TYPE DOSAODOR-D SOFTWARE FOR CONFIGURATION OF TYPE DOSAODOR-D ODORANT INJECTION SYSTEM

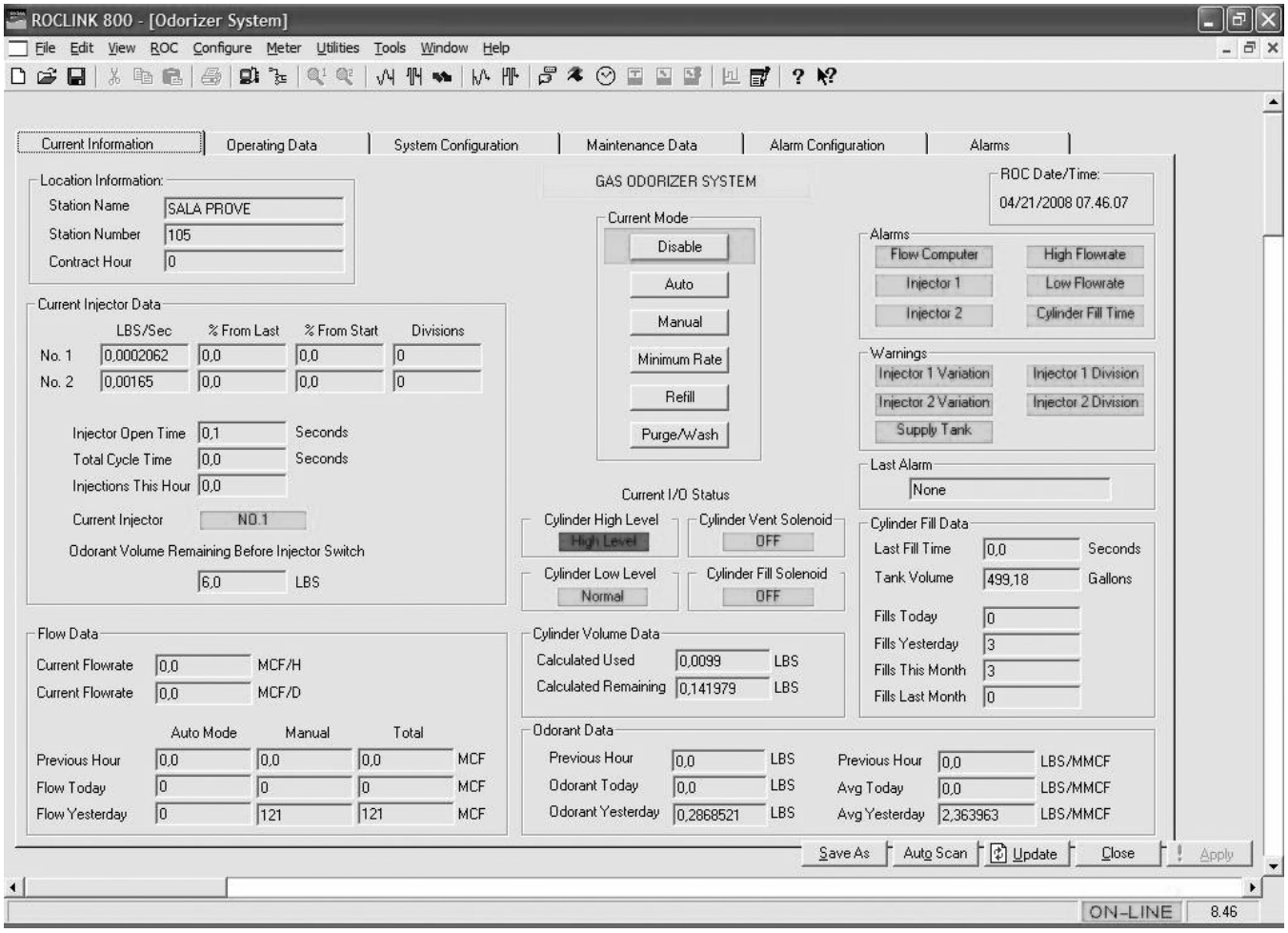


Figure 1. *ROCLINK 800 Odorizer System Software*

INDEX: General Overview

Introduction

Startup Procedure and Compilation of Work Parameters

System Configuration

Alarm Configuration

Alarms and Warnings

INDEX: Maintenance

Maintenance Data

Operation

Current Information

Operating Data

INDEX: **Hardware Configuration**

Modbus

General Overview

General Description

The Type Dosaodor-D is a computerized natural gas odorization system that injects odorant proportional to the flow rate of the gas in transit. The system operates by liquid-injection and can be installed in combination with traditional absorption-type devices.

The microprocessor based control system is operator configurable and can be interfaced with remote monitoring and control systems. The ability to collect historical data regarding gas volumes, amounts of injected odorant and the relative concentration provides facility managers with objective aids to verify proper system operation.

The control system maintains the desired odorant concentration level by varying the odorant injection rate in proportion to the gas flow rate of the station, even when there are significant variations in the flow rate. This particular feature provides a marked increase in safety regarding the distribution of natural gas for public use. By maintaining a constant level of odorant concentration in the gas flow, any leakage of gas can be identified, thereby decreasing the possibility of accidents.

The concentration ratio is ensured by the microprocessor based control unit which receives its flow input as either a digital pulse counter volume signal from a flow computer/volumetric counter or from a 4-20mA analog signal. The control unit compares the flow with the concentration level to be maintained and calculates the correct electronic signals to be transmitted to the injection device.

The electronic control unit uses a special odorant calibration cylinder to measure of the liquid that has been injected and calculates any adjustments to be made in the injection rate, thereby ensuring a marked level of reliability and overall precision of the system. This method allows the system to be self-monitoring and self-correcting.

During routine operation, in the versions that include two injection devices, the software provides the exchange from one injector to the other to ensure that the same device does not always remain idle. One injector is stopped and used as a back-up for the other.

A procedure has been designed to decontaminate the entire injection system in the unusual event of system maintenance. This Purge/Wash procedure is under the direct control of the maintenance technician using the ROCLINK 800 configuration software.

The pneumatic portion of the system operates using differential pressure created between the upstream and downstream sections of a gas reducing and metering station, or a gas compressor unit (minimum 14.5 psi / 1 bar above injection point pressure).

The high-pressure upstream gas is used as the pneumatic driving force in order to inject the odorizing liquid into the downstream pipeline.

The system does not use dosing pumps or other complex devices for the measurement of odorant flow rates. These devices still require periodical maintenance, which is a particularly difficult procedure with parts that have come into contact with the odorizing liquid.

The Type Dosaodor-D is designed to accomplish these overall objectives:

- Operational safety
- Extreme reliability
- Low maintenance
- Easy to use
- Reliability of the results - Consistent odorization throughout flow range

Equipment Description

The primary equipment consists of an electrically controlled injection panel installed in the hazardous area and interconnected by electrical cabling to a control system using the Type ROC809 Remote Operations Controller installed in the safe area.

Type Dosaodor-D

The injection panel will be designed and certified, in accordance with international standards, for installation in areas with a risk of explosion.

The entire injection panel is made of stainless steel and does not have a painted finish or screen printing due to the aggressive nature of odorizing liquids.

The control system supplies the proper power and control signals to the injection panel and, if required, must contain the safety barriers needed to comply with system installations requiring intrinsic safety.

The Type ROC809 based control system must be installed in a safe area and operates using 12 Vdc power supplied by either an AC to DC power supply or any adequate 12 Vdc power source with battery backup.

In the event of a power outage, the controller saves the programming data, by means of an on-board battery, and sends a signal to activate any emergency devices (it normally restarts operation of an absorption type backup system).

Objective

The objective of this document is to provide the operator with the necessary information to operate the user interface (also defined as HMI: Human-Machine Interface).

Figure 2. *Type ROC809 Remote Telemetry Unit*

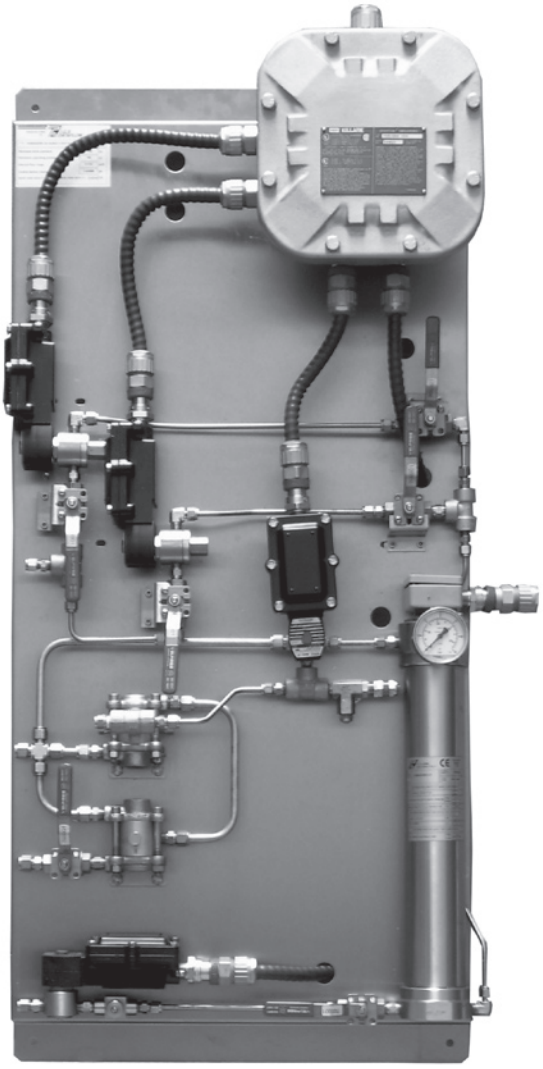


Figure 3. *Type Dosaodor-D Pneumatic Panel*

Introduction

ROCLINK 800 Configuration Software, a Windows® based program, enables complete configuration, whether local or remote, of the Type Dosaodor-D odorant system, measurement of data in real time, management of historical data, and control of alarm events. Connection is via serial port, ethernet port, or modem.

ROCLINK 800 software has an easy-to-use Windows interface. The Configuration Tree navigation interface makes accessing features quick and easy.

Drop-down menus simplify access to the software functions. Dialog boxes and drop-down list boxes facilitate direct selections and data entry. Actions can be performed with the keyboard or a mouse.

The main specifications of the ROCLINK 800 software are as follows:

- MS Windows interface
- Single configuration point for each part of the equipment
- Complete configuration for each part of the equipment
- Periodic consultation of real time data, historical data, and alarms
- Display of real time data, historical data, and alarms
- Archiving of historical data in relational database

Version Requirements for ROC800 Hardware and ROCLINK 800 Software

- ROC800 Version 2.02 or later
- ROCLINK 800 Version 1.74 or later

Minimum Software and Hardware Requirements

- Pentium®-class processor (233 MHz or greater recommended)
- CD-ROM drive
- Windows 98, ME, NT 4.0 (Service Pack 6), 2000 (Service Pack 2), or XP
- 64 MB of RAM (Random Access Memory)
- SVGA color monitor, 800 x 600 pixels, small fonts
- 15 to 75 MB of available hard disk space, depending on operating system and revision level

Installing License Key

Before install the ROCLINK 800 software please physically install the license key (hardware) on the ROC MPU board. Refer to section 2.7.1 “how to install a license key” in ROC809 Remote Operations Controller Instruction Manual (D301154X012).

Program Installation

If you are proceeding with a new installation, please follow the procedure below:

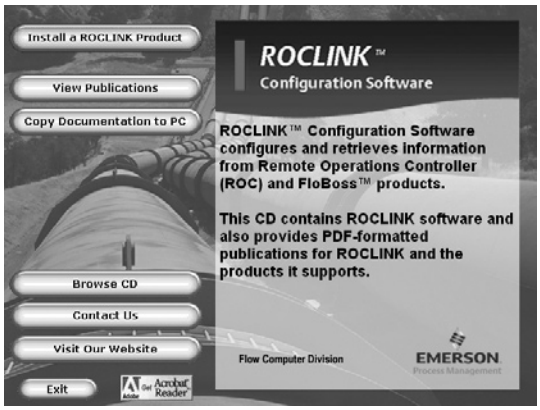


Figure 4. *ROCLINK Program Installation*

1. Insert the disk into the computer's CD-ROM Drive and it will start up automatically.

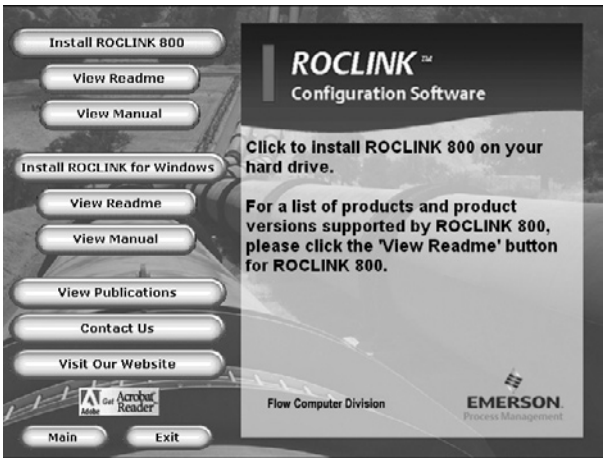


Figure 5. *ROCLINK 800 Auto Startup Interface*

2. Click "**Install a ROCLINK Product**"

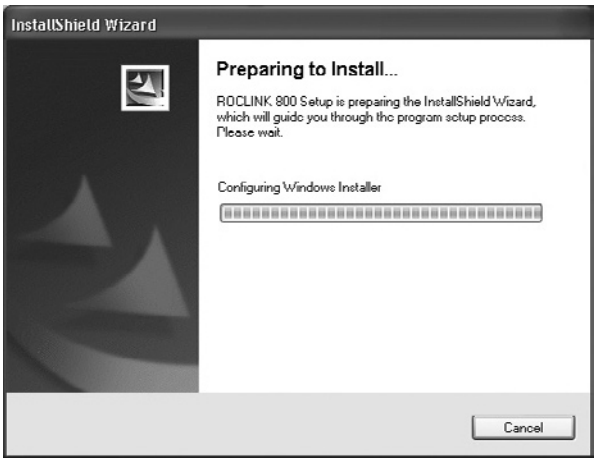


Figure 6. *ROCLINK 800 Installation In Progress*

3. Click "**Install ROCLINK 800**" and follow the setup procedure
4. The program will be installed in the following folder: C:\Program Files\ROCLINK800

If the disk does not start up automatically, click Start (located on the Windows task bar) and then click Run. Type D:\ROCLINK.exe in the "Open" field.

Program Startup

To startup the software:

- Select **All Programs** from the **Start** menu and then select and click ROCLINK 800.

Please refer to the ROCLINK 800 manual for the default **User ID** and **Password**.

Figure 7. *View of All Programs From Desktop*

Program Work Area

The ROCLINK 800 program work area is as follows:

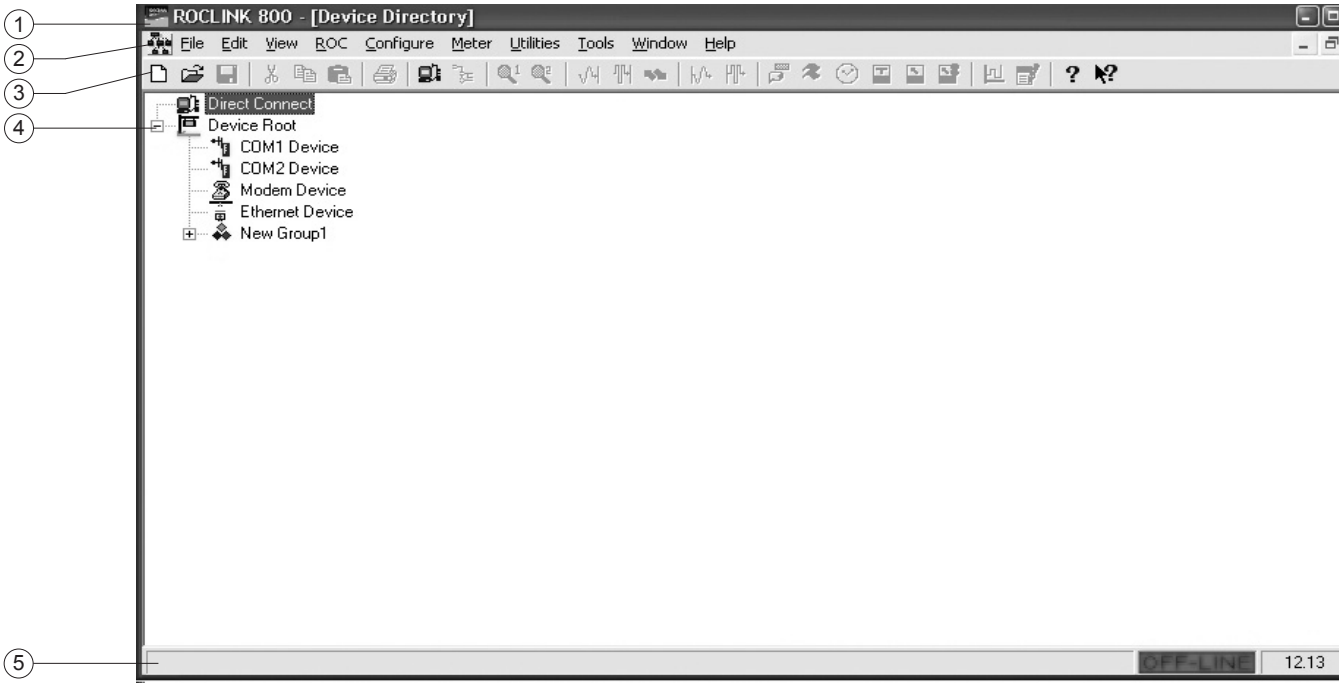


Figure 8. *ROCLINK 800 Listing Device*

1. **Title bar** Area displaying the type of remote connection
2. **Menu bar** Area containing menu options
3. **Tool bar** Bar containing push-button controls
4. **Main area** Area displaying list of devices available for remote connection and the Type Dosaodor-D system interface
5. **Status bar** Area showing: Remote connection status OFF-LINE/ON-LINE - current time

ROC Controller Programming

NOTE
Download "DosaodorStandard.tar" file to let the Type Dosaodor-D operator Interface display Imperial units.
Download "DosaodorMetric.tar" file to let the Type Dosaodor-D operator Interface display metric units.
Screen shots of the Imperial unit version (and related fields) are displayed in this manual.
All the concepts that are reported in this manual are applicable even to the Metric version of the Roclink software application.

