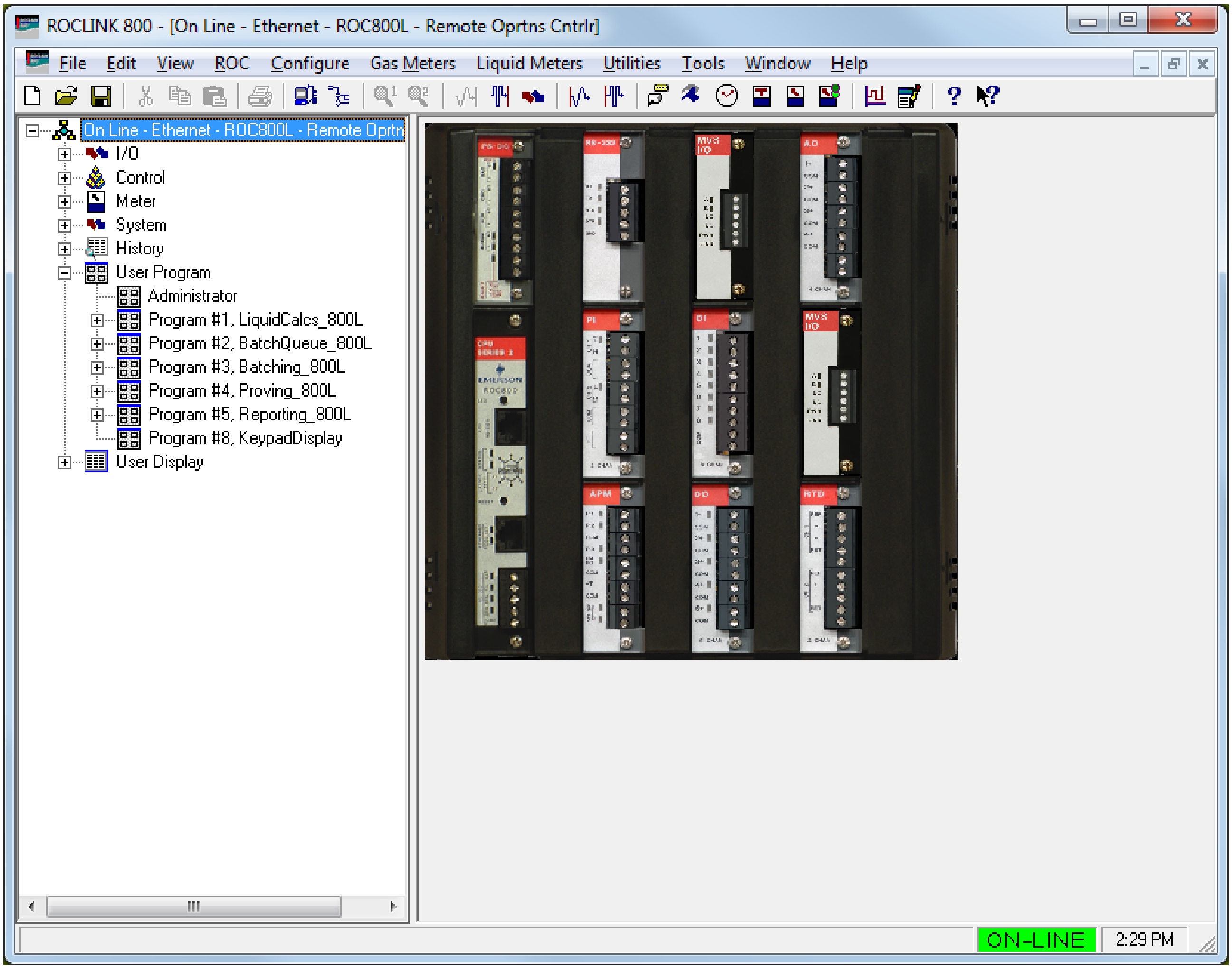
Part D301246X012
February 2024

ROCLINK™ 800 Configuration Software User Manual (for ROC800L)



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Chapter 1 – Introduction

In This Chapter

This chapter describes the ROCLINK™ 800 Configuration software (ROCLINK 800) you use to configure and monitor ROC800L Remote Operations Controllers (ROCs) and the dynamic user interface.

1.1 ROCLINK 800 Software Basics

ROCLINK 800 Configuration software enables you to monitor, configure, and calibrate Remote Operations Controllers (ROCs). Remote Automation Solutions provides the software and user documentation on a CD-ROM.

ROCLINK 800 is designed for ease of use. Drop-down menus simplify accessing the functions provided by the software. Dialog boxes and drop-down list boxes (▼) help to direct selections and data entry. You can perform actions with the keyboard or a pointing device, such as a mouse. Refer to *User Interface Basics* (located in this chapter) for a description of the user interface.

You access help screens either from the Help menu or in a context-sensitive fashion pressing the **F1** key when your cursor is in a field. This feature makes it easy to access on-line information for any ROCLINK 800 topic.

You can build custom displays for the ROC that combine both graphic and dynamic data elements, and then use these displays to monitor the operation of the ROC either locally or remotely.

The software also provides multiple levels of security for controlling access to ROCLINK 800 functions, as well as the ROC database.

1.2 Computer Requirements

ROCLINK 800 works on most compatible personal computers (PCs) running Windows® operating systems. The PC can be a desktop or a portable computer, but must meet the following minimum requirements:

- Pentium-class processor (233 MHz or greater recommended).
- DVD-ROM drive.
- Windows 7 (32-bit and 64-bit).
- Windows 8 (32-bit and 64-bit).
- Windows 10 (32-bit and 64-bit).
- Windows Server 2012
- 64 MB of RAM (random access memory).
- SVGA color monitor, 800 by 600 pixels, small fonts.
- 105 MB of available hard disk space depending on operating system and revision level.
- EIA-232 (RS-232) serial connection or USB-to-serial adaptor, a TCP/IP connection, or a dial-up modem connection.

1.3 Contacting Technical Support

For technical support, please contact your local sales representative or contact Remote Automation Solutions directly.

Emerson Automation Solutions
Energy and Transportation Solutions
Marshalltown, IA 50158 USA
Houston, TX 77065 USA
Pickering, North Yorkshire UK Y018 7JA

Website: http://www.emersonprocess.com/remote/

Technical Support Website:
http://www2.emersonprocess.com/en-US/brands/remote/systems_and_software/supportnet/support_contacts/Pages/support_contacts.aspx

Toll Free: (US and Canada) 800.537.9313
Hours: 24x5 during normal business days
SupportNet Login:
www3.emersonprocess.com/remote/support/v2/login.html

1.4 Software Installation

Note: The device requires version 1.88 or later of ROCLINK 800. When using the Microsoft Windows 8 or Windows 7 operating system, refer to *Installing ROCLINK 800 under Microsoft Windows 10, Windows 8 or Windows 7* (located in this chapter).

To install ROCLINK 800:

1. Extract the .zip file to the local hard drive (for example, in the C:\TEMP\directory) or place the DVD-ROM into the drive.
2. Double-click the **setup.exe** file if the installation Wizard does not automatically launch. The installation Wizard screen appears.
3. Click **Next** in the ROCLINK 800 Welcome screen. Read the License Agreement and click **YES** to accept it. Enter your **Name** and **Company** name, and click **Next.**

   The program installs the software in the default recommended directory C:\Program Files\ROCLINK800 or C:\Program Files (x86) \ROCLINK800. Select an alternative destination folder if you want to install the software in a folder other than the default.
4. Follow the setup installation directions.
5. Click the **Finish** button in the Wizard Complete screen.

   Note: You may need to restart your PC to complete the installation.

1.4.1 Installing ROCLINK 800 under Microsoft Windows 10, Windows 8 or Windows 7

To install or upgrade ROCLINK 800 on the Microsoft Windows 10, Windows 8 or Windows 7 platform, you must temporarily disable User Account Control **before** performing the installation and change your PC's Regional Settings.

Disabling User Account Control ensures that all files copy and are not limited by Windows' security enhancements. Refer to *Disabling User Account Control (Windows 10), Disabling User Account Control (Windows 8)* and *Disabling User Account Control (Windows7)* (located in this chapter).

Changing your PC's Region Settings prevents you from potentially encountering configuration file errors. Refer to *Changing Region Settings (Windows 10), Changing Region Settings (Windows 8)* and *Changing Region Settings (Windows 7)* (located in this chapter).

Disabling User Account Control (Windows 10)

Note: User Account Control must remain **disabled** in order to run ROCLINK 800.

To disable User Account Control:

1. Right-click the Start menu and select **Search** from the pop-up menu.

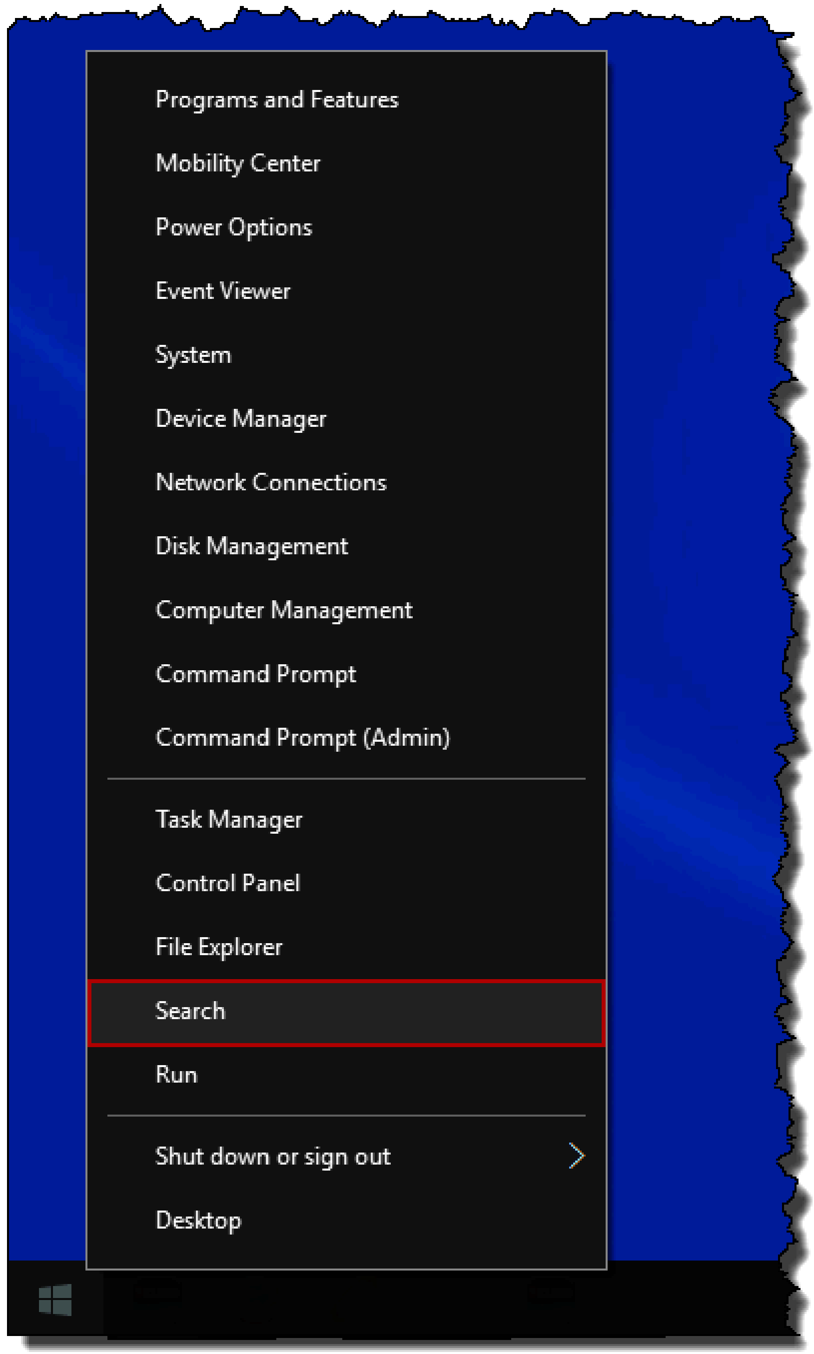


Figure 1-1. Pop-Up Menu

2. Type **UAC** into the Search field.

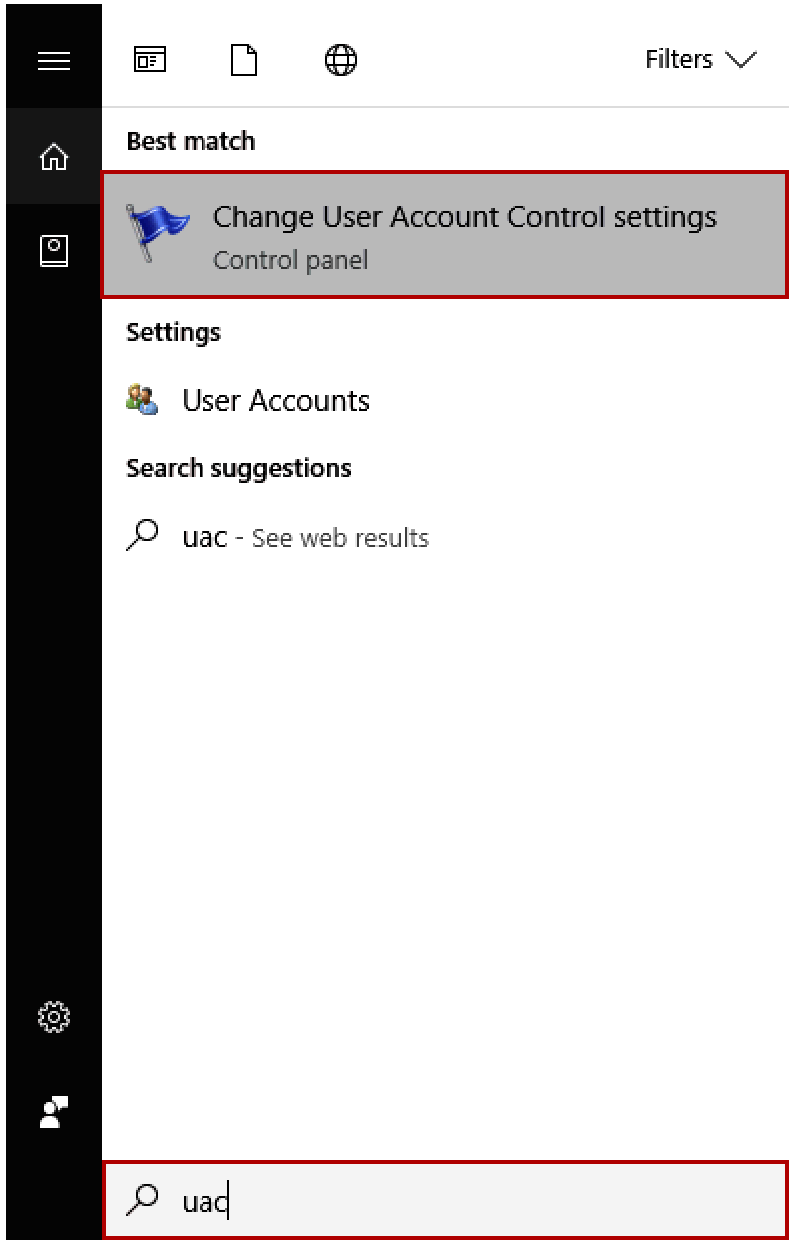


Figure 1-2. Search

3. Click **Change User Account Control settings** in the results list.
4. Move the User Account Control slider to **Never Notify**.

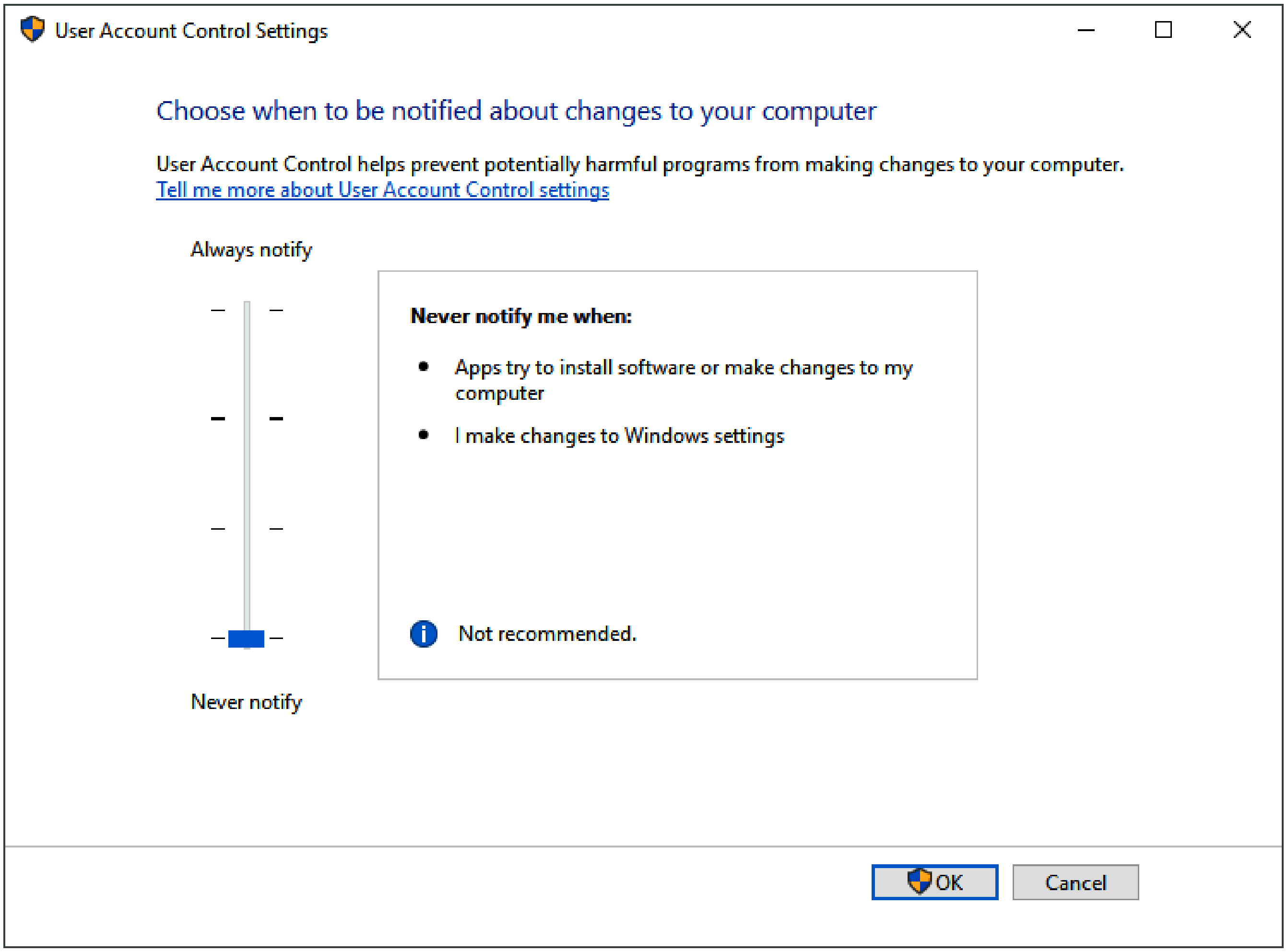


Figure 1-3. User Account Control Settings (Windows 10)

5. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter Administrator password if necessary) if Windows asks if you want to allow the changes.

6. **Reboot** the computer for your changes to take effect.
7. Start **ROCLINK 800**. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

Disabling User Account Control (Windows 8)

Note: User Account Control must remain **disabled** in order to run ROCLINK 800.

To disable User Account Control:

1. Select **Search** and type **UAC** into the Search field.

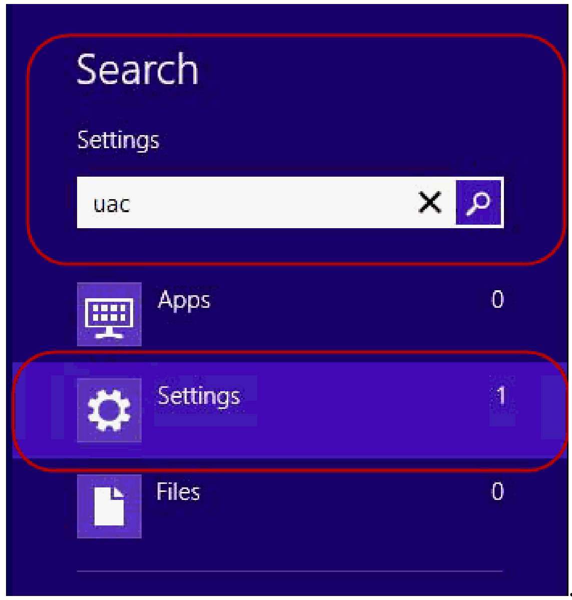


Figure 1-4. Search

2. Select **Settings** and click **Change User Account Control settings**.

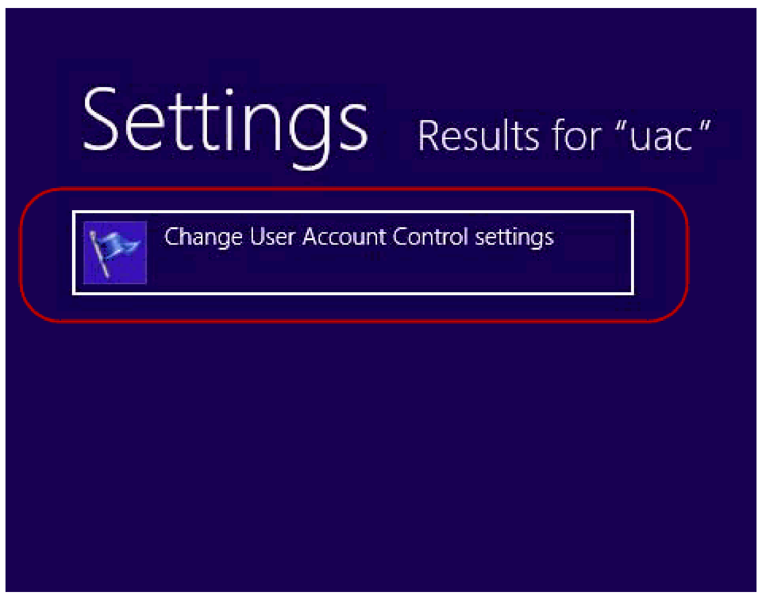


Figure 1-5. Settings – Results for "uac

3. Move the User Account Control slider to **Never Notify**.

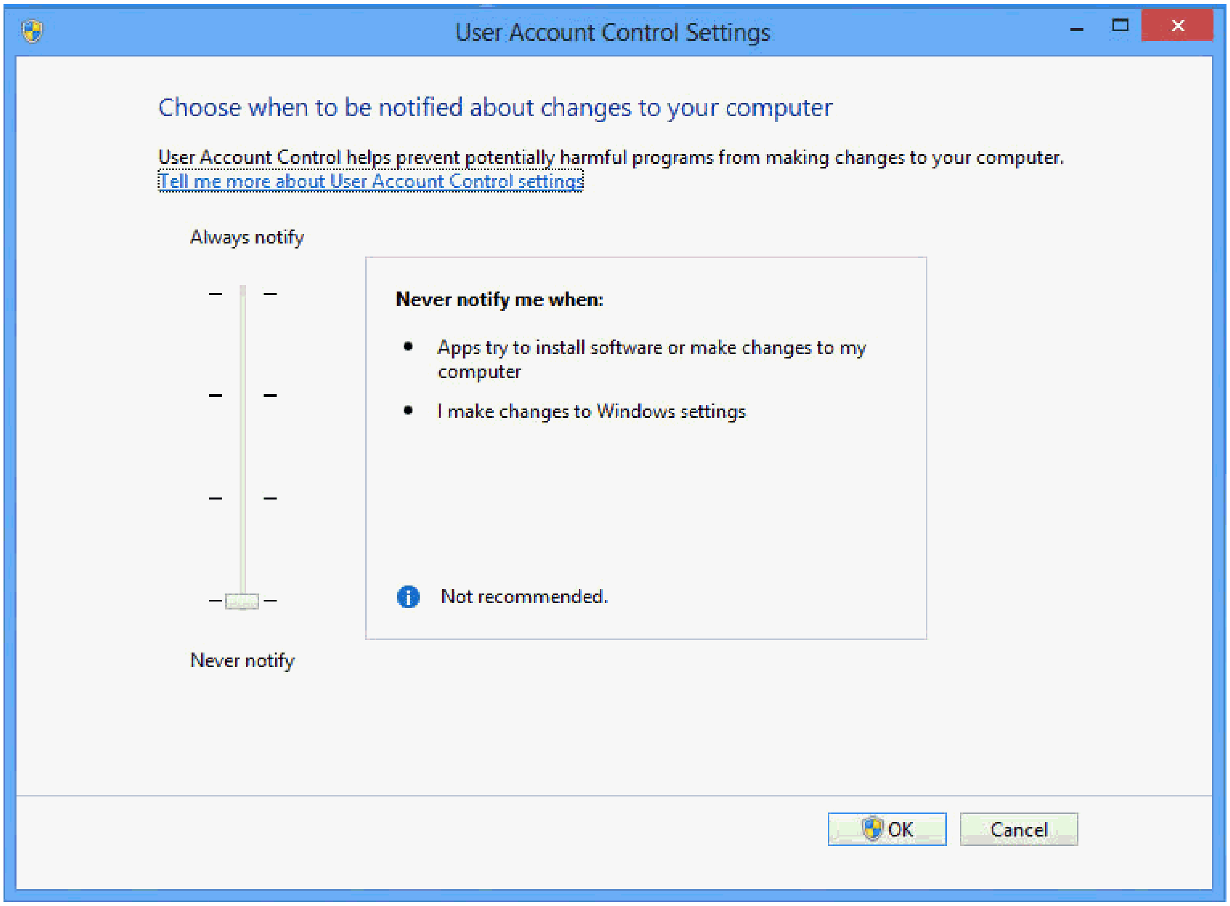
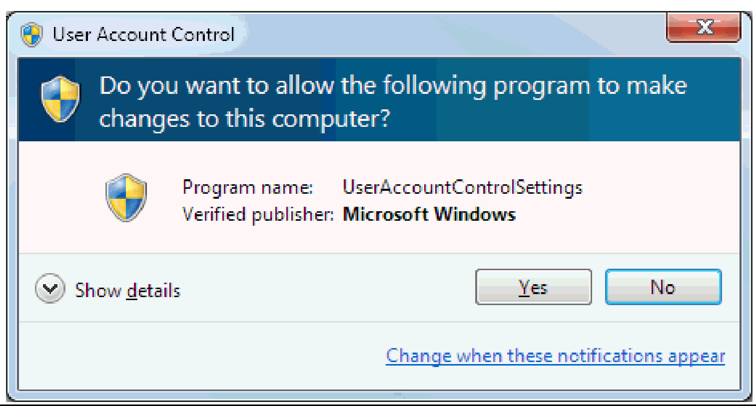


Figure 1-6. User Account Control Settings (Windows 8)

4. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter Administrator password if necessary) if Windows asks if you want to allow the changes.



5. Reboot the computer for your changes to take effect.
6. Start **ROCLINK 800**. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

Disabling User Account Control (Windows 7)

Note: User Account Control must remain **disabled** in order to run ROCLINK 800.

To disable User Account Control:

1. Select **Start** and type **MSCONFIG** in the Search field.
2. Click the program file **msconfig.exe**. The System Configuration screen displays.

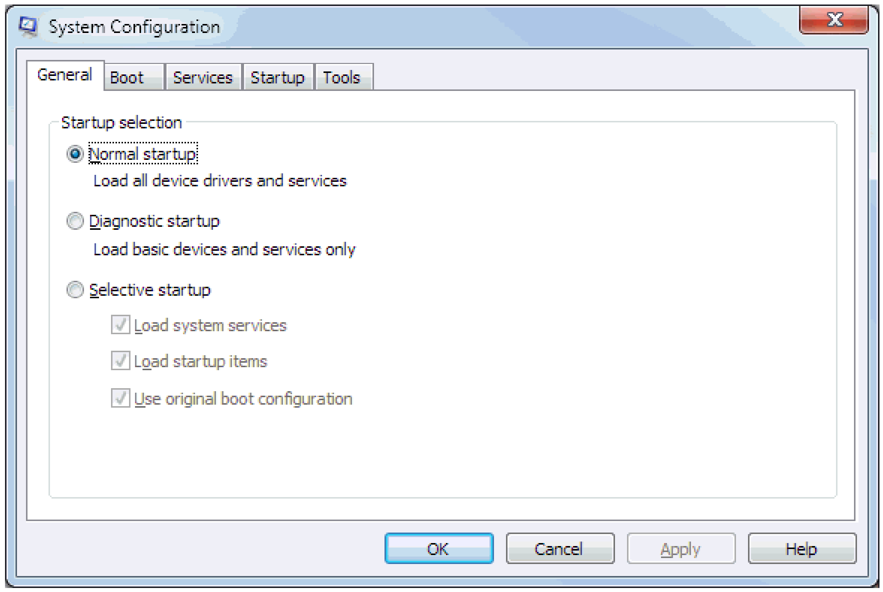


Figure 1-7. System Configuration

3. Click the **Tools** tab.

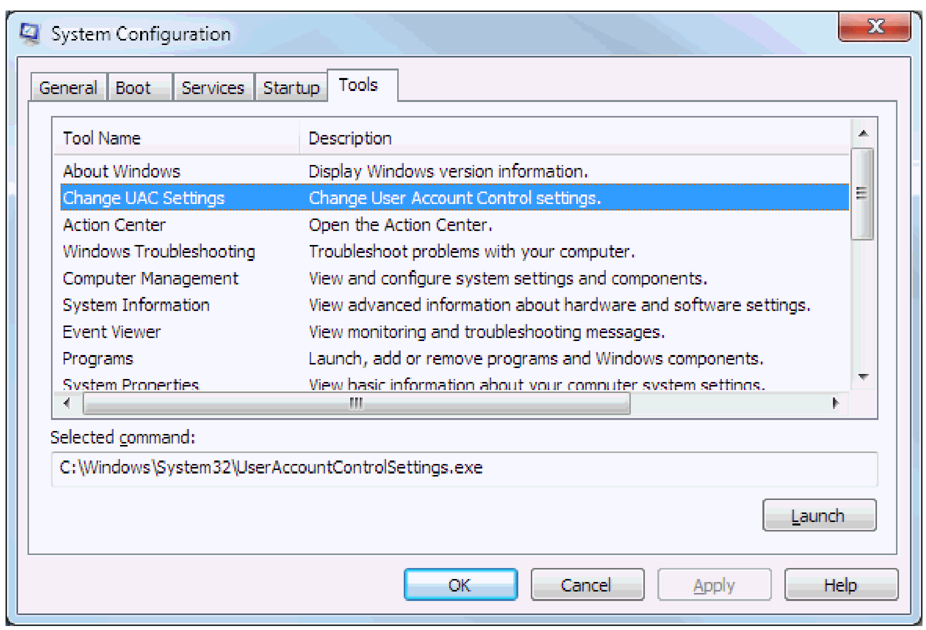


Figure 1-8. Change UAC Settings

4. Select **Change UAC Settings**.

5. Click **Launch**. The User Account Control Settings window displays.

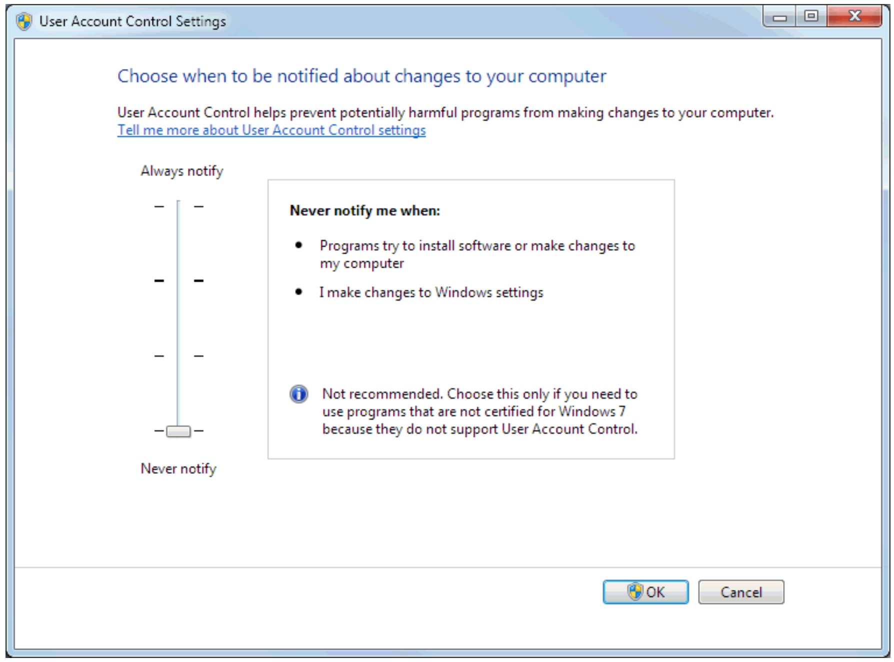
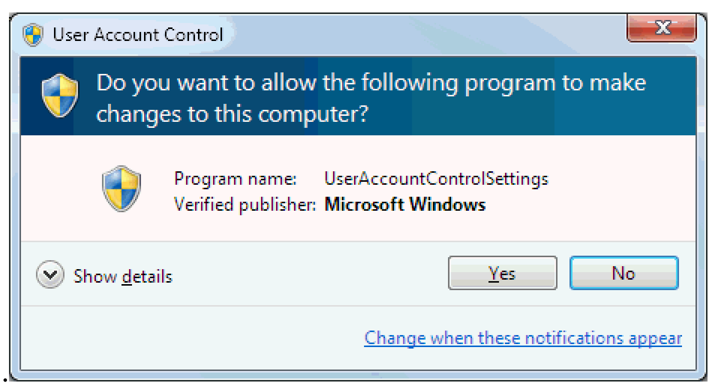


Figure 1-9. User Account Control Settings (Windows 7)

6. Move the User Account Control slider to **Never Notify**.
7. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter the Administrator password if necessary) if Windows asks if you want to allow the changes.



8. Reboot the computer to apply the changes.
9. Start ROCLINK 800. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

Changing Region Settings (Windows 10)

To avoid potential error when opening configuration files, we recommend that you change your PC's location to United States.

To change your PC's location:

1. Right-click the Start menu and select **Search** from the pop-up menu.

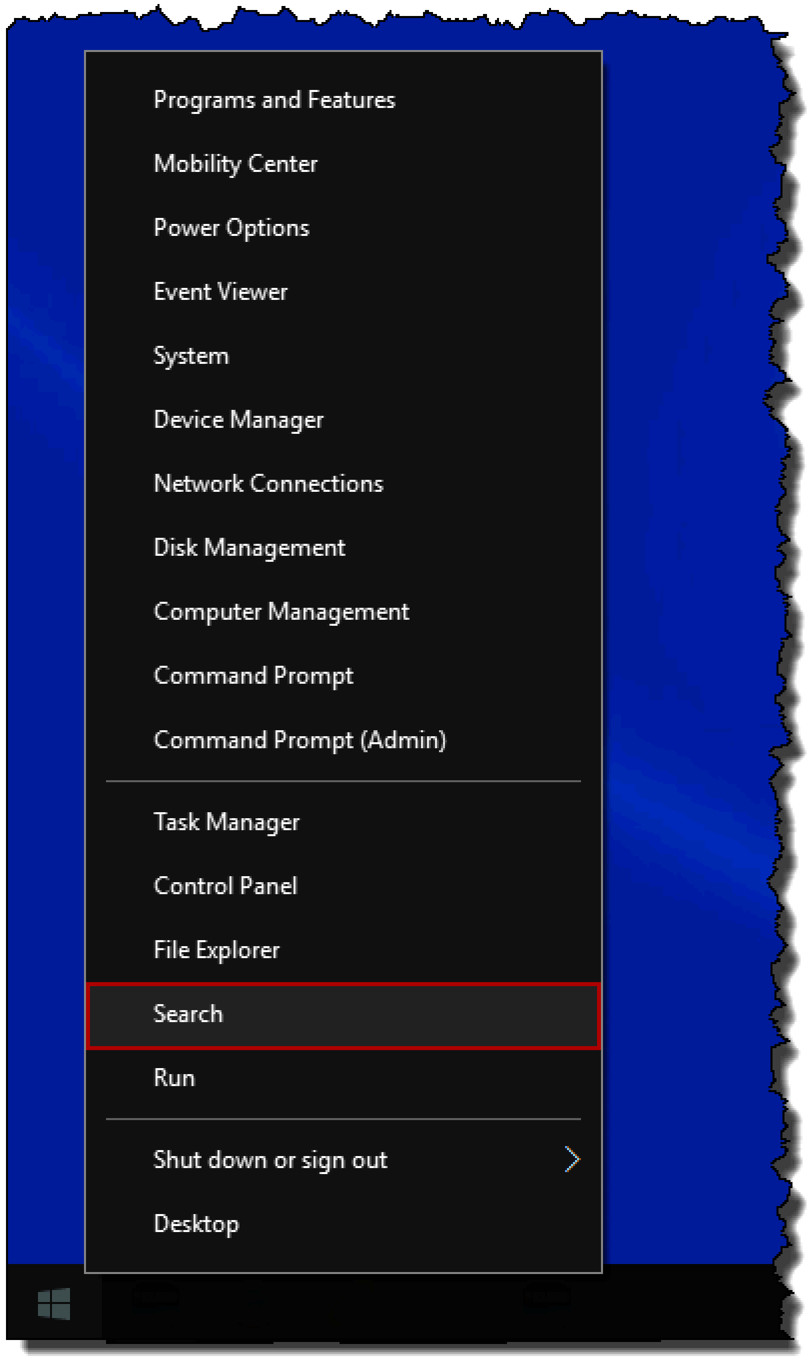


Figure 1-10. Pop-Up Menu

2. Type **region** into the search field.

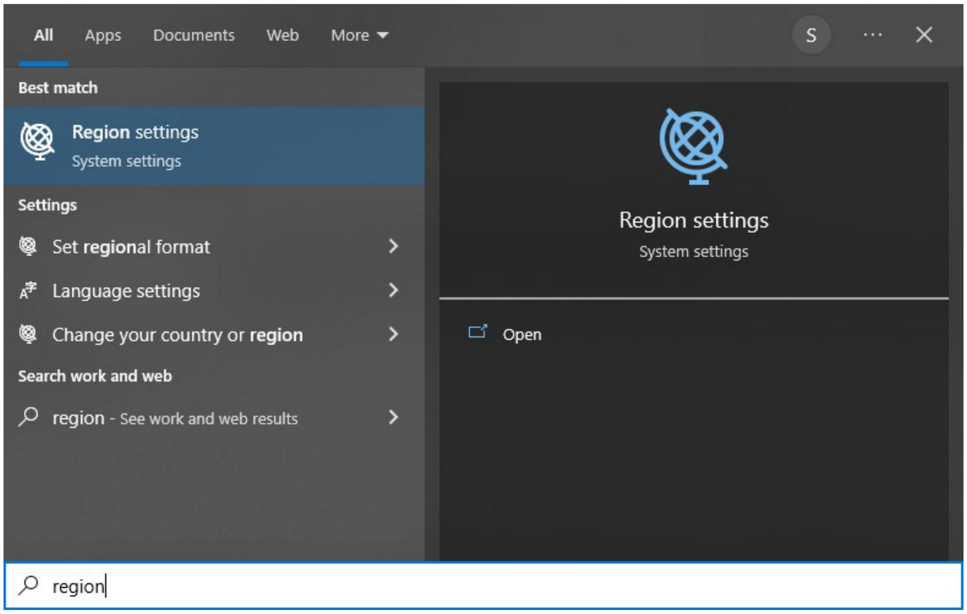


Figure 1-11. Search

3. Click **Region settings** in the results list.
4. Change or verify that the Regional format field is set to **English (United States)**.

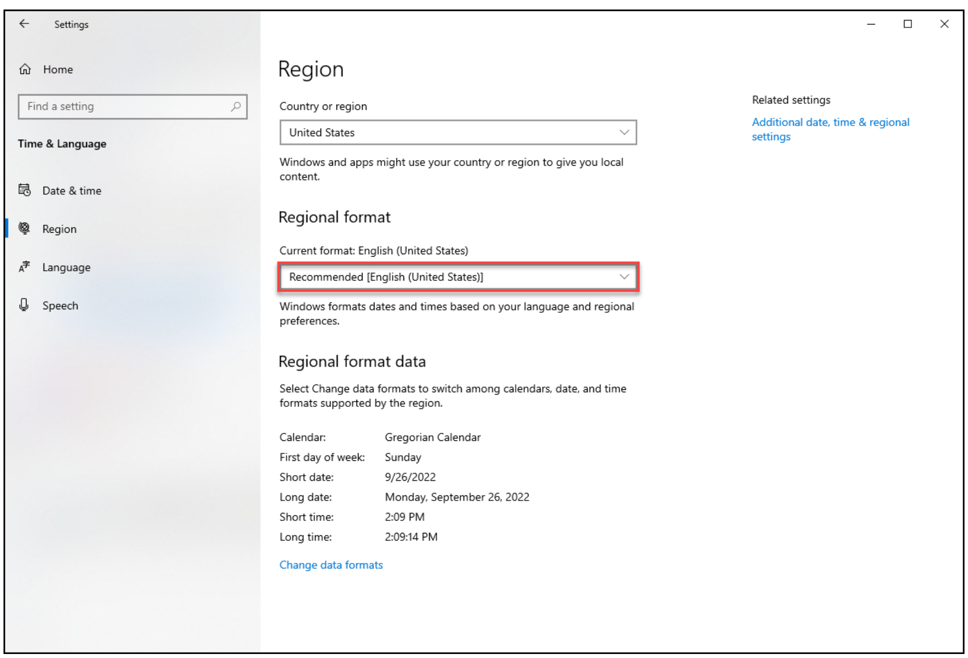


Figure 1-12. Regional Format

Changing Region Settings (Windows 8)

To avoid potential error when opening configuration files, we recommend that you change your PC's location to United States.

To change your PC's location:

1. Select **Search** and type **region** into search field.

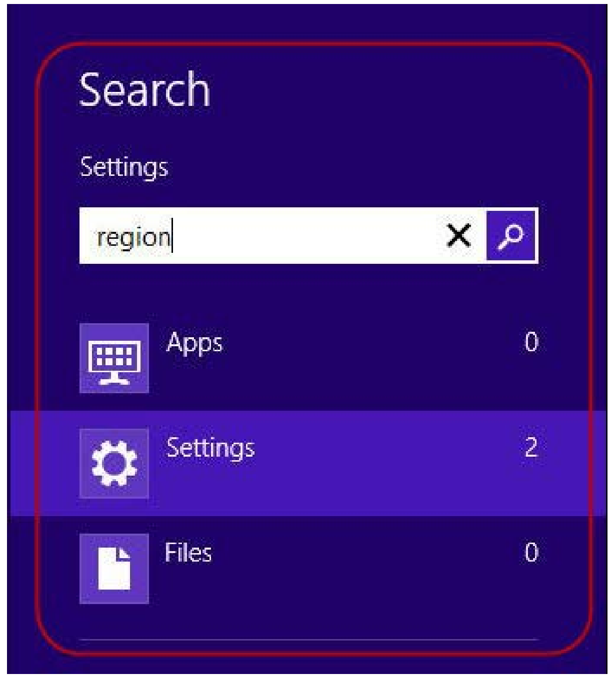


Figure 1-13. Search

2. Select **Settings** and click **Region** in the results list.

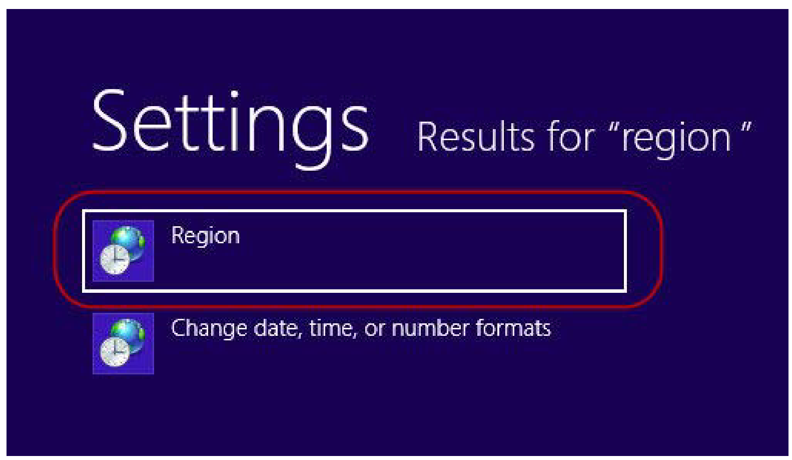


Figure 1-14. Search Results

3. Set the **Location** tab.
4. Change or verify that the current location is set to **United States**.

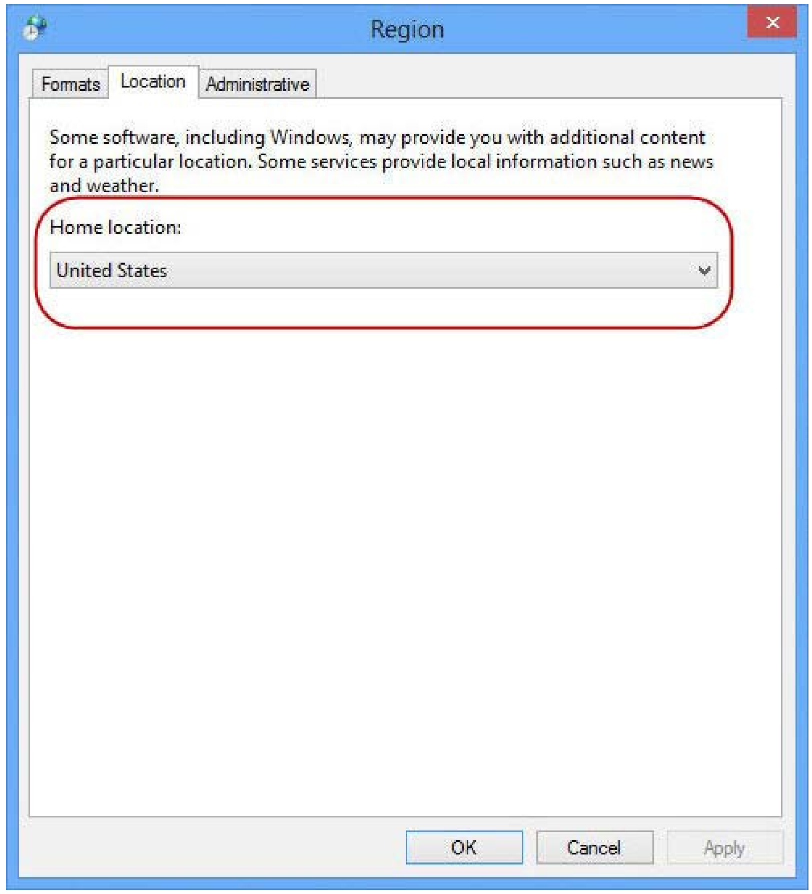


Figure 1-15. Home Location

5. Click **OK** to save changes and close the Region window.

Changing Region Settings (Windows 7)

To avoid potential errors when opening configuration files, we recommend that you change your PC's location to United States.

To change your PC's location:

1. Select **Start** > **Control Panel.** The Control Panel displays:

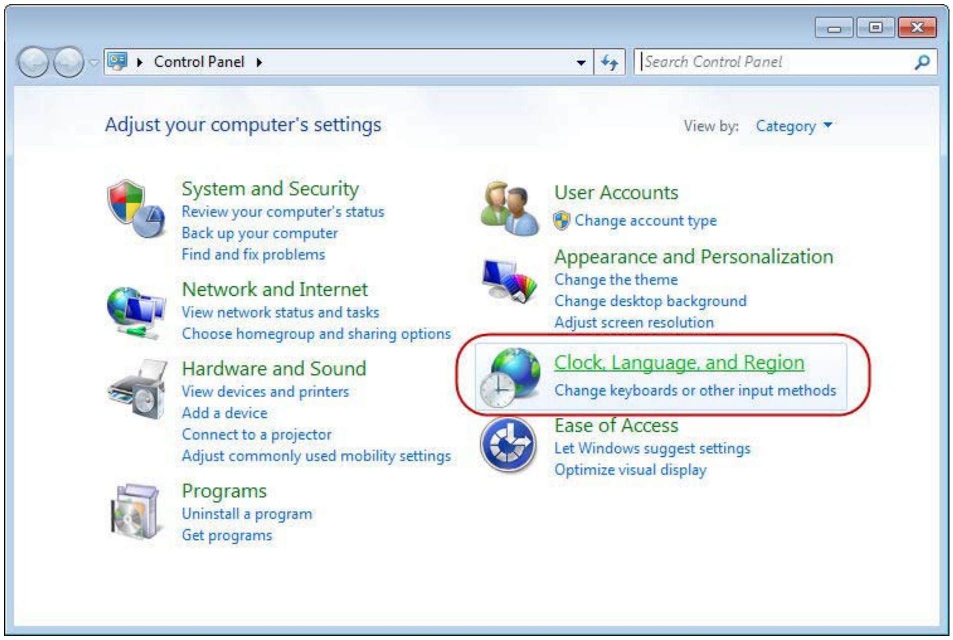


Figure 1-16. Control Panel

2. Select **Clock, Language, and Region**. The Clock, Language, and Region screen displays:

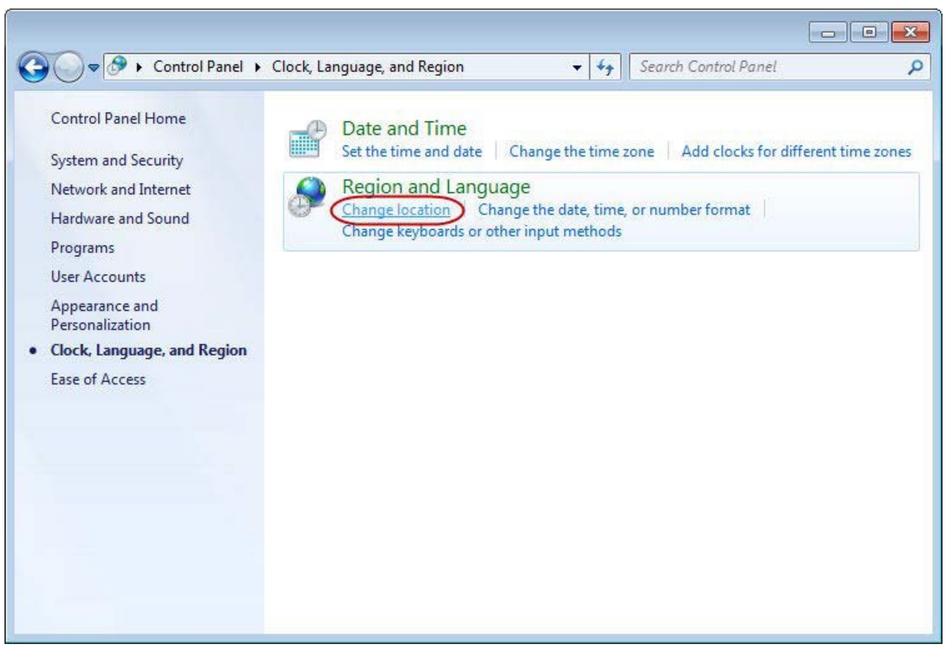


Figure 1-17. Clock, Language, and Region

3. Click **Change location**. The Region and Language screen displays showing the Location tab.

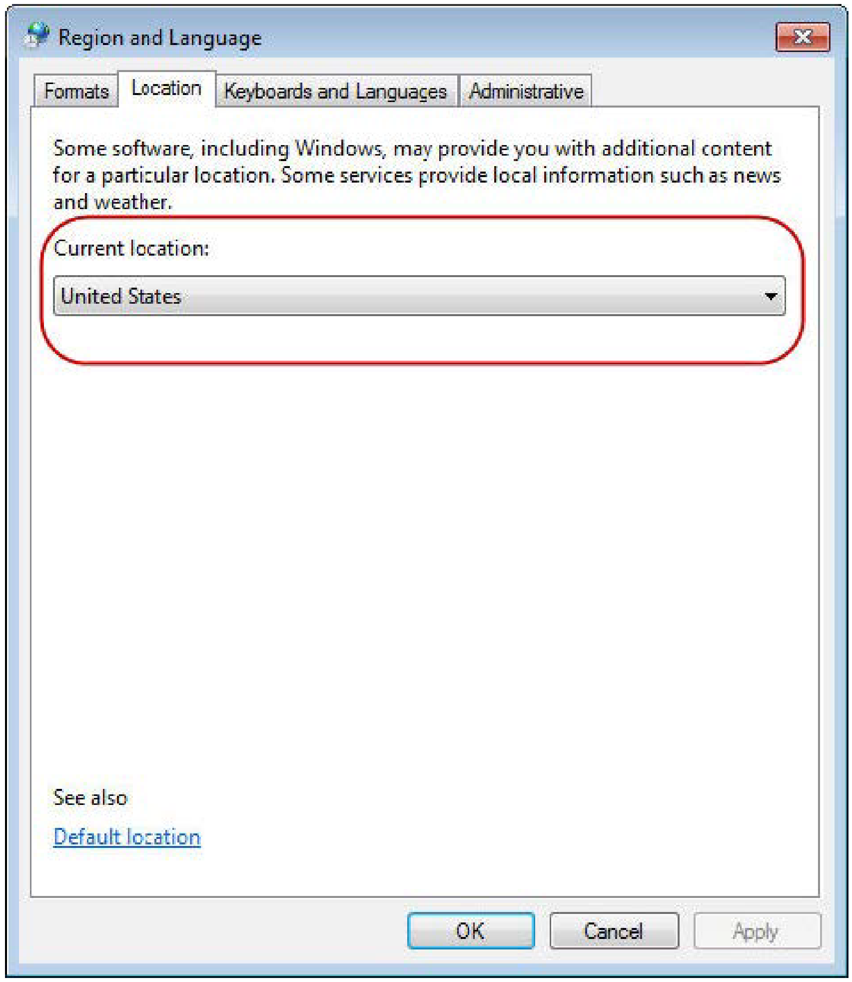


Figure 1-18. Region and Language

4. Change or verify that the current location is set to **United States.**
5. Click **OK** to save your changes and close the Region and Language window.

