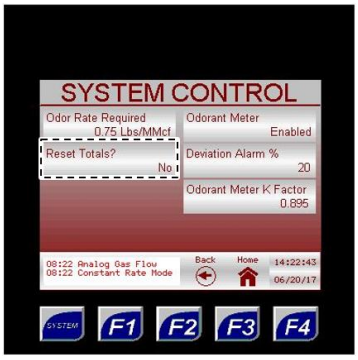
System Control
Enter this submenu to configure the operation of the odorizer.

Odor Rate Required
Set the number of pounds of odorant to pulse per million standard cubic feet (MMcf) of gas passed.



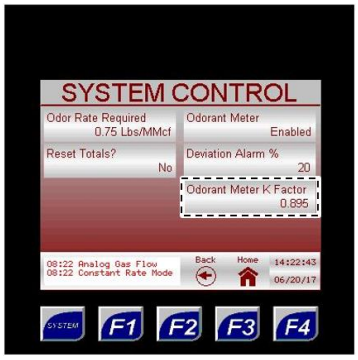
Deviation Alarm %
This is the allowable deviation the pumps can work in before they will alarm for low flow or pump overflow.

The smaller this value, the more closely the user must monitor the pumps and the less tolerant the system will be of pump output variations.

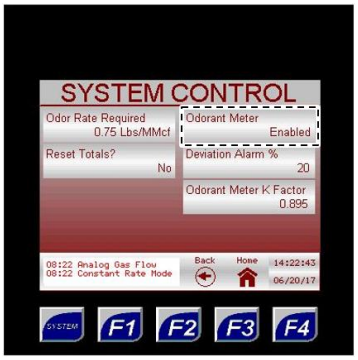


Reset Totals
Toggling this field to "Yes" causes the gas flow and odorant flow totals to be reset.

Once reset, this field will automatically revert to "No."



Odorant Meter K Factor
This value is factory-set for the odorant flow meter. This value represents how many revolutions of the meter it takes to equal 1 cc of liquid.



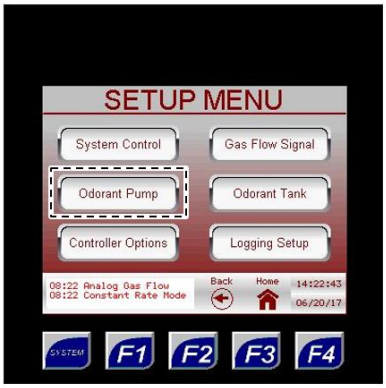
Odorant Meter
When enabled, each stroke of the pump is measured, monitored, and recorded, and the stroke frequency will adjust based on this value.

When disabled, each stroke of the pump is presumed to be at its set value.

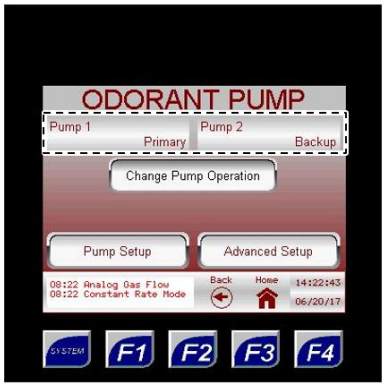
Odorant Pump

Through the Odorant Pump Submenus, the user can input information for the injection pump(s).

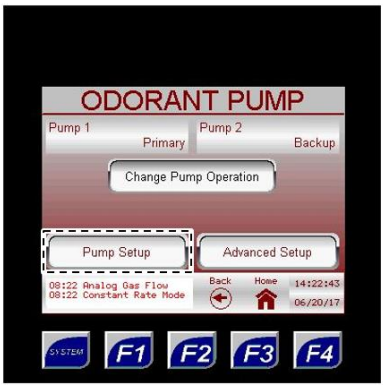
Figure 35: Setup Menu – Odorant Pump



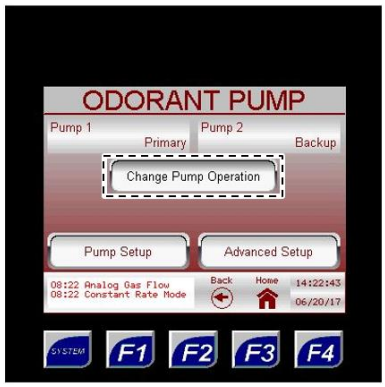
Odorant Pump
Enter this submenu to set the parameters for the odorant pumps.



Pump 1 / Pump 2
View the current operation of the pump.

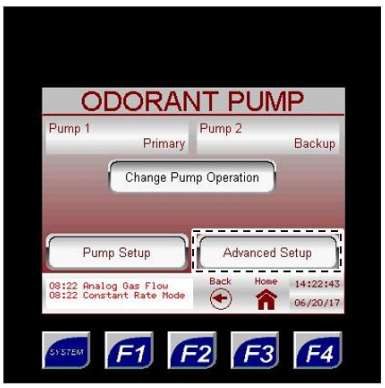


Pump Setup
Enter this submenu to set the known output of the pump, manually stroke the pump, reset the total number of pump strokes, and reset the pump alarms.



Change Pump Operation
Change the current operation of the pump as displayed above this button.

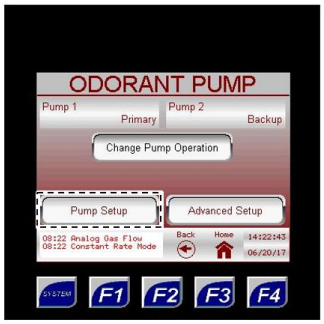
The pumps can be set up according to the Pump Operation Configurations table.

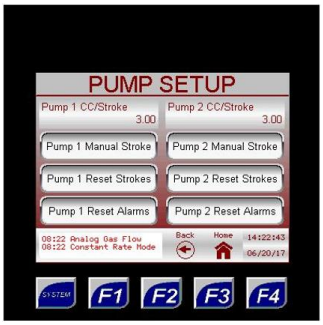


Advanced Setup
Enter this submenu to set the minimum cycle time of the pumps and enable both pumps to stroke together.

Pump Operation Configurations	
Pump 1	**Pump 2**
None	None
Primary	None
None	Primary
Primary	Backup
Backup	Primary

Figure 36: Odorant Pump – Pump Setup

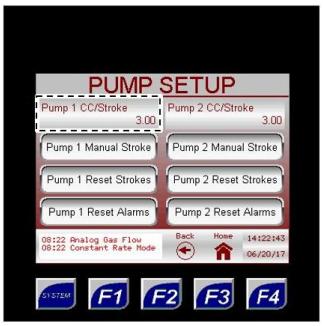




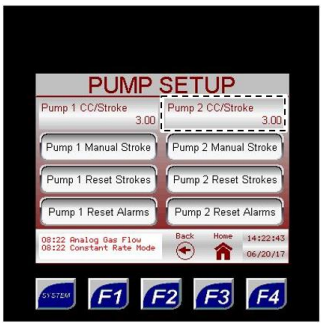
Pump Setup
Enter this submenu to set the known output of the pump, manually stroke the pump, reset the total number of pump strokes, and reset the pump alarms.

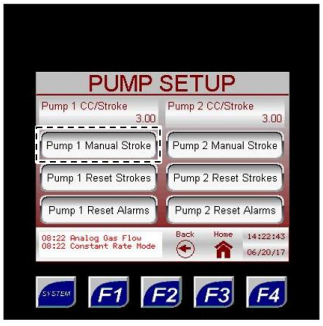
PUMP 1

PUMP 2



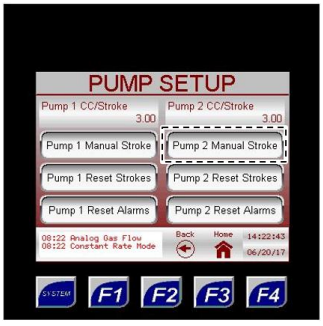
Pump CC/Stroke
Set the known output of the pump in cubic centimeters (cc).

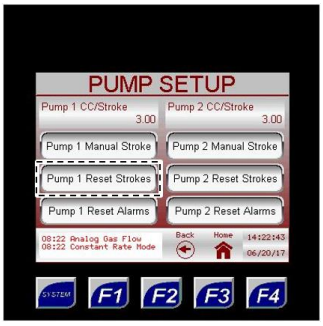




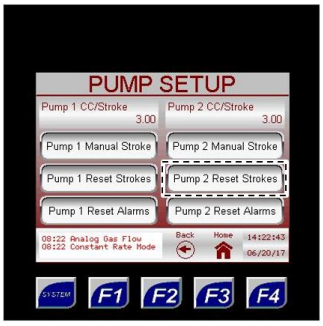
Manual Stroke
Manually stroke the pump.

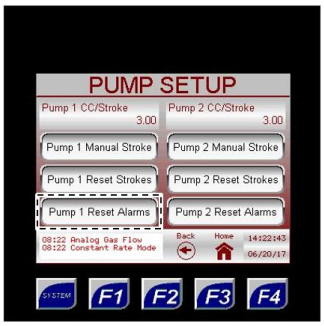
When the pump is set to stroke it will be highlighted until the first available opportunity, at which time it will stroke the pump. After a manual pump stroke, this field will revert to its normal state.





Reset Strokes
Pressing this button will reset the total number of strokes for the pump. This option is to assist in the tracking and scheduling of pump maintenance.





Reset Alarms
Pressing this button will reset the pump alarms, which also resets the average deviation to 0%. Alarms are typically reset after maintenance has been performed on the pump and it is put back into service. After being reset, this field will revert to its normal state.

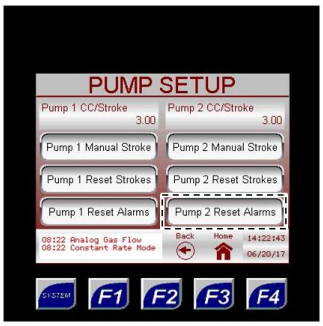
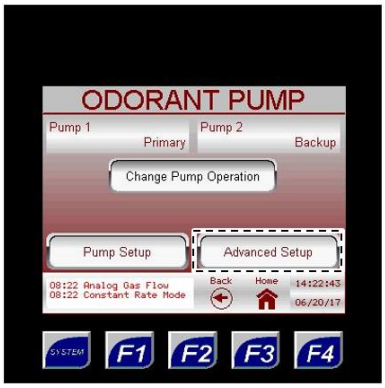
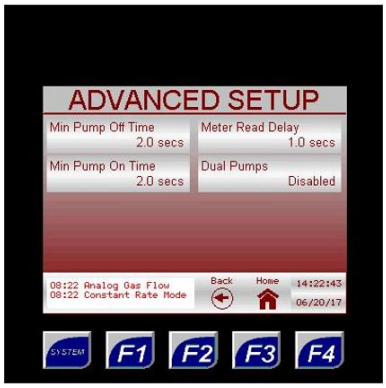
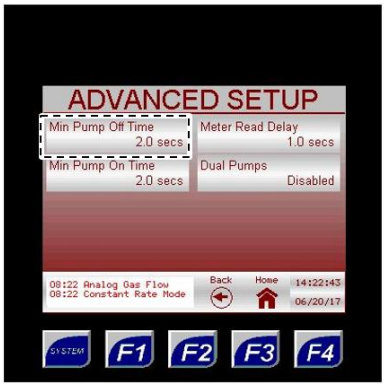


Figure 37: Odorant Pump – Advanced Setup



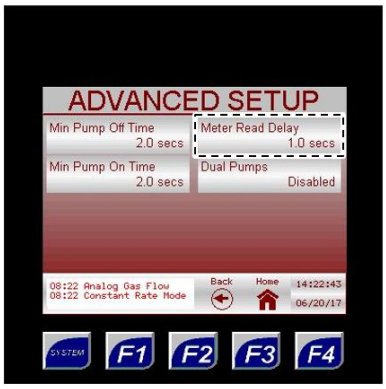


Advanced Setup
Enter this submenu to set the minimum cycle time of the pumps and enable both pumps to stroke together.