- It is necessary to copy files to hard disk from the installation CD before downloading to ROC.
- Program download (**DosaodorStandard.tar/DosaodorMetric.tar** file) must precede configuration download (**Dosaodor Default US.800** file).

DosaodorStandard.tar/DosaodorMetric.tar file may be downloaded using serial connection (the same used to upload the **Dosaodor Default US.800** file) or using an ethernet connection.

SERIAL CONNECTION

- Connect ROC809 Version unit with the programming PC/Laptop.
- Run "DS800.exe" program from the installation CD.
- Click the **Browse** button and select the file "**DosaodorStandard.tar**" (**DosaodorMetric.tar** in case metric units are required in the Operator Interface).
- Select Serial port and Baud rate.
- Click **OK** button to start the downloading procedure.

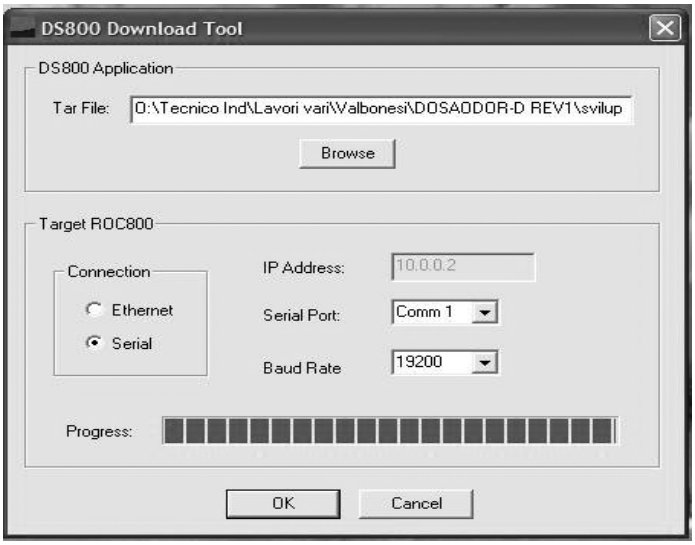


Figure 9. *Dosaodor Default Download For Controller Programming*

ETHERNET CONNECTION

Standard Type ROC800 IP address is 10.0.0.2.
For direct ethernet pc/laptop to ROC connection:

1) Ethernet cross-over cable is required.
2) Change IP address of your computer. From CONTROL PANEL -> NETWORK CONNECTIONS. Right click on USED CONNECTION and choose PROPERTIES.
3) Select INTERNET PROTOCOL (TCP/IP) and select PROPERTIES.
4) Select USE THE FOLLOWING IP ADDRESS and insert the following information:
   IP ADDRESS: 10.0.0.3 (different IP address from ROC address)
   SUBNET MASK 255.255.255.0

Run "**DS800.exe**" program file from the installation CD

- Click the **Browse** button and select the file: "**DosaodorStandard.tar/DosaodorMetric.tar**".
- Fill the **IP Address** field
- Click **OK** button to start the downloading procedure.

ROC Controller Configuration

Download “Dosaodor Default US.800” configuration file to ROC809 Version controller.
From the **Menu bar** > **File** > **Download** and select the file **Dosaodor Default US.800**.

Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012), section 9.3 “Downloading a configuration” for further information.

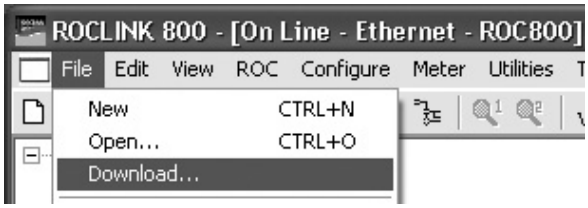


Figure 10. *Dosaodor Default Download For Controller Configuration*

Connecting to the ROC

Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012) for settings and connection to the ROC controller.

Single click with the left key on **Ethernet Device** on the **Device Root** list.

Right click on **Ethernet Device** again and select **Connect**.

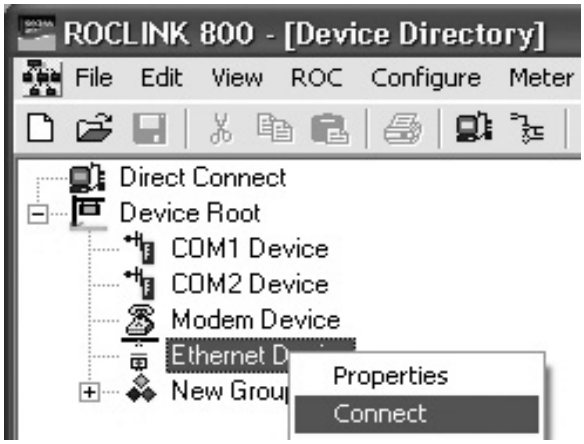


Figure 11. *Connection To The ROC From Device Directory*

Type Dosaodor-D Interface

After the ROC Controller programming the following page will be displayed once the connection has taken place.

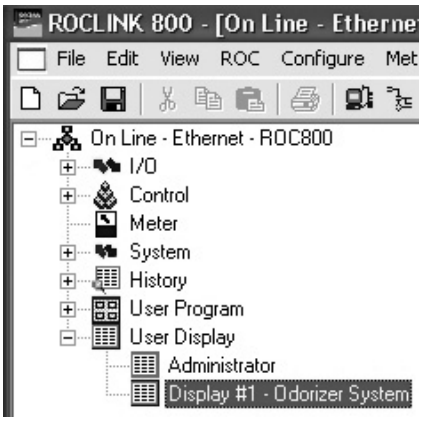


Figure 12. *Online Connection View From Device Directory*

Double click on **Display #1 - Odorizer System** from the User Display list to access the Type Dosaodor-D system interface.

The user interface will be loaded from the Type ROC809 controller.

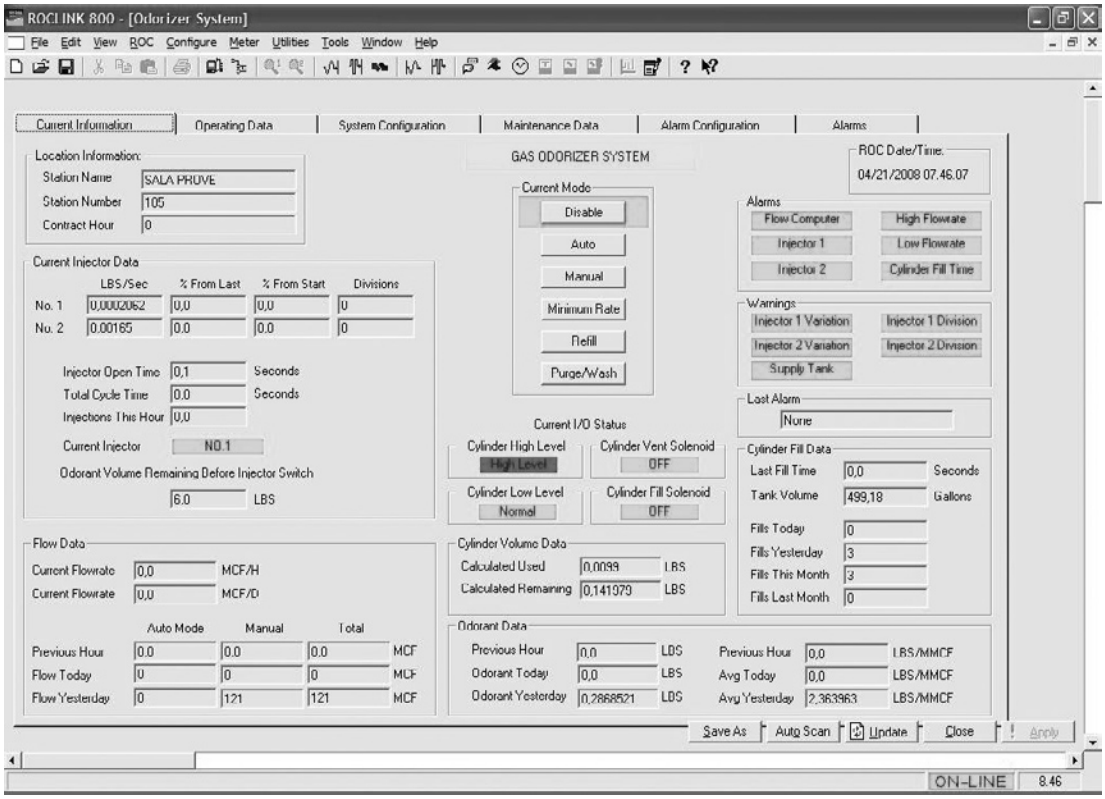


Figure 13. *Current Information Loaded From The Type ROC809 Controller*

The interface has the following five main pages:

- **Current Information**
- **Operating Data**
- **System Configuration**
- **Maintenance Data**
- **Alarm Configuration**
- **Alarms**

The following buttons are always present at the bottom of each window:

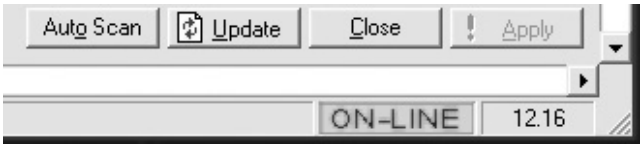


Figure 14. *Navigation Buttons Available*

- **Auto Scan**
  Enables periodic automatic updating of data present in the operator interface fields. The **Autoscan Update Interval** may be changed from the **Menu bar > Tools > Options.**
- **Update**
  Instantaneous updating of data present in the Operator Interface fields.
- **Close**
  Closes the interface.
- **Apply**
  Modifications to parameters will be applied.

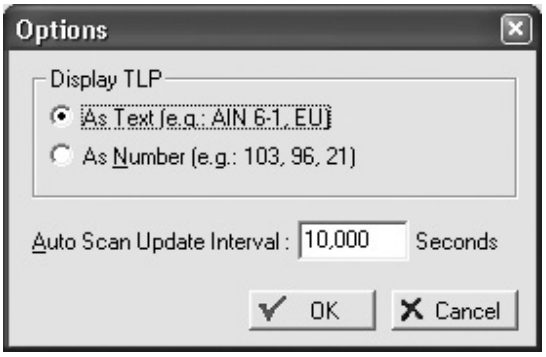


Figure 15. *View of Autoscan Update Interval*

Startup Procedure and Entering of Process Parameters

For installation and startup refer to Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012). This section will be helpful for filling in parameter fields that will be used during startup. The data fields are divided into two categories: Displayed fields which present a grey-colored background and fields which may be modified appearing in white-colored background. Some data fields may appear in different pages. The fields are related to the page topic.

System Configuration

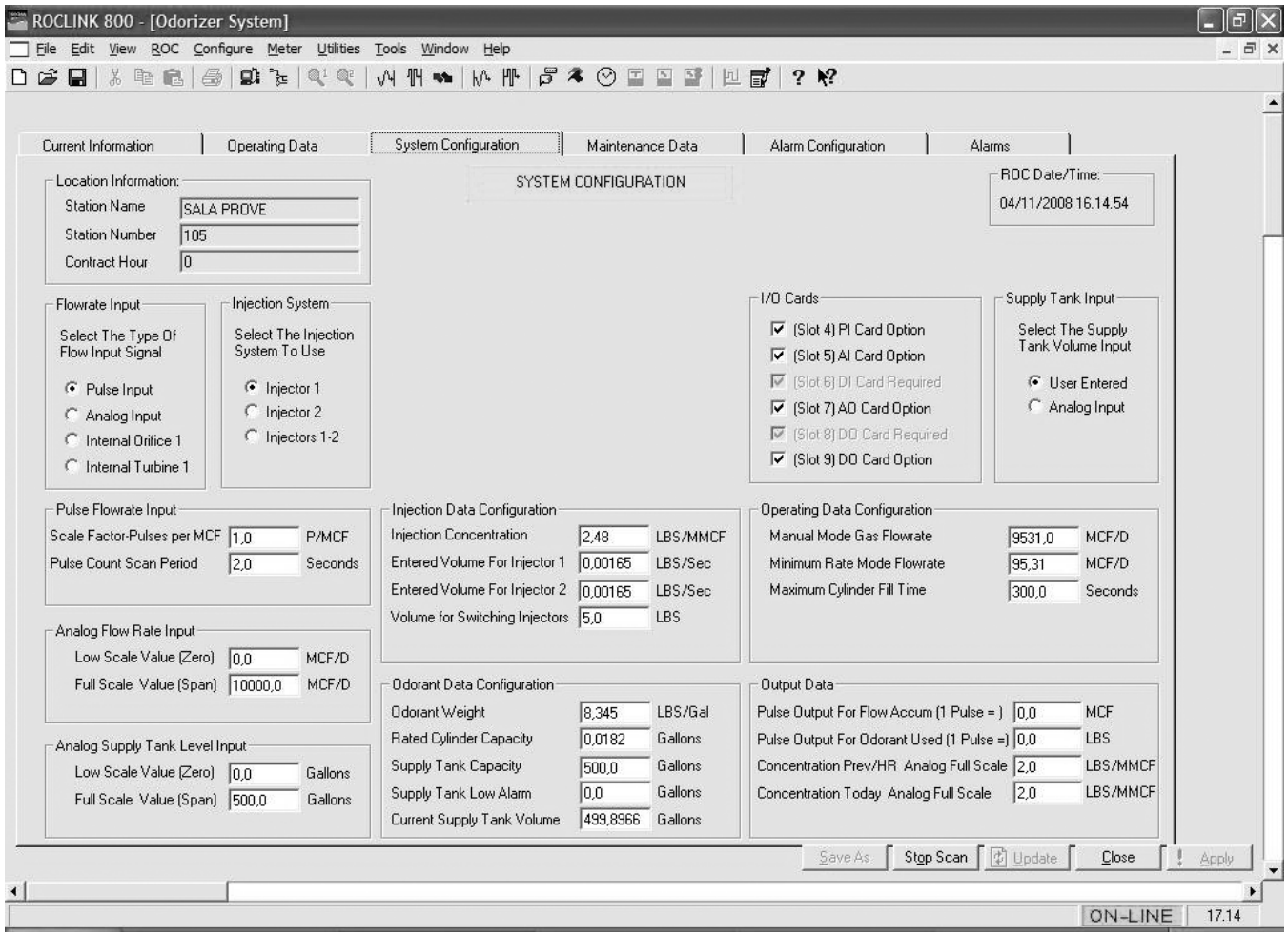


Figure 16. *View of System Configurations*

Note:
The parameters which must be initialized have the default value -1.

The following steps will configure the system in order to perform startup.

Location Information

- **Station Name:** Enter Station Name.
- **Station Number:** Enter Station Identifier.
- **Contract Hour:** Enter Contract Hour. This will be used for the History Log to set the end of fiscal days. Example: If 06 is set, the system will calculate all the logged data between 06:00:00 of the current day and 05:59:59 of the previous day.

Flow Rate Input

Select the type of Flow Input Signal:

- **Pulse Input:** Select Pulse Input Signal if available.
- **Analog Input:** Select Analog Input Signal if available.
- **Internal Orifice 1:** Select first Orifice Meter calculation for ROC.
- **Internal Turbine 1:** Select first Turbine Meter calculation for ROC.

When the Internal Orifice 1 or Internal Turbine 1 option is selected, the assumption is that the user has already configured the first meter run via ROCLINK. The Dosaodor software will then use the Internal Meter Flow Today Accumulator (TLP 114, 0, 19 for Orifice, TLP 116, 0, 12 for Turbine).

Refer to ROCLINK 800 Configuration Software User Manual (D301159X012) user manual, for meter configuration.

Injection System

Select the injection system:

- **Injector 1**
- **Injector 2** (if Type Dosaodor-D configuration contains B2 option)
- **Injection 1-2** (if Type Dosaodor-D configuration contains B2 option)

When the user selects Injector 1 only (or Injector 2 only), the system will continue to use the selected injector only, as programmed. When the option for Injectors 1 *and* 2 has been selected, the system will switch between the two, based on a given volume of odorant. **That volume of odorant is entered by the user as the "Volume for Switching Injectors"**. Every injection will subtract from this value, regardless of the mode. The current value of this parameter can be viewed by the user as "Odorant Volume Remaining Before Injector Switch". In order to avoid inaccurate calculations caused by switching injectors midway through a cylinder of odorant, the switch is only done at the end of a fill cycle. So the actual volume for switching injectors will be somewhat greater than the amount the user entered.

Supply Tank Input

Select the supply tank volume input:

- **User Entered:**
  When the input selection is set to "User Entered", the user must enter an approximation of the current volume of odorant in the tank in **Current Supply Tank Volume** field.
- **Analog Input:**
  When the supply tank level input selection is set to "Analog Input", the supply tank level will provide the value to the system using an analog input.

Pulse Flow Rate Input

These fields must be filled if the system receives a pulse input signal for flow rate.

- **Scale Factor-Pulses per MCF (P/MCF):**
  This field defines how many pulses the counter will receive for every MCF of flow. This parameter must be coherent with the one present in the system that is the source of the signal.
- **Pulse Count Scan Period:**
  The amount of time in seconds between updates of the EU values depends on incoming pulses for flow. The default value is 1 second for the ROC800 Series. The rate calculation is performed based on the number of pulses counted during the scan interval divided by the time interval. To avoid highly fluctuating calculation results, there should typically be at least 10 pulses occurring between scans at low flow conditions. For example, if a flow meter produces one pulse per second at low flow, then the Scan Period should be set to a minimum of 10 seconds.