Enabling User Account Control (Windows 10)

Note: User Account Control must remain disabled in order to run ROCLINK800.

To enable User Account Control:

1. Right-click the Start menu and select **Search** and from the pop-menu.

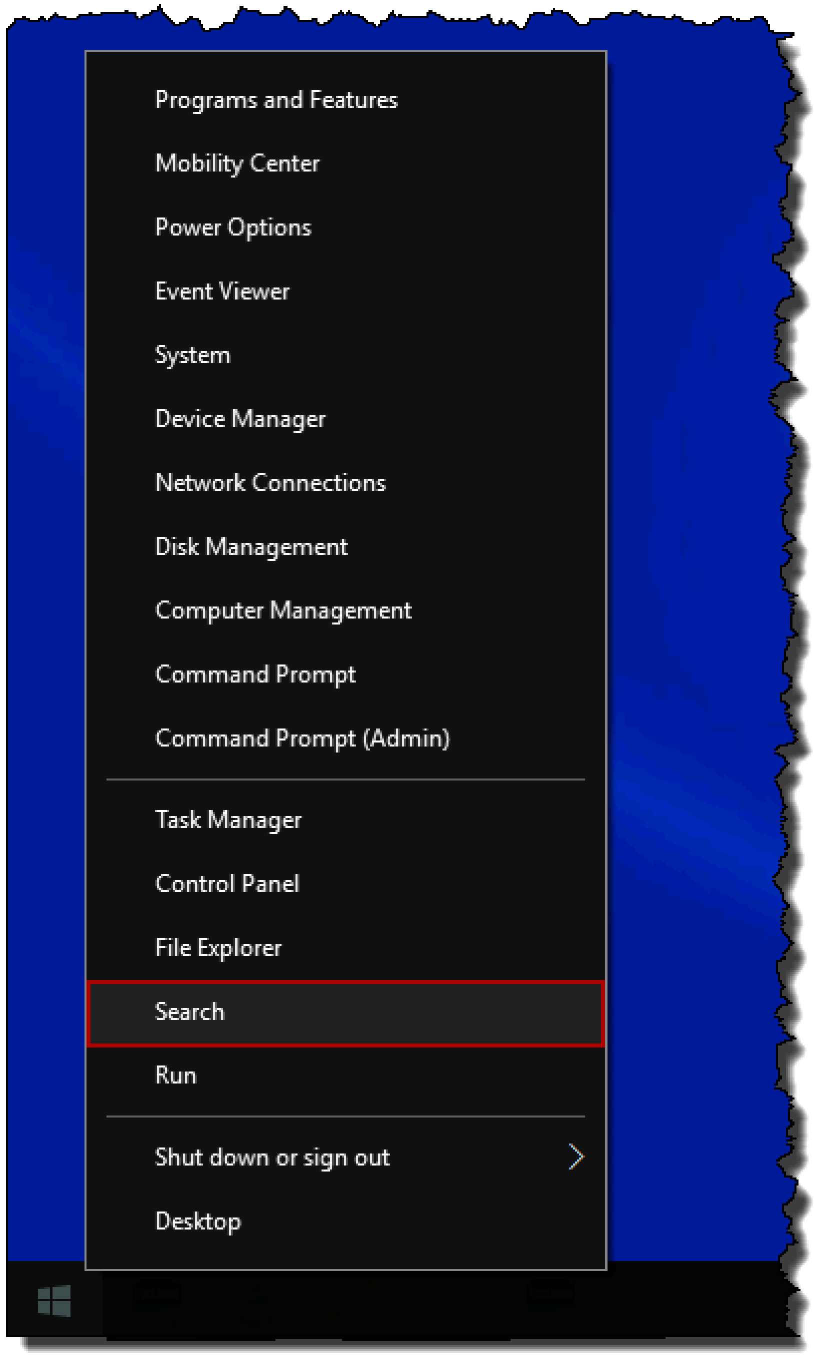


Figure 1-19. Pop-Up Menu

2. Type **UAC** into the search field.

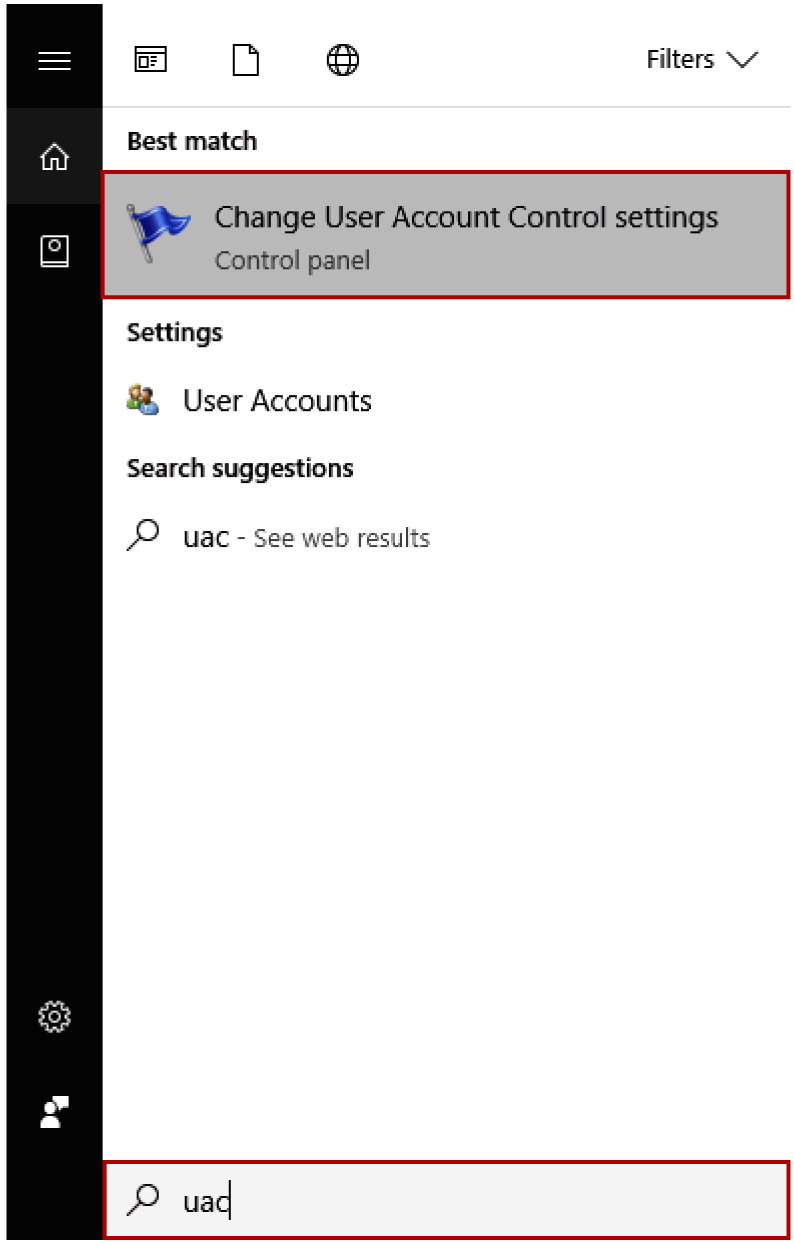


Figure 1-20. Search

3. Click **Change User Account Control settings** in the results list.
4. Move the User Account Control slider to the **default** position.

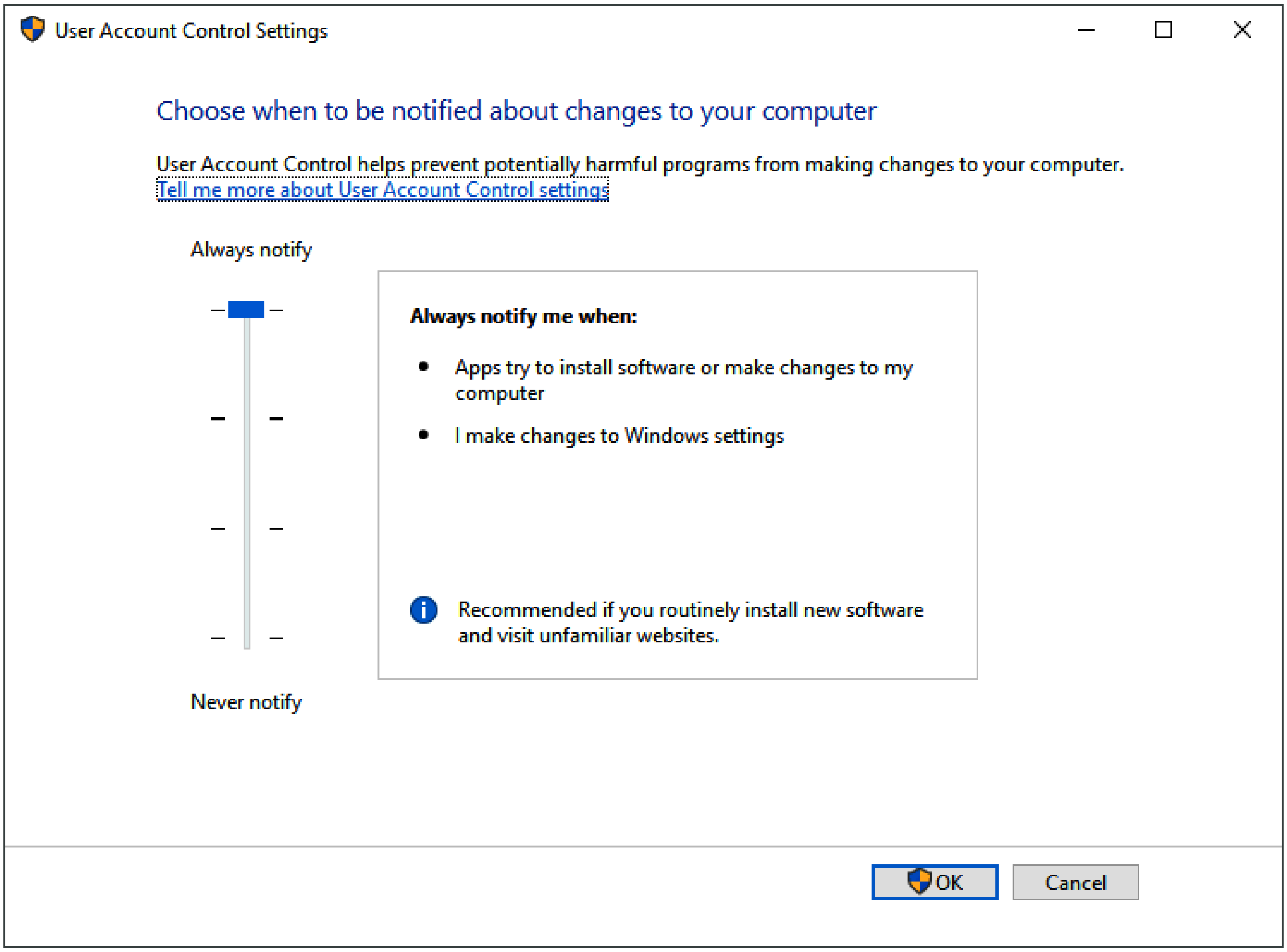


Figure 1-21. User Account Control Settings

5. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter Administrator password if necessary) if Windows asks if you want to allow the changes.

6. **Reboot** the computer for your changes to take effect.
7. Start **ROCLINK 800**. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

Enabling User Account Control (Windows 8)

Note: User Account Control must remain disabled in order to run ROCLINK800.

To enable User Account Control:

1. Select **Search** and type **UAC** into the search field.

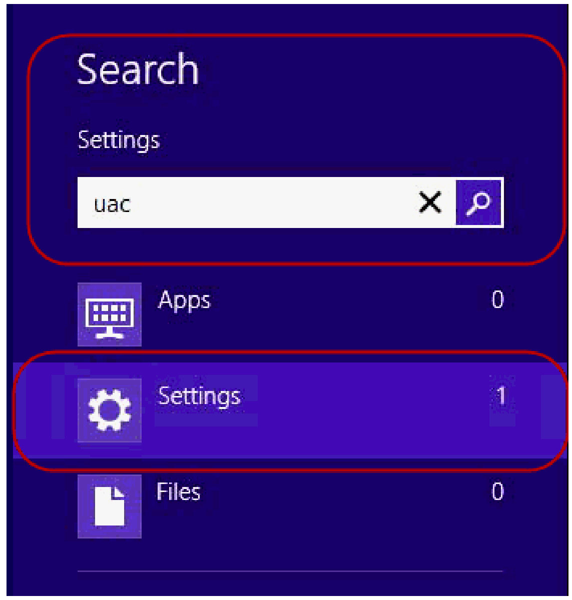


Figure 1-22. Search

2. Select **Settings** and click **Change User Account Control settings.**

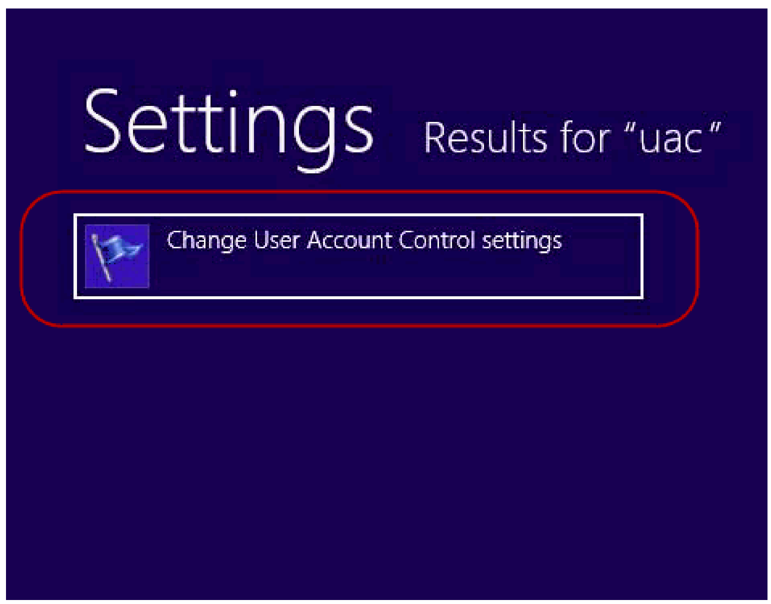


Figure 1-23. Settings, Results for "uac"

3. Move the User Account Control slider to the **default** position.

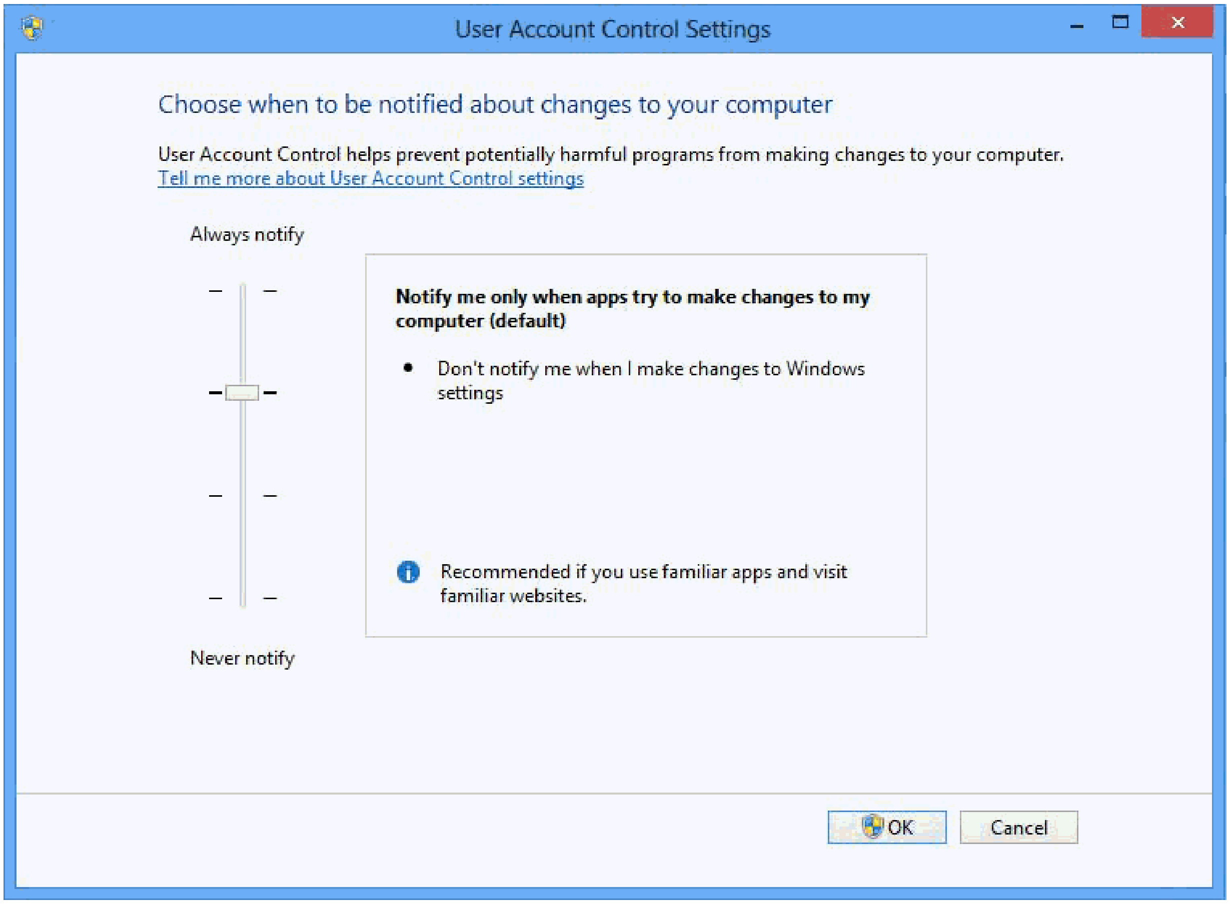
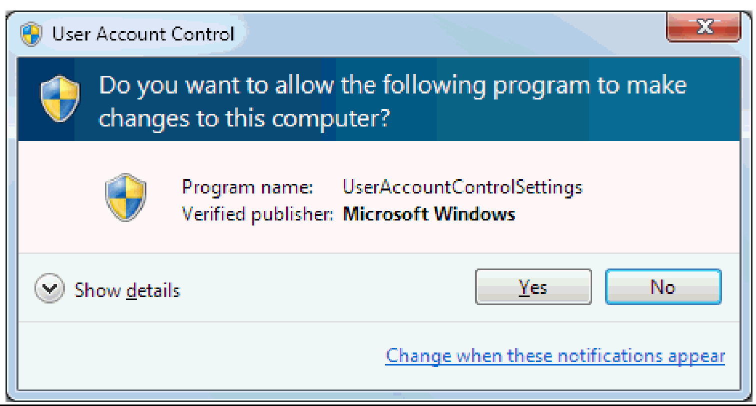


Figure 1-24. User Account Control Settings

4. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter the Administrator password if necessary) if Windows asks if you want to allow the changes.



5. **Reboot** the computer for your changes to take effect.

6. Start **ROCLINK 800**. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

Enabling User Account Control (Windows 7)

Note: User Account Control must remain **disabled** in order to run ROCLINK 800.

To enable User Account Control:

1. Select **Start** and type **MSCONFIG** in the Search field.
2. Click the program **msconfig.exe**. The System Configuration screen displays:

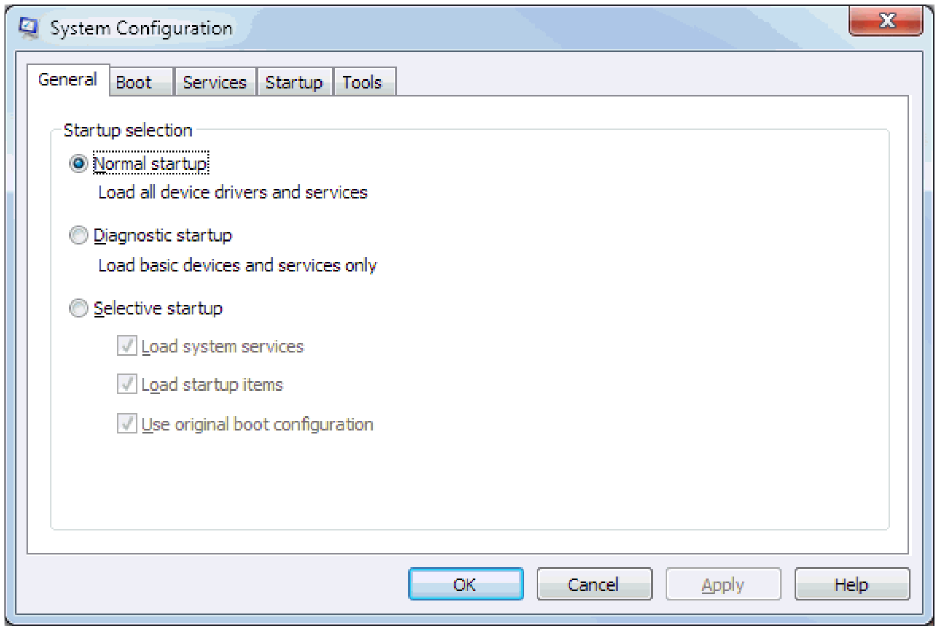


Figure 1-25. System Configuration

3. Click the **Tools** tabs.

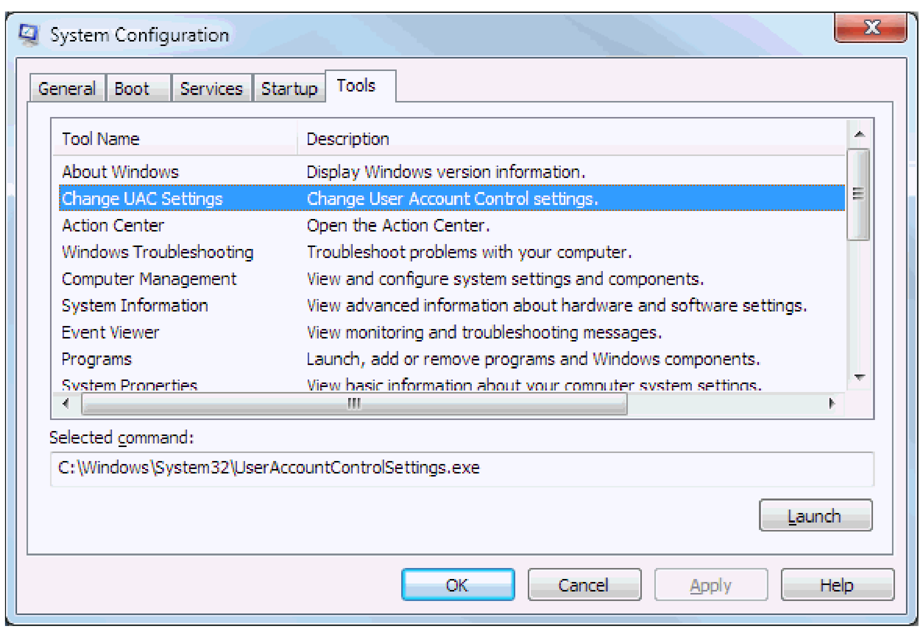


Figure 1-26. Change UAC Settings

4. Select **Change UAC Settings**.
5. Click **Launch**. The User Account Control Settings screen displays.

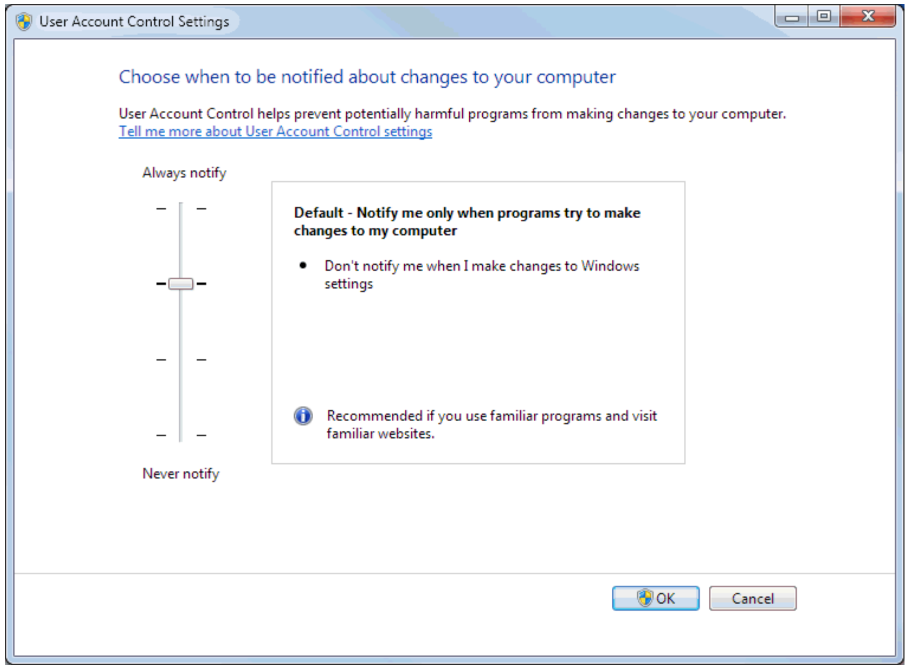
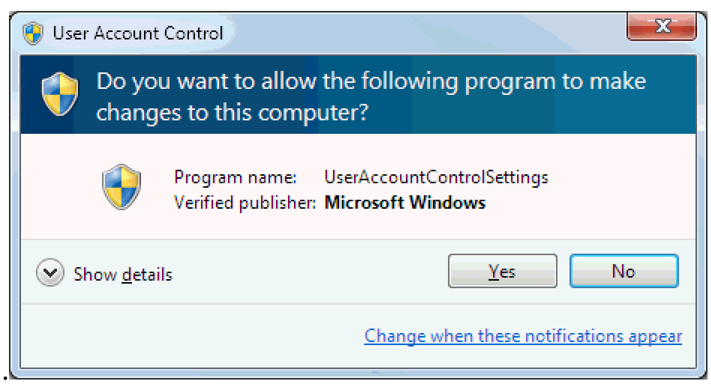


Figure 1-27. User Account Control Settings

6. Move the User Account Control slider to the default position.
7. Click **OK** to save your changes and close the User Account Control Settings window.

Note: You must have Administrator rights to make this change. Click **Yes** (and enter the Administrator password if necessary) if Windows asks if you want to allow the changes.



8. Reboot the computer to apply your changes.
9. Start ROCLINK 800. Refer to *Starting ROCLINK 800 Software* (located in this chapter).

1.4.2 Un-installing ROCLINK 800

To remove ROCLINK 800 from your PC:

1. Click the Windows **Start** button.
2. Select **Settings** > **Control Panel**.
3. Double-click the **Add/Remove Programs** icon.
4. Select **ROCLINK 800**.
5. Click **Add/Remove**.
6. Follow the instructions.

1.5 Starting ROCLINK 800 Software

To use ROCLINK 800 to configure a hardware device, you must have the ROC or properly connected to power. Refer to the appropriate hardware instruction manual. You must also connect the PC to the devices Local Operator Interface (LOI), Ethernet, serial, or modem port.

To run ROCLINK 800, perform one of the following:

- Double-click the Desktop Shortcut.
- Select **Start** > **Programs** > **ROCLINK 800** > **ROCLINK 800**.

The software loads and initializes.

Note: You can only run **one** version of ROCLINK 800 at a time.

1.5.1 Logging On

To log on to ROCLINK 800:

1. **Connect** the ROC to the Local Operator Interface (LOI – Local Port) and launch ROCLINK 800.

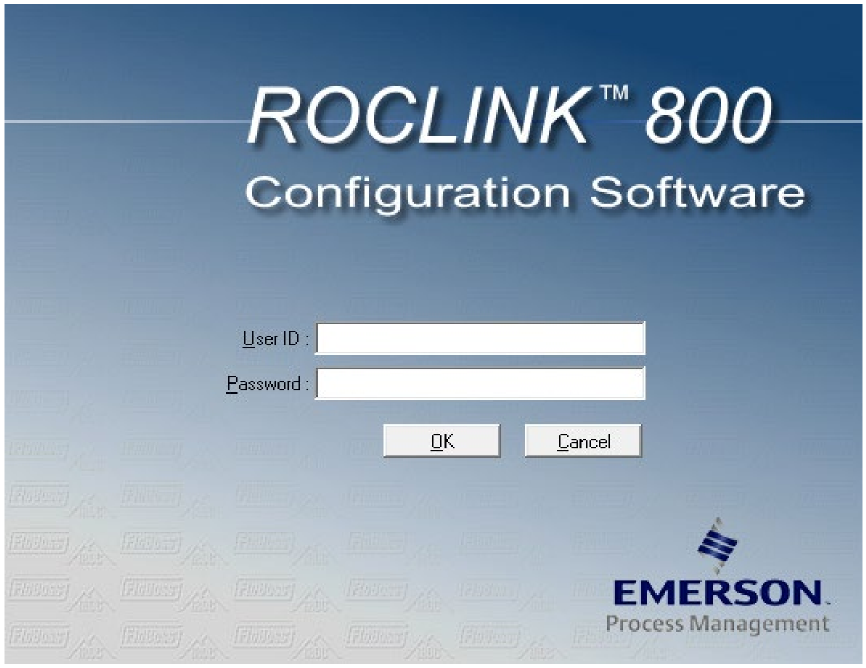


Figure 1-28. Logon

2. Type your assigned **User ID**. If User IDs have not yet been assigned, try using the default User ID of **LOI**. You assign User IDs using the **ROC > Security** features of ROCLINK 800.

Note: The requirements for the **User ID** field differ based on if you have selected **Enable Enhanced Security Features** (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*.

3. Type your assigned **Password** and click **OK**.

   For added security, the software displays an asterisk for each number that you type. If passwords have not yet been assigned, use the default password of **1000** (valid with default User ID of **LOI**).

Note: The requirements for the **Password** field differ based on if you have selected **Enable Enhanced Security Features** (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*.

ROCLINK 800 validates the User ID and Password you enter against a predefined list.

If the log on is **not** valid, a dialog box appears. Click **OK** and re-enter the User ID and Password. You can repeat the procedure as many times as needed until you successfully enter a valid User ID and Password. If the log on is valid, ROCLINK 800 displays the Device Directory screen.

To exit from the log on screen, press **Esc** or click **Cancel**. This closes ROCLINK 800 and returns you to the point where you started ROCLINK 800.

1.6 User Interface Basics

You interact with ROCLINK 800 using various displays on the computer monitor, keyboard, and pointing device.

The major components of ROCLINK 800 user interface are:

- Graphical interface.
- Menu bar and menus.
- Toolbar.
- Function screens.
- Dialog boxes.
- Help system, including the Status bar and message boxes.
- Device Directory or Configuration Tree menu.

ROCLINK 800 employs a Graphical User Interface (GUI) with a standard Windows menu structure. After logging on to ROCLINK 800, available functions display in a menu bar with drop-down menus:

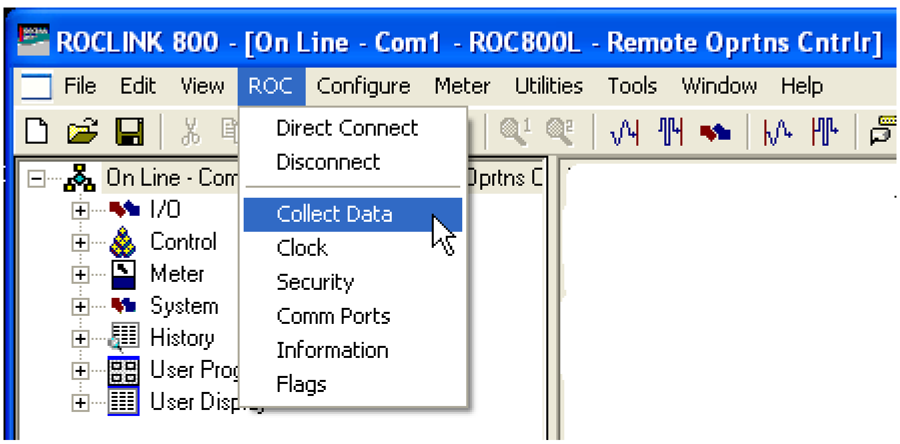


Figure 1-29. ROCLINK 800 Menu

A **Status Line** at the bottom left of the display contains pertinent information about the highlighted item, such as a menu option or a parameter.

Buttons display dialog boxes for further configuration details or perform a desired action, such as the **Update** button. To activate the button:

1. Click the button with a left click of the mouse.
2. When a button is active, press **Enter** or a function key.

Dialog boxes are areas that "pop up" inside the current screen to allow further selections or enter values. Dialog boxes also provide messages or more detailed information.

The menu structure lists choices from which you can set the desired function. Once a function is selected, the screen or dialog box for that function displays. This screen or dialog box provides the requested information and lets you enter the applicable configuration data.

Table 1-1. Menu Listing for ROCLINK 800 (ROC800L)

Menu	Options
File	New, Open, Download, Close, Save Configuration, Print Configuration, Print, Print Setup, [List of recent files], Exit
View	Directory, EFM Report, Calibration Report, History, Alarms, Events, Weights & Measure Events, Display, I/O Monitor, Toolbar, Refresh User Program Tree
ROC	Direct Connect, Connect, Disconnect, Collect Data, Clock, Security, Comm Ports, Information, Flags **Note**: The Direct Connect menu option is the default; it directs ROCLINK 800 to connect with any available valid connection. The Connect menu option becomes available when you select a connection option (COM1, COM2, Ethernet, etc.) from the Device Root. By clicking Connect, you tell ROCLINK 800 to use that specific communications connection.
Configure	I/O, Control, History Segments, History Points, Opcode Table, MODBUS
Meter	Setup, Calibration, Values, Plate Change
Utilities	Update Firmware, License Key Administrator, Convert EFM File, User Program Administrator, ROCLINK 800 Security, AI Calibration Values, RTD Calibration Values, MVS Calibration Values, FST Editor, Keypad Display Editor, Custom Display Editor, Custom EFM Report Editor, Read File From Device, Lock/Unlock, Communications Monitor
User Programs	(Located under the Configuration Tree) LiquidCalcs_800L, Batching_800L, BatchQueue_800L, Proving_800L, Reporting_800L
Tools	Options
Window	Cascade, Tile, Device Directory, [List of open windows]
Help	Help Topics, About ROCLINK 800

1.6.1 The ROC800-Series Dynamic Interface

You can navigate the ROC options either by using the ROCLINK menu structure or by clicking on the ROC graphical dynamic interface and selecting a tab or button. The dynamic interface display shows the current settings of the point including alarms and integrity.

The system displays a white line around objects that are links when you hover your cursor over them. A link descriptor displays indicating the links definition.

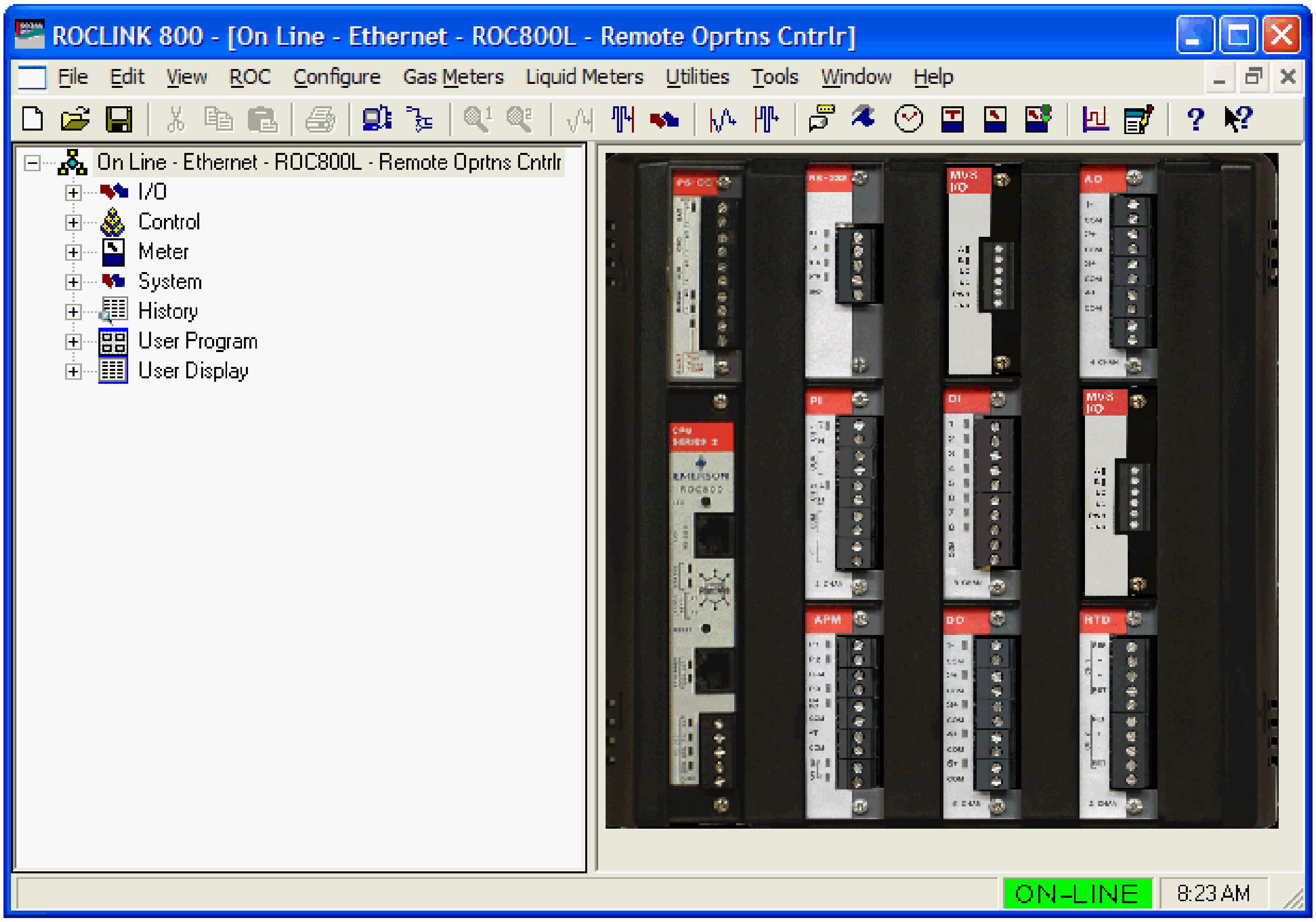
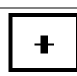
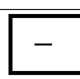


Figure 1-30. ROC800L User Interface

1.6.2 Standard Buttons

Several buttons appear on the majority of ROCLINK 800 screens.

Button	Description
	Minimizes and hides windows.
	Maximizes the size of the windows to fit in the screen area.
	Restore window to original size.
	Closes a window.
	Expands options listed in the Device Directory or Configuration Tree Menu.
	Hides options listed in the Device Directory or Configuration Tree Menu.
	Prints the active display.

...	Click to Browse for a selection.
Update	Updates contents of the active window from the device.
Copy	Copies the contents of window to Clipboard.
Paste	Pastes the contents of the Clipboard to the active window.
OK	Applies changes on the active window to the device and close the active window. A Confirm Save dialog box appears if there are unsaved changes.
Cancel	Cancels without saving changes and closes the active window.
Apply	Applies changes on the active window to the device. Clicking **Apply** does not close the active window.
Save	Saves the contents of the active window to the configuration file.
Close	Closes the active window. A Confirm Save dialog box appears if there are unsaved changes.
Delete	Deletes the current selection.
Auto Scan	Starts automatic device polling.
Stop Scan	Stops automatic device polling.

1.6.3 Toolbar Buttons

The following buttons appear in the ROCLINK 800 toolbar.

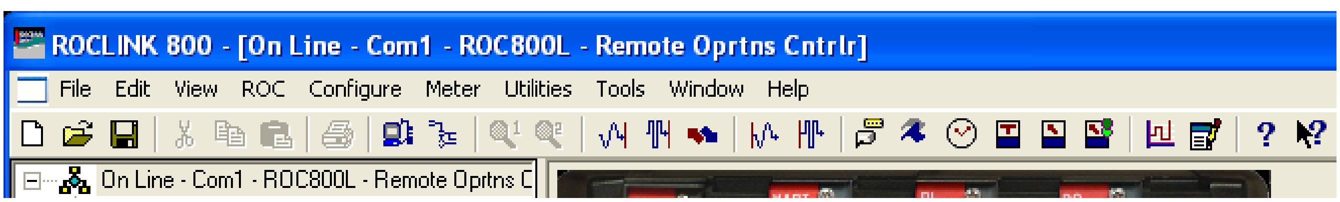
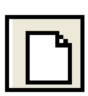
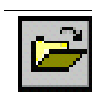
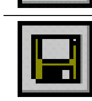
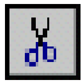
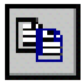
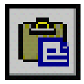
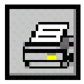
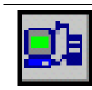
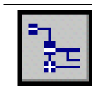
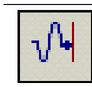
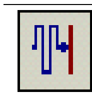
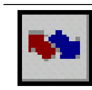
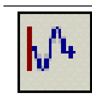
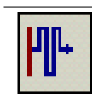
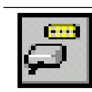
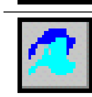
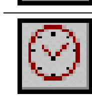
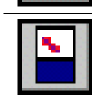
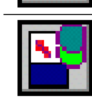
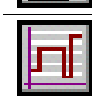
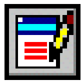
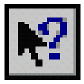


Figure 1-31. ROCLINK 800 Toolbar

ROCLINK 800 grays out a button if it is not applicable to the current screen.

Button	Description
	Creates a new configuration file. You specify available configuration parameters using menu selections. Configure the file as if you were connected to the device. Functions requiring a live connection are unavailable in this mode.
	Opens an existing configuration file. You create configuration files using the New Device or Save Configuration functions.
	Saves the current configuration of the connected device to a disk file.

Button	Description
	Deletes currently selected text and place it in the Clipboard. **Note**: Currently not available.
	Copies currently selected text and places it in the Clipboard. **Note**: Currently not available.
	Pastes text currently in the Clipboard at the cursor's current location. **Note**: Currently not available.
	Prints the configuration file. **Note**: Currently not available.
	Connects to a device locally using the (LOI) Local Operator Interface port.
	Disconnects from a device.
	Displays the first of two .DSP files loaded on the device. **Note**: Not currently functional on the ROC800L platform.
	Displays the second of two .DSP files loaded on the device. **Note**: Not currently functional on the ROC800L platform.
	Displays the Analog Input (AI) screen.
	Displays the Discrete Input (DI) screen.
	Displays the Pulse Input (PI) screen.
	Displays the Analog Output (AO) screen.
	Displays the Discrete Output (DO) screen.
	Displays the Comm Port screen.
	Displays the Flags screen.
	Displays the Clock screen.
	Displays the Meter Setup screen.
	Displays the Plate Change screen.
	Displays the PID Loop screen.

Button	Description
	Opens the Function Sequence Table (FST) Editor.
	Displays an About ROCLINK 800 screen providing program information, version, creation date, and copyright for ROCLINK 800.
	Launches the ROCLINK 800 on-line help system.

1.6.4 Configuration Tree Menu

When you open a configuration file or go on-line with a ROC, the Configuration Tree appears on the left-hand side of the screen. The tree hierarchically displays the parts of a configuration (such as I/O, Meter Runs, and History) that you can change.

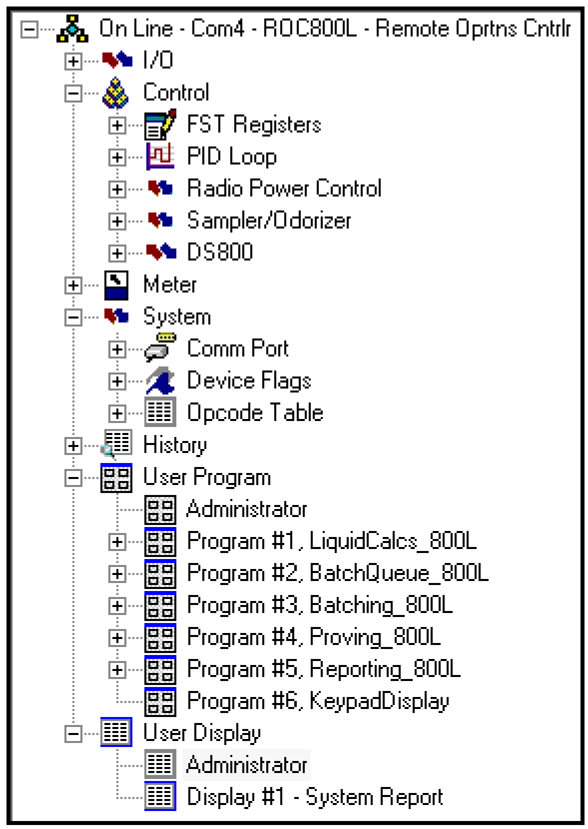


Figure 1-32. Configuration Tree Menu

From the Configuration Tree, you may change the configuration or monitor current operations. Once you are in the Configuration Tree menu, you can use the + and – symbols to display or hide various options.

Double-click the desired function in the Configuration Tree to display the associated screen. Double-clicking an icon is the same as selecting the option in the menu bar or clicking a Toolbar button.

If this is the first time that you have connected to the ROC, refer to *Setting the Clock* (located in Chapter 6).

1.6.5 Keystrokes

If you are using the keyboard, you may use the **Alt** key plus one or more letters to access menus. Windows underlines the appropriate letter in the menus. For example, to access the Open File dialog box, press **Alt + F** and press **O**. You may also use the Left Arrow (←) and Right Arrow (→) keys to highlight a menu bar item (the help Status Line at the bottom of the screen provides a description of the menu) and press the letter.

With a menu displayed, you can highlight the desired item by using the Down Arrow (↓) and Up Arrow (↑) keys or the mouse. Once you have highlighted an item, press **Enter** to activate the function.

To leave a menu or submenu, press **Esc**. You can then select another menu. You can also access another menu using ← and →.

The text scrolling keys are **Page Up** and **Page Down**.

To use the keyboard in configuration screens and dialog boxes, press **Tab** to move in a predetermined sequence from one parameter field or button to the next. The selected field or button becomes highlighted. Fields unavailable for changes are automatically skipped.

When you **Tab** to the last field or button in the screen or dialog box, pressing **Tab** again jumps back to the first field or button. To go back to a previous field or button, press **Shift + Tab**.

In an option field, the currently selected option is highlighted. To select one of the other options, use ↑ or ↓ to highlight the desired option and then press **Enter**.

In a field that requires a text or numerical entry, type in the required characters or numbers from the keyboard. Use **Backspace** or **Delete** to erase unwanted characters. Use ← and → to move the cursor one character at a time and **Home** and **End** to place the cursor at the beginning and end of the field, respectively.

Other keys or key combinations include:

- **F1** – Launches ROCLINK 800 on-line help.
- **Esc** – Cancels the current activity, closes the screen, and returns you to the last-used place in the menu structure, screen, or other place from which the dialog box originated. If a menu is active, **Esc** closes the last-opened menu, taking you up one level in the menu structure. If the menu bar is active, **Esc** de-selects all menu options. Press **Alt** or click with the mouse to reactivate the menu bar.
- **Ctrl** + **N** – Creates a new configuration file.
- **Ctrl** + **O** – Opens a configuration file.
- **Ctrl** + **S** – Saves the current configuration file.

1.6.6 Help System

The Help menu provides detailed on-screen information about getting started with ROCLINK 800 and performing keyboard operations, a list of the Help topics, and the ROCLINK 800 version.

To display context sensitive help on a field, a parameter, or a button, press **F1** while the field, parameter, or button is highlighted. A help window appears on the screen.

To view detailed help, select **Help** > **Help Topics** from the menu bar.

Table 1-2. Help System

Option	Description
Contents	Presents a list of Help Topics that display based on task-oriented situations. Each screen, tab, and field has a help topic associated with it. For example: the MODBUS Scale Values tab is located under **Modbus > Modbus Configuration > Scale Values** tab.
Index	Locates specific Help Topics. The Index lists each field by the tab or screen in which the field appears.
Search	Activates a search function on a specific word.
Back	Returns to the last topic that you viewed.
Print	Sends the currently displayed topic to the PC's default printer.
See Also	Displays topics related to the currently selected topic.
<< / >>	Navigates forward (**>>**) or backwards (**<<**) through the help system on a per topic basis. The Browse Sequence follows the order of the topics as displayed in the Contents tab.

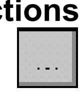
1.6.7 Basic Navigation

When you start the ROCLINK 800, the Device Directory displays. After you connect to a ROC, the Configuration Tree View displays.

Use the + and – symbols to display or hide various options. Double-click a point to display the associated parameter configuration screen. You can also use the menu options and buttons to display the associated parameter configuration screen.

The Status Line at the bottom of the Device Directory and Configuration Tree provides critical information. The left side displays brief information about the device being connected. The right side displays the device status (on-line or off-line) and system time.

TLP Selections



In many locations in ROCLINK 800, you can click the TLP Browse button (a button with three dots) to view the Select TLP dialog. The Select TLP dialog allows you to assign specific inputs and outputs to parameters. ROCLINK 800 uses Point Type (T), Logical Number (L), and Parameter (P) to define point locations.

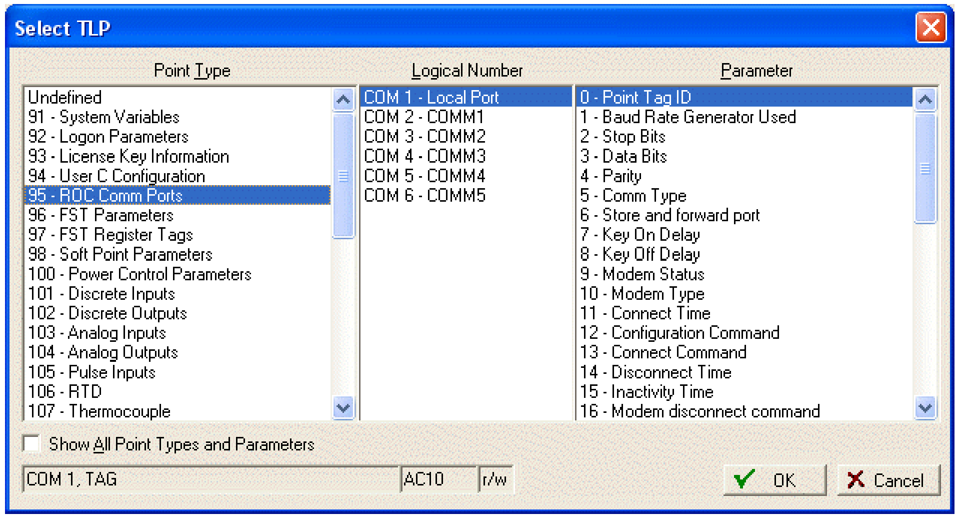


Figure 1-33. Select TLP Dialog

To use the Select TLP dialog box:

1. Select the **Point Type** from the list. This opens a list of logical numbers and parameters that belong to that Point Type.
2. Select the **Logical Number**. In the configuration screens, the Logical Number is generally referred to as Point Number or Number.
3. Select the specific **Parameter**. These are usually called by the same term as the Tag on the configuration screen.

   The field at the bottom of the Select TLP dialog displays the numeric point location of the TLP point or a text abbreviation, depending on the setting in the **Tools** > **Options** window.

4. Select the **Show All Point Types and Parameters** checkbox to view all points and parameters regardless of their validity. By default, ROCLINK only displays points and parameters that are valid for the current configuration you are performing.
5. Click **OK**.

Display TLP Displays values on the Select TLP screen as either text or numbers. For example, the TLP for Register 2 of FST 1 could display as either "FST 1,R2" or "96, 0, 3".

Auto Scan Update Interval Select **Tools** > **Options** to set the time interval, in seconds, at which the Auto Scan feature on various screens in ROCLINK 800 polls the ROC. Clicking Auto Scan causes ROCLINK 800 to poll the device automatically, until you click Stop Scan.

1.6.8 Text Boxes

Text boxes appear in various places throughout ROCLINK 800. You can enter alphanumeric character (A through Z and 0-9) into text boxes. For example, you can enter name (tag) for a device or a short description for an I/O point.

Chapter 2 – Device Directory and Device Root

In This Chapter

This chapter describes the Device Directory screen and the Device Root, the graphical representation of all devices, which appears on that screen.

2.1 Device Directory

The Device Directory is the first screen that displays after you successfully log onto ROCLINK 800 but before you connect to a device.

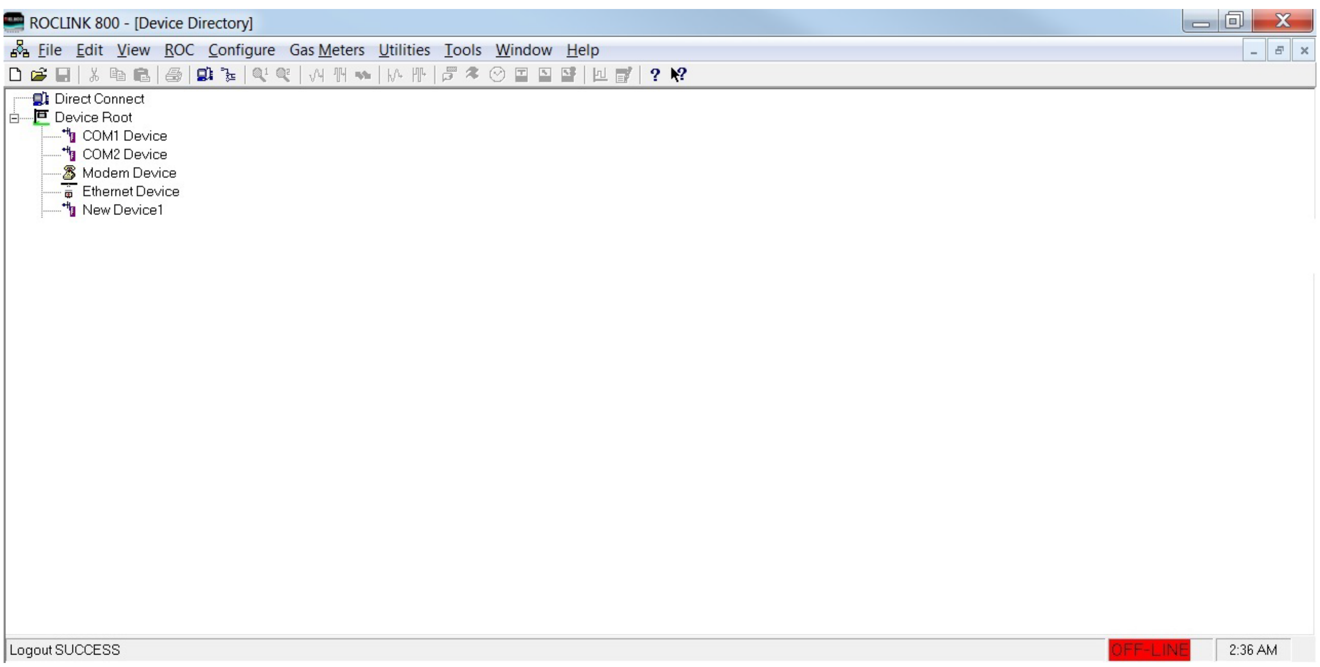


Figure 2-1. Device Directory and Device Root

Note: Once you connect to a device, ROCLINK 800 replaces the Device Directory screen with a device-specific configuration tree screen (see *Figure 2-2*).