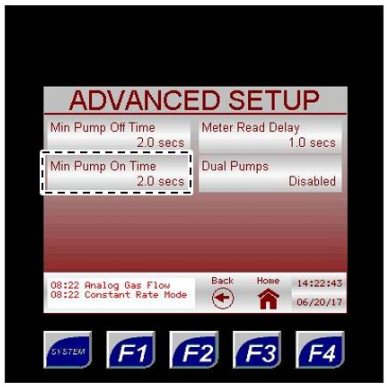
Min Pump Off Time
The minimum amount of time required to reset the pump before the next stroke.

This value is factory-set.



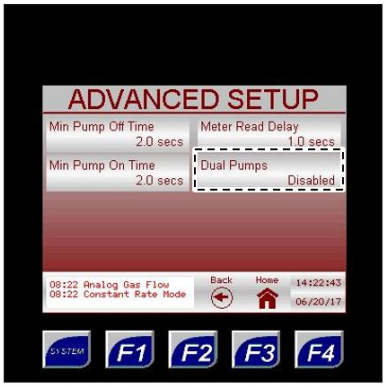
Meter Read Delay
The amount of time in seconds the meter is given to read the pump output and respond to the controller.

This value is factory-set.



Min Pump On Time
The minimum amount of time required to stroke the pump.

This value is factory-set.



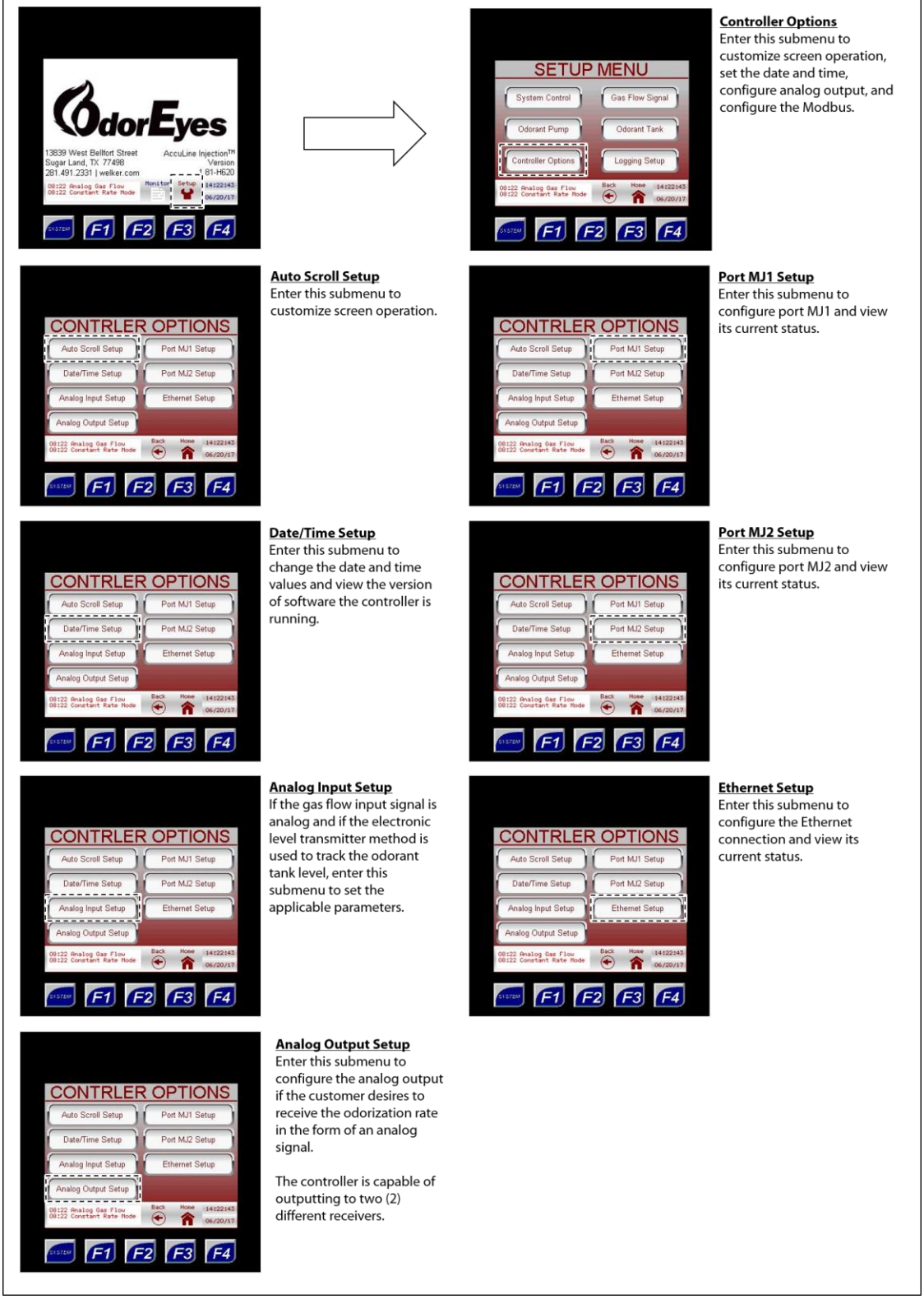
Dual Pumps
Enabling this option will allow both pumps to stroke simultaneously when one pump cannot keep up with the demand for odorant.

If the cycle time is longer than twelve (12) seconds, this option will automatically be disabled, and the system will return to single pump operation.

Controller Options

Through the Controller Options submenus, the user can customize the screen operation and set up communication for the controller.

Figure 38: Setup Menu – Controller Options



Controller Options
Enter this submenu to customize screen operation, set the date and time, configure analog output, and configure the Modbus.

Auto Scroll Setup
Enter this submenu to customize screen operation.

Port MJ1 Setup
Enter this submenu to configure port MJ1 and view its current status.

Date/Time Setup
Enter this submenu to change the date and time values and view the version of software the controller is running.

Port MJ2 Setup
Enter this submenu to configure port MJ2 and view its current status.

Analog Input Setup
If the gas flow input signal is analog and if the electronic level transmitter method is used to track the odorant tank level, enter this submenu to set the applicable parameters.

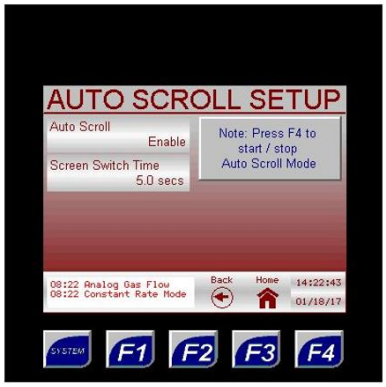
Ethernet Setup
Enter this submenu to configure the Ethernet connection and view its current status.

Analog Output Setup
Enter this submenu to configure the analog output if the customer desires to receive the odorization rate in the form of an analog signal.

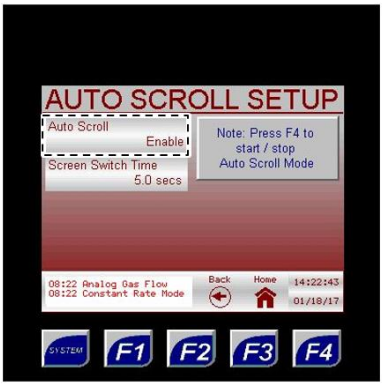
The controller is capable of outputting to two (2) different receivers.

Auto Scroll Setup

Figure 39: Controller Options – Auto Scroll Setup

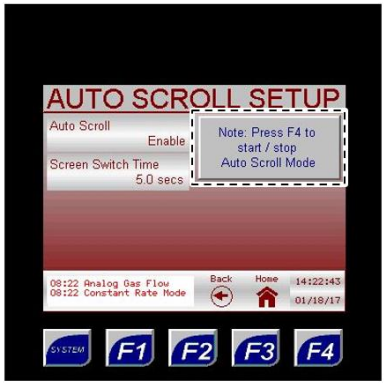


Auto Scroll Setup
Enter this submenu to customize screen operation.

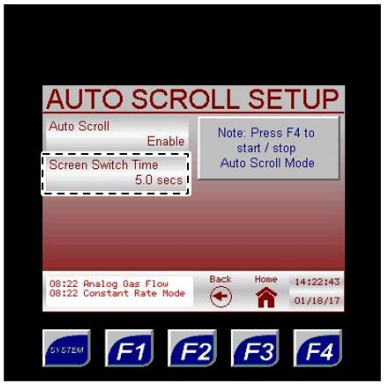


Auto Scroll
When Auto Scroll is enabled, the touch screen controller will automatically scroll through seven (7) pre-set screens.

See *Figure 40*.



Auto Scroll can be started or stopped at any time by pressing the F4 function key.

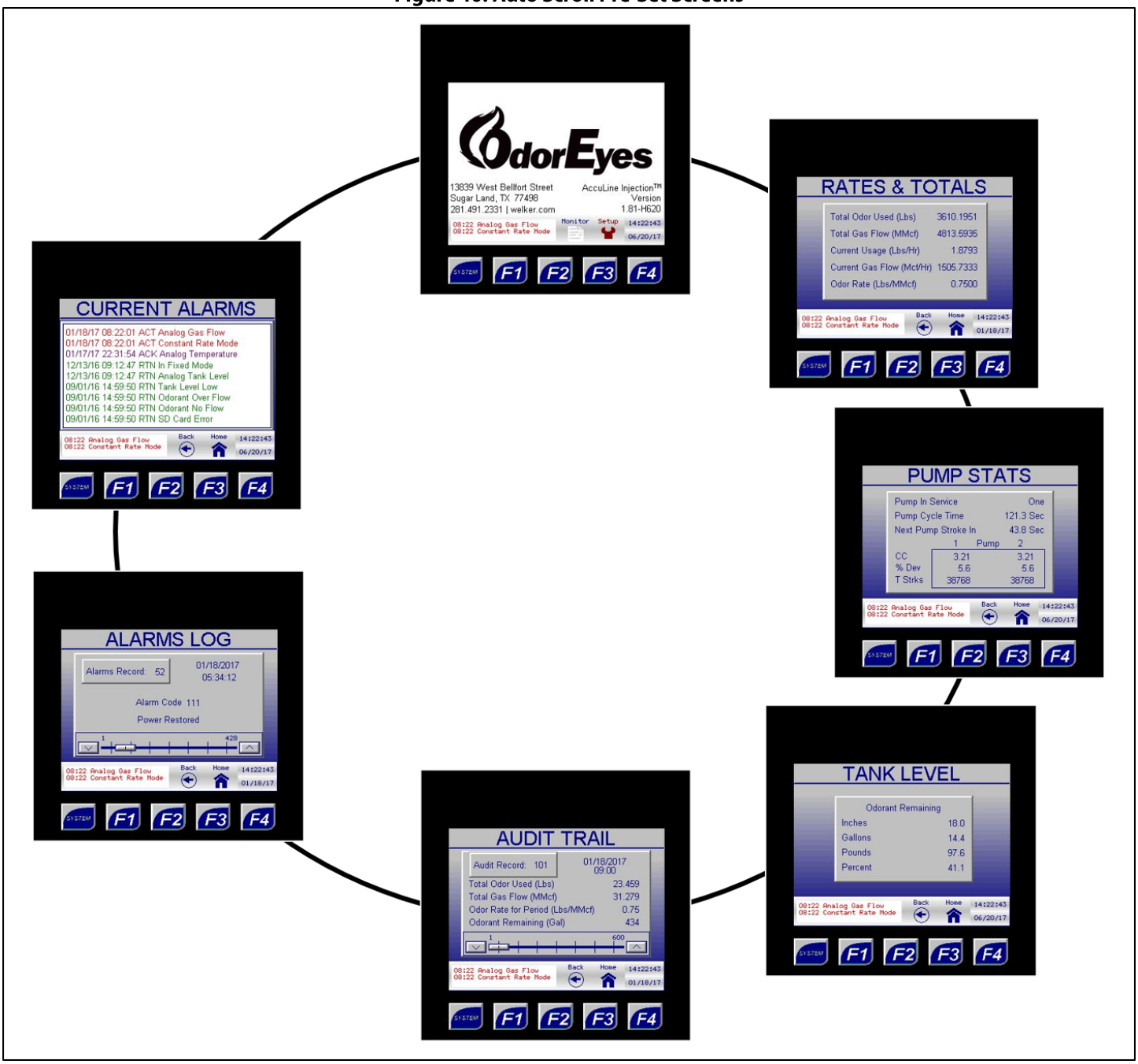


Screen Switch Time
When Auto Scroll is enabled, this is the length of time each of the pre-set screens will display before advancing to the next screen.