Analog Flow Rate Input

Low Scale Value (Zero) (Gallons): Minimum flow value.
Full Scale Value (Span) (Gallons): Maximum flow value.

These parameters are the same as the ones defined in the configuration of the analog card (I/O – analog input – flow input – general – low/high reading EU). Please refer to the definitions in the ROCLINK 800 Configuration Software User Manual (D301159X012). Values must be entered in these fields just as if an Analog Flow Rate Input Signal is used.

Analog Supply Tank Level Input

The tank containing liquid odorant may have a sensor. The operator can configure the alarm to communicate the level of odorant in the tank to the ROC controller using the Analog Signal.

Low Scale Value (Zero) (Gallons):
Minimum quantity of odorant contained in tank corresponding to the low scale value.

Full Scale Value (Span) (Gallons):
Maximum quantity of odorant contained in tank corresponding to the high scale value.

Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012) for the complete description of these parameters.

Injection Data Configuration

This section contains the main parameters defining the odorant injection process.

- **Injection Concentration (pounds/MMCF):**
  This indicates the desired concentration of odorant. The system will inject a quantity of odorant proportional to the gas flow in order to maintain the desired concentration.
- **Entered Volume For Injector 1 (pounds/second):**
  This indicates the quantity of odorant the injector is able to supply in one second of opening. If the system parameters have not been set then the value will be equal to -1.
  The injection value is recalculated during system operation (by means of feedback data).
  When a regular refill mode is complete, the system is able to recalculate the specific volume for an injector based on the actual odorant used.

  *** The value entered in this field must be calculated, multiply the specific gravity of the odorant to be injected (typical values range between 0.5 and 1.0) by the value found on the name plate of the pneumatic panel titled: Specific Volume Injector N°1.**

  For example, with an odorant specific gravity of 0.6 and the specific volume of Injector 1 being 0.0132 lb/s, the entered value would be:

  0.6 * 0.0132 = 0.00792 (entered value)

Figure 17. *Dosaodor-D Name Plate*

- **Entered Volume For Injector 2 (pounds/second):**

  The parameter is used exclusively for two injectors configuration of the product.
  It indicates the quantity of odorant the injector is able to supply in one second of opening. If the system parameters have not been set then the value will be equal to -1.

  The injection value is recalculated during system operation (by means of feedback data).
  When a regular refill mode is complete, the system is able to recalculate the specific volume for an injector based on the actual odorant used.

  **** The value entered in this field must be calculated, multiply the specific gravity of the odorant to be injected (typical values range between 0.5 and 1.0) by the value found on the name plate of the pneumatic panel titled: Specific Volume Injector N°2.**

  For example, with an odorant specific gravity of 0.6 and the specific volume of Injector 1 being 0.0132 lb/s, the entered value would be:

  0.6 * 0.0132 = 0.00792 (entered value)

- **Volume For Switching Injectors (pounds):**
  When the user selects Injector 1 only (or Injector 2 only), the system will continue to use the selected injector only, as programmed. When the option for Injectors 1 *and* 2 has been selected, the system will switch between the two, based on a given volume of odorant. **That volume of odorant is entered by the user as the "Volume for Switching Injectors"**. Every injection will subtract from this value, regardless of the mode. The current value of this parameter can be viewed by the user as "Odorant Volume Remaining Before Injector Switch". In order to avoid inaccurate calculations caused by switching injectors midway through a cylinder of odorant, this switch is only done at the end of a fill cycle. Due to this, the volume remaining before injector switch will become slightly negative. This indicates that the injectors will switch at the end of the next fill cycle. So the actual volume for switching injectors will be somewhat greater than the amount the user entered.

Odorant Data Configuration

This section must be completed with data that is related to the odorant contained in the supply tank.

- **Odorant Weight (pounds/gallon):**
  Enter the specific weight of odorant in pounds/gallon.
- **Rated Odorant Calibration Cylinder Capacity (gallons):**
  Enter the capacity of the odorant calibration cylinder in this field.

  ***** The value that must be entered in this field is indicated on the plate located on the pneumatic panel in the field: "Control device volume".** The value -1 indicates that the parameter must be initialized.
- **Supply Tank Capacity (gallons):**
  Enter the maximum capacity of odorant in the supply tank in gallons.
- **Supply Tank Low Alarm (gallons):**
  The user sets the tank volume level at which the alarm will activate. If the supply tank level is coming in from the analog input, this can happen whenever the analog input value is less than or equal to the low alarm level set by the user. If the tank level is "User Entered", in other words if the user enters an initial tank volume, the only time this is checked is at the end of a fill cycle, as this should be the only time the volume of the supply tank has changes.
- **Current Supply Tank Volume (gallons):**
  This field indicates the amount of odorant in the tank.
  When the supply tank level input selection is set to "Analog Input", then the **Current Supply Tank Volume** will supply the value provided to the system using the user defined analog input. No changes will be made to this value by the software. When the same input selection is set to "User Entered", **the user must enter an approximate volume of odorant currently in the tank in "Current Supply Tank Volume" field.** Volume in the amount of the entered rated odorant calibration cylinder capacity will be subtracted by the software at the end of each fill cycle. When the tank is refilled, the user must enter a new approximation volume of odorant in the tank.

Operating Data Configuration

This section contains operating process parameters.

- **Manual Mode Gas Flow Rate (gallons):**
  In Manual Mode, the gas flow value that is considered by the software is provided by a static value entered by the user in this field.
- **Minimum Rate Mode Flow Rate (gallons):**
  The Minimum Rate Mode is similar to the Manual Mode. Its purpose is to provide the user with an additional option for use when selecting the mode of operation during an alarm. The user would typically enter a flow rate in this field for use in minimum rate that is much less than the rate entered for Manual Mode.
- **Maximum Odorant Calibration Cylinder Fill Time (seconds):**
  The user must set a Maximum Odorant Calibration Cylinder Fill Time value in this field. This may be defined during startup (see Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012)). If the odorant calibration cylinder filling time exceeds the value set by the user, the odorant calibration cylinder fill time alarm will be activated. The only way for this alarm to clear is for the user to initiate an alarm reset.

Output Data

The system can provide output pulses representing odorant injected or gas flow to interface with external devices. The amount of odorant or flow that each pulse represents is user selectable. A pulse will last for 0.2 seconds.

- **Pulse Output For Flow Accum (1 PULSE=) (MCF):**
  This field determines the number of MCF assigned to each pulse of the output channel that is used to transmit the gas flow to external systems. Please see the I/O list to trace the output channel.
- **Pulse Output For Odorant Used (1 PULSE=) (pounds):**
  This field determines the number of pounds assigned to each pulse of the output channel that is used to transmit the quantity of injected odorant. Please see the I/O list to trace the output channel.
- **Concentration Prev/hr Analog Full Scale (pounds/MMCF):**
  This field indicates the odorant concentration value that is represented by the analog output 100% value, for previous hour concentration. Please see the I/O list to trace the output channel.
- **Concentration Today Analog Full Scale (pounds/MMCF):**
  This field indicates the odorant concentration value that is represented by the analog output 100% value, for today concentration. Please see the I/O list to trace the output channel.

I/O Cards

Select just the I/O optional cards that are present in your configuration. The required cards may not be deselected and display a gray description. Data fields that are related to unselected optional card have a gray background and are not writable.

Location Information

This section is displayed in the current page but cannot be modified. Please refer to the description of parameters in the section **“System Configuration”** (see page 13).

Alarm Output Contact Selection

Select the alarms that will activate the alarm contact.

A digital output channel is available to transmit alarms to an external device, multiple alarms can be selected. Please see the I/O list to identify the output channel. By flagging the option assigned to the alarms, when they occur, the alarm output signal will be raised. Pressing the “Acknowledge Button” on an active alarm will clear the alarm contact.

Alarm Configuration

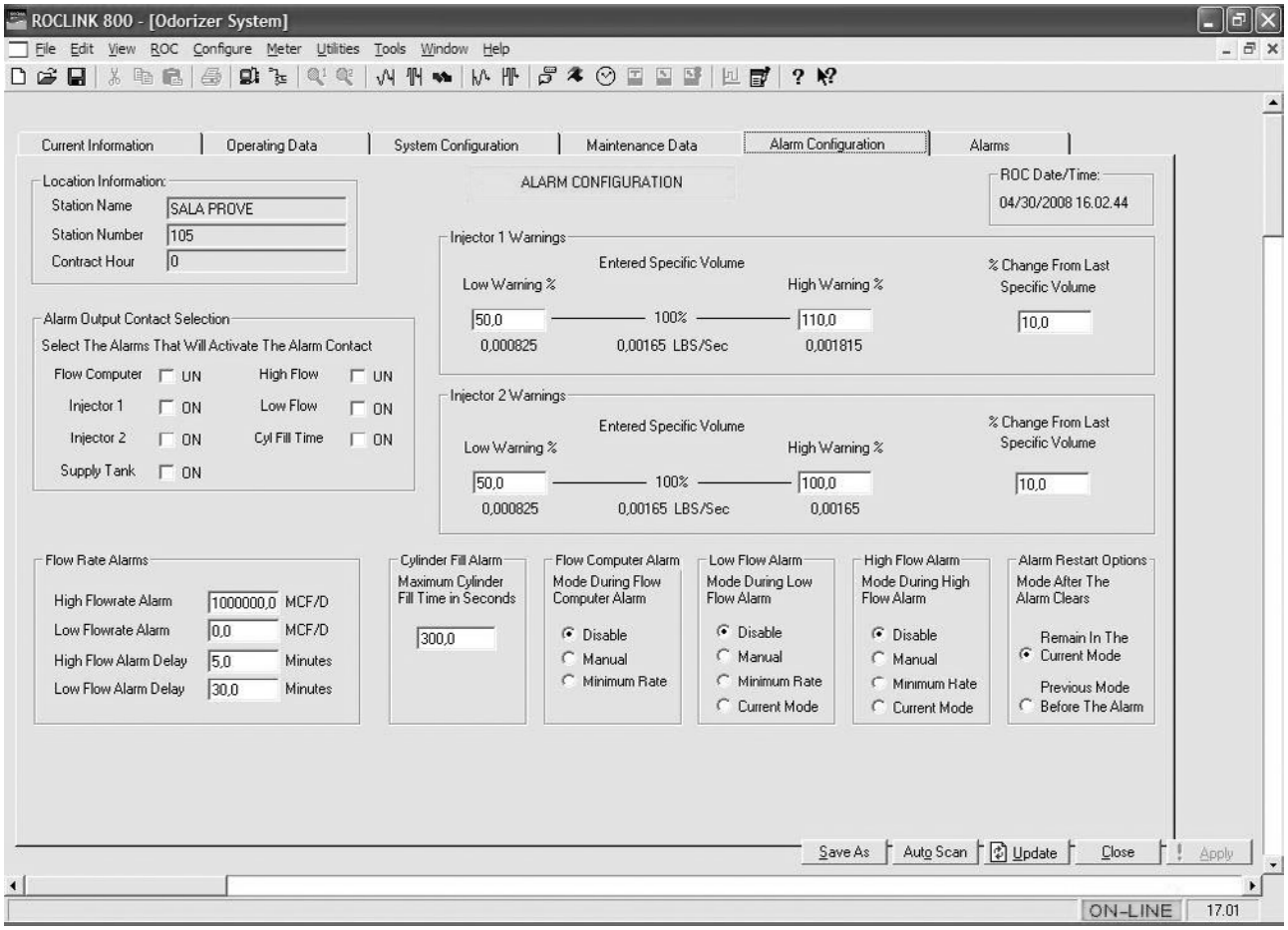


Figure 18. *View of Alarm Configuration*

The conditions that may activate the alarm output are the following:

- **Flow Computer:**
  This alarm is set when the discrete input assigned to the flow computer alarm is deactivated (Status - Off). It is cleared when the discrete input is activated (Status - On).

  If the input for this alarm condition is not utilized then the point should be manually configured to eliminate erroneous flow computer alarms. This is done by disabling the appropriate discrete input and setting the status to ON. See Discrete Input configuration screen example, Figure 19.

- **Injector 1 and Injector 2:**
  There are two specific conditions that trigger an injector alarm. When one of these conditions occurs, the system cannot clear the alarm without user intervention. In order to do this, the issue causing the alarm must be solved, and the user must push the “Alarm Reset Button”.

- **Supply Tank Low:**
  The user sets the volume level at which the alarm will be triggered in **“System Configuration”**. If the supply tank level is coming in from the analog input, this can occur whenever the analog input value is less than or equal to the low alarm level set by the user. If the tank level is “User Entered”, in other words if the user enters an initial tank volume, the only time this is checked is at the end of a fill cycle, as this should be the only time the volume of the supply tank changes.

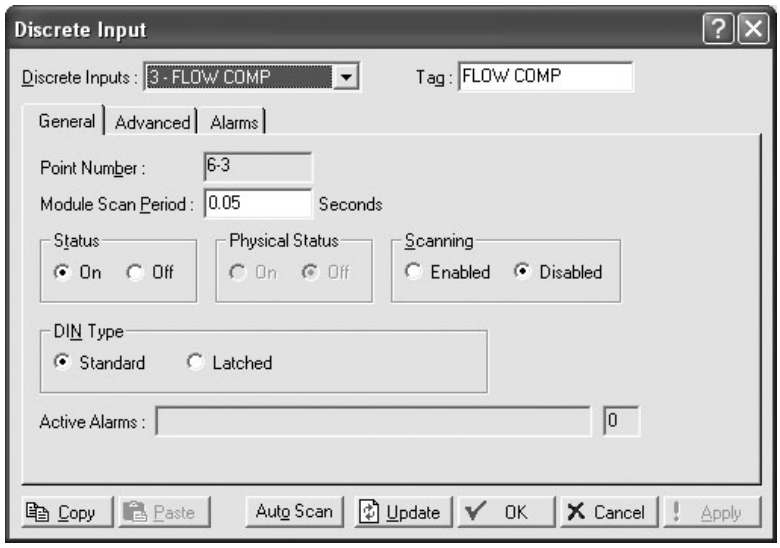


Figure 19. *View of Discrete Input Configuration*

- **High Flow:**
  Should the current daily flow rate become greater or equal to the “User Entered” value for a high flow rate a timer will start for a user specified amount of time. If at anytime before the timer expires the current daily flow rate should dip back below the value for a high flow rate, the timer will be stopped, and no alarm will be triggered. If the timer runs to expiration, then a high flow rate alarm is activated. The alarm and timer are reset when the current daily flow rate goes below the high flow rate alarm value. In addition, this alarm is activated only in Auto Mode.

  High flow rate level and time delay is entered in “Flow Rate Alarm” section.

- **Low Flow:**
  The low flow rate alarm operation is similar to the high flow rate alarm. If the current daily flow rate drops below the “User Entered” low flow rate alarm value, then a timer starts. If at anytime the current daily flow rate returns to an acceptable value, the alarm and timer are reset. This alarm is activated only in Auto Mode.

  Low flow rate level and time delay is entered in “Flow Rate Alarm” section.

- **Odorant Calibration Cylinder Fill Time:**
  The user sets a maximum fill time value for the odorant calibration cylinder. When a fill cycle begins, a timer is started. Should the timer reach the maximum fill time entered by the user, the fill time alarm for the odorant calibration cylinder will be activated. The alarm and timer can only be cleared by the user pushing the alarm reset button.

  The maximum odorant calibration cylinder fill time in seconds is entered in “Odorant Calibration Cylinder Fill Alarm” section.

Flow Rate Alarm

- **High Flow Rate Alarm (gallons):**
  This field determines the maximum gas flow rate which causes the system to go into alarm mode. The moment the maximum flow threshold is exceeded, the activation of the alarm will have a time delay equal to the time specified in the **HIGH FLOW ALARM DELAY** field. The alarm will not be activated if the flow value returns to below the indicated threshold before the time delay has elapsed.

- **Low Flow Rate Alarm (gallons):**
  This field determines the minimum gas underflow which causes the system to go into alarm mode. The moment the minimum flow threshold is exceeded, the activation of the alarm will have a time delay equal to the time specified in the **LOW FLOW ALARM DELAY** field. The alarm will not be activated if the flow value returns to above the indicated threshold before the time delay has elapsed.

- **High Flow Alarm Delay:**
  This field determines the time that will elapse between the passing of the maximum flow threshold and the alarm activation. If the flow returns to an acceptable value within the considered time, the alarm will not be activated and the relative timer will be reset.
  The threshold is passed when flow values are higher than those of the specified threshold.
- **Low Flow Alarm Delay:**
  This field determines the time that will elapse between the passing of the minimum flow threshold and the alarm activation. If the flow returns to an acceptable value within the considered time, the alarm will not be activated and the relative timer will be reset.
  The threshold is passed when flow values are lower than those of the specified threshold.

Odorant Calibration Cylinder Fill Alarm

Maximum Odorant Calibration Cylinder Fill Time in Seconds.

Please refer to the "**System Configuration**" section for a description of this parameter (see page 13).

Flow Computer Alarm

Mode During Flow Computer Alarm.
In this section the user may choose the system operation mode which takes place when the flow computer alarm is activated. The available operation modes are: Disable, manual, or minimum rate.

Low Flow Alarm

Mode During Low Flow Alarm.
In this section the user may choose the system operation mode which takes place when the low flow condition alarm is activated. The operation modes available are: Disable, manual, minimum rate, or current mode (the current operation mode is unchanged).

High Flow Alarm

Mode During High Flow Alarm.
In this section the user may choose the system operation mode which takes place when the high flow alarm condition alarm is activated.
The operation modes available are: Disable, manual, minimum rate, or current mode (the current operation mode is unchanged).

Alarm Restart Options

Mode After The Alarm Clears.
This section defines the chosen behavior for the system when the alarms are cleared. The options are:

- Remain in current mode.
- Return to previous operation mode that was used before the alarm event.

