INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER ECOSYSTEM™ PULSE BYPASS SYSTEM
WITH XL4 CONTROLLER

DRAWING NUMBERS
0E153VS
0E180VS.1
0E181VS
0E181VS.3E
0E183VS.1E
0E190VS
0E220VS.1E

MANUAL NUMBER
IOM-229

REVISION
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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 ECOsystem™ Pulse Bypass 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 ECOsystem™ Pulse Bypass 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 ECOsystem™ Pulse Bypass 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 *ECOsystem™ Pulse Bypass System With XL4 Controller* is designed to infuse the customer pipeline proportional to flow with natural gas that has been supersaturated with vaporized odorant. This skid-mounted automatic bypass system has three (3) primary components: the touch screen controller, the valve section, and the odorant supply tank. Each primary component plays an integral role in the operation of the ECOsystem™ 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 flow switch in the valve section, allowing the system to respond to changing flow conditions. As pipeline conditions change, the controller increases or decreases the injection rate so that the ECOsystem™ continues infusing 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. An optional solar panel generates renewable energy to power the system when an electrical source is unavailable.

The valve section contains one (1), two (2), or three (3) solenoids, which control the flow of gas through the odorant supply tank and into the pipeline. Having two (2) or three (3) solenoids allows the ECOsystem™ to better respond to and accommodate varying flow rates and limits interruption to operation in the event of solenoid maintenance. To prolong the operational life of the regulator and solenoid(s), the Welker F-5 Filter Dryer conditions the natural gas supply. The flow switch communicates the solenoid operation to the controller to ensure proper odorization. For pulse bypass systems used in cold climates, a heater with thermostat can be added to replenish heat lost during regulation.

Each odorant supply tank is equipped with a tank fill inlet, vent port, blanket pressure inlet, level gauge, and outlet to the pipeline. The temperature transmitter communicates odorant temperature to the controller so the system can compensate for temperature changes within the odorant tank. For added automation, an electronic level transmitter can be installed to communicate tank level to the controller. Regardless of volume or orientation, the odorant supply tank comes with 110% containment that is sloped to the drain for easy draining.

Welker may custom design the ECOsystem™ Pulse Bypass 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

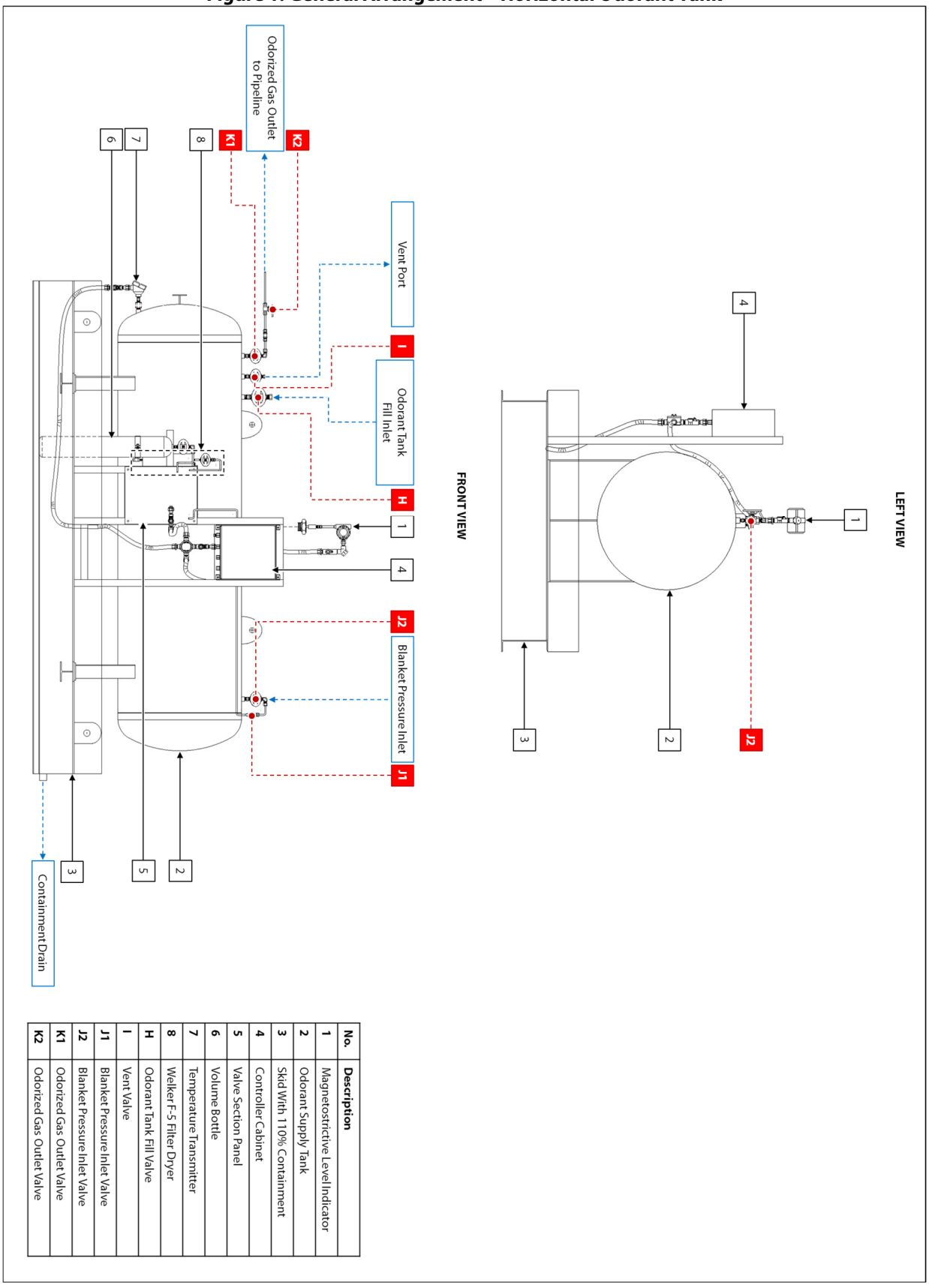
The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: ECOsystem™ Specifications	
Application	Vaporized Odorant Infusion
Electrical Connection	AC 120 V DC 12 V DC 24 V
Odorant Tank Volume	5 US Gallons (*18 L*) 20 US Gallons (*75 L*) 50 US Gallons (*189 L*) 60 US Gallons (*227 L*) 100 US Gallons (*378 L*) 120 US Gallons (*454 L*) 250 US Gallons (*946 L*) 500 US Gallons (*1892 L*) Others Available
Features	Odorant Tank Level Gauge Skid With 110% Containment Temperature Transmitter Touch Screen Controller Valve Section (See *Table 2*)
Options	Flag Tracker Level Indicator Heater for Controller Enclosure NEMA 4 or NEMA 7 Enclosure for Controller Solar Panel Steel Building

Table 2: Valve Section Specifications	
Tubing Size	**Low Flow:** ¼" (*0.6 cm*) **High Flow:** ⅜" (*0.9 cm*) **Variable Flow:** ¼" and ⅜" (*0.6* and *0.9 cm*)
Features	2-Way Solenoid Valve Flow Switch Regulator for Natural Gas Supply Welker F-5 Filter Dryer for Natural Gas Supply
Options	Backup Solenoid Enclosure Heater With Thermostat Low Flow Solenoid Volume Bottle (for Systems With ⅜" (*0.9* cm) Tubing)

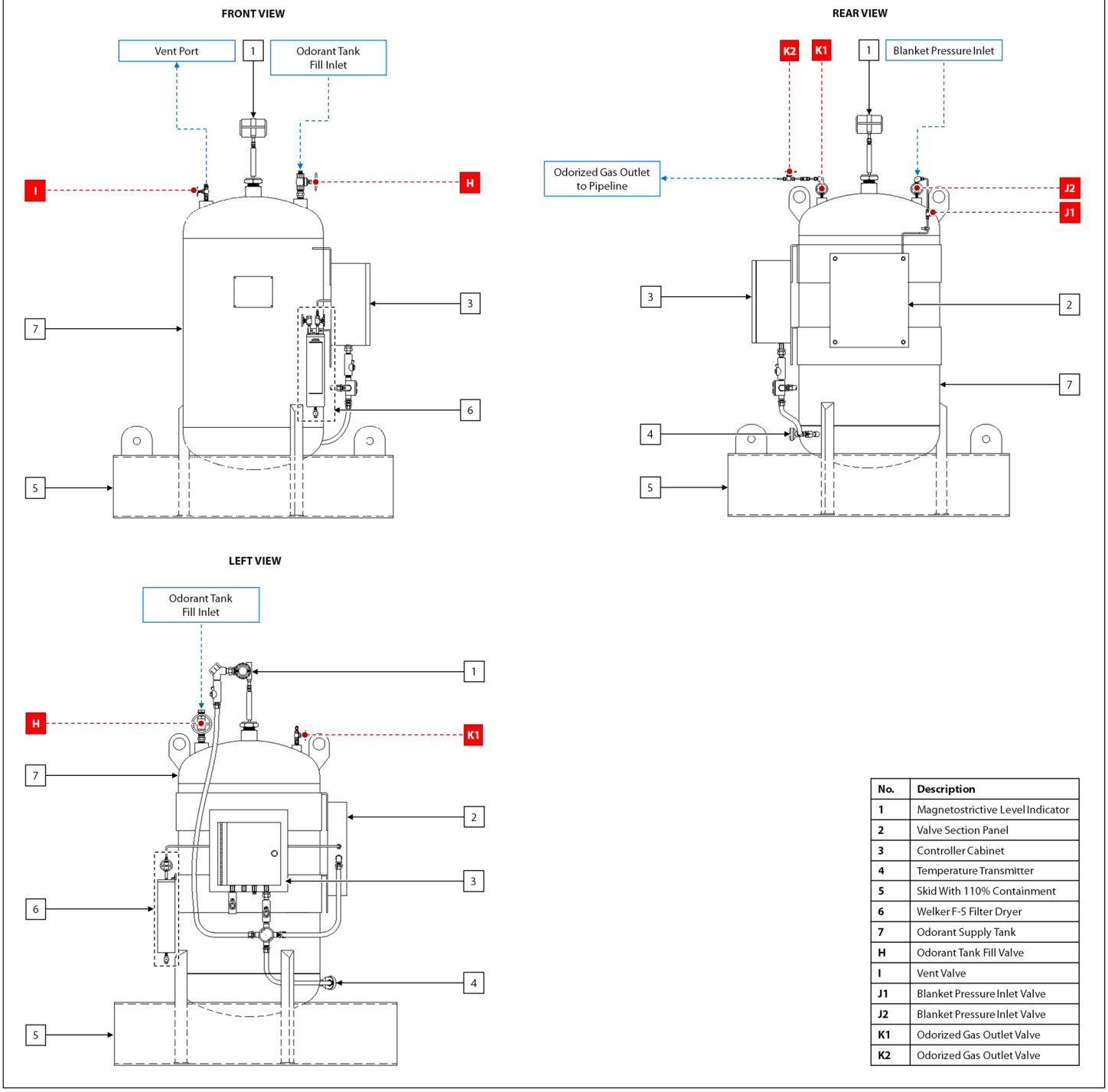
1.5 Equipment Diagrams

Figure 1: General Arrangement – Horizontal Odorant Tank



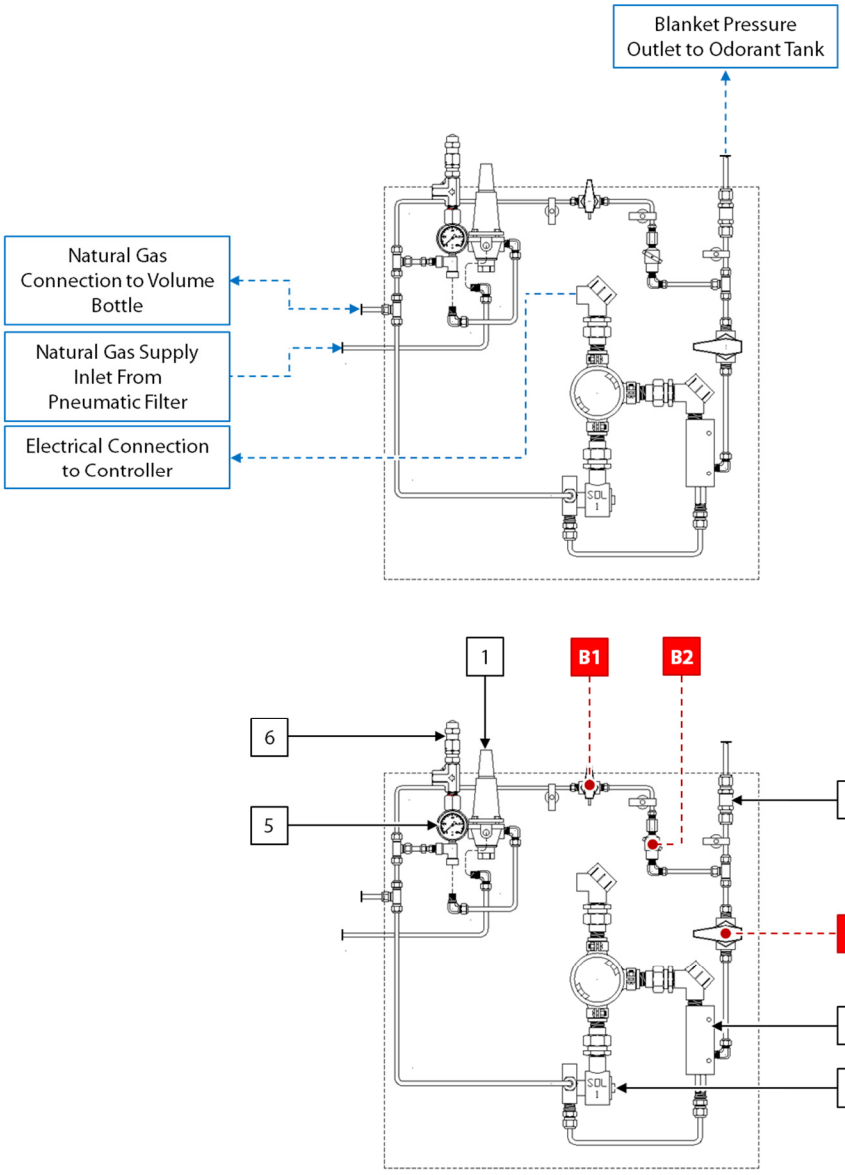
No.	Description
1	Magnetostrictive Level Indicator
2	Odorant Supply Tank
3	Skid With 110% Containment
4	Controller Cabinet
5	Valve Section Panel
6	Volume Bottle
7	Temperature Transmitter
8	Welker F-5 Filter Dryer
H	Odorant Tank Fill Valve
I	Vent Valve
J1	Blanket Pressure Inlet Valve
J2	Blanket Pressure Inlet Valve
K1	Odorized Gas Outlet Valve
K2	Odorized Gas Outlet Valve

Figure 2: General Arrangement – Vertical Odorant Tank



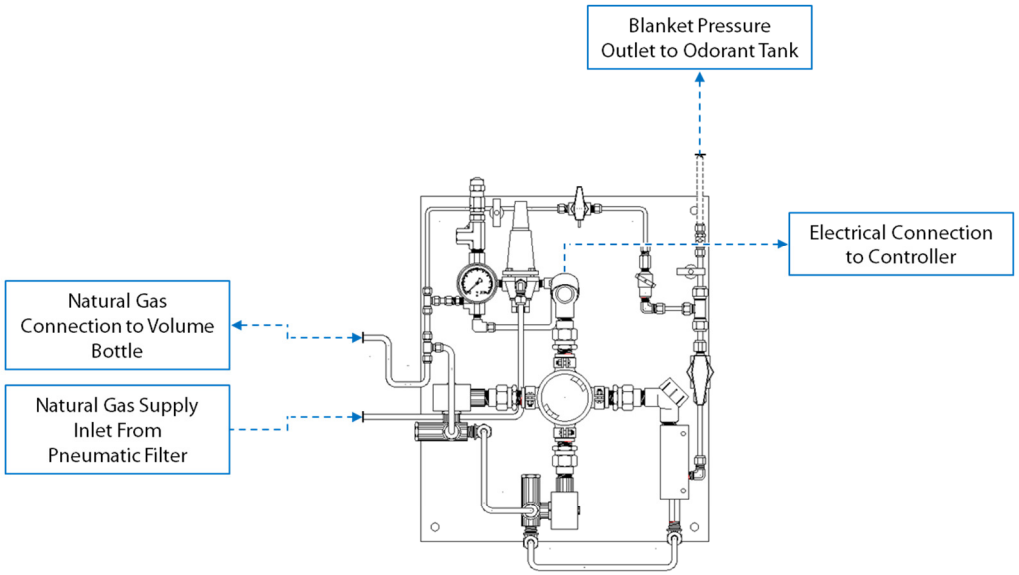
No.	Description
1	Magnetostrictive Level Indicator
2	Valve Section Panel
3	Controller Cabinet
4	Temperature Transmitter
5	Skid With 110% Containment
6	Welker F-5 Filter Dryer
7	Odorant Supply Tank
H	Odorant Tank Fill Valve
I	Vent Valve
J1	Blanket Pressure Inlet Valve
J2	Blanket Pressure Inlet Valve
K1	Odorized Gas Outlet Valve
K2	Odorized Gas Outlet Valve

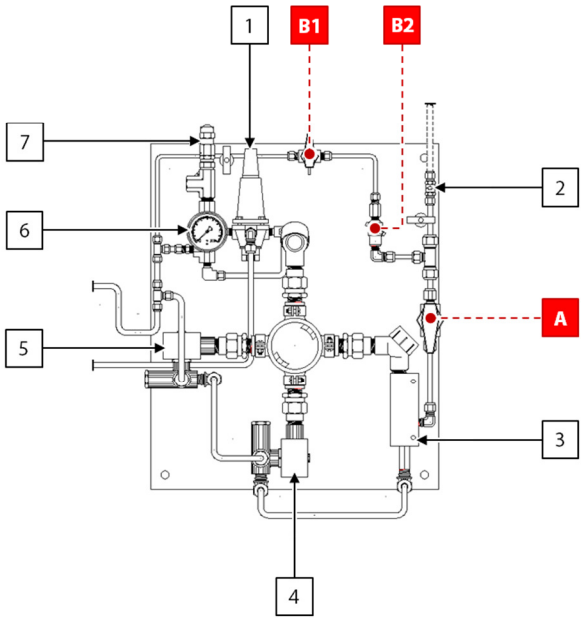
Figure 3: Valve Section – Single Solenoid, ⅜" Tubing



No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve
5	Pressure Gauge, Natural Gas Supply
6	Relief Valve
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2