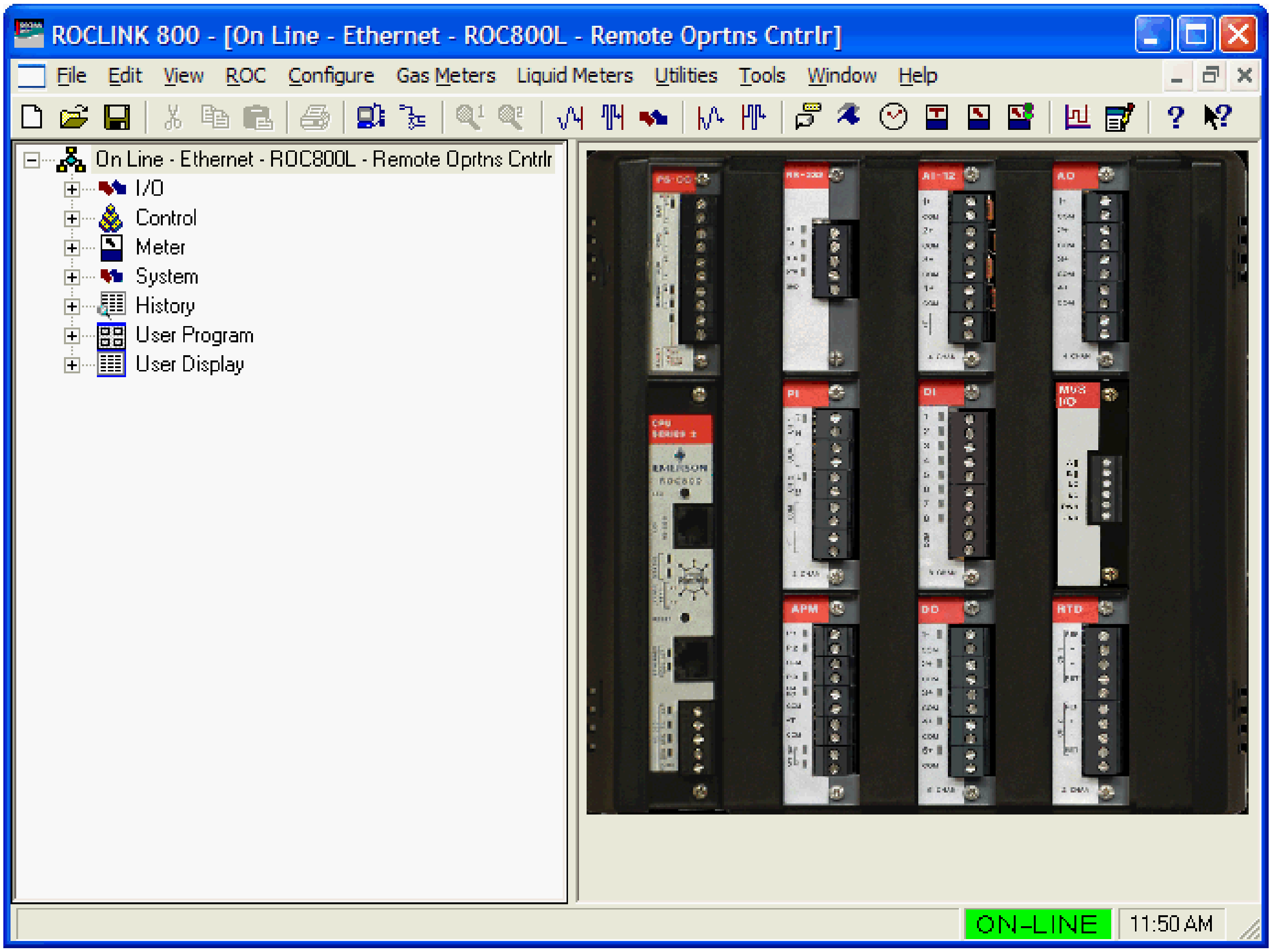


Figure 2-2. Configuration Tree

You use the Device Directory screen to create and maintain communications setup configurations for a PC running ROCLINK 800. You can uniquely configure the communication ports on the PC to send data to a specified ROC. You may add, delete, or modify these communications setups and establish a tree of groups and devices.

Use the + and – symbols to display or hide various options.

Note: You can only configure a PC's communications ports from the Device Directory screen. To re-display the Device Directory screen at any time, select **Window** > **Device Directory** or **View** > **Directory**.

2.1.1 Communication Parameter Setup Screen

The ROCLINK 800 Communication Parameter Setup screen allows you to change your PC communications port, time-out settings, and other variables ROCLINK 800 uses when establishing a connection to a device.

In order for ROCLINK 800 to communicate with a device, ROCLINK 800 must know to which device it is communicating. Each device within a group is given a unique device address.

To set the PC communication parameters:

1. Right-click the label in the Device Directory that corresponds to the PC port you want to use.

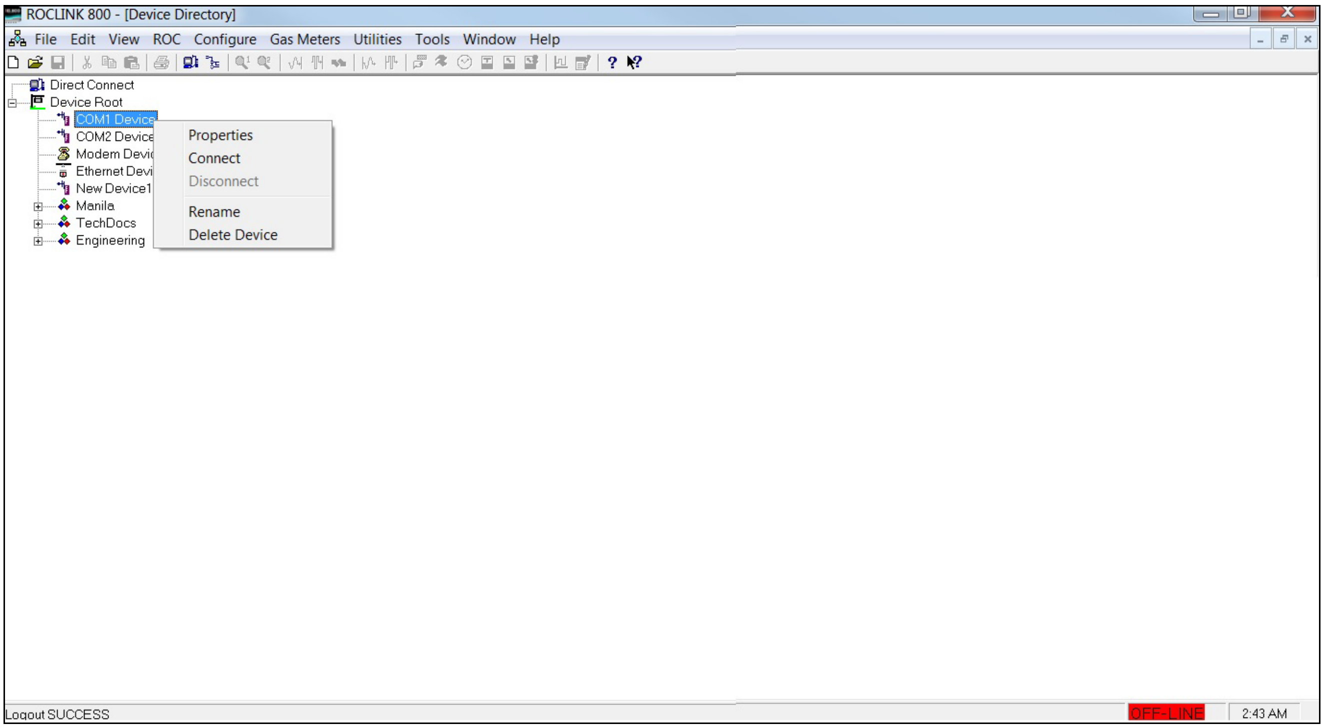


Figure 2-3. Device Pop-up Menu Tree

2. Select **Properties**. The ROCLINK 800 Communications Parameters screen displays.

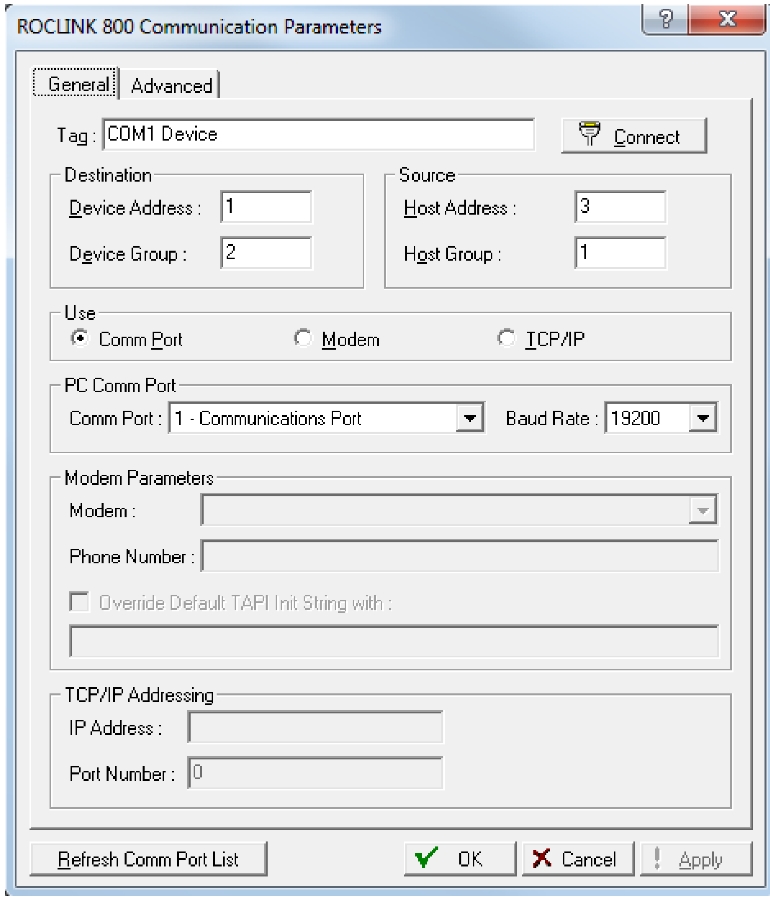


Figure 2-4. Communication Parameters

3. Configure the ROCLINK 800 communications parameters (refer to *Chapter 3, Communications and Security* for a complete discussion of this screen).
4. Click **Apply**. You are ready to connect to the ROC.

2.2 Device Root

The device root graphically represents the devices and their organizational structure on the Device Directory screen. When you open ROCLINK 800, the device root displays the default device labels. Using the Communication Parameters screen, you can modify the communications setup configurations for these devices or add new devices with new configurations. Each icon on the device root represents a different type of communications connection.

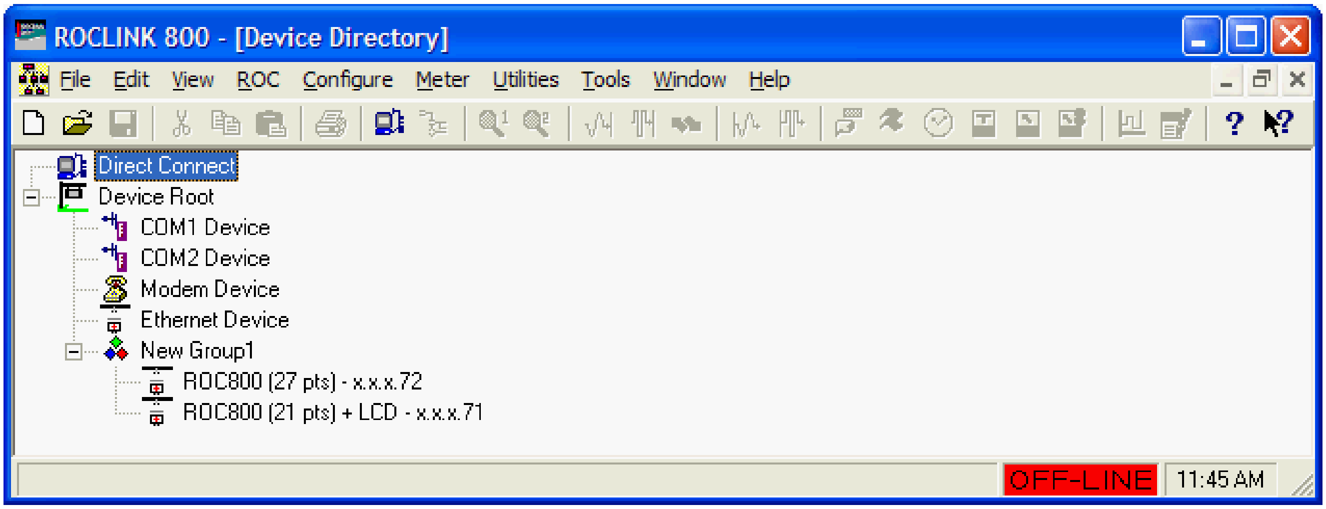


Figure 2-5. Device Root

The default device labels, which correspond to available communication ports, include:

- COM1 Device.
- COM2 Device.
- Modem Device.
- Ethernet Device.
- New Group1 > New Device1.
- New Group1 > New Device2.

You may add, delete, or modify the communication configurations for each of these devices. You can also define device groups.

2.2.1 Backing Up ROCLINK Device Definitions

After you configure your device settings, we strongly recommend that you create a back-up file of those settings. ROCLINK 800 stores these values in the file **ROC_USER.mdb**. Use Windows Explorer to find the **ROC_USER.mdb** file, then copy the file and store it in a safe place. This backup file enables you to restore your settings in case they ever become corrupted.

You can configure devices on-line communications using the Local Operator Interface (LOI) Port (also known as the "local port") or a communication port, such as a modem.

For differentiation, each ROC has a **Tag** and a unique **Device Address** which you define on the ROCLINK 800 Communications Parameters screen (see *Figure 2-4*). The Device Address must be different from any other host system that may access the network.

2.2.2 Adding a Group

You can organize devices into groups. Typically, groups contain devices in the same geographical area or with another common feature. When you double-click a group icon, ROCLINK 800 displays all devices or subgroups associated with that group.

To add a **new group** to the device root directory:

1. Right-click the Device Root icon. A pop-up menu displays.
2. Select **Add a Group**. ROCLINK 800 adds the new group icon to the device root graphic.

To add a **subgroup** to an existing group:

1. Right-click the Group icon. A pop-up menu displays.
2. Select **Add a Group**. ROCLINK 800 adds the new group icon to the selected group.

2.2.3 Deleting a Group

To delete a group:

1. Right-click a group icon. A pop-up menu displays.
2. Select **Delete Group**. A Confirm Delete dialog box displays.

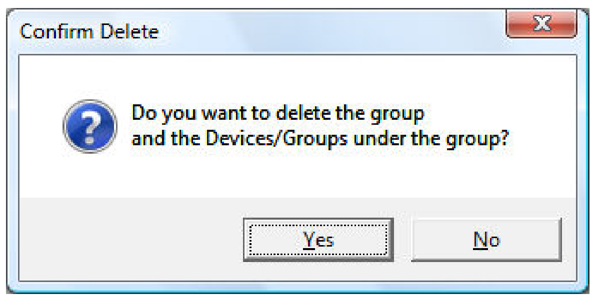


Figure 2-6. Delete Group

3. Click **Yes** to delete the group and all subordinate groups and devices in that group.

2.2.4 Adding a Device

To add a new device to the device root:

1. Right-click the device root icon. A pop-up menu displays.
2. Select **Add a Device**. ROCLINK 800 adds a device icon to the device root.
3. Configure the new device's communication parameters (see *Chapter 3, Communications and Security*).

To add a device to an existing group:

1. Right-click the group icon. A pop-up menu displays.
2. Select **Add a Device**. ROCLINK 800 adds a device icon in the selected group.

3. Configure the new device's communication parameters (see *Chapter 3, Communications and Security*).

2.2.5 Deleting a Device

To delete a device:

1. Right-click a device icon. A pop-up menu displays.
2. Select **Delete Device**. A Confirm Delete dialog displays.

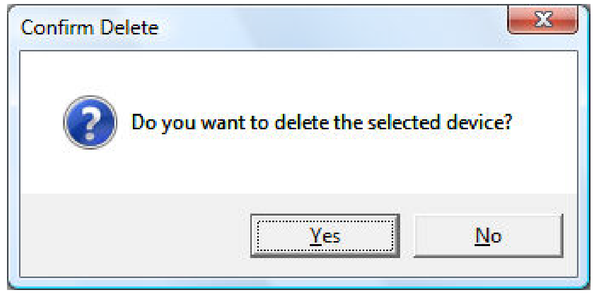


Figure 2-7. Delete Device

3. Click **Yes** to delete the device.

2.2.6 Deleting All Devices

To delete all device communication parameter configurations in the device root directory:

Note: This deletes **all** ROC units that you currently have configured.

1. Right-click the device root icon. A pop-up menu displays.
2. Select **Delete All Devices**. A Confirm Delete dialog displays.

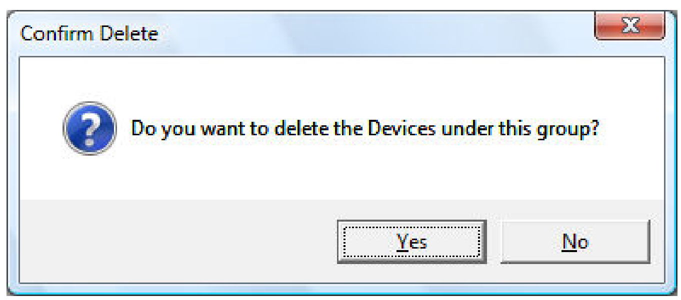


Figure 2-8. Delete All Devices

3. Click **Yes**. ROCLINK 800 deletes all devices in the device root.

2.2.7 Renaming a Group or Device

You can easily replace the ROCLINK 800-provided default group or device names with names you choose. To rename a group or device in the Device directory:

1. Right-click the device or group icon. A pop-up menu displays.
2. Select **Rename**. Enter a name.

Note: Although your label can be up to 72 characters in length, keep the label short for easy recognition.

3. Press **Enter** when finished. ROCLINK 800 adds the new label to the device or group.

Chapter 3 – Communications and Security

In This Chapter

This chapter describes how to configure the communication ports on a PC and on a ROC. It also describes how to use the Connect and Direct Connect features in ROCLINK 800 and how to define security to control access to the ROC and ROCLINK 800.

3.1 Communications

Before you attempt to connect to a ROC, you must configure communication parameters in two places:

- **ROCLINK 800 Communications**
  Configure device communications on the Device Directory screen (Device Directory and Device Root). This sets the PC's comm ports to communicate with a specific device.
- **Communication Ports on the ROC**
  Select **ROC > Comm Ports** to access the Comm Port screen and configure the ROC communication ports for incoming or outgoing communications. Refer to *Section 3.3, Communication Ports*.

3.2 ROCLINK 800 Communications

The Device Directory communication configurations allow ROCLINK 800 to communicate to an individual ROC.

To set the PC communication parameters:

1. Right-click the label in the **Device Directory** that corresponds to the PC port you want to use.
2. Select **Properties**. The ROCLINK 800 Communication Parameters screen displays.
3. Configure the ROCLINK 800 communications parameters. Refer to *Section 3.3, Communications and Security*.
4. Click **Apply**. You are ready to connect to the ROC.

3.2.1 ROCLINK 800 Communications General Tab

The Device Directory is the first screen that displays after you successfully log onto ROCLINK 800 but before you connect to a device.

To display the ROCLINK 800 Communication Parameters screen, right-click on a device icon in the device root and select Properties. The ROCLINK 800 Communication Parameters screen displays, showing the General tab.

Use the General tab to configure basic communications for the PC running ROCLINK 800.

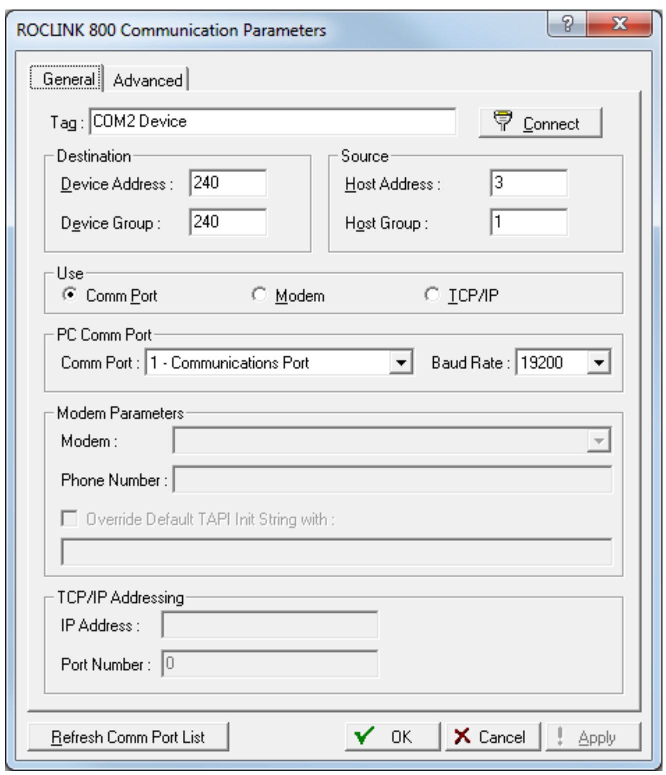


Figure 3-1. ROCLINK 800 Communications – General tab

Field	Description
Tag	Sets a unique name for the ROC. Enter up to 50 alphanumeric characters to identify the ROC.
Connect	Click to communicate with the PC using the parameters configured for this PC's communications port.
Device Address	Sets the address of the specific ROC with which you desire to communicate. If you are connected to a multi-drop series of devices, enter the **Device Address** (default is 240) and **Device Group** of the specific device. The default values for the Device Address and Device Group are **240**. **Note:** The default device address is **240**.
Device Group	Associates the ROC with a specific group. The default Device Group is **240**. **Note:** If you connect a PC running ROCLINK 800 directly to the device's LOI (Local Port), ROCLINK 800 makes a request to Device Group of 240 and Device Address of 240. The Local Port of a device always responds to a request for Address 240 and Group 240, no matter what Device Address and Device Group is configured in the device if the LOI Security is valid.
Host Address	Identifies the PC's host address, which by default is Address **3**. If more than one computer running ROCLINK 800 communicates with a group of devices (either by radio or by other multi-drop communications), you must define unique host address for each device to avoid multiple responses. The host address must also be different from any other host system that may access the communications link. Use the following host group and host address conventions: 0 and 240 are reserved
Host Group	Identifies the PC's host group, which by default is **1**. When using ROC Protocol, the group address must match the address defined at the destination device in order for communications to properly transmit. Use the following host group and host address convention: 0 and 240 are reserved
Use	Sets the type of connection. Valid values are **Comm Port**, **Modem**, or **TCP/IP**. **Note:** If you select **TCP/IP**, ROCLINK 800 applies **only** the Time Out parameter you define on the **Advanced** tab. No other parameters defined on that tab apply.

Field	Description
PC Comm Port	Sets the comm port on the PC ROCLINK 800 uses for this setup. The ROC can communicate through any of the PC's configured comm ports. The default comm port is **1**. **Note:** This field is available **only** if you set the **Comm Port** option. Before you select this parameter, check to see which communications ports are assigned in the PC.
PC Baud Rate	Sets the baud rate ROCLINK 800 uses to communicate with the device through a serial port (COM port). For successful communications, the baud rate you set here must match the baud rate on the PC. The default value is **19200**. If you have difficulties communicating to your device, set the baud rate in both the device and the computer to the default baud rate. **Note:** This field is available **only** if you selected the **Comm Port** option.
Modem	Indicates the modem ROCLINK 800 uses. Click ▼ to list all available modems. Only the modems defined in the Windows Control Panel display. Ensure that the modem you select is properly set up. **Note:** This field is available **only** if you selected the **Modem** option.
Phone Number	Sets the telephone number for the device ROCLINK 800 dials. **Note:** This field is available **only** if you selected the **Modem** option.
Override Default TAPI Init String	Indicates that ROCLINK 800 should use an override initialization string configuration. When you select this option, you must provide an override initialization string. **Note:** This field is available **only** if you selected the **Modem** option.
IP Address	Indicates the IP address for the **TCP/IP** connection. **Note:** This field is available **only** if you selected the **TCP/IP** option.
Port Number	Indicates the port for the **TCP/IP** connection. **Note:** This field is available **only** if you selected the **TCP/IP** option.
Refresh Comm Port List	Click to enable ROCLINK 800 to refresh the listing of displayed comm ports. **Note:** This field is available **only** if you selected the **Comm Port** option.

3.2.2 ROCLINK 800 Communications Advanced tab

Use the Advanced tab on the ROCLINK 800 Communications Parameters screen to configure advanced communications features.

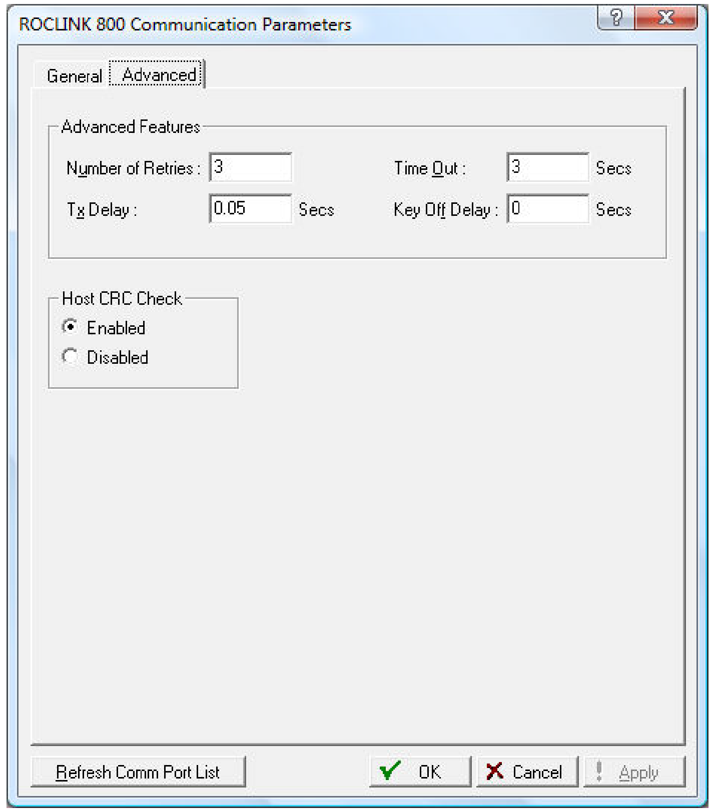


Figure 3-2. ROCLINK 800 Communications – Advanced tab

Field	Description
Number of Retries	Sets the number of times (after the initial attempt) ROCLINK 800 tries to request data from the specified device before reporting a timeout error. Valid values are between **0** and **25**. The default is **3**. Use the Time Out parameter to adjust the amount of time between retries. **Note:** This parameter does not apply to the dial-up modem, which only tries to establish a connection once.
Tx Delay	Sets, in seconds, the amount of time ROCLINK 800 waits before transmitting data. This delay enables the request-to-send (RTS) line for the amount of delay specified before transmitting data. The default is **0.05**. Typically, this value allows a radio to fully stabilize before the system applies data for transmission. ▪ For EIA-232 (RS-232) and dial-up modem communications, set this value (and the value in the Key Off Delay field) to 0 (zero) or the default of **0.05** seconds. ▪ For EIA-485 (RS-485) and radio communications, set this value to **0.1**. **Note:** These variables may change, based on your situation. These are general values that you need to assess for each circumstance.
Time Out	Sets, in seconds, the actual amount of time that ROCLINK 800 waits to receive a valid message after it sends a request to a device. The default is **3**. Modem users typically accept the default value. **Do not** set this field to **0** (zero). This prevents ROCLINK 800 from timing out, and quickly exhausts the Retries. **Note:** If you select **TCP/IP** as the communications method on the General tab, ROCLINK 800 applies **only** the Time Out parameter. No other parameters defined on that tab apply.
Key Off Delay	Sets, in seconds, the amount of time ROCLINK 800 waits after transmitting a message before turning off the ready to send (RTS) signal. The default is **0**. You can change this value to optimize communications. The default value should be sufficient for dial-up modems and EIA-232 (RS-232) connections. For radios, a value of **0.01** may be appropriate.
Host CRC Check	Indicates whether ROCLINK 800 uses cyclical redundancy checking. The default value is **Enabled**.

3.3 Communication Ports

In addition to configuring the communications ports on the PC, you also configure the device-specific communication parameters.

While in a configuration and on-line with an ROC, select **ROC > Comm Ports** to display the Comm Port screen. Each communications port has a unique set of parameters on the screen.

Use the Comm Ports screen to set up the communications ports that are available for incoming and outgoing communications with the ROC.

Note: Use the Device Directory to define PC communication ports.

The communication ports located on the ROC provide a data link to ROCLINK 800, other devices, and host systems. The type of module enables the following communications:

- EIA-232 (RS-232) serial communications.
- EIA-422 (RS-422) serial communications.
- EIA-485 (RS-485) multi-point serial communications.
- Dial-up modem communications.
- TCP/IP communications.

Table 3-1. Communication Ports for the ROC800-Series

Port	Port Location	Default Tag	Function/Type
1	CPU RJ-45 (top)	Local Port	LOI / RS-232D
2	CPU RJ-45 (middle)	COMM1	Ethernet
3	CPU 5-pin (bottom)	COMM2	Serial / EIA-232 (RS-232)
4	Module Slot 1	COMM3	EIA-232 (RS-232), EIA-485 (RS-485), or Modem
5	Module Slot 2	COMM4	EIA-232 (RS-232), EIA-485 (RS-485), or Modem
6	Module Slot 3	COMM5	EIA-232 (RS-232), EIA-485 (RS-485), or Modem

3.4 Configuring Communications Ports

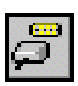
The ROC comm. ports provide a link to computers, such as one running ROCLINK 800 or a host computer.

Select **ROC > Comm Ports** to set up communication ports available for the ROC.

The SRBX or RBX (Spontaneous Report-by-Exception) alarming feature is available for serial communication ports. It is not supported on the Ethernet port. This feature allows the device to call in to a host computer when a configured alarm occurs. To prevent "nuisance" alarms from being reported to the host, configure the parameters correctly. If you wish to configure dial-up RBX, a modem must be present and appropriately configured.

When using RBX Alarming, you must ensure that the alarms are enabled and configured for each point you desire to monitor. Configure the alarm parameters so that an alarm occurs only when desired. Configure the parameters on the Alarms tabs of the I/O configuration screens.

Once configured, save the configuration of all communications ports to programmable ROM using **ROC > Flags > Flash Memory Save Configuration**.



Note: You also access the Comm Port screen by selecting **ROC > Comm Ports** from the ROCLINK 800 menu bar and then selecting the appropriate comm port from the drop-down menu or by selecting the Comm Ports icon from the menu bar.

3.4.1 Configuring TCP/IP Communications on the Ethernet Port

Use TCP/IP connections through the Ethernet port for DS800, Modbus® RTU encapsulated in TCP/IP, Modbus TCP/IP, or ROC Plus Protocol communications.

To configure TCP/IP communications:

1. **Connect** to the ROC.

2. If using ROC Plus, Modbus RTU Encapsulated in TCP/IP, or Modbus TCP/IP, set the parameters on the **ROC > Information > Internet** tab.
3. If using DS800, set the parameters and enable the DS800 communications on the **Configure > Control > DS800** screen.
4. If using Modbus RTU Encapsulated using TCP/IP or Modbus TCP/IP, sets the communications port and configure the parameters on the **Configure > Modbus > Configuration** screen.

Note: The parameters on the General, Modem, SRBX, and Store and Forward Tabs of the **ROC > Comm Ports** screen do **not** apply to the Ethernet port.

The **ROC > Comm Ports Diagnostics** tab displays the communication statistics available for all Modbus and ROC Plus Protocol communications transmitted using TCP/IP connections. Refer to the discussion of the *Comm Ports Diagnostics Tab*.

The Ethernet port supports up to six ROC Plus connections, six Modbus slave connections, and one Modbus Master connection **all** at the same time. The number of active TCP/IP connections displays on the Active Connections field on the **ROC** > **Information** > **Internet** tab.

SRBX messaging or firmware updates cannot be transmitted over a TCP/IP connection.

Once a ROC Plus Protocol, Modbus RTU encapsulated in TCP/IP, or Modbus TCP/IP connection is made, the communication session can be closed by a timeout. Three timeouts that can close a connection are executed as follows:

- A security timeout is started after a valid login. If a valid ROC Plus Protocol message is not received within 60 minutes, the connection closes. The timeout is reset after each valid message.
- An inactivity timer for each TCP/IP connection has been added in addition to the security timeout. The ROC Information > Internet > Inactivity Time field sets this parameter in seconds. A value of 0 disables the timer. If a valid ROC Plus Protocol message is not received within the Inactivity Time, the connection closes.
- Each connection will be kept alive by periodic transmissions of messages (probes). If the other side of the connection fails to respond to ten repetitive probes, the connection will be considered broken and the connection closes. The amount of idle time (in seconds) before the first probe is configurable is set in the ROC > Information > Internet > Keep Alive Time field. The other nine probes will be 64 seconds apart. The total time will be: (9*64) + the value of the **Keep Alive Time** parameter.

DS800 Use the DS800 Development Suite Software to develop programs, independently of ROCLINK 800. You can download these programs over the Ethernet port to a ROC800-Series that has the optional license key installed.

Once DS800 is enabled on the **Configure > Control > DS800** screen, the Ethernet port for DS800 is always available to accept DS800 connections.

The ROC800-Series is capable of distinguishing TCP/IP messages received from DS800, in Modbus, or in ROC Protocol. The ROC800-Series firmware routes the DS800 messages to the correct communications task.

ROC Plus Protocol **ROC > Security** for the Ethernet port enables or disables security for all ROC Plus Protocol based Ethernet connections.

The Ethernet port is always available to accept ROC Plus Protocol connections.

Modbus The ROC800-Series (firmware version 1.30 or greater) allows both Modbus RTU encapsulated in TCP/IP and Modbus TCP/IP communications on the Ethernet port. Modbus RTU encapsulated in TCP/IP is the form of Modbus protocol traditionally supported on serial connections in the ROC800-Series, which is encapsulated in a TCP/IP message. Modbus TCP/IP is the protocol developed for use over TCP/IP connections.

The Ethernet port is always available to accept Modbus connections.

The ROC800-Series supports Modbus communications on any of the serial ports, at the same time as Modbus RTU encapsulated over TCP/IP or Modbus TCP/IP connections.

3.4.2 Comm Ports General Tab

Select **ROC > Comm Ports** to configure the communications ports on the ROC. The Comm Port screen displays, showing the General tab.

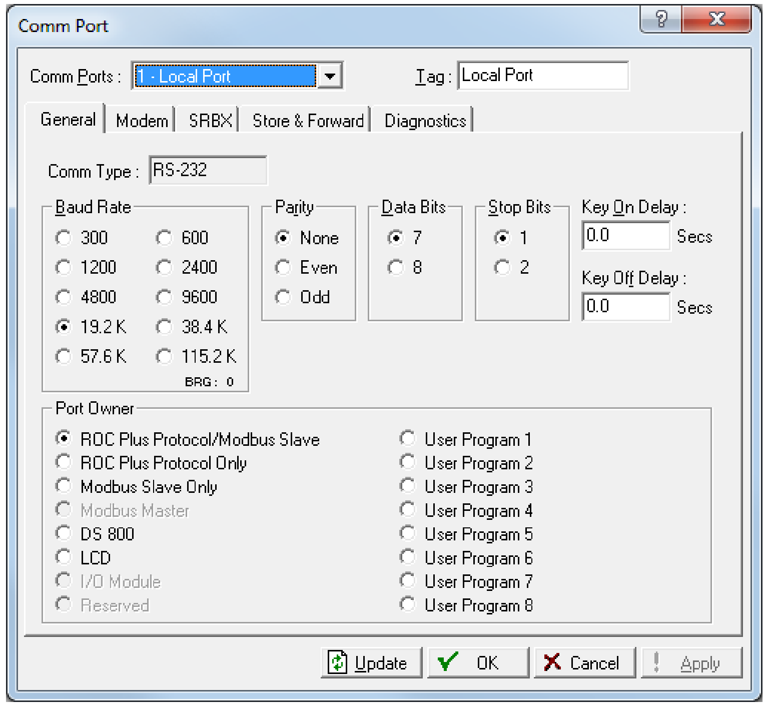


Figure 3-3. Comm Port - General tab

Field	Description
Comm Ports	Indicates the specific comm port to be configured. Click ▼ to display all valid selections.
Tag	Sets a 10-character name (“tag”) to help identify the comm port.
Comm Type	This **read-only** field displays the type of communications port, such as EIA-232 (RS-232) or Ethernet. **Note**: The message “No Module” appears in this field when no communication module is present in slots 1, 2, or 3 of the base unit.
Baud Rate	Sets, in bits per second, the transmit and receive data baud rate for the comm port.
Parity	Indicates whether the communications controller performs parity checks and, if selected, the parity value (odd or even).
Data Bits	Sets the number of data bits contained in an asynchronous byte, or character. The default is **8**.
Stop Bits	Sets the number of stop bits contained in an asynchronous byte, or character. The default is **1**.
Key On Delay	Sets, in seconds, the amount of time the ROC waits after turning on the ready to send (RTS) signal before beginning transmission. The default is **0**. You can change this value to optimize communications. The default value should be sufficient for dial-up modems and EIA-232 (RS-232) connections. For older radios, you may need to set this value to 0.2 seconds. For newer radios, 0.02 seconds should be sufficient.

Field	Description
Key Off Delay	Sets, in seconds, the amount of time the ROC waits after transmitting a message before turning off the ready to send (RTS) signal. The default is **0**. You can change this value to optimize communications. The default value should be sufficient for dial-up modems and EIA-232 (RS-232) connections. For radios, a value of 0.01 may be appropriate. **Note:** These variables may change, based on your situation. These are general values that you need to assess for each circumstance.
Port Owner	Sets the communication protocol this port uses ▪ **ROC Plus Protocol/Modbus Slave** configures the port to automatically switch between Modbus and ROC Plus Protocol messages. ▪ **ROC Plus Protocol Only** configures the port to only accept ROC Plus protocol messages (Modbus Slave is disabled). ▪ **Modbus Slave Only** configures the port to allow the ROC to act only as a Modbus slave device (ROC Plus Protocol is disabled). **Note:** Use the "Only" options only if the messages received use this specific protocol. Otherwise, select **ROC Plus Protocol/Modbus Slave** if this comm port is going to have both protocols communicate on it. ▪ **Modbus Master** configures the port to allow the ROC to poll Modbus devices. ▪ **DS800** configures the port to download and debug Development Suite 800 projects only. You will not be able to connect two ROC units together with this option. It is exclusively configured for DS800/PC communications. **Note**: Modems are **not** supported for the DS800 communication type. ▪ **LCD** configures the port for communications with a ROC Keypad Display. ▪ **I/O Module** configures this port to use the communications protocol residing in the I/O module. ▪ **User Program** configures this port to use the communications protocol residing in the loaded user program. The user program number here matches the user program number in the Configuration Tree menu and the User Program Administrator screen. ▪ **Reserved** indicates that this port is reserved and cannot be used for communications.

3.4.3 Comm Ports Modem Tab

Use the **Modem** tab on the Comm Ports screen to configure the device's modem communication ports.

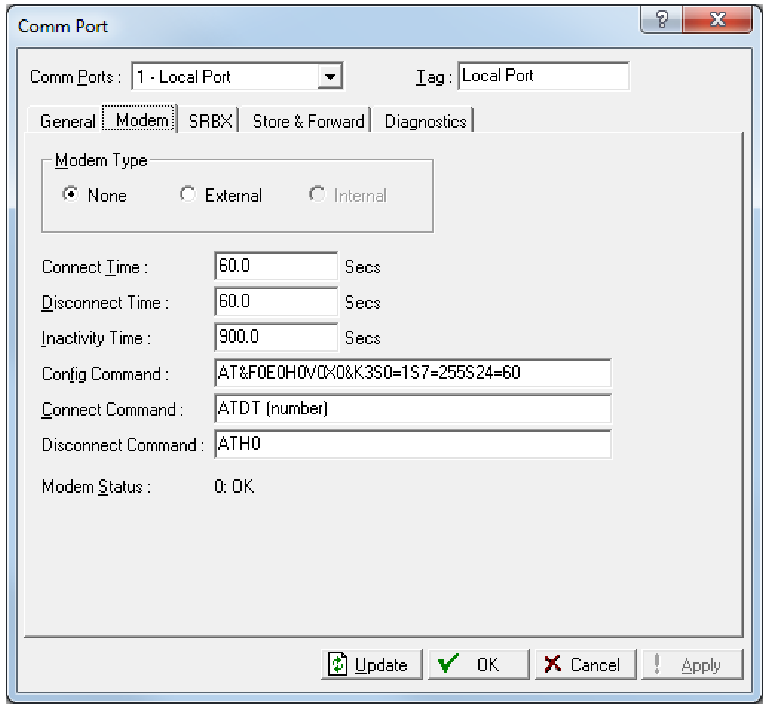


Figure 3-4. Comm Port - Modem tab

Field	Description
Modem Type	Sets the modem type. Valid values are **None** (using a serial link to the host), **External** (using an external modem), and **Internal** (using an internal modem). The default is **None**.
Connect Time	Sets, in seconds, the amount of time that the ROC waits after initiating a call to receive a connect message from a device (typically the modem) before it terminates the call. The default is **60** seconds. The **Connect Time** varies from system to system and can take up to 60 seconds to make and complete a dial up connection. If a successful connection is made, the Disconnect Time begins.
Disconnect Time	Sets, in seconds, the amount of time that the ROC waits for further activity on the line before it hangs up. ROCLINK 800 resets this timer after each valid receive signal.
Inactivity Time	Sets, in seconds, how long the ROC waits without receiving a signal before resetting the modem. The inactivity timer looks at the valid receive counter to determine if the signal has been received.

Field	Description
Config Command	Sets the string of characters the device requires to initialize the modem. For external modems, refer to the manufacturer's literature. For an internal modem, use the default value or the modem card may not operate correctly. Refer to your modem's documentation for default **Config Command** characters.
Connect Command	Sets the Hayes-style connect command the unit requires to contact the host. Typically, this is the command **ATDT** followed by the telephone number (for example, **ATDT5155551212**). The unit requires this parameter for dial-out operations, such as for SRBX Alarming.
Disconnect Command	Sets the Hayes-style disconnect command required to disconnect the contact to the host. Typically, this is the command **ATH0**.
Modem Status	This **read-only** field shows the modem's current status result code. Valid values are:

Result Code	Definition
0 = OK	Successfully executed command line
1 = CONNECT	Connection established
2 = RING	Ring signal detected
3 = NO CARRIER	Carrier not detected/lost
4 = ERROR	Error in command line
6 = NO DIAL TONE	No dial tone detected
7 = BUSY	Busy signal detected
8 = NO ANSWER	Line not picked up on the called end

3.4.4 Comm Ports SRBX Tab

Use the **SRBX** tab to configure the Spontaneous-Report-by-Exception alarming features.

The SRBX (Spontaneous Report-by-Exception) alarming feature is available for serial communication ports. This feature allows the device to call in to a host computer when a configured alarm occurs. If you wish to configure dial-up RBX, then a modem must be present and appropriately configured.

When you use RBX alarming, ensure that you enable and configure alarms for each point you desire to monitor. Configure the alarm parameters so that an alarm occurs only when desired. This prevents "nuisance" alarms. You configure RBX alarm parameters on the **Alarms** tab on the I/O, MVS, and Meter Setup configuration screens.

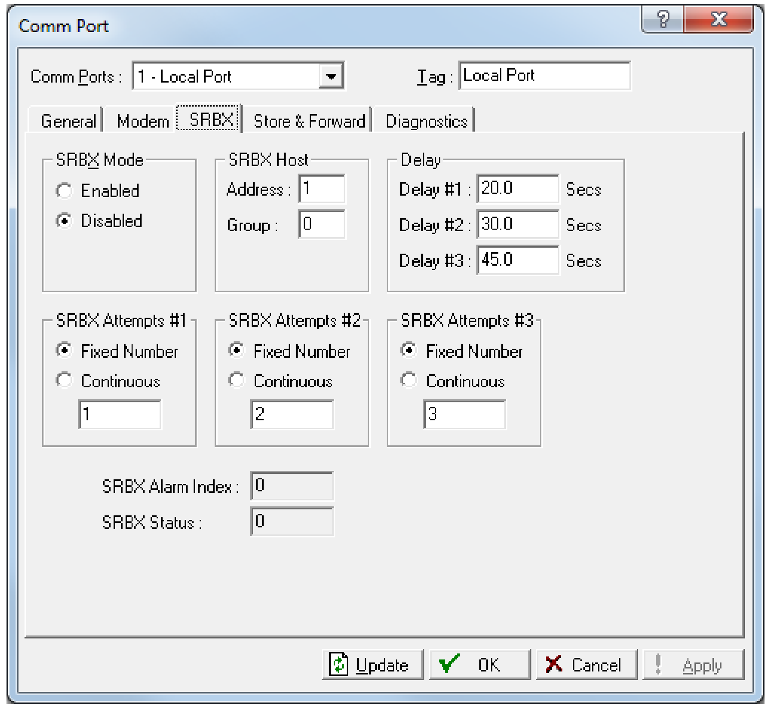


Figure 3-5. Comm Port - SRBX tab

Field	Description
SRBX Mode	Sets the SRBX Mode for Spontaneous-Report-by-Exception alarming on this comm port. The default is **Disabled**.
SRBX Host Address	Sets the address of the host to which the SRBX feature communicates.
SRBX Host Group	Sets the group of the host to which the SRBX feature communicates.
Delay	Sets, in seconds, the time the device waits between attempts to transmit an SRBX or RBX message. Each SRBX or RBX Attempts parameter has an associated delay parameter. The default for **Delay #1** is **20** seconds, the default for **Delay #2** is **30** seconds, and the default for **Delay #3** is **45** seconds.
SRBX Attempts	Sets the number of times the device attempts to resend a message if it does not obtain a valid response on the first try. "Attempt" refers to the initial message plus any retries. ROCLINK 800 provides three parameters. The default for all parameters is **Fixed Number**. The default value for **SRBX Attempt #1** is **1**. The default value for **SRBX Attempt #2** is **2**. The default value for **SRBX Attempt #3** is **3**. Select **Fixed Number** to set how many times ROCLINK 800 retries sending a message after the first unsuccessful attempt. If you enter **0**, no retries occur. Select **Continuous** (255) to start continuous retries that stop only when the host acknowledges the SRBX alarm.

Field	Description
SRBX Alarm Index	This **read-only** field shows the current SRBX alarm.
SRBX Status	This **read-only** field shows the status of SRBX messaging. Valid values are **Active** (SRBX alarm is processing) or **Inactive**.

3.4.5 Comm Ports Store & Forward Tab

Select **ROC > Comm Ports > Store & Forward** tab to configure the Store & Forward features on the ROC.

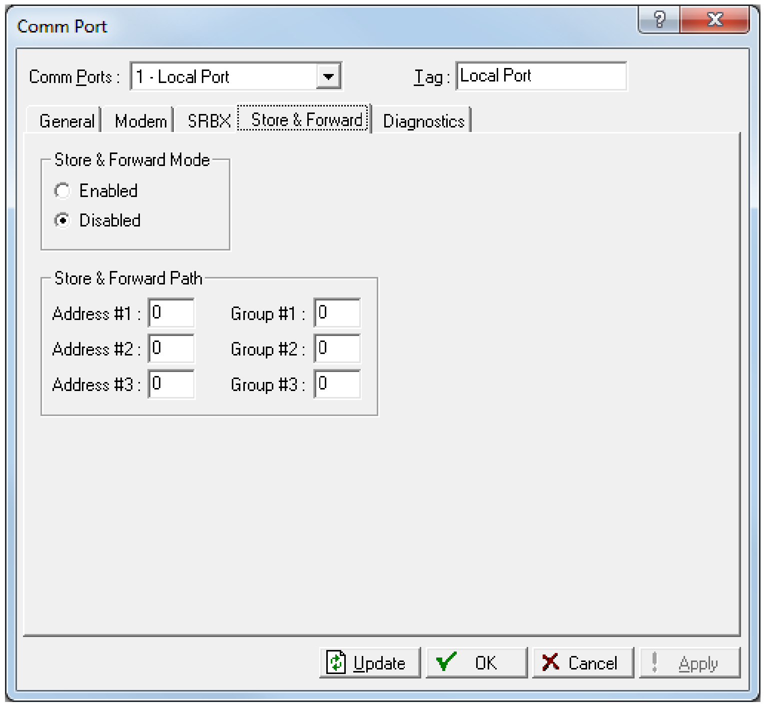


Figure 3-6. Comm Port - Store & Forward tab

Field	Description
Store & Forward	Indicates whether the port transmits messages (Store & Forward). Valid values are **Enabled** (transmit messages out of the port) and **Disabled** (do **not** transmit messages).
Store & Forward Path	Sets the path and group numbers of the devices that need to receive this SRBX message and forward it on to the next device to extend the communications path. You may also specify addresses for other devices that support the ROC Protocol. The device you specify by the last non-zero **Address** or then sends the message to the host from by the previous parameter.

3.4.6 Comm Ports Diagnostics Tab

Select **ROC > Comm Ports > Diagnostics** tab to view the communications diagnostic features on the ROC.

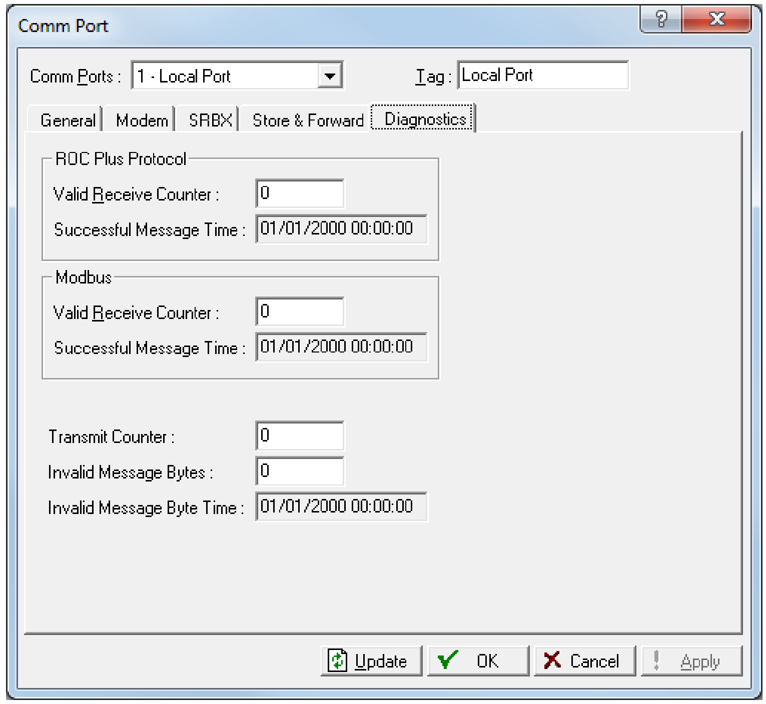


Figure 3-7. Comm Port – Diagnostics tab

Field	Description
Valid Receive Counters	Indicates the number of valid ROC Plus protocol or Modbus protocol messages the ROC800 has received. Although these are incrementing values, you can zero them out if necessary.
Successful Message Time	This **read-only** field Indicates the time and date of the last valid ROC Plus protocol or Modbus protocol message received.
Transmit Counter	Indicates the number of messages sent by the ROC. This is an incrementing value that you can zero out if necessary.
Invalid Message Bytes	Indicates the number of ROC Plus protocol or Modbus protocol bytes lost. This is an incrementing value that you can zero out if necessary.
Invalid Message Byte Time	This **read-only** field shows the time and date of the last invalid message.

3.5 Connecting to a ROC

To connect the computer to a remotely located ROC a serial, dial-up modem, radio, satellite, or other communications line should be installed. This connection may be made through the LOI (Local Port) or other Communications Port on the ROC.

Use the **Connect** command to connect to a serial or dial-up modem. To use Connect:

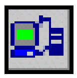
1. Physically **connect** the ROC.

2. Launch and **log in** to ROCLINK 800.

3. Perform one of the following:

- Select a device from the Device Directory and press the **Enter** key.
- Double-click a device in the Device Directory.
- Select a device from the Device Directory and click the **Connect** button on the toolbar.
- Select **ROC > Connect** to connect to the device currently selected in the Device Directory.

3.5.1 Direct Connect



Click the Direct Connect icon to establish a connection with a ROC. ROCLINK 800 attempts to establish communications through all PC comm ports at various baud rates, until it receives a valid reply.

By default, ROCLINK 800 tags the LOI Port as the local port (comm 1), as shown on the Comm Port screen (**ROC > Comm Ports**).

For the Direct Connect option to work, security conditions must be met, and the PC must be connected to the Local Operator (LOI) port of the device with communication settings of:

- 8 Data Bits.
- 1 Stop Bit.
- No Parity.