This value can be set by the customer.

The Auto Scroll behavior can also be started by pressing the F4 function key (*Figure 23*).

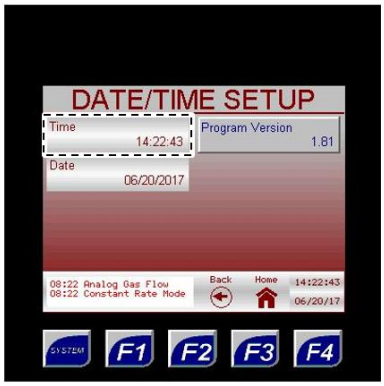
Figure 40: Auto Scroll Pre-Set Screens



Date/Time Setup

Figure 41: Controller Options – Date/Time Setup

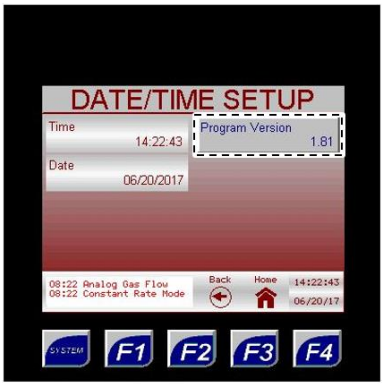
Date/Time Setup
Enter this submenu to change the date and time values and view the version of software the controller is running.



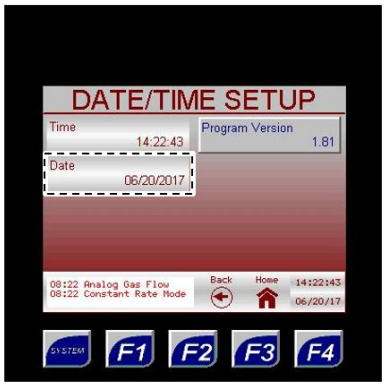
Time
Change the current time here.

The backup battery ensures that the current date and time will not be lost.

Note that the clock does not account for daylight saving time.



Program Version
This is the version of software the controller is currently running.

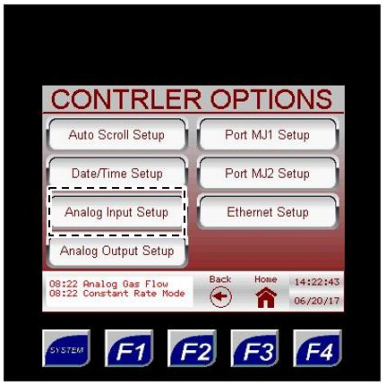


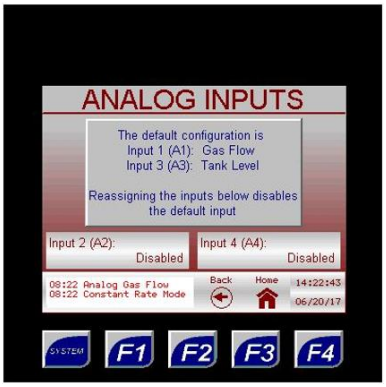
Date
Change the current date here.

The date and time can also be edited by selecting the current date and time on any screen (*Figure 23*).

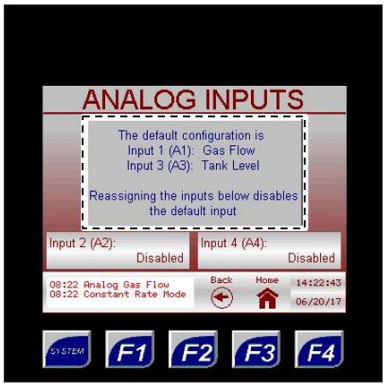
Analog Input Setup

Figure 42: Controller Options – Analog Input Setup



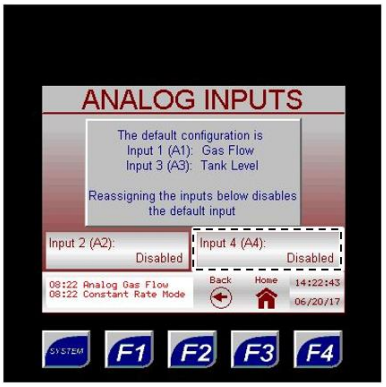


Analog Input Setup
If the gas flow input signal is analog and if the electronic level transmitter method is used to track the odorant tank level, enter this submenu to set the applicable parameters.



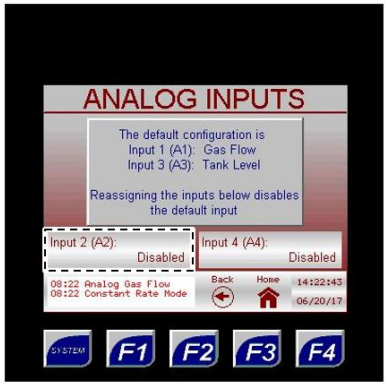
Default Configuration
Analog input port 1 (A1) is the default port for the gas flow signal.

Analog input port 3 (A3) is the default port for the tank level transmitter.



Input 4 (A4)
Analog input port 4 (A4) is left open and disabled.

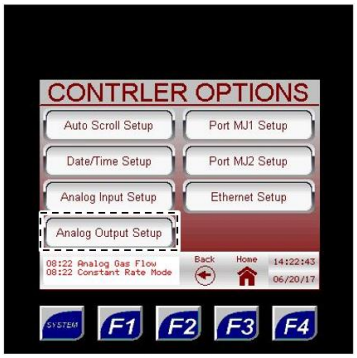
If the assigned analog input port for the gas flow signal or tank level transmitter must change (e.g., in the event of port damage), A4 can be enabled and the analog signal physically moved to this port.

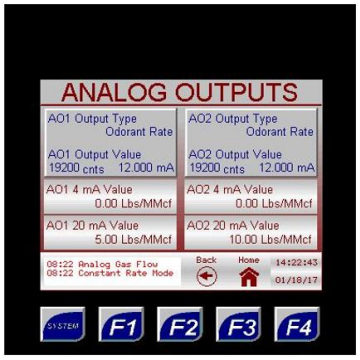


Input 2 (A2)
Analog input port 2 (A2) is left open and disabled.

If the assigned analog input port for the gas flow signal or tank level transmitter must change (e.g., in the event of port damage), A2 can be enabled and the analog signal physically moved to this port.

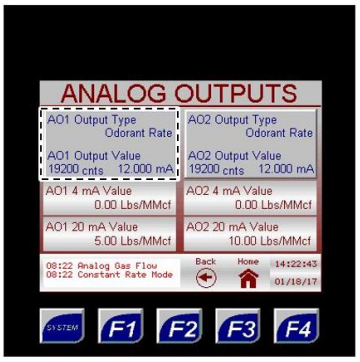
Figure 43: Controller Options – Analog Output Setup





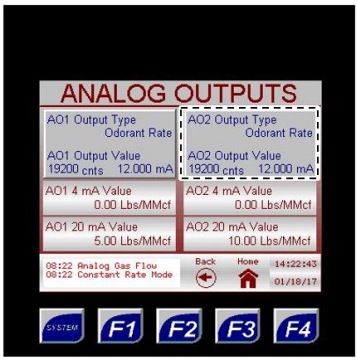
Analog Output Setup
Enter this submenu to configure the analog output if the customer desires to receive the odorization rate in the form of an analog signal.

The controller is capable of outputting to two (2) different receivers.



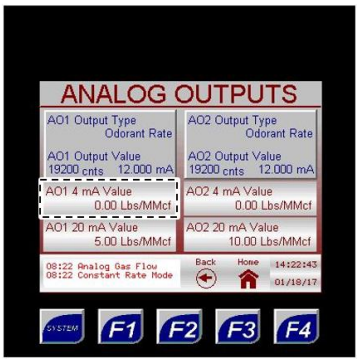
AO1 Output Type
The analog output signal to the first receiver.

AO1 Output Value
The current analog output signal to the first receiver, indicating the current odorization rate (lb/MMcf).



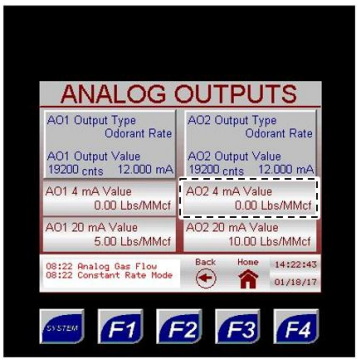
AO2 Output Type
The analog output signal to the optional second receiver.

AO2 Output Value
The current analog output signal to the optional second receiver, indicating the current odorization rate (lb/MMcf).



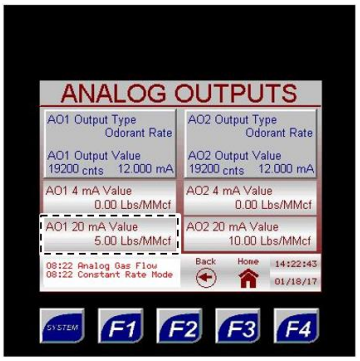
AO1 4 mA Value
Touch to configure the 4 mA signal for the analog output.

In most cases, this will be set to zero (0) lb/MMcf.

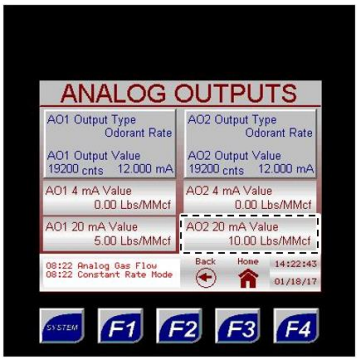


AO2 4 mA Value
Touch to configure the 4 mA signal for the analog output.

In most cases, this will be set to zero (0) lb/MMcf.



AO1 20 mA Value
Touch to configure the 20 mA signal for the analog output.