For the alarm to clear, the event that caused the alarm must be solved.
The system can go back to the previous mode automatically if the alarm clears. For example, if the Flow Computer Input caused an alarm and later cleared. If the restart option was set to **return to previous mode**, the program would return to the previous mode when the alarm clears. In this example the alarm would clear automatically.

Injector Warnings

The injector variation warning takes place if the current calculated injector specific volume has varied from the last value or from the entered value by an amount that exceeds the warning limits. The injector specific volume is recalculated after every refill cycle of the odorant calibration cylinder to update the process parameters and the process model.

The limits for the warnings are configured on the alarm configuration screen. They may be used by the operator to check the process parameters and receive a feedback when the process model is changing heavily, according to the real process.

- **Entered Specific Volume - Low Warning Percent**

  The low warning for variation from the entered injector specific volume (that is contained in “injection data configuration”) is a percentage of the entered specific volume.

- **Entered Specific Volume - High Warning Percent**

  The high warning for variation from the entered injector specific volume (that is contained in “injection data configuration”) is a percentage of the entered specific volume.

- **Percent Change From Last Specific Volume**

  The low warning and high warning for variation from the last injector specific volume (the previous calculated value) is a percentage of the last specific volume calculated value.

The limits for the warnings are collected in two sets: “**Injector 1 Warnings**” and “**Injector 2 Warnings**”.

Alarms and Warnings

This page may be used for:

- Recognizing active alarms and warnings
- Acknowledging and resetting alarms and warnings
- Troubleshooting information

There is a conceptual difference between alarms and warnings: alarms indicate an existing issue and require the operator intervention, warnings indicate an anomalous status of the system that may (or may not) evolve and become an issue.

Please refer to the “Troubleshooting Paragraph” in Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012).

The “**Troubleshooting Information section**” of Alarms page presents a description of alarms and warnings. Push the button that presents the alarm/warning title, to read its description.

Available information buttons:

Warnings: **Injector Variation, Injector Division, and Supply Tank**

Alarms: **Injector Alarms, Flow computer Alarm, High Flow Alarm, Low Flow Alarm, and Odorant Calibration Cylinder Fill Time Alarm**

The **Clear** button cleans the troubleshooting information area, deleting current text.

For complete alarm/warning description and troubleshooting refer to Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012). Let’s describe the Injector Alarm.

Injector Alarm Type 1 - High Limit Alarm - A high limit alarm will be generated if the new calculated specific volume for injector is greater than 500% of the entered volume for injector.

Possible Cause:

The system recalculates the specific volume parameter for the injector every (automatic) filling cycle. The system triggers an alarm if the calculation gives a value that is too high. One of the possible reasons for this (apart from the introduction of incorrect initial parameters) is calibration of the injection valve (excessive opening) with no subsequent modification of the parameter for entered volume for injector.

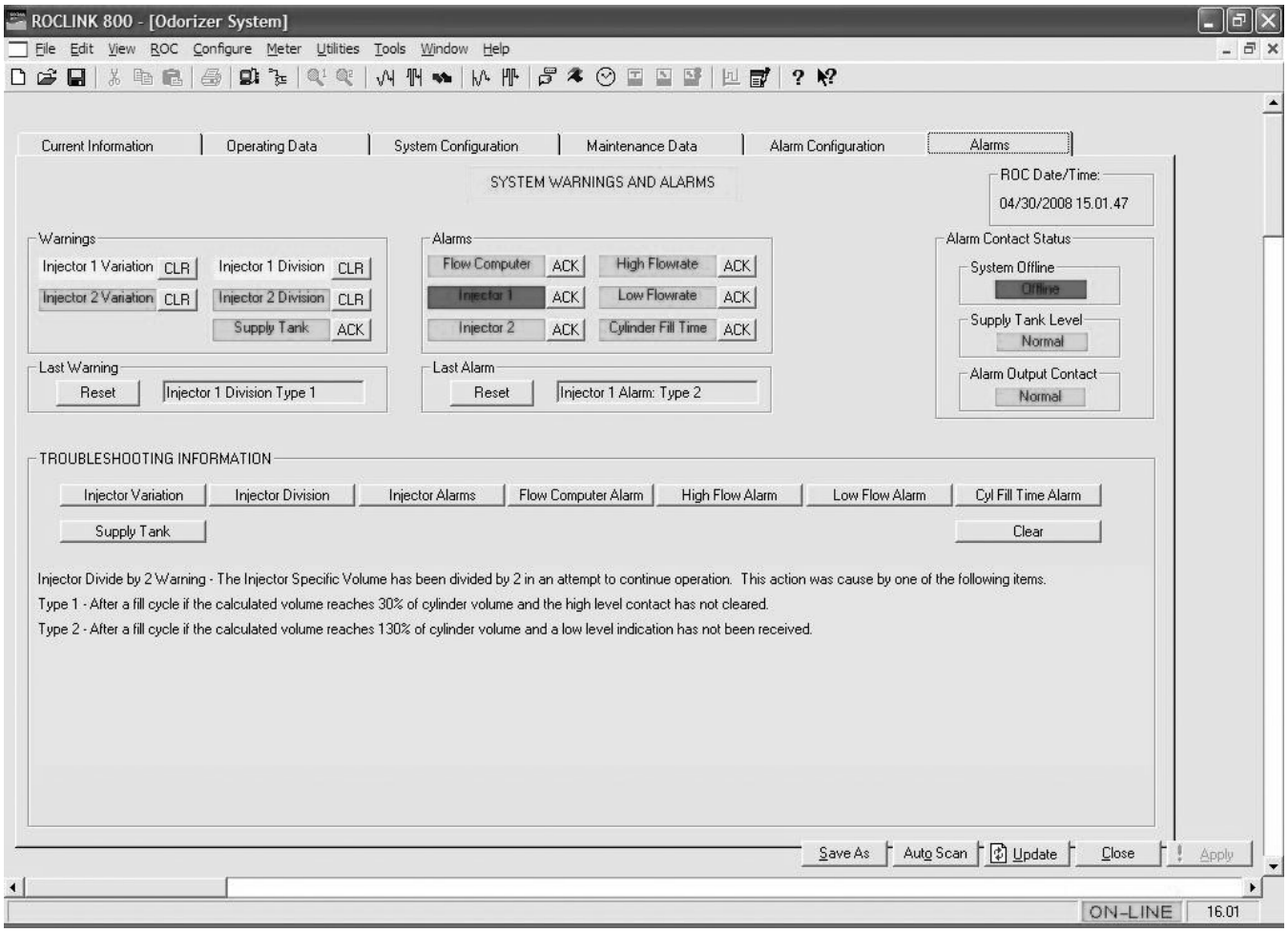


Figure 20. *View of System Warnings and Alarms*

Injector Alarm Type 2 - Low Limit Alarm - A low limit alarm will be generated if the new calculated specific volume is less than 20% of the entered specific volume.

Possible Cause:

The system recalculates the specific volume parameter for the injector every (automatic) filling cycle. The system triggers an alarm if the calculation gives a value that is too low. One of the possible reasons for this (apart from the introduction of incorrect initial parameters) is calibration of the injection valve (excessive closure) with no subsequent modification of the parameter for entered volume for injector.

Alarm types 1 and 2 are checked during each fill cycle.

If an alarm is detected the system will log the alarm and disable the current injector (set the injector alarm flag) switching to the other injector, if available.

Events may be logged in the log file (See Page 24).

Alarms

Six different alarms are displayed:

- Flow computer, injector 1, injector 2, high flow rate, low flow rate, or odorant calibration cylinder fill time.
- When the alarm is not active, the field background is green.
- When the alarm is acknowledged (pressing the button next to the alarm description) the background is yellow.
- When the alarm is active and not acknowledged the background is red.

ACK button

The acknowledge button is located next to each alarm. By pressing this button the operator informs the system that the Alarm has been acknowledged. The system may work with acknowledged alarms (yellow colored). The operator must solve the issue and inform the system of this operation by pressing the acknowledge button before resetting the alarm.

Last Alarm

This section provides a description of the last detected alarm.
All alarms are reset by pressing the RESET button (each alarm will have a green background).

Warning

Five warning types are displayed:

- Injector 1 variation, injector 2 variation, injector 1 division, injector 2 division, or supply tank.
- When the warning is not active the field background is green.
- When the warning is active the field background is yellow.
- When the warnings are acknowledged (pushing **ACK** button) the field background becomes green.

Data related to Injection Variation and Division are shown in **Current Injector Data** section that is contained in **Current Information** page. In this data set the **Divisions** field contains the number of divisions related to the injector specific volume calculation. The number of divisions represents the number of attempts of defining the proper process parameter by the control algorithm. The counter (**Divisions** field) may be reset pressing **RESET** button in **Warnings** section of **Alarms** page.

Last Warning

This section provides a description of the last “injector division by 2” warning type. Warnings are reset by pushing **RESET** button.

Alarm Contact Status

System Offline:

This signal communicates that the system is offline. This output is set to OFF in Disabled mode and Purge/Wash mode. Description is OFFLINE and background is RED when the signal is low (system is offline).
This contact is usually closed due to safety functions.
Please refer to the I/O list to trace the assigned channel (See Page 40).

Supply Tank Level:

This signal transmits the SUPPLY TANK LEVEL alarm.
Description is NORMAL and background is GREEN when the signal is low (tank is not empty).
Description is ALARM and background is RED when the signal is high (tank is empty).
Please refer to the I/O list to trace the assigned channel (See Page 40).

Alarm Output Contact:

This signal communicates that an Alarm is ON.
Description is NORMAL and background is GREEN when the signal is low (no alarms).
Description is ALARM and background is RED when the signal is high (one or more alarms existing).
Please refer to the I/O list to trace the assigned channel (See Page 40).

Alarm Log File

Alarm reports are present in a log file (see example) which can be displayed as follows View > Alarms > From Device.

The Alarm Log records the last 450 configured occurrences of alarms.
Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012) regarding instructions on this feature.

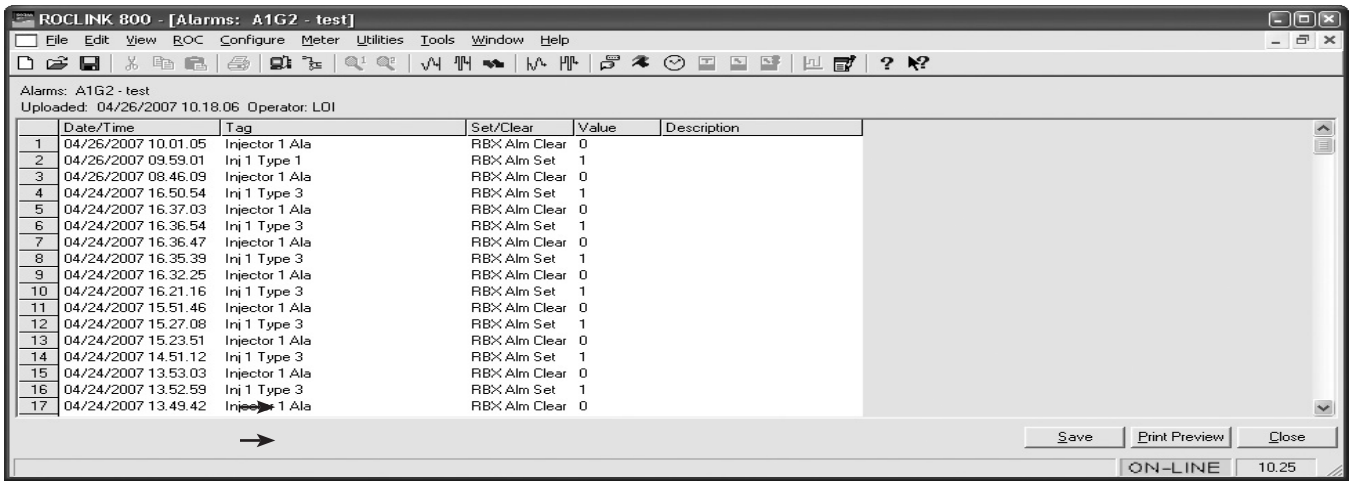


Figure 21. *View of Log File*

Events Log File

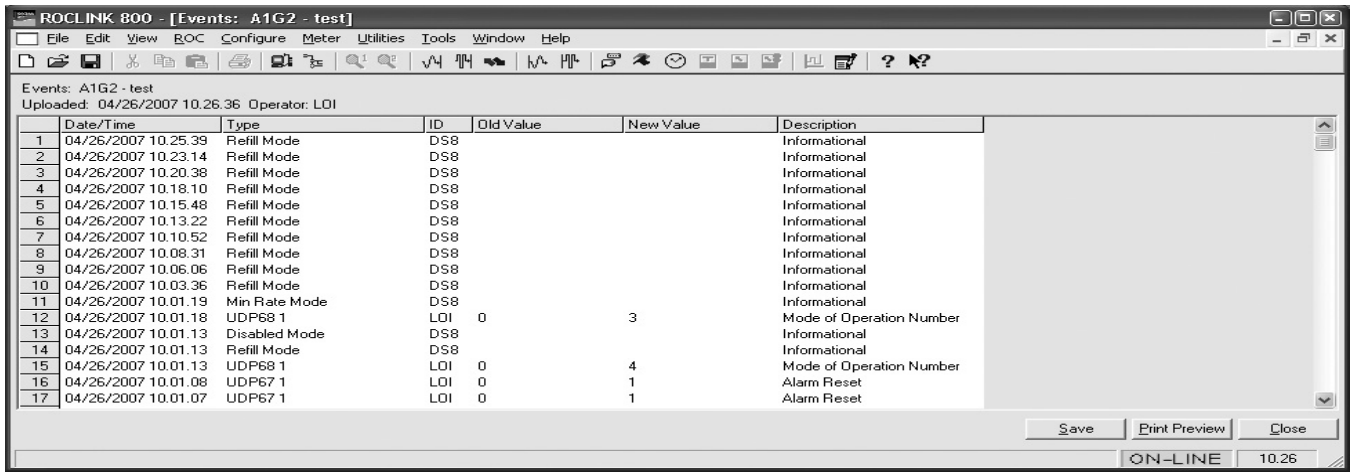
Events are reported in a log file (see example) which can be displayed as follows View > Events > From device. The Event Log records the last 450 events and parameter changes: power on/off cycles, injectors specific volume data, and other system events. Events logged by the Odorizer application:

- Disabled Mode
- Auto Mode
- Manual Mode
- Minimum Rate Mode
- Refill Mode
- Wash Mode
- Injector Switch 1 2
- Injector Switch 2 1
- Start Odorant Recov
- Start Gas Wash

Useful events for troubleshooting:

- Division by 2 events for the injector specific volume calculation. Format: IN1 divide 2, IN2 divide 2. The first number (1/2) represents the injector to which the event is related.
- Injector specific volume value. Format: #1 number, #2 number. The first number (1/2) represent the injector for which this process parameter has been recalculated, the second number represents the process parameter value.
- Start of refilling cycle for odorant calibration cylinder. Format: Refill Start.
- End of refilling cycle for odorant calibration cylinder. Format: Refill End.

Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012) for further information on this feature.



	Date/Time	Type	ID	Old Value	New Value	Description
1	04/26/2007 10.25.39	Refill Mode	DS8			Informational
2	04/26/2007 10.23.14	Refill Mode	DS8			Informational
3	04/26/2007 10.20.38	Refill Mode	DS8			Informational
4	04/26/2007 10.18.10	Refill Mode	DS8			Informational
5	04/26/2007 10.15.48	Refill Mode	DS8			Informational
6	04/26/2007 10.13.22	Refill Mode	DS8			Informational
7	04/26/2007 10.10.52	Refill Mode	DS8			Informational
8	04/26/2007 10.08.31	Refill Mode	DS8			Informational
9	04/26/2007 10.06.06	Refill Mode	DS8			Informational
10	04/26/2007 10.03.36	Refill Mode	DS8			Informational
11	04/26/2007 10.01.19	Min Rate Mode	DS8			Informational
12	04/26/2007 10.01.18	UDP68 1	LOI	0	3	Mode of Operation Number
13	04/26/2007 10.01.13	Disabled Mode	DS8			Informational
14	04/26/2007 10.01.13	Refill Mode	DS8			Informational
15	04/26/2007 10.01.13	UDP68 1	LOI	0	4	Mode of Operation Number
16	04/26/2007 10.01.08	UDP67 1	LOI	0	1	Alarm Reset
17	04/26/2007 10.01.07	UDP67 1	LOI	0	1	Alarm Reset