When you click **Direct Connect**, ROCLINK tries to initiate communications with the device by performing a search of the PC communication ports at various baud rates. ROCLINK then "locks on" to the first comm port and baud rate that are successful in communicating with a device.

To use Direct Connect:

1. Physically connect a cable to the ROC.

2. Launch and log into ROCLINK 800.

3. Do one of the following:

- Click on the **Direct Connect** icon in the Device Directory.
- Click the **Direct Connect** button on the toolbar.
- Select **ROC > Direct Connect**.

4. If this is the first time that you have connected to the ROC, continue to the steps for *Setting the Clock*.

3.5.2 Local Port (LOI)

The PC running ROCLINK 800 physically connects to the device through a cable. For a local connection, this cable is typically a prefabricated local operator interface (LOI) cable (available from Remote Automation Solutions). One end of the cable (a 9-pin, D-shell, female connector) plugs into a serial communications port on the PC running ROCLINK 800. The other end of the cable plugs into the ROC operator interface connector called the Local Port.

Note: If your PC does not have a serial port, you may use a USB-to-serial connector for the LOI connection.

3.5.3 Connect to a ROC

To connect the computer to a remotely located ROC, install a serial, dial-up modem, radio, satellite, or other communications line. This connection may be made through the LOI (Local Port) or other communications port on the ROC.

Use the **Connect** command to connect to a serial or dial-up modem. To use Connect:

1. Physically **connect** the ROC.
2. Launch and **log in** to ROCLINK 800.
3. Perform one of the following:
   - Select a device from the Device Directory and press the **Enter** key.
   - Double-click a device in the Device Directory.
   - Select a device from the Device Directory and click the **Connect** button on the toolbar.
   - Select **ROC > Connect** to connect to the device currently selected in the Device Directory.

3.5.4 Successful Login

A successful login produces an on-line connection and displays a tree representing the configuration in the ROC. Refer to *Configuration Tree Menu*.

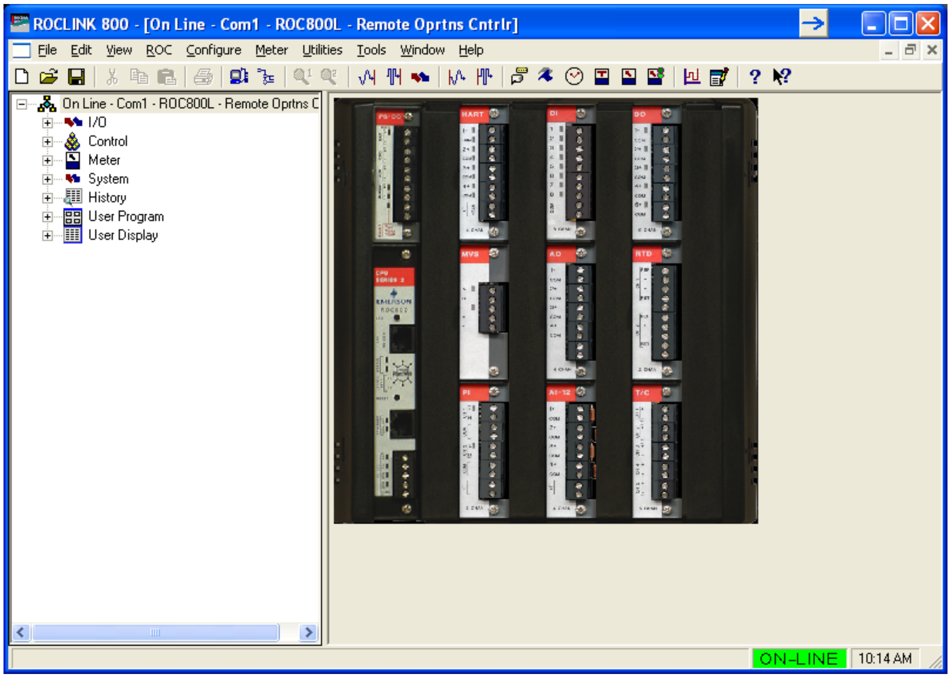
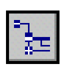


Figure 3-8. Successful Logon

3.5.5 Disconnecting from a ROC

To disconnect an online connection:

- Close the screen by clicking the lower of the two Close buttons located in the upper-right corner of the device screen.



- Click the **Disconnect** button located on the Toolbar.
- Select **File** > **Close**. This automatically closes the connection.

3.6 Troubleshooting Connection Errors

Several events can cause a connection problem:

- If the parameters ROCLINK 800 uses when establishing a communications link to your PC are incorrect, it cannot make a direct connection. Refer to *Troubleshooting ROCLINK 800 Communications*.
- If ROCLINK 800 stands idle for too long and exceeds the timeout value for a device, a communications failure can also occur. In this case, simply log back into ROCLINK 800 and use the Direct Connect or Connect features.
- If you do not have security access to the ROC, you cannot make a connection. You must configure a valid User ID and Password (using the ROC > Security option) for each user who can connect to a ROC.

- If the PC cannot establish a connection to the ROC by "pinging" the Device Address (ROC Address), ROCLINK 800 cannot make a TCP/IP connection. Refer to *Troubleshooting TCP/IP Connections*.

3.6.1 Troubleshooting ROCLINK 800 Communications

Occasionally, you may need to alter your PC communications options when you are having problems communicating with your ROC.

1. Select the desired **Device** in the Device Directory. Right-click and select **Properties**.
2. Make sure you have specified the correct Device Address and Device Group of the ROC or with which you are trying to communicate. If you are communicating through the LOI port of the device, the universal address is **Device Address** is **240** and **Group Address** is **240**.
3. Click the **Advanced** tab. Try increasing the **Time Out** and/or **Tx Delay**.
4. Click **Apply**. Return to the **General** tab, and click **Connect**.
5. If you are still having trouble communicating, try increasing the **Number of Retries** field in the Advanced tab. Click **Apply**. Return to the **General** tab, and click **Connect**.
6. If you are still having trouble communicating, try increasing or decreasing the **Key Off Delay** field in the Advanced tab. Click **Apply**. Return to the **General** tab, and click **Connect**.
7. Check the security settings of ROCLINK 800.

3.6.2 Troubleshooting TCP/IP Connections

If you are unable to establish a connection between ROCLINK 800 and the ROC on the Ethernet port, verify that the PC is able to "ping" the ROC.

1. Launch the DOS command prompt and write a command to "**ping**" the ROC at its IP address (for example, **C:\>ping 155.177.78.111**).
2. If the Ping Statistics Reply is similar to "Packets: Sent = 4, Received = 4, Lost = 0 <0% loss>", then the PC and ROC are connecting. You may need to alter the Internet communications setting in ROCLINK 800 software. Verify all parameters on the pertinent screens. Refer to *Configuring TCP/IP Communications on the Ethernet Port (ROC800-Series)*.
3. If the Ping Statistics Reply is similar to "Packets: Sent = 4, Received = 0, Lost = 4 <100% loss>", then the PC and ROC are not connecting. Review your network, your physical connection, your router, and your PC.

3.7 Security

You control security in two ways:

- **ROCLINK 800 Security**: Enables who can access (log on) ROCLINK 800 software and the Access Level assigned to a user.
- **Device Security:** Enables who has access to the ROC Comm Ports and the LCD.

Note: Security Access Levels enable you to control which users have access to specific ROCLINK 800 functions.

3.7.1 ROCLINK 800 Security

Use the ROCLINK 800 Security screen to set access to ROCLINK 800.

Note:

- Refer to *Device Security* for instructions on securing the ROC.
- The requirements for the Operator ID and Password fields are dependent on your selection in the **Enable Enhanced Security Features** field on the Device Security screen (**ROC > Security)**. For more information, refer to *Section 3.7.3 Enhanced Security*.

To access this screen, select **Utilities > ROCLINK 800 Security**. The ROCLINK 800 Security screen displays. Its table format enables you to define, by operator ID, password, and security level, who can log on to ROCLINK 800 and the screens which those IDs can access. You may define up to 64 different users.

Note: **Utilities** > **ROCLINK 800 Security** must match **ROC > Security** (Device Security) in order for users to log into ROCLINK 800.

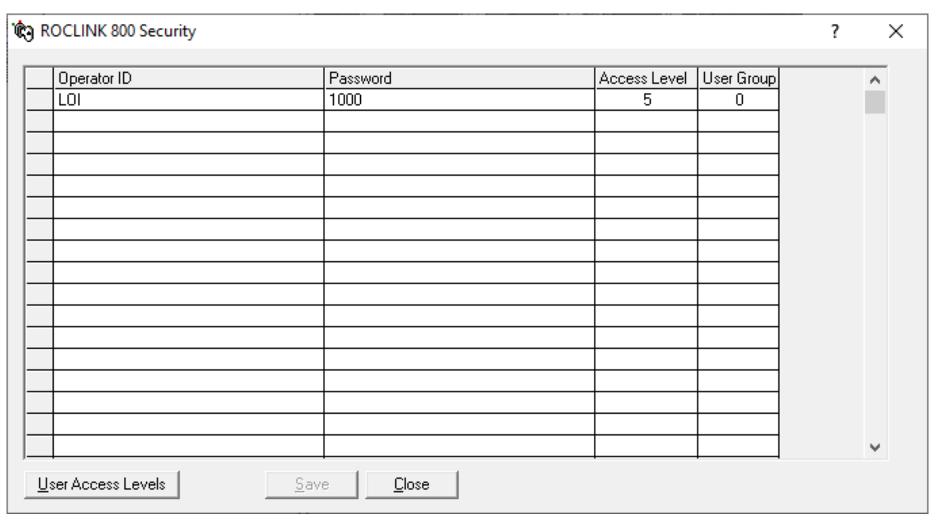


Figure 3-9. ROCLINK 800 Security

Note: The default Operator ID is **LOI**. The default Password is **1000**.

1. Select **Utilities** > **ROCLINK 800 Security**.
2. Enter an **Operator ID**. The requirements for the Operator ID field differ based on if you have selected **Enable Enhanced Security Features** (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*:
   - If you **have not** selected **Enable Enhanced Security Features**, enter three alphanumeric characters for the **Operator ID**. Typically these are the initials of the person who operates the device.

     Note: Each Operator ID must be unique and **is** case-sensitive (that is, **ABC** is different from **Abc**).

   - If you **have** selected **Enable Enhanced Security Features**, enter between three and 30 alphanumeric characters for the **Operator ID**.

     Note: The Operator ID is **not** case-sensitive.

3. Enter a **Password** for the Operator ID. The requirements for the Password field differ based on if you have selected **Enable Enhanced Security Features** (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*:
   - If you have **not** selected **Enable Enhanced Security Features**, enter four numeric characters (between **0000** and **9999**) to define the operator **Password**. More than one user can have the same password.

     Note: If you precede a password value with zeroes (such as **0006**), ROCLINK 800 saves that password as **6**.

   - If you **have** selected **Enable Enhanced Security Features**, enter between eight and 32 alphanumeric characters to define the operator **Password**. More than one user can have the same password.
4. Enter the desired **Access Level** for the user. **0** is the lowest (least inclusive) access level and allows access to the fewest number of screens. **5** is the highest (most inclusive) access level and allow access to all screens. Each access level permits access to screens at that level and any inherited from lower access levels. For example, an operator ID with Access Level 3 can access screens with levels 0, 1, 2, and 3. Refer to *Security Access Levels*.

   Note: Click the **User Access Levels** button to globally all access levels.

5. Click the **Save** button.

Security Access Levels

Table 3-2 lists the system screens and their system-assigned security access levels. The **Menu Options** focus on the activity while you use the **Access Levels** to increase or decrease responsibility levels within the Menu Options.

To access this screen, select **Utilities > ROCLINK 800 Security > User Access Levels**.

Notes:

- If you enable security on any port, at least one operator ID must have the highest level of security (level 5).
- ROCLINK 800 rejects login requests if access levels are greater than device security.

Table 3-2. Security Access Levels

	Menu	Menu Option	Access Level
1	Configure	Transaction History	5
15	View Display	New	5
24	ROC	Security	5
71	Utilities	License Key Admin 107	5
72	Utilities	License Key Administrator 800	5
80	Utilities	Custom Display Editor	5
81	Utilities	Custom EFM Report Editor	4
20	ROC Display	Administrator	4
69	Utilities	Update Firmware	4
70	Utilities	Upgrade Hardware	4
74	Utilities	User Program Administrator	3
2	File	New	3
4	File	Download	3
5	File	Save Configuration	3
18	View Display	From File	3
19	View Display	From Device	3
23	ROC	Clock	3
25	ROC	Comm Ports	3
27	ROC	Information	3
28	ROC	Flags	3
29	Configure IO	AI Points	3
30	Configure IO	AO Points	3
31	Configure IO	DI Points	3
32	Configure IO	DO Points	3
33	Configure IO	PI Points	3

	Menu	Menu Option	Access Level
34	Configure IO	TC Points	3
35	Configure IO	RTD Points	3
36	Configure IO	System AI Points	3
37	Configure IO	Soft Points	3
38	Configure IO	Extended Soft Point	3
39	Configure IO	MVS Sensor	3
40	Configure IO	HART Points	3
41	Configure IO	Setup	3
42	Configure IO	Advanced Pulse Module	3
43	Configure IO	ACIO Module	3
44	Configure IO	Virtual Discrete Output	3
45	Configure Control	FST Registers	3
46	Configure Control	PID Loop	3
47	Configure Control	Radio Power Control	3
48	Configure Control	Sampler/Odorizer	3
49	Configure Control	DS800	3
50	Configure	History Segments	3
51	Configure	HistoryPoints	3
52	Configure	Opcode Table	3
53	Configure	Modbus	3
54	Configure	Rtu Network	3
55	Configure	LCD User List	3
56	Configure User Data	UD1	3
73	Utilities	Convert EFM File	3
75	Utilities	AI Calibration Values	3
76	Utilities	MVS Calibration Values	3
77	Utilities	FST Editor	3
78	Utilities	Keypad Display Editor	3
79	Utilities	Read File From Device	3
82	Utilities	Options	3
84	Tools	Data Logger	3
7	View	EFM Report	2
8	View	Calibration Report	2
22	ROC	Collect Data	2
57	Meter	Setup	2

	Menu	Menu Option	Access Level
58	Meter Setup 800	Station	2
59	Meter Setup 800	Orifice meter	2
60	Meter Setup 800	Linear meter	2
61	Meter	Calibration	2
62	Meter Calibration 800	Orifice meter	2
63	Meter Calibration 800	Linear Meter	2
64	Meter	Values	2
65	Meter Values 800	Orifice meter	2
66	Meter Values 800	Linear Meter	2
67	Meter	Plate Change	2
68	Meter	History	2
3	File	open	1
6	File	Print Configuration	1
9	View History	From Device	1
10	View History	From File	1
11	View Alarms	From Device	1
12	View Alarms	From File	1
13	View Events	From Device	1
14	View Events	From File	1
21	View	I/O Monitor	1
26	ROC	Memory	1
16	View Display	Display 1	0
17	View Display	Display 2	0
83	Utilities	Communications Monitor	0

3.7.2 Device Security

Use the Device Security screen to control who has access to the Comm Ports on a specific device. When you enable this feature, you must log in to ROCLINK 800 to use the communications port. You can enable this feature on each communications port separately.

To access the Device Security screen, select **ROC > Security**. The Device Security screen displays. Refer to *Adding and Deleting Users in Device Security*.

Note:

- Any operator ID you define in **ROC** >**Security** (which defines access to a device) **must** match an operator ID you also must define in **Utilities > ROCLINK 800 Security** (which defines access to the software). Without both components, an ID cannot log onto ROCLINK 800 **and** gain access to a ROC.

- The **Failed Login Counter** field displays the number of failed attempts to log in to the device.
- The Device Security screen changes based on in you have selected Enable Enhanced Security Features. For more information, refer to *Section 3.7.3 Enhanced Security*.

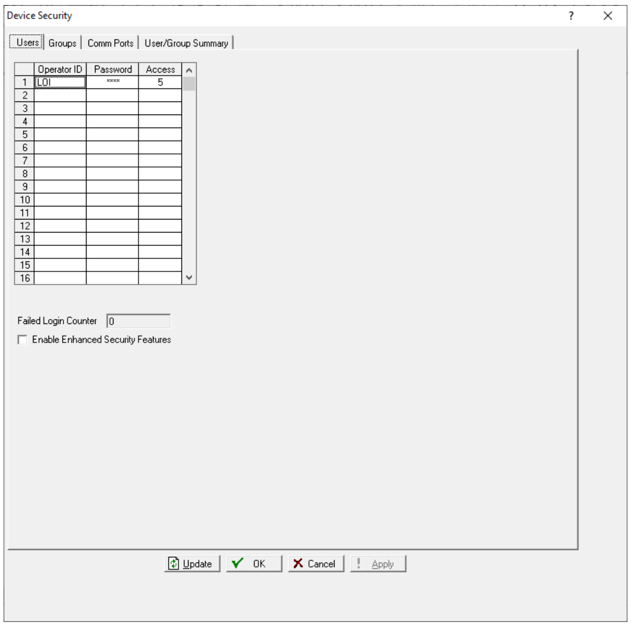


Figure 3-10. Device Security

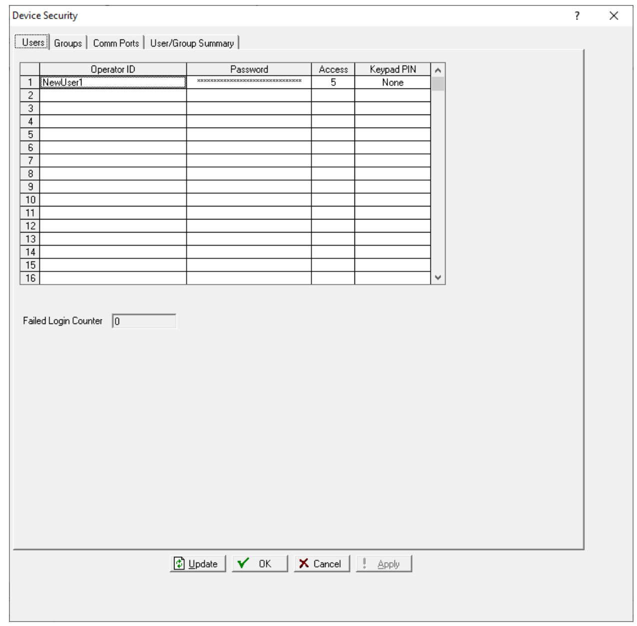


Figure 3-11. Enhanced Device Security

The default Operator ID is **LOI**; the default Password is **1000**.

1. Select **ROC** > **Security**.
2. Click an **Operator ID** field to add, edit, or remove a user. Refer to *Security Access Levels* for a full list of the access levels.

3.7.2.1. Adding and Deleting Users

This section details how to add and delete users in Device Security.

Adding a User To add an operator ID:

1. Select **ROC** > **Security**.
2. Click on an empty cell in the table. The Device Security dialog displays.

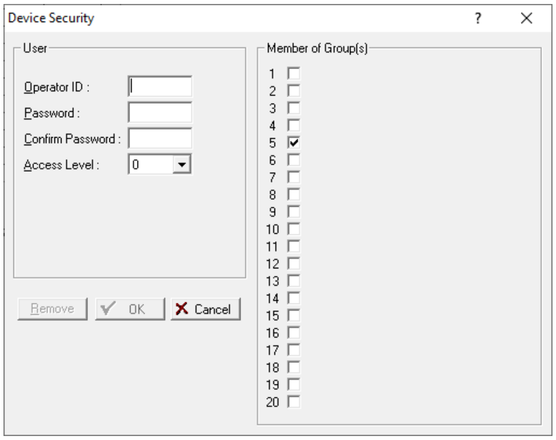


Figure 3-12. Device Security – User Table

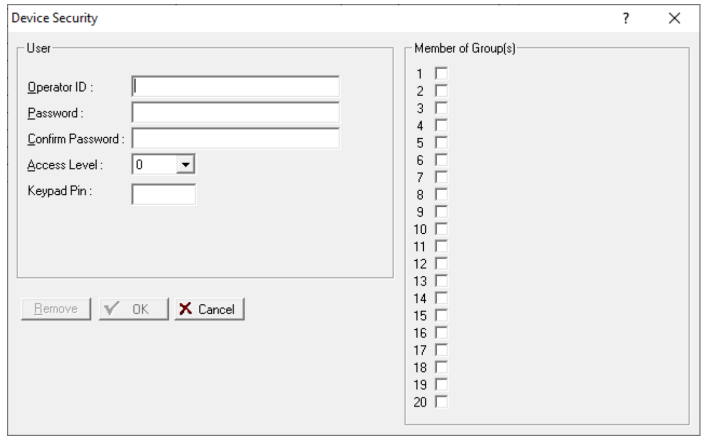


Figure 3-13. Enhanced Device Security – User Table

3. Complete the dialog as described.

Field	Description
Operator ID	Sets an Operator ID used to log into the device. The requirements for the Operator ID field differ based on if you have selected Enable Enhanced Security Features (**ROC > Security**): ▪ If you have **not** selected **Enable Enhanced Security Features**, enter three alphanumeric characters for the Operator ID. Typically these are the initials of the person who operates the device. **Note:** Each Operator ID must be unique and is case-sensitive (that is, **ABC** is different from **Abc**). ▪ If you have selected **Enable Enhanced Security Features**, enter between three and 30 alphanumeric/special characters for the Operator ID. **Note:** The Operator ID is **not** case-sensitive.
Password	Sets a Password for the Operator ID. The requirements for the Password field differ based on if you have selected Enable Enhanced Security Features (**ROC > Security**): ▪ If you have **not** selected **Enable Enhanced Security Features**, enter four numeric characters (between 0000 and 9999) to define the operator Password. More than one user can have the same password. **Note:** If you precede a password value with zeroes (such as 0006), ROCLINK 800 saves that password as 6. If you have selected **Enable Enhanced Security Features**, enter between eight and 32 alphanumeric/special characters to define the operator Password. More than one user can have the same password.
Confirm Password	Validates the password you entered in the Password field.

Field	Description
Access Levels	Sets the access level for this operator ID. **0** is the lowest access level and allows access to the fewest number of screens. **5** is the highest access level and permits access to all screens. Each access level permits access to screens at that level and any inherited from lower access levels. For example, the IDs with access level 3 can access screens with levels 0, 1, 2, and 3. Refer to *Table 3-2*.
Keypad PIN	Sets an eight-digit numeric code for users to log into the device using the keypad. **Note:** ▪ This feature requires ROC Keypad Display user program version 1.05 or higher. ▪ This field appears **only** if you have selected **Enable Enhanced Security Features.** ▪ The Keypad PIN **must** be eight-digits long.
Member of Groups	Sets the groups to which this user belongs. This field corresponds to the groups the Keypad Display uses for security.

4. Click **OK** to add the user and close the dialog. The Device Security screen displays, showing the user you have just added.

Deleting a User To delete an operator ID:

1. Select **ROC** > **Security**.
2. Click an **Operator ID** to delete.
3. Click **Remove**.
4. Click **Yes** to the confirmation dialog. The Device Security screen displays, showing that the operator ID has been removed.

3.7.2.2. Groups Tab

Select **ROC > Security > Groups** tab to establish up to 20 unique groups that Keypad Display security uses.

Note: If your application **does not** require a keypad display, you do not need to create groups.

To create a group:

1. Select **ROC** > **Security**.
2. Select the **Groups** tab. The Groups screen displays.

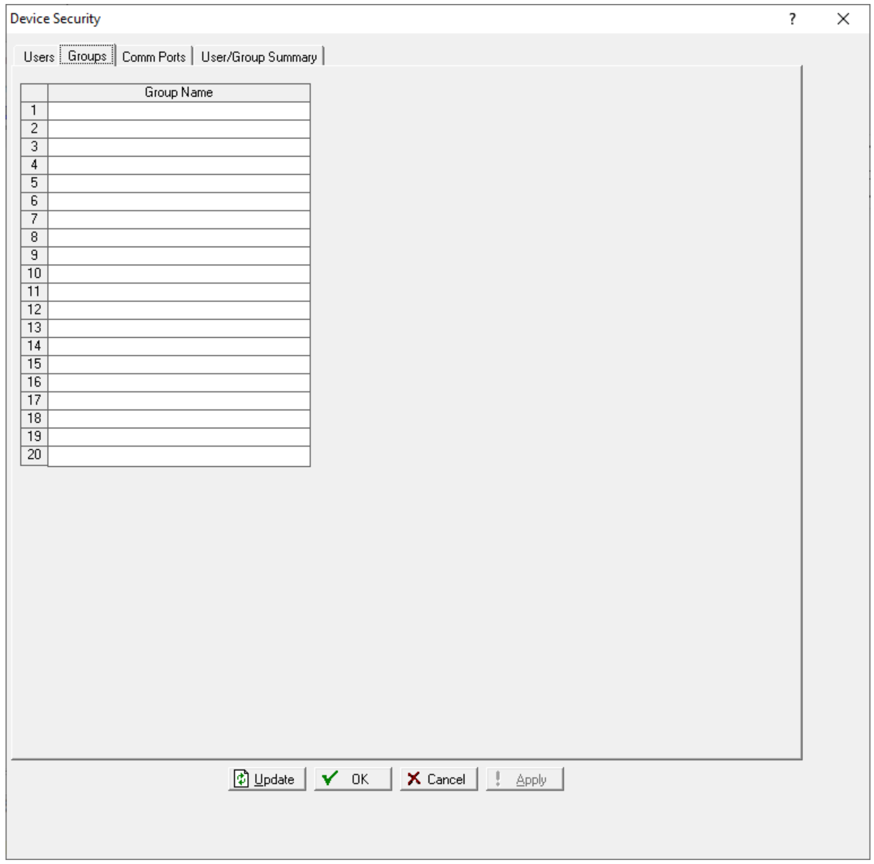


Figure 3-14. Device Security – Groups tab

3. Enter a group name (such as **Operators**, **Technicians**, or **Supervisors**) in each line.
4. Click **Apply** to save your groups.

Note: You then use the Keypad Display Editor (**Utilities** > **Keypad Display Editor**) to indicate which displays those particular groups may access. Your application **does not** require a keypad display; you do not need to create groups.

3.7.2.3. Comm Ports Tab

When you select the Comm Ports tab, the Comm Ports screen displays:

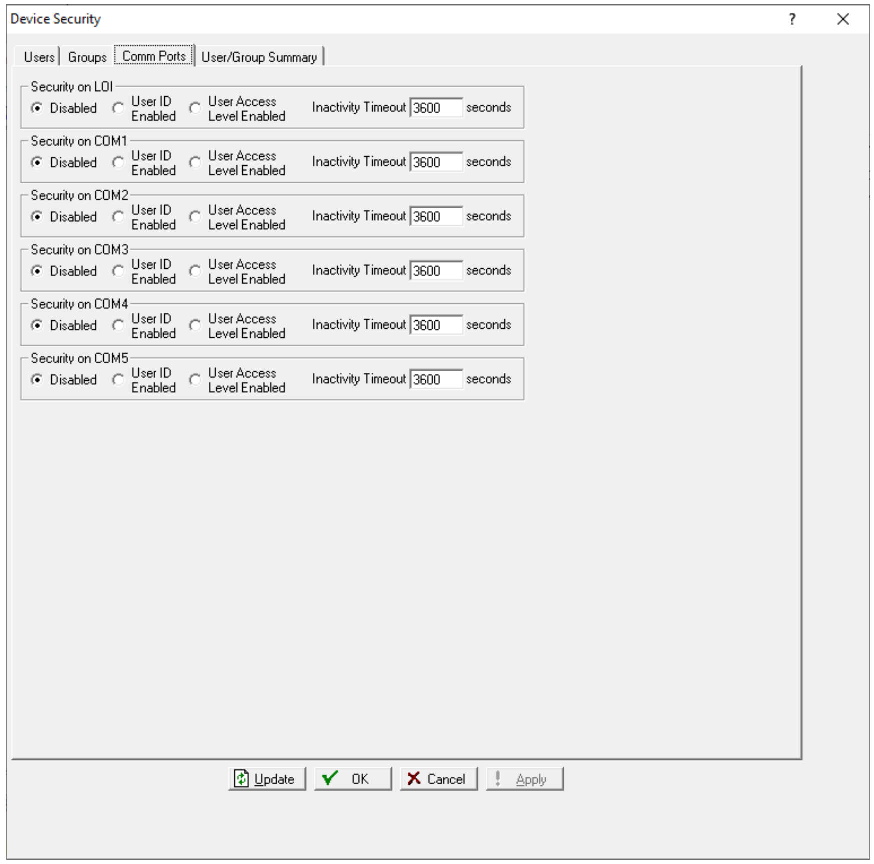


Figure 3-15. Device Security – Comm Ports tab

For each communications port, select one of the following **Security** options:

- **Disabled** – All login requests are accepted.
- **User ID Enabled** – Login requests are accepted if the Operator ID and password are valid. Upon successful login, full access is allowed.
- **User Access Level Enabled** – Login requests are accepted if the Operator ID and password are valid. Upon successful login, the user is restricted by access level. See *Security Access Levels*.

Note: If you enable security on any port, at least **one** user must have the highest level of security (level 5).

3.7.2.4. User/Group Summary Tab

The **Device Security** > **User/Group Summary** tab displays a table that summarizes the defined associations between users and groups. It reflects the users you defined on the Users tab and the groups you defined on the Groups tab.

You can also use this table to modify those associations. Click in a box to add (or remove) a user ID from a group. Click **Apply** to save any changes.

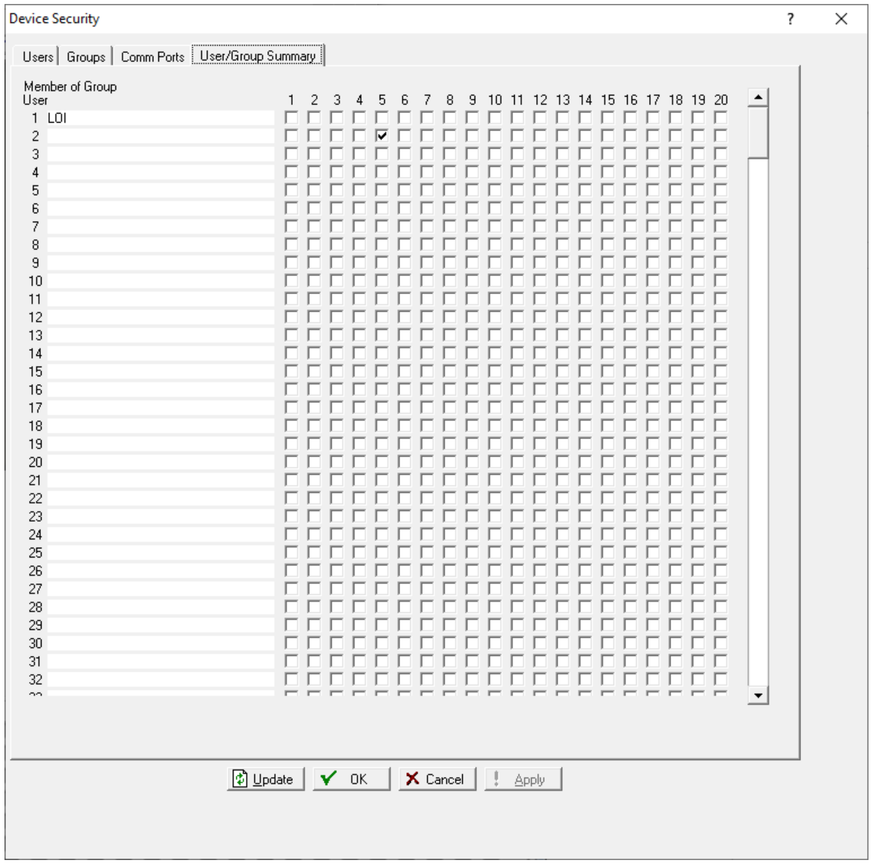


Figure 3-16. Device Security – User/Group Summary tab

3.7.3 Enhanced Security

Caution — **Before** opting into the new feature, confirm support in **all** software and devices communicating with the RTU or flow computer.

Opting into the new complex usernames/password format occurs at the device.

Note:

- You **must** run ROCLINK 800 as an administrator in Windows.
- You **must** log into ROCLINK 800 using an administrator-level ID.
- Once you opt into the complex usernames/passwords format, you **cannot** change back to the previous security format.

1. Select **Utilities** > **ROCLINK 800 Security**. The ROCLINK 800 Security screen displays:

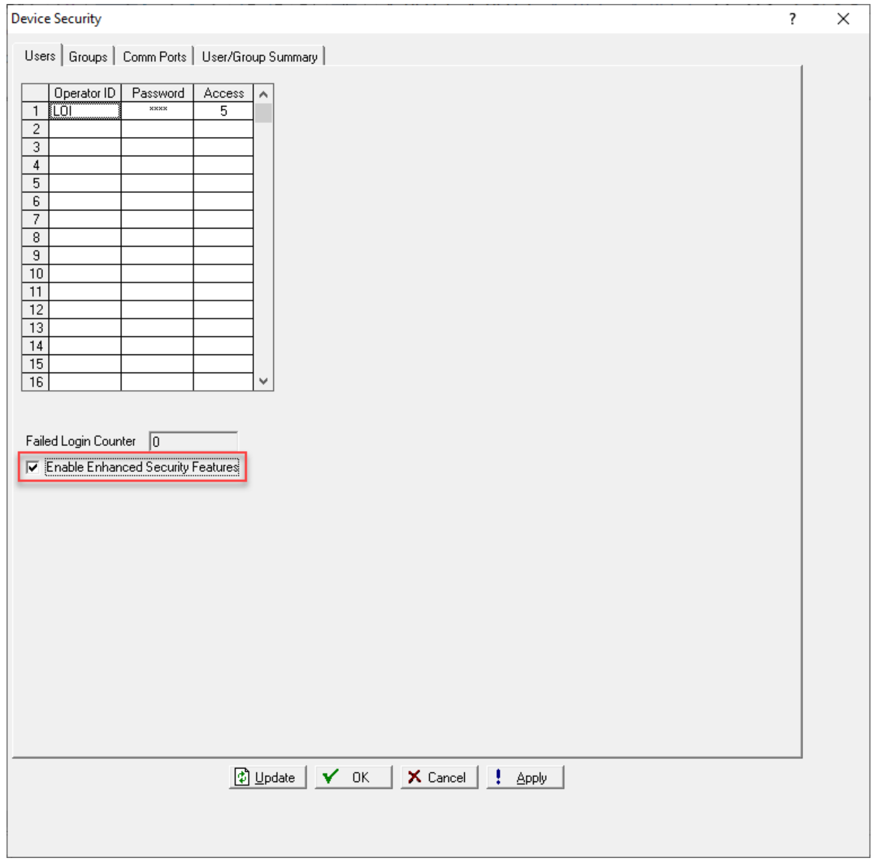


Figure 3-17. Device Security – Enable Enhanced Security Features

2. Select the **Enable Enhanced Security Features** option and click **Apply**. A warning dialog displays:

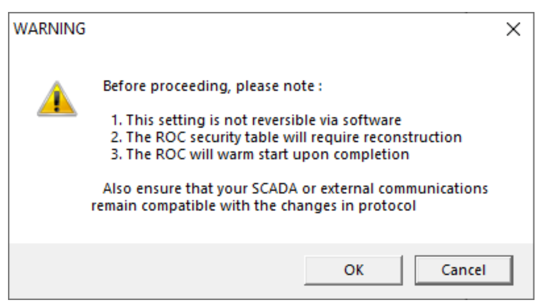


Figure 3-18. Warning Dialog

Note: Click **Cancel** (the default value) to exit this dialog and retain your current security table.

---

3. Click **OK** to opt into the new security enhancement. The Update ROC Security Logon dialog displays:

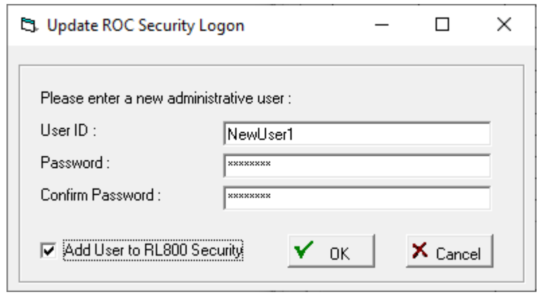


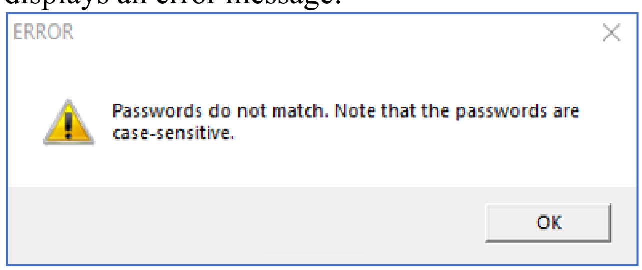
Figure 3-19. Update ROC Security Logon Dialog

Note: Click **Cancel** to exit this dialog and retain your current security table.

---

4. Define a new User ID and Password. This becomes is the **new administrative User ID**. Select the **Add User to RL800 Security** option to automatically add this administrative user ID to the ROCLINK 800 Security table.

Note: If the contents of the Password and Confirm Password fields do not exactly match (remember case-sensitivity), ROCLINK displays an error message:



Click **OK** to clear the message and re-enter the contents of both fields.

---

5. Click **OK**. When ROCLINK accepts the new administrative ID and password, ROCLINK displays a verification message:

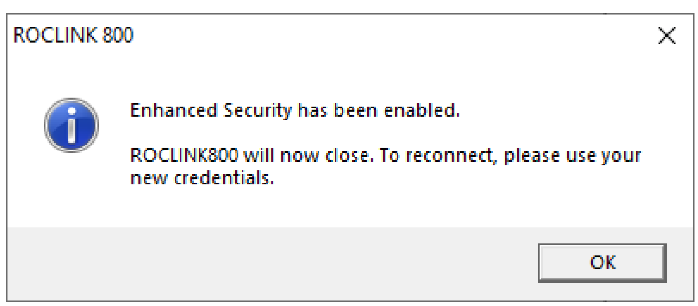


Figure 3-20. Verification Message

6. Click **OK** to close the message and exit ROCLINK 800.

3.7.3.1 After Opting In: ROCLINK 800 Security

1. Log into ROCLINK using the new administrator operator ID and password (defined in step 4 of the previous section).

2. Access the ROCLINK 800 Security screen (**Utilities** > **ROCLINK 800 Security**).

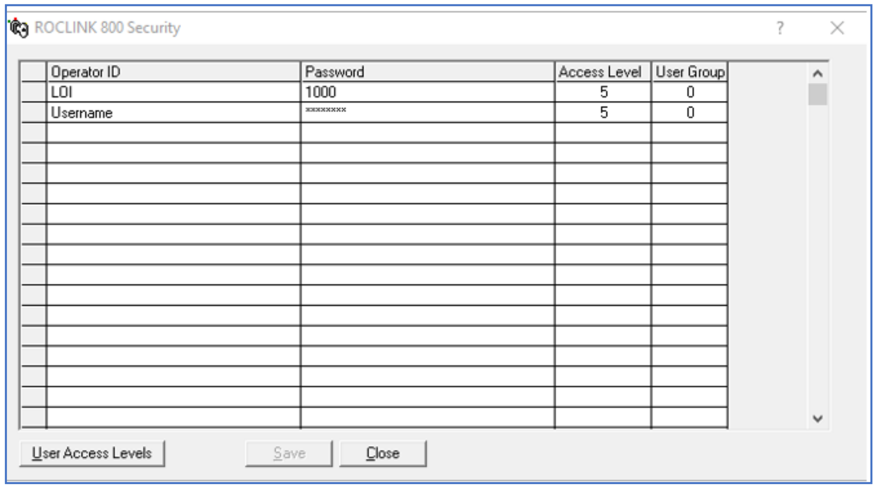


Figure 3-21. Enhanced ROCLINK 800 Security Screen

3. Define any additional operator IDs/passwords for ROCLINK 800 users.

Note: When connecting to a device that still uses the older security format, you need to close ROCLINK and reconnect to that device using the corresponding operator ID/password.

3.7.3.2 After Opting In: Device Security (ID/Password/Keypad PIN)

Once you implement the new enhanced security, you then need to modify the device security table for **each** device.

Note: Once you configure a device to use the longer operator IDs/passwords, you cannot log into that device using the old (short) operator IDs/passwords.

1. Log onto a device and access its security table (**ROC** > **Security**):

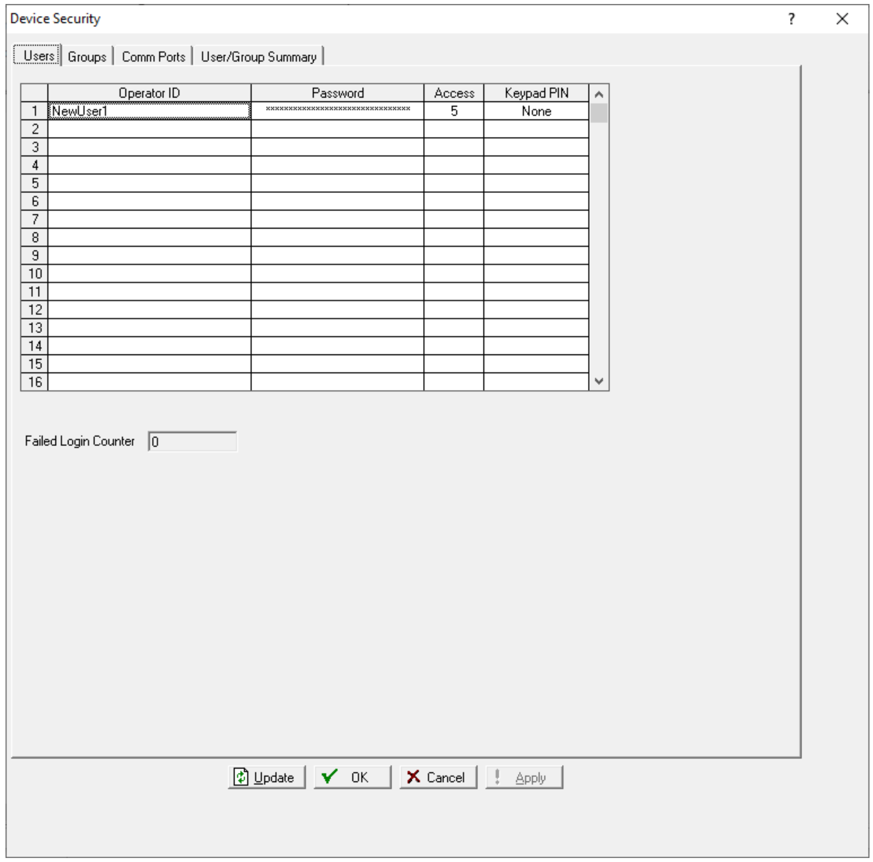


Figure 3-22. Enhanced Device Security Screen

2. Define new operator IDs (of at least **3** and no more than **30** alphanumeric/special characters) and passwords (of at least **8** and no more than **32** alphanumeric/special characters).

Note: Ensure that you define IDs and password for individual users in ROCLINK 800 security to enable them to easily log onto their device.

3. In the Keypad/Keypad PIN field, set a numeric code for users to log into a device using the keypad.

Note:

- Failure to enter a Keypad PIN will prevent the user from logging in to the device through the keypad.
- This feature requires ROC Keypad Display user program version 1.05 or higher.
- The Keypad PIN **must** be eight-digits long.

3.7.3.3 After Opting In: Device Security (Comm Ports)

This feature is unchanged from previous versions of ROCLINK 800, but to comply with the security directive you **must** enable security (either by User ID or User Access Level) for each comm port.

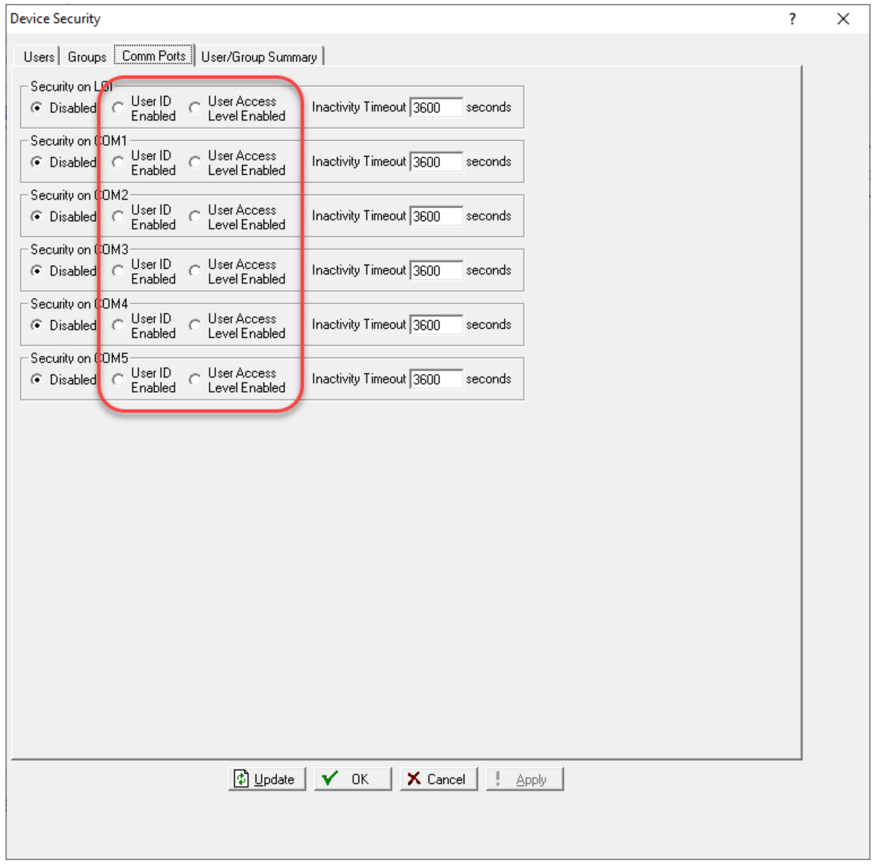


Figure 3-23. Enhanced Device Security Screen – Comm Ports tab

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Chapter 4 – The File Menu

In This Chapter

Use the File Menu to print, open, close, and save configuration files. Configuration files contain all hardware and software settings for your ROC800L.

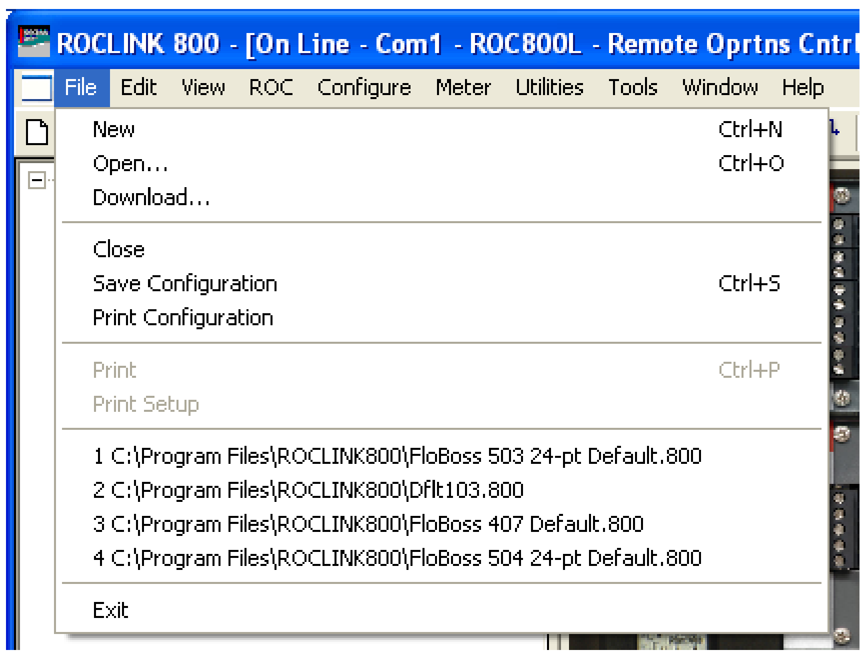


Figure 4-1. File Menu

Note: Because of the complex relationship of point types and user programs in the ROC800L, you cannot currently use **File** > **New** to create a new ROC800L configuration file. However, you can save the configuration file resident in a working ROC800L and subsequently edit it.

4.1 New Configuration

The New option on the File menu allows you to create a configuration file when you are not physically connected to a ROC. However, because of the complex relationship of point types and user programs in the ROC800L, it is not currently possible to create a ROC800L configuration file while you are off-line. However, you **can** save the configuration file resident in a working ROC800L and subsequently edit it. See the section Saving a ROC User File

In addition to keeping backup copies of the configuration file, it is also good practice to keep a backup copy of the ROC_USER.mdb file. This file contains the communications, security, and password settings for the device.

To create a backup copy of the file:

Open Windows Explorer and navigate to the folder where ROCLINK 800 software is located. Typically, this folder is C:\Program Files\ROCLINK800.

Create a copy of the ROC_USER.mdb file.

Paste the copy into another folder on the PC or a disk.

Saving a Configuration (located in this chapter) for further information.

4.1.1 Configuration Checklist

For a ROC800-Series:

- ROC menu > ROCLINK 800 Security (logon)
- Device Directory > Comm Port > Properties (PC communication configurations)
- ROC menu > Security (User List and Comm Port Security)
- ROC menu > Clock
- ROC menu > Information (system variables)
- ROC menu > Comm Ports (FloBoss device communication configurations)
- Configure menu > I/O menu > AI, AO, DI, DO, DOR, PI, TC, RTD, MVS, HART, APM, ACIO, VDO and IEC62591
- Meter > Setup > Station
- Meter > Setup > Orifice Meter
- Meter > Setup > Linear Meter
- Configure menu > Control menu > PID Loop
- Configure menu > Control menu > FST Registers
- Configure menu > History Segments
- Utilities menu > FST Editor
- View menu > Display > New or from File (for custom PC displays)

- ROC menu > Flags (for saving and system variables to Flash memory)

4.1.2 Duplicating a Configuration

You can duplicate the configuration for another ROC800-Series by using these menu functions in the following order:

1. **File** > **Save Configuration** to save a device's configuration to a specified file.
2. **ROC** > **Direct Connect** (Local Port) or **Connect** (modem) to connect physically to the second unit, and then communicate.
3. **File** > **Download** loads the configuration into the unit.

After you have loaded configuration data into the second device (Step 3) and changed it as needed, you can save the configuration to its own disk file by using Step 1.

4.2 Opening a Configuration File

Use the Open option to open a configuration file stored on a PC's hard drive. Once you open the configuration file, it automatically becomes the active configuration file and you may edit the file offline. You can also load the configuration file into the device using the Download function.

To open a configuration file:

1. Start ROCLINK 800.
2. Select **File > Open**. The Open dialog box displays.
3. Select a configuration file name and click **Open**. The configuration file displays.

Notes:

- ROCLINK 800 files have the .800 extension.
- If you receive an error when opening a configuration file, ensure that your PC's Regional Settings are configured correctly. Refer to *Installing ROCKLINK 800 under Microsoft Windows 10, 8 or Windows 7* (located in Chapter 1).

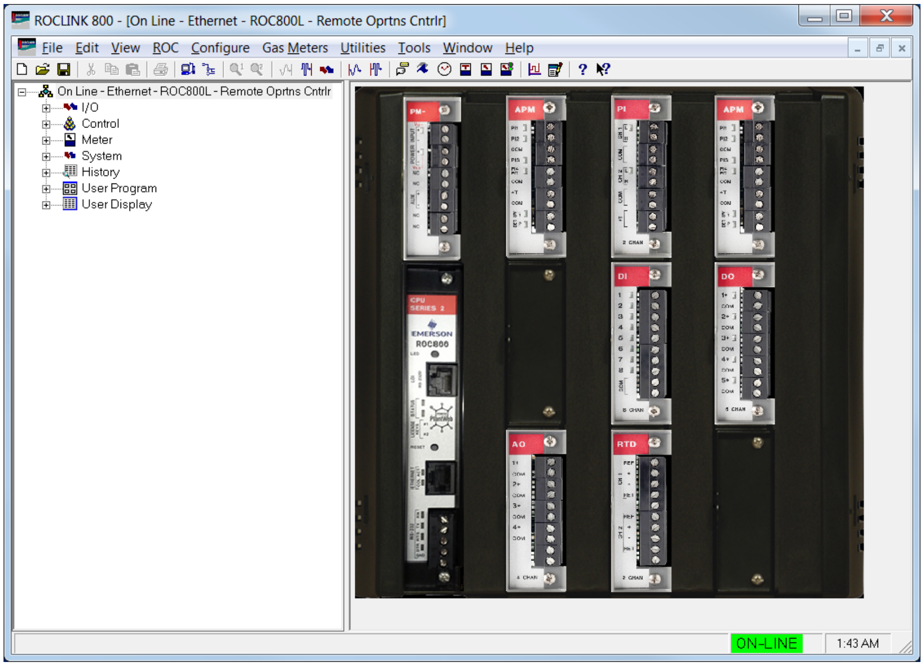


Figure 4-2. Open File Configuration

4.2.1 Configuration Tree Menu

When you open a configuration file, the Configuration Tree appears on the left-hand side of the screen. The tree hierarchically displays the parts of a configuration (such as I/O, Meter Runs, and History) that you can change.

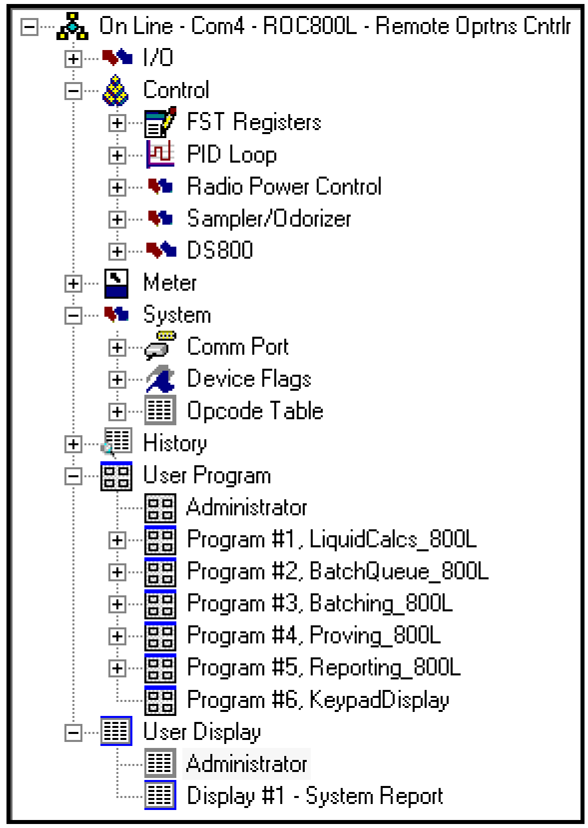


Figure 4-3. Configuration Tree Menu

Option	Description
I/O	Lists all available inputs and outputs by type.
Control	Displays the FST, Radio Control, Sampler/Odorizer, DS800, and PID options enabled on the **ROC > Information** screen.
Meter	Lists all available gas meters and all stations.
System	Displays Comm Port, Device Flags, and Opcode Table information.
History	Displays all available History Segments and History Points.
User Program	Displays all user programs.
User Display	Accesses custom displays stored in the configuration file. The file can store a maximum of 246 displays (both custom user displays and user program displays).