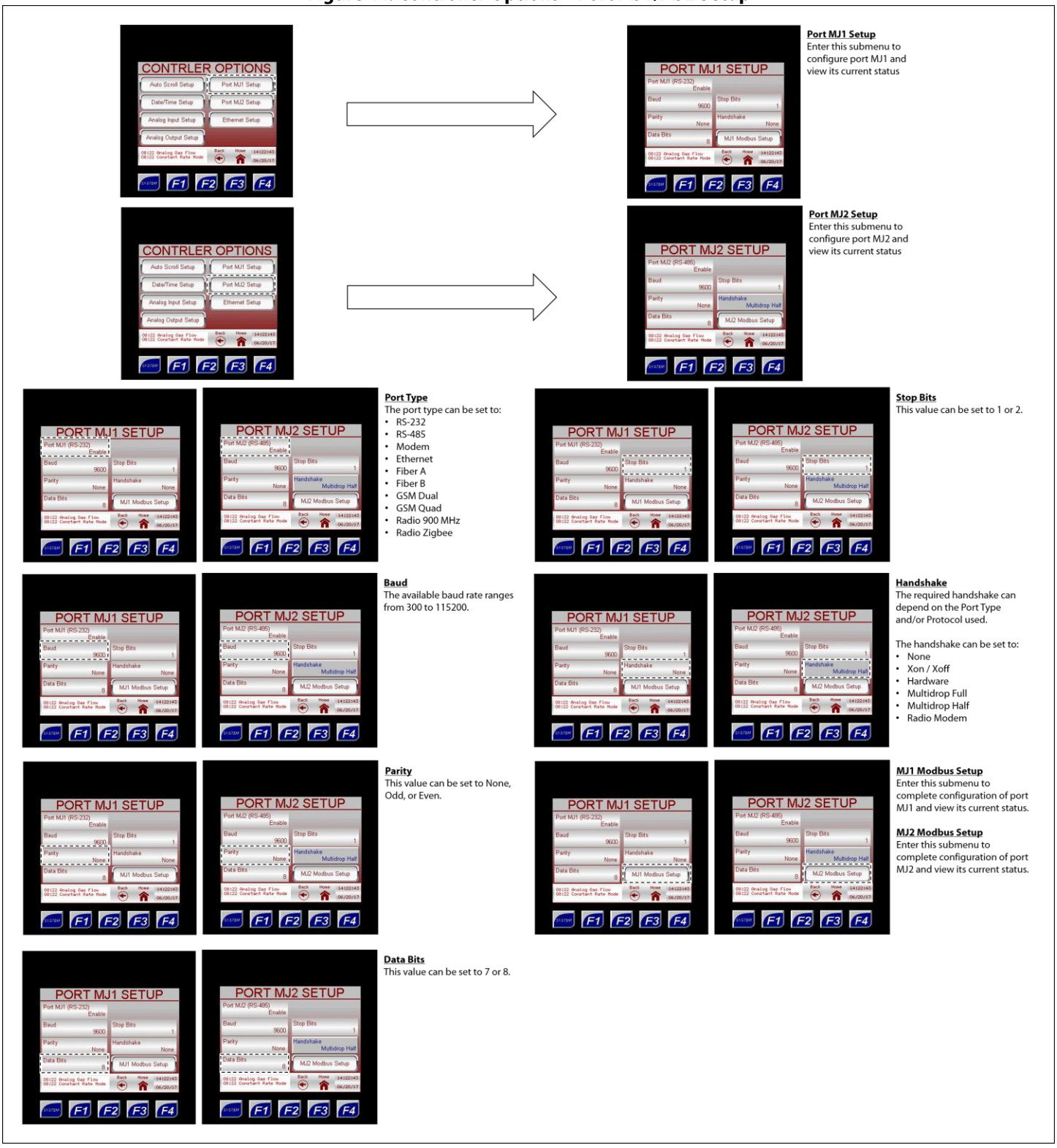


AO2 20 mA Value
Touch to configure the 20 mA signal for the analog output.

Analog Output Conversion	
Signal (mA)	**Raw Count**
4	6400
20	32000

Port MJ1/MJ2 Setup

Figure 44: Controller Options – Port MJ1/MJ2 Setup



Port MJ1 Setup
Enter this submenu to configure port MJ1 and view its current status

Port MJ2 Setup
Enter this submenu to configure port MJ2 and view its current status

Port Type
The port type can be set to:
- RS-232
- RS-485
- Modem
- Ethernet
- Fiber A
- Fiber B
- GSM Dual
- GSM Quad
- Radio 900 MHz
- Radio Zigbee

Stop Bits
This value can be set to 1 or 2.

Baud
The available baud rate ranges from 300 to 115200.

Handshake
The required handshake can depend on the Port Type and/or Protocol used.

The handshake can be set to:
- None
- Xon / Xoff
- Hardware
- Multidrop Full
- Multidrop Half
- Radio Modem

Parity
This value can be set to None, Odd, or Even.

MJ1 Modbus Setup
Enter this submenu to complete configuration of port MJ1 and view its current status.

MJ2 Modbus Setup
Enter this submenu to complete configuration of port MJ2 and view its current status.

Data Bits
This value can be set to 7 or 8.

Figure 45: Port MJ1/MJ2 Setup – MJ1/MJ2 Modbus Setup

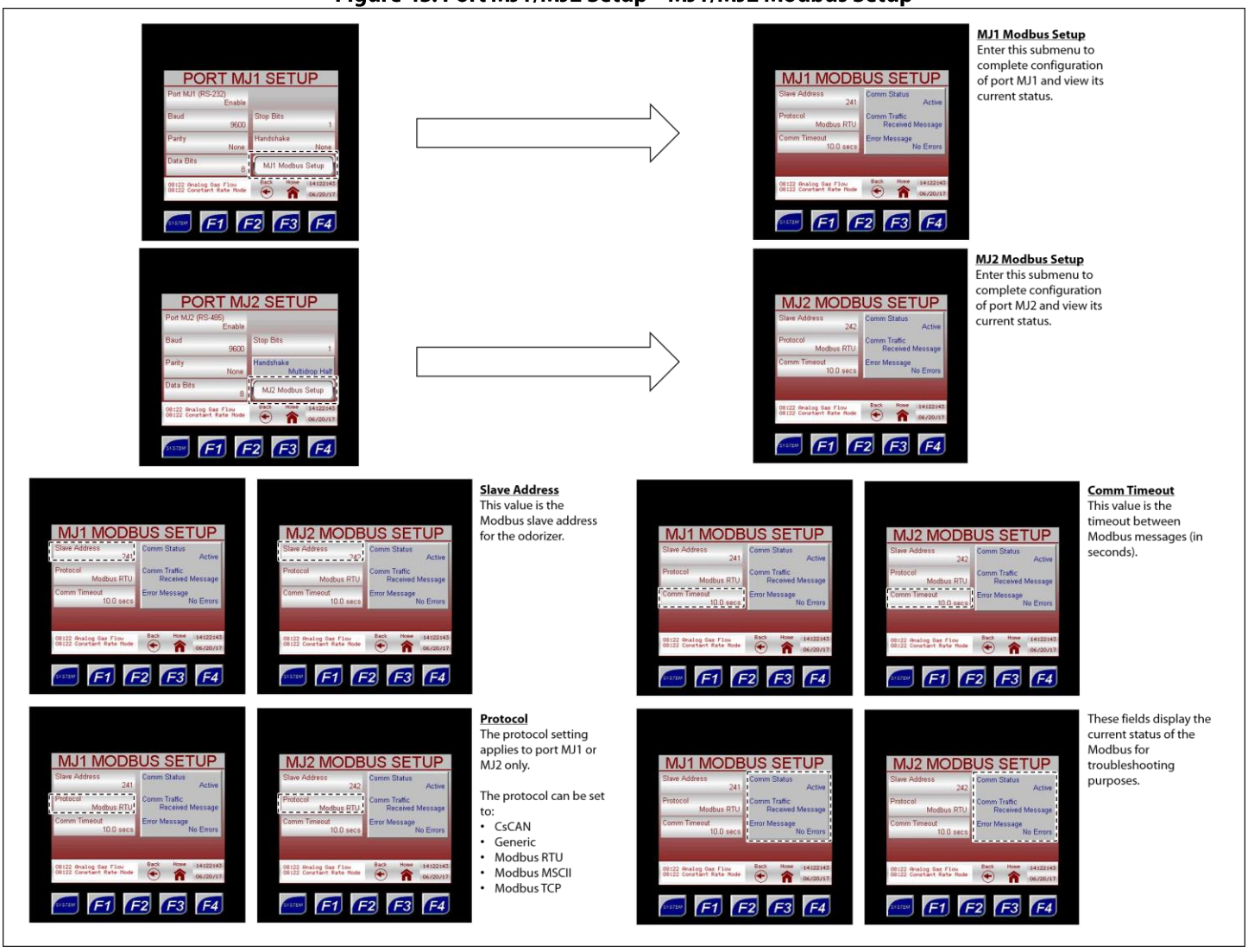
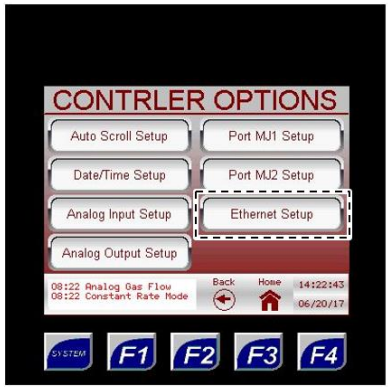
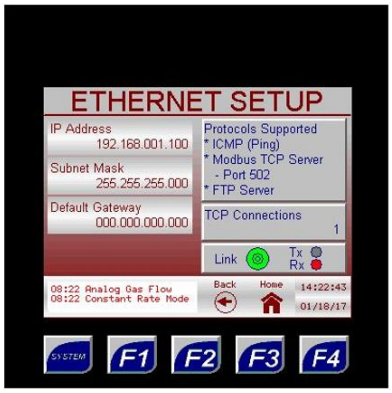
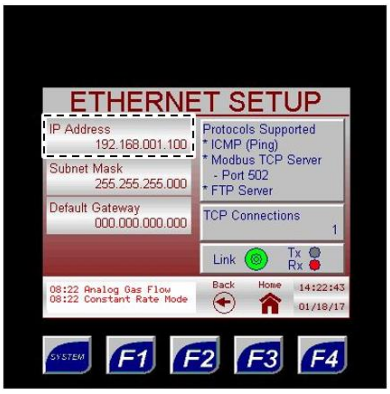


Figure 46: Controller Options – Ethernet Setup



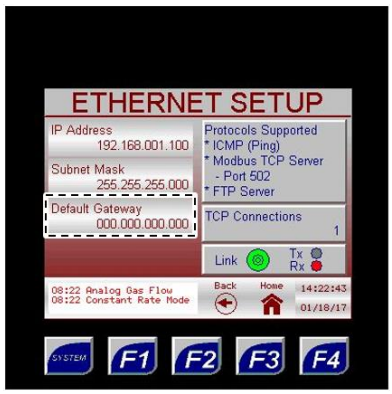


Ethernet Setup
Enter this submenu to configure the Ethernet connection and view its current status.



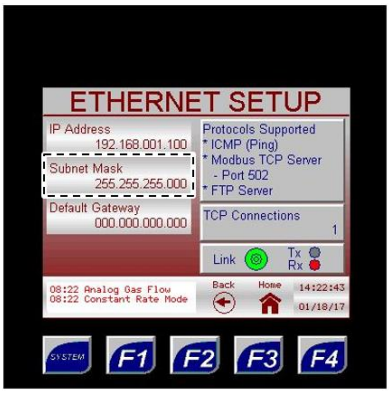
IP Address
Manually assign an IP address.

Pressing this field will bring up an on-screen keyboard for address entry.



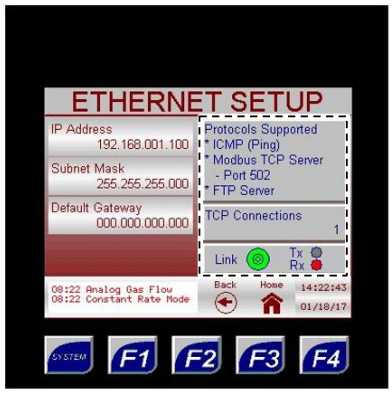
Default Gateway
Manually assign the default gateway.

Pressing this field will bring up an on-screen keyboard for gateway entry.



Subnet Mask
Manually assign the subnet mask.

Pressing this field will bring up an on-screen keyboard for subnet mask entry.



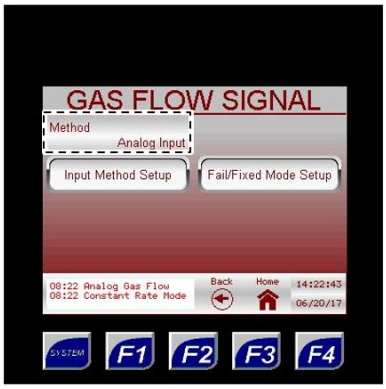
This column displays diagnostic information about the Ethernet connection.

Gas Flow Signal

Through the Gas Flow Signal submenus, the user can set up the parameters of the odorant gas flow input signal.

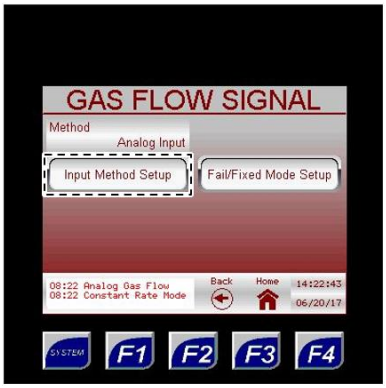
Figure 47: Setup Menu – Gas Flow Signal

Gas Flow Signal
Enter this submenu to set the parameters for the gas flow signal and set the fail mode.