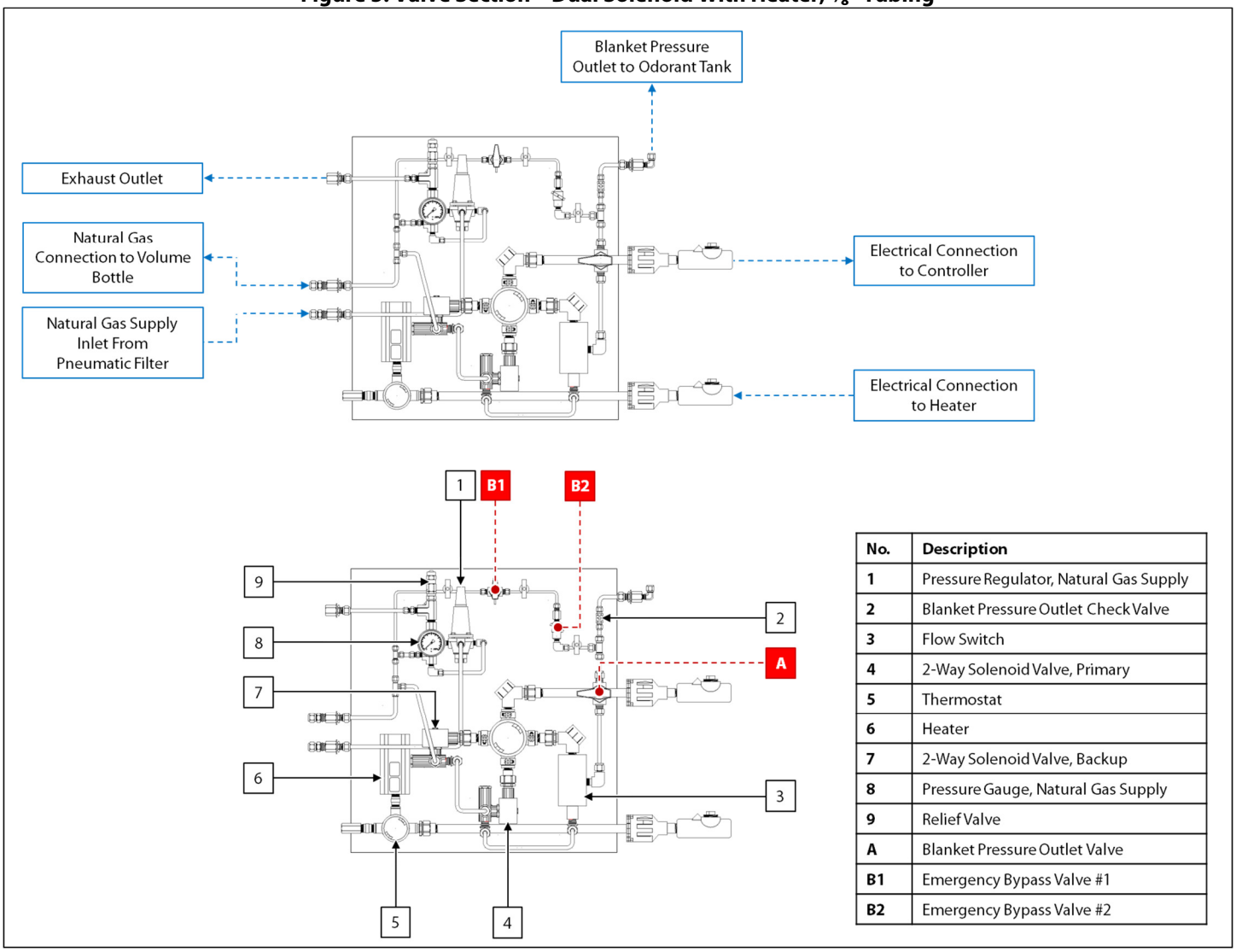
Figure 4: Valve Section – Dual Solenoid, $^{3}/_{8}$" Tubing





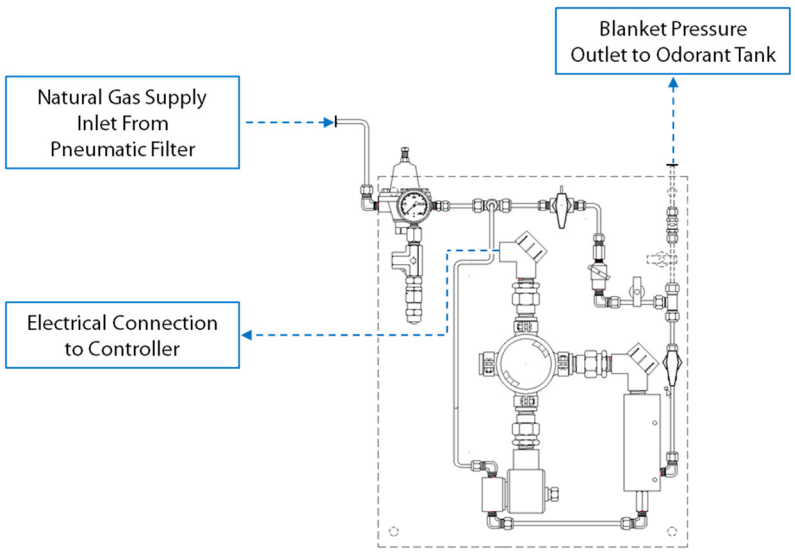
No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve, Primary
5	2-Way Solenoid Valve, Backup
6	Pressure Gauge, Natural Gas Supply
7	Relief Valve
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2

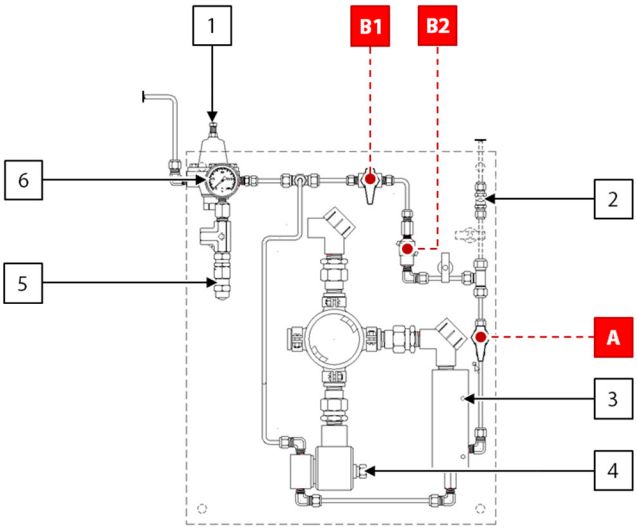
Figure 5: Valve Section – Dual Solenoid With Heater, ⅜" Tubing



No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve, Primary
5	Thermostat
6	Heater
7	2-Way Solenoid Valve, Backup
8	Pressure Gauge, Natural Gas Supply
9	Relief Valve
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2

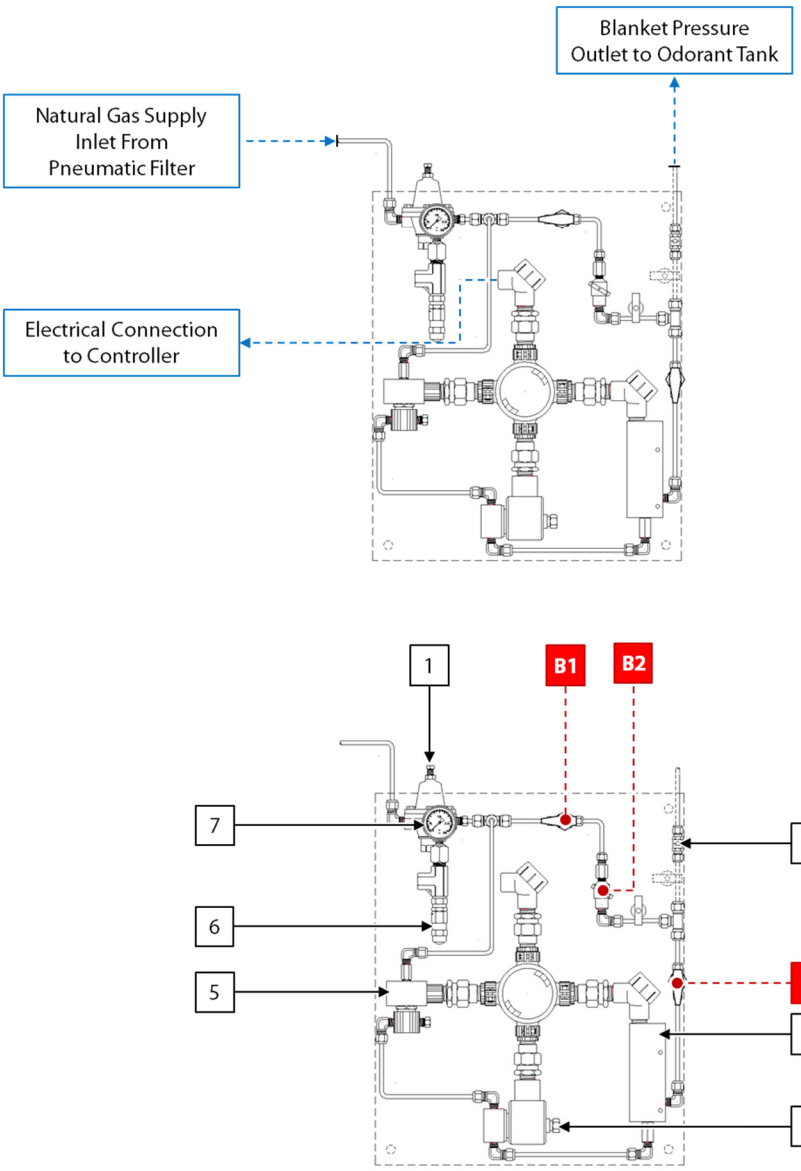
Figure 6: Valve Section – Single Solenoid, ¼" Tubing





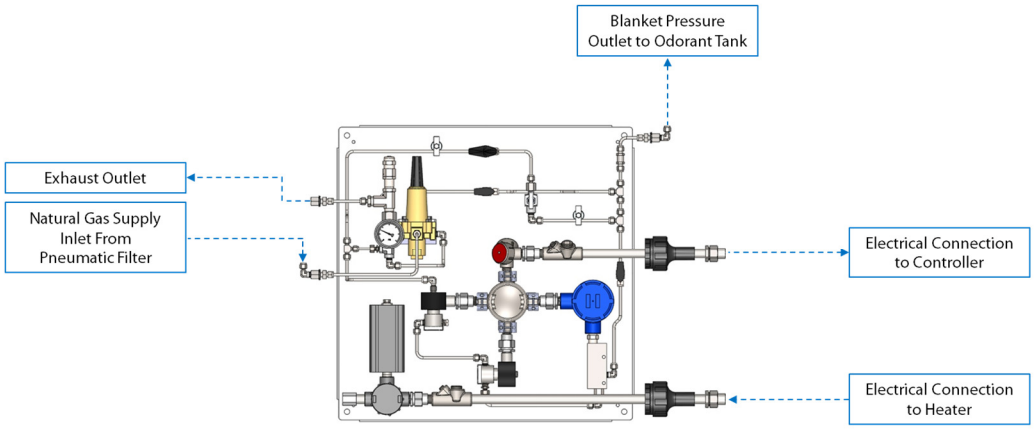
No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve
5	Relief Valve
6	Pressure Gauge, Natural Gas Supply
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2

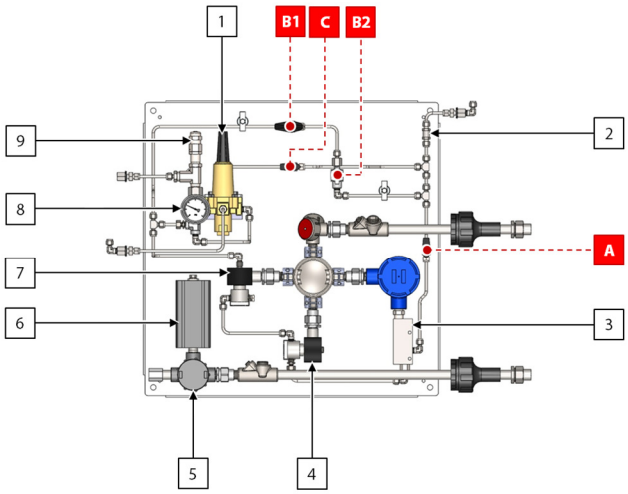
Figure 7: Valve Section – Dual Solenoid, ¼" Tubing



No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve, Primary
5	2-Way Solenoid Valve, Backup
6	Relief Valve
7	Pressure Gauge, Natural Gas Supply
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2

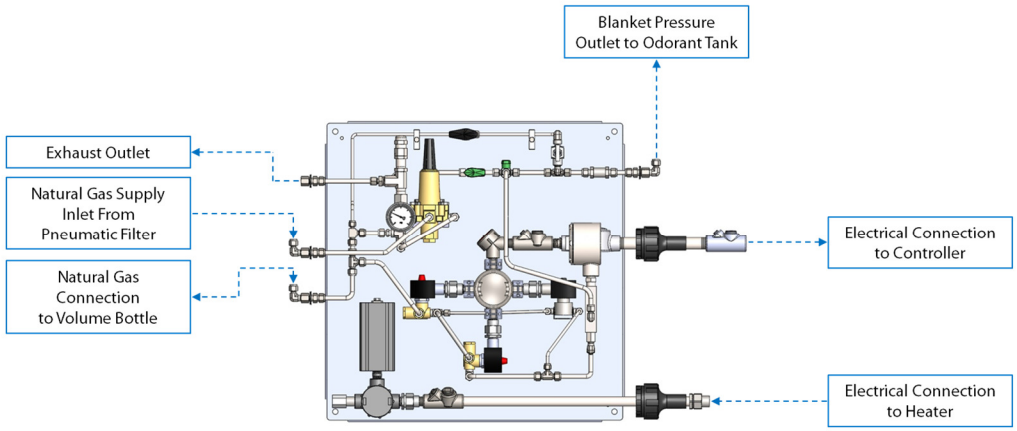
Figure 8: Valve Section – Dual Solenoid With Heater, ¼" Tubing

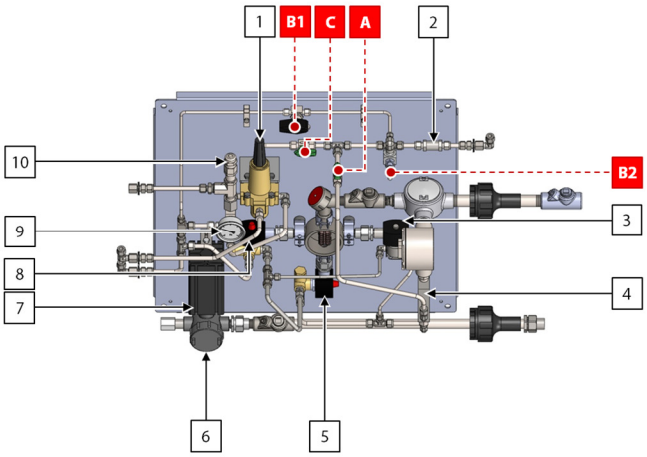




No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	Flow Switch
4	2-Way Solenoid Valve, Primary
5	Thermostat
6	Heater
7	2-Way Solenoid Valve, Backup
8	Pressure Gauge, Natural Gas Supply
9	Relief Valve
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2
C	Regulator Outlet Valve

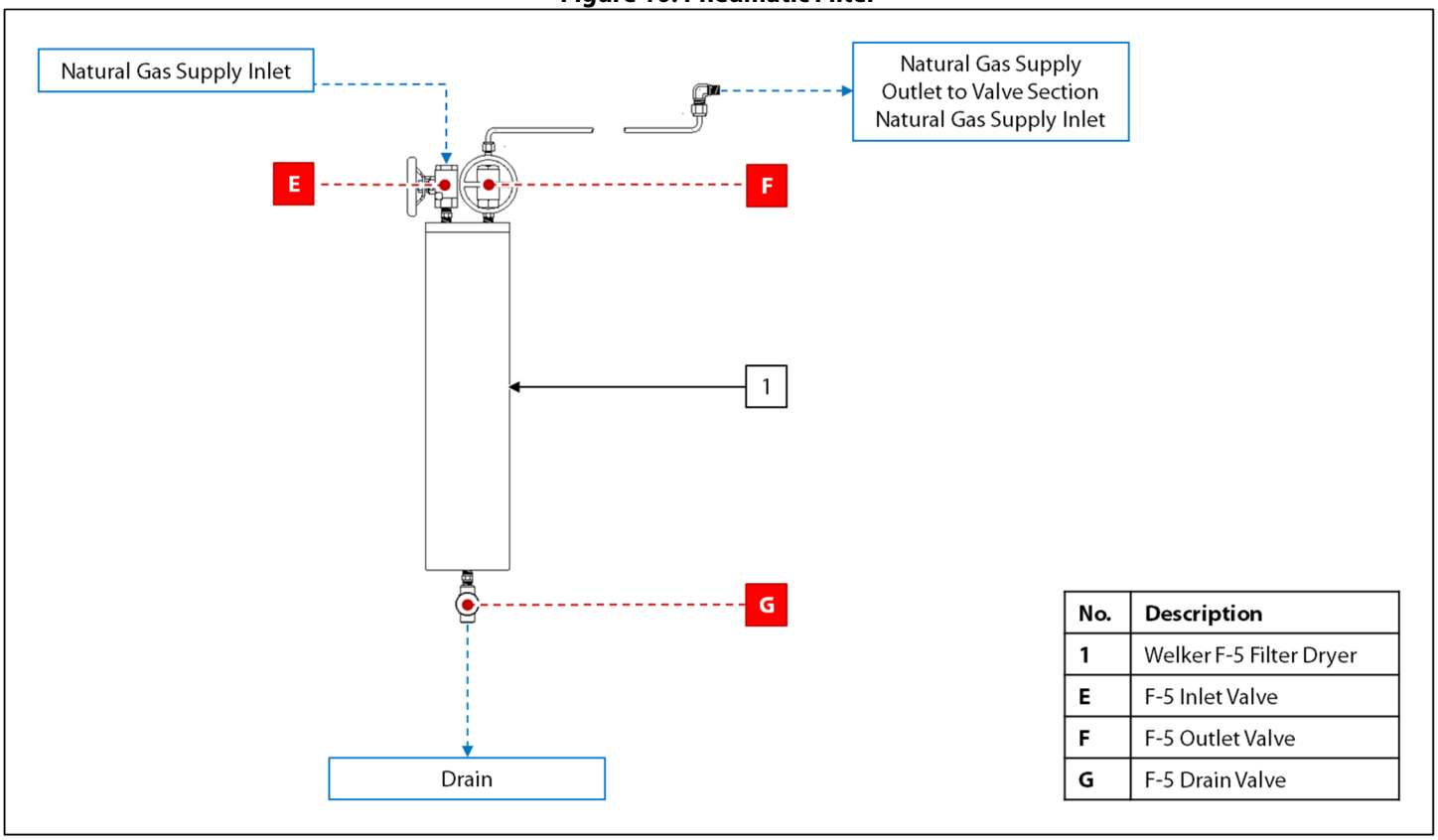
Figure 9: Valve Section – Triple Solenoid With Heater, ¼" and $^{3}/_{8}$" Tubing