From the Configuration Tree, you may change the configuration or monitor current operations. Once you are in the Configuration Tree menu, you can use the + and – symbols to display or hide various options.

Double-click the desired function in the Configuration Tree to display the associated screen. Double-clicking an icon is the same as selecting the option in the menu bar or clicking a Toolbar button.

4.2.2 Modifying an Existing Configuration File

You can make modifications to an existing configuration file offline. This allows you to share configuration files between multiple devices and customize each configuration file to account for device differences.

To modify an existing configuration file:

1. Start ROCLINK 800.
2. Select **File** > **Open**. The Open dialog box displays.
3. Select a configuration file name and click **Open**. The configuration file displays.

Note: ROCLINK 800 files have the .800 extension.

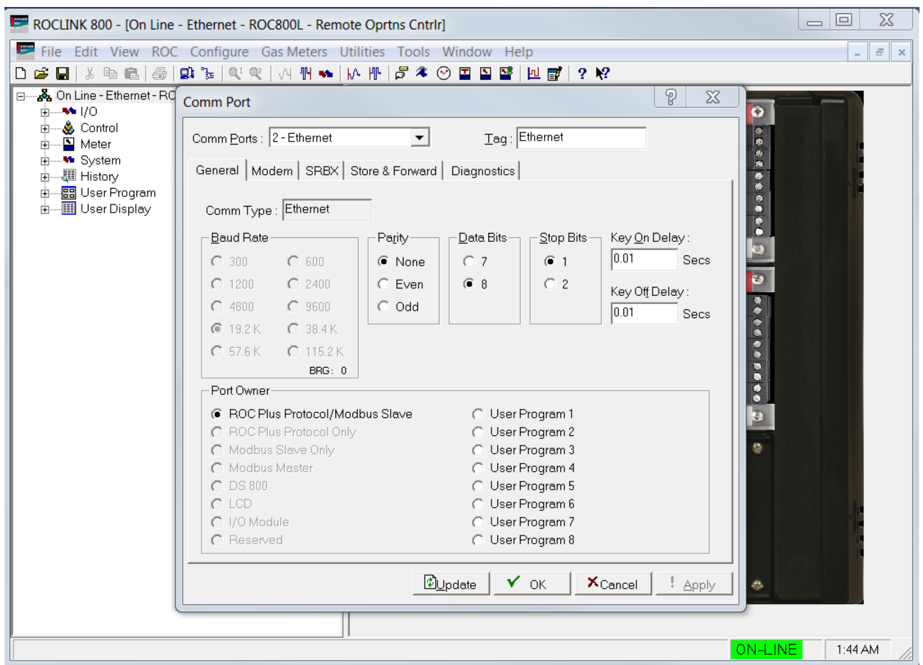


Figure 4-4. Modifying Configuration File

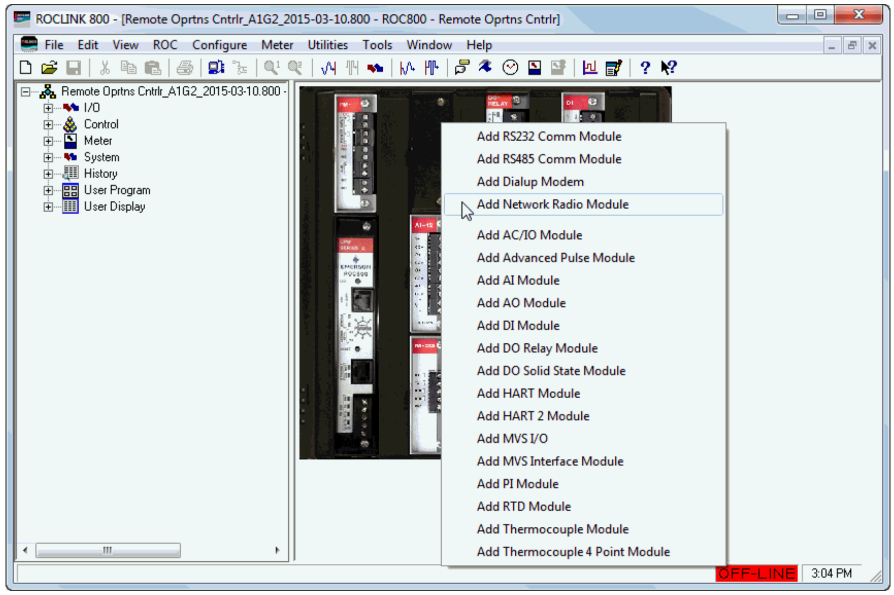
4.2.3 Adding Modules to an Existing Configuration File

You can add modules to an existing device configuration file. To modify an existing configuration file:

1. Start ROCLINK 800.
2. Select **File** > **Open**. The Open dialog box displays.
3. Select a configuration file name and click **Open**. The configuration file displays.

Note: ROCLINK 800 files have the .800 extension.

4. Right-click an empty slot to display a pop-up menu of available modules.



5. Select the appropriate module from the pop-up menu. An Add New Module dialog displays.

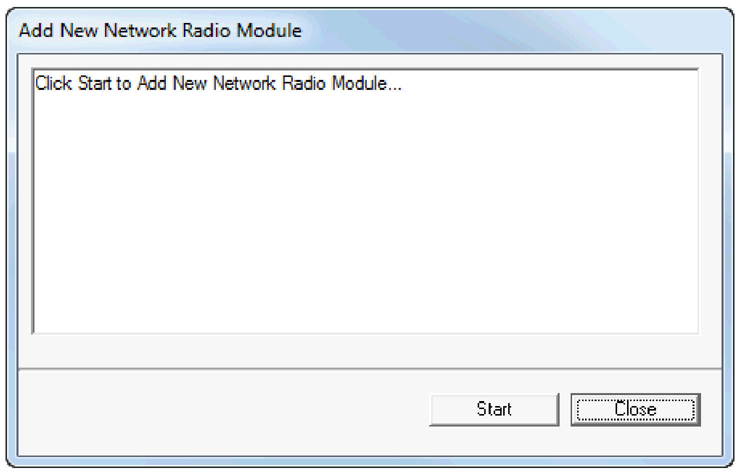


Figure 4-5. Add New Module

6. Click **Start** to add the new module TLPs to the configuration file.

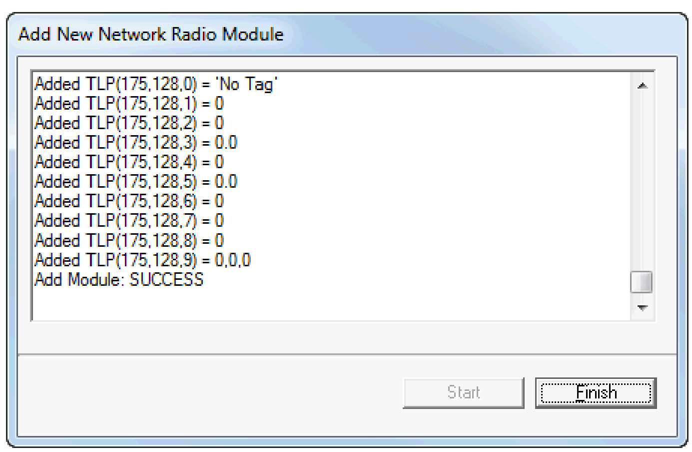


Figure 4-6. Add New Module Success

7. Click **Finish**. A dialog displays warning you that all offline and online connections must be closed to complete the operation.

⚠ **Caution**	**Any unsaved changes to other configuration files are lost when the connections are closed.**

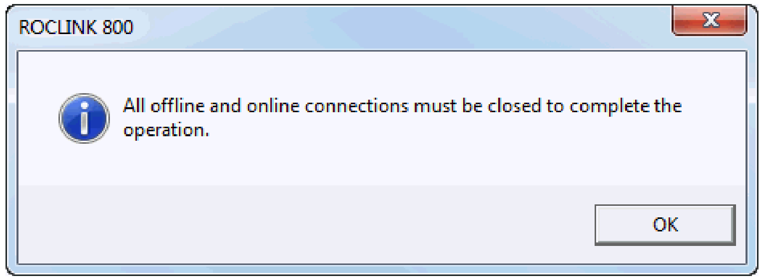


Figure 4-7. Connection Must Be Closed

8. Click **OK** to close all online and offline connections and the new module to the configuration.

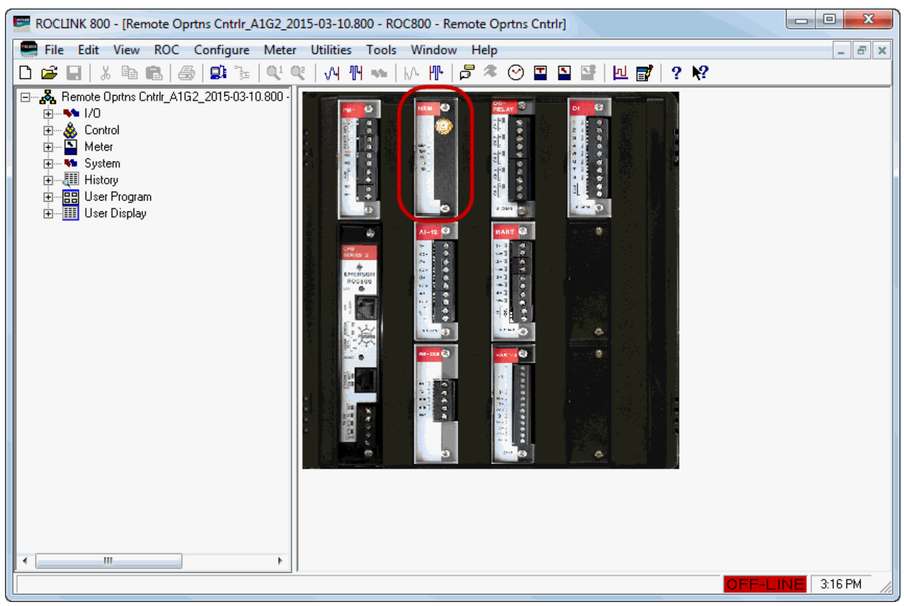


Figure 4-8. New Module Added

4.3 Downloading a Configuration

Use the Download option to download a saved configuration to a ROC.

1. Connect to the ROC.
2. Select **File** > **Download**. The Select Configuration File to Download dialog displays.
3. Select a configuration file. ROCLINK 800 configuration files have the extension .800.
4. Click **Open**. The Download Configuration screen displays.

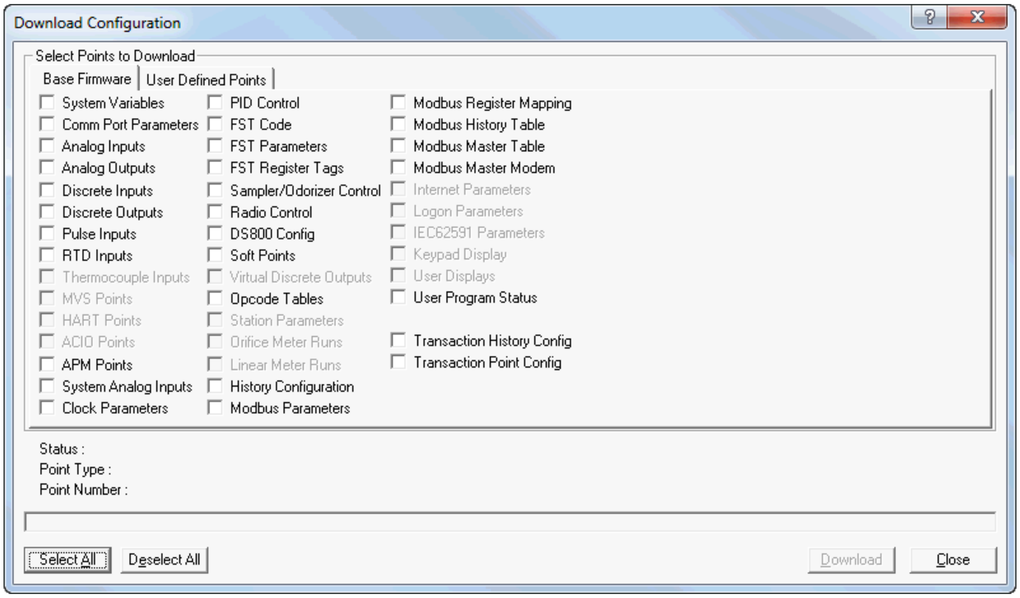


Figure 4-9. Download Configuration-Base Firmware Tab

5. Select only the configuration points you desire to download. ROCLINK 800 grays out any items not configured in your configuration.
6. Select the **User Defined Points** tab. The User Defined Points screen displays.

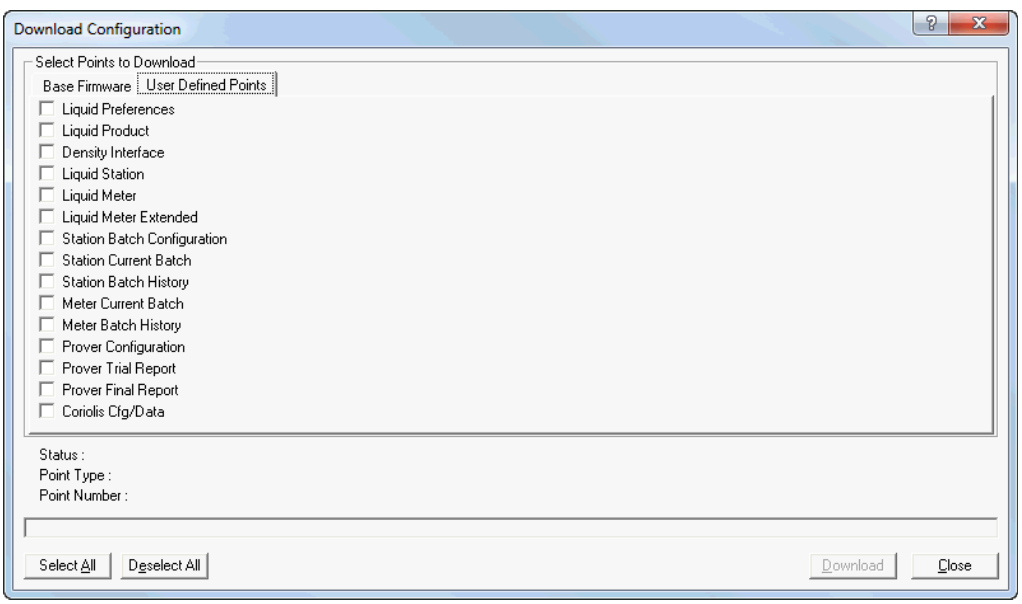


Figure 4-10. Download Configuration-User Defined Points Tab

7. Select only the User Defined Points you desire to download.
8. Click **Download**. ROCLINK 800 begins to download the configuration points you have chosen, and displays the status, point type, and point number information as the download progresses.
9. Click **OK** when the download completes.

10. Select **ROC** > **Flags** and click the **Save Configuration for Flash Memory** button.

4.4 Saving a ROC User File

In addition to keeping backup copies of the configuration file, it is also good practice to keep a backup copy of the **ROC_USER.mdb** file. This file contains the communications, security, and password settings for the device.

To create a backup copy of the file:

Open Windows Explorer and navigate to the folder where ROCLINK 800 software is located. Typically, this folder is C:\Program Files\ROCLINK800.

Create a copy of the **ROC_USER.mdb** file.

Paste the copy into another folder on the PC or a disk.

4.5 Saving a Configuration

The **Save Configuration** option saves the current configuration of a connected device to a disk file. This feature is useful when creating a backup, when configuring similar ROC for the first time, or when making configuration changes off-line. Once a backup configuration file is created, it can be loaded into a device using **File > Download**.

1. Select **File > Save Configuration**. The Save As dialog box appears.
2. Type the desired **File name** of the backup file.
3. Click **Save**.

ROCLINK 800 configuration files have the extension **.800**.

4.6 Printing a Configuration

Use the Print Configuration option to specify the point types that you want to print.

1. Select **File > Print Configuration**. The Print Configuration Setup screen displays.

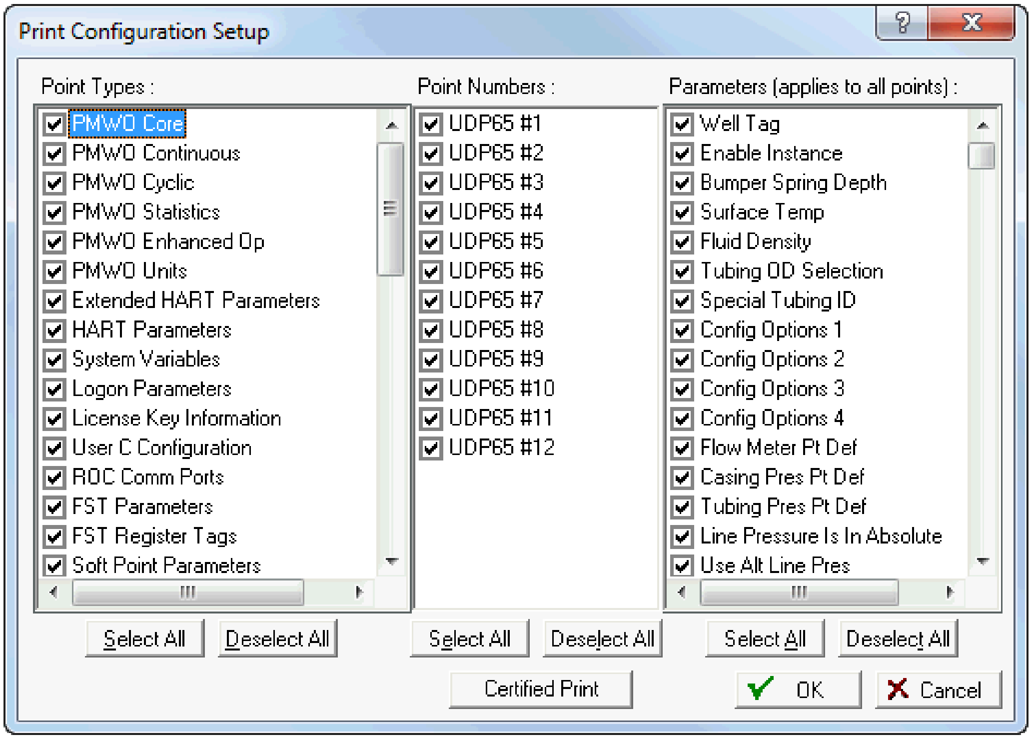


Figure 4-11. Print Configuration

2. Select the specific **Point Types** to print.

Note: Click **Select All** or **Deselect All** to select multiple point types, point numbers, or parameters. Use your mouse to select/deselect individual point types, point numbers, or parameters.

3. Select the **Point Numbers** to print.
4. Select the **Parameters** to print.

Note: Click the **Certified Print** button to automatically print all point types, point numbers, and parameters in the device. This option does not allow you to deselect any point types, point numbers, or parameters.

5. Click **OK**. ROCLINK 800 reads the configuration from the device and displays the **Print Preview** screen.

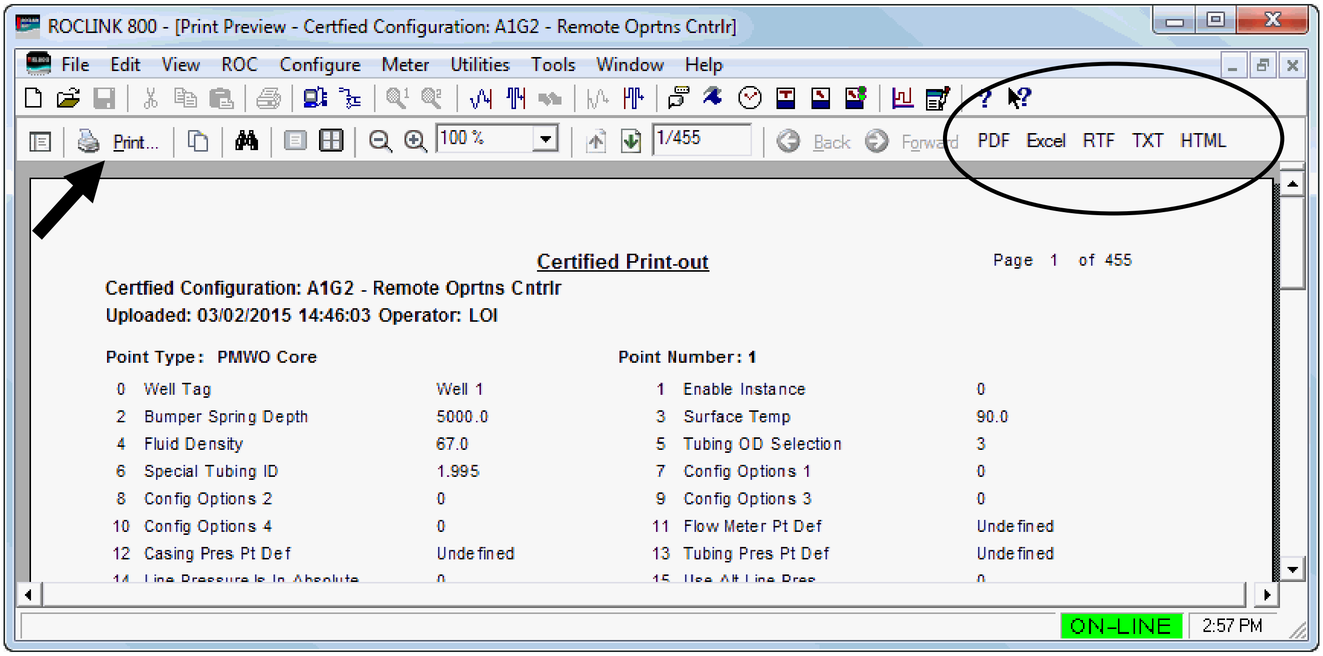


Figure 4-12. Print Preview-Certified Print

6. Use screen option buttons (located on the toolbar) to either directly print the preview or export the preview (with a file name you specify) to your PC's hard drive in one of the following formats:

Button	Result
Print	Sends file to a local printer
PDF	Converts the content to the format of an Adobe® Acrobat® file
Excel	Converts the content to the format of a Microsoft® Excel™ spreadsheet file
RTF	Converts the content to the format of a Microsoft Rich Text Format (RTF®) file
TXT	Converts the file to the format of an ASCII-compatible text file
HTML	Converts the file to the format of a hypertext markup language file.

4.7 Print

Click Print or select Print from the File menu to print ROCLINK 800-generated historical, event, and alarm log reports.

4.8 Print Setup

Use Print Setup to change the default printer for ROCLINK 800 information.

To change printers:

Select **File** > **Print Setup**.

Select the printer you desire to print to from the **Name** drop-down list.

4.9 Recent Files

The File menu displays the configuration files that you have recently opened or saved.

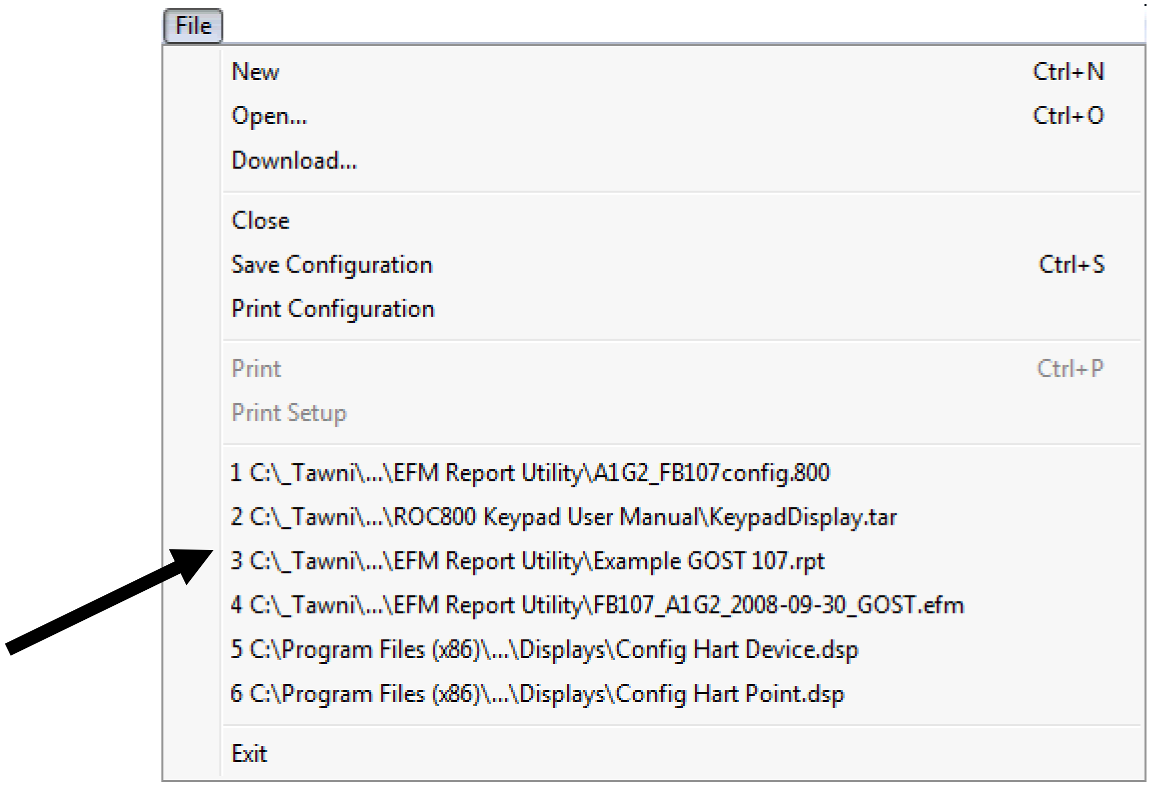


Figure 4-13. Recent Files

4.10 Close

Select **File > Close** to close the active screen.

Note: Because the graphic display is an active screen, selecting Close can terminate the online connection.

4.11 Exit

Select **File > Exit** to exit the ROCLINK 800 program. The following may occur:

- If you are currently editing a configuration file, ROCLINK 800 closes the file.
- If you are currently connected to a dial-up ROC, ROCLINK 800 issues the hang-up command to the modem.
- If you are currently online with a ROC, the connection automatically terminates.

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Chapter 5 – The View Menu

In This Chapter

Use the View menu options to view the Device Directory; electronic flow measurement (EFM) reports; calibration logs; history, alarms, weights and measures, and events logs; create, view, and manage custom displays, monitor I/O; view the toolbar; and update point tags on the User Program configuration tree.

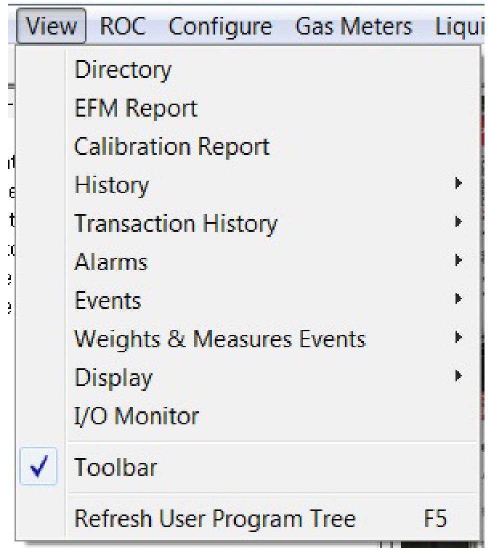


Figure 5-1. View Menu

5.1 Directory

Select **View > Directory** to replace the ROC800-Series graphic image or Configuration Tree with the Device Directory. The Device Directory displays the root level of all devices and groups configured in ROCLINK 800.

Note: You can also switch displays between the Device Directory and the online device using the Windows option on the ROCLINK 800 menu bar.

5.2 EFM Reports

Select **View > EFM Report** to generate printed and on-screen reports of the configuration, alarms, events, and historical flow data for a gas meter point and to the EFM reports to other formats. ROCLINK 800 uses EFM (Electronic Flow Measurement) reports in conjunction with the ROC's AGA flow calculation capabilities to display or print previously collected flow data. An EFM report file contains all flow data, which includes the operational characteristics (configuration parameters, history, events, and alarms) of each measured meter run configured in the ROC.

Note: If a communication failure occurs during the EFM Report process, the initial data collected **before** the comm failure remains in the report.

5.2.1 Creating the EFM File

Before you can view the EFM report data, you must first create the report file. Refer to *Chapter 6, Section 6.3, Collect ROC Data*, for this process.

5.2.2 Viewing EFM Reports

"Viewing" an EFM report requires you to identify the EFM data you want to use, selecting a report format file, and then indicating the kinds of data to include in the report. To view the EFM report:

1. Select **View** > **EFM Report**. An Open dialog displays, listing all the .EFM files.
2. Select an .EFM file and click **Open**. The View EFM Report screen displays.

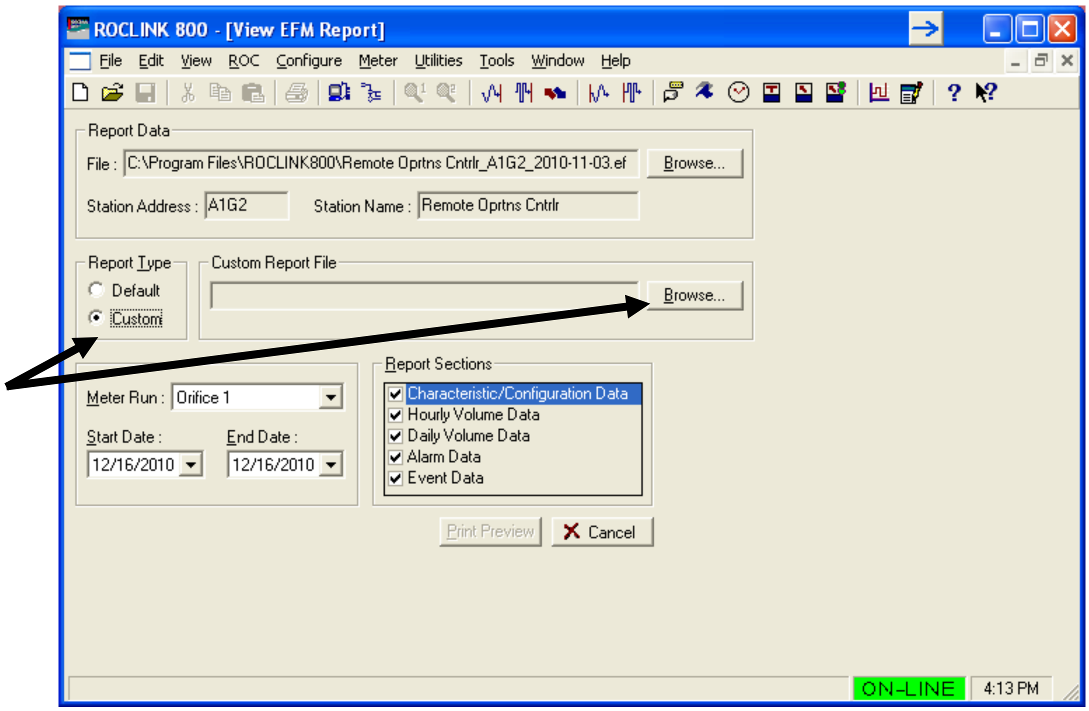


Figure 5-2. View EFM Report

3. Select **Custom** as the Report Type. This activates the Browse button.
4. Click **Browse** to display a Select Custom Report screen.

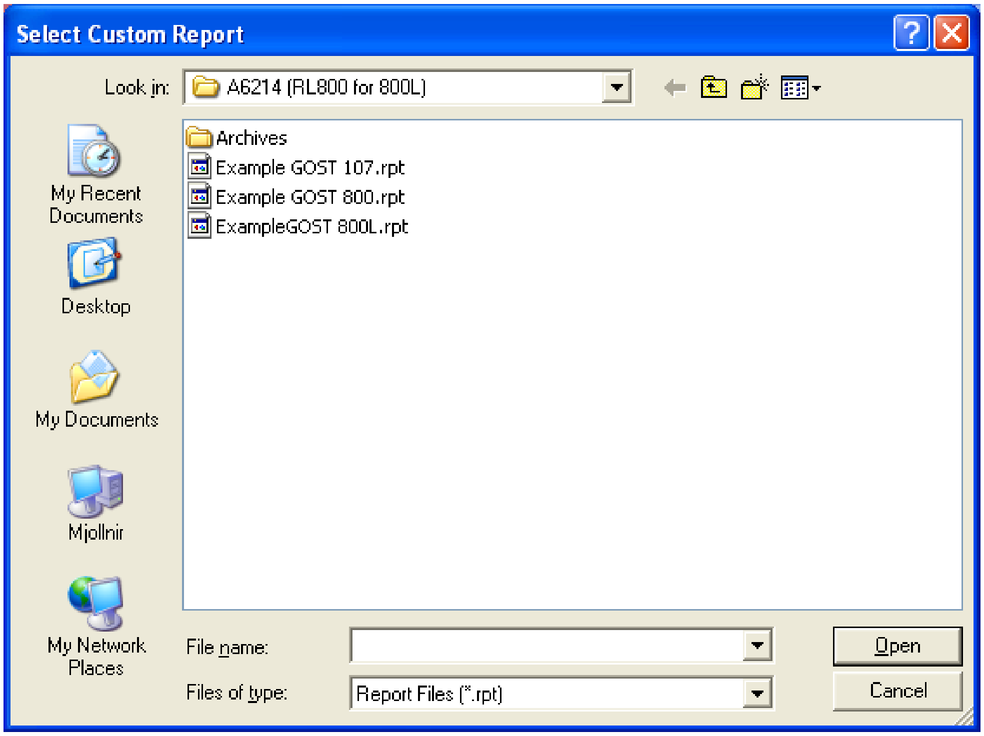


Figure 5-3. Select Custom Report

5. Select a report file and click **Open**. The View EFM Report screen displays, indicating the selected report file.

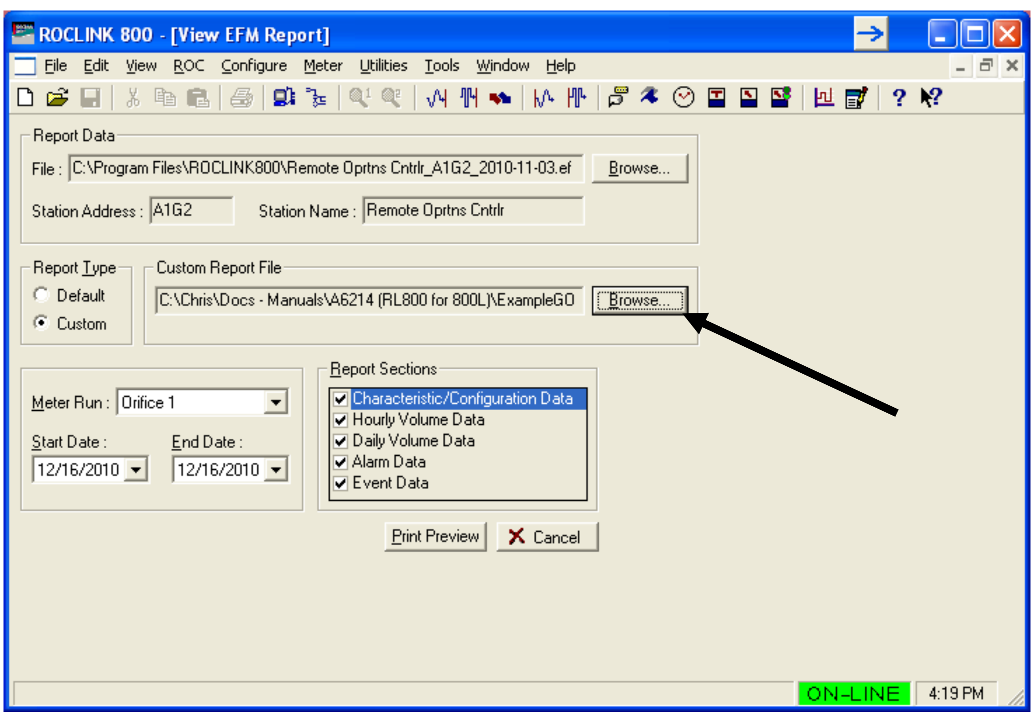


Figure 5-4. Selected Custom Report File

6. Define the report content:

Field	Description
Meter Run	Click ▼ to select the meter run for the report.
Start Date	Indicates a starting date for the report. Click ▼ to display a calendar to assist in date selection.
End Date	Indicates an ending date for the report. Click ▼ to display a calendar to assist in date selection.
Report Sections	Specifies the report contents. By default, all sections are selected; you can de-select sections based on your needs.

7. Select a meter. Click ▼ in the **Meter Run** field to display all available meter runs.
8. Click **Print Preview** to display a preview of the printed report.

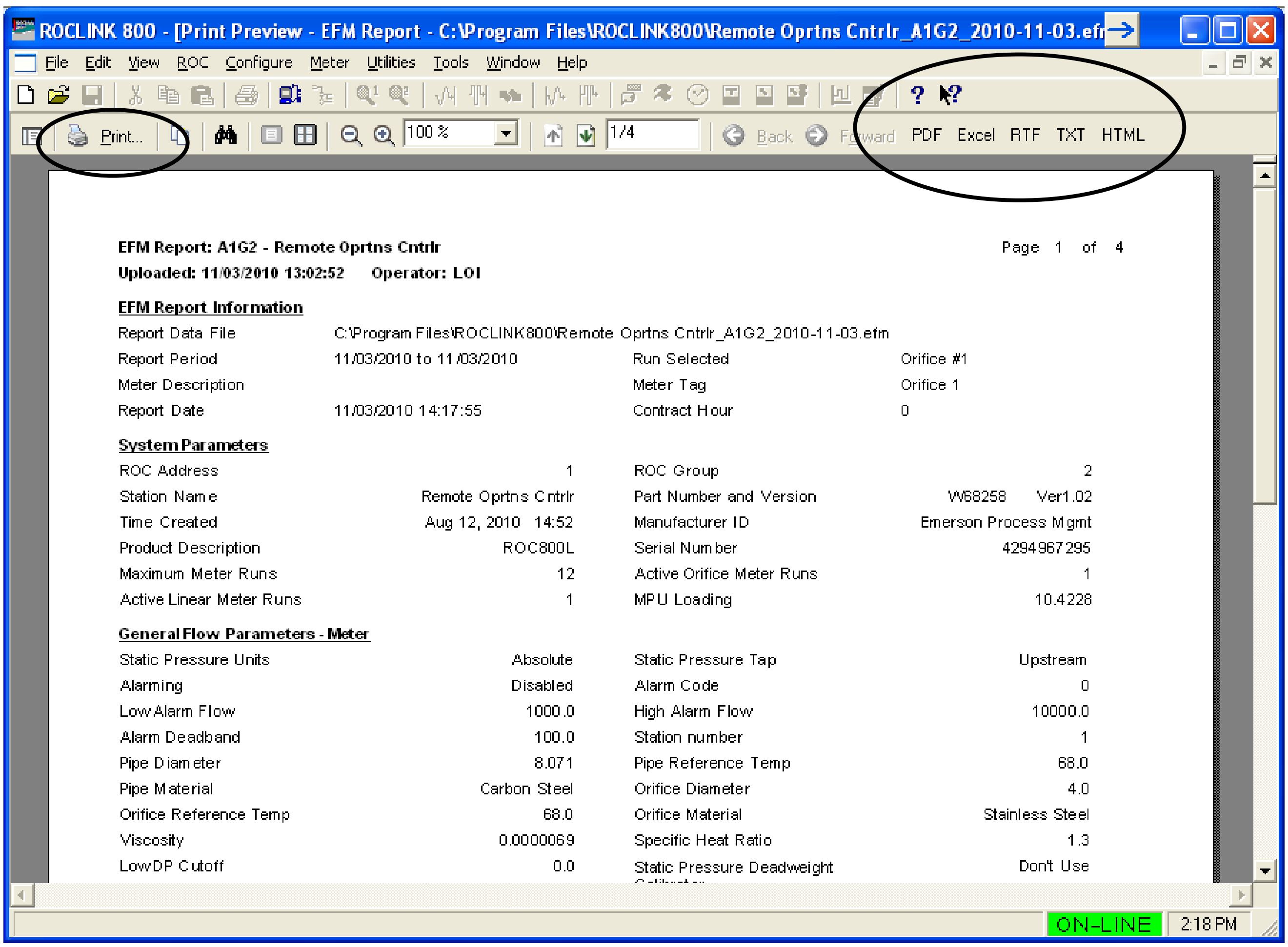


Figure 5-5. Preview of EFM Report

9. Use the options on the menu bar to print the report to a local printer or convert the report file to another format. *Figure 5-6* shows a page of an example printed report.

Note: Select **Utilities** > **Convert EFM File** (from the menu bar) to convert the report data to the PGAS or Coastal Flow data format. See *Chapter 9, Section 9.3, Converting EFM Report Files* for further information.

EFM Report: A1G2 - Remote Oprtns Cntrlr Page 1 of 4
Uploaded: 11/03/2010 13:02:52 Operator: LOI

EFM Report Information

Report Data File	C:\Program Files\ROCLINK800\Remote Oprtns Cntrlr_A1G2_2010-11-03.efm		
Report Period	11/03/2010 to 11/03/2010	Run Selected	Orifice #1
Meter Description		Meter Tag	Orifice 1
Report Date	11/03/2010 14:17:55	Contract Hour	0

System Parameters

ROC Address	1	ROC Group	2
Station Name	Remote Oprtns Cntrlr	Part Number and Version	W68258 Ver1.02
Time Created	Aug 12, 2010 14:52	Manufacturer ID	Emerson Process Mgmt
Product Description	ROC800L	Serial Number	4294967295
Maximum Meter Runs	12	Active Orifice Meter Runs	1
Active Linear Meter Runs	1	MPU Loading	10.4228

General Flow Parameters - Meter

Static Pressure Units	Absolute	Static Pressure Tap	Upstream
Alarming	Disabled	Alarm Code	0
Low Alarm Flow	1000.0	High Alarm Flow	10000.0
Alarm Deadband	100.0	Station number	1
Pipe Diameter	8.071	Pipe Reference Temp	68.0
Pipe Material	Carbon Steel	Orifice Diameter	4.0
Orifice Reference Temp	68.0	Orifice Material	Stainless Steel
Viscosity	0.0000069	Specific Heat Ratio	1.3
Low DP Cutoff	0.0	Static Pressure Deadweight Calibrator	Don't Use
Differential Pressure Deadweight Calibrator	Don't Use	Calibration Weights Gravitational Acceleration	32.174
User Correction Factor	1.0		

General Flow Parameters - Station

Point Tag ID	Station 1	Calculation Standard	AGA3-92/ AGA7-96/ AGA11-2003
Edition of Calculations	1992	Compressibility Calculation	AGA8 Detail
Units	English	Alarming	Disabled
Alarm Code	0	Low Alarm Flow	1000.0
High Alarm Flow	10000.0	Alarm Deadband	100.0
History Segment	0	Base or Contract Pressure	14.73
Base or Contract Temperature	60.0	Atmospheric Pressure Option	Entered
Atmospheric Pressure	14.45	Gravity Option	Calculated
Local Gravitational Acceleration	32.14398	Elevation	500.0
Latitude	35.0	Heating Value Type	Dry
Heating Value	1027.189	Specific Gravity	0.573538
Gas Quality	Constant	Normalization Type	Methane Adj
Heavy Gas Option	Don't Use	Heavy Gas Percent	0.0
Heavy Gas % C6H14n-Hexane	100.0	Heavy Gas % C7H16n-Heptane	0.0
Heavy Gas % C8H18n-Octane	0.0	Heavy Gas % C9H20n-Nonane	0.0
Heavy Gas % C10H22 n-Decane	0.0	Flow Rate per Day	0.0
Energy Rate per Day	0.0	Flow Today	0.0
Flow Yesterday	0.0	Energy Today	0.0
Energy Yesterday	0.0	Zs	0.9979234
Zb	0.9979234	Base Density	0.043892

Gas Composition (Mole %)

N2 - Nitrogen	1.00	CO2 - Carbon Dioxide	0.00

Figure 5-6. Sample Page of EFM Report

5.3 Calibration Reports

ROCLINK 800 enables you to create a calibration report to record the calibration procedure.

Creating Calibration Report Data

Before you can view a calibration report, you must create calibration report data. Refer to *Chapter 8, Section 8.2, Meter Calibration Basics*, for instructions on creating calibration data.

5.3.1 Viewing a Calibration Report

To view a calibration report:

1. Select **View** > **Calibration Report**. An Open dialog displays, listing available calibration reports.
2. Select a **Calibration Report** to view.
3. Click **Open**. The View Calibration Report screen displays.

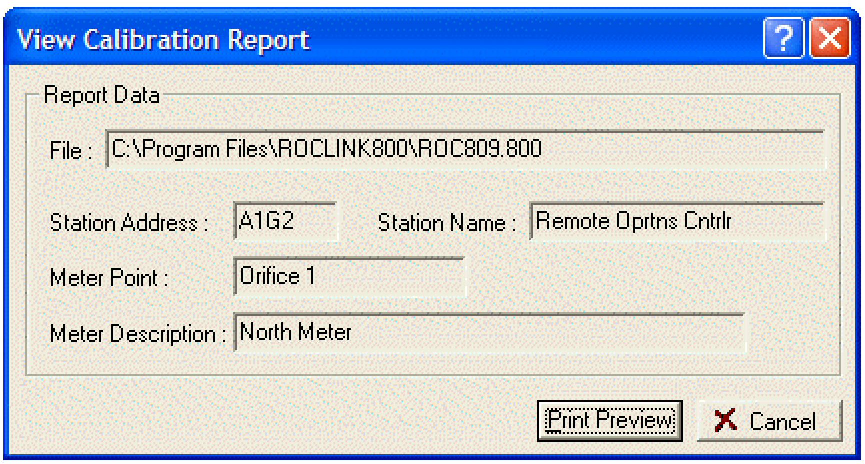


Figure 5-7. View Calibration Report

4. Click **Print Preview**. The Print Preview screen displays.

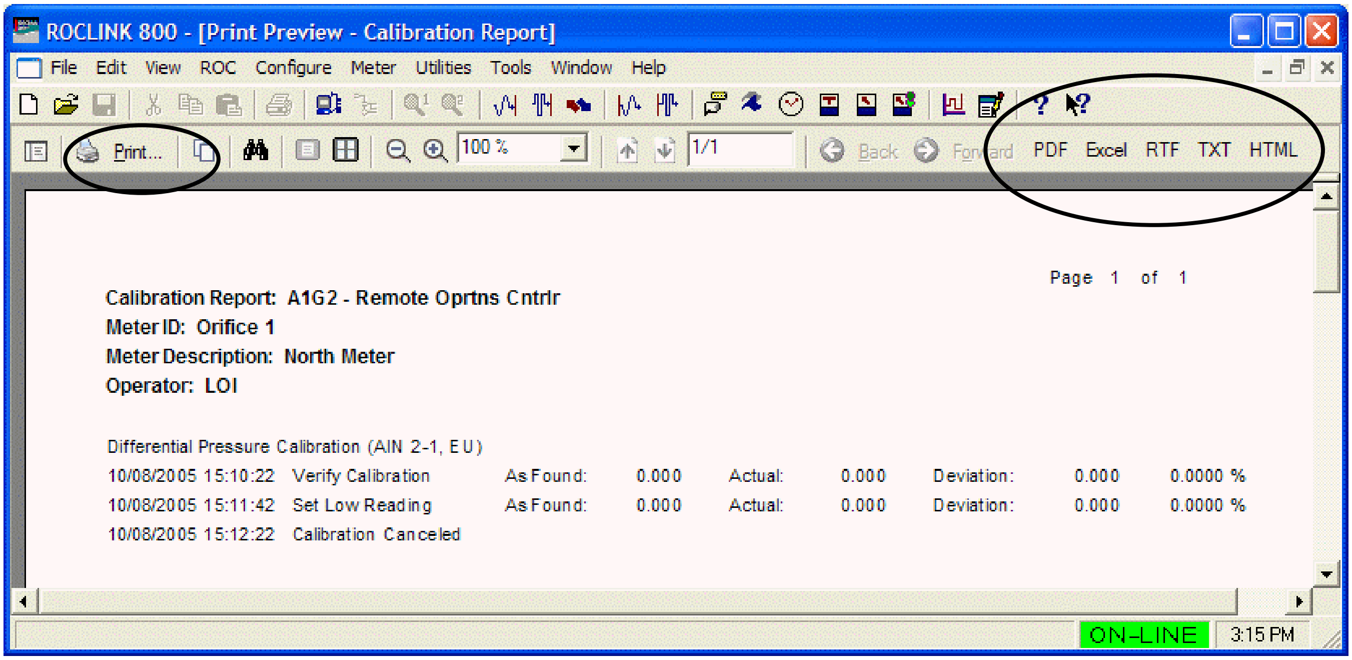


Figure 5-8. Calibration Report Print Preview

5. Click **Print** to print the report. ROCLINK 800 displays a Print window that allows you select the printer, number of copies, and other options.

You can also export the report to different formats using the PDF, Excel, RTF, TXT, and HTML buttons on the toolbar.

5.4 History Logs

The History option on the View menu option enables you to access and display the Minute, Hourly (Periodic), and Daily History logs either directly from a ROC800L to which you are connected (**From Device**) or from a previously saved file (**From File**).

Note: You **must** configure history points before you can view them. Refer to *Configure History Points* in *Chapter 7, Configure.*

Once you select the view, the system displays the log (see *Figure*):

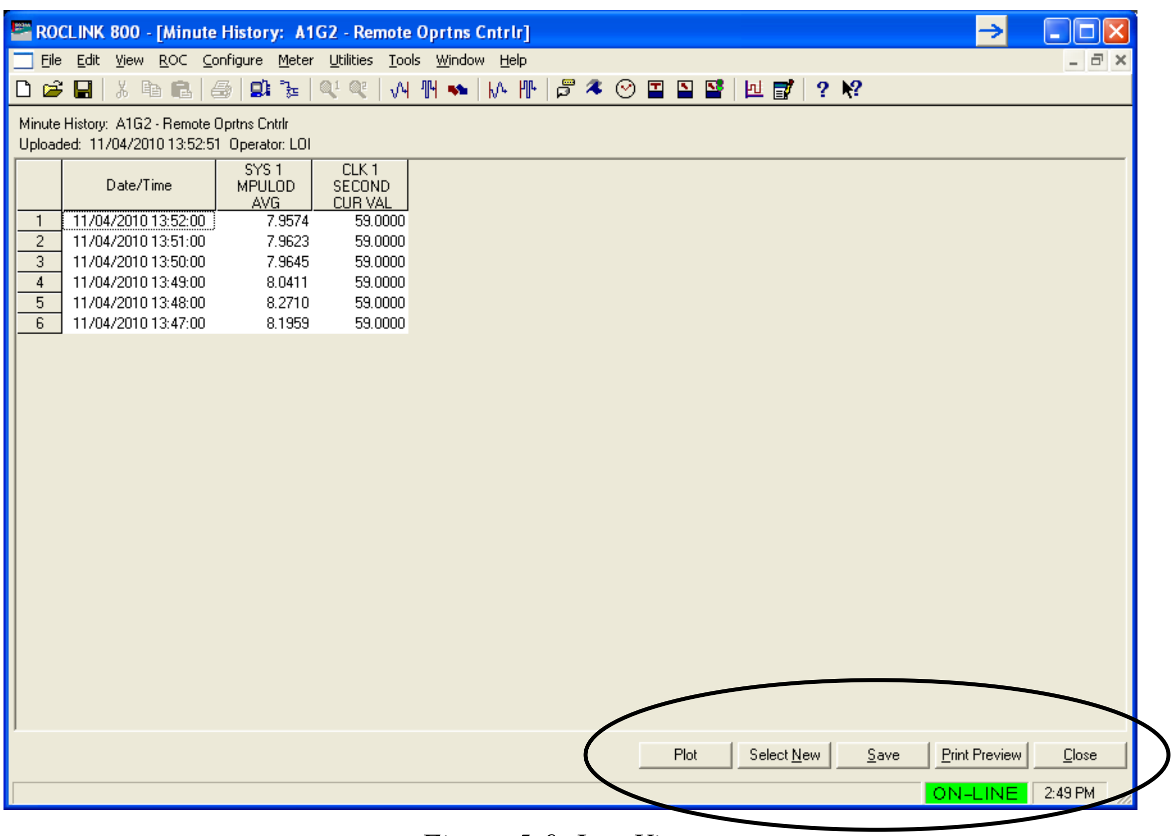


Figure 5-9. Log Viewer

ROCLINK 800 provides several option buttons you can use to manage report data:

Button	Description
Plot	Graphically displays history data based on criteria you select. Refer to *Section 5.4.3, Plotting History,* for further information.
Select New	Re-displays the Select History Points screen, which you can use to select new history values. **Note:** This option is available **only** if you are viewing data from the device.
Save	Saves the log as a file on your PC, using one of the following file name extensions based on the kind of data. ▪ **.MDB** – Minute-based history log file. ▪ **.PDB** – Hourly/Periodic-based history file. ▪ **.DAY** – Daily-based history log file. **Note:** This option is available **only** if you are viewing data from the device.
Print Preview	Displays a preview of the report data as it would appear if printed. Refer to *Print Configuration* for information on managing the print preview.
Close	Closes the display.