Figure 22. *Log File Events*

Maintenance

Maintenance Data

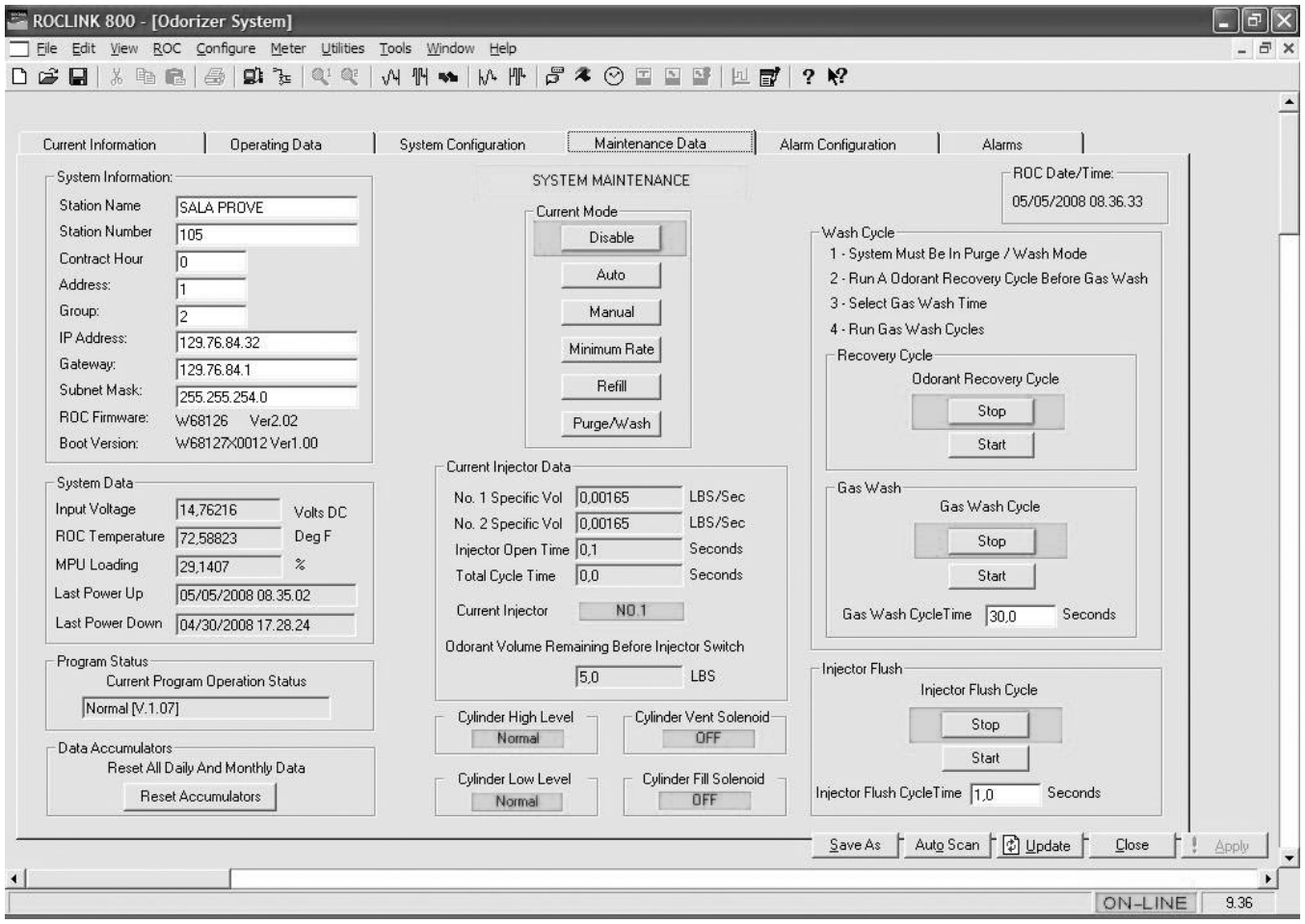


Figure 23. *System Maintenance Data*

System Information

- **Station Name**
- **Station Number**
- **Contract Hour**
  Please refer to the description in the "**System Configuration**" section regarding these parameters (see page 13).
- **Address**
- **Group**
  Please refer to the ROCLINK 800 Configuration Software User Manual (D301159X012) for the meaning of these parameters.
- **IP Address**
- **Gateway**
- **Subnet Mask**
  Configuration parameters of the ethernet network. Please see ROCLINK 800 Configuration Software User Manual (D301159X012).
- **ROC Firmware** (read only)
- **Boot Version** (read only)
  Installed software versions.

System Data

- **Input Voltage (Volts DC):**
  Displays the current input voltage to the ROC.
- **ROC Temperature (Deg °F):**
  Displays the current operating temperature for the ROC.
- **MPU Loading:**
  Displays the work load (processes) of the microprocessor.
- **Last Power Up:**
  Day, hour, minutes, and seconds of the last time the system was turned on.
- **Last Power Down:**
  Day, hour, minutes, and seconds of the last time the system was turned off.

Program Status

- **Current Program Operation Status:**
  This read-only field provides information on the current status of the program.

Data Accumulators

- **Reset All Daily and Monthly Data:**
  Pressing the **Reset Accumulators** button resets all daily and monthly data accumulators. These accumulators are displayed in the lower section of the "**Current Information**" page.

Current Injector Data

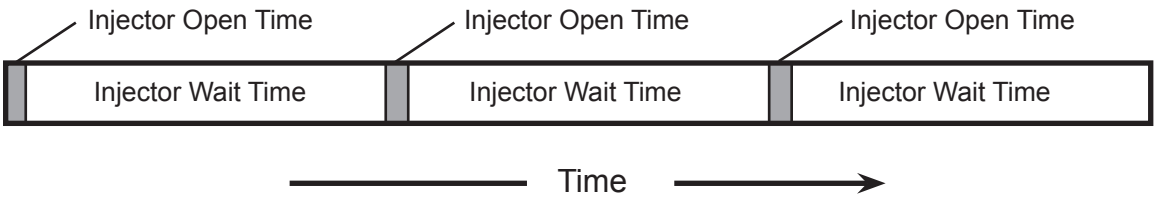
- **No. 1 Specific Vol (pounds/second):**
  This field displays the current value of the specific volume for injector 1.
  As explained in the previous sections, the field value is recalculated at every automatic odorant calibration cylinder refill cycle in order to compensate variations of the operating conditions (dirt in the injection system, etc).
- **No. 2 Specific Vol (pounds/second):**
  This field displays the current value of the specific volume for injector 2.
  As explained in the previous sections, the field value is recalculated at every automatic odorant calibration cylinder refill cycle in order to compensate variations of the operating conditions (dirt in the injection system, etc).

- **Injector Open Time:**
  This field indicates the current value of the opening time for the current injector.
  The injector open time can range from a minimum of 0.1 seconds to a maximum of 1 second.
- **Total Cycle Time:**
  The entire cycle time for the injection has a minimum of 2 seconds and a maximum of 10 seconds. The maximum injection cycle time is 10 seconds but in low flow conditions an injection may not take place during each cycle. Once enough gas has been accumulated an injection would take place.

T1: Injector Open Time (Shown in GRAY below).

T2: Injector Wait Time (Shown in WHITE below).

T3: Injection Total Cycle Time (T3 = T1 + T2).



- **Current Injector:**
  This field indicates the injector used and its status (green if it is operating correctly).
- **Odorant Volume Remaining Before Injector Switch:**
  On the "**System Configuration**" page the operator may define the quantity of odorant that the current injector must supply before switching to the remaining injector (if the switch between injectors has been programmed in Operating Mode).

  This field indicates how much odorant must still be injected before the switch of injector takes place. The value decreases at each opening of the current injector.
  This field is not used by the control algorithm if the operating switch between injectors has not been programmed.

ROC Date/time

This field indicates the current day and hour (minutes, seconds). It is displayed in each record of log files.

Wash Cycle

Refer to Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012) for the complete Purge/Wash procedure. Take in consideration following notes for the programming component of the procedure.

As described in the Maintenance Data page, the following programming procedure must be used:

The active status (START or STOP) is displayed with green background on the related button.

1. Set the system in Purge/Wash mode.
2. Run an Odorant Recovery Cycle before Gas Wash.
   - Push START button for odorant recovery cycle and STOP button to stop it.
   - This cycle sends odorant back to the supply tank and must be done before Wash Cycle.
   - Once an odorant recovery cycle has started, it is impossible for the software to detect the end of the cycle; therefore, it will continue indefinitely until stopped by the user.
3. Select Gas Wash Time.
   - Enter the desired value in the Gas Wash Cycle Time field.

4. Run Gas Wash Cycles.
    - Push START button for Gas Wash. If you wish to stop the cycle push the STOP button or wait until the Cycle Time has finished.
    - This cycle sends higher pressure to the odorant calibration cylinder and opens the injector valves to wash the odorant calibration cylinder.
    - The Gas Wash Cycle runs for a period of time specified by the user, before stopping.

Injector Flush

Refer to Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012) for the complete Injector Flush procedure. Take in consideration following notes for the programming component of the procedure.

Default value for “INJECTOR FLUSH CYCLE TIME” is 1 second.

Maximum allowed value for “INJECTOR FLUSH CYCLE TIME” is 5 seconds.

Push START button to clean the selected injection solenoid valve with liquid odorant.

Push STOP button to stop the cleaning process.

Current Odorant Calibration Cylinder I/O

This section displays the status of those input/output channels that are related to the process control of the Odorant Calibration Cylinder.

Process Digital Inputs

Odorant Calibration Cylinder High Level:

This field displays the signal value for high level input from the odorant calibration cylinder.

Description is NORMAL and background is GREEN when the signal is low (odorant calibration cylinder is not full).

Description is HIGH LEVEL and background is RED when the signal is high (odorant calibration cylinder is full).

Please refer to the I/O list to trace the assigned channel.

Odorant Calibration Cylinder Low Level:

This field displays the signal value for low level input from the odorant calibration cylinder.

Description is NORMAL and background is GREEN when the signal is low (odorant calibration cylinder is not empty).

Description is LOW LEVEL and background is RED when the signal is high (odorant calibration cylinder is empty).

Please refer to the I/O list to trace the assigned channel.

Process Digital Output

Odorant Calibration Cylinder Vent Solenoid:

This output is used to control solenoid pressure for the Odorant Calibration Cylinder and Tank Pressure Solenoid.

When the output Is OFF higher pressure is sent to the Odorant Calibration Cylinder and lowering the pressure in the tank.

Description is OFF and background is GREEN when the signal is low (higher pressure in the Odorant Calibration Cylinder and lower pressure in the tank).

Description is ON and background is RED when the signal is high (lower pressure in the Odorant Calibration Cylinder and higher pressure in the tank).

Odorant Calibration Cylinder Fill Solenoid:

This output is used to control odorant calibration cylinder fill valve. When the output Is OFF the Odorant Calibration Cylinder Fill Valve is closed. Description is OFF and background is GREEN when the signal is low (Odorant Calibration Cylinder Fill Valve is closed).

Description is ON and background is RED when the signal is high (Odorant Calibration Cylinder Fill valve is open).

Operation

After programming the process parameters (see **System Configuration** section), starting up and testing the unit (refer to Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012)) the operator will use the Current Information page for standard operations. Please refer to the Type Dosaodor-D Odorant Injection System Controlled By Type ROC809 Remote Telemetry Unit For North America Installation (D103102X012) for all the operations that must be accomplished before putting the system in Auto Mode.

Current Information

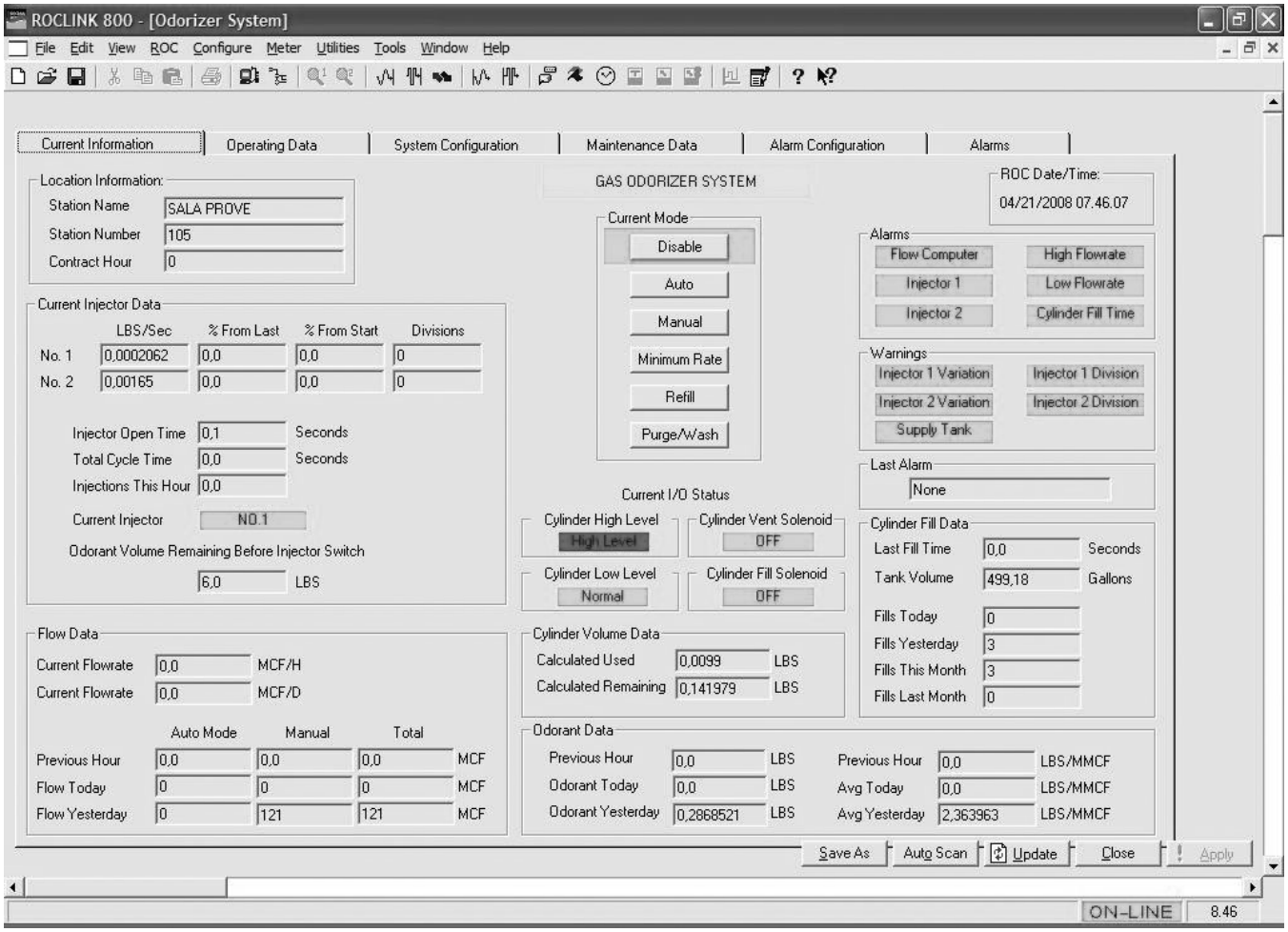


Figure 24. *Current Injector Data*

Location Information

- **Station Name**
- **Station Number**
- **Contract Hour**
  Please see the description in the "**System Configuration**" section for these parameters.

Current Injector Data

The first six fields are related to the injectors' specific volume and its variations.

A matrix of two lines and four columns is present.

- The first line contains data related to the first injector. The second line contains data related to the second injector.
- The first column contains the current injector specific volume **(pounds/second)**.
- The second column represents the variation of the value of injection specific volume compared to the previous calculation in percentage **(%From Last)**.
- The third column represents the variation of the value of injection specific volume compared to the entered value in percentage **(% From Start)**.
- The fourth Column represents the number of division by 2 that took place in injection specific volume calculation (Divisions).

This matrix is useful for troubleshooting purpose and gives an idea about the modification of process parameters.

See **Alarms configuration** section to configure the variation limits that will create a warning message.

See **Alarms** section to reset the Divisions counters.

- **Injector Open Time**
- **Total Cycle Time**
- **Current Injector**
- **Odorant Volume Remaining Before Injector Switch**
  See the description given in the "**Maintenance Data**" section for these parameters.
- **Injections This Hour:**
  Number of injection cycles that have occurred in the current hour.

Current (Odorant Calibration Cylinder) I/O Status

Inputs:

- **Odorant Calibration Cylinder High Level**
- **Odorant Calibration Cylinder Low Level**

Outputs:

- **Odorant Calibration Cylinder Vent Solenoid**
- **Odorant Calibration Cylinder Fill Solenoid**
  See the description in the "**Maintenance Data**" section for these messages.

Alarms - Warnings - Last Alarm

See the description given in the "**Alarms**" section for these messages.

ROC Date/time

See the description given in the "**Maintenance Data**" section for these parameters.

Flow Data

The following fields display useful process data:

- **Current Flow Rate (MCF/Hour):**
  This field displays current flow rate expressed in MCF/Hour.
- **Current Flow Rate (MCF/Day):**
  This field displays current flow rate expressed in MCF/Day.

The 3 x 3 table indicates the following flow values:

- **Previous Hour (MCF):**
  Flow calculated during previous hour.
- **Flow Today (MCF):**
  Flow in current day.
- **Flow Yesterday (MCF):**
  Flow in previous day.

The flows in AUTOMATIC MODE (AUTO MODE column), MANUAL OR MINIMUM RATE mode (MANUAL column) and the total flow (TOTAL column) are displayed.

Odorant Calibration Cylinder Volume Data

- **Calculated Used (pounds):**
  This parameter indicates the (theoretical) volume of injected odorant after the last odorant calibration cylinder refill and is calculated by adding the quantities of odorant injected at each opening of the injection valve.
- **Calculated Remaining (pounds):**
  This parameter indicates the (theoretical) volume of remaining odorant in the odorant calibration cylinder after the last refill and is calculated by subtracting the quantity of odorant that has already been injected (CALCULATED USED field) from the odorant calibration cylinder capacity (Rated Odorant Calibration Cylinder capacity).

Odorant Calibration Cylinder Fill Data

This section displays data that is related to the Odorant Calibration Cylinder Refill Cycles.

- **Last Fill Time (seconds):**
  This indicates the Odorant Calibration Cylinder Refill time for the last refill cycle.
- **Tank Volume (gallons):**
  This indicates the quantity of odorant that is currently contained in the tank.
- **Fills Today:**
  Number of Odorant Calibration Cylinder Refills that have occurred in current day.
- **Fills Yesterday:**
  Number of Odorant Calibration Cylinder Refills that occurred yesterday.
- **Fills This Month:**
  Number of Odorant Calibration Cylinder Refills that have occurred this month.
- **Fills Last Month:**
  Number of Odorant Calibration Cylinder Refills that occurred in previous month.

Odorant Data

The left column displays the odorant consumptions, the right column displays the odorant concentrations.

Left Column:

- **Previous Hour (pounds):**
  Quantity of odorant injected in the previous hour.

- **Odorant Today (pounds):**
  Quantity of odorant injected in the current day.
- **Odorant Yesterday (pounds):**
  Quantity of odorant injected yesterday.