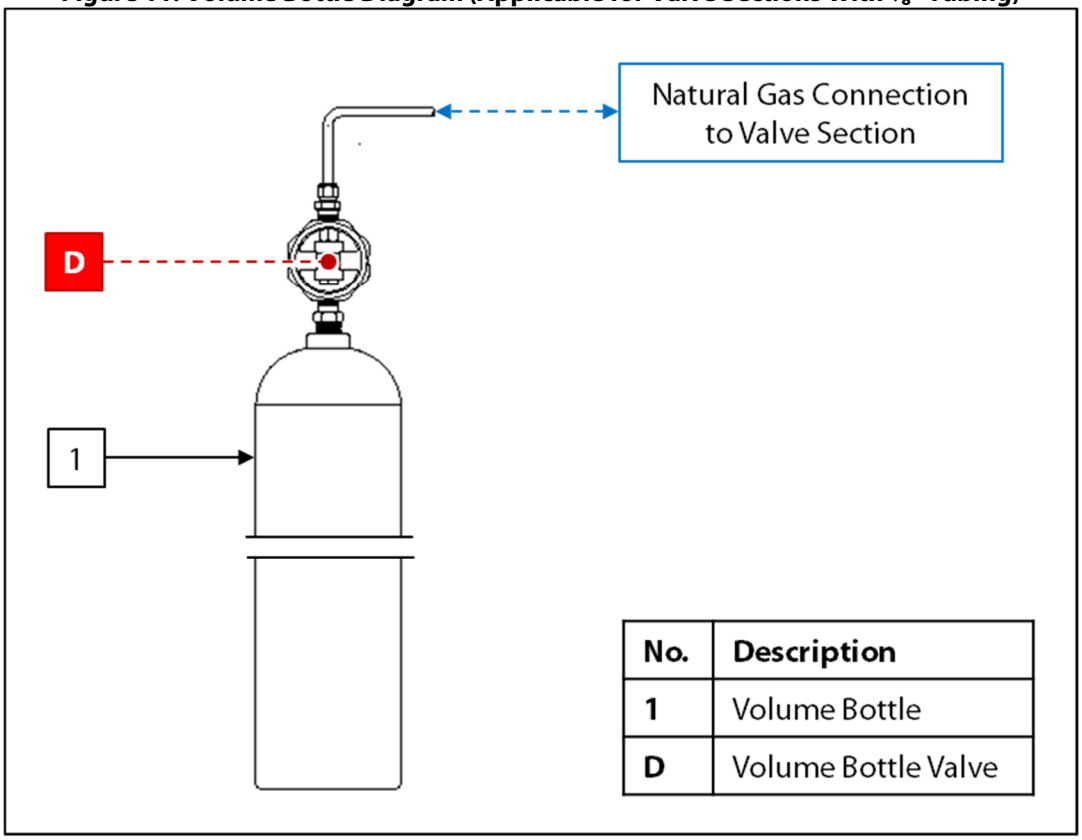
No.	Description
1	Pressure Regulator, Natural Gas Supply
2	Blanket Pressure Outlet Check Valve
3	2-Way Solenoid Valve, Low Flow
4	Flow Switch
5	2-Way Solenoid Valve, High Flow
6	Thermostat
7	Heater
8	2-Way Solenoid Valve, Backup
9	Pressure Gauge, Natural Gas Supply
10	Relief Valve
A	Blanket Pressure Outlet Valve
B1	Emergency Bypass Valve #1
B2	Emergency Bypass Valve #2
C	Regulator Outlet Valve

Figure 10: Pneumatic Filter



No.	Description
1	Welker F-5 Filter Dryer
E	F-5 Inlet Valve
F	F-5 Outlet Valve
G	F-5 Drain Valve

Figure 11: Volume Bottle Diagram (Applicable for Valve Sections With $^{3}/_{8}$" Tubing)



No.	Description
1	Volume Bottle
D	Volume Bottle Valve

SECTION 2: INSTALLATION & OPERATION

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 ECOsystem™ 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.

The ECOsystem™ must be installed in a section of the natural gas pipeline with a regulated pressure drop, such as a regulator station or gate station.

All electrical connections must meet local and national electric codes, and excessive weight added to the conduit run must be supported.

2.2 Installation

System Skid

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

System Connections

4. Using appropriately sized customer-supplied tubing, connect from the outlet of the pipeline upstream of the regulated pressure drop to the inlet of the Welker F-5 Filter Dryer (*Figure 10*).

Tubing must have a minimum diameter of $^{3}/_{8}$".

5. Connect from odorized gas outlet valve K2 to an unused valve on the natural gas pipeline downstream of the regulated pressure drop (*Figure 1* or *Figure 2*).

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

6. Ensure that all valves on the system are closed.
7. Ensure that all fittings, connections, and bolts are tightened.

Electrical Connections

Turn OFF the electrical supply prior to making electrical connections.

8. Connect an appropriate electrical supply to the controller. Refer to 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.

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

The controller can accept analog or pulse input.

10. If the ECOsystem™ is not equipped with the optional flag tracker level indicator, installation is now complete; proceed to *Section 2.3, Start-Up Procedures*. If the ECOsystem™ is equipped with the optional flag tracker level indicator, continue to step 11.

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.

11. Remove the bottom drain flange from the base of the level indicator.
12. 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.

13. Replace the shipping gasket with the provided gasket.
14. Install the bottom drain flange with float to the level indicator.

2.3 Start-Up Procedures

Odorant Supply Tank

1. Open emergency bypass valves B1 and B2 (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6, Figure 7*, *Figure 8*, or *Figure 9*).
2. 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.

3. Check the odorant supply tank for leaks and repair as necessary.
4. Close emergency bypass valves B1and B2 (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6, Figure 7*, *Figure 8*, or *Figure 9*).

Natural Gas Supply Regulator

5. As necessary, open any valves between the outlet on the natural gas pipeline and the F-5 inlet.
6. Open F-5 inlet valve E and F-5 outlet valve F (*Figure 10*).
7. Apply natural gas to the valve section to pressurize the natural gas supply regulator (*Figure 3*, *Figure 4*, *Figure 5*, *Figure 6, Figure 7*, *Figure 8*, or *Figure 9*).

> The pneumatic supply regulator comes factory-set to the setting required to operate the solenoid(s).

8. If applicable, open regulator outlet valve C (*Figure* 8 or *Figure 9*).
9. If applicable, open volume bottle valve D (*Figure 11*). The volume bottle will fill with the conditioned natural gas.

> Only systems with $^{3}/_{8}$" tubing are equipped with a volume bottle.

Valve Configuration

10. Slowly open the valves indicated in Table 3.

Table 3: Start-Up Valve Orientation

Valve Letter	Valve Description	Reference Figures
A	Blanket Pressure Outlet	3–9
J1 & J2	Blanket Pressure Inlet	1 & 2
K1 & K2	Odorized Gas Outlet	1 & 2

> Once odorized gas outlet valves K1 and K2 are open, gas may free flow from the odorant supply tank to the pipeline until pressure in the system equalizes. Note that free flow will last only for a short time and over-odorization will not occur.

11. If applicable, slowly open any valves between the odorized gas outlet on the odorant supply tank and the pipeline.
12. Check for leaks and repair as necessary.

Controller Configuration

13. Verify that the customer set points have been correctly set by the manufacturer.

Verifying Solenoid and Flow Switch Operation

14. From the controller, verify the correct operation of the solenoid and flow switch. From the Home screen, select Monitor (*Figure 15*). From the Monitor menu, select System I/O (*Figure 19*).
15. As the controller opens the solenoid, verify that Flow Switch and Main Sol darken simultaneously.
16. As the controller closes the solenoid, verify that Flow Switch and Main Sol clear simultaneously.
17. Once the correct operation of the solenoid and flow switch has been confirmed, the ECOsystem™ is operational.

SECTION 3: TOUCH SCREEN CONTROLLER

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 12*).

Figure 12: Home Screen

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

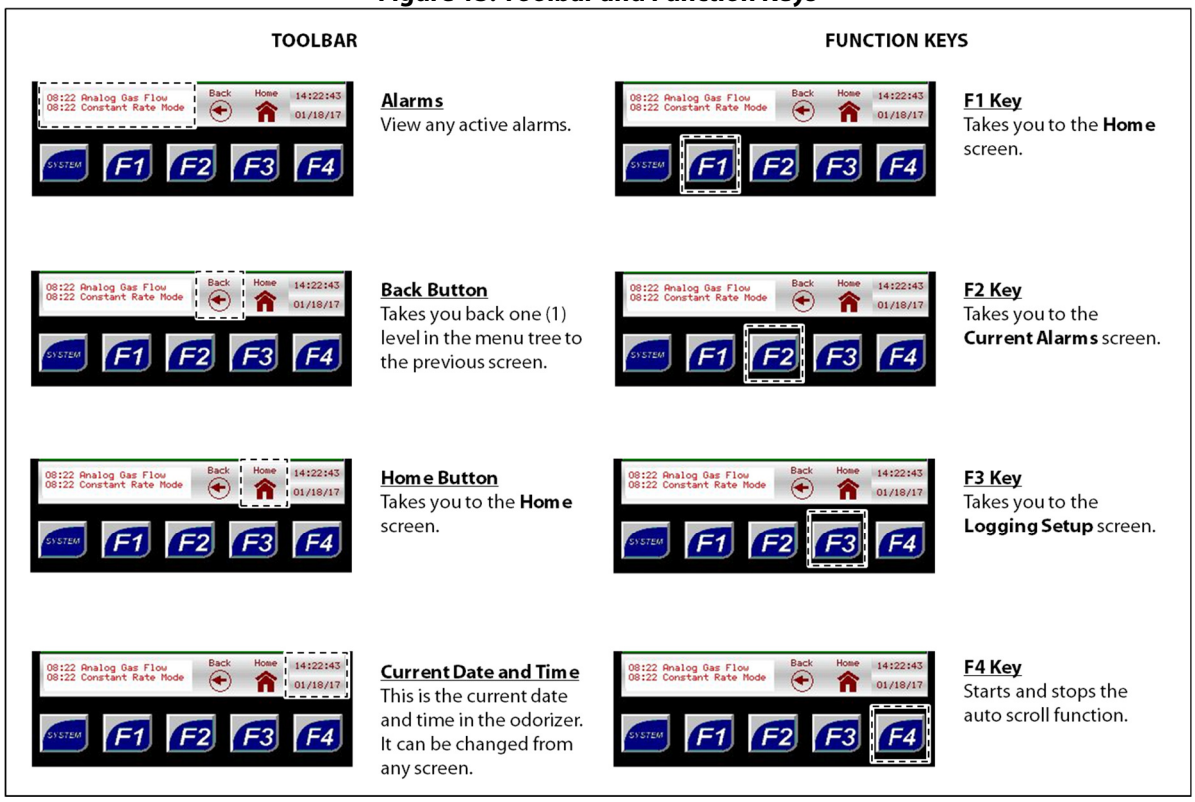
Setup
Takes you to the setup screens where you can change any set point values in the odorizer.

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. These screens have a **blue** background.
- **Setup-**from this type of screen, numeric and/or text values that affect the setup of the odorizer can be changed. These screens have a **red** background.

Navigating the Display

Figure 13: Toolbar and Function Keys



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 key to go to the Current Alarms screen (*Figure 14*).

Figure 14: Current Alarms Screen

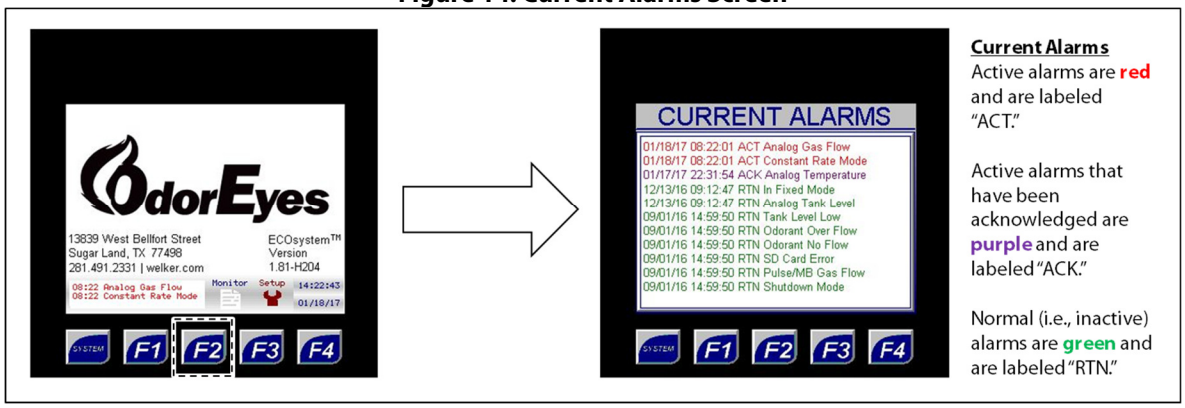


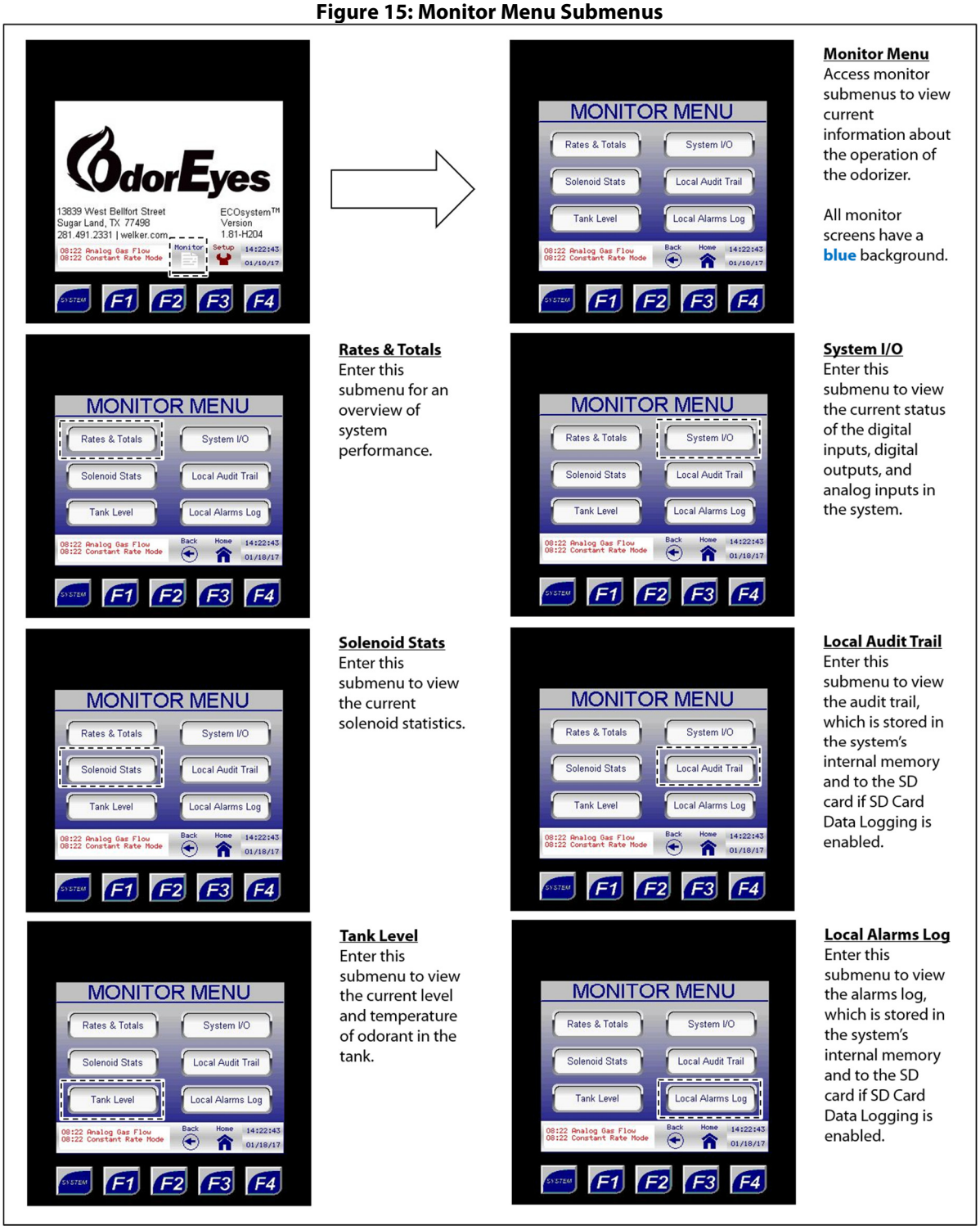
Table 4: Current Alarms	
Analog Gas Flow	Can only be active if Analog mode is selected. The controller will go into the selected fail mode when this alarm is active. **NOTE:** If this alarm is active, verify that a 4–20 mA signal is being received from the flow meter.
Pulse Gas Flow	Can only be active if Pulse mode is selected. The controller will go into the selected fail mode when this alarm is active. **NOTE:** If this alarm is active, the pulse input cutoff time has expired. Verify that a pulse input is being received from the flow meter. If this alarm is active when the controller is receiving pulse input from the flow meter, Welker recommends increasing the pulse input cutoff time to prevent the alarm from becoming active prematurely.
Constant Rate Mode	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 Mode	Can only be active if Fixed Mode is enabled and the Fixed Alarm Rate is set. **NOTE:** If this alarm is active, the Fixed Alarm Rate will be the assumed gas flow in the system and will override any other input parameters. The Fixed Rate Alarm will not clear until Fixed Mode is disabled.
Analog Temperature	Can only be active if Transmitter is set as the RTD setup method. **NOTE:** If this alarm is active, verify that a 4–20 mA signal is being received from the temperature transmitter. If this alarm is active, the system will use the manually entered temperature; therefore, Welker recommends regularly updating the manual temperature value.
Analog 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 each time the solenoid opens.
Tank Low Level	Active if the odorant tank level has dropped below the specified value. **NOTE:** This alarm will clear once the tank is filled with odorant or the alarm set point is lowered.
Odorant Overflow	Active if the flow switch signals the controller indicating gas is passing through it even though the solenoid(s) should not be open. **NOTE:** If this alarm is active, it could be an indication that a solenoid is stuck open and that the system is over-odorizing or that the flow switch is stuck open.
Odorant No Flow	Active if the controller signals the solenoid to open but does not receive a signal from the flow switch confirming the solenoid has opened. **NOTE:** If this alarm is active, it could be an indication that the solenoid has failed closed or that the pressure differential across the system is not great enough to odorize.

3.2 Navigating the Monitor Menus

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

Monitor screens, which have a **blue** background, are informational screens: no values can be changed from these screens.