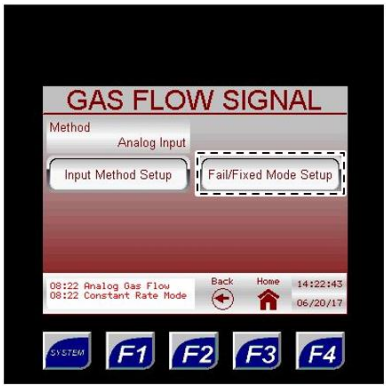
Method
Toggle this field to switch between the three (3) methods for the gas flow input signal:

1. analog input
2. pulse input
3. Modbus input



Input Method Setup
Enter this submenu to set up the applicable parameters for the chosen input method.

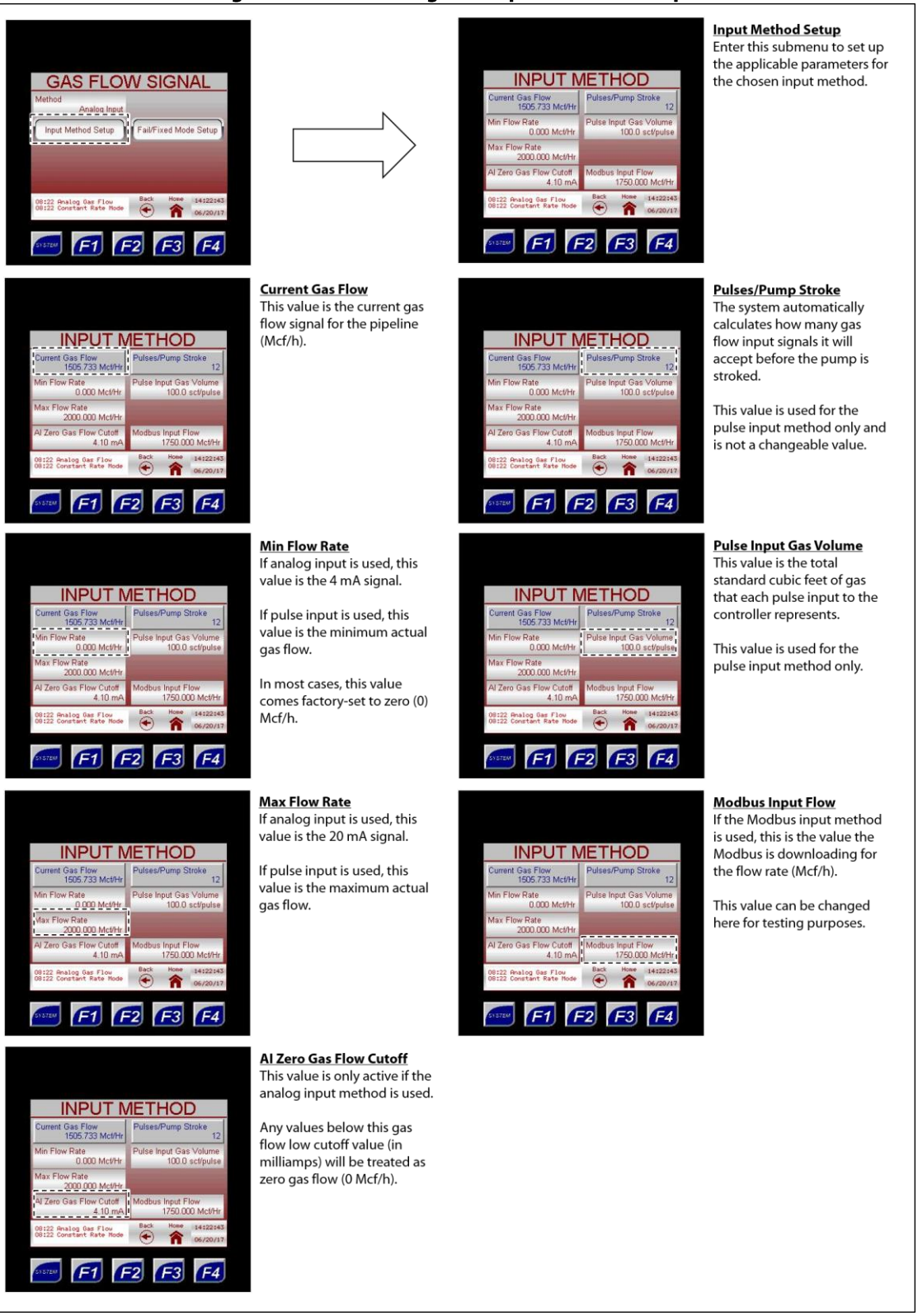
See *Figure 48*.



Fail/Fixed Mode Setup
Enter this submenu to select the desired fail mode, enable or disable the fixed mode, and set up applicable parameters.

See *Figure 49*.

Figure 48: Gas Flow Signal – Input Method Setup



Input Method Setup
Enter this submenu to set up the applicable parameters for the chosen input method.

Current Gas Flow
This value is the current gas flow signal for the pipeline (Mcf/h).

Pulses/Pump Stroke
The system automatically calculates how many gas flow input signals it will accept before the pump is stroked.

This value is used for the pulse input method only and is not a changeable value.

Min Flow Rate
If analog input is used, this value is the 4 mA signal.

If pulse input is used, this value is the minimum actual gas flow.

In most cases, this value comes factory-set to zero (0) Mcf/h.

Pulse Input Gas Volume
This value is the total standard cubic feet of gas that each pulse input to the controller represents.

This value is used for the pulse input method only.

Max Flow Rate
If analog input is used, this value is the 20 mA signal.

If pulse input is used, this value is the maximum actual gas flow.

Modbus Input Flow
If the Modbus input method is used, this is the value the Modbus is downloading for the flow rate (Mcf/h).

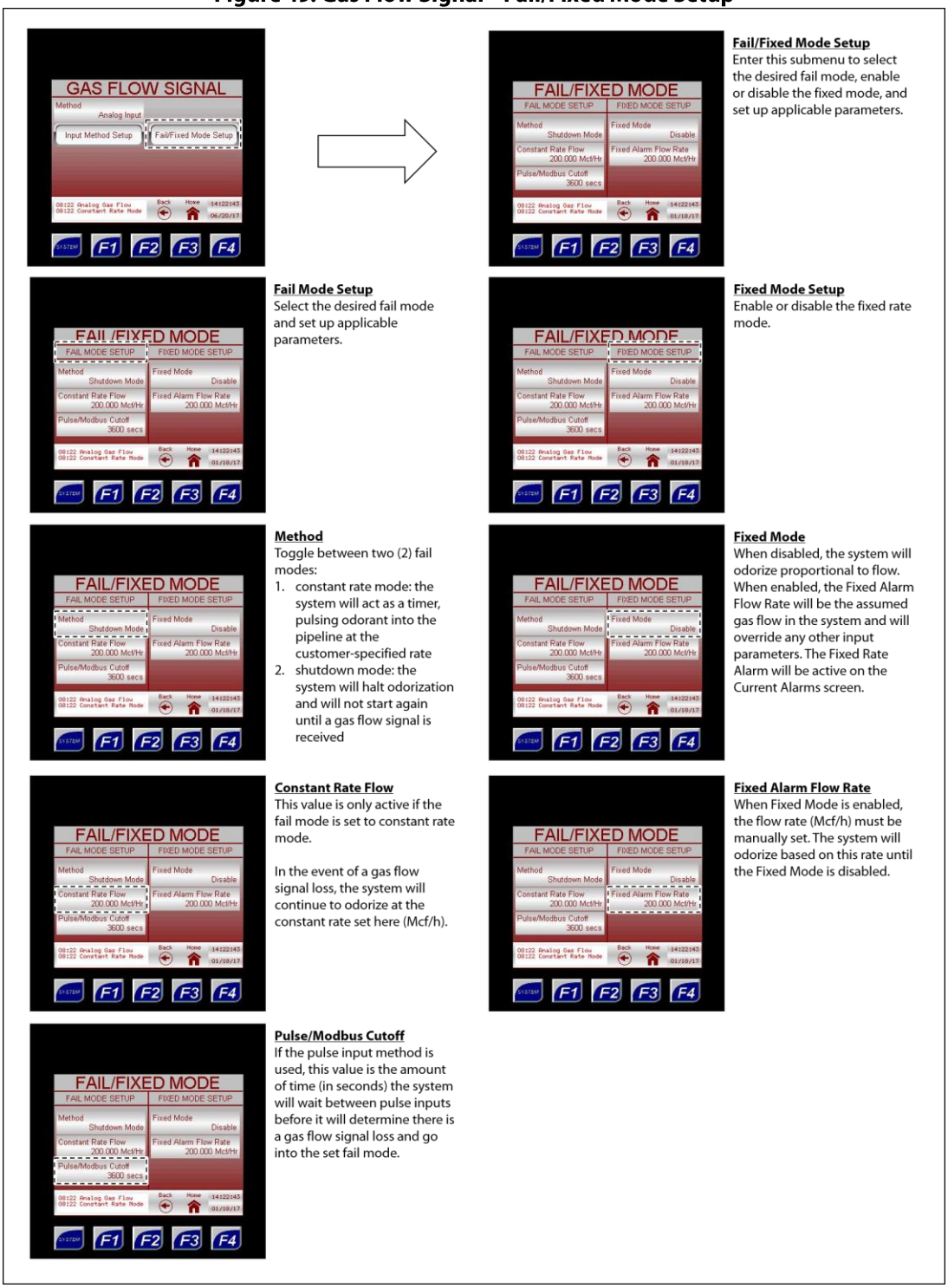
This value can be changed here for testing purposes.

Al Zero Gas Flow Cutoff
This value is only active if the analog input method is used.

Any values below this gas flow low cutoff value (in milliamps) will be treated as zero gas flow (0 Mcf/h).

If the gas flow signal will be analog, the analog signal must be 4–20 mA powered by the user.
If the gas flow signal will be pulse, the pulse will be a digital pulse powered by the controller.
If the gas flow signal will be Modbus, the Modbus input will be a value downloaded from the Modbus master device in Mcf/h. The Modbus Register is 43275, and the input value should be downloaded as a 32-bit float.

Figure 49: Gas Flow Signal – Fail/Fixed Mode Setup



Fail/Fixed Mode Setup
Enter this submenu to select the desired fail mode, enable or disable the fixed mode, and set up applicable parameters.

Fail Mode Setup
Select the desired fail mode and set up applicable parameters.

Fixed Mode Setup
Enable or disable the fixed rate mode.

Method
Toggle between two (2) fail modes:

1. constant rate mode: the system will act as a timer, pulsing odorant into the pipeline at the customer-specified rate
2. shutdown mode: the system will halt odorization and will not start again until a gas flow signal is received

Fixed Mode
When disabled, the system will odorize proportional to flow. When enabled, the Fixed Alarm Flow Rate will be the assumed gas flow in the system and will override any other input parameters. The Fixed Rate Alarm will be active on the Current Alarms screen.

Constant Rate Flow
This value is only active if the fail mode is set to constant rate mode.

In the event of a gas flow signal loss, the system will continue to odorize at the constant rate set here (Mcf/h).

Fixed Alarm Flow Rate
When Fixed Mode is enabled, the flow rate (Mcf/h) must be manually set. The system will odorize based on this rate until the Fixed Mode is disabled.

Pulse/Modbus Cutoff
If the pulse input method is used, this value is the amount of time (in seconds) the system will wait between pulse inputs before it will determine there is a gas flow signal loss and go into the set fail mode.

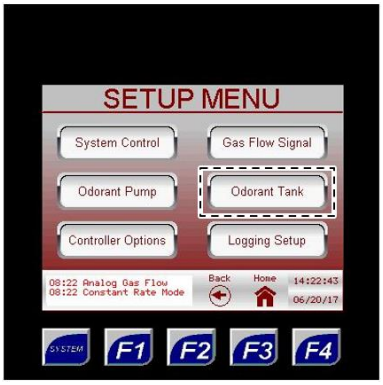
Setting the Fail Mode to Shutdown will halt odorization until the alarm is cleared.
Setting the Fail Mode to Constant Rate will allow odorization to continue at the specified rate.

If the gas flow value does not change during the Pulse/Modbus Cutoff time, the system will alarm for loss of flow and will enter the specified Fail Mode. The alarm will clear on the next pulse input or change in Modbus gas flow, and the system will resume normal operation.

Odorant Tank Setup

Through the Odorant Tank submenus, the user can input information for the odorant tank.