Right Column:

- **Previous Hour (pounds/MMCF):**
  Average concentration of odorant injected in the previous hour.
- **Average Today (pounds/MMCF):**
  Average concentration of odorant injected in current day.
- **Average Yesterday (pounds/MMCF):**
  Average concentration of odorant injected yesterday.

The **Reset Accumulators** button that is present in "**Maintenance Data**" page resets all described accumulator data, with the following exceptions:

- **Current Flow Rate Fields**
- **Odorant Calibration Cylinder Volume Data**
- **Tank Volume Field**

Update of Flow Data and Odorant Data Accumulators

The system stores several accumulating variables for gas flow, odorant used, and average concentration.

The first of these is a "Previous Hour" value. A tally of all incoming flow, as well as the odorant used to odorize it is stored for an hour. At the end of that hour these totals are placed into the previous hour parameter and a previous hour average concentration is calculated. This calculation only happens once an hour.

The "Flow Today", "Odorant Today", and "Average Concentration Today" are updated every cycle of execution (approximately every 100ms). Every time an amount of gas flow has entered the system, or an injection of odorant is done, these parameters are updated immediately. At contract hour these parameters are set to zero.

The "Yesterday" version of these parameters is updated once a day, at contract hour. At that point the "Today" values are copied into the "Yesterday" values before they are zeroed.

"Flow this Month", "Odorant this Month", and "Average Concentration this Month" (that are displayed in **Operating Data** page) are similar to the "Today" version of the parameters. They are updated immediately and accumulated for an entire calendar month. On contract hour of the last day of the calendar month this value is set to zero.

The "Last Month" version of these parameters is updated once a month. At the end of a month, just before the monthly accumulators are zeroed, they are copied into these parameters.

The software monitors the internal ROC clock to be aware of changes in hour, day, and month. If the ROC809's clock is changed, it will affect these accumulators.

Current Mode

This section is extremely important. It enables the user to view the current operation mode and modify it.

The current operation mode is indicated by the green background of the related button.

The operator can modify the operation mode by pressing the Relative button. One of the following modes may be selected: **Disable, Auto, Manual, Minimum Rate, Refill, Purge/Wash**.

Let us examine the features of each Operation Mode.

Disabled Mode

No injections will occur when the system is in Disabled Mode. All discrete control outputs are turned off, with the exception of the system offline output, which is activated.

Log Event

Log the beginning of the Disabled Mode of operation.

Set Valves for Disable Mode

Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).
Turn off the Tank Pressure Valve (lowers pressure in the tank).
Turn off the Injectors (closes the Injector Valves).

Offline Contact

Set the Offline Discrete Output Contact to the offline position

Auto Mode

Auto mode receives incoming flow data from one of four user selectable places: A pulse input, an analog input, the ROC809's first orifice meter calculation or the ROC809's first turbine meter calculation.

When a pulse input is selected as the method for incoming flow, the flow rate that is displayed to the user is not the flow rate given by the PI card but instead is the average for the last 20 flow rates sampled every PI card scan time.

If the incoming flow data is provided by an analog input, flow increments once every second, in the amount of the daily flow rate divided by the seconds in a day.

The same is also true for the orifice meter and turbine meter.

The system will inject odorant in proportion to the flow rate in order to maintain a uniform degree of concentration. If the system has a double injector, the injector used will be the one programmed by the user (either fixed or in exchange).

When the system detects a low odorant calibration cylinder input during Auto, Manual, or Minimum Rate Modes, the system goes into Refill Mode and then starts injection again.

During injection:

Log Event

Log the beginning of the Auto Mode of operation.

Offline Contact

Set the Offline Discrete Output Contact to the normal position.

Set Valves for Auto Mode

Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).
Turn off the Tank Pressure Valve (lowers pressure in the tank).

Injector Test

Check which Injector is in use No. 1 or No. 2 (dual units only).

Injector Data

Calculate the Injector operational data based on current flow rate and concentration.

Control Injector

Operate the Injector Valve based on the calculated data.
Calculate the current Odorant Calibration Cylinder volume data.

Update Data

Update the daily and monthly odorant volume data.

Manual Mode

In Manual Mode, the system's incoming flow is provided by a static value entered by the user in **"System configuration"** page.

When the system detects a low odorant calibration cylinder input during Auto, Manual, or Minimum Rate Modes, that sends the system into Refill Mode and then starts injection again.

Log Event
Log the beginning of the Manual Mode of operation.

Offline Contact
Set the Offline Discrete Output Contact to the normal position.

Set Valves for Manual Mode

Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).
Turn off the Tank Pressure Valve (lowers pressure in the tank).

Injector Test
Check for which Injector is in use No. 1 or No. 2 (dual units only).

Flow Value
Load the manual flow rate value.

Injector Data
Calculate the Injector operational data based on selected flow rate and concentration.

Control Injector
Operate the Injector Valve based on the calculated data.
Calculate the current Odorant Calibration Cylinder volume data.

Update Data
Update the daily and monthly odorant volume data.

Minimum Rate Mode

From the operational point of view the Minimum Rate Mode is equal to the Manual Mode. Its purpose is to provide the user with an additional option to be chosen when selecting the mode of operation during an alarm. The user would typically enter a flow rate value to be used in minimum rate that is much lower than the entered flow rate for Manual Mode.

When the system detects a low Odorant Calibration Cylinder input during Auto, Manual, or Minimum Rate Modes, the system goes into Refill Mode and then starts injection again.

Log Event
Log the beginning of the Minimum Rate Mode of operation.

Offline Contact
Set the Offline Discrete Output Contact to the normal position.

Set Valves for Minimum Rate Mode
Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).
Turn off the Tank Pressure Valve (lowers pressure in the tank).

Injector Test
Check for which Injector is in use No.1 or No.2 (dual units only).

Flow Value
Load the minimum rate flow rate value.

Injector Data
Calculate the Injector operational data based on selected flow rate and concentration.

Control Injector

Operate the Injector Valve based on the calculated data.
Calculate the current Odorant Calibration Cylinder volume data.

Update Data

Update the daily and monthly odorant volume data.

Refill Mode

When the system detects a low Odorant Calibration Cylinder input during Auto, Manual, or Minimum Rate modes, the system goes into Refill Mode. No injections are performed while the Odorant Calibration Cylinder is refilling, but the flow is accounted for. The system will "catch up" when it returns to the previous mode. There are two types of refill modes: an Automatic Refill Mode and a User Started Refill Mode. A user started Refill Mode may be activated by the operator pushing **Refill** button. An Automatic Refill Mode takes place as a result of normal operations, when the odorant calibration cylinder is empty. When an Automatic Refill Mode is complete, the system is able to recalculate the specific volume for an injector taking in account the actual odorant used. A User Started Refill Cycle will not perform this calculation, as it is uncertain how much actual odorant has been used when the refilling cycle starts.

Stop Injection

Turn off the Injectors (Closes the Injector Valves).

Fill the Odorant Calibration Cylinder

Turn on the Odorant Calibration Cylinder Fill Valve (opens the Odorant Calibration Cylinder Fill Valve).
Turn on the Tank Pressure Valve (sends higher pressure to the tank).
Turn on the Odorant Calibration Cylinder Pressure Valve (lowers the pressure in the Odorant Calibration Cylinder).
Test for clear of Low Level Indication.
If the low level indication does not clear during the maximum fill time force a 30 second purge (odorant recovery) cycle and restart the fill cycle. If the low level indication still does not clear set the Odorant Calibration Cylinder fill alarm and go to disable mode.
Test for activation of High Level Indication.
If a high level indication is not received during the maximum fill time force a 30 second purge (odorant recovery) cycle and restart the fill cycle. If the high level indication still fails to activate set the Odorant Calibration Cylinder fill alarm and go to disable mode.
On High Level Indication.
Turn off the Odorant Calibration Cylinder Fill Valve (closes the Cylinder Fill Valve).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Cylinder).
Turn off the Tank Pressure Valve (lowers pressure in the tank).

Injector Calculation

Calculate new specific volume data for the Injector in use
Divide the actual Odorant Calibration Cylinder volume by the calculated volume to obtain the correction factor.
Multiply the current injector specific volume by the correction factor to obtain the new current injector specific volume.
Test for Injector alarm based on specific volume.
Is the new current injector specific volume within the high and low alarm limits?
The alarm limits were established by multiplying the entered injector specific volume by +5 for high and 0.2 for low.
If the injector alarm condition is true set the injector alarm flag.
Is the new current injector specific volume within the previous value high and low alarm limits?
In some conditions, the control algorithm operates a division by 2 of the calculated specific volume, modifying the internal model of the process to better match the current working parameters.

Test for Switching Injectors

Check for Injector 1 / Injector 2 mode of operation.
If dual mode of operation is selected check the volume remaining before injector switch.
If the value is <= 0 check the injector alarm flag and switch injectors if the alarm flag is not set.

Odorant Supply Tank

Update the Odorant Supply Tank volume data.

Return

Return to the previous mode of operation.

Purge/Wash Mode

Wash Mode begins similarly to disabled mode. The system-offline output is set, and the cycle time is set to zero seconds. The user then starts an Odorant Recovery Cycle first, followed by one or more Gas Wash Cycles. Once an Odorant Recovery Cycle has started, it is impossible for the software to detect the end of the cycle; therefore, it will continue indefinitely until stopped by the user. The Gas Wash Cycle is slightly different in that it runs for a user specified amount of time before stopping. The Injector Flush Cycle is similar to the Gas Wash Cycle. It runs for a user specified amount of time before stopping. The maximum allowed time is 5 seconds only the selected injector is activated.

Log Event

Log the time for the start of the wash cycle.

Stop Injection

Turn off the Injectors (closes the Injector Valves).
Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Tank Pressure Valve (lowers pressure in the tank).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).

Offline Contact

Set the Offline Discrete Output Contact to the offline position.

Scan for Operator Input

Test for the operator start of an Odorant Recovery Cycle.

Odorant Recovery Cycle (send odorant back to supply tank before Gas Wash Cycle).

Log start of Odorant Recovery Cycle.
Turn off the Injectors (closes the Injector Valves).
Turn off the Tank Pressure Valve (lowers the tank pressure).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).
Turn on the Odorant Calibration Cylinder Fill Valve (opens the Odorant Calibration Cylinder Fill Valve).
Test for operator termination of the Odorant Recovery Cycle.
On termination
Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).

Scan for Operator Input

Test for the operator start of a Gas Wash Cycle.

Gas Wash Cycle

Log start of Gas Wash Cycle.
Turn off the Odorant Calibration Cylinder Fill Valve (closes the Odorant Calibration Cylinder Fill Valve).
Turn off the Tank Pressure Control Valve (lowers the pressure in the tank).
Turn off the Odorant Calibration Cylinder Pressure Valve (sends higher pressure to the Odorant Calibration Cylinder).

Turn on the Injectors (opens the Injector Valves).
Start the Gas Wash Cycle Timer.
Check for timeout of Gas Wash Cycle Timer.
Check for Operator termination of the Gas Wash Cycle.
On Termination.
Turn off the Injectors (closes the Injector Valves).

Injector Flush Cycle

Similar to the Gas Wash Cycle except that just the selected injector is activated.

Operating Data

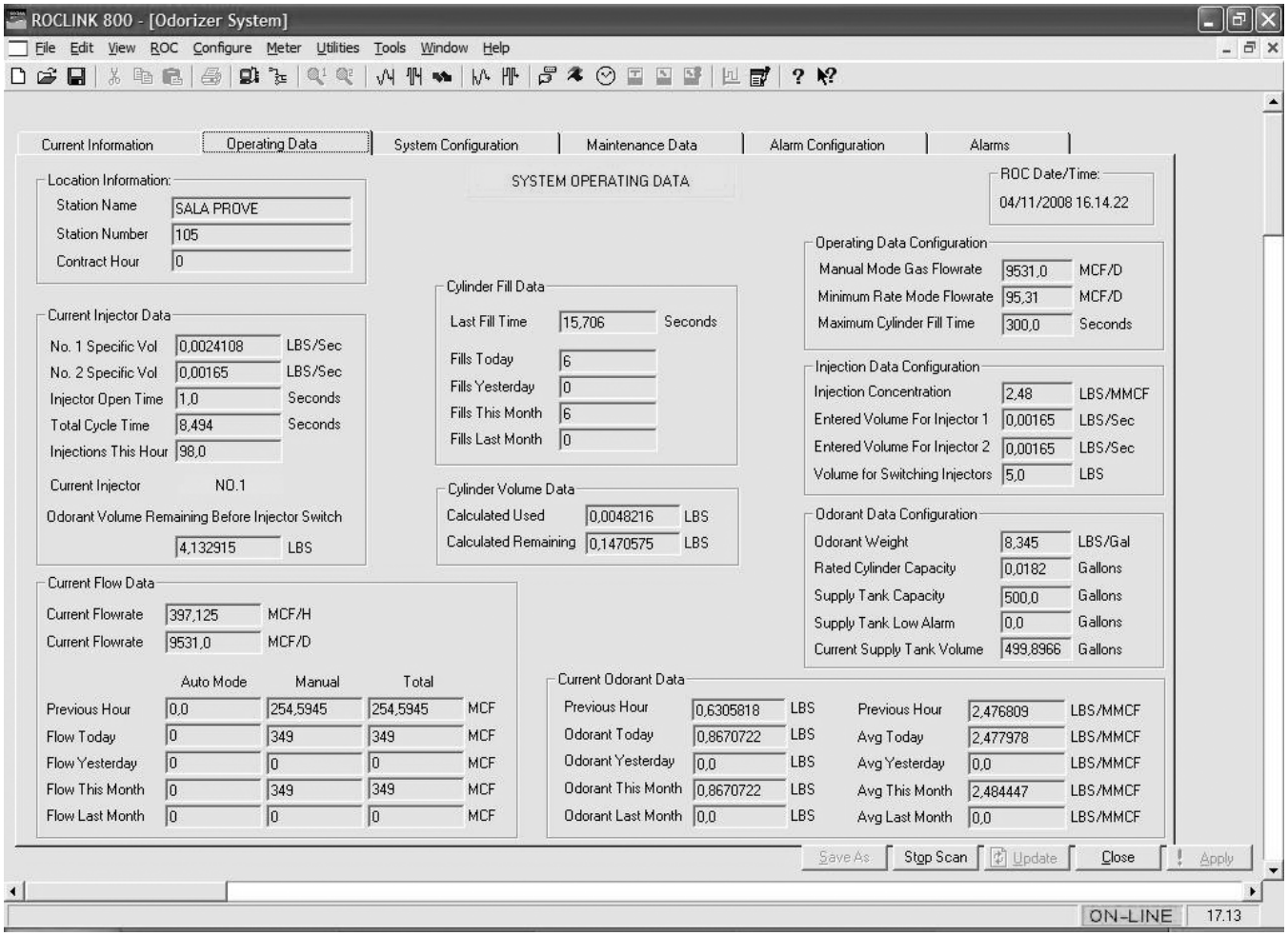


Figure 25. *System Operating Data*

Location Information

- **Station Name**
- **Station Number**
- **Contract Hour**

Please see the description in the "**System Configuration**" section for these parameters (see page 13).

Current Injector Data

- **No. 1 Specific Vol: 1 [pound/second]**

Current specific volume for injector 1

- **No. 2 Specific Vol: 2 [pound/second]**
  Current specific volume for injector 2
- **Injector Open Time**
- **Total Cycle Time**
- **Current Injector**
- **Odorant Volume Remaining Before Injector Switch**
  See the description given in the "**Maintenance Data**" section for these parameters.
- **Injections This Hour:**
  Number of injection cycles that have occurred in the current hour.

Odorant Calibration Cylinder Fill Data

This section shows the data relative to the Odorant Calibration Cylinder Refill Cycles.

- **Last Fill Time (seconds):**
  This indicates the Odorant Calibration Cylinder Refill time for the last refill cycle.
- **Fills Today:**
  Number of Odorant Calibration Cylinder Refills that have occurred in current day.
- **Fills Yesterday:**
  Number of Odorant Calibration Cylinder Refills that occurred yesterday.
- **Fills This Month:**
  Number of Odorant Calibration Cylinder Refills that have occurred this month.
- **Fills Last Month:**
  Number of Odorant Calibration Cylinder Refills that occurred in previous month.

Odorant Calibration Cylinder Volume Data

- **Calculated Used (pounds):**
  This parameter indicates the (theoretical) volume of injected odorant after the last Odorant Calibration Cylinder Refill and is calculated by adding the quantities of odorant injected at each opening of the Injection Valve.
- **Calculated Remaining (pounds):**
  This parameter indicates the (theoretical) volume of remaining odorant in the Odorant Calibration Cylinder after the last refill and is calculated by subtracting the quantity of odorant that has already been injected (CALCULATED USED field) from the odorant calibration cylinder capacity (Rated Odorant Calibration Cylinder capacity).

Operating Data Configuration

Refer to **"System Configuration"** Chapter.

Injection Data Configuration

Refer to **"System Configuration"** Chapter.

Odorant Data Configuration

Refer to **"System Configuration"** Chapter.

ROC Date/time

This field indicates the current day and hour (minutes, seconds). It is displayed in each record of log files.

Current Flow Data

Refer to **Current Information** page - **Flow Data** for the Fields description.
This data set contains six more fields:

- **Flow This Month Fields:**
  This data is related to the flow that takes place in the current month.
- **Flow Last Month Fields:**
  This data is related to the flow that took place in the last month.

Current Odorant Data

Refer to **Current Information** page - "**Odorant Data** for the Fields description".

This data set contain four more fields:

Left Column:

- **Odorant This Month:**
  Quantity of odorant injected in the current month [pounds].
- **Odorant Last Month:**
  Quantity of odorant injected in the last month [pounds].

Right Column:

- **Average This Month:**
  Average injected odorant concentration in the current month [pounds/MMCF].
- **Average Last Month:**
  Average injected odorant concentration in the last month [pounds/MMCF].