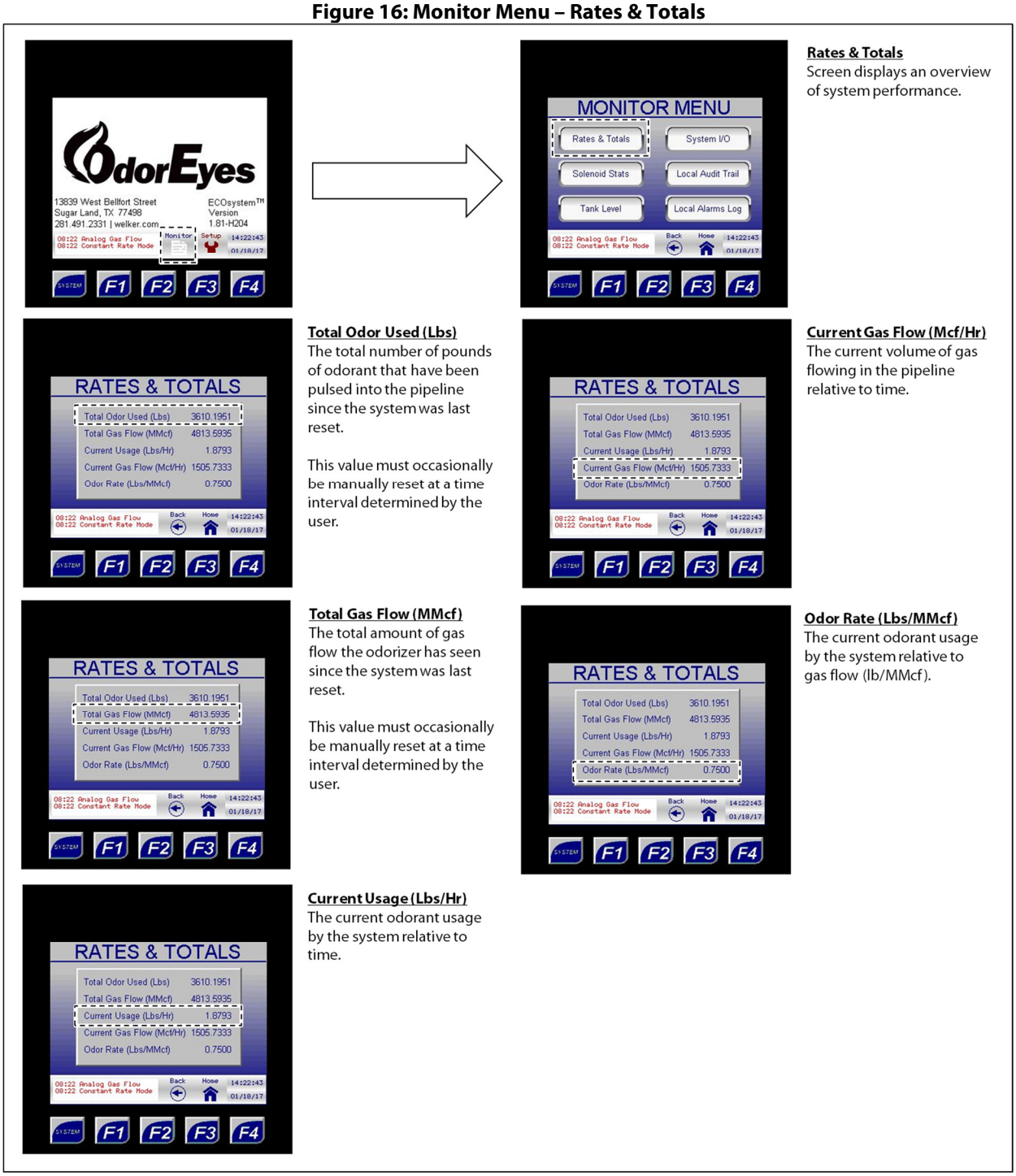
Figure 15: Monitor Menu Submenus



Rates & Totals

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

Figure 16: 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.

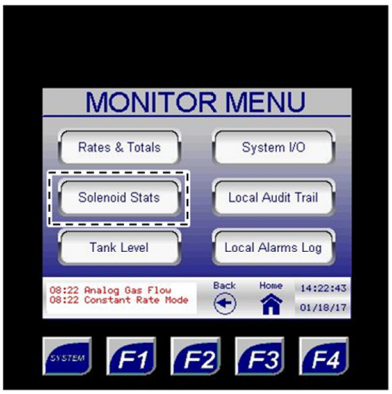
Odor Rate (Lbs/MMcf)
The current odorant usage by the system relative to gas flow (lb/MMcf).

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

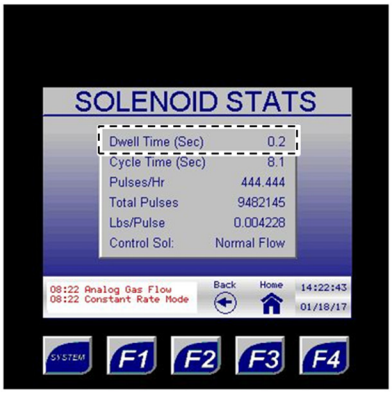
If the system status totals are used to track system performance, they should be periodically reset through the Controller Setup submenu (*Figure 24*). As the total values increase, they will begin to lose accuracy and will eventually stop accumulating.

Solenoid Stats

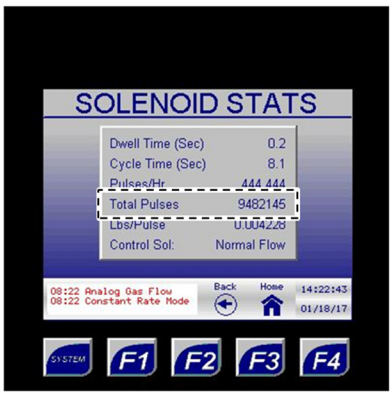
Figure 17: Monitor Menu – Solenoid Stats



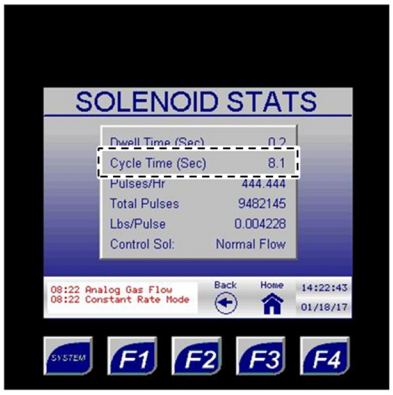
Solenoid Stats
Screen displays the current solenoid statistics.



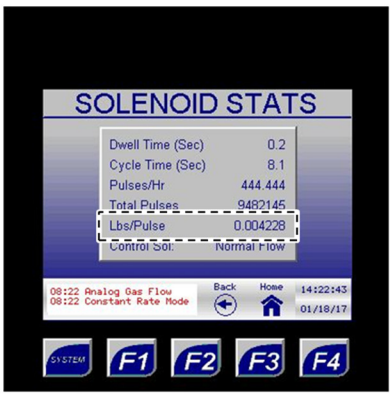
Dwell Time (Sec)
The dwell time is the length of time (in seconds) the solenoid remains open each time it opens.



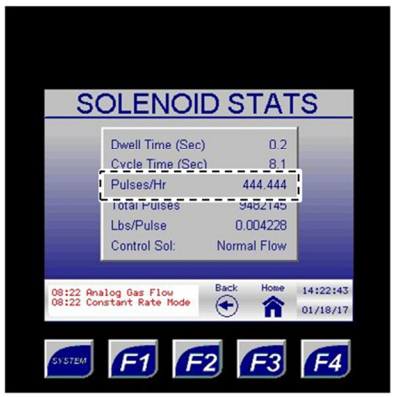
Total Pulses
The total number of times the solenoid has pulsed odorant into the pipeline.



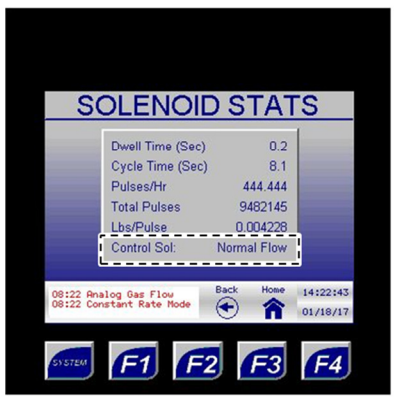
Cycle Time (Sec)
The cycle time is how frequently (in seconds) the solenoid is opening.



Lbs/Pulse
Pounds per pulse is the volume of odorant pulsed into the pipeline every time the solenoid opens.



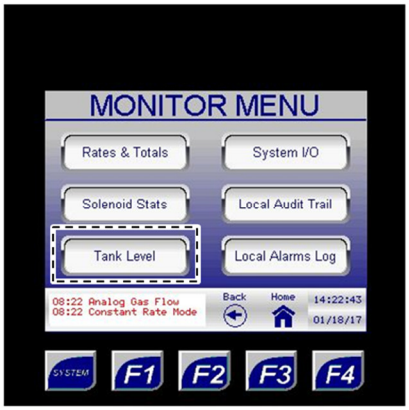
Pulses/Hr
Pulses per hour is the number of times the solenoid will open per hour given the current dwell and cycle times.



Control Sol:
This indicates which solenoid is currently operating.

Odorant Tank Level

Figure 18: Monitor Menu – Tank Level



This screen displays the amount of odorant remaining in the odorant supply tank in inches, US gallons, and pounds, as well as the temperature of the odorant in degrees Fahrenheit.

These values will either be from a transmitter or manually entered.

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

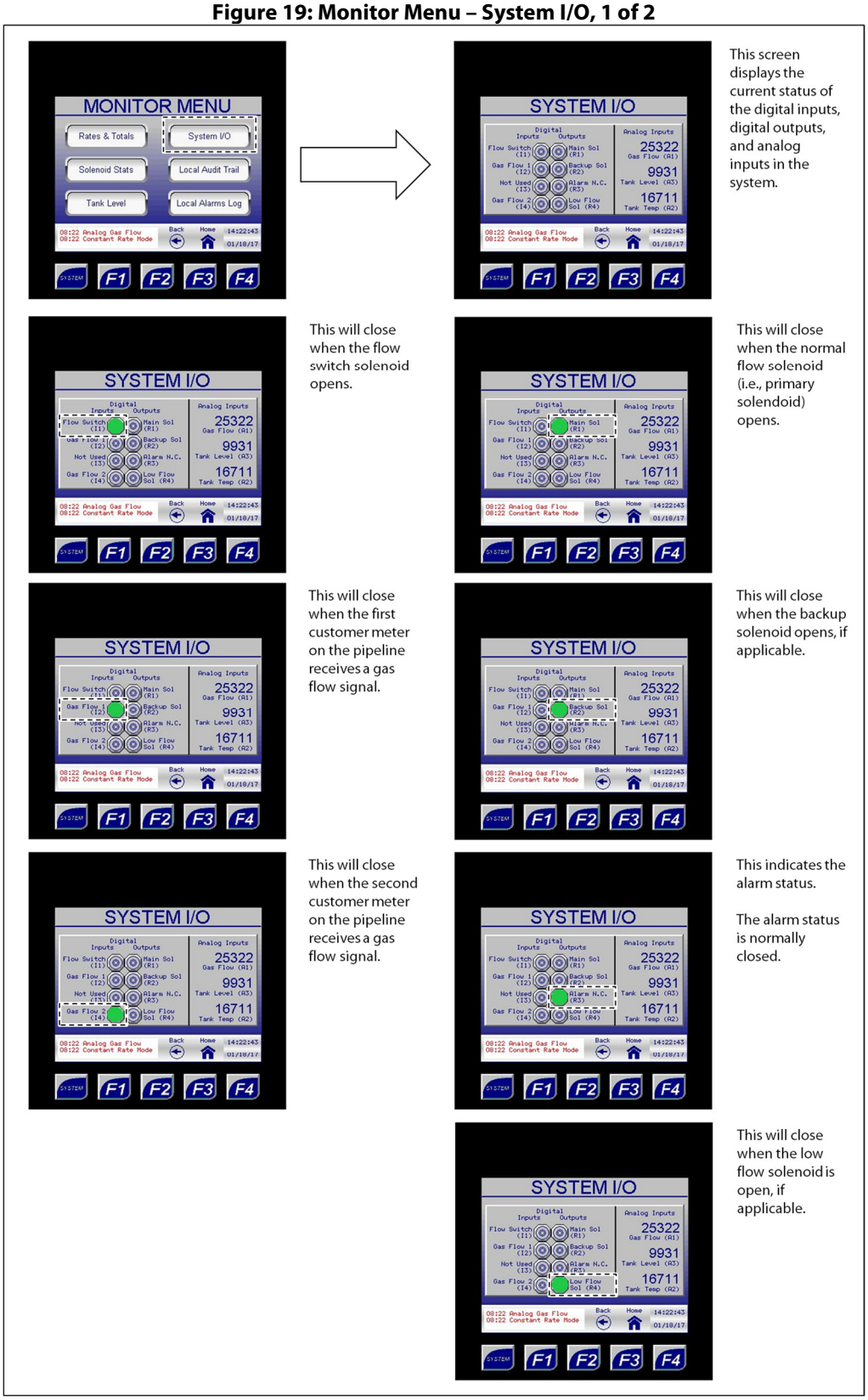
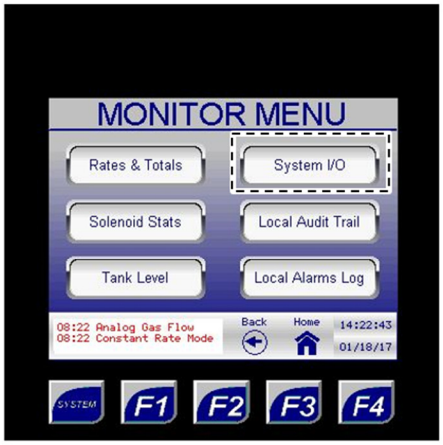
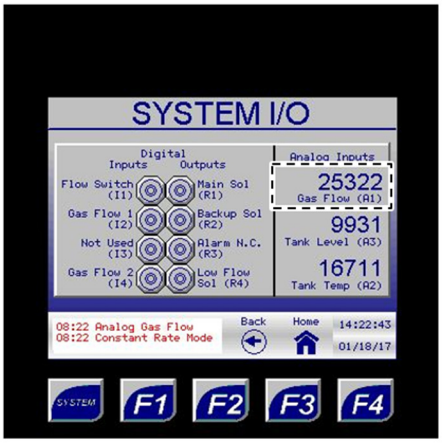


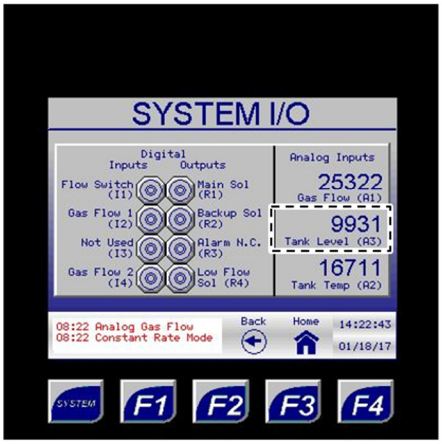
Figure 20: Monitor Menu – System I/O, 2 of 2



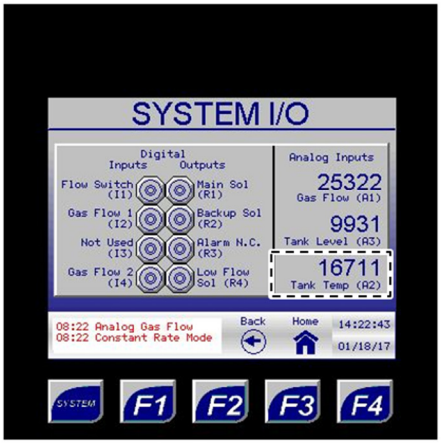


This analog signal is the raw count coming into the odorizer after the signal has been converted from milliamps. This value will vary according to the output from the customer gas flow meter.

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



This analog signal is the raw count coming into the odorizer after the signal has been converted from milliamps. This value will vary according to the output from the level transmitter.



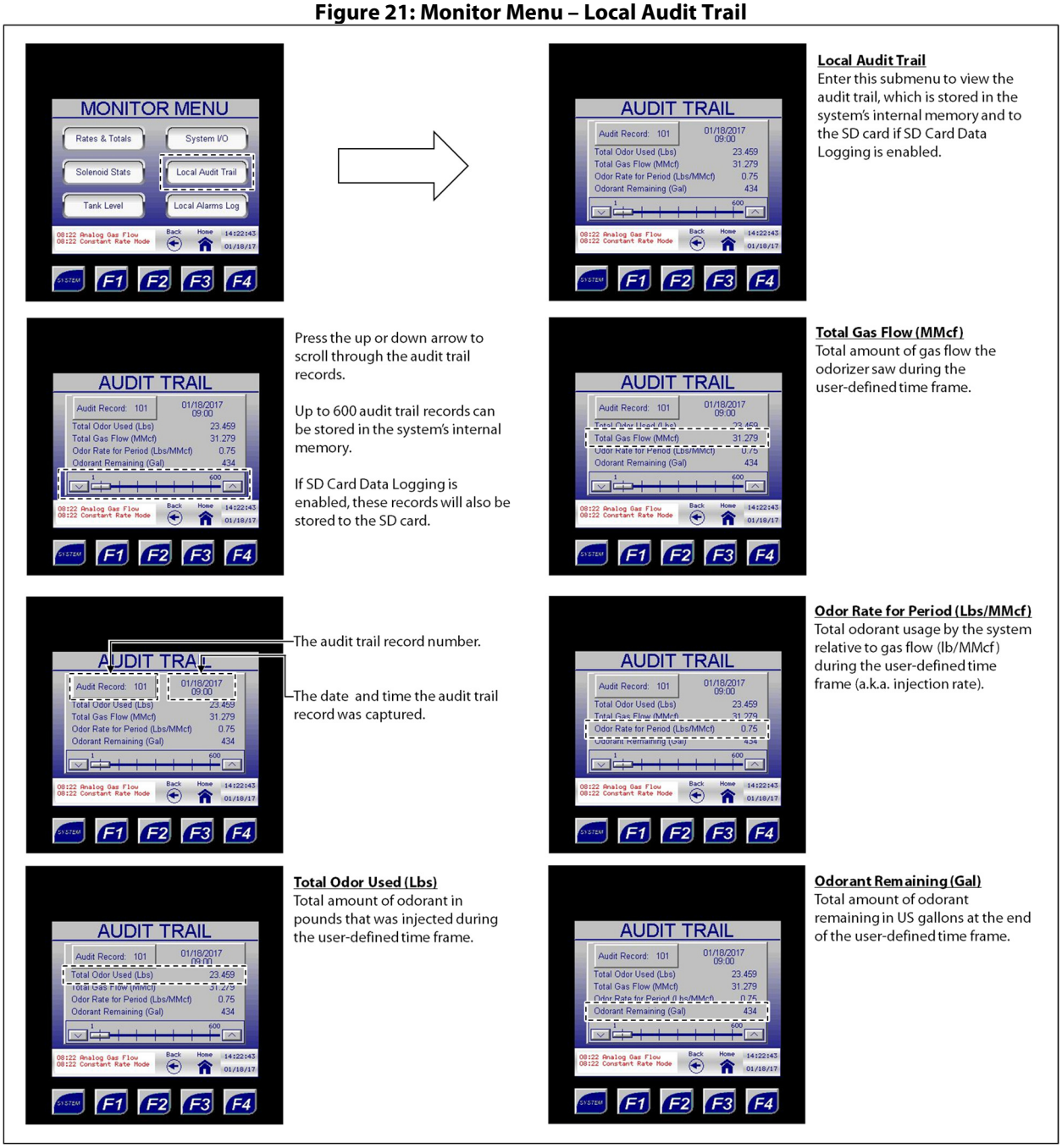
This analog signal is the raw count coming into the odorizer after the RTD signal has been converted from milliamps. This value will vary according to the output from the RTD, if one is used.