5.4.1 Viewing Logs from a Device

When you choose to view history logs from a connected device, ROCLINK 800 displays a dialog box. You use this dialog to specify the report contents.

1. Select **View** > **History** > **From Device**. The Select History to View screen displays:

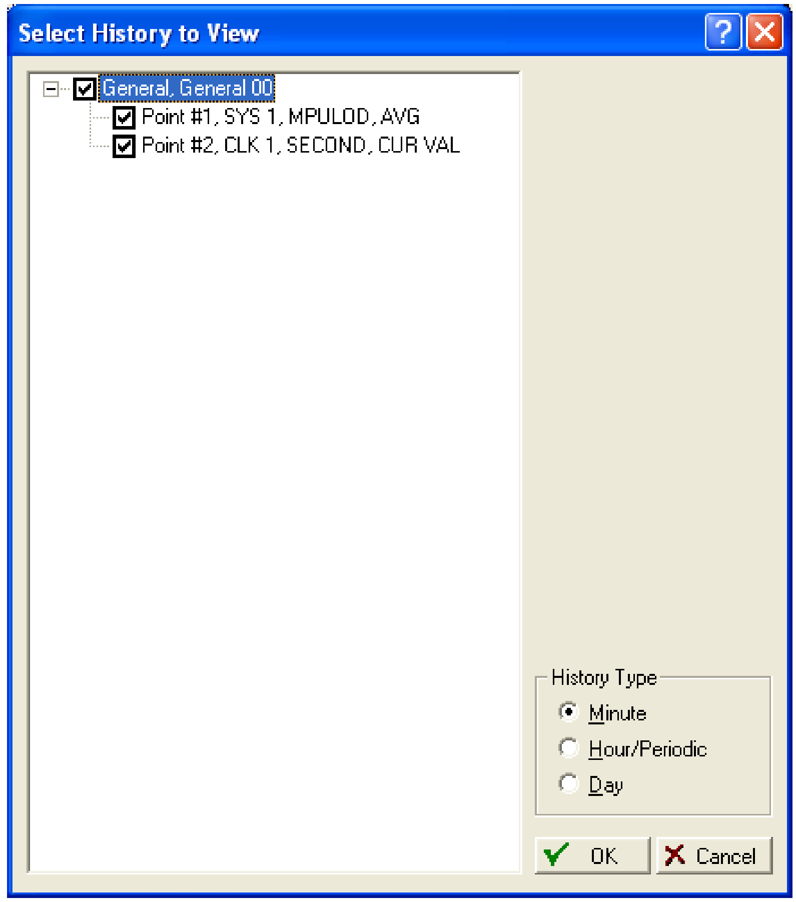
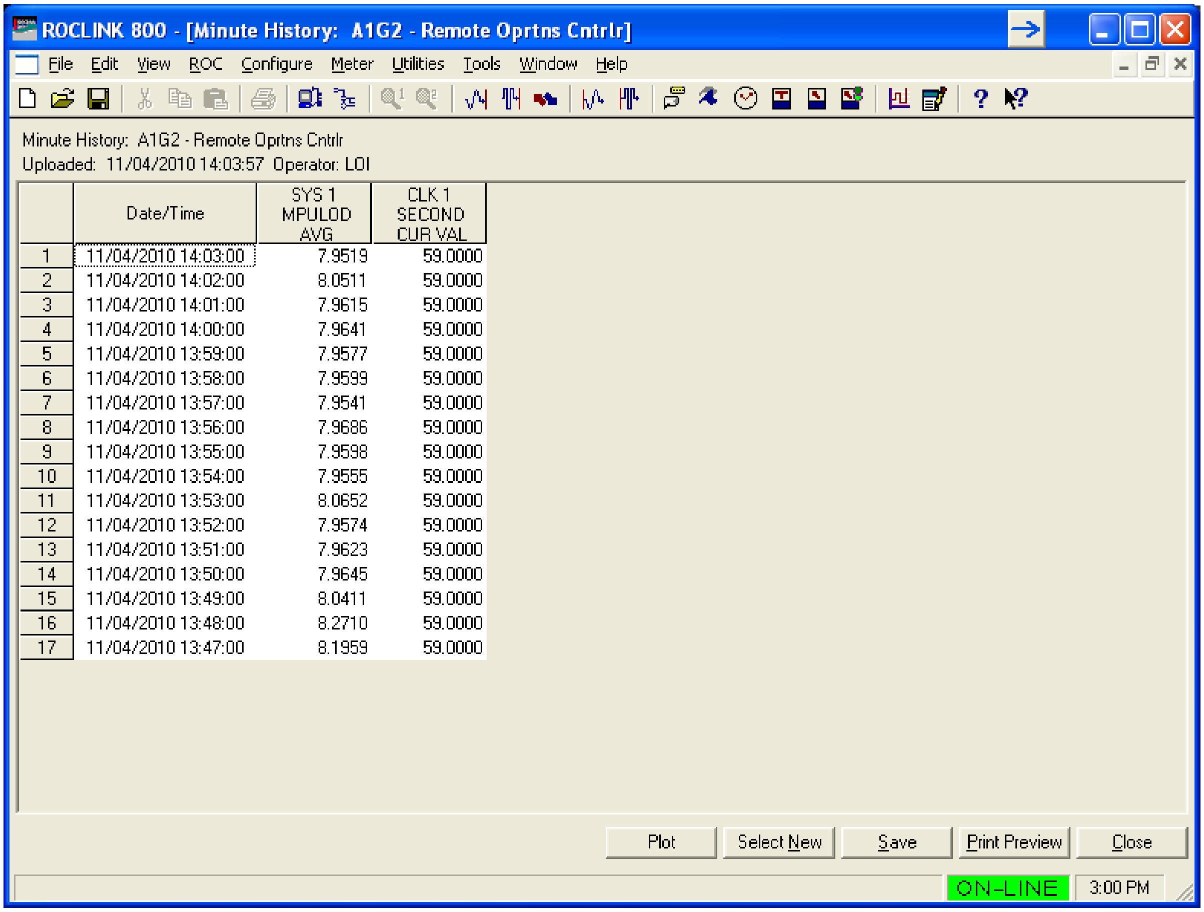


Figure 5-10. Select History to View

2. Select or de-select the **History Points** to include on the view.
3. For History views, select the **History Type** and indicate a log frequency. You can view Minute, Hourly (Hour or Periodic), or Daily (Day).
4. Click **OK**. ROCLINK 800 retrieves the data you have selected and displays it on a preview screen.



	Date/Time	SYS 1 MPULOD AVG	CLK 1 SECOND CUR VAL
1	11/04/2010 14:03:00	7.9519	59.0000
2	11/04/2010 14:02:00	8.0511	59.0000
3	11/04/2010 14:01:00	7.9615	59.0000
4	11/04/2010 14:00:00	7.9641	59.0000
5	11/04/2010 13:59:00	7.9577	59.0000
6	11/04/2010 13:58:00	7.9599	59.0000
7	11/04/2010 13:57:00	7.9541	59.0000
8	11/04/2010 13:56:00	7.9686	59.0000
9	11/04/2010 13:55:00	7.9598	59.0000
10	11/04/2010 13:54:00	7.9555	59.0000
11	11/04/2010 13:53:00	8.0652	59.0000
12	11/04/2010 13:52:00	7.9574	59.0000
13	11/04/2010 13:51:00	7.9623	59.0000
14	11/04/2010 13:50:00	7.9645	59.0000
15	11/04/2010 13:49:00	8.0411	59.0000
16	11/04/2010 13:48:00	8.2710	59.0000
17	11/04/2010 13:47:00	8.1959	59.0000

Figure 5-11. History (from device)

5. Review the report.

Note: Click the **Save** button at the bottom to save the data to a file on your PC. You can then view history logs without being connected to the device.

6. Click **Close** to close the preview.

5.4.2 Viewing History Logs from a File

During the course of operation, the ROC creates a history log. You can save this log to a file on your PC for off-line viewing and analysis. ROCLINK 800 provides additional tools you can use to manipulate the data.

Note: You must first retrieve the history file from the device and then save the file before you can view a history log from a file.

1. Select **View** > **History** > **From File**. An Open dialog displays.

2. Select the file and click **Open**. A preview screen displays. Refer to *History, Alarm, and Event Log Reports* for valid history file name extensions.

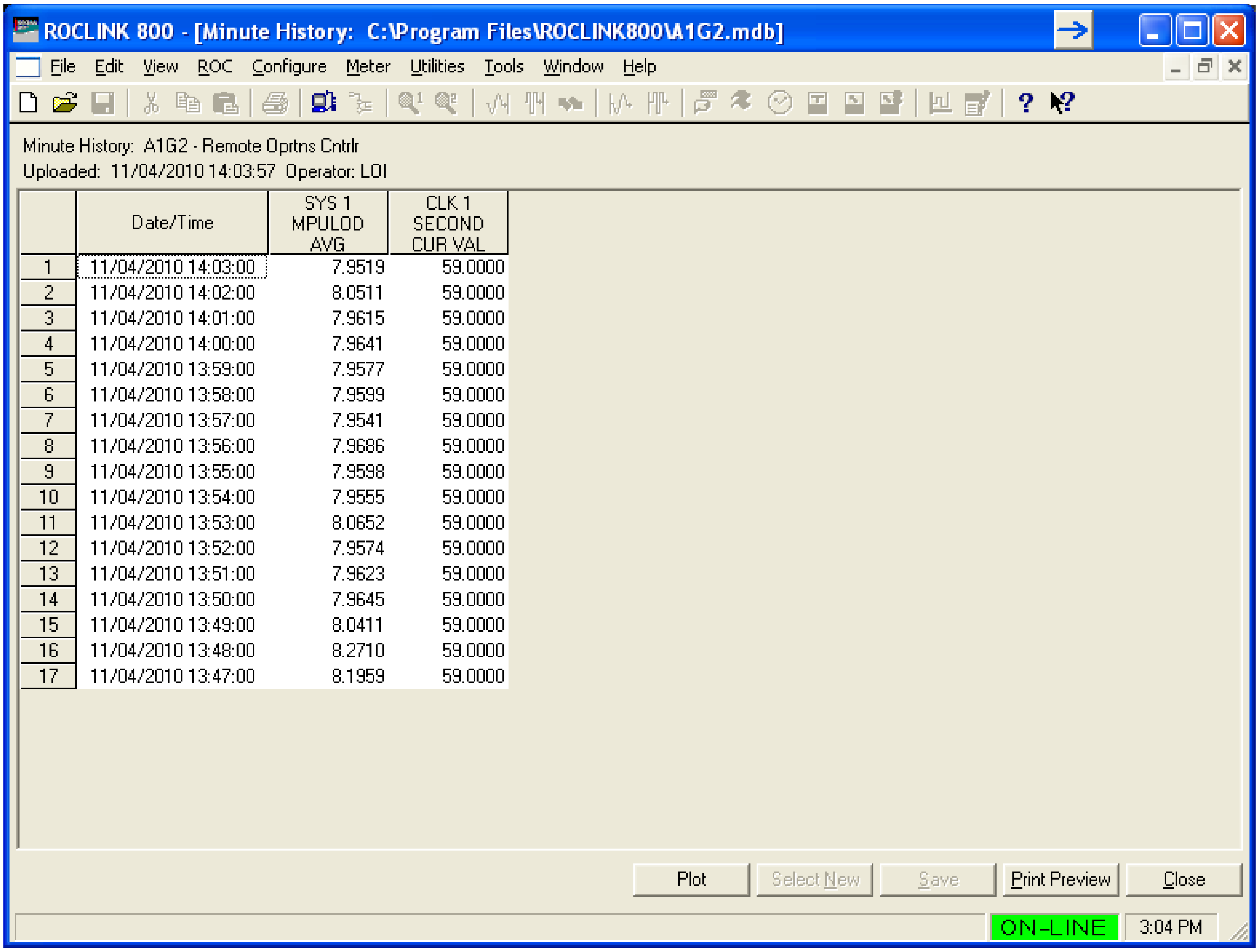


Figure 5-12. History (from file)

3. Review the file.

Note: Click **Print Preview** to print the report contents (see *Print Configuration*) or **Plot** to create a graphic display of the report contents (see *Plotting History*).

---

4. Click **Close**.

5.4.3 Plotting History

For history data you obtain from either a connected device or a file and display on a print preview, ROCLINK 800 provides an option that enables you to graphically display the report results.

After you select the report data, click **Plot**. ROCLINK 800 displays a graphical version of the selected data.

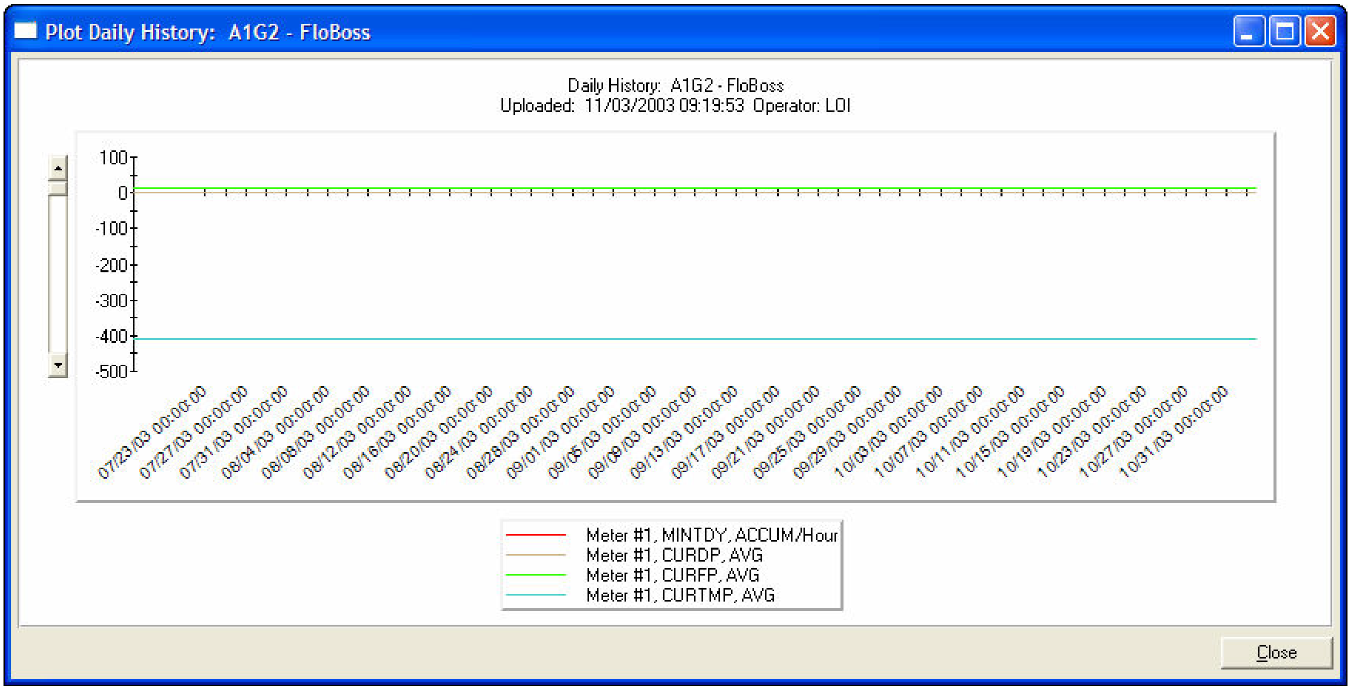


Figure 5-13. Plotting History

5.4.4 Managing Plotted History

The plot displays each series of lines as connected points of data, based on the time the data was archived and the current value at that time. The plot chart displays the type of history, device type, date, time, and the Operator ID in the header. The left (Y) axis displays the value and the bottom (X) axis displays the date and time the value was read. A legend at the bottom of the graph corresponds with the lines within the graph.

Use the scroll bar to the left of the graph to change the Y-axis.

Graphics zoom enlarges the selected area of a chart, while not necessarily showing the axes.

Axis zoom changes the minimum and maximum data values to those selected and redraws only that data with the axes.

Graphics Zoom To zoom an area of the plot:

1. Press **Ctrl** and hold down the left mouse button.
2. Drag the mouse to select zoom area and release the mouse button.
3. Press **r** to remove the effect and restore the original plot.

Axis Zoom To zoom into a particular axis of the plot:

1. Press **Shift** and hold down the left mouse button.
2. Drag the mouse to sets the zoom area and release the mouse button.
3. Press **r** to remove the effect and restore the original plot.

Scaling To scale the chart to a specific size: :

1. Press **Ctrl** and hold down both mouse buttons (or middle button on a 3-button mouse).
2. Move the mouse **down** to **increase** chart size or move the mouse **up** to **decrease** chart size.
3. Press **r** to remove the effect and restore the original plot.

Moving To move the chart:

1. Press **Shift**, and press down both mouse buttons (or the middle button on a 3-button mouse).
2. Move the mouse to change the positioning of the chart.
3. Press **r** to remove the effect and restore the original plot.

5.5 Transaction History

After you configure transaction history, you can view transaction history stored on a device or stored in a file on your PC.

Note: Transaction history is stored with a **.tdb** file extension.

5.5.1 Viewing Transaction History Stored in a Device

To view transaction history logs stored in device memory:

1. Select **View** > **Transaction History** > **From Device**. The select Transaction to View screen displays:

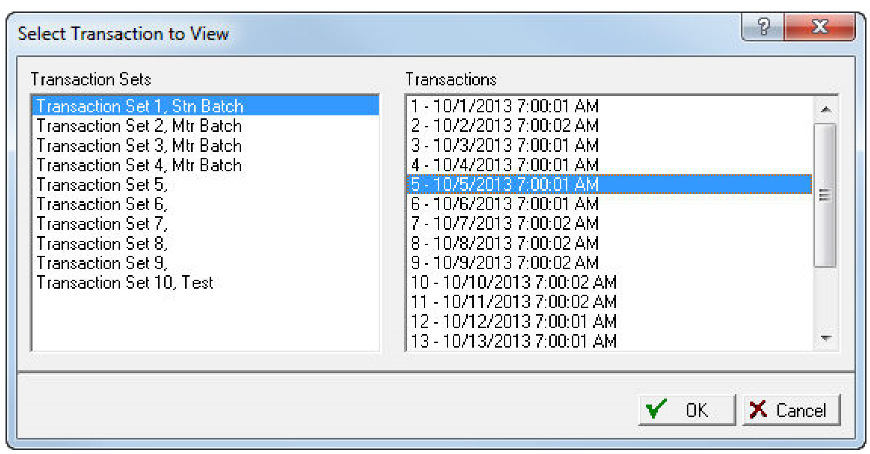


Figure 5-14. Select Transaction to View, From Device

2. Select a transaction configuration from the Transaction Sets list. The Transaction Sets list corresponds with the each configured transaction on the Transaction History Configuration screen.
3. Select the date and time of the transaction from the Transactions list. The Transactions list corresponds with the Stored field on the Transaction History Configuration screen.

4. Click **OK**. The selected transaction displays:

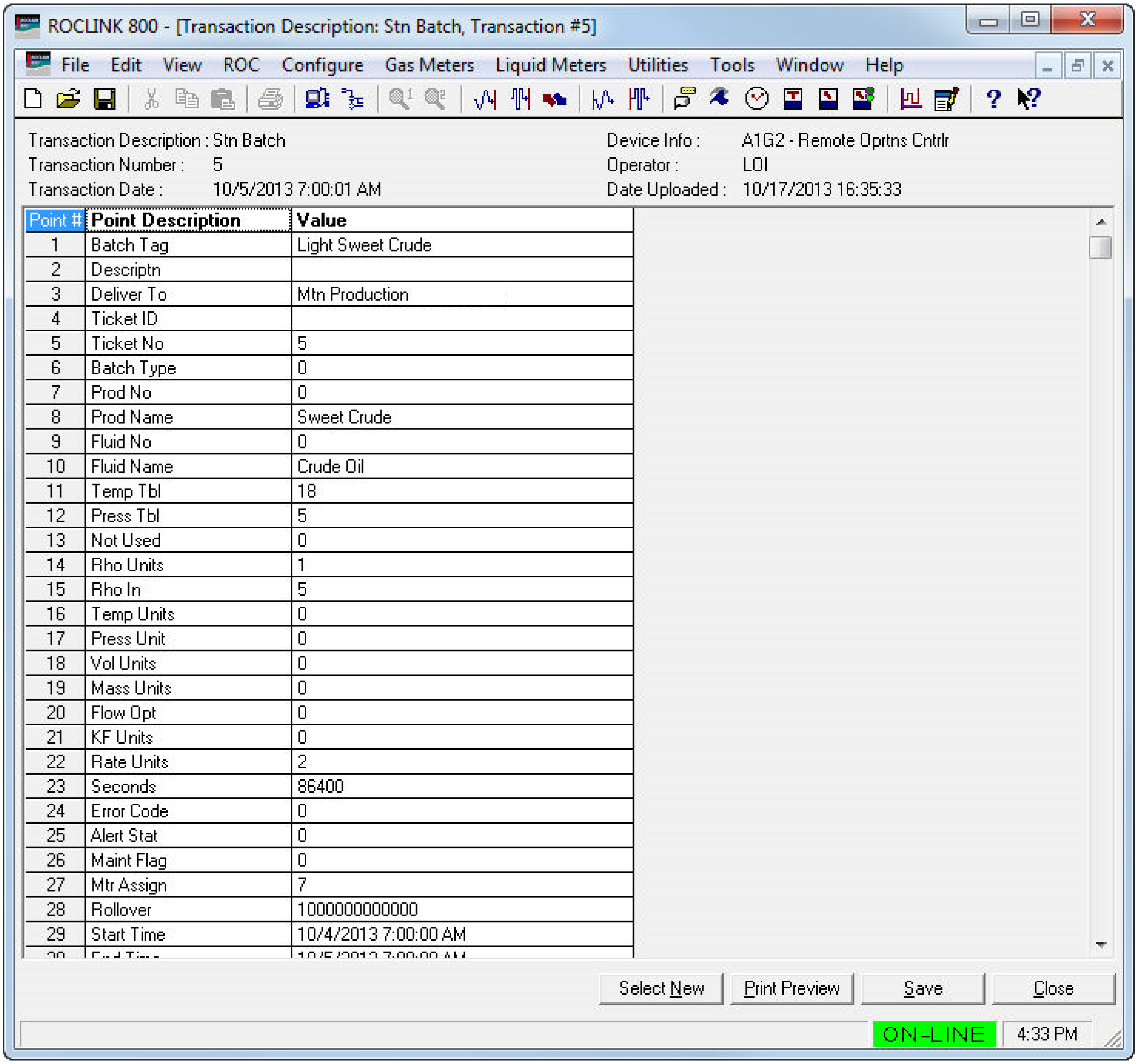


Figure 5-15. Transaction History Log

5. Click **Save** to save the transaction history log to a file with a **.tdb** extension on your PC.

6. Click **Print Preview** to print the file or save the file on your PC with a **.pdf**, **.xls**, **.rtf**, **.txt** or **.html** extension.

7. Click **Select New** to return to the Select Transaction to View screen and select a new transaction history log to view.

8. Click **Close** to return to the main ROCLINK screen.

5.5.2 Viewing Transaction History Stored in a File

To view transaction history logs from a file stored on your PC:

1. Select **View** > **Transaction History** > **From File**. An open dialog displays:

Note: Transaction history files are stored with a **.tdb** file extension.

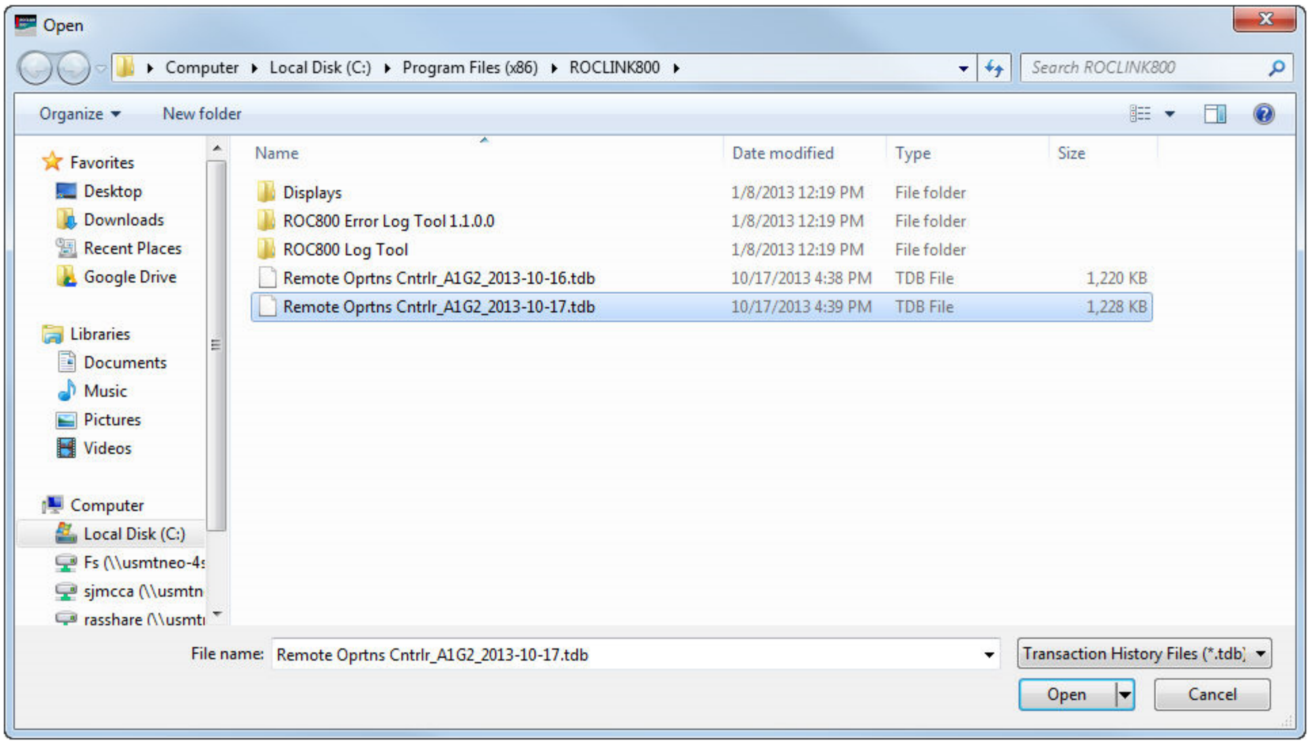
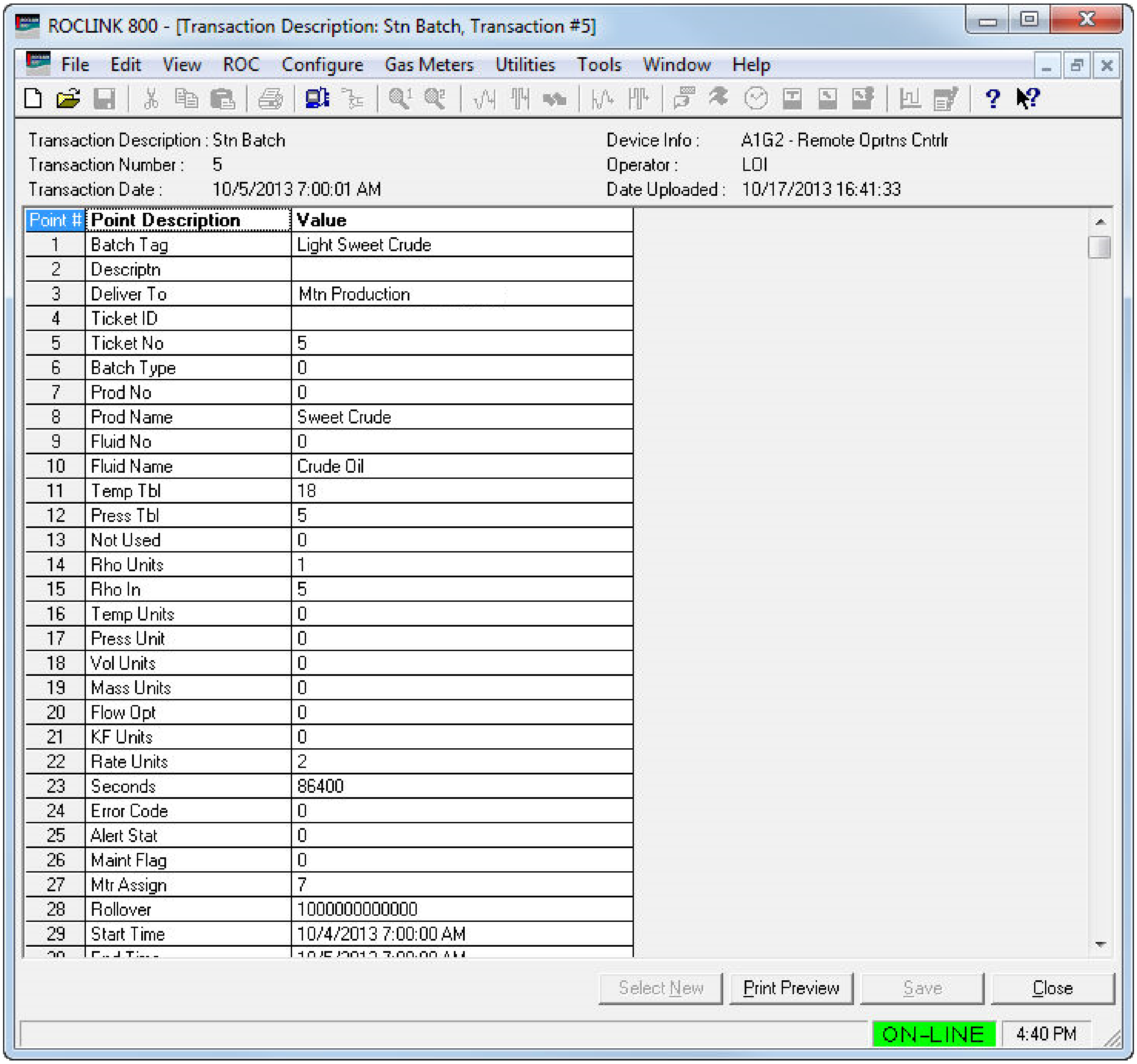


Figure 5-16. Select Transaction to View, From File

2. Navigate to the file you want to view and click **Open**. The selected transaction displays:



Point #	Point Description	Value
1	Batch Tag	Light Sweet Crude
2	Descriptn	
3	Deliver To	Mtn Production
4	Ticket ID	
5	Ticket No	5
6	Batch Type	0
7	Prod No	0
8	Prod Name	Sweet Crude
9	Fluid No	0
10	Fluid Name	Crude Oil
11	Temp Tbl	18
12	Press Tbl	5
13	Not Used	0
14	Rho Units	1
15	Rho In	5
16	Temp Units	0
17	Press Unit	0
18	Vol Units	0
19	Mass Units	0
20	Flow Opt	0
21	KF Units	0
22	Rate Units	2
23	Seconds	86400
24	Error Code	0
25	Alert Stat	0
26	Maint Flag	0
27	Mtr Assign	7
28	Rollover	1000000000000
29	Start Time	10/4/2013 7:00:00 AM

Figure 5-17. Transaction History Log

3. Click **Print Preview** to print the file or save the file on your PC with a **.pdf**, **.xls**, **.rtf**, **.txt** or **.html** extension.
4. Click **Close** to return to the main ROCLINK screen.

5.6 Alarm, Event, and Weights & Measurements Events Logs

The View menu option enables you to access and display the Alarm logs, the Event logs, and the Weights & Measurements logs either from the connected ROC or from a file.

Once you select the view, the system displays the log. ROCLINK 800 provides several option buttons you can use to manage report data:

5.6.1 Viewing Alarm Logs

You can view a log of all alarms on your connected ROC or from a disk file.

1. Select **View** > **Alarms** > **From Device** or **From File**. A viewer displays, showing the log:

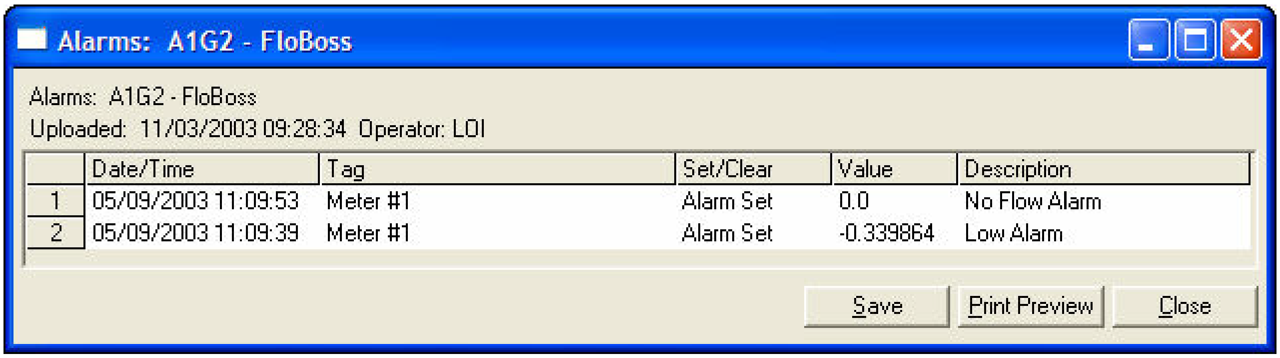


Figure 5-18. Alarm Log

2. Review the alarms preview and select an option:

Save	Saves the log as an .ALM file. **Note:** This option is available **only** if you are viewing data from the device.
Print Preview	Shows a preview of the printed version which you can send directly to a printer or convert to one of five file formats.
Close	Closes the log viewer.

3. Click **Close** to close the viewer.

5.6.2 Viewing Event Logs

You can view a log of all events on your connected ROC or from a disk file.

1. Select **View** > **Events** > **From Device** or **From File**. A viewer displays, showing the log:

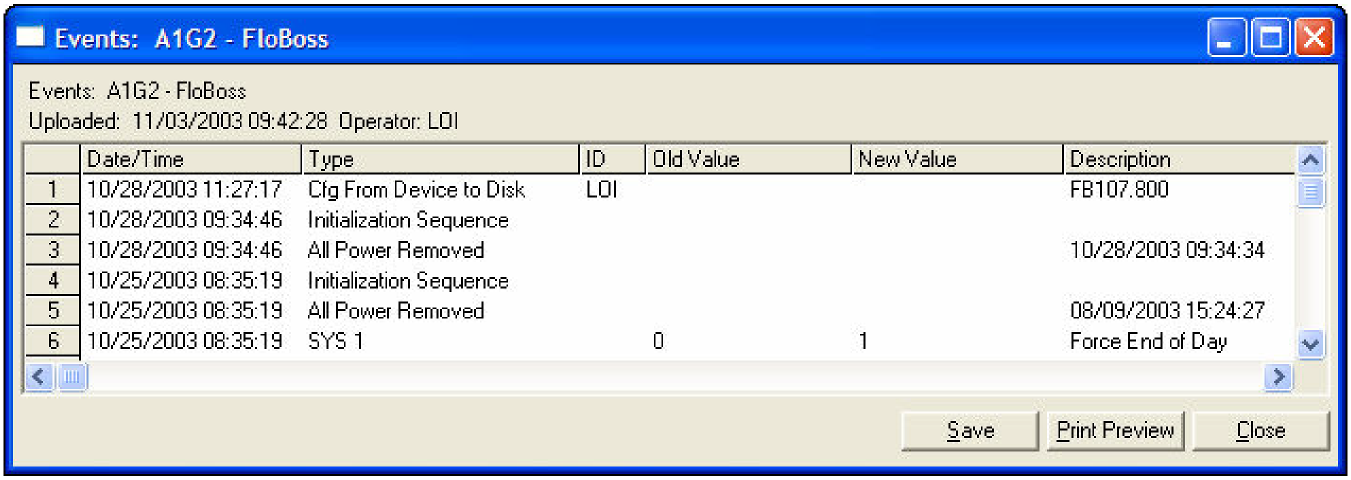


Figure 5-19. Events Log

2. Review the events preview and select an option:

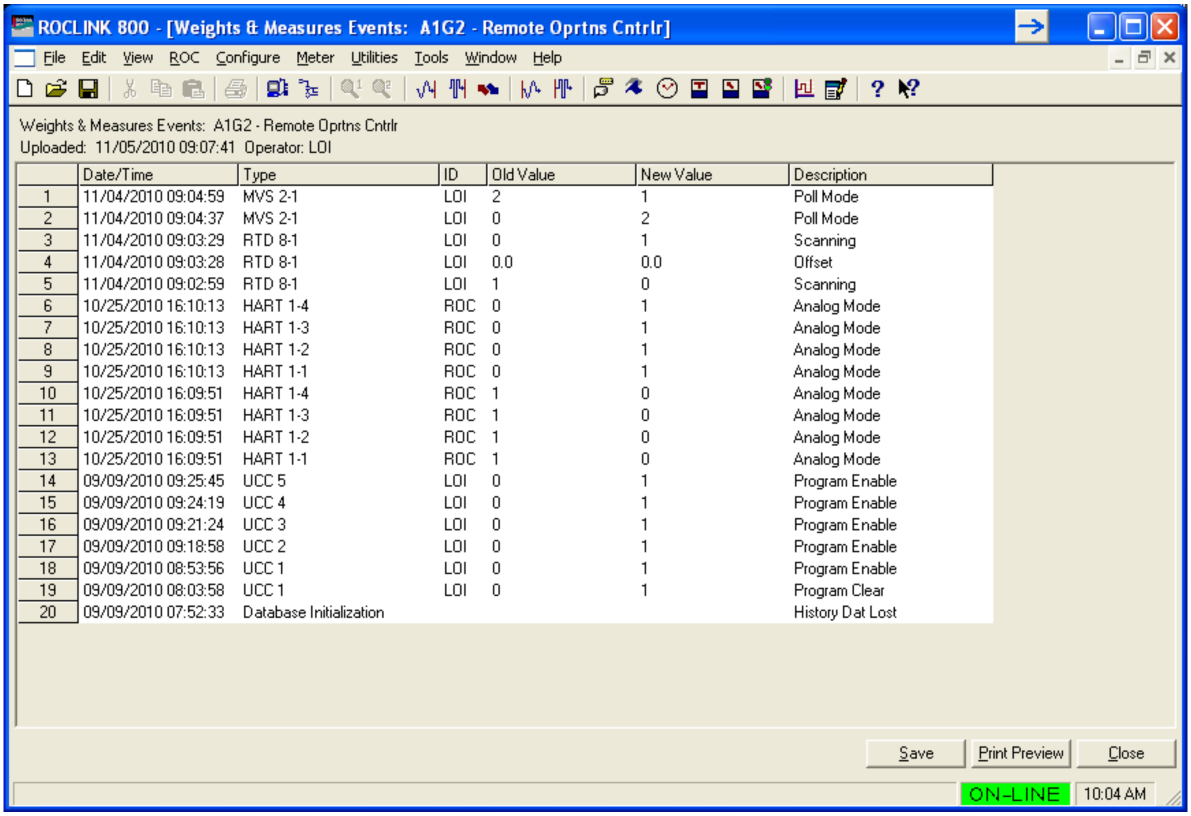
Save	Saves the log as an .EVT file. **Note:** This option is available **only** if you are viewing data from the device.
Print Preview	Shows a preview of the printed version which you can send directly to a printer or convert to one of five file formats.
Close	Closes the log viewer.

3. Click **Close** to close the viewer.

5.6.3 Viewing Weight and Measure Events Logs

You can view a log of all events on your connected ROC or from a disk file.

1. Select **View > Events > From Device** or **From File**. A viewer displays, showing the log:



Weights & Measures Events: A1G2 - Remote Oprtns Cntrlr
Uploaded: 11/05/2010 09:07:41 Operator: LOI

	Date/Time	Type	ID	Old Value	New Value	Description
1	11/04/2010 09:04:59	MVS 2-1	LOI	2	1	Poll Mode
2	11/04/2010 09:04:37	MVS 2-1	LOI	0	2	Poll Mode
3	11/04/2010 09:03:29	RTD 8-1	LOI	0	1	Scanning
4	11/04/2010 09:03:28	RTD 8-1	LOI	0.0	0.0	Offset
5	11/04/2010 09:02:59	RTD 8-1	LOI	1	0	Scanning
6	10/25/2010 16:10:13	HART 1-4	ROC	0	1	Analog Mode
7	10/25/2010 16:10:13	HART 1-3	ROC	0	1	Analog Mode
8	10/25/2010 16:10:13	HART 1-2	ROC	0	1	Analog Mode
9	10/25/2010 16:10:13	HART 1-1	ROC	0	1	Analog Mode
10	10/25/2010 16:09:51	HART 1-4	ROC	1	0	Analog Mode
11	10/25/2010 16:09:51	HART 1-3	ROC	1	0	Analog Mode
12	10/25/2010 16:09:51	HART 1-2	ROC	1	0	Analog Mode
13	10/25/2010 16:09:51	HART 1-1	ROC	1	0	Analog Mode
14	09/09/2010 09:25:45	UCC 5	LOI	0	1	Program Enable
15	09/09/2010 09:24:19	UCC 4	LOI	0	1	Program Enable
16	09/09/2010 09:21:24	UCC 3	LOI	0	1	Program Enable
17	09/09/2010 09:18:58	UCC 2	LOI	0	1	Program Enable
18	09/09/2010 08:53:56	UCC 1	LOI	0	1	Program Enable
19	09/09/2010 08:03:58	UCC 1	LOI	0	1	Program Clear
20	09/09/2010 07:52:33	Database Initialization				History Dat Lost

Figure 5-20. Weights & Measures Log

2. Review the weights & measures preview and select an option:

Save	Saves the log as a .WEVT file. **Note:** This option is available **only** if you are viewing data from the device.
Print Preview	Shows a preview of the printed version which you can send directly to a printer or convert to one of five file formats.
Close	Closes the log viewer.

3. Click **Close** to close the viewer.

5.7 Display Editor

You can create custom displays using ROCLINK 800's Display Editor (**View** > **Display** > **New**). Custom displays enable you to group significant data on a single screen for monitoring or control or to otherwise streamline system use.

For a complete discussion on using the Display Editor to create custom displays, refer to *Appendix B, The Display Editor*.

5.8 Display Administrator

You create and store custom displays as .DSP files on your PC. You can also download custom displays for use on your ROC. How you view these custom displays depends on where you have stored them.

Note: As part of its factory-installed software, the ROC800L is pre-loaded with a library of custom displays. These reside in slots 200 through 219.

5.8.1 Viewing a Custom Display

To view a custom display stored as a disk file on your PC:

1. Select **View** > **Display** > **From File**. An Open dialog displays.
2. Navigate to the folder in which you store custom displays (typically, this is the Displays folder in ROCLINK800).
3. Select a display file (*.DSP) and click **Open**. ROCLINK 800 loads the file into the Display Editor.

5.8.2 Downloading a Custom Display

Once you have created a custom display (see *Appendix B*), you use the Display Administrator utility to download the display to your ROC.

The ROC can store a maximum of 246 displays, which includes both custom user displays (that your organization may create) and user program displays (that accompany User C programs).

To access the Display Administrator:

1. Select **View > Display > From Device > Administrator**. The Display Administrator screen displays, showing all displays currently loaded in the ROC.

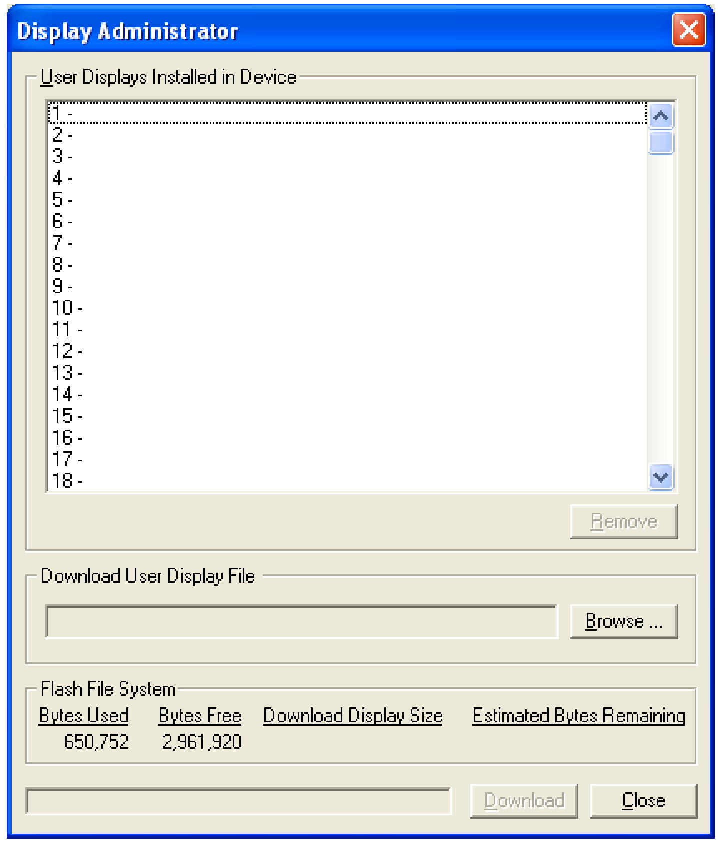


Figure 5-21. Display Administrator

Note: The ROC800L factory-loaded displays are located in slots 200 through 219.

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2. Click an empty slot to highlight it.
3. Click **Browse** to open the Select User Display File dialog. .
4. Double-click the display file you want to download. The Display Administrator screen re-displays with the **Download** button now active.
5. Click **Download** to add the user display to the ROC.
6. ROCLINK 800 displays a verification dialog.
7. Click **Yes**. ROCLINK 800 loads the display in the designated location and displays a completion dialog.
8. Click **OK** to close the dialog. The Display Administrator screen displays, showing the display you have just added. .

   Note: Use the Flash File System frame on this screen to monitor the number of available bytes used and remaining.

   ---

9. Click **Close**.

5.8.3 Deleting a Custom Display

You can also remove custom display you no longer require from the ROC.

1. Select the custom display to highlight it.
2. Click **Remove**. ROCLINK 800 displays a verification dialog.
3. Click **Yes**. ROCLINK 800 displays a completion dialog.
4. Click **OK** to close the dialog.

5.9 I/O Monitor

Use I/O Monitor to view all installed and active I/O points, MVS values, and flow calculations that provide information configured in the ROC and its operating environment.

1. Select **View** > **I/O Monitor**. The Select Points to Monitor screen displays.

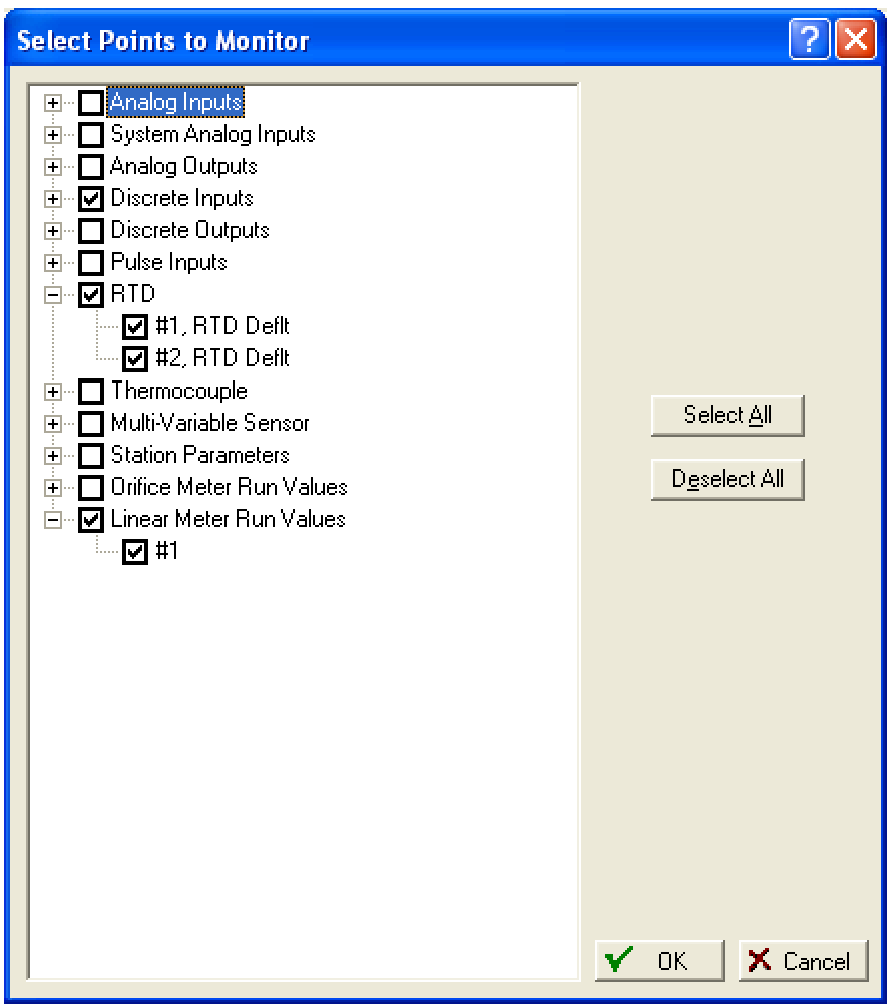


Figure 5-22. Select Points to Monitor

2. Select the points you want to monitor. Click the plus sign next to each item to expand the selection. Click **Select All** or **Deselect All** to select or deselect all points.

3. Click **OK**. ROCLINK 800 displays a screen showing the point information you have requested and automatically updates the on-screen values.

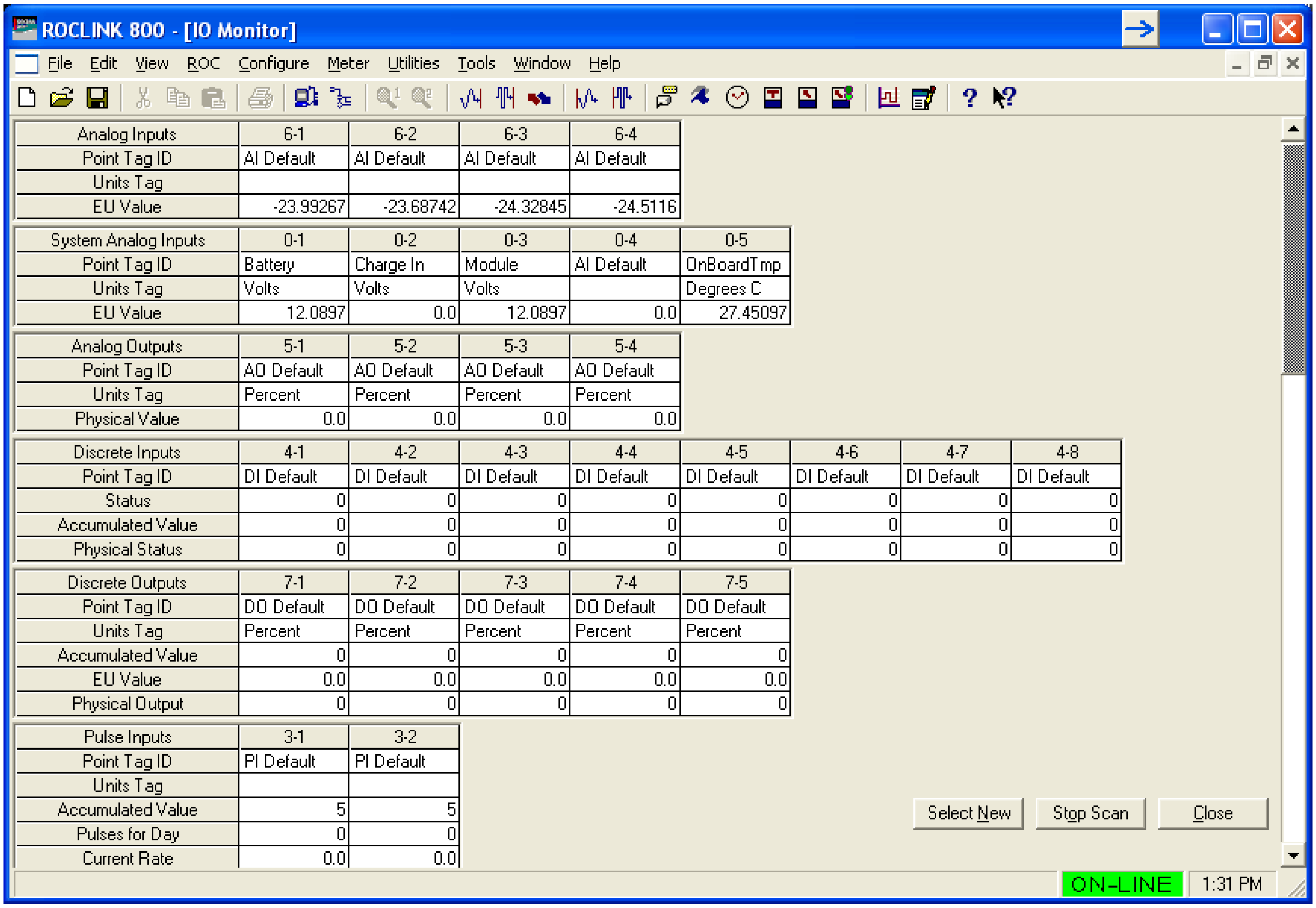


Figure 5-23. I/O Monitor

Note: Use the **Select New** button to redisplay the Select Points to Monitor screen and select other I/O points to monitor.

Click the **Stop Scan** button to end automatic device polling. Note that this button changes to **Auto Scan**. Click the **Auto Scan** button to restart the automatic device polling.

5.10 Toolbar

Select **View > Toolbar** to display or hide the ROCLINK 800 toolbar. A check mark appears next to the menu option when the toolbar is available.

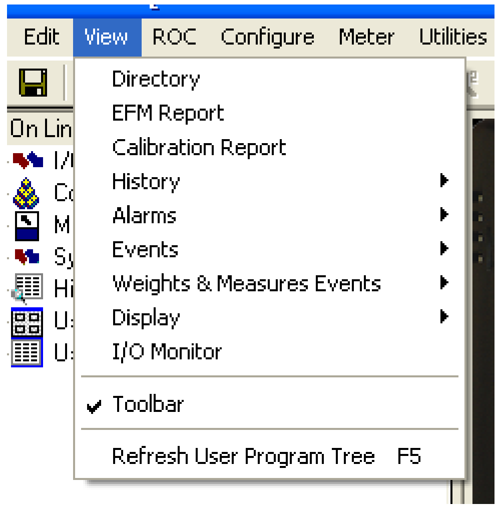


Figure 5-24. Toolbar Selected

5.11 Refresh User Program Tree

Select **View** > **Refresh User Program Tree** (or press the **F5** key on your keyboard) to refresh the listing of user programs ROCLINK 800 displays on the program tree.