Hardware Configuration

The complete Product Configuration is composed by the following parts:

Type ROC809 Hardware

Enclosure
Pneumatic Panel
ROCLINK 800 for Dosaodor Application
Type ROC809 software for Dosaodor application

The previous sections described the Dosaodor Human-Machine interface that is based on ROCLINK 800. This paragraph focuses on the the HW component. Some I/O points have already been described in the previous pages.

ROC809 Hardware Configuration

This section describes the required hw configuration and the optional modules.

Required Equipment:

QUANTITY	DESCRIPTION	SELECTION CODE
1	Type ROC809E Controller	FSROC-809/809E
1	Type ROC800 12Vdc Power Supply	FS8PS-1
2	Type ROC800 Discrete Relay Output Card	FS8DO-2
1	Type ROC800 Discrete Input Card	FS8DI-1
1	Type DS800 Runtime License	FS8KY-2

Type Dosaodor-D

Input Card Type Selected for Flow Rate Input:

QUANTITY	DESCRIPTION	SELECTION CODE
1	Type ROC800 Analog Input Card	FS8AI-1
1	Type ROC800 Pulse Input Card	FS8PI-1

Optional Equipment:

QUANTITY	DESCRIPTION	SELECTION CODE
1	ROCLINK 800 Software	FSRW-1/RLW1
1	Type ROC800 LOI Cable	FSACC-8/CBL8A
1	Type ROC800 Ethernet Crossover Cable	FSACC-8/CBL8B
1	Type ROC800 RS232 Comm Module	FS8CM-1
1	Type ROC800 RS485 Comm Module	FS8CM-2
1	Type ROC800 14.4 Dial-up Modem Comm	FS8CM-3
1	Type ROC800 Analog Output Card	FS8AO-1
1	Power Supply Charger 12Vdc	FSACC-8/PS121H

Please refer to Remote Automation Solutions material for specifications at www.emersonprocess.com/flow/.

Enclosure for Type ROC809 may be required depending on customer installation.

The software requires all I/O cards to be placed in the correct slots, as defined in the default configuration. If the cards are moved or removed, the software will not work. There are two exceptions to this. If the system is receiving incoming flow from an input other than a pulse, and the flow input select parameter is set accordingly, the PI card can be removed and the software will not be adversely affected. Similarly, if the system is receiving incoming flow from an input other than analog and the supply tank input is not tied to the analog input, then the AI card may be removed.

Physical I/O

The I/O modules that are used for the Type Dosaodor- D product are standard ROC800 equipment.

The list below describes every module, its position, and the list of the I/O points that are contained in the module.

Every module must be inserted in the assigned slot. See list below:

Slot 1 Optional Comm Card, MVS, Hart or I/O Card

Slot 2 Optional Comm Card, MVS, Hart or I/O Card

Slot 3 Optional Comm Card, MVS, Hart or I/O Card

Slot 4 Pulse Inputs **Point Description** **(Specification Sheet 6.3:PI)**

Channel 1	Flow input from computer or pulse meter
Channel 2	Spare

Slot 5 Analog Inputs **Point Description** **(Specification Sheet 6.3:AI)**

Channel 1	Flow input from computer
Channel 2	Supply tank level input
Channel 3	Spare
Channel 4	Spare

Slot 6 Discrete Inputs **Point Description** **(Specification Sheet 6.3:DI)**

Channel 1	Odorant calibration cylinder high level
Channel 2	Odorant calibration cylinder low level
Channel 3	Gas flow computer alarm
Channel 4	Spare

Channel 5	Spare	
Channel 6	Spare	
Channel 7	Spare	
Channel 8	Spare	

Slot 7	**Analog Outputs**	**Point Description**	**(Specification Sheet 6.3:AO)**
	Channel 1	Instantaneous Odorant Concentration	
	Channel 2	Average Odorant Concentration for Current Day	
	Channel 3	Spare	
	Channel 4	Spare	

Slot 8	**Discrete Relay Outputs**	**Point Description**	**(Specification Sheet 6.3:IOM3)**
	Channel 1	Injector #1 solenoid	
	Channel 2	Injector #2 solenoid	
	Channel 3	Odorant calibration cylinder pressure solenoid / Tank pressure solenoid	
	Channel 4	Odorant calibration cylinder refill control solenoid	
	Channel 5	System is offline	

Slot 9	**Discrete Relay Outputs**	**Point Description**	**(Specification Sheet 6.3:IOM3)**
	Channel 1	Alarm Output	
	Channel 2	Low odorant supply tank level	
	Channel 3	Gas volume output pulse	
	Channel 4	Odorant volume output pulse	
	Channel 5	Spare	

Data History

The Type ROC809 is configured to collect up to 20 points of historical data information. The historical data is logged in three databases: minute data, hourly data, and daily data. The minute database provides (60) one minute values for each point for the previous hour, the hourly database stores 365 days worth of hourly (8760) values for each point and the daily database stores 365 days of daily values for each point.

The following 16 points are assigned in history:

	Value	**Archive Type**
1	Hourly Flow Rate ----------	Average
2	Daily Flow Rate ----------	Average
3	Previous Hour Odorant Concentration --	Current Value
4	Flow Today Total ----------	Current Value
5	Odorant Today Total ----------	Current Value
6	Odorant Concentration Today ----------	Current Value
7	Flow This Month Total ----------	Current Value
8	Odorant This Month Total ----------	Current Value
9	Odorant Concentration This Month ------	Current Value
10	Injections This Hour ----------	Current Value
11	Current Cycle Time ----------	Average
12	Current Injector Open Time ----------	Average
13	Injector 1 Specific Volume ----------	Average

14	Injector 2 Specific Volume ----------	Average
15	Spare ----------	
16	Spare ----------	
17	Spare ----------	
18	Spare ----------	
19	Battery Voltage ----------	Average
20	ROC Temperature ----------	Average

Historical data can be viewed, saved, printed, plotted, or converted to spreadsheet format by using the ROCLINK Configuration Program.

See ROCLINK 800 Configuration Software User Manual (D301159X012).

Reports

Reports can be generated either by the host polling system or by using ROCLINK to capture historical data. Data can either be printed or converted to spreadsheet format to be used for report generation.

See ROCLINK 800 Configuration Software User Manual (D301159X012).

Alarm Callouts

The standard ROC SRBX callout system may be used for remote notification of alarms. This system is supported by most host packages that use ROC protocol for polling of remote stations.

Parameters

Configuration Parameters - Point Type 67

No.	Description	Units	Default
0)	Station Name		
1)	Station Number		
2)	Contract Hour	0 / 23	0
3)	Odorant Concentration	lb/mmcf	0.5
4)	Entered Specific Volume for Injector 1	lb/s	-1
5)	Entered Specific Volume for Injector 2	lb/s	-1
6)	Volume for Switching Injectors	lbs	5.0
7)	Odorant Specific Weight	lb/gal	6.75
8)	Odorant Supply Tank capacity	gal	500
9)	Odorant Supply Tank low level	gal	50
10)	Rated Odorant Calibration Cylinder Capacity	lb	-1
11)	Maximum Odorant Calibration Cylinder fill time	sec	300
12)	Manual Mode Gas Flow Rate	Gallons	0
13)	Minimum Mode Gas Flow Rate	Gallons	0
14)	Low Flow Alarm Value	Gallons	0
15)	High Flow Alarm Value	Gallons	100000
16)	Low Flow Alarm Timeout	minutes	20
17)	High Flow Alarm Timeout	minutes	5
18)	Output Pulse value for gas flow	mcf/pulse	1
19)	Output Pulse value for odorant	lb/pulse	0.01
20)	Gas Wash Cycle Time	sec	30
21)	Flow Input Point Type	Selection	Pulse
22)	Injector Operation Select	Selection	Injector 1
23)	Odorant Recovery Cycle	Start / Stop	Stop

Output Parameters - Point Type 67 (Continued)

No.	Description	Units	
24)	Gas Wash Cycle	Start / Stop	Stop
25)	Spare		
26)	Tank Level Input Select	Selection	Operator Entered
27)	Spare		
28)	Alarm output Select	Selection	None
29)	Alarm Acknowledge	Selection	None
30)	Flow Computer Alarm Action	Selection	Disable
31)	Low Flow Rate Alarm Action	Selection	Disable
32)	High Flow Rate Alarm Action	Selection	Disable
33)	Injector Alarm Select	Selection	Disable
34)	Alarm Restart Options	Selection	Disable
35)	Reset Last Alarm	Yes/No	No
36)	Reset the accumulators	Yes/No	No

Output Parameters - Point Type 68

No.	Description	Units
0)	Mode of Operation	Text
1)	Mode of Operation	Numeric
2)	Gas Flow Rate Hourly	mcf/h
3)	Gas Flow Rate Daily	Gallons
4)	Gas Flow Previous Hour - Auto Mode	mcf
5)	Gas Flow Today - Auto Mode	mcf
6)	Gas Flow Yesterday - Auto Mode	mcf
7)	Gas Flow This Month - Auto Mode	mcf
8)	Gas Flow Last Month - Auto Mode	mcf
9)	Gas Flow Previous Hour - Manual Mode	mcf
10)	Gas Flow Today - Manual Mode	mcf
11)	Gas Flow Yesterday - Manual Mode	mcf
12)	Gas Flow This Month - Manual Mode	mcf
13)	Gas Flow Last Month - Manual Mode	mcf
14)	Gas Flow Previous Hour - Total Flow	mcf
15)	Gas Flow Today - Total Flow	mcf
16)	Gas Flow Yesterday - Total Flow	mcf
17)	Gas Flow This Month - Total Flow	mcf
18)	Gas Flow Last Month - Total Flow	mcf
19)	Odorant Previous Hour	lb
20)	Odorant Today	lb
21)	Odorant Yesterday	lb
22)	Odorant This Month	lb
23)	Odorant Last Month	lb
24)	Injections this hour	numeric
25)	Odorant Concentration Previous Hour	lb/mmcf
26)	Average Concentration Today	lb/mmcf
27)	Average Concentration Yesterday	lb/mmcf
28)	Average Concentration This Month	lb/mmcf
29)	Average Concentration Last Month	lb/mmcf
30)	Current Injector Open Time	sec
31)	Current Injection Cycle Time	sec
32)	Current Injector 1 Specific Volume	lb/sec
33)	Current Injector 2 Specific Volume	lb/sec
34)	Volume Remaining for Injector Switch	lb

Output Parameters - Point Type 68 (Continued)

No.	Description	Units
35)	Odorant Calibration Cylinder Volume Usd	lb
36)	Odorant Calibration Cylinder Volume Remaining	lb
37)	Last Odorant Calibration Cylinder Fill Time	sec
38)	Current Supply Tank Volume	gas
39)	License Key Status	numeric
40)	Flow Computer Alarm Code	numeric
41)	Low Gas Flow Alarm Code	numeric
42)	High Gas Flow Alarm Code	numeric
43)	Injector 1 Alarm Code	numeric
44)	Injector 2 Alarm Code	numeric
45)	Odorant Calibration Cylinder Fill Time Alarm Code	numeric
46)	Odorant Supply Tank Low Alarm Code	numeric
47)	Current Injector	numeric
48)	Odorant Calibration Cylinder Fills Today	numeric
49)	Odorant Calibration Cylinder Fills Yesterday	numeric
50)	Odorant Calibration Cylinder Fills This Month	numeric
51)	Cylinder Fills Last Month	numeric
52)	Internal - MCF Accumulated	mcf
53)	Internal - MCF Per Hour	mcf/h
54)	Last Alarm Message	Text
55)	Program Status	Text

Host Modbus

The following Modbus register list may be customized. Please refer to your local Emerson Business Partner.

TAG NAME	VARIABLE NAME	ROC TLP	INTERNAL	MODBUS	MODBUS	NO. MODBUS	ROC MODBUS		POSSIBLE HOST MODBUS	
			ROC Data Type	Convert Code	Output Data Type	Registers	Addresses		Starting Addresses	
	Contract hour	67,0,2	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	100	101	30101	40101
	Odorant concentration	67,0,3	32 Bit Float	70	32 Bit Float	2	102	103	30103	40103
	Entered specific volume for injector 1	67,0,4	32 Bit Float	70	32 Bit Float	2	104	105	30105	40105
	Entered specific volume for injector 2	67,0,5	32 Bit Float	70	32 Bit Float	2	106	107	30107	40107
	Volume for switching injectors	67,0,6	32 Bit Float	70	32 Bit Float	2	108	109	30109	40109
	Odorant specific weight	67,0,7	32 Bit Float	70	32 Bit Float	2	110	111	30111	40111
	Supply tank capacity	67,0,8	32 Bit Float	70	32 Bit Float	2	112	113	30113	40113
	Supply tank low alarm	67,0,9	32 Bit Float	70	32 Bit Float	2	114	115	30115	40115
	Rated Cylinder capacity	67,0,10	32 Bit Float	70	32 Bit Float	2	116	117	30117	40117
	Maximum cylinder fill time	67,0,11	32 Bit Float	70	32 Bit Float	2	118	119	30119	40119
	Manual Mode gas flow rate	67,0,12	32 Bit Float	70	32 Bit Float	2	120	121	30121	40121
	Minimum Rate Mode gas flow rate	67,0,13	32 Bit Float	70	32 Bit Float	2	122	123	30123	40123
	Low flow alarm value	67,0,14	32 Bit Float	70	32 Bit Float	2	124	125	30125	40125
	High flow alarm value	67,0,15	32 Bit Float	70	32 Bit Float	2	126	127	30127	40127
	Low Flow alarm timeout	67,0,16	32 Bit Float	70	32 Bit Float	2	128	129	30129	40129

Host Modbus (continued)

TAG NAME	VARIABLE NAME	ROC TLP	INTERNAL ROC Data Type	MODBUS Convert Code	MODBUS Output Data Type	NO. MODBUS Registers	ROC MODBUS Addresses		POSSIBLE HOST MODBUS Starting Addresses	
	High Flow alarm timeout	67,0,17	32 Bit Float	70	32 Bit Float	2	130	131	30131	40131
	Output pulse value for flow	67,0,18	32 Bit Float	70	32 Bit Float	2	132	133	30133	40133
	Output pulse value for odorant	67,0,19	32 Bit Float	70	32 Bit Float	2	134	135	30135	40135
	Gas wash cycle time	67,0,20	32 Bit Float	70	32 Bit Float	2	136	137	30137	40137
	Flush wash cycle time	67,0,21	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	138	139	30139	40139
	Flow input point select	67,0,22	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	140	141	30141	40141
	Injector system select	67,0,23	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	142	143	30143	40143
	Recovery cycle select	67,0,24	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	144	145	30145	40145
	Gas wash cycle select	67,0,25	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	146	147	30147	40147
	Flush wash cycle select	67,0,26	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	148	149	30149	40149
	Tank level input select	67,0,27	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	150	151	30151	40151
	Alarm output select	67,0,28	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	152	153	30153	40153
	Alarm acknowledge	67,0,29	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	154	155	30155	40155
	Computer flow alarm select	67,0,30	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	156	157	30157	40157
	Low flow alarm select	67,0,31	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	158	159	30159	40159
	High flow alarm select	67,0,32	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	160	161	30161	40161
	Injector alarm select	67,0,33	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	162	163	30163	40163
	Alarm restart options	67,0,34	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	164	165	30165	40165
	Alarm Reset	67,0,35	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	166	167	30167	40167
	Reset accumulators	67,0,36	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	168	169	30169	40169
	Pulse Input card option	67,0,37	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	170	171	30171	40171
	Analog Input Card Option	67,0,38	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	172	173	30173	40173
	Discrete Input Card Required	67,0,39	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	174	175	30175	40175
	Analog Output Card Option	67,0,40	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	176	177	30177	40177
	Discrete Output Card Required	67,0,41	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	178	179	30179	40179
	Discrete Output Card Option	67,0,42	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	180	181	30181	40181
	PI Scale Factor	67,0,43	32 Bit Float	70	32 Bit Float	2	182	183	30183	40183
	PI Scan Period	67,0,44	32 Bit Float	70	32 Bit Float	2	184	185	30185	40185
	AO Concentration Prev Hour Scale	67,0,45	32 Bit Float	70	32 Bit Float	2	186	187	30187	40187
	AO Concentration Today Scale	67,0,46	32 Bit Float	70	32 Bit Float	2	188	189	30189	40189
	AI Flow Low Scale Value	67,0,47	32 Bit Float	70	32 Bit Float	2	190	191	30191	40191
	AI Flow High Scale Value	67,0,48	32 Bit Float	70	32 Bit Float	2	192	193	30193	40193
	AI Tank Low Scale Value	67,0,49	32 Bit Float	70	32 Bit Float	2	194	195	30195	40195
	AI Tank High Scale Value	67,0,50	32 Bit Float	70	32 Bit Float	2	196	197	30197	40197

Host Modbus (continued)