Local Audit Trail

From the Local Audit Trail submenu, the user can access the audit trail 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 21: Monitor Menu – Local Audit Trail

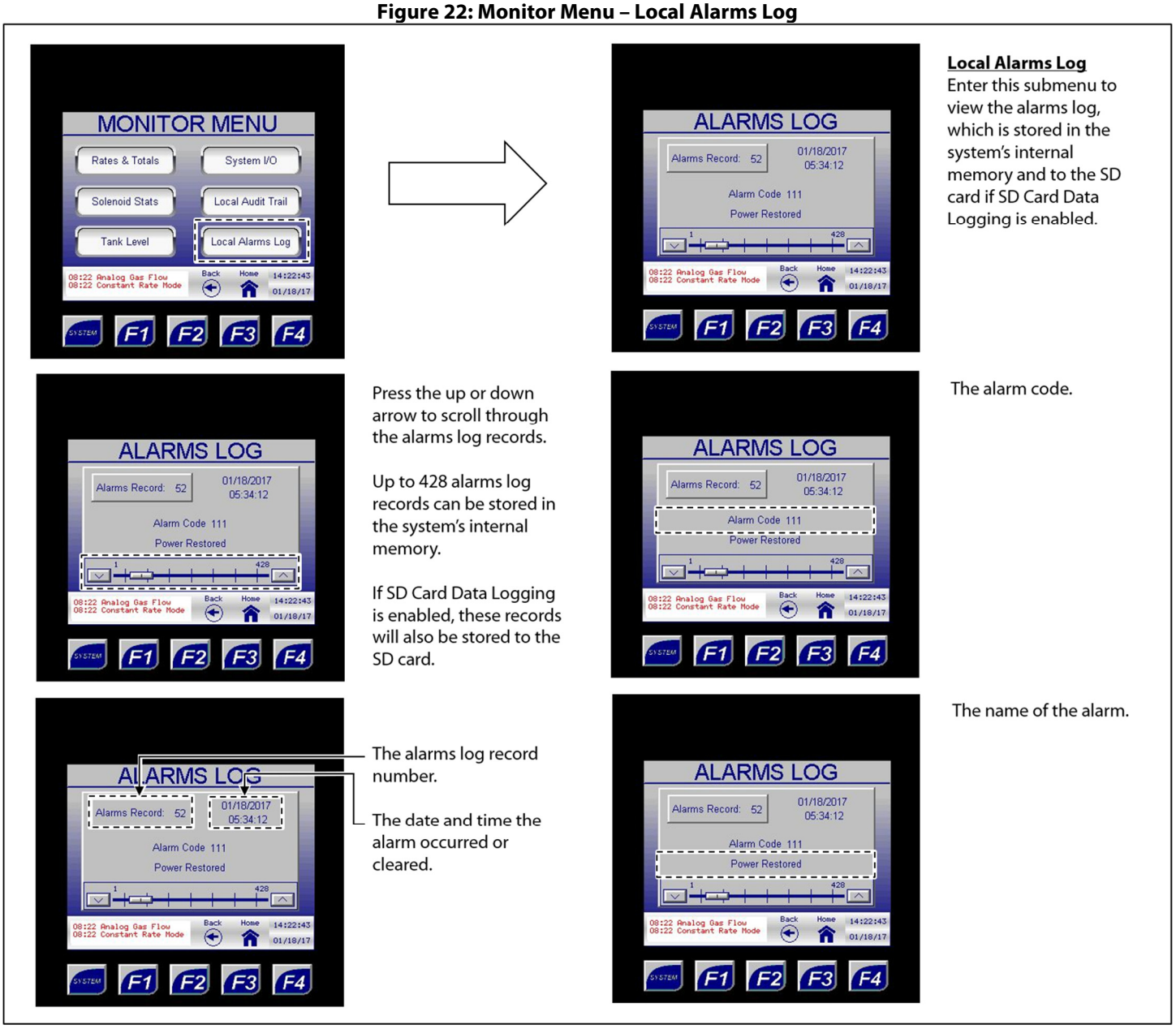


Local Alarms Log

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

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

Figure 22: Monitor Menu – Local Alarms Log

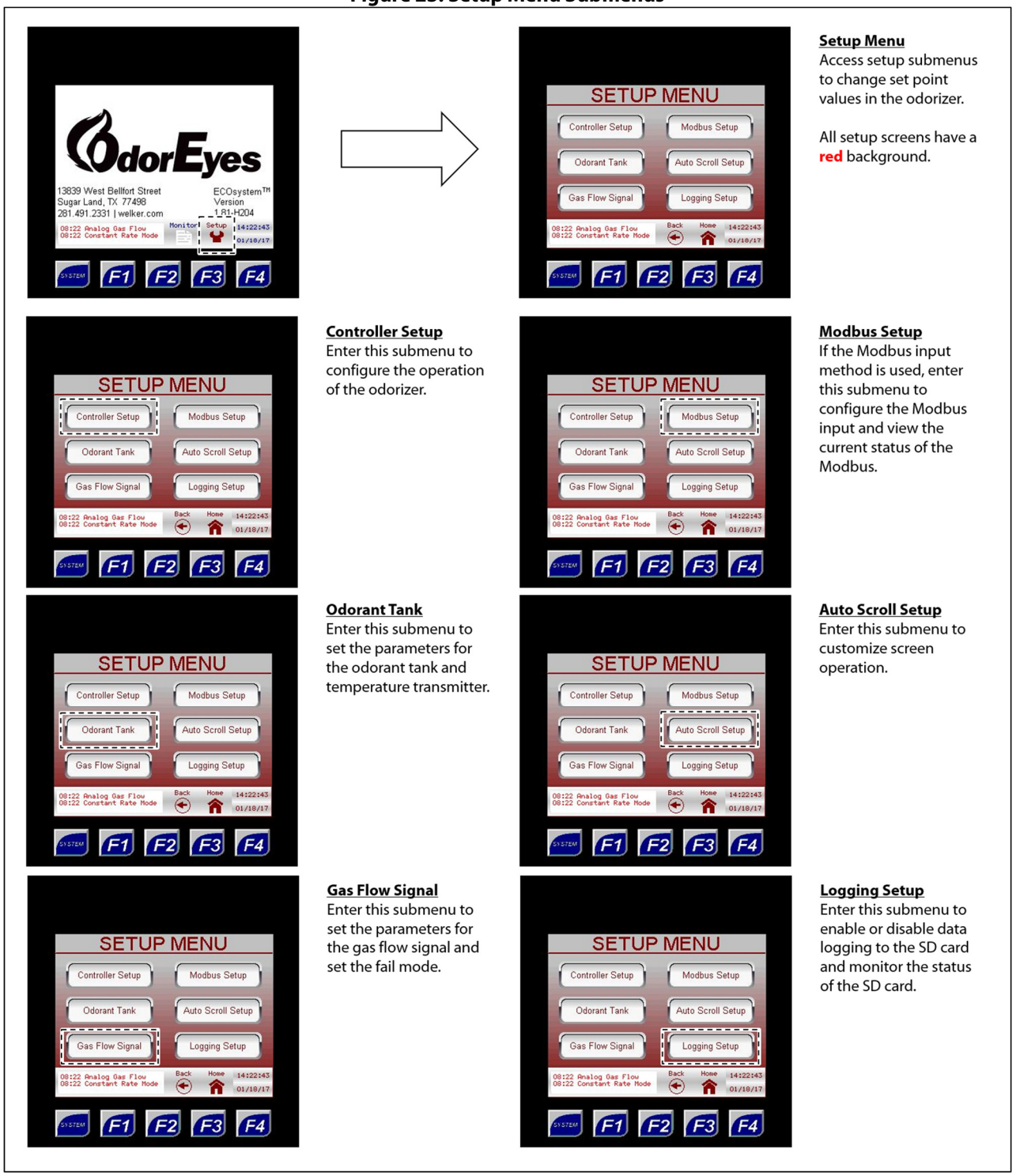


3.3 Navigating the Setup Menus

Through the Setup menu, the user can access the Controller Setup, Odorant Tank, Gas Flow Signal, Modbus Setup, Auto Scroll Setup, and Logging Setup 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 23: Setup Menu Submenus



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

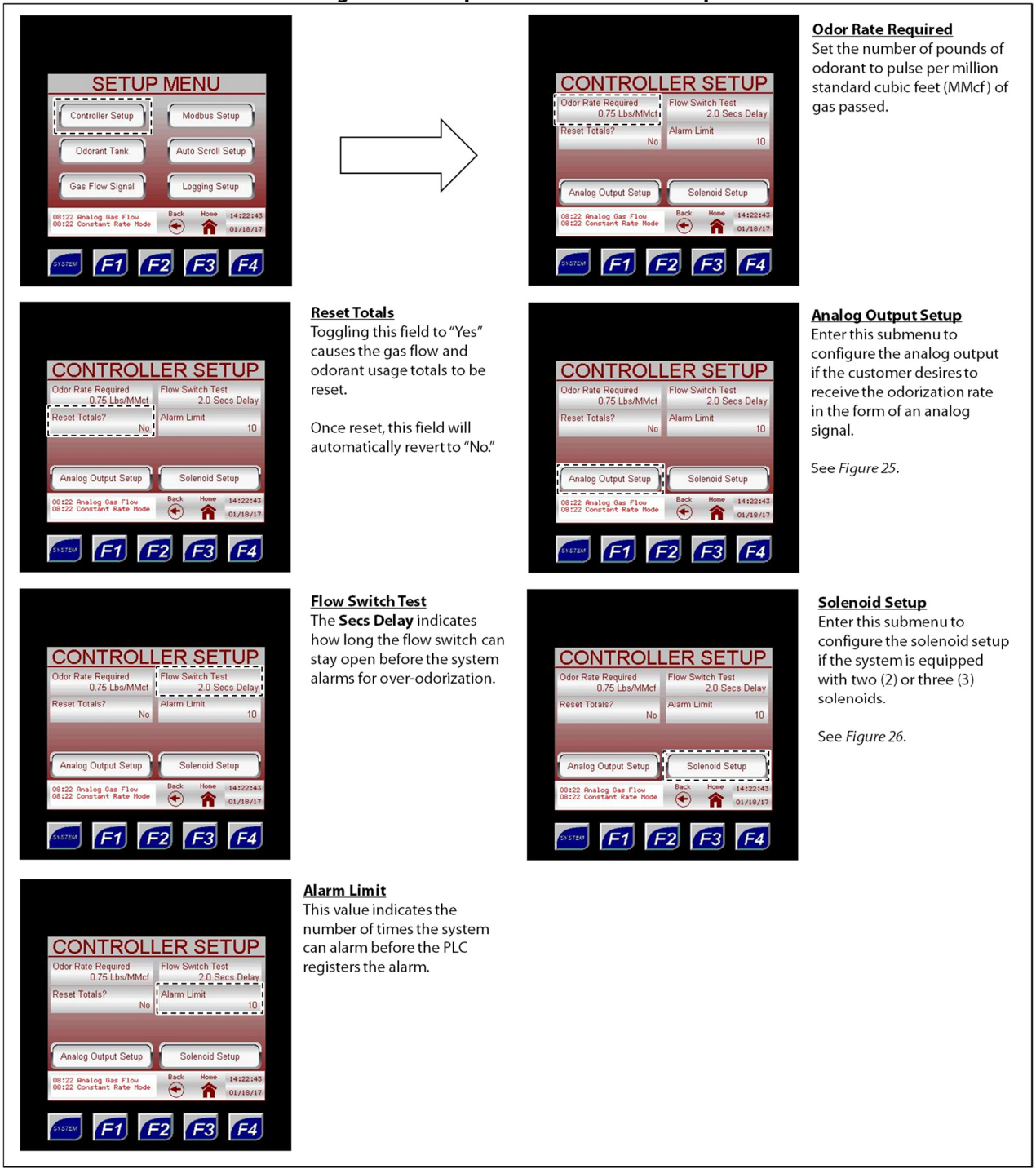
4. To change a text value, press on the value to be changed. A dropdown menu will appear on the screen.
5. Scroll through the value's options using the arrow keys in the dropdown menu.
6. Highlight the desired text value, and then press ENTER to save the changes.

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.

Controller Setup

Through the Controller Setup submenu, the user can set the general parameters for the odorizer.

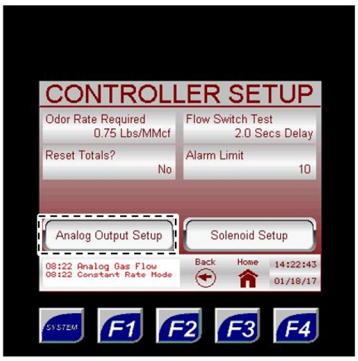
Figure 24: Setup Menu – Controller Setup

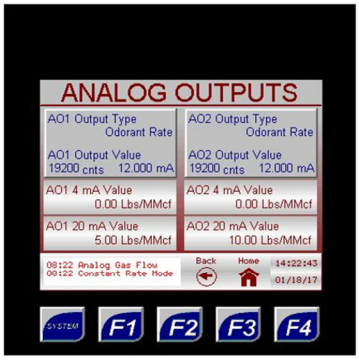


If the system status totals are used to track system performance, they should be periodically reset through the Controller Setup submenu (*Figure 24*). As the total values increase, they will begin to lose accuracy and will eventually stop accumulating.

Analog Output Setup

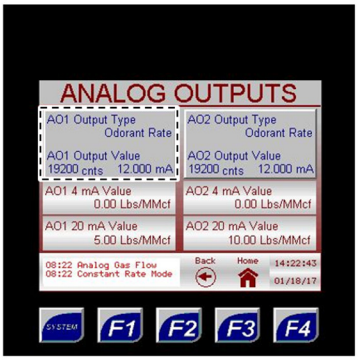
Figure 25: Controller Setup – Analog Output Setup





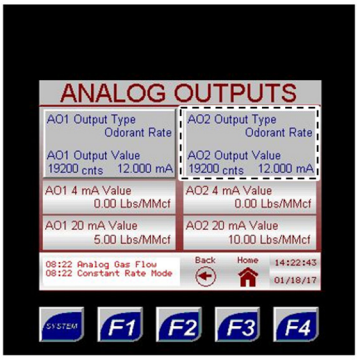
Analog Output Setup
Enter this submenu to configure the analog output if the customer desires to receive the odorization rate in the form of an analog signal.

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



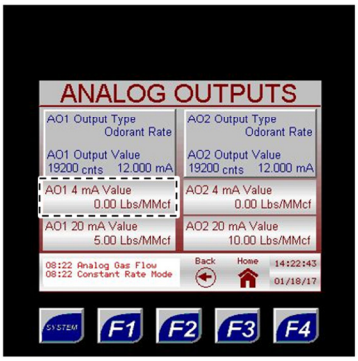
AO1 Output Type
The analog output signal to the first receiver.

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



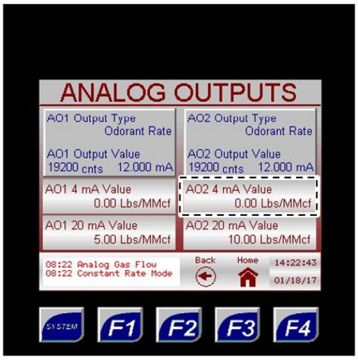
AO2 Output Type
The analog output signal to the optional second receiver.

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



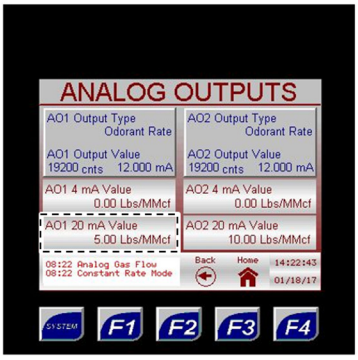
AO1 4 mA Value
Touch to configure the 4 mA signal for the analog output.

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

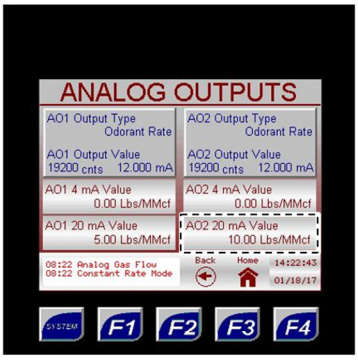


AO2 4 mA Value
Touch to configure the 4 mA signal for the analog output.

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.

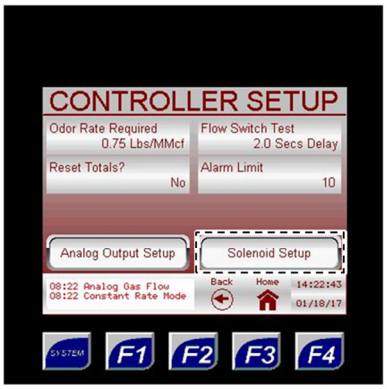


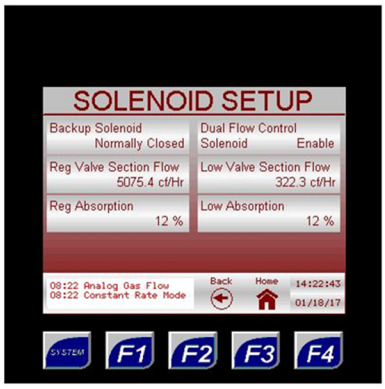
AO2 20 mA Value
Touch to configure the 20 mA signal for the analog output.

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

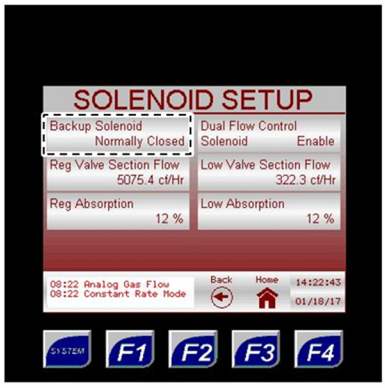
Solenoid Setup

Figure 26: Controller Setup – Solenoid Setup



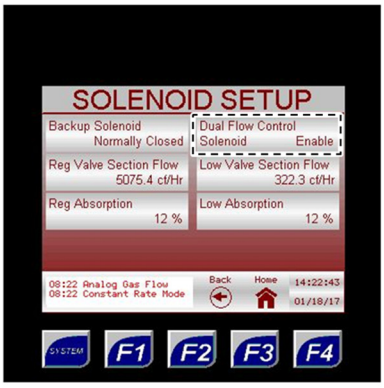


Solenoid Setup
Enter this submenu to configure the solenoid setup if the system is equipped with two (2) or three (3) solenoids.



Backup Solenoid
For systems that use a backup solenoid in series with the primary solenoid, the backup solenoid can be normally open or normally closed.

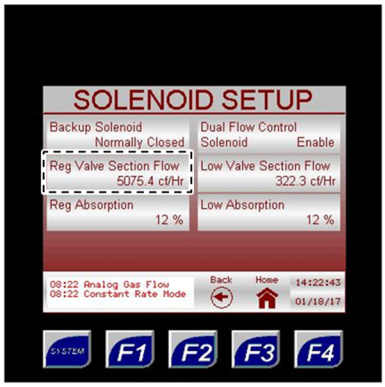
This must be set correctly so that the system will operate properly in the event of primary solenoid failure.



Dual Flow Control Solenoid
For dual solenoid systems, this should be **disabled**.

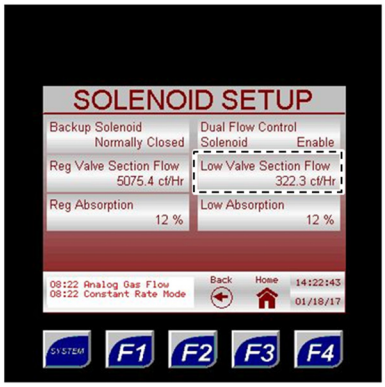
For triple solenoid systems, this should be **enabled**.

This is set at the factory.

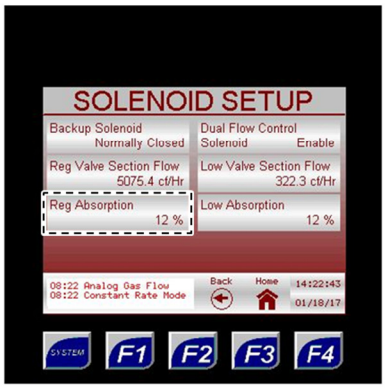


Reg Valve Section Flow
This constant, which is based on the inlet pressure and the pressure drop across the solenoid, is the volume of gas (cf/h) used by the control logic for calculations.