Figure 50: Setup Menu – Odorant Tank



Odorant Tank
Enter this submenu to set the parameters for the odorant tank and temperature transmitter.

Method
Toggle this field to switch between the two (2) methods for tracking the odorant tank level:
1. odorant flow
2. electronic level transmitter

Low Level Alarm
The low level alarm set point is a percent value at which the system will trigger an alarm for low odorant level in the tank.

Tank Level Setup
Enter this submenu to set up the parameters for how the tank level will operate.

See *Figure 51*.

Tank Volume Setup
Enter this submenu to view the tank volume settings and access the strapping tables.

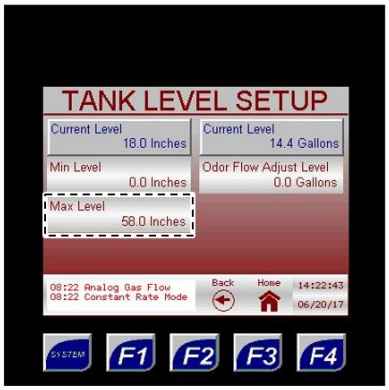
See *Figure 52*.

When using an electronic level transmitter to track the odorant tank level, the Method should be set to Transmitter.
When estimating the odorant tank level based on odorant usage, the Method should be set to Odorant Flow.

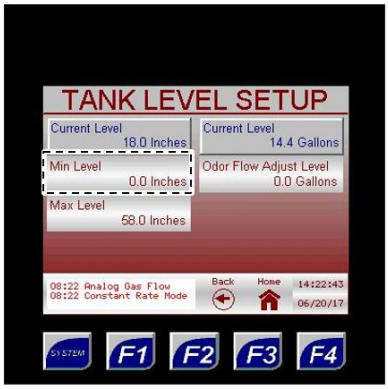
Figure 51: Odorant Tank – Tank Level Setup

Tank Level Setup
Set up the parameters for how the tank level will operate.

Current Level
View the current level of the tank in inches and US gallons.

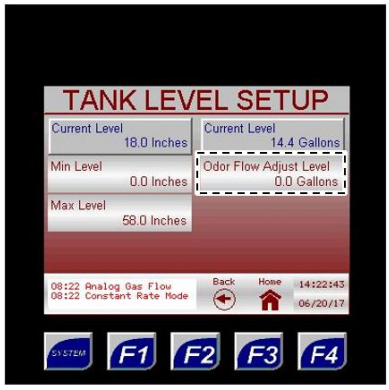


Max Level
If the electronic level transmitter method is used, this value is the 20 mA signal.



Min Level
If the electronic level transmitter method is used, this value is the 4 mA signal.

This value is typically factory-set at 0.0 inches.



Odor Flow Adjust Level
If the odorant flow method is used, the current tank level can be manually adjusted.

The Current Level numeric value cannot be directly changed. Instead, the user must enter a value in the Odor Flow Adjust Level field to increase or decrease the Current Level by the specified amount.

- To decrease the Current Level, enter the volume to be subtracted from the current level as a negative number in the Odor Flow Adjust Level field, and then press ENTER to save the changes. The Current Level should have decreased by the amount entered, and the Odor Flow Adjust Level should have reverted to 0.0 Gallons.
- To increase the Current Level, enter the volume to be added to the current level in the Odor Flow Adjust Level field, and then press ENTER to save the changes. The Current Level should have increased by the amount entered, and the Odor Flow Adjust Level should have reverted to 0.0 Gallons.

Figure 52: Odorant Tank – Tank Volume Setup

Tank Volume Setup
Enter this submenu to view the tank volume settings and access the strapping tables.

Size
This is the volume of the tank in US gallons.

Odorant Density
The odorant density will vary according to the odorant used.

The odorant density should be published by the odorant manufacturer in pounds/US gallons at 60 °F.

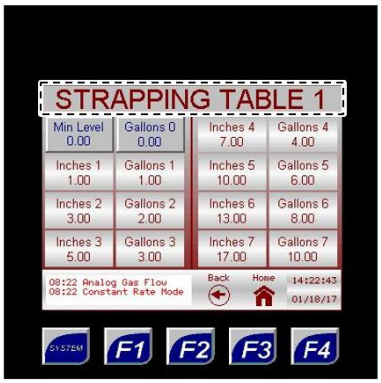
Volume Conversion
This value is the volume of liquid odorant per inch. This is used only with vertical odorant tanks.

Strapping Table
Toggle this field to enable or disable the tank strapping field.

For horizontal odorant tanks, this field should be **enabled**. For vertical odorant tanks, this field should be **disabled**.

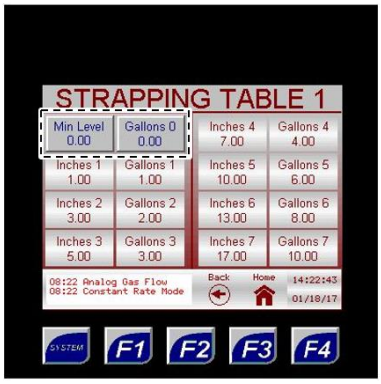
Strapping Table Pg 1, 2, 3
If strapping is enabled, view the tank depth and tank volume for each strapping point. See *Figure 53*.

Figure 53: Tank Volume Setup – Strapping Tables



The strapping table page number.

Each page displays the tank depth in inches and the tank volume in US gallons for multiple strapping points.

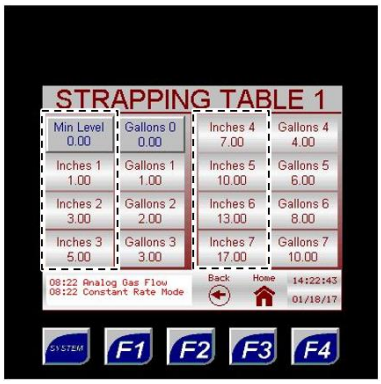


The minimum strapping point for the tank is displayed on page 1.

It is zero (0) inches and zero (0) US gallons.

The right column of each table displays the tank volume in US gallons per inch.

Each table row is a single strapping point.



The left column of each table displays the tank depth in inches.

Each table row is a single strapping point.

The maximum strapping point for the tank is displayed on the last page.

The maximum strapping point will depend on the tank size and volume.

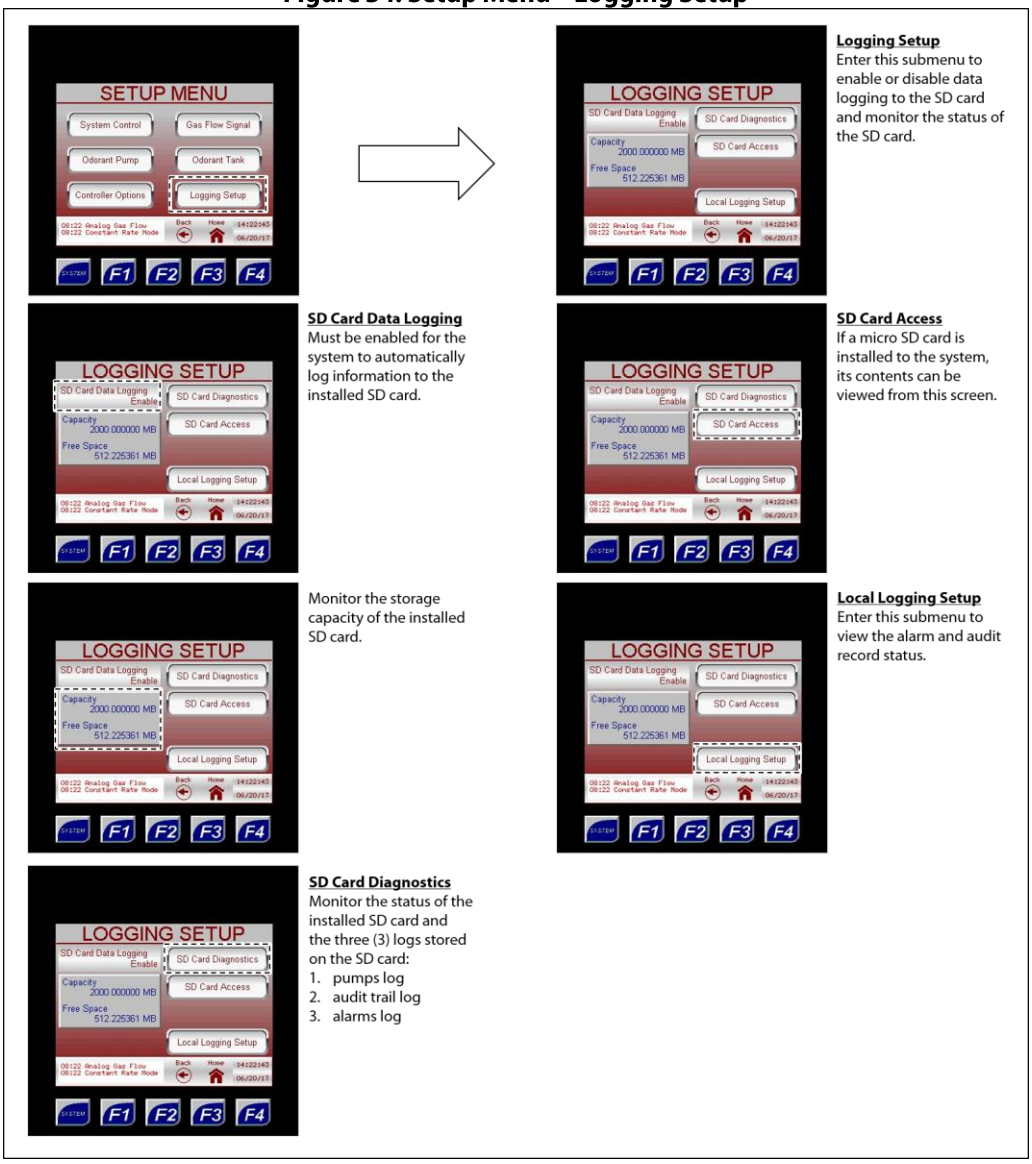
If the odorant tank is horizontal, the strapping points will be calculated and entered at the factory.

Logging Setup

Through the Logging Setup submenu, the user can set up and monitor the data logs stored on the installed micro SD card.

If a micro SD card is installed, data will automatically be logged to the installed card when SD Card Data Logging is enabled.

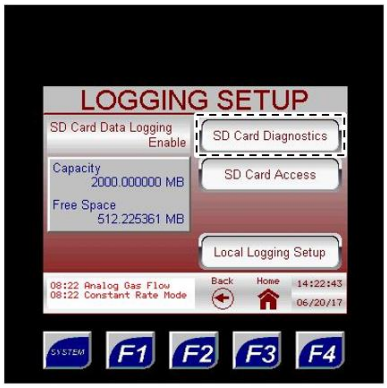
Figure 54: Setup Menu – Logging Setup



If the micro SD card needs to be removed, first disable SD Card Data Logging. Failure to disable SD Card Data Logging prior to removing the micro SD card will trigger the SD Card Error alarm.

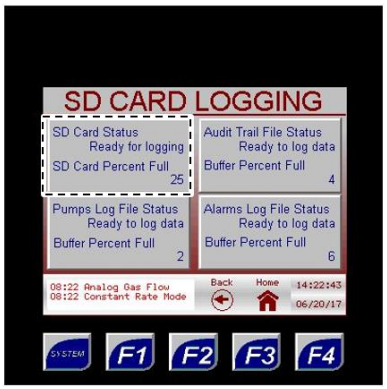
To continue data logging, insert a new micro SD card, and then enable SD Card Data Logging.