Chapter 6 – The ROC Menu

In This Chapter

Use the ROC menu options to set system information for the ROC.

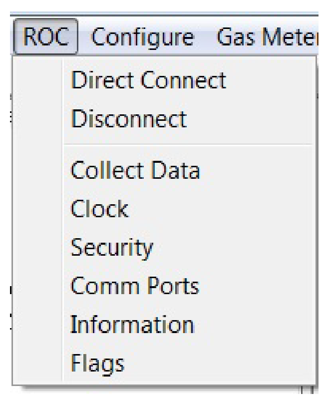
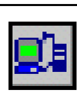


Figure 6-1. ROC Menu

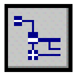
6.1 Direct Connect



Use this option (**ROC** > **Direct Connect**) to connect to the ROC via the LOI (local) port. When you select this option, ROCLINK 800 proceeds through all available connection options (ports and connection speeds) until it locates a connection that works.

You can also directly connect to the ROC by clicking the Direct Connect icon on the ROCLINK 800 menu bar.

6.2 Connect/Disconnect



Use this option (which displays as **Connect** when you are **not** connected and **Disconnect** when you **are** connected) to connect to the ROC using a specific port and connection speed. You select the preferred connection using the Device Directory.

You can also directly connect to the ROC by clicking the Connect icon on the ROCLINK 800 menu bar.

Use this option to disconnect from the ROC. You can also disconnect by clicking the Disconnect icon on the ROCLINK 800 menu bar.

6.3 Collect ROC Data

Note: This option is available **only** for AGA gas measurement data.

Use this option to save ROC electronic flow management (EFM) data to disk files. Data includes:

- Configuration data.
- Hourly volume history data.
- Daily volume history data.
- Alarm Log data.
- Event Log data.
- User defined point data.

Once you select **ROC > Collect Data**, the Collect Device Data screen displays.

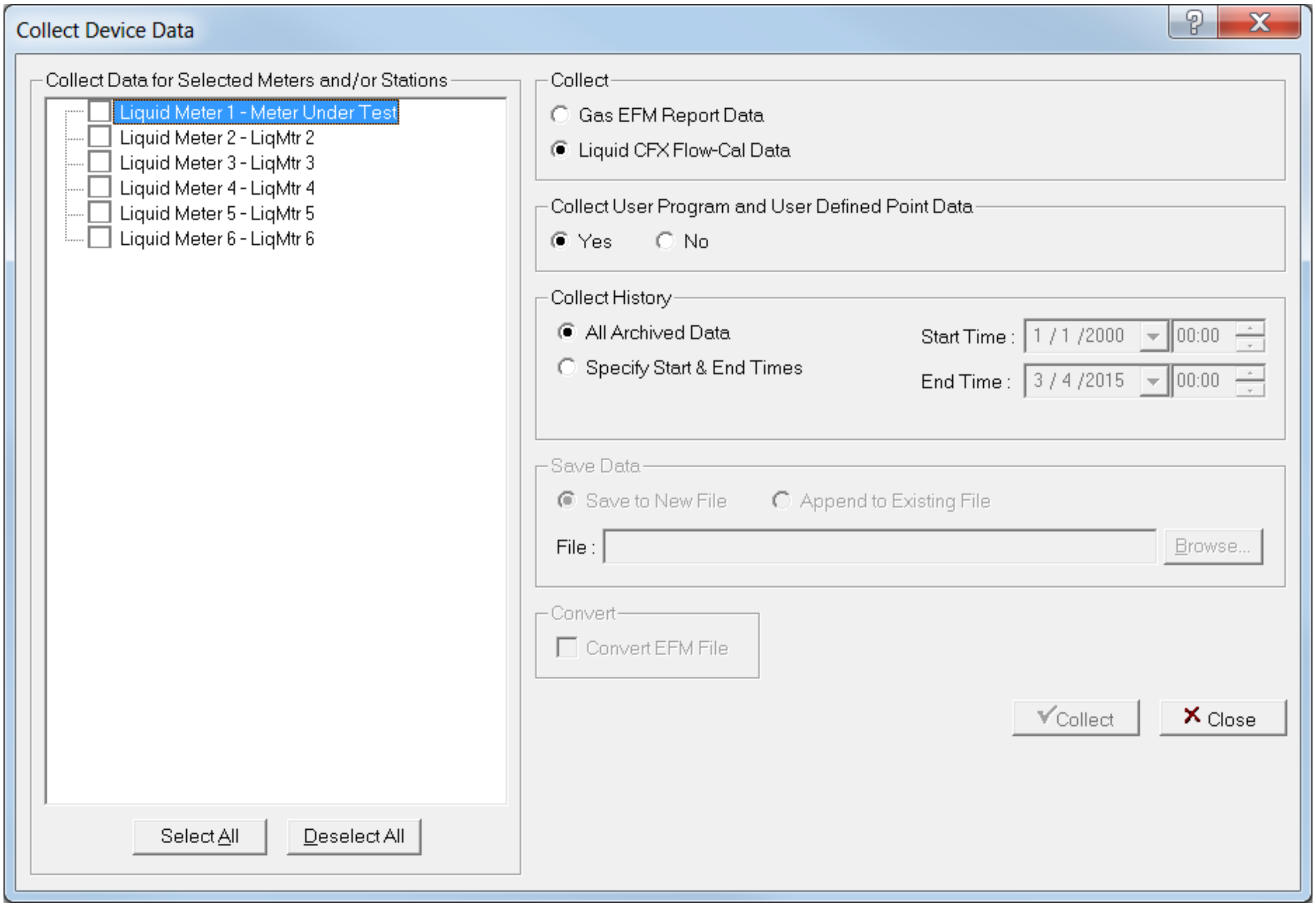


Figure 6-2. Collect Device Data

Field	Description	
Collect Data for Selected Meters and/or Stations	Selects the meters and/or stations from which data is to be collected.	
Collect	Selects the data format the system uses when saving reports.	
	Gas EFM Report Data	For gas meters, select this check box to allow the system to save the collected data to a file using the .EFM file extension.
	Liquid CFX Flow-Cal Data	For liquid meters, select this check box to allow the system to save the collected data to a file using Flow-Cal's Common File Exchange format (.CFX). **Note**: This option is **only** available for the ROC800L with firmware version 1.3 or greater. **Note**: You **must** have a CFX license key installed in your ROC800L in order to save collected data using the CFX file format.

Field	Description	
Collect User Program and User Defined Point Data	Sets if the program collects user program and user defined point data from the device to include in the report. Valid values are:	
	Yes	The program collects all user program and user defined point data from the device to include in the report. **Note**: This option may substantially increase the collection time based on the amount of user program and user defined point data.
	No	The program does not collect user program or user defined point data from the device.
Collect History	Sets to report on all historical data or only data collected between dates you specify. Valid values are:	
	All Archived Data	Select to report on all historic data collected. **Note**: This is the default value..
	Specify Start & End Times	Select to only collect data between the Start Time and End Time dates you specify.
Save Data	Sets a file name (other than the default C:\Program Files\ROCLINK800\Station Name_address group_yyyy-mm-dd.efm) to which the ROC saves .EFM information. Select **Save to New File** to create a new report or **Append to Existing File** to append the report to an existing file. Click **Browse** to search for a file to receive the appended data.	
Convert	Launches the EFM file conversion utility. After the system collects EFM data, you can convert the data to an .AGA, .CFX, or .DET file for subsequent import into the PGAS or Flow-Cal metering report applications. **Note:** You can also access this utility by selecting **Utilities** > **Convert EFM** File.	

Field	Description	
Conversion Type	Sets the format for .EFM file conversion. Valid values are: **Note**: This field displays **only** if you select **Convert EFM File**.	
	PGAS	EVT, .ANA, .ARM, and .VOL are ROC800-Series files available for PGAS (EMS Pipeline Services).
	Flow-Cal	.CFX is the ROC800-Series file available for Flow-Cal (Coastal Flow Measurement, Inc.). This is the **default**.
	.AGA	FloBoss files and contain the History Points for the Meter Run.
	.DET	ROC300-Series and FloBoss 407 files are formatted to contain gas composition, specific gravity (relative density), and heating value averages.

Note: If a communication failure occurs during the collection of EFM data, any data collected **before** the comm failure remains in the report data.

6.3.1 Collecting EFM Report Data

Before you can view the EFM report data, you must first create the data file. A single EMF data file can contain information for one or multiple meters/stations. To create this file:

1. Select **ROC** > **Collect Data**. A Collect Device Data dialog box displays.

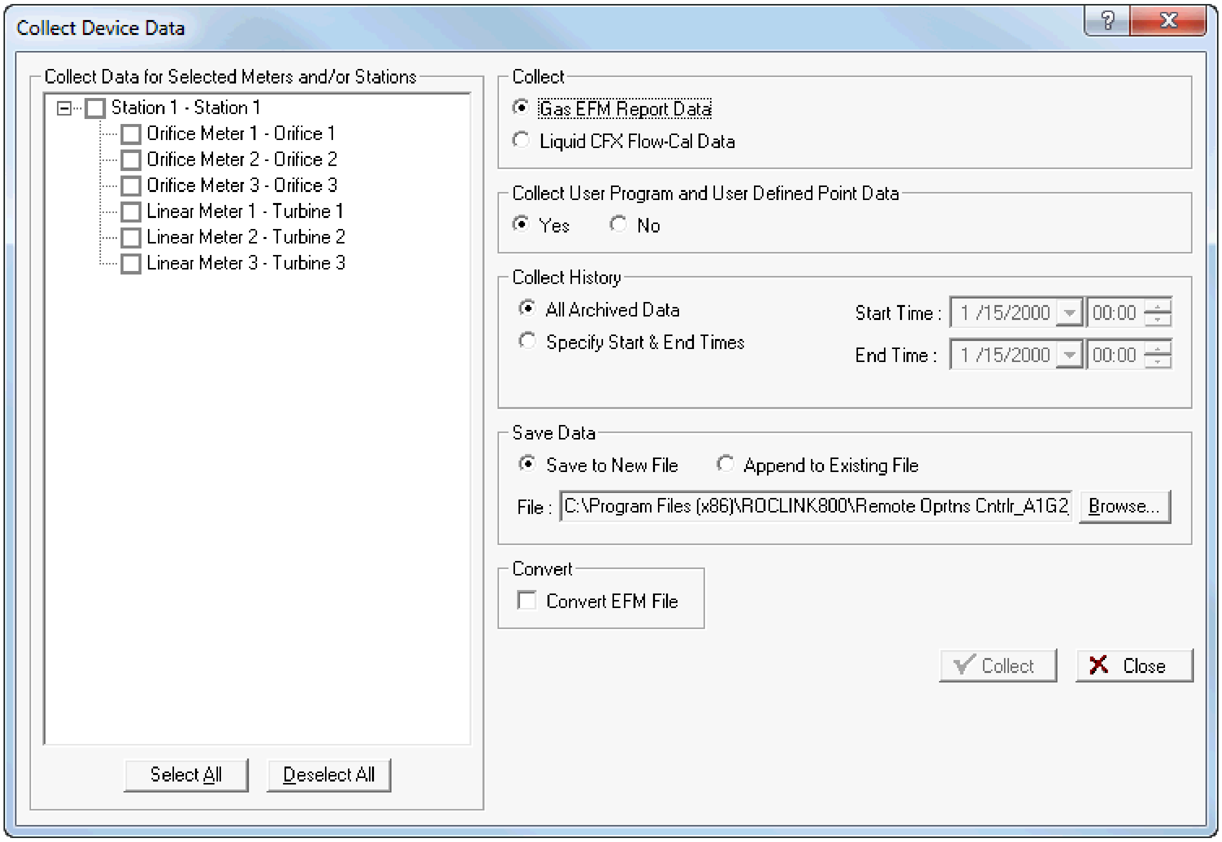


Figure 6-3. Collective Device Data (initial)

2. Select **EFM Report Data** in the Collect field.

3. Select the meter and/or station from which data is to be collected or click **Select All** to select all available meters/stations.

4. In the Collect User Program and User Defined Point Data, select **Yes** to collect user program and user defined point data or **No** to not collect user program and user defined point data.

Note: Selecting **Yes** may substantially increase the collection time based on the amount of user program and user defined point data in the device.

5. In the Collect History field, select to report on all historical data (**All Archived Data**) or only data collected between dates you specify (**Start Time** and **End Time**).

6. Select to **Save to New File** or **Append to Existing File** in the Save Data field. If you select Append to Existing File, click **Browse** to search for a file to receive the appended data.

7. If you want to convert the EFM file to a different file type, select **Convert EFM File** and then select your desired data format.

8. Click **Collect**. ROCLINK 800 collects information about the device to the designated .EFM file. When the collection completes, the system displays a message at the bottom of the screen.

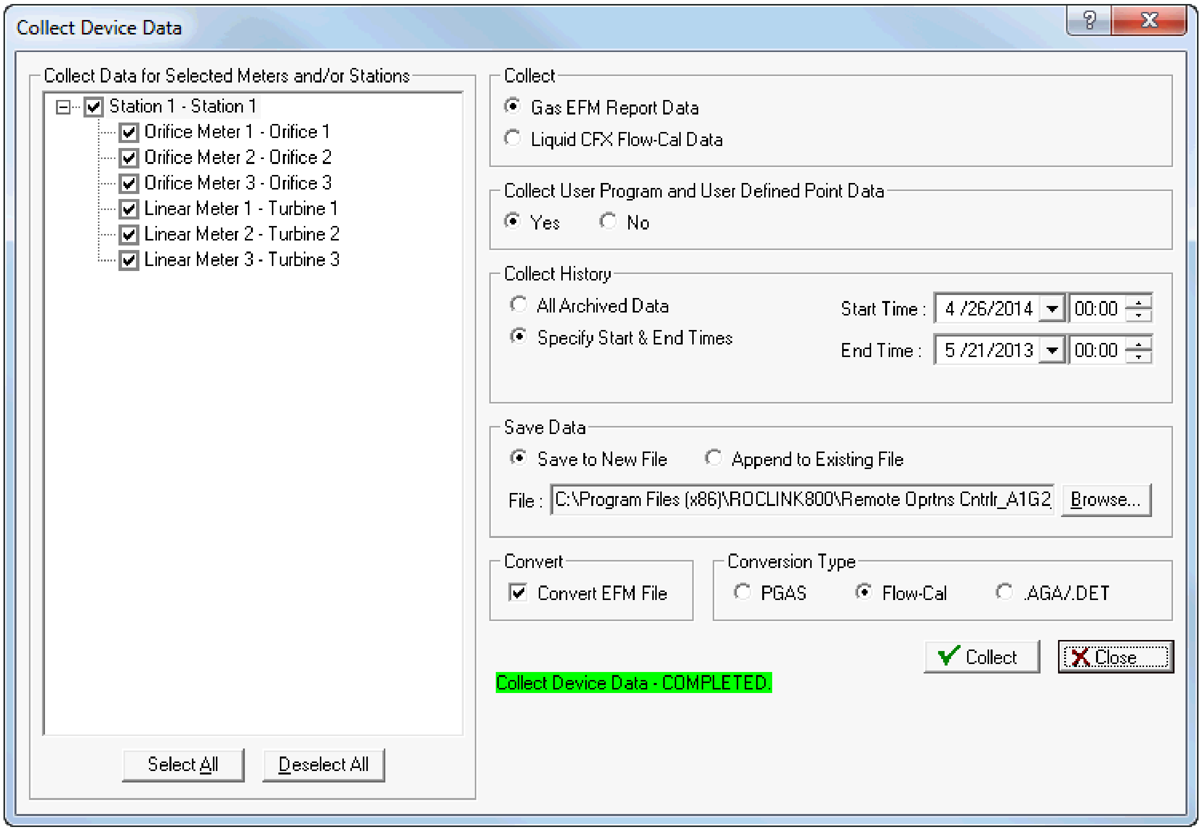


Figure 6-4. Collective Device Data (complete)

9. Click **Close**.

Once you create this file, you can generate a report at any time (such as in the office) and a connection with the device is no longer necessary. The EFM Reports utility retrieves the data associated with the requested meter run and time period from the *.EFM file and formats this report for each meter run covering a specified period of time.

Note: For the EFM Reports utility to function correctly, you must configure the historical database in the device so that the system can retrieve flow values from memory. Refer to *Configuring History Points* (located in Chapter 7).

6.3.2 Collecting Liquid CFX Flow-Cal Data (ROC800L)

Liquid CFX files are generated in a per-meter basis and contain audit trial information that you **must** import into Flow-Cal's Enterprise Liquids measurement system to create this file:

Notes:

- This option is **only** available when you are connected to a ROC800L.
- You **must** configure liquid meter history in the device so that the system can retrieve liquid flow from memory. Refer to *Liquid Meter History Configuration Wizard* (located in Chapter 7).
- You **must** import the .CFX file into Flow-Cal's Enterprise Liquids measurement system in order to view the resulting data. You **cannot** view .CFX file data in ROCLINK.

1. Select **ROC** > **Collect Data**. A Collect Device Data dialog box displays.

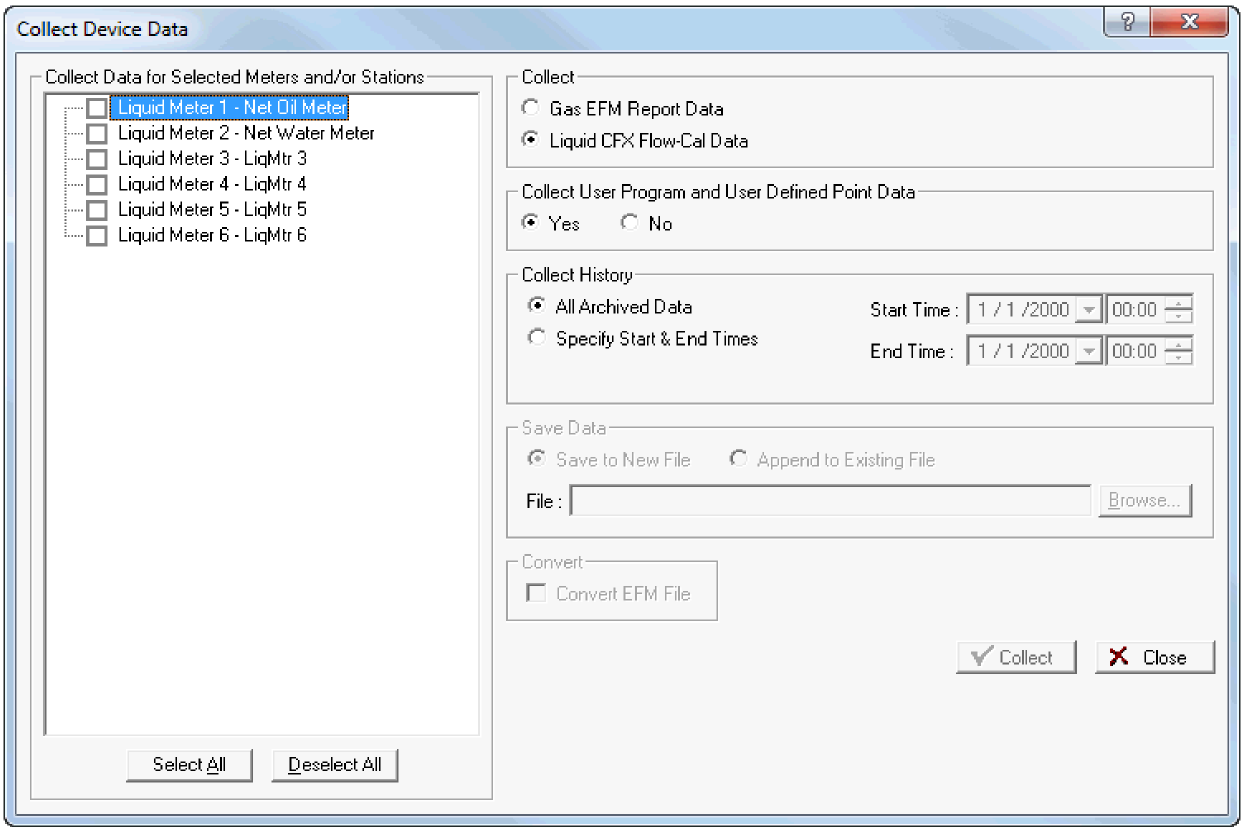


Figure 6-5. Collective Device Data (initial)

2. Select **Liquid CFX Flow-Cal Data** in the Collect field.
3. Select the liquid meter(s) from which data is to be collected or click **Select All** to select all available meters.
4. In the Collect User Program and User Defined Point Data, select **Yes** to collect user program and user defined point data.
5. In the Collect History field, select to retrieve all historical data (**All Archived Data**) or only data collected between dates you specify (**Start Time** and **End Time**).

Note: If you collect CFX Data over a time period that includes a daylight saving time (DST) change, one of two results occurs:
- If you collect CFX data that includes the DST start time, the CFX data contains no information for the hour following the DST start time.
- If you collect CFX data that includes the DST end time, the CFX data records two hours of information for the single hour following the DST end time.

This behavior is expected and **all of your totals are correct.** For more information on configuring your DST start and end times, refer to *Setting the Clock* (located in this chapter).

6. Click **Collect**. ROCLINK 800 collects information about the device to the designated .CFX file. When the collection completes, the system displays a Save As dialog and prompts you to save the .CFX data to a file on your computer.
7. Navigate to the desired file location and click **Save**. The system saves the .CFX file, closes the dialog, and displays a message at the bottom of the screen.

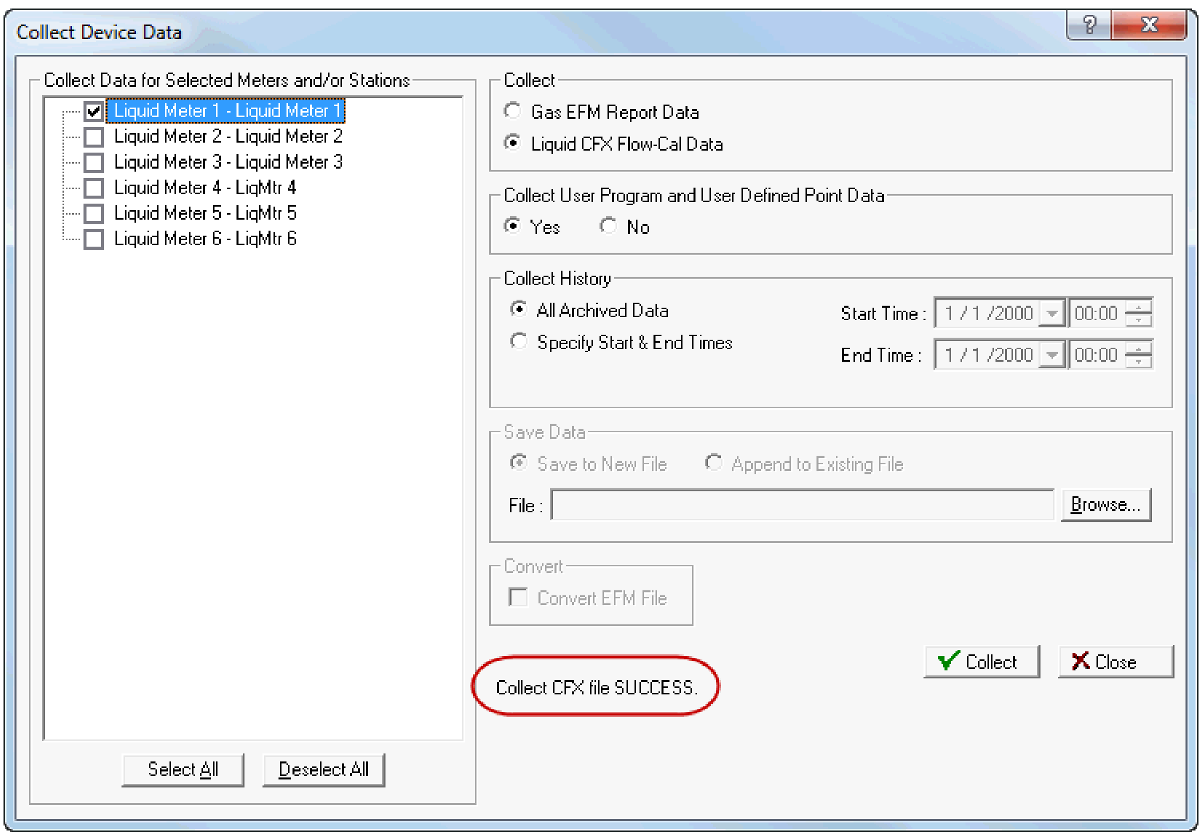


Figure 6-6. Collective Device Data (complete)

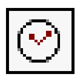
8. Click **Close**.

6.4 Clock

The internal real-time clock provides time-stamping and control of the historical databases, Event Log, and Alarm Log.

⚠ Caution **Immediately after connecting to a ROC for the first time, set the clock to ensure proper logging of history.**

Note: The user-selectable time stamp in the ROC reflects the time either at the beginning or at the end of the period. Select **Configure** > **History Points** > **Setup** tab to adjust this preference in the History Time Stamp field.



1. Select **ROC > Clock** or click the Clock icon in the toolbar. The Clock screen displays.

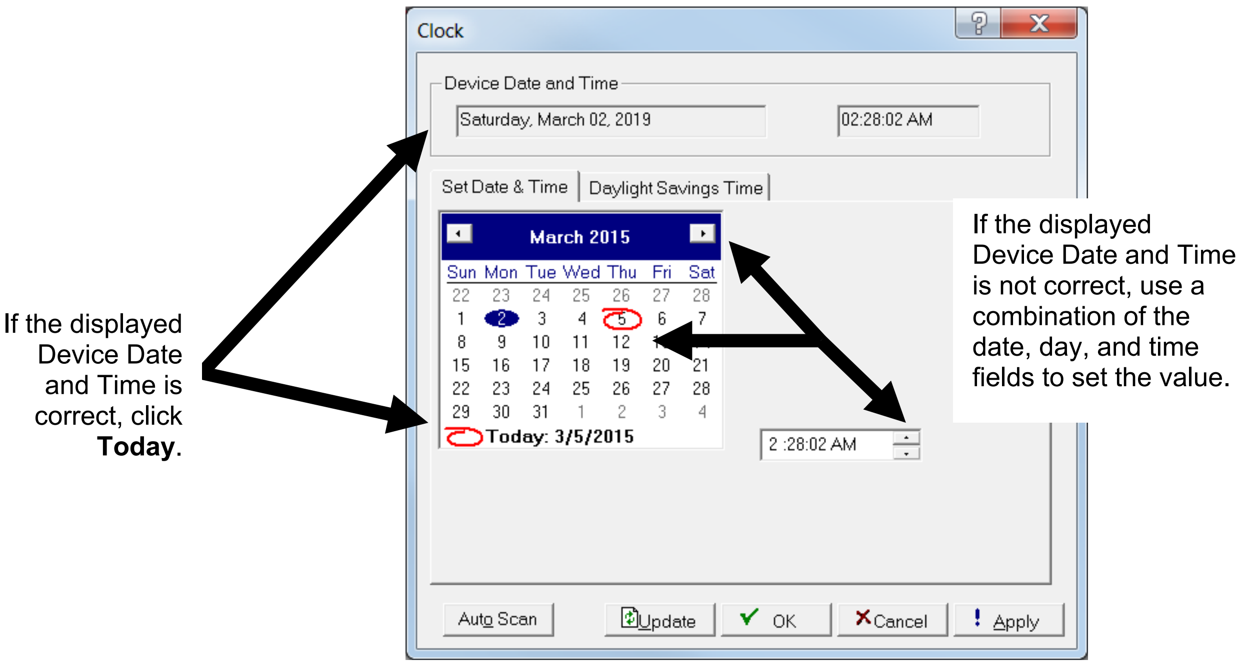


Figure 6-7. Clock

2. Set the clock.
   - If the clock in your PC **is** correct, click the circled area next to **Today** at the bottom of the calendar and click **Apply**. ROCLINK 800 uses the date and time in your PC to set the ROC clock.
   - If the PC clock **is not** correct, use a combination of the calendar (for year, month, and day) and the time (for hour, minute, and seconds) to set the time and date and click **Apply**.
3. Click **Auto Scan** to enable ROCLINK 800 to poll the device automatically. Auto scanning continues until you click **Stop Scan**.

Note: Select **Tools** > **Options** to set the time interval, in seconds, at which the Auto Scan feature polls the ROC.

4. Click **Apply**.
5. Click **OK** to close the screen.

6.4.1 Daylight Savings Time Tab

The Daylight Savings Time tab sets the clock to automatically compensate for daylight savings time.

Select **ROC** > **Clock**. The Device Information screen displays, showing the Daylight Savings Time tab.

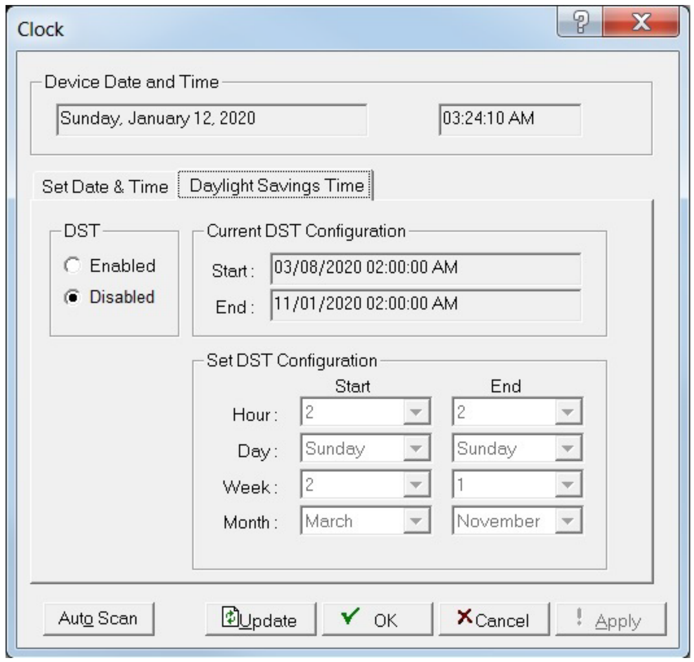


Figure 6-8. Clock, Daylight Savings Time tab

Review the following fields for your organization's values:

Field	Description
DST	Sets the clock to automatically compensate for **Daylight Savings Time** by enabling this feature.
Current DST Configuration	This **read-only** field shows the currently configured daylight savings time start and end times.
Set DST Configuration	Sets the hour, day, week, and month that the daylight savings time adjustment starts and ends.

6.5 ROC Security

For a complete discussion of device security, refer to the *Device Security* section in *Chapter 3, Communications and Security*.

6.6 ROC Comm Ports

For a complete discussion on configuring communications ports, refer to *Chapter 3, Communications and Security*.

6.7 Configuring Device Information

Use this option to set a number of variables — including station name, address, group, active PIDs and associated history points, and other global variables — as well as review device information that differentiates individual ROC units.

When you select **ROC** > **Information**, the Device Information screen displays with the following tabs:

Tab	Description
General	Provides basic information about the ROC.
Internet	Enables you to define Internet communication parameters.
Points	Displays maximum point information and enables you to define the number of active points.
Other Information	Displays technical ROC information such as firmware versions and boot versions.
System Configuration	Specifies the four baud rates the ROC can use at any given time.
Module Information	Displays information on programmable modules (such as the MVS I/O or APM) installed in the ROC. **Note**: This tab displays **only** if you have one of these modules installed.
Keypad Display	Provides configuration options for the ROC800-Series external keypad. **Note**: This tab displays **only** if you have an external keypad installed.
Expanded I/O	Provides information on the expanded provides information detailing the CPU backplane and how many expanded backplanes are installed, their status, and version information. **Note**: This tab displays **only** if you have expanded backplanes.

6.7.1 General Tab

The General tab provides basic information about the ROC.

1. Select **ROC > Information**. The Device Information screen displays, showing the General tab.

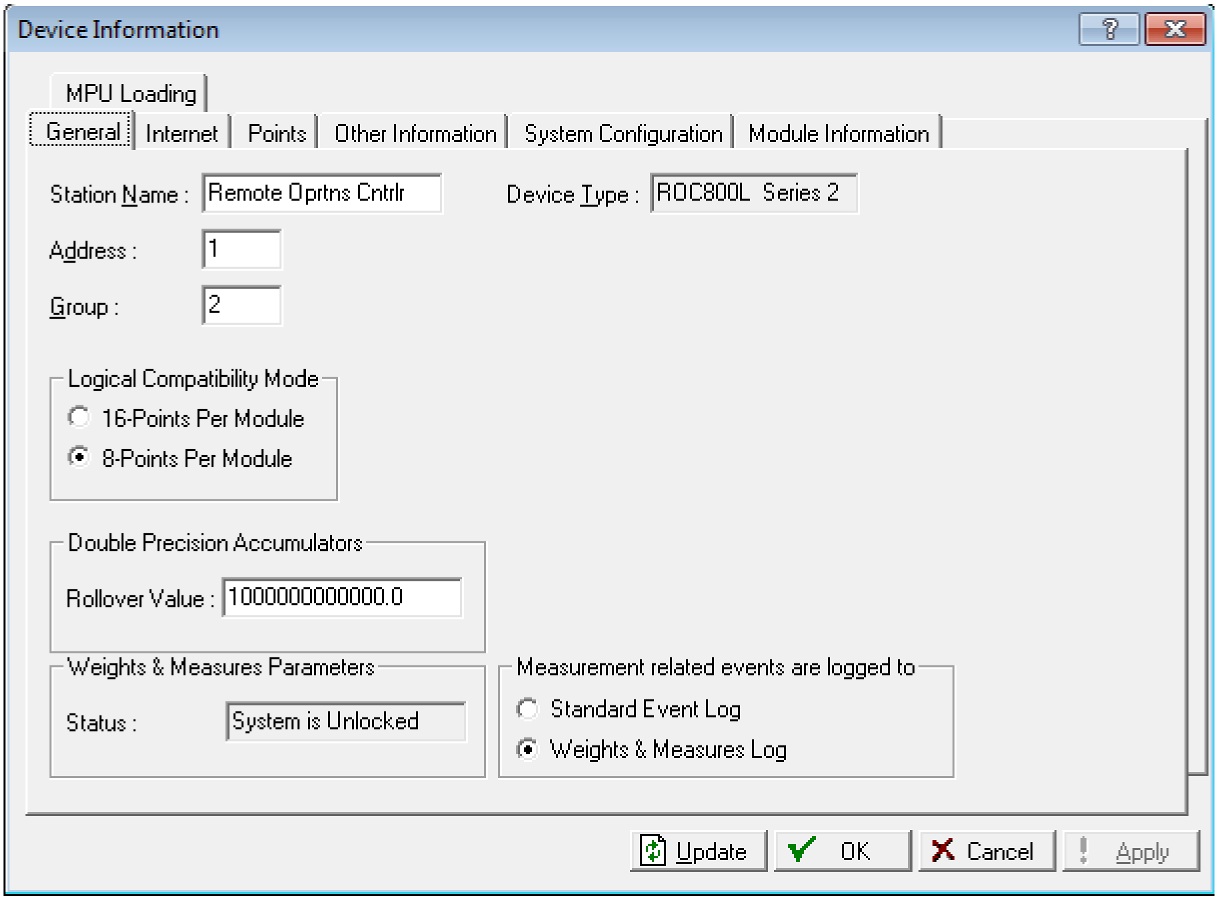


Figure 6-9. Device Information – General tab

2. Review the information on this screen.

Field	Description
Station Name	Indicates the **Station Name** to be logged in EFM Reports. You can change this value to any meaningful 20 alphanumeric string.
Device Type	This **read-only** field shows the currently attached ROC.
Address	Sets a unique address for this ROC that differentiates it from all other devices in a communication group. Valid values are **1** to **255**. **Note:** To avoid communications problems, do not use **240**.

Field	Description
Group	Sets a number that identifies a group of ROCs for communication purposes. All ROCs defined as an area in the host must have the same group. Valid values are **1** to **255**. **Note:** To avoid communications problems, do not use **240**. With ROC Protocol, the values in the Address and Group fields must match the address defined in the destination device for communications to work. You can use TCP/IP connections for Modbus RTU encapsulated in TCP/IP, Modbus TCP/IP, and ROC Plus Protocol communications. If you change the default value of the Address or Group parameters, then all Modbus RTU encapsulated in TCP/IP, Modbus TCP/IP, or ROC Plus Protocol over TCP/IP connections close, and you must re-establish a connection.
Logical Compatibility Mode	Indicates whether the ROC uses 16 or 8 logical points per module. The **default** for a Series 2 CPU is **8** points.
Double Precision Accumulators	Indicates the value at which the double precision accumulators roll over. The default value is **1,000,000,000,000.0**.
Weight & Measures Parameters	Displays the current status of the system regarding the weights & measures parameters. All parameters (TLPs) in the ROC800-Series device have an associated access type. For most parameters, that access type is either Read/Only or Read/Write. For the ROC800L, there is an additional access type, named Read/Write Conditional. Parameters of this access type are considered to be significant, meaning they deal with the configuration of the measurement features. When the system is unlocked (as it is by default), then parameters of this type may be written to. When the system is locked by the user (this can only be done by a user with the highest level of security), then these parameters can no longer be written to. They essentially become Read/Only. To lock and unlock the system, see Utilties > W&M Lock/Unlock.
Measurement related events are logged to	Determines where changes to parameters will be stored. By default, this is the **Weights & Measures Log**. Some legacy systems are not capable of reading the weights & measures event log, and require events to be placed in the standard event log. When this is necessary, select **Standard Event Log** to record all events in the standard event log.

3. Click **Apply** if you change any parameters on this screen.

6.7.2 Internet Tab

The Internet tab configures addresses for Internet communications.

1. Select **ROC** > **Information** > **Internet tab**. The Internet screen displays.

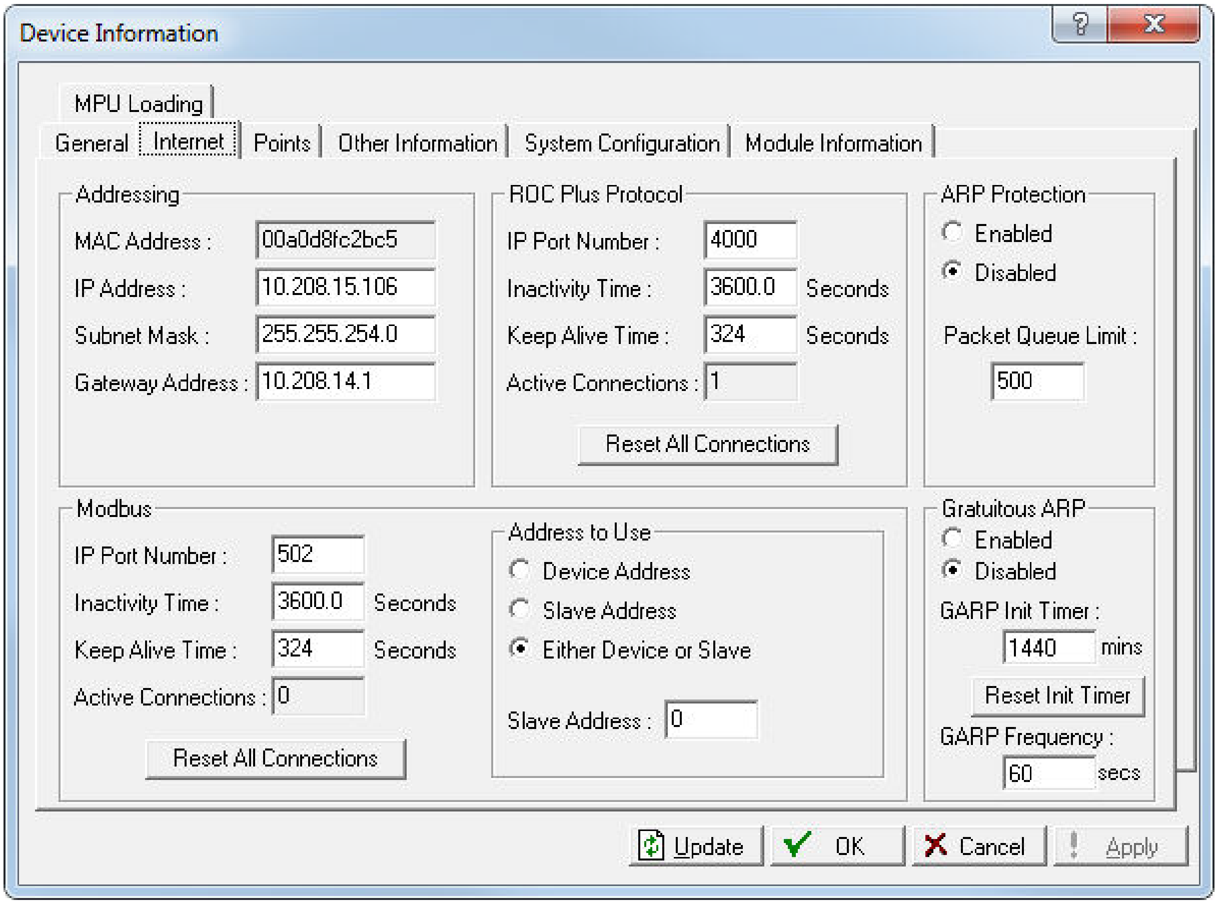


Figure 6-10. Device Information – Internet tab

2. Review the information on the screen.

Field	Description
Addressing	
MAC Address	This **display-only** field shows the Media Access Control (MAC) address for the ROC. The MAC address is factory-set.
IP Address	Sets the Internet Protocol address for this ROC. The factory-set default address is **10.0.0.2**.
Subnet Mask	Sets, if required, a value for the subnet mask portion of the IP address. The subnet mask indicates the subnet to which an IP address belongs. The factory-set default is **255.255.255.0**.
Gateway Address	Sets the gateway address for the ROC. This value identifies the network node that serves as an entrance to the network on which the ROC resides. The factory-set default is **10.0.0.1**.

Field	Description
Modbus or **ROC Plus Protocol**	
IP Port Number	Sets the **IP Port Number** for the Modbus or ROC Plus Protocol communications. The IP Port Number identifies the port that the ROC monitors for Modbus or ROC Plus protocol connections when communicating over a TCP/IP connection. The ROC Plus protocol default is **4000**. The Modbus default is **502**. Port numbers 1113 and 1131 are reserved. If you change the IP Port Number, the change takes effect immediately. If you change the default value of this parameter, all Modbus or ROC Plus communications over TCP/IP connections close, and you have to re-establish a connection.
Inactivity Time	Sets the time, in seconds, ROCLINK 800 waits for a valid Modbus or ROC Plus protocol message before closing the connection. The default value is **3600**. This timer is **in addition to** the security timeout. Set this field to zero (**0**) to disable the timer.
Keep Alive Time	Keeps a connection “alive” by periodically transmitting of messages (probes). Indicate, in seconds, the amount of idle time before the first probe occurs. If the other side of the connection fails to respond after ten consecutive probes, the connection is considered broken and the connection closes. The default is **0** (no messages are sent). After the first probe, ROCLINK 800 sends nine other probes, 64 seconds apart. The total Keep Alive Time is 486 seconds (9 x 64) plus the value you enter in the Keep Alive Time field.
Active Connections	This **read-only** field displays the total number of active TCP/IP connections. The Ethernet port supports up to six ROC Plus connections, six Modbus slave connections, and one Modbus Master connection **all** at the same time.
Reset All Connections	Click to close all active Modbus or ROC Plus Protocol over TCP/IP connections. This button returns to an un-pressed state when connections are successfully closed.
ARP Protection	Enables Address Resolution Protection (ARP) storm protection, which limits the number of incoming messages to the value you enter in the Packet Queue Limit field and ignores the remainder until the number of messages drops below the value you enter. The default is **Disabled**.
Packet Queue List	Indicates a limit of incoming messages. **Note**: This field is active only if you enable ARP Protection.

Field	Description
Address to Use	Indicates the protocol address to use. Valid values are **Device Address**, **Slave Address**, or **Either Device or Slave Address.**
Slave Address	Indicates, a specific address if you have chosen **Slave Address** in the Address to Use frame.
Gratuitous ARP	Enables the Gratuitous ARP functionality. A Gratuitous ARP is a broadcast to every device on the network, and enables each device to pre-update its device listings.
GARP Init Timer	Sets, in seconds, the amount of time the ROC waits after the Gratuitous ARP is activated to begin ARPing at the user-configured frequency. **Note:** This field is active only if you enable Gratuitous ARP.
Reset Timer	Click to reset the GARP Init Timer to the configured value. No ARPing will occur if you click this button (or SCADA writes to this parameter as a part of its normal polling sequence) before the GARP Init Timer expires. **Note:** This field is active only if you enable Gratuitous ARP.
GARP Frequency	Sets, in seconds, the ARP interval. The ROC repeats at this interval (frequency) until it the GARP Init Timer field is reset. **Note:** This field is active only if you enable Gratuitous ARP.

3. Click **Apply** if you change any parameters on this screen.

6.7.3 Points Tab

The Points tab displays history point information.

1. Select the **ROC > Information > Points** tab. The Points screen displays.

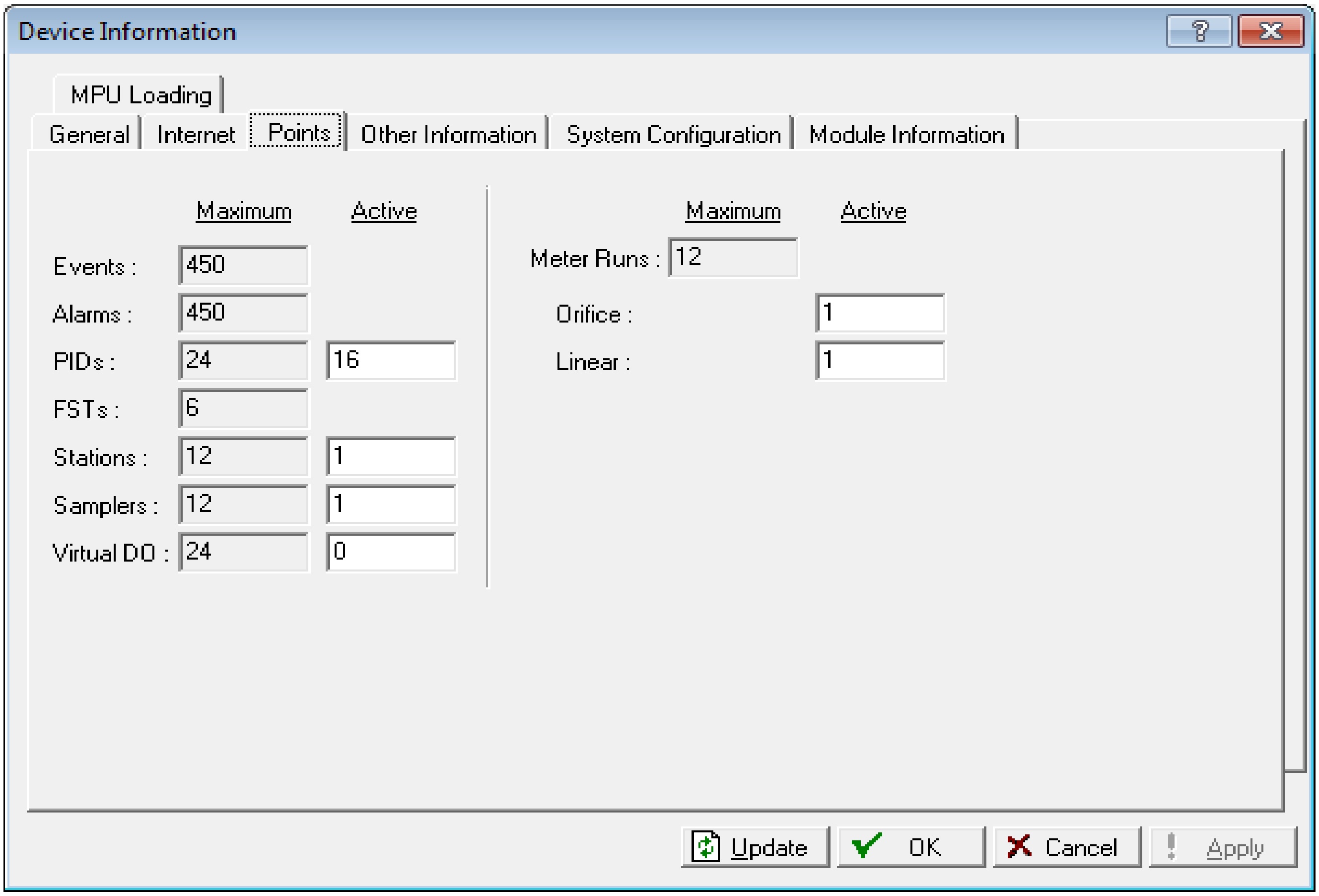


Figure 6-11. Device Information – Points tab

2. Review the information on this screen.

Field	Description
Maximum	This **read-only** field shows the **maximum** number of Events, Alarms, PIDs, Stations, Samplers, FSTs, and AGA meter runs (Orifice and Linear) allowed in the ROC.
Active	Sets the number of active Events, Alarms, PIDs, Stations, Samplers, FSTs, and AGA meter runs (Orifice and Turbine) points on the currently attached device. **Note:** This value **cannot** exceed the value shown in the Maximum number field. To conserve processor executions, set this value to the **minimum** value your application requires.
Meter Runs	This read-only field indicates the maximum number of active meter runs (orifice and linear) for this ROC.
Orifice and Linear	Sets the number of currently active orifice and linear runs in the ROC. **Note:** This value **cannot** exceed the value shown in the Maximum Meter Runs field. To conserve processor executions, set this value to the **minimum** value your application requires.

3. Click **Apply** if you change any parameters on this screen.

6.7.4 Other Information Tab

The Other Information tab displays customer information.

1. Select **ROC** > **Information** > **Other Information** tab. The Other Information screen displays.

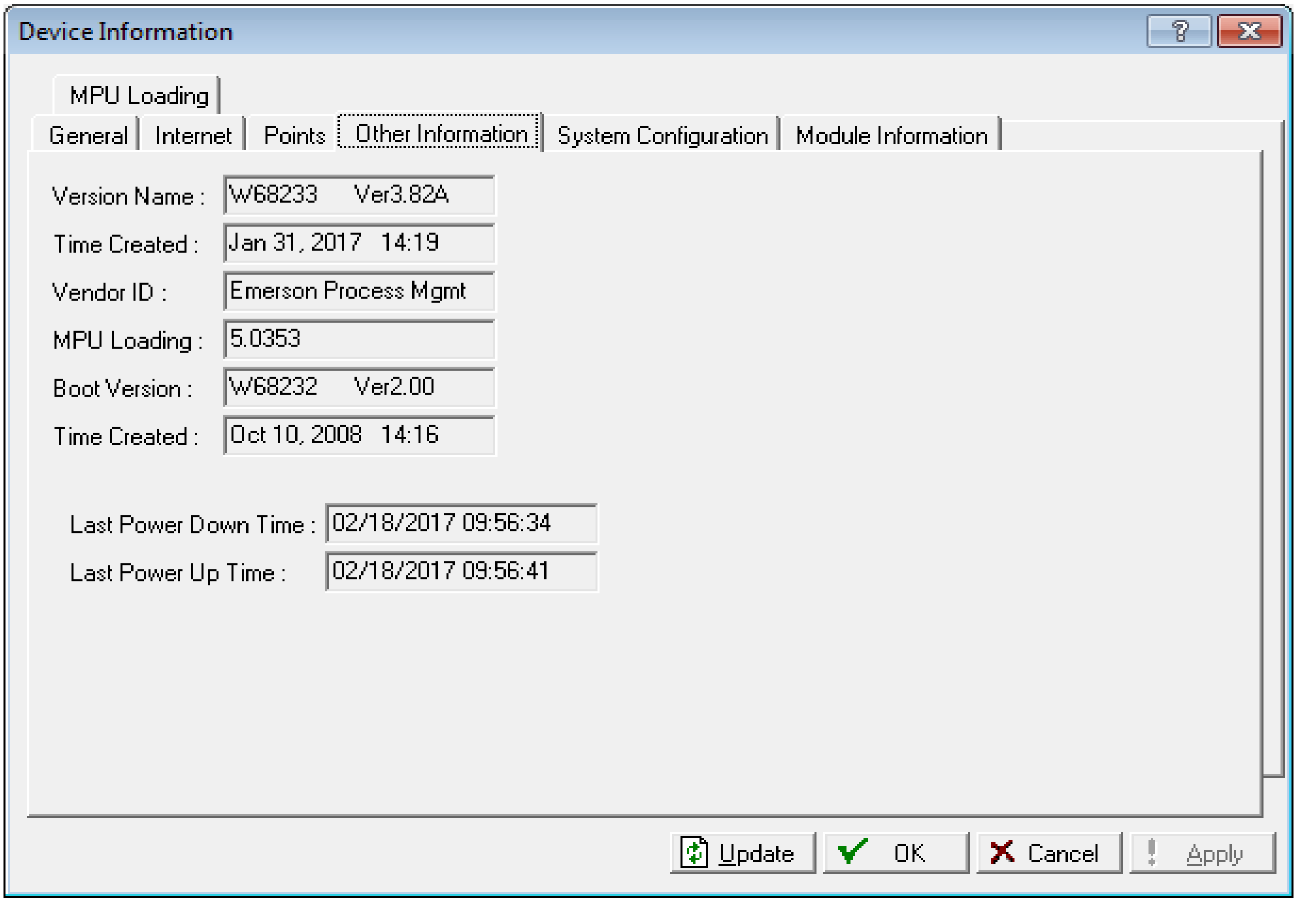


Figure 6-12. Device Information – Other Information tab

2. Review the information on this screen.

Field	Description
Version Name	This **read-only** field shows the version number for this device.
Time Created	This **read-only** field shows the date and time the firmware was created.
Vendor ID	This **read-only** field shows the vendor associated with this device.
MPU Loading	This **read-only** field shows the current percentage of system utilization. This value is updated each time the screen is refreshed.
Boot Version	This **read-only** field shows the version of the main startup firmware currently installed in the ROC.
Time Created (Boot)	This **read-only** field shows the date and time the boot firmware was created.