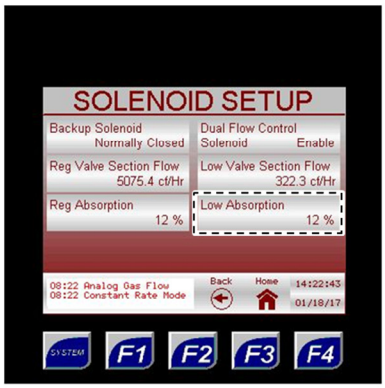
This value is factory-set according to customer specifications and should not be changed unless instructed by Welker OdorEyes personnel.



Low Valve Section Flow
This value is factory-set according to customer specifications and should not be changed unless instructed by Welker OdorEyes personnel.



Reg Absorption
This value is factory-set according to customer specifications and should not be changed unless instructed by Welker OdorEyes personnel.

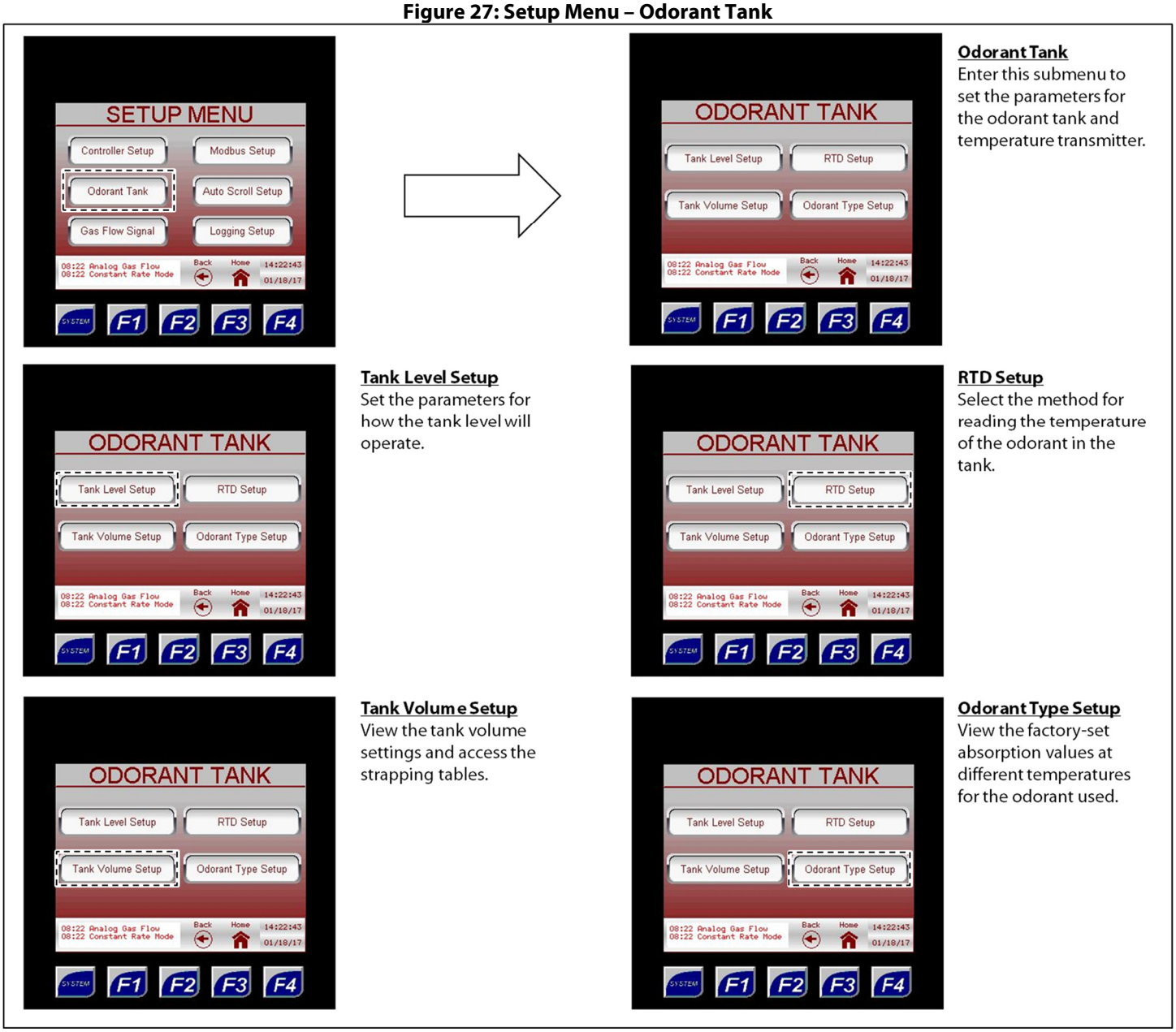


Low Absorption
This value is factory-set according to customer specifications and should not be changed unless instructed by Welker OdorEyes personnel.

Odorant Tank Setup

Through the Odorant Tank Setup submenus, the user can input information for the odorant tank and temperature transmitter.

Figure 27: Setup Menu – Odorant Tank



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

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

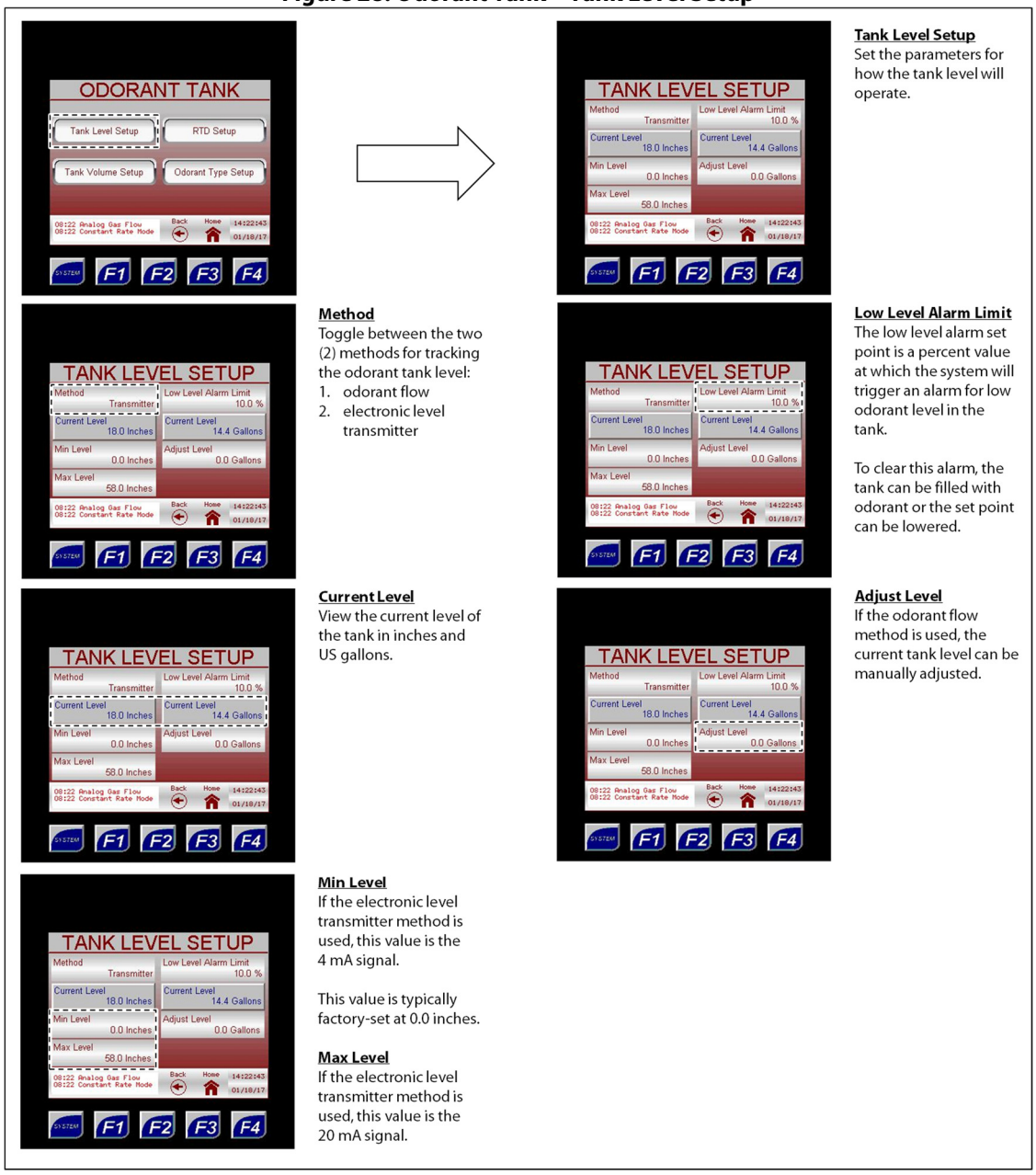
RTD Setup
Select the method for reading the temperature of the odorant in the tank.

Tank Volume Setup
View the tank volume settings and access the strapping tables.

Odorant Type Setup
View the factory-set absorption values at different temperatures for the odorant used.

Tank Level Setup

Figure 28: Odorant Tank – Tank Level Setup



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.

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

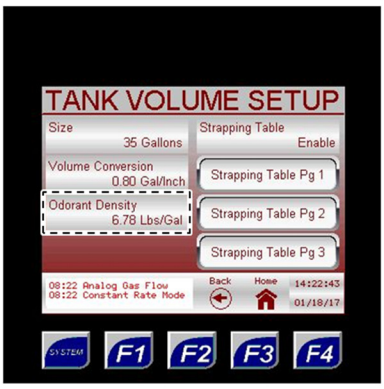
- To decrease the Current Level, enter the volume to be subtracted from the current level as a negative number in the Adjust Level field, and then press ENTER to save the changes. The Current Level should have decreased by the amount entered, and the Adjust Level should have reverted to 0.0.
- To increase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

Tank Volume Setup

Figure 29: Odorant Tank – Tank Volume Setup

Tank Volume Setup
Set the parameters for the tank volume.

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.

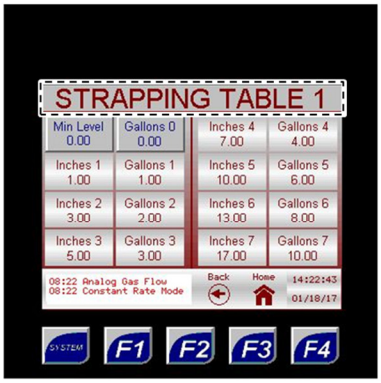
Volume Conversion
This value is the volume of liquid odorant per inch. This is used only with vertical odorant tanks.

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**.

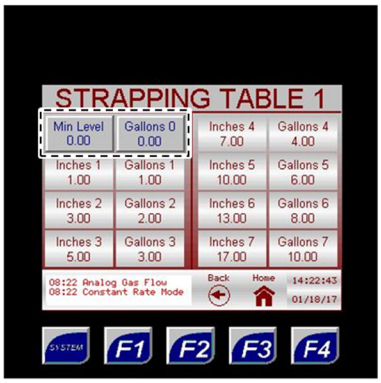
Strapping Table Pg 1, 2, 3
If strapping is enabled, view the tank depth and tank volume for each strapping point. See *Figure 30*.

Figure 30: 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.

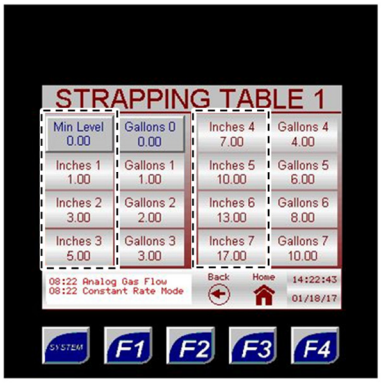


The minimum strapping point for the tank is displayed on page 1.

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.

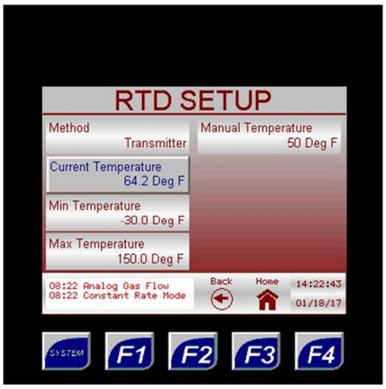
The maximum strapping point for the tank is displayed on the last page.

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

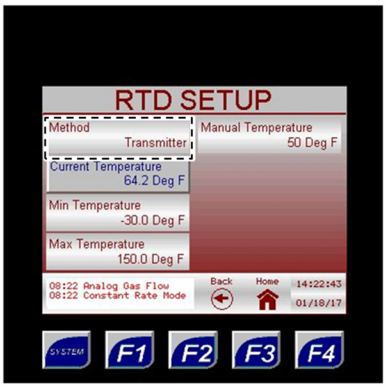
If the odorant tank is horizontal, the strapping points will be calculated and entered at the factory.

RTD Setup

Figure 31: Odorant Tank – RTD Setup

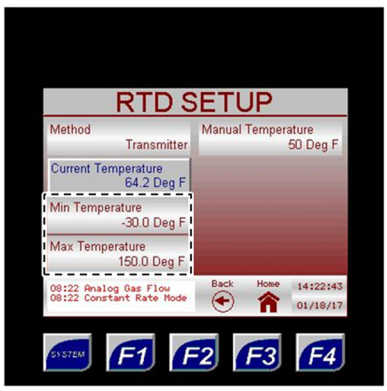


RTD Setup
Select the method for reading the temperature of the odorant in the tank.



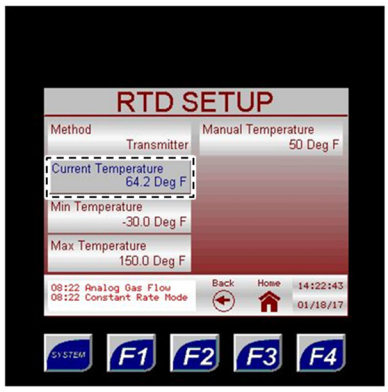
Method
Toggle between the two (2) methods for reading the temperature of the odorant in the tank:

1. manual entry
2. temperature transmitter

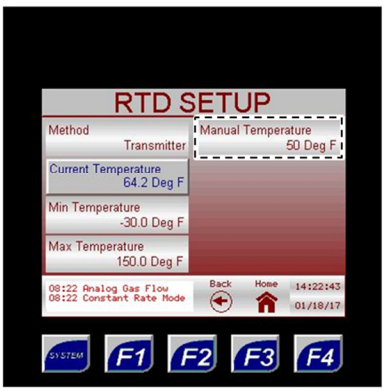


Min Temperature
If the temperature transmitter method is used, this value is the 4 mA signal.

Max Temperature
If the temperature transmitter method is used, this value is the 20 mA signal.



Current Temperature
If the temperature transmitter method is used, this is the current temperature of the odorant tank.



Manual Temperature
Manually enter the temperature of the odorant in the tank in degrees Fahrenheit.

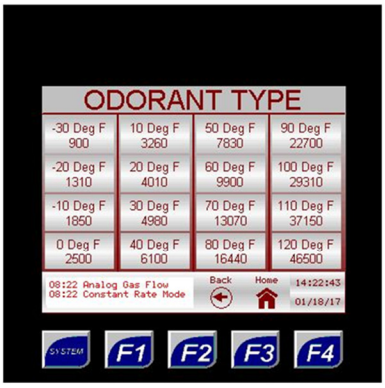
The temperature should be manually entered even if the temperature transmitter method is used, as the system will automatically switch over to manual entry in the event of signal loss from the transmitter.

When using a temperature transmitter to track the temperature in the odorant tank, the Method should be set to Transmitter. When there is no device tracking the temperature in the odorant tank, the Method should be set to Manual Entry.

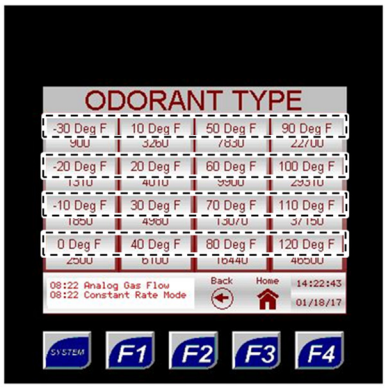
Setting an accurate manual temperature is necessary even when using a temperature transmitter. The temperature of the odorant supply tank is key to system operation; correct odorization is not possible without this value.

Odorant Type Setup

Figure 32: Odorant Tank – Odorant Type Setup

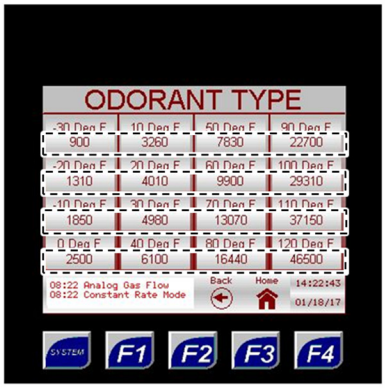


Odorant Type Setup
View the factory-set absorption values at different temperatures for the odorant used.



The first value in each cell is the temperature in degrees Fahrenheit.

The temperatures range from -30 °F to 120 °F and increase by increments of 10 °F.



The second value in each cell is the absorption value associated with the temperature in the cell.

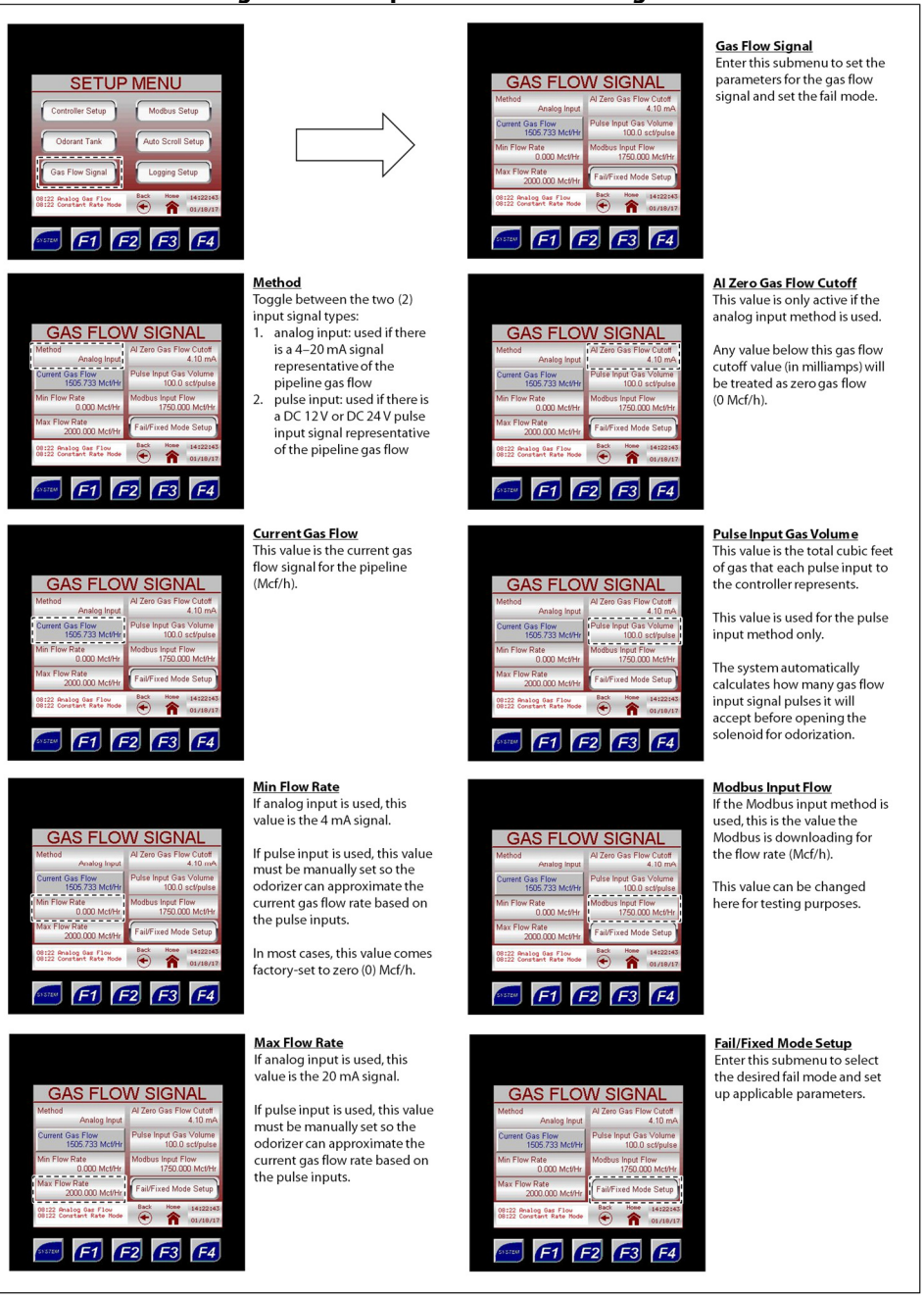
These values are factory-set based on customer specifications.