Figure 55: Logging Setup – SD Card Diagnostics

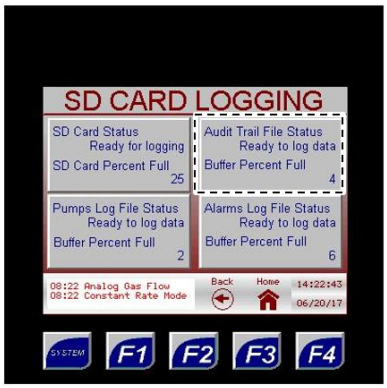


SD Card Diagnostics
Monitor the status of the installed SD card and the three (3) logs stored on the SD card:

1. pumps log
2. audit trail log
3. alarms log

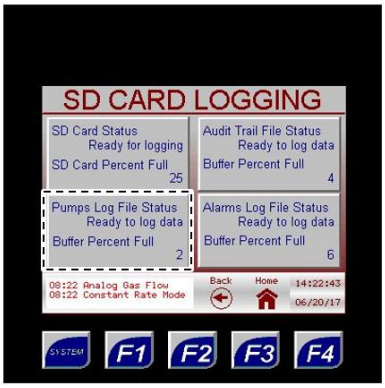


SD Card Data Status
Monitor the status and storage capacity of the installed SD card.



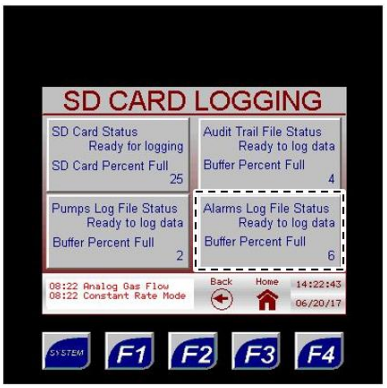
Audit Trail File Status
Monitor the status and storage capacity of the audit trail.

A new audit log entry is created every 5 minutes.



Pumps Log File Status
Monitor the status and storage capacity of the pumps log.

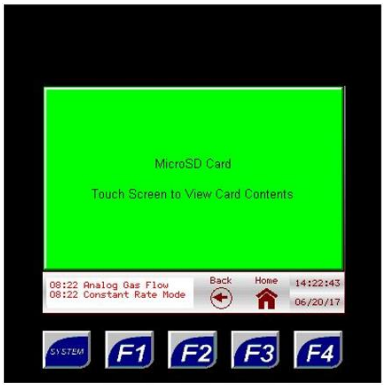
A new pumps log entry is created with each stroke of the odorizer.



Alarms Log File Status
Monitor the status and storage capacity of the alarms log.

A new alarms log entry is created when an alarm occurs or clears.

Figure 56: Logging Setup – SD Card Access

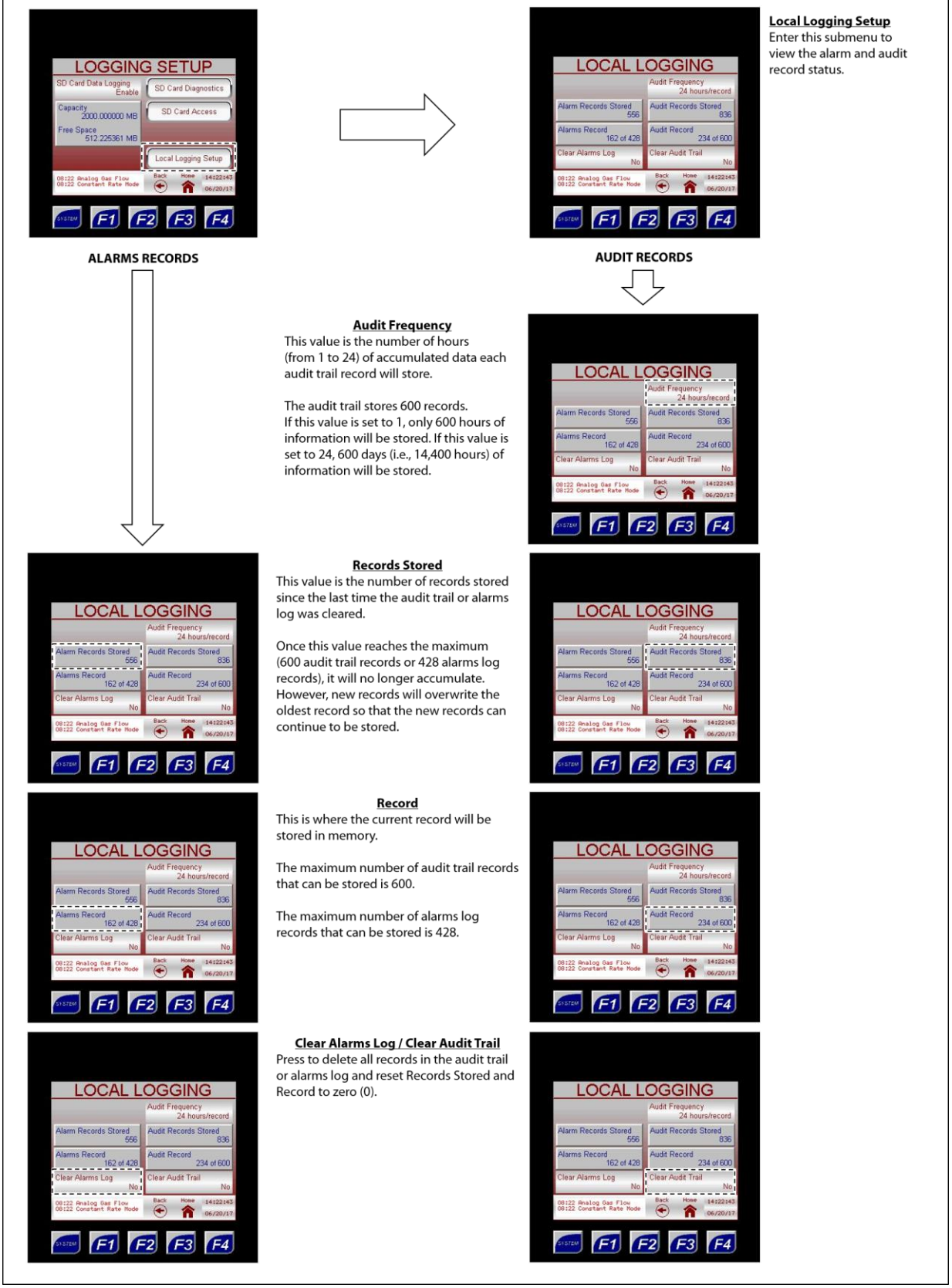


SD Card Access
If a micro SD card is installed to the system, its contents can be viewed from this screen.

Contact Welker for assistance installing software updates.

Through the Local Logging Setup submenu, the user can set up and reset the data logs stored locally.

Figure 57: Logging Setup – Local Logging Setup



4.1 Before You Begin

1. **Refer to *Appendix B, Maintenance Schedule,* for the itemized Welker recommended maintenance schedule for the Accu/Line™.**
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs of the system in case of unexpected wear or faulty seals.

New seals supplied in spare parts kits should be lightly lubricated before being installed to ease the installation of the seals and reduce the risk of damage when positioning them on parts. Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.

For sample-exposed seals, Welker recommends non-hydrocarbon-based lubricants, such as Krytox®.
For non-sample-exposed seals, Welker recommends either non-hydrocarbon-based lubricants or silicone-based lubricants, such as Molykote® 111.

After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.

4.2 Maintenance

1. During injection, monitor the system for leaks. If leaks are present, halt operation and repair as necessary.
2. Prior to performing maintenance on any system components, the odorant line should be purged. To purge the odorant line to the tank, proceed to step 4.
3. To perform maintenance on a single injection pump system, proceed to step 23. To perform maintenance on a dual injection pump system, proceed to step 24.
4. To perform maintenance on an individual system component, proceed to step 15.

If a pump or other component requires maintenance, the odorant line should be purged to remove any residual product from the system. See *Section 4.3, Purging to the Tank,* for instructions on purging the odorant line.

Single Injection Pump System

5. Occasionally, a system component may need to be repaired or replaced for manufacturer recommended maintenance. To perform maintenance on components:
    a. Turn OFF all electrical power to the system.
    b. Depressurize the system and close all valves.
    c. Disconnect the tubing and remove individual system components for maintenance.
    d. For complete and proper maintenance on individual system components, refer to their respective *Installation, Operation, and Maintenance* (IOM) *Manual*. A list of component *Installation, Operation, and Maintenance* (IOM) *Manuals* is available in *Appendix A, Referenced or Attached Documents,* in this manual.
    e. After performing necessary maintenance on system components, reconnect all instrument tubing.
    f. Reinstall the system according to the instructions in *Section 2.2, Installation,* and *Section 2.3, Start-Up Procedures.*

Dual Injection Pump System

Primary Injection Pump

6. Prior to performing maintenance on the primary injection pump, the pump operation must be changed in the controller. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Odorant Pump menu, select Change Pump Operation (*Figure 35*). Set Pump 1 to "None" and Pump 2 to "Primary."
7. Once the primary injection pump has been set to "None," the primary injection pump can be removed from the pump cabinet for maintenance. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the Welker OdorEyes BIP Injection Pump, the Welker SSO-9 Sample/Injection Pump, or the Welker Vanishing Chamber™ Injection Pump for maintenance instructions.
8. After maintenance has been performed on the primary injection pump, reinstall the pump to the pump cabinet.
9. To return to normal operation, the pump operation must be changed in the controller. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Odorant Pump menu, select Change Pump Operation (*Figure 35*). Set Pump 1 to "Primary" and Pump 2 to "Backup," or set Pump 1 to "Backup" and Pump 2 to "Primary."
10. To perform maintenance on the backup injection pump, continue to step 9. To perform maintenance on other system components, proceed to step 13. If no other components require maintenance, maintenance is now complete.

Backup Injection Pump

11. Prior to performing maintenance on the backup injection pump, the pump operation must be changed in the controller. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Odorant Pump menu, select Change Pump Operation (*Figure 35*). Set Pump 1 to "Primary" and Pump 2 to "None."
12. Once the backup injection pump has been set to "None," the backup injection pump can be removed from the pump cabinet for maintenance. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the BIP, SSO-9, or the VCIP for maintenance instructions.
13. After maintenance has been performed on the backup injection pump, reinstall the pump to the pump cabinet. To return to normal operation, the pump operation must be changed in the controller. From the Setup Menu, select Odorant Pump (*Figure 33*). From the Odorant Pump menu, select Change Pump Operation (*Figure 35*). Set Pump 1 to "Primary" and Pump 2 to "Backup," or set Pump 1 to "Backup" and Pump 2 to "Primary."
14. To perform maintenance on other system components, continue to step 13. If no other components require maintenance, maintenance is now complete.

System Components

15. Occasionally, a system component may need to be repaired or replaced for manufacturer recommended maintenance. To perform maintenance on components:
    a. Turn OFF all electrical power to the system.
    b. Depressurize the system and close all valves.
    c. Disconnect the tubing and remove individual system components for maintenance.
    d. For complete and proper maintenance on individual system components, refer to their respective *Installation, Operation, and Maintenance* (IOM) *Manual*. A list of component *Installation, Operation, and Maintenance* (IOM) *Manuals* is available in *Appendix A, Referenced or Attached Documents,* in this manual.
    e. After performing necessary maintenance on system components, reconnect all instrument tubing.
    f. Reinstall the system according to the instructions in *Section 2.2, Installation,* and *Section 2.3, Start-Up Procedures.*

4.3 Purging to the Tank

If a pump or other component requires maintenance, the odorant line should be purged to remove any residual product from the system.

The purge to tank procedure is meant to clear all odorant lines of residual product. However, product may remain within each individual injection pump. Follow appropriate company guidelines and procedures for containing residual product when performing maintenance on the injection pumps.

1. To purge the odorant line to the tank, depressurize the system and close all valves.
2. From the Setup Menu in the PLC, select System Control (*Figure 33*). From the System Control submenu, select Odor Rate Required (*Figure 34*). Record the current Odor Rate Required, and then set the Odor Rate Required to zero (0) lbs/MMcf.
3. Close odorant injection valve Y (*Figure 15*).
4. Close odorant flow meter inlet valve C and odorant flow meter outlet valve D (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
5. Open odorant flow meter bypass valve E (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
6. Close odorant inlet valve R and open odorant outlet valve S on the odorant filter (*Figure 16*).
7. Open primary injection pump outlet valve B1 (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*).
8. Using customer-supplied ¼" tubing, connect from a customer-supplied nitrogen or natural gas supply to the purge inlet on the odorant filter (*Figure 16*).