TAG NAME	VARIABLE NAME	ROC TLP	INTERNAL	MODBUS	MODBUS	NO. MODBUS	ROC MODBUS		POSSIBLE HOST MODBUS	
			ROC Data Type	Convert Code	Output Data Type	Registers	Addresses		Starting Addresses	
	Low Warning Limit Entered Injector 1	67,0,51	32 Bit Float	70	32 Bit Float	2	198	199	30199	40199
	High Warning Limit Entered Injector 1	67,0,52	32 Bit Float	70	32 Bit Float	2	200	201	30201	40201
	Low Warning Limit Entered Injector 2	67,0,53	32 Bit Float	70	32 Bit Float	2	202	203	30203	40203
	High Warning Limit Entered Injector 2	67,0,54	32 Bit Float	70	32 Bit Float	2	204	205	30205	40205
	Warning Limit Previous Injector 1	67,0,55	32 Bit Float	70	32 Bit Float	2	206	207	30207	40207
	Warning Limit Previous Injector 2	67,0,56	32 Bit Float	70	32 Bit Float	2	208	209	30209	40209
	Alarm / Warning Information Display	67,0,57	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	210	211	30211	40211
	Reset Warnings Injector 1	67,0,58	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	212	213	30213	40213
	Reset Warnings Injector 2	67,0,59	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	214	215	30215	40215
	Last Warning Reset	67,0,60	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	216	217	30217	40217
Spare						2	218	219	30219	40219
Spare						2	220	221	30221	40221
Spare						2	222	223	30223	40223
Spare						2	224	225	30225	40225
Spare						2	226	227	30227	40227
Spare						2	228	229	30229	40229
Spare						2	230	231	30231	40231
Spare						2	232	233	30233	40233
Spare						2	234	235	30235	40235
Spare						2	236	237	30237	40237
Spare						2	238	239	30239	40239
Spare						2	240	241	30241	40241
Spare						2	242	243	30243	40243
Spare						2	244	245	30245	40245
Spare						2	246	247	30247	40247
Spare						2	248	249	30249	40249
	Mode of operation (Numeric)	68,0,1	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	250	251	30251	40251
	Flow rate hourly	68,0,2	32 Bit Float	70	32 Bit Float	2	252	253	30253	40253
	Flow rate daily	68,0,3	32 Bit Float	70	32 Bit Float	2	254	255	30255	40255
	Flow previous hour auto	68,0,4	32 Bit Float	70	32 Bit Float	2	256	257	30257	40257
	Flow today auto	68,0,5	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	258	259	30259	40259
	Flow yesterday auto	68,0,6	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	260	261	30261	40261
	Flow this month auto	68,0,7	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	262	263	30263	40263
	Flow last month auto	68,0,8	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	264	265	30265	40265
	Flow previous hour manual	68,0,9	32 Bit Float	70	32 Bit Float	2	266	267	30267	40267
	Flow today manual	68,0,10	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	268	269	30269	40269
	Flow yesterday manual	68,0,11	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	270	271	30271	40271
	Flow this month manual	68,0,12	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	272	273	30273	40273
	Flow last month manual	68,0,13	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	274	275	30275	40275
	Flow previous hour total	68,0,14	32 Bit Float	70	32 Bit Float	2	276	277	30277	40277
	Flow today total	68,0,15	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	278	279	30279	40279
	Flow yesterday total	68,0,16	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	280	281	30281	40281

Host Modbus (continued)

TAG NAME	VARIABLE NAME	ROC TLP	INTERNAL	MODBUS	MODBUS	NO. MODBUS	ROC MODBUS		POSSIBLE HOST MODBUS	
			ROC Data Type	Convert Code	Output Data Type	Registers	Addresses		Starting Addresses	
	Flow this month total	68,0,17	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	282	283	30283	40283
	Flow last month total	68,0,18	32 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	284	285	30285	40285
	Odorant previous hour	68,0,19	32 Bit Float	70	32 Bit Float	2	286	287	30287	40287
	Odorant today	68,0,20	32 Bit Float	70	32 Bit Float	2	288	289	30289	40289
	Odorant yesterday	68,0,21	32 Bit Float	70	32 Bit Float	2	290	291	30291	40291
	Odorant this month	68,0,22	32 Bit Float	70	32 Bit Float	2	292	293	30293	40293
	Odorant last month	68,0,23	32 Bit Float	70	32 Bit Float	2	294	295	30295	40295
	Injections this hour	68,0,24	32 Bit Float	70	32 Bit Float	2	296	297	30297	40297
	Average concentration previous hour	68,0,25	32 Bit Float	70	32 Bit Float	2	298	299	30299	40299
	Average concentration today	68,0,26	32 Bit Float	70	32 Bit Float	2	300	301	30301	40301
	Average concentration yesterday	68,0,27	32 Bit Float	70	32 Bit Float	2	302	303	30303	40303
	Average concentration this month	68,0,28	32 Bit Float	70	32 Bit Float	2	304	305	30305	40305
	Average concentration last month	68,0,29	32 Bit Float	70	32 Bit Float	2	306	307	30307	40307
	Current Injector open time	68,0,30	32 Bit Float	70	32 Bit Float	2	308	309	30309	40309
	Injection cycle time	68,0,31	32 Bit Float	70	32 Bit Float	2	310	311	30311	40311
	Current injector 1 specific volume	68,0,32	32 Bit Float	70	32 Bit Float	2	312	313	30313	40313
	Current injector 2 specific volume	68,0,33	32 Bit Float	70	32 Bit Float	2	314	315	30315	40315
	Volume remaining before injector switch	68,0,34	32 Bit Float	70	32 Bit Float	2	316	317	30317	40317
	Cylinder volume used	68,0,35	32 Bit Float	70	32 Bit Float	2	318	319	30319	40319
	Cylinder volume remaining	68,0,36	32 Bit Float	70	32 Bit Float	2	320	321	30321	40321
	Last cylinder fill time	68,0,37	32 Bit Float	70	32 Bit Float	2	322	323	30323	40323
	Current supply tank volume	68,0,38	32 Bit Float	70	32 Bit Float	2	324	325	30325	40325
	License key status	68,0,39	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	326	327	30327	40327
	Flow computer alarm	68,0,40	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	328	329	30329	40329
	Low gas flow alarm	68,0,41	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	330	331	30331	40331
	High gas flow alarm	68,0,42	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	332	333	30333	40333
	Injector no.1 alarm	68,0,43	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	334	335	30335	40335
	Injector no.2 alarm	68,0,44	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	336	337	30337	40337
	Cylinder fill time alarm	68,0,45	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	338	339	30339	40339
	Odorant supply tank low alarm	68,0,46	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	340	341	30341	40341
	Current injector	68,0,47	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	342	343	30343	40343
	Cylinder fills today	68,0,48	16 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	344	345	30345	40345
	Cylinder fills yesterday	68,0,49	16 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	346	347	30347	40347
	Cylinder fills this month	68,0,50	16 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	348	349	30349	40349
	Cylinder fill last month	68,0,51	16 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	350	351	30351	40351

Host Modbus (continued)

TAG NAME	VARIABLE NAME	ROC TLP	INTERNAL ROC Data Type	MODBUS Convert Code	MODBUS Output Data Type	NO. MODBUS Registers	ROC MODBUS Addresses		POSSIBLE HOST MODBUS Starting Addresses	
	Number of divide by 2 events injector 1	68,0,56	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	352	353	30353	40353
	Number of divide by 2 events injector 2	68,0,57	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	354	355	30355	40355
	Injector 1 previous value limit warning	68,0,58	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	356	357	30357	40357
	Injector 2 previous value limit warning	68,0,59	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	358	359	30359	40359
	Injector 1 entered value limit warning	68,0,60	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	360	361	30361	40361
	Injector 2 entered value limit warning	68,0,61	8 Bit Unsigned Integer	61	32 Bit Unsigned Integer	2	362	363	30363	40363
	Percent change entered injector 1	68,0,62	32 Bit Float	70	32 Bit Float	2	364	365	30365	40365
	Percent change entered injector 2	68,0,63	32 Bit Float	70	32 Bit Float	2	366	367	30367	40367
	Percent change previous injector 1	68,0,64	32 Bit Float	70	32 Bit Float	2	368	369	30369	40369
	Percent change previous injector 2	68,0,65	32 Bit Float	70	32 Bit Float	2	370	371	30371	40371
	Low warning value injector 1	68,0,66	32 Bit Float	70	32 Bit Float	2	372	373	30373	40373
	High warning value injector 1	68,0,67	32 Bit Float	70	32 Bit Float	2	374	375	30375	40375
	Low warning value injector 2	68,0,68	32 Bit Float	70	32 Bit Float	2	376	377	30377	40377
	High warning value injector 2	68,0,69	32 Bit Float	70	32 Bit Float	2	378	379	30379	40379
Spare						2	380	381	30381	40381
Spare						2	382	383	30383	40383
Spare						2	384	385	30385	40385
Spare						2	386	387	30387	40387
Spare						2	388	389	30389	40389
Spare						2	390	391	30391	40391
Spare						2	392	393	30393	40393
Spare						2	394	395	30395	40395
Spare						2	396	397	30397	40397
Spare						2	398	399	30399	40399
	Station name	67,0,0	ASCII 20 Character	81	16 Bit Registers	10	400	409	30401	40401
	Station Number	67,0,1	ASCII 20 Character	81	16 Bit Registers	10	410	419	30411	40411
	Mode of operation (Text)	68,0,0	ASCII 20 Character	81	16 Bit Registers	10	420	429	30421	40421
	Last Alarm	68,0,54	ASCII 30 Character	81	16 Bit Registers	15	430	444	30431	40431
	Program status	68,0,55	ASCII 30 Character	81	16 Bit Registers	15	445	459	30446	40446
	Last warning	68,0,70	ASCII 30 Character	81	16 Bit Registers	15	460	474	30461	40461

Notes: ASCII Character transmission using convert code 81 is available in the ROC800 Series II

ROC800 Modbus Data Conversion

CONVERT Code	DESCRIPTION	SLAVE Function	DEFINITION
0	No Conversion	N/A	N/A
1	Float to integer, Float Scale 1	3,4	The Float to Integer conversion changes ROC or FloBoss floating point data to an integer for transmission to the Host. The number of the Convert Code specifies which floating point scaling value is to be used for the conversion.
2	Float to integer, Float Scale 2	3,4	
3	Float to integer, Float Scale 3	3,4	
4	Float to integer, Float Scale 4	3,4	
5	Float to integer, Float Scale 5	3,4	
6	Float to integer, Float Scale 6	3,4	
7	Float to integer, Float Scale 7	3,4	
8	Float to integer, Float Scale 8	3,4	

ROC800 Modbus Data Conversion (continued)

CONVERT Code	DESCRIPTION	SLAVE Function	DEFINITION
9	Any type to signed long with 1 implied decimal place	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –12).
10	Any type to signed long with 2 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –123).
11	Any type to signed long with 3 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –1234).
12	Any type to signed long with 4 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –12345).
13	Any type to signed long with 5 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –123456).
14	Any type to signed long with 6 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –1234567).
15	Any type to signed long with 7 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –12345670).
16	Any type to signed long with 8 implied decimal places	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000000.0 and converted to a signed 32 bit integer. (A value of –1.234567 would be sent as –123456700).
17	Any Type to Unsigned Long Implied 1	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 12).
18	Any Type to Unsigned Long Implied 2	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 123).
19	Any Type to Unsigned Long Implied 3	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 1234).
20	Any Type to Unsigned Long Implied 4	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 12345).
21	Any Type to Unsigned Long Implied 5	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 123456).
22	Any Type to Unsigned Long Implied 6	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 1234567).
23	Any Type to Unsigned Long Implied 7	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 12345670).
24	Any Type to Unsigned Long Implied 8	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000000.0 and converted to an unsigned 32 bit integer. (A value of 1.234567 would be sent as 123456700).
25	Any type to Float, No Scaling	3,4,6,16	ROC800 Series and FloBoss 107. When using Function Code 03 or 04, this conversion changes any data type (unsigned or signed Character, Integer, or Long) in the ROC to a specific point value for transmission to the Host. When using Function Code 6 or 16, this conversion changes a transmitted floating point value to the correct data type for the ROC TLP.
26	Any type to Signed Short Integer	3,4,6,16	
27	Any type to Signed Long Integer	3,4,6,16	
28	Any type to Unsigned Short Integer	3,4,6,16	
29	Any type to Unsigned Long Integer	3,4,6,16	
30 to 32	No Conversion	N/A	N/A
37	Unsigned Byte to Packed Bit	3,4,6,16	ROC800 Series only. Response is identical that for a function 1 or 2 request. All registers in the range requested must be unsigned integer 8 values and have a conversion code of 37.

ROC800 Modbus Data Conversion (continued)

CONVERT Code	DESCRIPTION	SLAVE Function	DEFINITION
41	Any Type to Signed Short Implied 1	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10.0 and converted to a signed 16 bit integer. (A value of –0.12345 would be sent as –1).
42	Any Type to Signed Short Implied 2	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100.0 and converted to a signed 16 bit integer. (A value of –0.12345 would be sent as –12).
43	Any Type to Signed Short Implied 3	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000.0 and converted to a signed 16 bit integer. (A value of –0.12345 would be sent as –123).
44	Any Type to Signed Short Implied 4	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000.0 and converted to a signed 16 bit integer. (A value of –0.12345 would be sent as –1234).
45	Any Type to Signed Short Implied 5	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000.0 and converted to a signed 16 bit integer. (A value of –0.12345 would be sent as –12345).
46	Any Type to Signed Short Implied 6	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000000.0 and converted to a signed 16 bit integer. (A value of –0.01234567 would be sent as –12345).
47	Any Type to Signed Short Implied 7	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000.0 and converted to a signed 16 bit integer. (A value of –0.0012345 would be sent as –12345).
48	Any Type to Signed Short Implied 8	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000000.0 and converted to a signed 16 bit integer. (A value of –0.0001234567 would be sent as –12345).
49	Any Type to Unsigned Short Implied 1	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10.0 and converted to an unsigned 16 bit integer. (A value of 0.1234567 would be sent as 1).
50	Any Type to Unsigned Short Implied 2	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100.0 and converted to an unsigned 16 bit integer. (A value of 0.1234567 would be sent as 12).
51	Any Type to Unsigned Short Implied 3	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000.0 and converted to an unsigned 16 bit integer. (A value of 0.1234567 would be sent as 123).
52	Any Type to Unsigned Short Implied 4	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000.0 and converted to an unsigned 16 bit integer. (A value of 0.1234567 would be sent as 1234).
53	Any Type to Unsigned Short Implied 5	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000.0 and converted to an unsigned 16 bit integer. (A value of 0.1234567 would be sent as 12345).
54	Any Type to Unsigned Short Implied 6	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 1000000.0 and converted to an unsigned 16 bit integer. (A value of 0.01234567 would be sent as 12345).
55	Any Type to Unsigned Short Implied 7	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 10000000.0 and converted to an unsigned 16 bit integer. (A value of 0.001234567 would be sent as 12345).
56	Any Type to Unsigned Short Implied 8	3,4,6,16	ROC800 Series only. Value within ROC is multiplied by 100000000.0 and converted to an unsigned 16 bit integer. (A value of 0.0001234567 would be sent as 12345).
57	Any type to signed long Byte Order 0, 1, 2, 3	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 0-1-2-3. Note: Byte 0 = MSB and Byte 3 = LSB
58	Any type to signed long Byte Order 1, 0, 3, 2	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 1-0-3-2. Note: Byte 0 = MSB and Byte 3 = LSB
59	Any type to signed long Byte Order 2, 3, 0, 1	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 2-3-0-1. Note: Byte 0 = MSB and Byte 3 = LSB
60	Any type to signed long Byte Order 3, 2, 1, 0	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 3-2-1-0. Note: Byte 0 = MSB and Byte 3 = LSB

ROC800 Modbus Data Conversion (continued)

CONVERT Code	DESCRIPTION	SLAVE Function	DEFINITION
61	Any type to unsigned long Byte Order 0, 1, 2, 3	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 0-1-2-3. Note: Byte 0 = MSB and Byte 3 = LSB
62	Any type to unsigned long Byte Order 1, 0, 3, 2	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 1-0-3-2. Note: Byte 0 = MSB and Byte 3 = LSB
63	Any type to unsigned long Byte Order 2, 3, 0, 1	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 2-3-0-1. Note: Byte 0 = MSB and Byte 3 = LSB
64	Any type to unsigned long Byte Order 3, 2, 1, 0	3,4,6,16	ROC800 Series only. Response is similar to dual register floating point conversions. Dual register – byte order 3-2-1-0. Note: Byte 0 = MSB and Byte 3 = LSB
65	IEEE Floating Point Number	3,4,16	Code 65 places byte 0 and byte 1 in register xxxx; byte 2 and byte 3 are placed in register xxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 66 does the same as Code 65 regardless of the Byte Order field in the Modbus Configuration screen. LSB MSB Register xxxx byte 0, byte 1 byte 1, byte 0 Register xxxx + 1 byte 2, byte 3 byte 3, byte 2
66	IEEE Floating Point	3,4,16	Register xxxx byte 0, byte 1
			Register xxxx + 1 byte 2, byte 3
67	IEEE Floating Point Number	3,4,16	Code 67 reverses byte 0 and byte 1 order in register xxxx; reverses byte 2 and byte 3 order in register xxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 68 does the same as Code 67 regardless of the Byte Order field in the Modbus Configuration screen. LSB MSB Register xxxx byte 1, byte 0 byte 0, byte 1 Register xxxx + 1 byte 3, byte 2 byte 2, byte 3
68	IEEE Floating Point	3,4,16	Register xxxx byte 1, byte 0
	Number		Register xxxx + 1 byte 3, byte 2
69	IEEE Floating Point Number	3,4,16	Code 69 places byte 2 and byte 3 in register xxxx; byte 0 and byte 1 are placed in register xxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 70 does the same as Code 69 regardless of the Byte Order field in the Modbus Configuration screen. LSB MSB Register xxxx byte 2, byte 3 byte 3, byte 2 Register xxxx + 1 byte 0, byte 1 byte 1, byte 0
70	IEEE Floating Point	3,4,16	Register xxxx byte 2, byte 3
	Number		Register xxxx + 1 byte 0, byte 1
71	IEEE Floating Point Number	3,4,16	Code 71 reverses byte 2 and byte 3 order in register xxxx; reverses byte 0 and byte 1 order in register xxxx + 1. This places a 4-byte floating point value into two, 2-byte registers to allow integer values to be transmitted. Code 72 does the same as Code 71 regardless of the Byte Order field in the Modbus Configuration screen. LSB MSB Register xxxx byte 3, byte 2 byte 2, byte 3 Register xxxx + 1 byte 1, byte 0 byte 0, byte 1
72	IEEE Floating Point	3,4,16	Register xxxx byte 3, byte 2
	Number		Register xxxx + 1 byte 1, byte 0
75 to 255	No Conversion	N/A	N/A

Type Dosaodor-D

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