If the type of odorant used is changed, please contact Welker OdorEyes personnel for new absorption values and/or pressure regulator settings.

Gas Flow Signal

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

Figure 33: 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 between the two (2) input signal types:
1. analog input: used if there is a 4–20 mA signal representative of the pipeline gas flow
2. pulse input: used if there is a DC 12 V or DC 24 V pulse input signal representative of the pipeline gas flow

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

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

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

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

This value is used for the pulse input method only.

The system automatically calculates how many gas flow input signal pulses it will accept before opening the solenoid for odorization.

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

If pulse input is used, this value must be manually set so the odorizer can approximate the current gas flow rate based on the pulse inputs.

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

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.

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

If pulse input is used, this value must be manually set so the odorizer can approximate the current gas flow rate based on the pulse inputs.

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

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 a pulse, the pulse will be a digital pulse powered by the controller.

If the pulse input method is selected, the Pulse/Modbus Cutoff must also be set (*Figure 34*).

Fail/Fixed Mode Setup

Figure 34: 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.

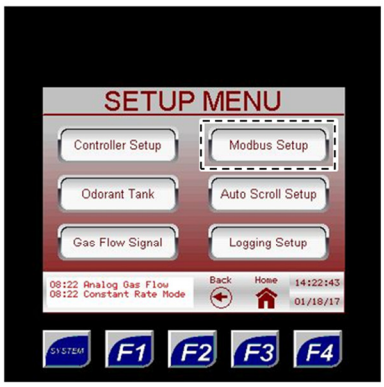
Pulse/Modbus Cutoff
If the pulse input method is used, this value is the amount of time (in seconds) the system will wait between pulse inputs before it will determine there is a gas flow signal loss and go into the set fail mode.

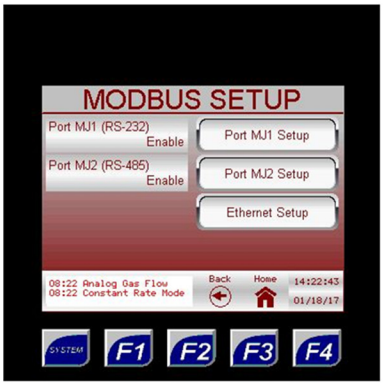
Setting the Fail Mode to Constant Rate will allow odorization to continue at the specified rate.
Setting the Fail Mode to Shutdown will halt odorization until the alarm is cleared.

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.

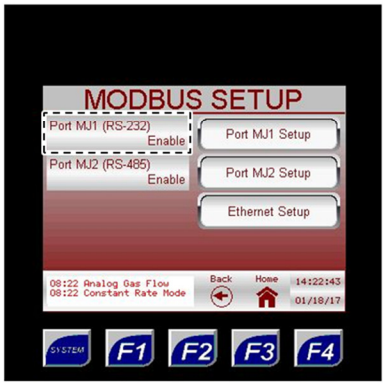
Modbus Setup

Figure 35: Setup Menu – Modbus Setup

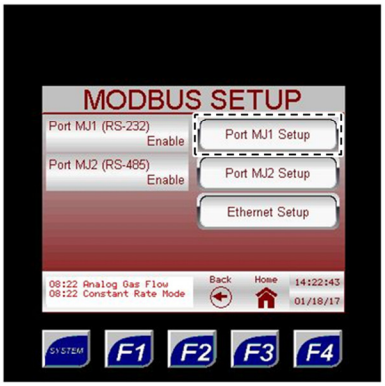




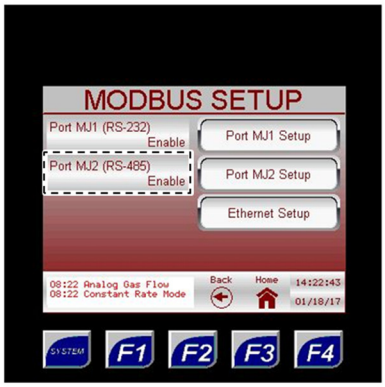
Modbus Setup
If the Modbus input method is used, enter this submenu to configure the Modbus input and view the current status of the Modbus.



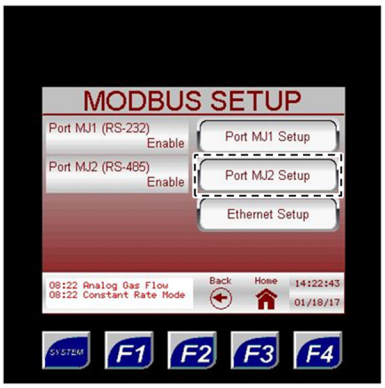
Port MJ1
When enabled, the mode of port MJ1 switches to Modbus.



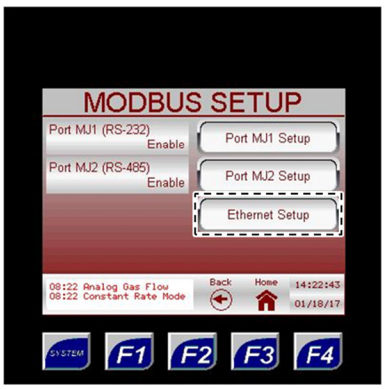
Port MJ1 Setup
Enter this submenu to configure port MJ1 and view its current status.



Port MJ2
When enabled, the mode of port MJ2 switches to Modbus.



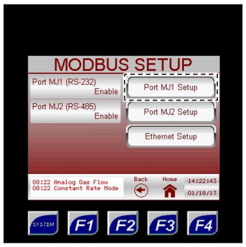
Port MJ2 Setup
Enter this submenu to configure port MJ2 and view its current status.

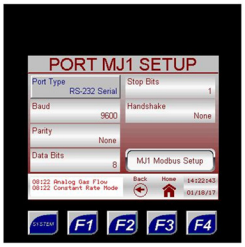


Ethernet Setup
Enter this submenu to configure the Ethernet connection and view its current status.

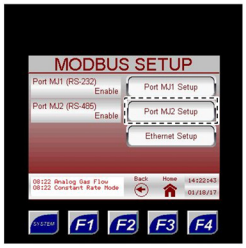
Port MJ1/MJ2 Setup

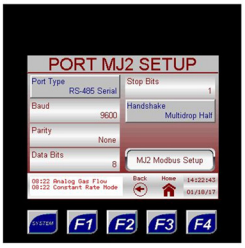
Figure 36: Modbus Setup – Port MJ1/MJ2 Setup



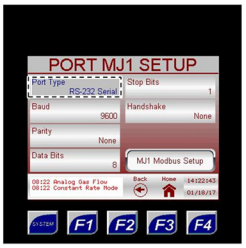


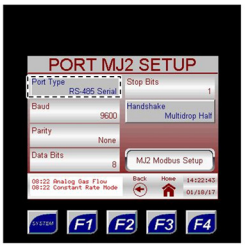
Port MJ1 Setup
Enter this submenu to configure port MJ1 and view its current status



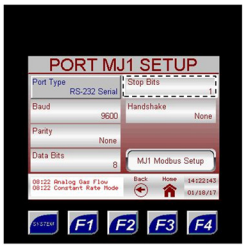


Port MJ2 Setup
Enter this submenu to configure port MJ2 and view its current status

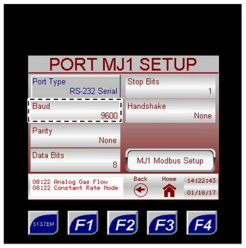


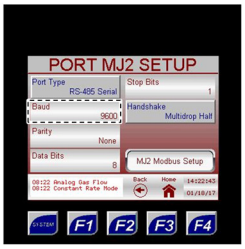


Port Type
The port type can be set to:
- RS-232
- RS-485
- Modem
- Ethernet
- Fiber A
- Fiber B
- GSM Dual
- GSM Quad
- Radio 900 MHz
- Radio Zigbee

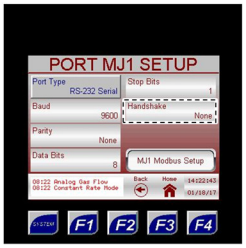


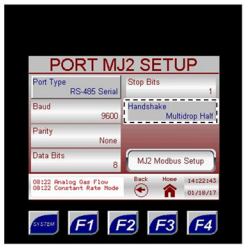
Stop Bits
This value can be set to 1 or 2.





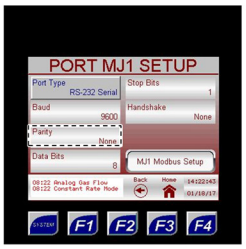
Baud
The available baud rate ranges from 300 to 115200.

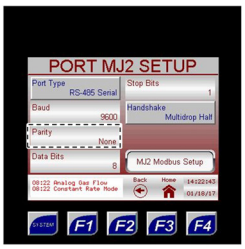




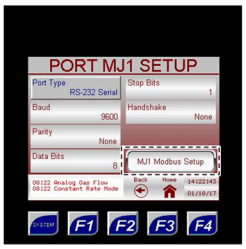
Handshake
The required handshake can depend on the Port Type and/or Protocol used.

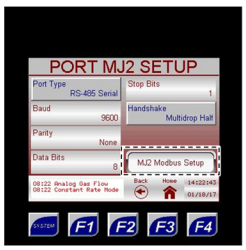
The handshake can be set to:
- None
- Xon / Xoff
- Hardware
- Multidrop Full
- Multidrop Half
- Radio Modem





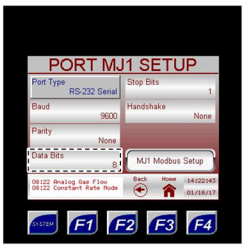
Parity
This value can be set to None, Odd, or Even.

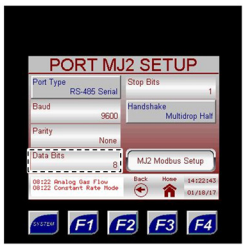




MJ1 Modbus Setup
Enter this submenu to complete configuration of port MJ1 and view its current status.

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

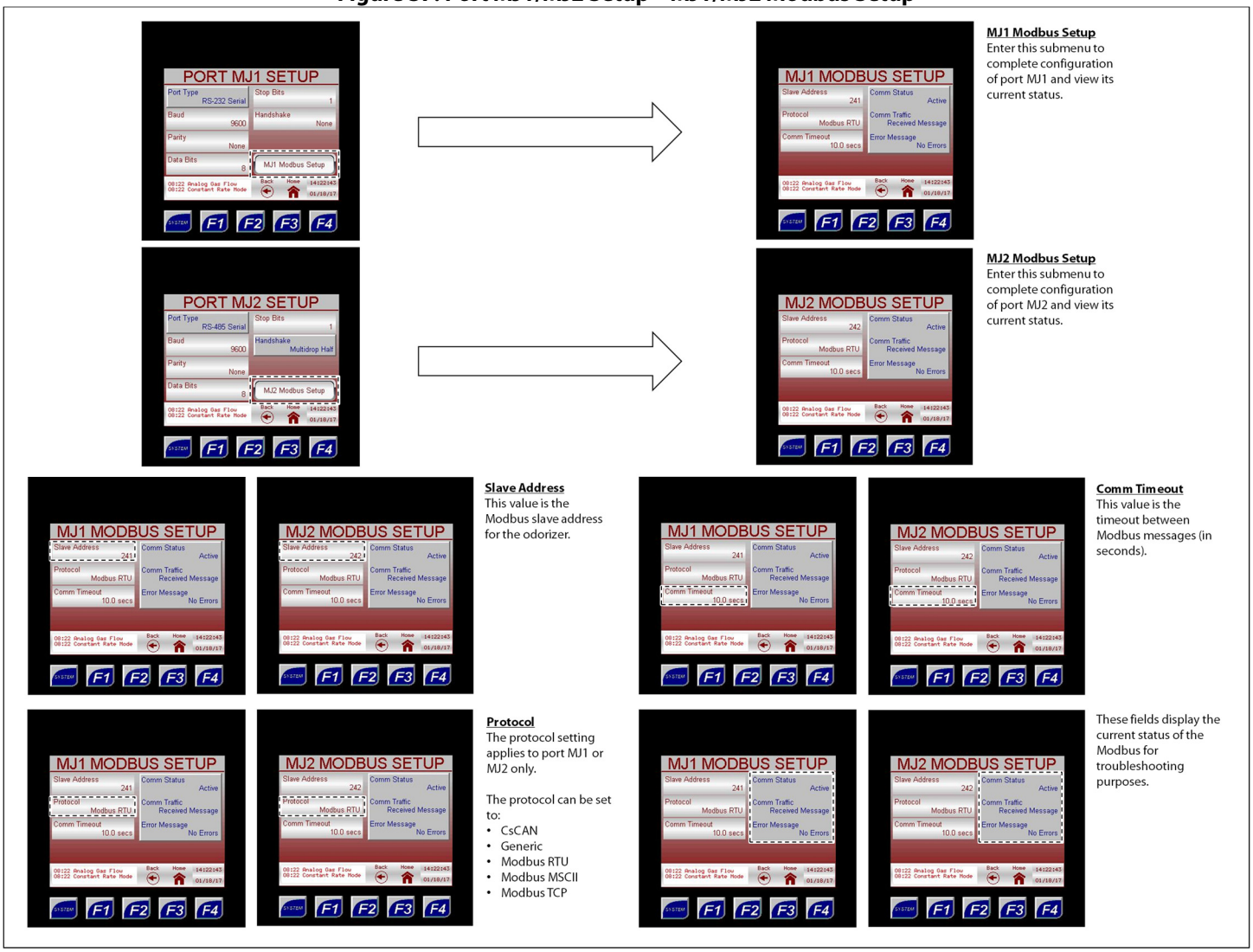




Data Bits
This value can be set to 7 or 8.

MJ1/MJ2 Modbus Setup

Figure 37: Port MJ1/MJ2 Setup – MJ1/MJ2 Modbus Setup



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.

Slave Address
This value is the Modbus slave address for the odorizer.

Comm Timeout
This value is the timeout between Modbus messages (in seconds).

Protocol
The protocol setting applies to port MJ1 or MJ2 only.

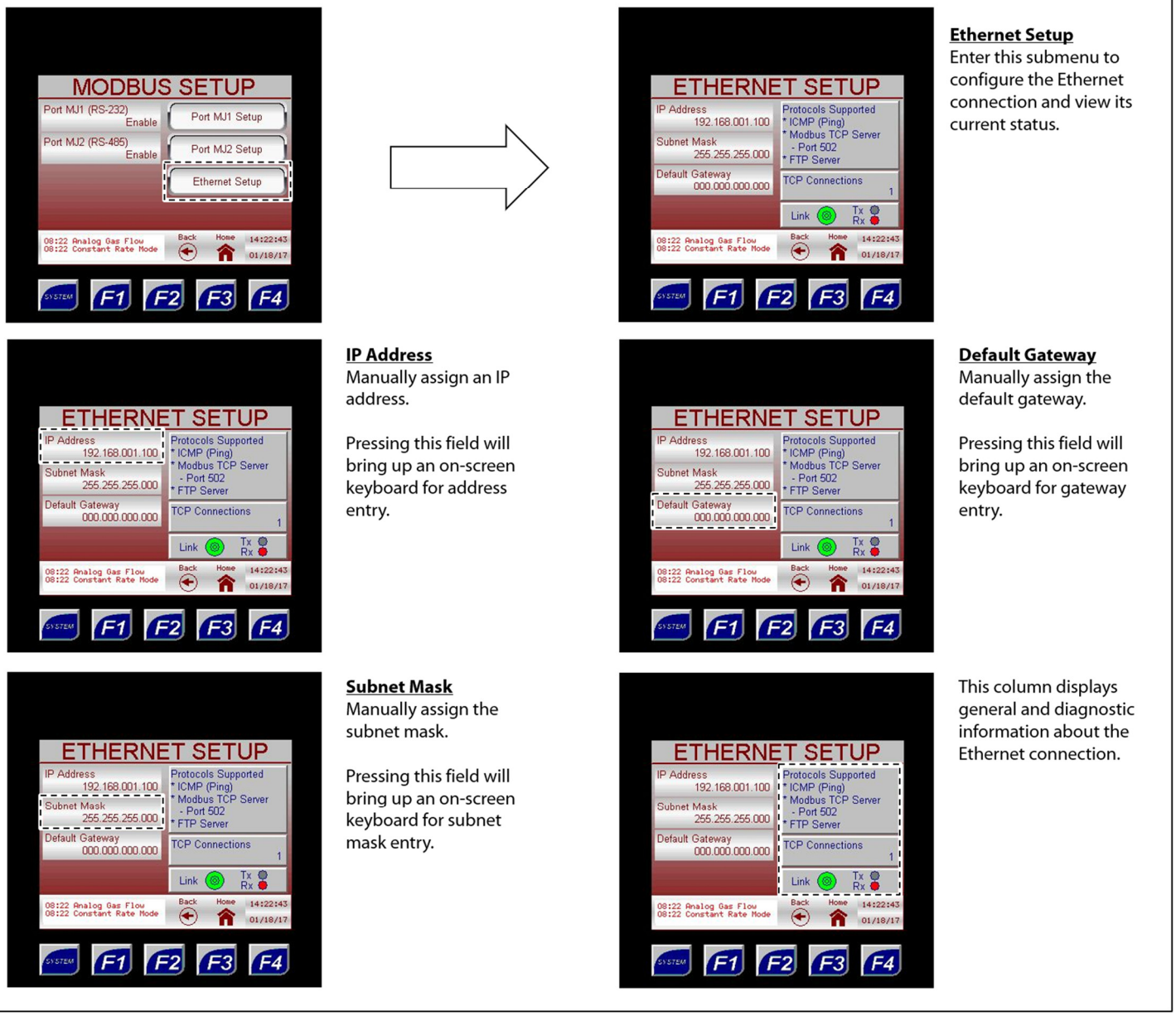
The protocol can be set to:

- CsCAN
- Generic
- Modbus RTU
- Modbus MSCII
- Modbus TCP

These fields display the current status of the Modbus for troubleshooting purposes.