The nitrogen or natural gas supply used to purge the odorant line should be set to 40 psig or 10–20 psig higher than tank pressure.

9. Open purge outlet valve M (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
10. Open purge line valve Z on the odorant tank (*Figure 1*).
11. Open purge inlet valve T on the odorant filter (*Figure 16*).
12. Open primary injection pump inlet valve A1 and wait approximately five to ten (5–10) seconds to allow any leftover product or liquid to be sufficiently purged (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*). Close primary injection pump inlet valve A1 and primary injection pump outlet valve B1 once purging is complete.
13. If the system is equipped with a backup pump, open backup injection pump outlet valve B2 (*Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*).
14. Open backup injection pump inlet valve A2 and wait approximately five to ten (5–10) seconds to allow any leftover product or liquid to be sufficiently purged (*Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*). Close backup injection pump inlet valve A2 and backup injection pump outlet valve B2 once purging is complete.
15. Once the odorant line has been purged of all remaining product, close purge inlet valve T on the odorant filter (*Figure 16*).
16. Close purge line valve Z on the odorant tank (*Figure 1*).
17. Close purge outlet valve M and open odorant injection valve Y (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
18. Disconnect the customer-supplied nitrogen or natural gas supply from the drain on the odorant filter (*Figure 16*).
19. It is now safe to perform maintenance on the selected components.

4.4 Return to Operation

1. Monitor the system for leaks while proceeding. If leaks are present, halt operation and repair as necessary.
2. Ensure primary injection pump inlet valve A1, primary injection pump outlet valve B1, backup injection pump inlet valve A2, and backup injection pump outlet valve B2 are closed (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*).
3. Ensure odorant flow meter inlet valve C and odorant flow meter outlet valve D are closed (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
4. Open odorant flow meter bypass valve E (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
5. Ensure purge outlet valve M is closed and odorant injection valve Y is open (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
6. From the Setup Menu in the PLC, select Odorant Pump (*Figure 33*). From the Odorant Pump submenu, select Pump Setup (*Figure 36*). Record the Pump 1 and Pump 2 CC/Stroke, and then physically adjust each Pump CC/Stroke to the full volume, if available.
7. Slowly open odorant inlet valve R on the odorant filter (*Figure 16*).
8. Slowly open primary injection pump inlet valve A1 and primary injection pump outlet valve B1 (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*).
9. Slowly open backup injection pump inlet valve A2 and backup injection pump outlet valve B2 (*Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, *Figure 14*, *or Figure 15*).
10. Slowly open purge outlet valve M (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
11. Open purge line valve Z on the odorant tank (*Figure 1*).
12. From the Pump Setup submenu in the PLC, press Pump 1 Manual Stroke a minimum of four times (4x) (*Figure 36*). Repeat this process for Pump 2.
13. Slowly open odorant flow meter inlet valve C and odorant flow meter outlet valve D (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
14. Slowly close odorant flow meter bypass valve E (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6*, *Figure 7*, *Figure 8*, *Figure 9*, *Figure 10*, *Figure 11*, *Figure 12*, *Figure 13*, or *Figure 15*).
15. From the Pump Setup submenu in the PLC, press Pump 1 Manual Stroke a minimum of five times (5x) (*Figure 36*). Repeat this process for Pump 2.
16. From the Pump Setup submenu in the PLC, reset each pump to the original Pump CC/Stroke (*Figure 36*).
17. From the Pump Setup submenu in the PLC, press Pump 1 Manual Stroke a minimum of five times (5x) (*Figure 36*). Repeat this process for Pump 2.
18. Slowly close purge line valve Z on the odorant tank (*Figure 1*).
19. Slowly close purge outlet valve M (*Figure 3*, *Figure 5*, *Figure 8*, *Figure 10*, *Figure 14*, or *Figure 15*).
20. Slowly open odorant injection valve Y (*Figure 15*).
21. From the Pump Setup submenu in the PLC, press Pump 1 Manual Stroke until odorant is observed through the sight glass at the injection point (*Figure 36*).
22. If desired, from the Pump Setup submenu in the PLC, press Pump 1 Reset Strokes to reset the stroke count for the primary pump (*Figure 36*). Press Pump 2 Reset Strokes to reset the stroke count for the backup pump.
23. From the Setup Menu in the PLC, select System Control (*Figure 33*). From the System Control submenu, press Odor Rate Required (*Figure 34*). Reset the Odor Rate Required to the original setting.
24. From the Monitor Menu in the PLC, select Pump Stats (*Figure 25*). From the Pump Stats submenu, observe for the correct volume of odorant per stroke (*Figure 27*). Make adjustments as necessary.
25. Verify odorant flow through the sight glass at the injection point when the pump strokes.
26. The Accu/Line™ is now operational.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

Welker *Installation, Operation, and Maintenance* (IOM) *Manuals* suggested for use with this unit:

- IOM-010: Welker OdorEyes BIP-1, BIP-2, BIP-3, and BIP-4 Bellows Injection Pumps
- IOM-033: Welker RV-1, RV-2, RV-2CP, and RV-3 Relief Valves
- IOM-058: Welker SSO-9 Sample/Injection Pump
- IOM-105: Welker NV-1 and NV-2 Instrument Valves
- IOM-169: Welker F-5 Filter Dryer
- IOM-180: Welker OdorEyes AEF-1 Atmospheric Exhaust Filter
- IOM-182: Welker CV-K Check Valve
- IOM-187: Welker OdorEyes SFA Sight Flow Assembly
- IOM-203: Welker SP-DP Diffusing Probe
- IOM-213: Welker F-9 and F-10 Filters
- IOM-230: Welker Vanishing Chamber™ Injection Pump

Other *Installation, Operation, and Maintenance* (IOM) *Manuals* suggested for use with this unit:

- Cellex Manufacturing, Inc. ESE 150 and ESE 200 Constant Watt Heaters (Welker IOM-V252)
- Emerson Process Management Regulator Technologies, Inc. Fisher™ 67C Series Instrument Supply Regulators (Welker IOM-V048)
- Emerson Process Management Regulator Technologies, Inc. Fisher™ 1301 Series High-Pressure Regulators Types 1301F and 1301G (Welker IOM-V107)
- Horner APG, LLC XL4 OCS Modules (Welker IOM-V369)
- Inline Industries, Inc. 201F Ball Valve (Welker IOM-V222)
- INTERTEC Instrumentation Ltd. CP MULTITHERM C Electric Heater (Welker IOM-V104)
- INTERTEC Instrumentation Ltd. TS Thermostat (Welker IOM-V105)
- Max Machinery, Inc. 286-300 Series Transmitters (Welker IOM-V220)
- Max Machinery, Inc. High Resolution, Linearized Frequency Transmitters Models 269, 294 and 295 (Welker IOM-V221)
- Max Machinery, Inc. Positive Displacement Flowmeters Models P001, P002, 213, 214, and 215 (Welker IOM-V106)
- Morgan Products Inc. Model TR2 Air Actuated Timer (Welker IOM-V219)
- MTS Systems Corporation Level Plus® Liquid-Level Sensors With Temposonics® Technology M-Series Model MR Analog Transmitter (Welker IOM-V036)
- Parker Hannifin Corporation Ball and Plug Valves (Welker IOM-V213)
- Parker Hannifin Corporation 3-Way Solenoid Valves Types 71313, 71315, 71335, 71385, 71395, 7131V, and 7133V (Welker IOM-V016)
- Power-Sonic Corporation PS-1270 12 Volt 7.0 AH Rechargeable Sealed Lead Acid Battery (Welker IOM-V223)
- Solutions With Innovation L505 Visual Level Indicator Dip-Tape Visual Level Indicator (Welker IOM-V037)
- Swagelok Company Bleed Valves and Purge Valves (Welker IOM-V208)
- Swagelok Company Check Valves C, CA, CH, CP, and CPA Series (Welker IOM-V076)
- Swagelok Company Hose and Flexible Tubing (Welker IOM-V176)
- Swagelok Company One-Piece Instrumentation Ball Valves 40G Series and 40 Series (Welker IOM-V085)
- Swagelok Company Plug Valves P4T and P6T Series (Welker IOM-V102)
- Versa Products Company, Inc. C Series Solenoid Valves (Welker IOM-V041)
- WIKA Instrument Corporation Bourdon Tube Pressure Gauges Type 232.53 and Type 233.53 (Welker IOM-V171)

Welker drawings and schematics suggested for use with this unit:

- System Drawing: OE160VS (Dual BIP Injection Pump Valve Section)
- System Drawing: OE161VS (Dual BIP Injection Pump Valve Section With Pneumatic Timer)
- System Drawing: OE162VS.124 (Dual BIP Injection Pump Valve Section With Blanket Pressure Regulator)
- System Drawing: OE162VS.624 (Dual SSO-9 Injection Pump Valve Section With Blanket Pressure Regulator)
- System Drawing: OE163VS (Dual BIP Injection Pump Valve Section With Heater)
- System Drawing: OE163VS.624 (Dual SSO-9 Injection Pump Valve Section With Blanket Pressure Regulator and Heater)
- System Drawing: OE164VS (Dual BIP Injection Pump Valve Section With Pneumatic Timer, Blanket Pressure Regulator, and Heater)
- System Drawing: OE165VS (Dual BIP Injection Pump Valve Section With Pneumatic Timer and Blanket Pressure Regulator)
- System Drawing: OE166VS.124 (Dual BIP Injection Pump Valve Section With Pneumatic Timer and Purge System but Without Flow Meter)
- System Drawing: OE170VS.224 (Single BIP Injection Pump Valve Section With Purge System)
- System Drawing: OE172VS.124 (Single BIP Injection Pump Valve Section With Blanket Pressure Regulator)
- System Drawing: OE173VS.624 (Single SSO-9 Injection Pump Valve Section With Blanket Pressure Regulator and Heater)
- System Drawing: OE400VS (Dual Vanishing Chamber™ Injection Pump Valve Section With Blanket Pressure Regulator and Heater)

APPENDIX B: MAINTENANCE SCHEDULE

Welker recommends keeping high-wear parts on hand and replacing these parts immediately when worn or damaged.

Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for each component for maintenance instructions.

Table B1: Accu/Line™ Maintenance Schedule

Action	Weekly	Every 12 Months	As Necessary
If applicable, confirm proper functioning of the heater.	X		
Open F-5 drain valve Q to allow moisture to drain from the filter.	X		
Verify the pneumatic supply pressure and blanket pressure, if applicable.		X	
Rebuild the BIP(s) using a Welker repair kit. • Replace the seals and bearing. • Replace the check cartridges. • Inspect the bellows, actuator piston, actuator spring, and actuator housing for damage or wear.		X	
Rebuild the SSO-9(s) using a Welker repair kit. • Replace the O-rings, back ups, U-cups, seal, and retaining ring. • Examine the cylinders for scratches and pits.		X	
Rebuild the VCIP(s) using a Welker repair kit. • Replace the O-rings, back ups, seal, snap ring, and bearing. • Replace the check cartridge. • Inspect the bellows, diaphragm housing, diaphragm spring, and piston for damage or wear.		X	
Rebuild the F-5 using a Welker repair kit. • Replace the O-rings and filter cartridge.		X	
View the controller's current alarms.			X
Inspect the injection pump(s), tubing, valves, and fittings on the system for leaks.			X
Open F-9 drain valve U to allow moisture to drain from the filter.			X
Rebuild the F-9 using a Welker repair kit. • Replace the O-rings and filter element.			X
Rebuild the RV-1(s) using a Welker repair kit. • Replace the O-rings. • Inspect the spring and ball for damage or wear.			X
Replace the controller battery.			X
Maintain the flow meter.			X
Maintain the regulator(s).			X
Maintain the solenoid(s).			X

Table B1: Accu/Line™ Maintenance Schedule (Continued)			
Action	**Weekly**	**Every 12 Months**	**As Necessary**
If applicable, maintain the atmospheric exhaust filter.			**X**
If applicable, maintain the pneumatic timer.			**X**

NOTES

13839 West Bellfort Street
Sugar Land, TX 77498
Phone: 281.491.2331

welker.com