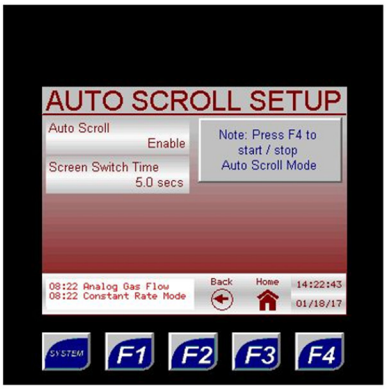
Ethernet Setup

Figure 38: Modbus Setup – Ethernet Setup

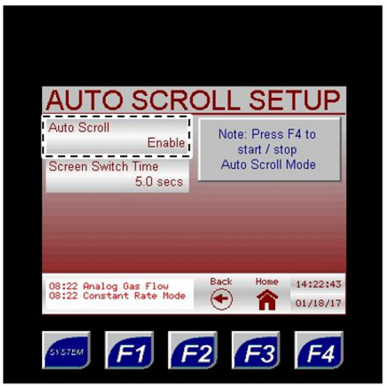


Auto Scroll Setup

Figure 39: Setup Menu – Auto Scroll Setup

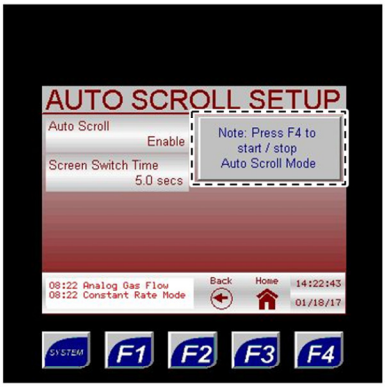


Auto Scroll Setup
Enter this submenu to customize screen operation.

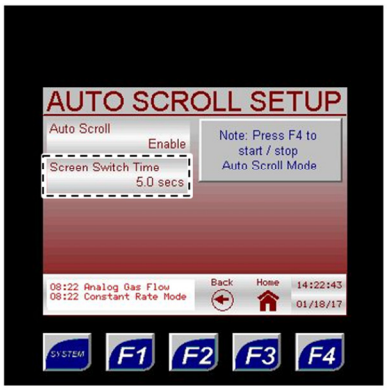


Auto Scroll
When Auto Scroll is enabled, the touch screen controller will automatically scroll through seven (7) pre-set screens.

See *Figure 40*.



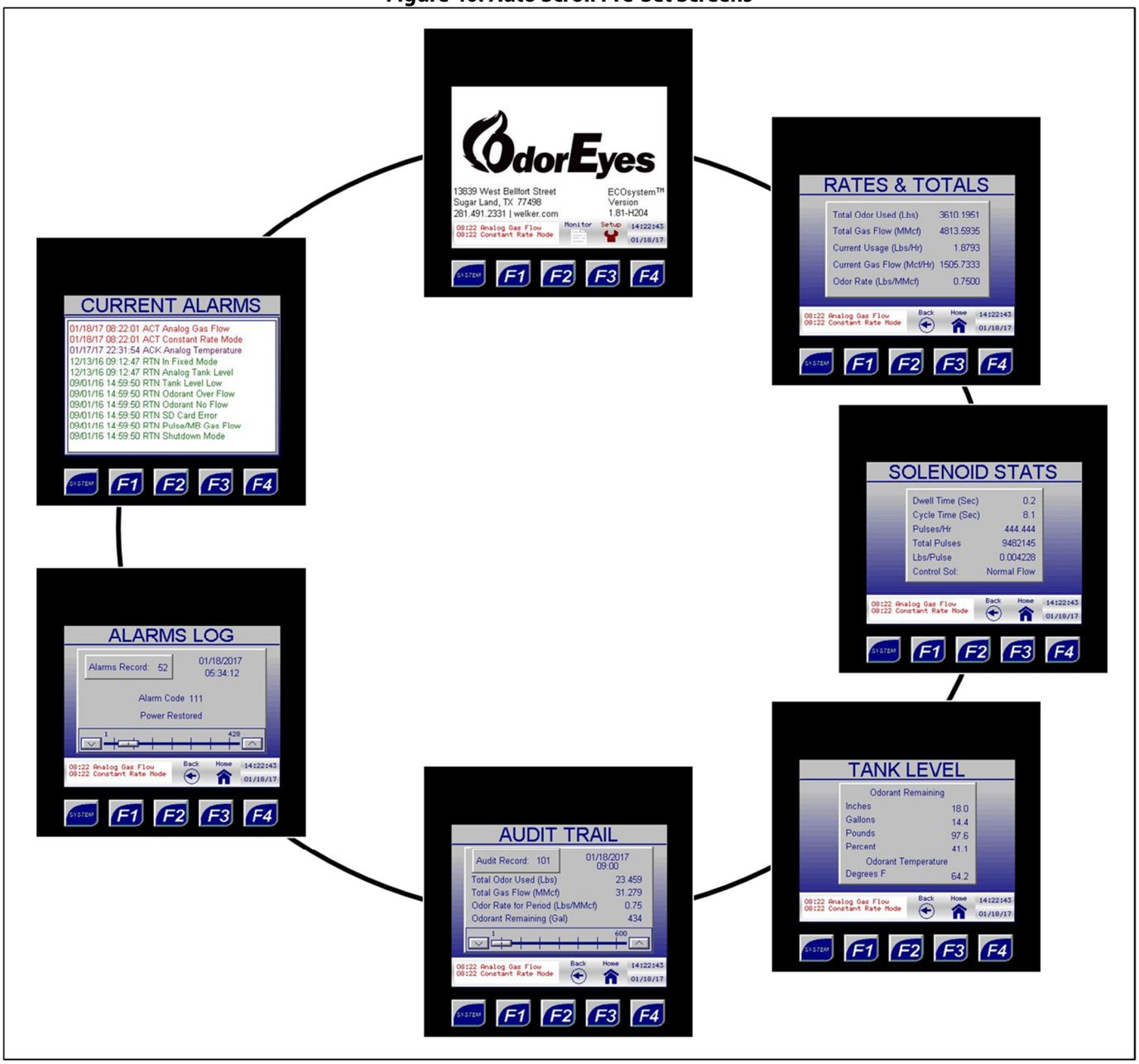
Auto Scroll can be started or stopped at any time by pressing the F4 key.



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

The Screen Switch Time can be set by the customer to the desired length of time.

Figure 40: Auto Scroll Pre-Set Screens

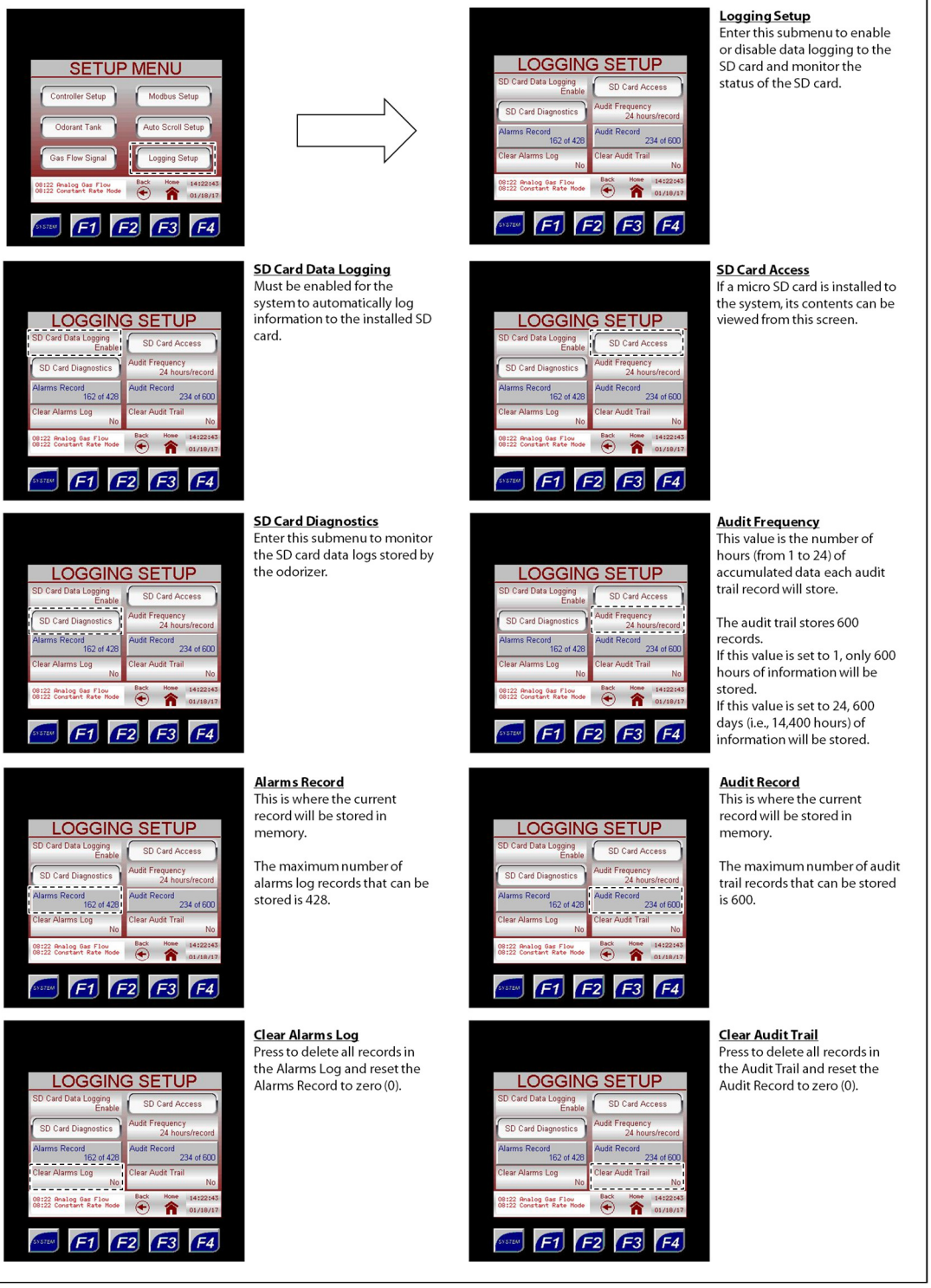


Logging Setup

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

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

Figure 41: Setup Menu – Logging Setup



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

SD Card Data Logging
Must be enabled for the system to automatically log information to the installed SD card.

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

SD Card Diagnostics
Enter this submenu to monitor the SD card data logs stored by the odorizer.

Audit Frequency
This value is the number of hours (from 1 to 24) of accumulated data each audit trail record will store.

The audit trail stores 600 records.
If this value is set to 1, only 600 hours of information will be stored.
If this value is set to 24, 600 days (i.e., 14,400 hours) of information will be stored.

Alarms Record
This is where the current record will be stored in memory.

The maximum number of alarms log records that can be stored is 428.

Audit Record
This is where the current record will be stored in memory.

The maximum number of audit trail records that can be stored is 600.

Clear Alarms Log
Press to delete all records in the Alarms Log and reset the Alarms Record to zero (0).

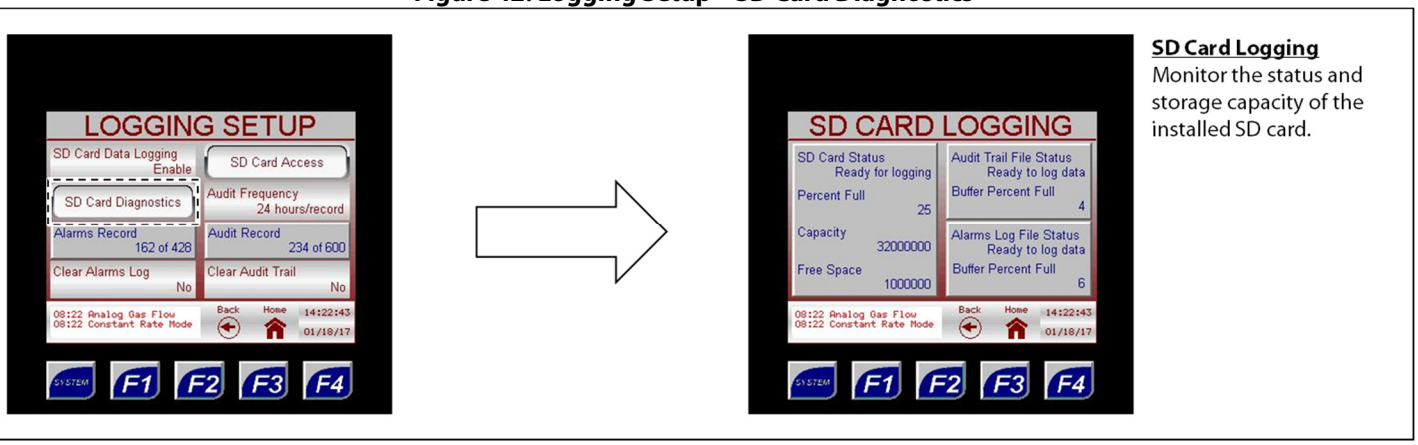
Clear Audit Trail
Press to delete all records in the Audit Trail and reset the Audit Record to zero (0).

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 through the Logging Setup submenu (*Figure 41*).

SD Card Diagnostics

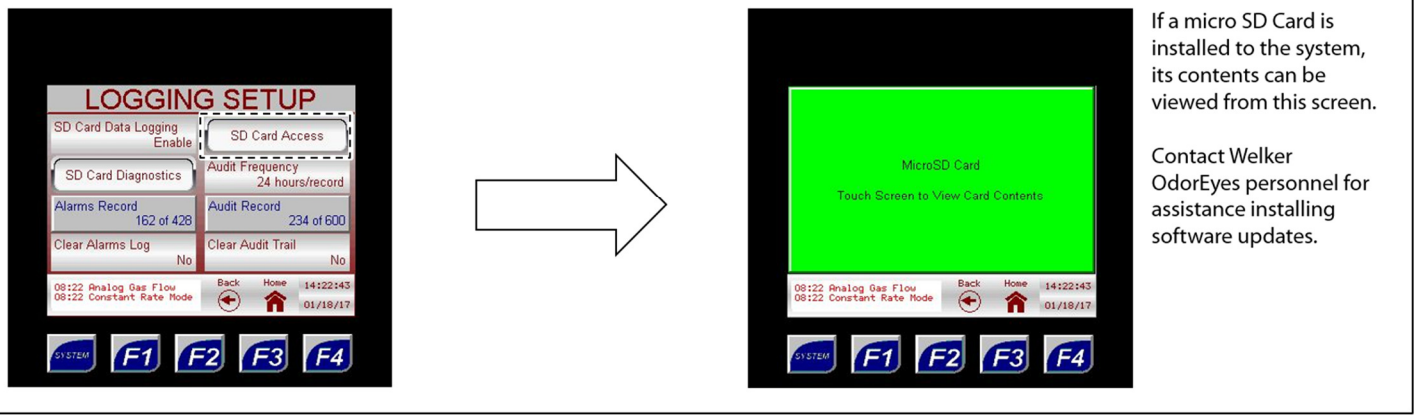
Figure 42: Logging Setup – SD Card Diagnostics



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

SD Card Access

Figure 43: Logging Setup – SD Card Access



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

Contact Welker OdorEyes personnel for assistance installing software updates.

SECTION 4: MAINTENANCE

4.1 Before You Begin

1. **Refer to *Appendix B, Maintenance Schedule*, for the itemized Welker recommended maintenance schedule for the ECOsystem™.**
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 operation, monitor the system for leaks. If leaks are present, halt operation and repair as necessary.
2. 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.

Prior to closing odorized gas outlet valves K1 and K2 and/or the pipeline isolation valve, the ECOsystem™ must be powered down. This is to prevent the odorant supply tank from building pressure.

    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*.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

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

- IOM-025: Welker IR-1, IR-2, IR-4, and IR-6 Instrument Regulators
- IOM-033: Welker RV-1, RV-2, RV-2CP, and RV-3 Relief Valves
- IOM-105: Welker NV-1 and NV-2 Instrument Valves
- IOM-169: Welker F-5 Filter Dryer

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

- ABB Inc. K-TEK Products AT200 Magnetostrictive Level Transmitter (Welker IOM-V011)
- ASCO, L.P. 0.55 W Low Power Solenoid Valves Low Power Series (Welker IOM-V267)
- ASCO, L.P. 1.4 W Low Power Solenoid Valves Low Power Series (Welker IOM-V266)
- ASCO, L.P. General Service Solenoid Valves Series 8314 (Welker IOM-V121)
- ASCO, L.P. High Pressure Solenoid Valves Series 8223 (Welker IOM-V103)
- CCI Thermal Technologies Inc. Cata-Dyne™ Explosion-Proof Gas Catalytic Heaters WX Series (Welker IOM-V030)
- Emerson Process Management Regulator Technologies, Inc. Fisher™ 1301 Series High-Pressure Regulators Types 1301F and 1301G (Welker IOM-V107)
- Gems Sensors Inc. Piston-Type Flow Switches Series FS-925/926 & FS-927/930 (Welker IOM-V029)
- GE Oil & Gas Mooney Series 20/20S/20H/20HS Pilot Regulators (Welker IOM-V101)
- 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)
- MTS Systems Corporation Level Plus® Liquid-Level Sensors With Temposonics® Technology M-Series Model MR Analog Transmitter (Welker IOM-V036)
- Power-Sonic Corporation PS-1270 12 Volt 7.0 AH Rechargeable Sealed Lead Acid Battery (Welker IOM-V223)
- PR electronics 5333D 2-Wire Programmable Transmitter (Welker IOM-V270)
- PR electronics PRetop 5331B 2-Wire Programmable Transmitter (Welker IOM-V269)
- Quest-Tec Solutions Magne-Trac™ Level Indicators (Welker IOM-V367)
- Saginaw Control & Engineering EL Enclosure SCE-30EL3012LP (Welker IOM-V265)
- Solutions With Innovation L505 Visual Level Indicator Dip-Tape Visual Level Indicator (Welker IOM-V037)
- Swagelok Company Check Valves C, CA, CH, CP, and CPA Series (Welker IOM-V076)
- 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)
- Swagelok Company Proportional Relief Valves R Series (Welker IOM-V086)
- 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: OE153VS (Single Solenoid Valve Section, ⅜" Tubing)
- System Drawing: OE180VS.1 (Dual Solenoid Valve Section, ⅜" Tubing)
- System Drawing: OE181VS (Dual Solenoid Valve Section, ¼" Tubing)
- System Drawing: OE181VS.3E (Dual Solenoid Valve Section With Optional Heater, ¼" Tubing)
- System Drawing: OE183VS.1E (Dual Solenoid Valve Section With Optional Heater, ⅜" Tubing)
- System Drawing: OE190VS (Single Solenoid Valve Section, ¼" Tubing)
- System Drawing: OE220VS.1E (Triple Solenoid Valve Section, ¼" and ⅜" Tubing)

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: ECOsystem™ Maintenance Schedule

Action	Weekly	Every 12 Months	As Necessary
If applicable, confirm proper functioning of the heater.	X		
Open F-5 drain valve G to allow moisture to drain from the filter.	X		
Verify the pneumatic supply pressure.		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 tubing, valves, and fittings on the system for leaks.			X
Replace the controller battery.			X
Maintain the flow switch.			X
Maintain the regulator.			X
Maintain the relief valve.			X
Maintain the solenoid(s).			X

NOTES

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