Field	Description
Last Power Down Time/Last Power Up Time	These **read-only** fields show the date and time when the ROC was last connected to power (**Last Power Up Time**) and when the ROC was last disconnected from power (**Last Power Down Time**).

6.7.5 System Configuration Tab

The **System Configuration** tab allows you to specify four baud rates (BPS) the ROC can use at any given time.

1. Select **ROC** > **Information** > **System Configuration** tab. The System Configuration screen displays.

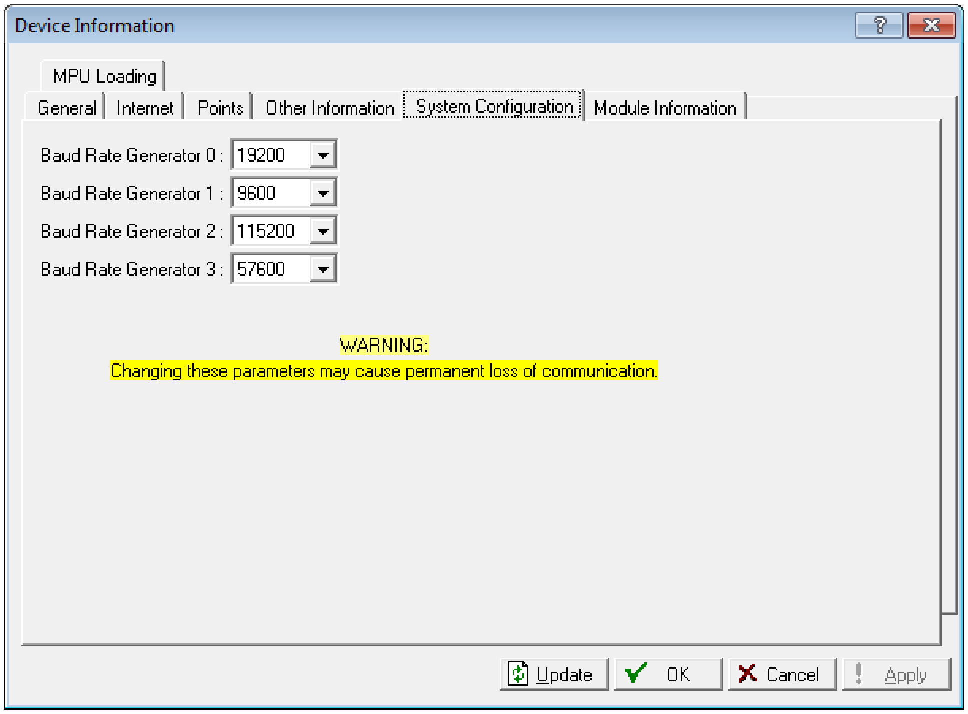


Figure 6-13. Device Information – System Configuration tab

2. Review the information on this screen.

Field	Description
Baud Rate	Sets the four baud rates the ROC can use at any given time. A **read-only** display on the Comm Ports General screen indicates which of the four baud rate generators is currently in use. **Note:** Do **not** change these baud rates unless directed to do so by Technical Support personnel.

3. Click **Apply** if you change any parameters on this screen.

6.7.6 Keypad Display Tab

The Keypad Display tab allows you to configure settings for the ROC800-Series optional Display Keypad. You can also view the current LCD Firmware Version installed.

1. Select **ROC** > **Information** > **Keypad Display** tab. The Keypad Display screen displays.

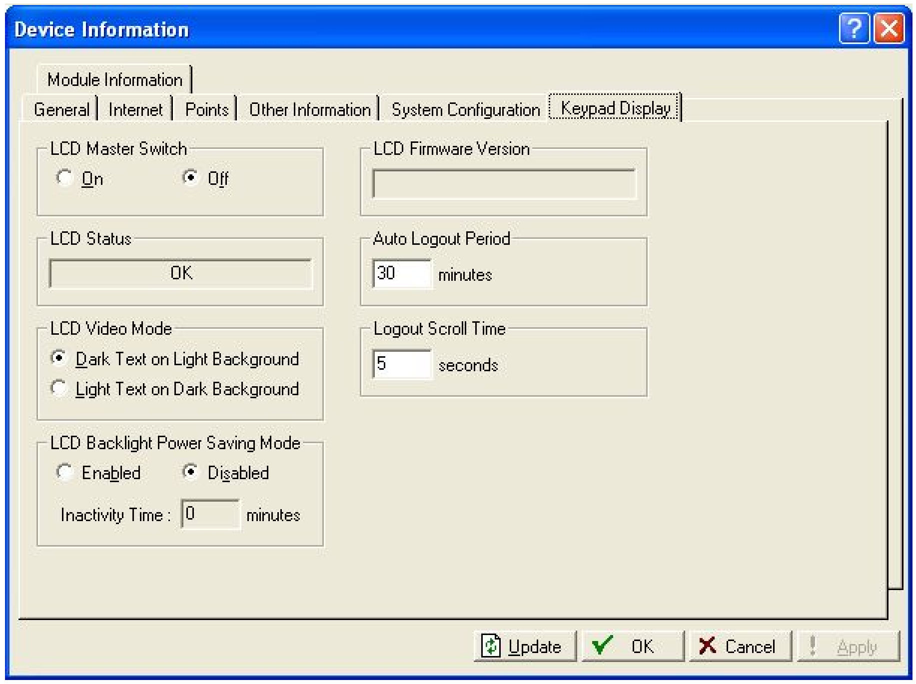


Figure 6-14. Information – Keypad Display

2. Review the information on this screen.

Field	Description
LCD Master Switch	Enables you to reset the Keypad/Display without cycling power or performing a warm start.
LCD Status	This **read-only** field shows the status of the ROC Keypad Display. OK displays if a keypad display is installed and has a valid configuration file. An error displays if the configuration file is invalid, no keypad display is installed, or if there is a CRC error.
LCD Video Mode	Sets the mode for the display. **Dark Text on Light Background** is the **default**. Click **Apply** to change the display mode.
LCD Backlight Power Saving Mode	Shuts off the LCD automatically after a defined amount of inactivity. The **default** is **Disabled**.
Inactivity Time	Indicates, in seconds, how long the LCD backlight remains on without activity before automatically shutting off. **Note**: This field is active **only** if you enable the LCD Backlight Power Saving Mode.

Field	Description
LCD Firmware Version	This **read-only** field shows the currently installed version of firmware for the Keypad Display.
Auto Logout Period	Indicates, in minutes, how long the display waits inactive before automatically timing out and logging out the current user.
Logout Scroll Time	Indicates, in seconds, how long the display pauses between parameter displays. For example, if you configure 10 parameters, the LCD displays parameters 1 through 5 and then parameters 6 through 10 after the amount of time set in this field. The **default** value is **5** seconds.

3. Click **Apply** if you change any parameters on this screen.

6.7.7 Expanded I/O Tab (ROC827)

The **Expanded I/O** tab provides information detailing the CPU backplane, including the number of installed expanded backplanes, their status, and version information. You can install up to four expanded I/O backplanes to expand the I/O capabilities of a ROC827.

Note: This tab displays only if you are connected to a ROC with expanded backplanes.

1. Select **ROC** > **Information** > **Expanded I/O** tab. The Expanded I/O screen displays.

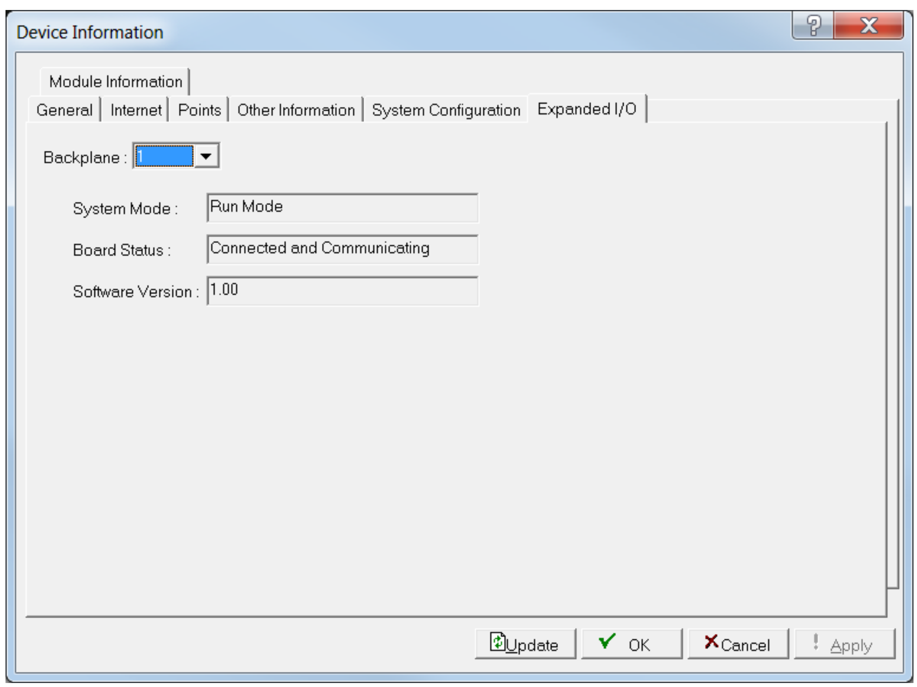


Figure 6-15. Device Information – Expanded I/O tab

2. Review the information on this screen.

Field	Description	
Backplane	Identifies the backplane you want to view. Click ▼ to display all available backplanes.	
System Mode	This **read-only** field shows the current mode of the ROC.	
Board Status	This **read-only** field shows the current status of the backplane. Valid values are:	
	Connected and Communicating	Board is functioning correctly.
	Module not installed	No module is currently installed.
	Communications lost	ROC has lost communications with the backplane.
Software Version	This **read-only** field shows the part number and version of the internal software (firmware).	

3. Click **Apply** if you change any parameters on this screen.

6.7.8 Module Information Tab

The **Module Information** tab displays information about programmable modules (such as the HART-2, MVS I/O, or ACIO) installed in the ROC.

1. Select **ROC > Information > Module Information** tab. The Module Information screen displays.

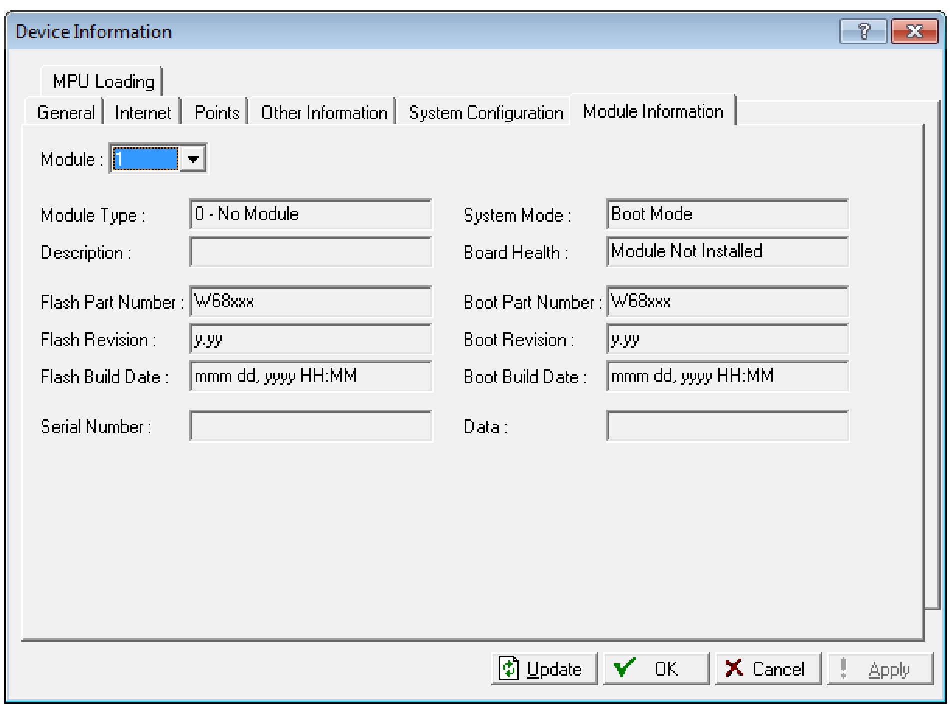


Figure 6-16. Device Information – Module Information tab

2. Review the information on this screen.

Field	Description
Module	Selects the module to view. Click ▼ to display all available slots. **Note**: To populate this screen, you **must** select a programmable module.
Module Type	This **read-only** field shows the type of module installed in the selected slot.
Description	This **read-only** field describes the currently installed module.
Flash Part Number	This **read-only** field shows the part number associated with the selected module.
Flash Revision	This **read-only** field shows the firmware version number for the selected module.
Flash Build Date	This **read-only** field shows the date the firmware was produced for the selected module.
Serial Number	This **read-only** field shows the serial number for the selected module.
System Mode	This **read-only** field shows the module's system mode. Valid values are: **Run Mode** – Module is functioning correctly. **Boot Mode** – No module is currently installed or module has no firmware. **Communications lost** – Module is not functioning correctly, is not running, or communications may have been lost.
Board Health	This **read-only** field shows the module's health. Valid values are: **OK** – Board is functioning correctly. **Module Not installed** – No module is currently installed. **Communications lost** – ROC has lost communications with the expanded backplane.
Boot Part Number	This **read-only** field shows the part number of the main startup (boot) firmware currently installed in the module.
Boot Revision	This **read-only** field shows the revision number for the main startup (boot) firmware currently installed in the module. **Note:** This field is not valid for communications modules.
Boot Build Date	This **read-only** field shows the build date for the main startup (boot) firmware currently installed in the module. **Note:** This field is not valid for communications modules.
Data	This **read-only** field shows additional module-specific information.

6.7.9 MPU Loading Tab

Use the MPU Loading tab to monitor the average MPU load (system utilization) over a user-configurable amount of time. You can run two MPU load diagnostics simultaneously, and set alarming for each instance separately. This allows you to obtain averages from two different time periods (such as a 10 second average and a 180 second average), and set different thresholds and alarming for each instance.

To access this screen:

1. Select **ROC** > **Information** > **MPU Loading** tab. The MPU Loading screen displays.

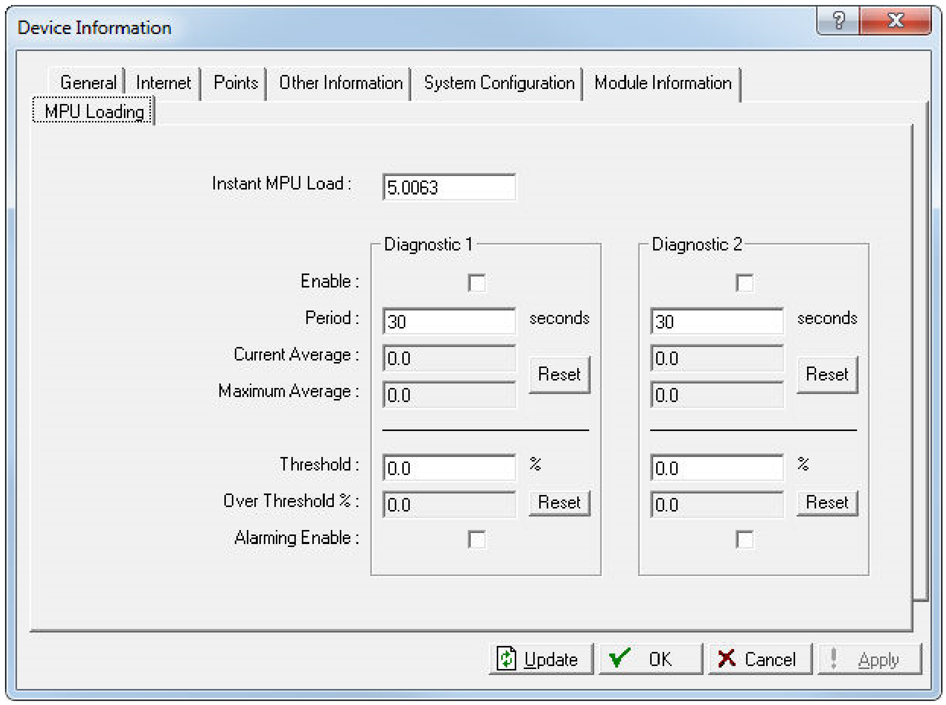


Figure 6-17. Device Information – MPU Loading tab

2. Review the information on this screen.

Field	Description
Instant MPU Load	This **read-only** field shows the current percentage of system utilization. This value is updated each time the screen is refreshed.
Enable	Enables the MPU load diagnostic to run.
Period	Sets, in seconds, the length of time on which to base averages. **Note:** This value applies to both the Current Average and Maximum Average fields.
Current Average	This **read-only** field shows the MPU load averaged over the length of time specified in the Period field. **Note:** This field updates every time you select the Update button.

Field	Description
Maximum Average	This **read-only** field shows the maximum MPU load average that occurred since the MPU diagnostic was started or reset.
Reset (Averages)	Click to clear the values in the Current Average and Maximum Average fields.
Threshold	Sets, in percent, a maximum MPU load value to monitor. If a sample is greater than the value in this field, the system updates the Over Threshold % field and raises an alarm (if alarming is enabled).
Over Threshold %	This **read-only** field shows the percentage of samples that have exceeded the value set in the Threshold field. **Note:** This value will not clear until the Reset button next to it is pressed.
Reset (Threshold)	Click to clear the value in the Over Threshold % field.
Alarming Enable	Place a check mark to enable the system to log an alarm when the current load sample exceeds the value in the Threshold field.

6.8 Flags

Use the selections on the Flags screen to perform actions that affect the overall operation of the ROC. From this screen, you can save a configuration to Flash memory and, if necessary, re-initialize the ROC.

⚠ Caution **Be very careful when using system flags. Selecting certain flags can lose data, change parameter values, and clear configuration memory. Be sure you understand the function of any flag before changing it.**

When you select **ROC > Flags**, ROCLINK 800 displays the Flags screen and defaults to the Flags tab (see *Figure 6-12*).

6.8.1 Flags Tab

Use the Flags tab to restart the ROC or save your configuration to flash memory.

1. Select **ROC > Flags**. The Flags screen displays.

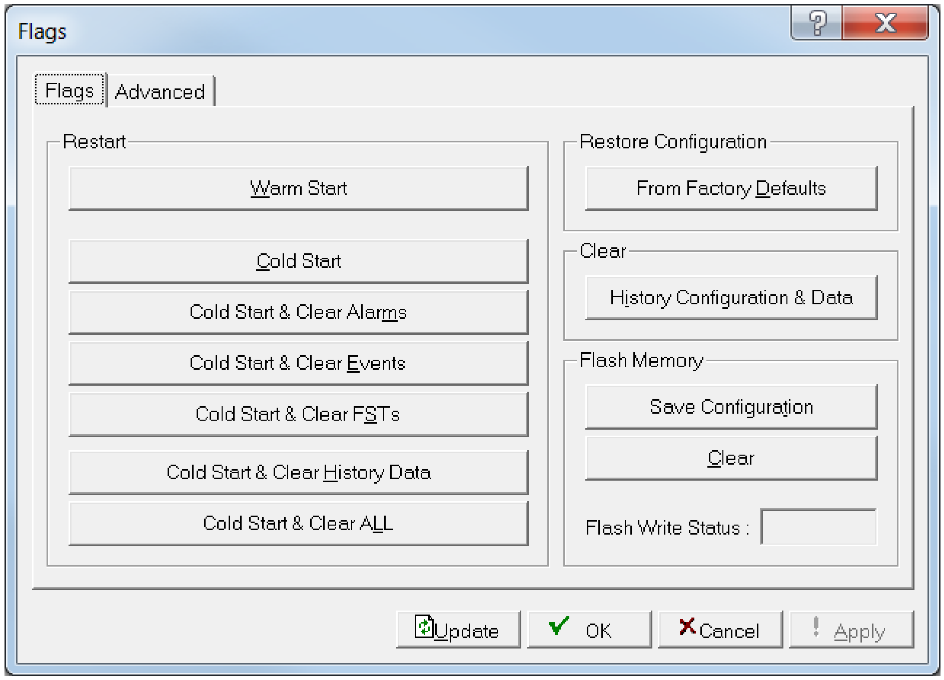


Figure 6-18. Flags – Flags tab

2. Select one of these options:

Button	Description
Warm Start	Click to begin a warm start. Following a warm start, ROCLINK 800 initializes SRAM memory. If the configuration is **valid**, databases and FSTs remain intact. If the configuration is **not valid**, ROCLINK 800 uses the last configuration saved to flash memory. To save a valid configuration, click **Save Configuration**. A user program remains on after a warm start.

Button	Description
Cold Start	Click to begin a cold start. A cold start initializes the ROC from the last valid restart configuration saved in flash memory. If the configuration memory does not have a valid configuration written to it, the process uses the factory defaults. Use a cold start if a ROC is performing erratically, when the memory appears to be corrupted, or when resetting the unit to the last saved configuration. **Note:** A cold start reloads all restart configuration data and may also clear logs, displays, and FSTs. Additionally, it may change outputs, load new accumulator values, and disable user program tasks and user data types. **Generally, do not use Cold Start on a ROC that is actively gathering data or performing control.** Save or document all required data and parameter values that could be affected before you perform a cold start. A cold star may clear logs and FSTs. If you performed a Save Configuration (which includes the FST and FST point in flash memory) before the cold start, the system reloads the saved FST in place of the cleared one.
Cold Start & Clear Alarms	Click to restore a configuration from default values stored in flash memory and clears the Alarm Log.
Cold Start & Clear Events	Click to restore a configuration from default values stored in flash memory and clears the Event Log.
Cold Start & Clear FSTs	Click to restore a configuration from default values stored in flash memory and clears all FSTs.
Cold Start & Clear History Data	Restores a configuration from default values stored in flash memory and clears all history database files.
Cold Start & Clear ALL	Click to restore a configuration from default values stored in flash memory and clears all history database files, alarm logs, event logs, and FSTs.
From Factory Defaults	See *Section 6.8.2, Returning the Device to Factory Default Settings*.
History Configuration & Data	Click to clear all history configuration **and** database files.
Save Configuration	Click to save the current configuration to flash memory. When using a ROC800-Series, most configuration settings (including calibration values and loads) are stored into flash memory as the new configuration after a cold start. All user flags are maintained at their current status during this process. Clicking **Save Configuration** temporarily suspends all incoming communications. A running FST is temporarily suspended, but restarts where it was suspended.

Button	Description
Clear	Clears flash memory.
Flash Write Status	This **read-only** field shows the status of the selected activity.

Reset (RST) Switch

The ROC's CPU module provides a Reset (RST) switch that you can use to restart the ROC from the boot block of flash memory (essentially a cold start) rather than from RAM (a warm start).

For further information, refer to *Central Processing Unit (CPU)* in *Chapter 2* of the *ROC800-Series Remote Operations Controller Instruction Manual* (Part D301217X012).

6.8.2 Returning the Device to Factory Default Settings

Sometimes it is necessary to return the ROC to the original factory default settings. The following procedure clears all saved restart configuration data contained in Flash memory. Only factory defaults are retained.

To return the device to the original factory default settings:

1. Select **ROC** > **Flags**.
2. Click **Flash Memory Clear**.
3. Click **Yes** and **OK**.
4. Click **From Factory Defaults** (in the Restore Configuration frame).
5. Click **Yes** and **OK**.

Note: You may need to re-connect as the factory default settings may be altered from the stored data.

6.8.3 Flags Advanced Tab

Use the Advanced tab to perform actions that affect the CRC checking and the I/O scanning.

1. Select the **Advanced** tab. The Flags Advanced screen displays.

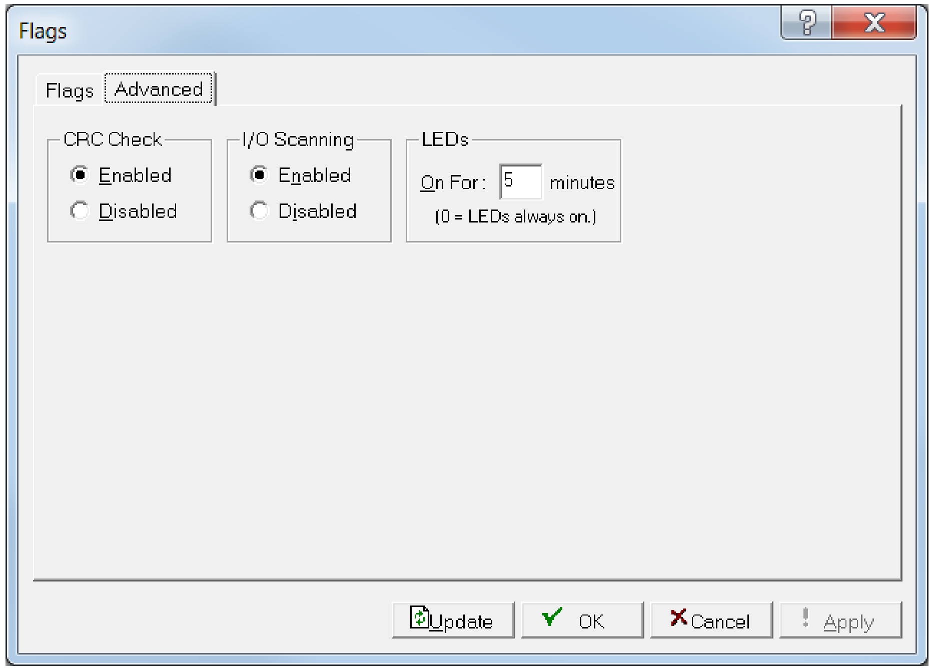


Figure 6-19. Flags – Advanced tab

Field	Description
CRC Check	Activates Cyclical Redundancy Checking (CRC) on ROC protocol communications. Valid values are **Enabled** or **Disabled**. The default is **Enabled**. **Note:** The ROC800-Series does not perform CRC checks on Ethernet communications.
I/O Scanning	Enables I/O scanning on the I/O point displays. The default value is **Enabled**.
LEDs	Enables a power-saving feature for LEDs (with the exception of the LED on the Power module). This parameter controls how long the LEDs remain on after you press the LED button on the CPU module. For instance, with the **default** setting of 5 minutes, all LEDs will go off. If you press the LED button, the LEDs become active again for 5 minutes. Enter **0** (zero) in this field to allow the LEDs to always stay active.

Chapter 7 – The Configure Menu

In This Chapter

Use the Configure menu options to define points for inputs/outputs, control functions, Opcode points, history points, LCD user lists, user programs, and Modbus.

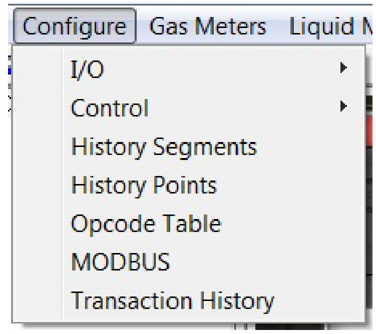


Figure 7-1. Configure Menu

7.1 Configuring I/O

The input/output (I/O) points in the ROC have many items that can be configured. For more information on the types of I/O available and their functions, refer to *Chapter 4* of the *ROC800-Series Remote Operations Controller Instruction Manual* (part D301217X012).

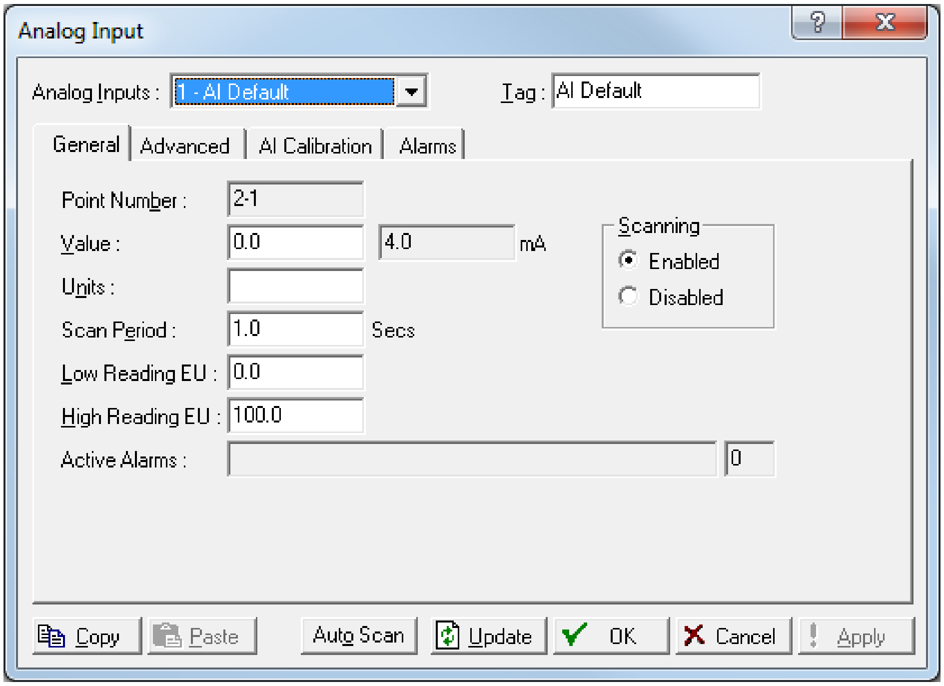
Configuring a ROC is a matter of establishing points and then configuring various parameters.

Each input and output has a unique point number to identify the input or output. The point number indicates the location of the point at the slot number of the I/O module and channel number in the ROC. For example, DI 2-1 indicates the Point Number for a discrete input at module slot number two, first channel.

7.1.1 Analog Input (AI) Configuration

Analog inputs are analog signals that measurement devices (such as pressure and temperature transmitters, including RTD probes and pressure sensors) generate.

Select **Configure > I/O > AI Points**. The Analog Input screen displays.



The Analog Input screen has four tabs. Use each tab to configure a component of the input.

- Use the **General** tab to set the basic parameters for the analog input point.
- Use the **Advanced** tab to configure features, such as filtering, A/D conversions, and clipping for the selected analog input.
- Use the **AI Calibration** tab to calibrate the AI point while on-line.
- Use the **Alarms** tab to set the alarm parameters for this AI point.

Note: You enable alarming on the Alarms tab. If you enable alarming, the limit alarms (four levels, Rate, and Deadband) are configured on the Alarms tab. To conserve Alarm Log space, alarms should be enabled only when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one so that no false alarms generate.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start.

AI: General Tab

Select **Configure > I/O > AI Points**. The Analog Input screen displays with the General tab active. Use this tab to set the basic parameters for the analog input point.

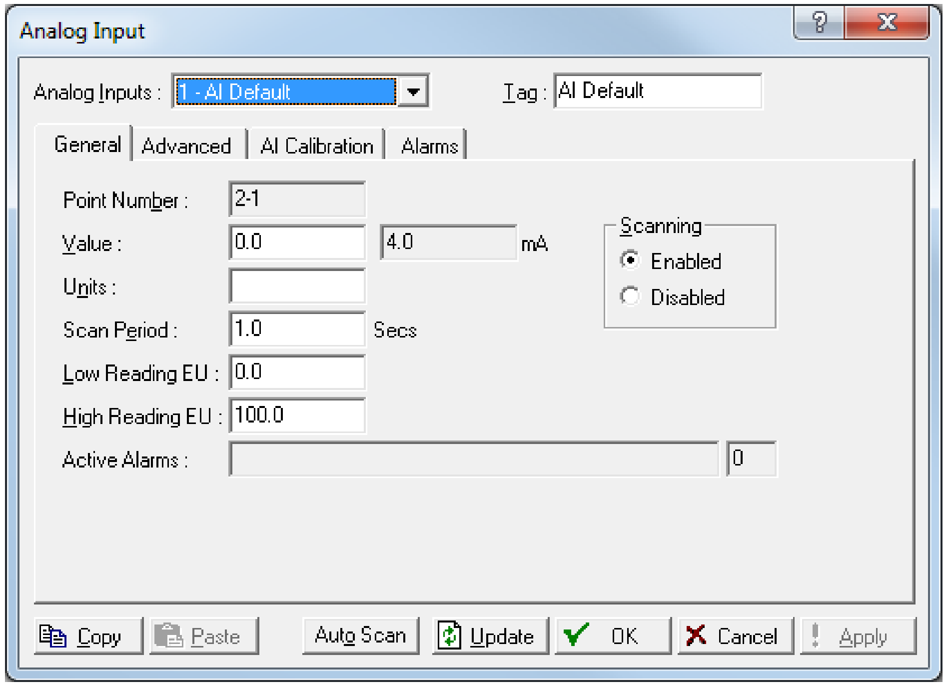


Figure 7-2. AI – General tab

Field	Description
Analog Inputs	Selects the analog input to be configured. Click ▼ to display all available analog inputs. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Provides a 10-alphanumeric character identifier associated with each point type. **Note:** The selection in this field applies to **each** tab on this screen.
Point Number	The **read-only** field shows the rack location for this point.
Value	This read-only field shows the value from the field device. When scanning is **disabled**, you can write to the failsafe or download value and then choose either the User Failsafe or User Download option in the Off Scan Mode frame on the Advanced tab.
Units	Shows the engineering for the I/O (such as IN H2O, PSIG, MCF, degrees F, milliamps, or volts).
Scan Period	Sets, in seconds, how frequently the system scans the input to acquire the Value when you enable scanning. Each AI updates based on its individual scan period.
Low Reading EU	Sets the engineering unit (EU) for the low reading to zero percent input. For example, if a temperature transmitter is connected to the analog input with a range of – 40 to 160 degrees F, the **Low Reading EU** would be set to – 40.

Field	Description	
High Reading EU	Sets the engineering unit (EU) for the high reading to 100 percent input. For example, if a temperature transmitter is connected to the analog input with a range of – 40 to 160 degrees F, set this value to 160.	
Active Alarms	This **read-only** field shows any alarms that are active for this point. If you enable alarming, any active limit alarms (such as Low Alarm and Rate Alarm) display. Even if you disable alarming, the Point Fail alarm (hardware reports a malfunction) and Manual (Scanning Disabled) indicators can still appear.	
Scanning	Sets the scanning option for this point. Valid values:	
	Enabled	Automatically process the field input and display the last analog input scan in the Value field.
	Disabled	Permit only manual updates of the Value field.
	Note: If you enable alarming, the ROC generates a Manual Mode alarm when scanning is disabled. If you disable scanning, you must manually enter a value to override the input.	
EU Status	This **read-only** field shows the current status of the EU Value: Valid values are:	
	Live Reading	EU value within normal range
	Live Failed	EU value in Point Fail
	Channel Fail	EU value with failsafe value
	Offscan Live	EU value with Last live reading
	Offscan Failsafe	EU value with failsafe value
	Offscan Download	EU value with EU download value

AI: Advanced Tab

Use the Advanced tab to configure features such as filtering, A/D conversions, and clipping for the selected analog input.

Select **Configure > I/O > AI Points > Advanced** tab. The Advanced screen displays.

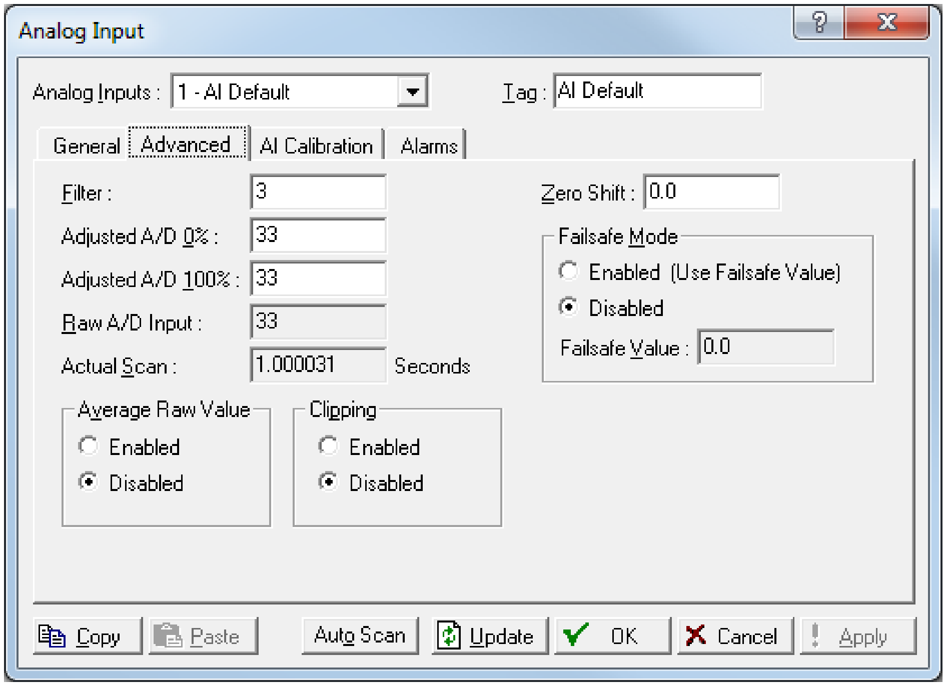


Figure 7-3. AI – Advanced tab

Field	Description
Filter	Sets the Filter percent (ENTERED_DATA) as a weighted sample using a percentage of the last value plus a percentage of the new value. The system calculates the Filtered EU Value (on the General tab) once every second, regardless of the scan period, using the formula: Filtered EU Value = (last_value x ENTERED_DATA) + (new_value x (100 - (ENTERED_DATA / 100))
Adjusted A/D 0%	Sets the calibrated Analog-to-Digital count corresponding to zero percent input. In the Calibrate function, this value is altered to set the zero percent input exactly at the **Low Reading EU** value.
Adjusted A/D 100 %	Sets the calibrated Analog-to-Digital count corresponding to 100 percent input. Use this value to convert the input to engineering units. In the Calibrate function, this value is altered to set the 100 percent input exactly at the **High Reading EU** value.
Raw A/D Input	This **read-only** field shows the current digital count directly from the Analog-to-Digital converter.
Actual Scan	This **read-only** field shows the actual amount of time, in seconds, taken to complete the entire list of tasks. This value should be the same as the value in the **Scan Period** field on the General tab if the system is not overloaded.

Field	Description
Average Raw Value	Sets whether the system averages raw values during the scan period. Valid values are **Enabled** (average and calculate the raw readings during the scan period and use the results as the Raw A/D Input during calculations) or **Disabled** (acquire instantaneous values).
Clipping	Forces the filtered EUs within a defined limit set on the Alarms tab. Valid values are **Enabled** (forces the filtered EUs to stay within a range defined by the cut off limits, set by using the LoLo Alarm and HiHi Alarm parameters defined on the Alarms tab) or **Disabled** (do not force clipping).
Zero Shift	Sets a value (if necessary) to compensate for the zero shift effect on an input.
Action on Failure	Sets the action the system performs upon alarm detection. Valid values are **Use Failsafe Value** (use the value in the Failsafe Value field) and **Use Live Value** (use the value at which the input is currently set). **Note**: If you select **Use Failsave Value**, you must also enter a value in the **Failsafe Value** field the system uses if a restart occurs.
Failsafe Value	Indicates a value to use after a restart. **Note**: This field activates **only** if you select **Use Failsafe Value**.
Off Scan Mode	Sets the action to take when you disable scanning. Valid values are: **Hold Last Value** – EU value retains the last live reading **Use Failsafe Value** – Set EU value to Failsafe Value **Use Download Value** – Set EU value to EU Download Value. **Note**: If you select this option, you must also complete the Download Value field.
Download Value	If you enable **Use Download Value**, enter a value the system uses after you turn off a scan. ROCLINK does **not** log this change to this parameter.

AI:AI Calibration Tab

Use this tab to verify or calibrate an analog input.

The calibration routine provides Verify, Calibrate, and Zero Shift functions for AI inputs. You can calibrate differential pressure (orifice metering may be High or Low Differential Pressure, depending on the device), static pressure, or temperature readings for each meter run.

Select the **Configure > I/O > AI Points > AI Calibration** tab. The AI Calibration screen displays:

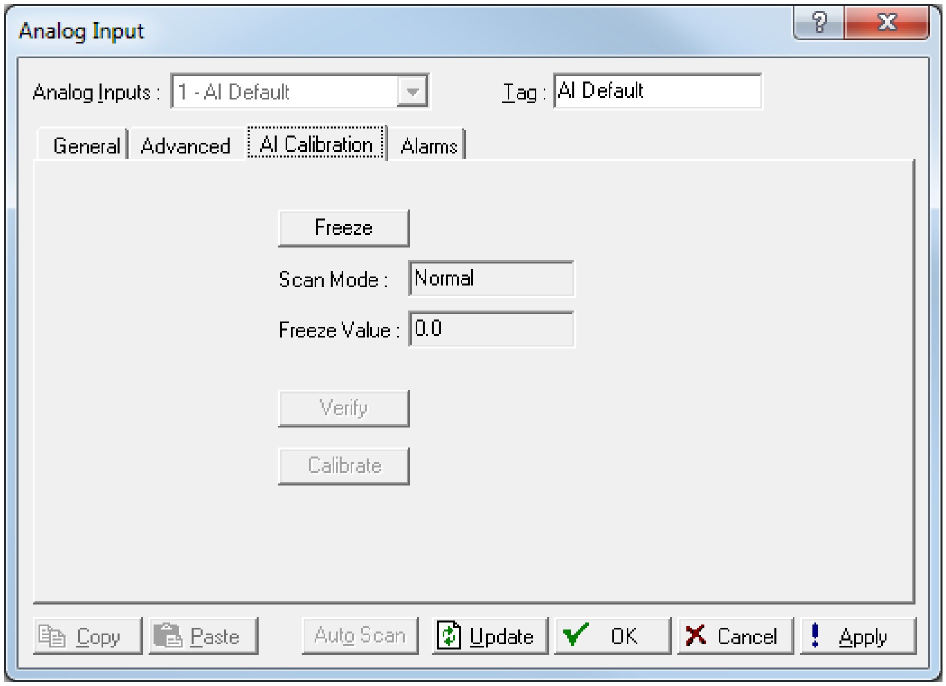


Figure 7-4. AI – Calibration tab

Notes:

- You can calibrate inputs for up to five points (zero, span, and up to three mid-points). You must define at least **two** points (zero and span) for calibration.
- If you leave the ROC idle during calibration, the ROC times out and resumes normal processing. Calibration values are restored to the previous values, an event is logged, and you must reconnect to start calibration from the beginning.
- Click **Cancel** to exit the calibration without saving the changes. The ROC retains the previous calibration settings and logs an event.

⚠ Caution **If you have an MVS transmitter, refer to *Chapter 6, Sensor/Transmitter Accessories,* in the *ROC/FloBoss Accessories Instruction Manual* (Form A4637) for the recommended way to remove or restore the device from or to working pressure during calibration. Failure to follow recommendations may damage the device.**

Field	Description
Freeze	Click to stop the system from updating analog, MVS, DVS, HART, or temperature (RTD) inputs during verification or calibration. Once you click **Freeze**, the input is frozen at the current Freeze Values.

Field	Description	
Scan Mode	This **read-only** field displays the current input status. Valid values are:	
	Manual	The system is in manual mode.
	Normal Poll	The system is functioning normally
	Input Freeze	After you click **Freeze**, input is frozen and activates **Verify** and **Calibrate**.
	Poll Mode	Sends an initial communication to a sensor to gather all the configuration data stored on that sensor.
	Off Scan	The sensor is disabled
Freeze Value	This **read-only** field shows the value received from the analog input, DVS, HART, MVS, RTD, or meter inputs when the **Update** button was last clicked. The system uses these values in ongoing processing (such as flow calculations, history logging, or control) while calibration occurs.	
Verify	Click to start the verification process.	
Calibrate	Click to begin calibration and display the Set Zero dialog.	
Update	Click to request a value update from the input to be used as the Freeze Values.	
Zero Shift/Offset/RTD Bias	Click to set adjustment factors for the input. The value is sent to the device for:	
	Zero Shift	Click to zeros the static pressure effect for the differential pressure input (Set Offset).
	Offset	Click to send the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
	RTD Bias	Click to calibrate the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).

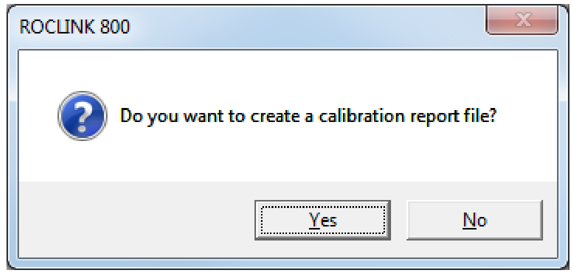
Verifying an Analog Input

Use this process to verify that the analog input is within operating limits.

Note: If the value is incorrect, you should calibrate the input.

1. Select **Configure > I/O > AI Points**. The Analog Input screen displays.
2. From the **AI Calibration** tab, click **Freeze** to stop the values of the input from being updated during verification. ROCLINK prompts you to create a calibration report file.

Note: The **Freeze Value** field displays the value received from the input when you clicked **Freeze**. This is the value the system uses in ongoing processing (such as flow calculations and history logging) while performing calibration.



3. Click **Yes** to display a Save As dialog.

Note: If you **do not** need a calibration report, click **No** to immediately display the Calibration screen.

4. Indicate the file name for the report and click **Save**. The AI Calibration screen displays with active **Verify** and **Calibrate** buttons.

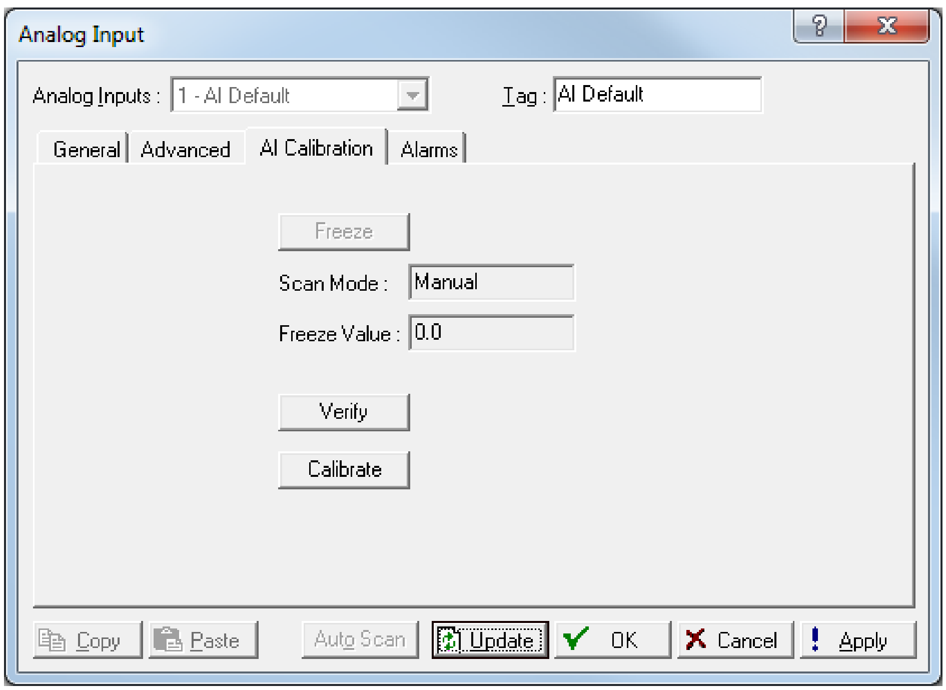


Figure 7-5. AI – AI Calibration tab

5. Review the value in the **Scan Mode** field. Valid values are **Normal** (point scanning is enabled and is updated each scan period) or **Manual** (the point is not in scanning mode).

6. Click **Verify**. A Verify dialog displays.

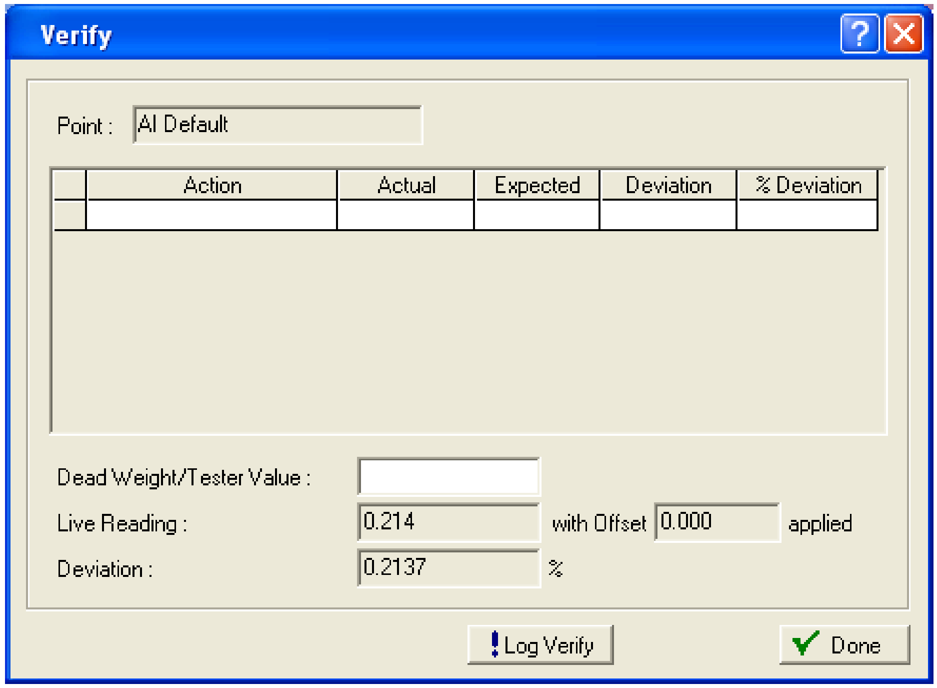


Figure 7-6. Verify

7. Complete the **Dead Weight/Tester Value** field with a value against which the test equipment verifies.

   When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it to the value in the **Live Reading** field (obtained from the temperature probe) and calculating the percentage deviation between the two values.

8. Click **Log Verify**. ROCLINK 800 completes the first log entry on the screen.

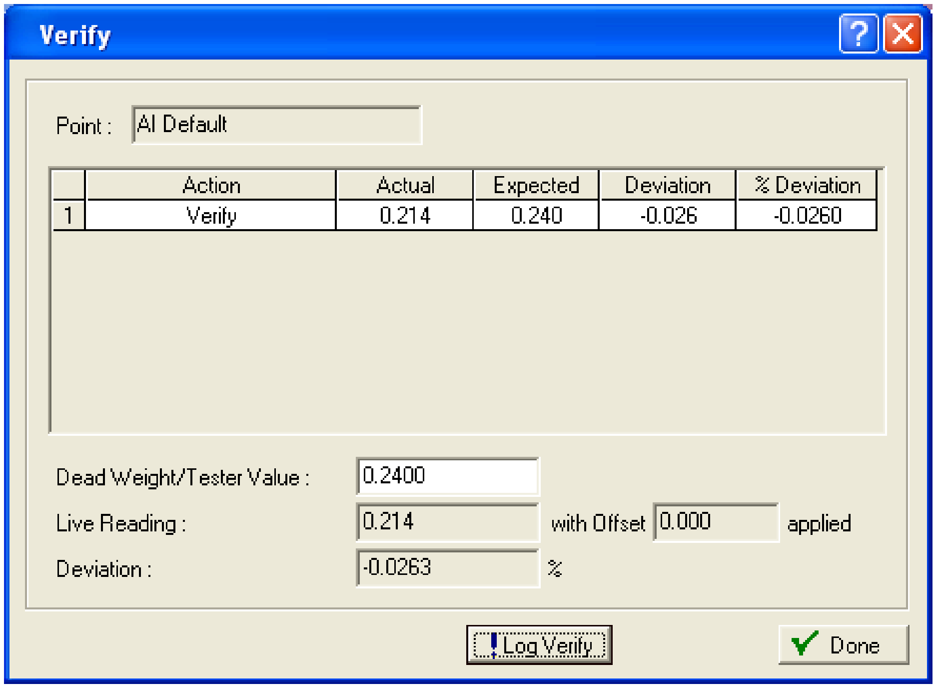


Figure 7-7. Verify – Log Entry

Field	Description
Action	Indicates the current action. Valid values are **Verify** or **Calibrate**.
Actual	Displays the value in the **Live Reading** field.
Expected	Displays the value in the **Dead Weight/Tester Value** field.
Deviation	Displays the amount of deviation between the actual and expected values.
% Deviation	Displays a percentage deviation between the Actual and Expected values.

9. As the live reading value changes, click **Log Verify** as many times as necessary to establish the verification log.

10. Typically you verify the same points you calibrate. Temperature might be an example (– 100, 200, 50). For each test point, you set your test equipment to produce the expected value, enter that expected value in the **Tester Value** field, wait for live input to stabilize, and then click **Log Verify**. You can verify as many points as you want.

11. Click **Done**. The AI Calibration screen displays. .

12. If your verification is satisfactory, click **OK** to close the Analog Input screen. If you need to calibrate the AI, proceed to *Calibrating an Analog Input*.

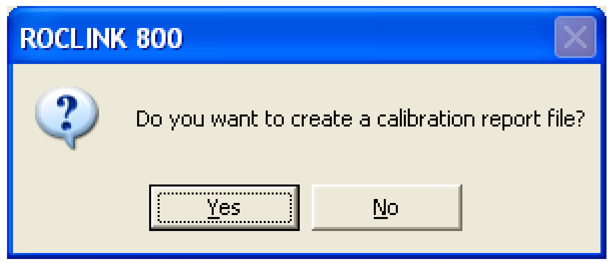
Calibrating an Analog Input

Use this process to calibrate an analog input.

1. Select **Configure > I/O > AI Points**. The Analog Input screen displays.
2. From the **AI Calibration** tab, click **Freeze** to stop the values of the input from being updated. ROCLINK prompts you to create a calibration report file.

Note: The **Freeze Value** field displays the value received from the input when you clicked **Freeze**. This is the value the system uses in ongoing processing (such as flow calculations and history logging) while performing calibration.

3. Click **Yes** to display a Save As dialog.



Note: If you **do not** need a calibration report, click **No** to immediately display the Calibration screen.

4. Indicate the file name for the report and click **Save**. The AI Calibration screen displays with active **Verify** and **Calibrate** buttons.
5. Review the value in the **Scan Mode** field. Valid values are **Normal** (point scanning is enabled and is updated each scan period) or **Manual** (the point is not in scanning mode).
6. Click **Calibrate**. A Set Zero dialog displays.

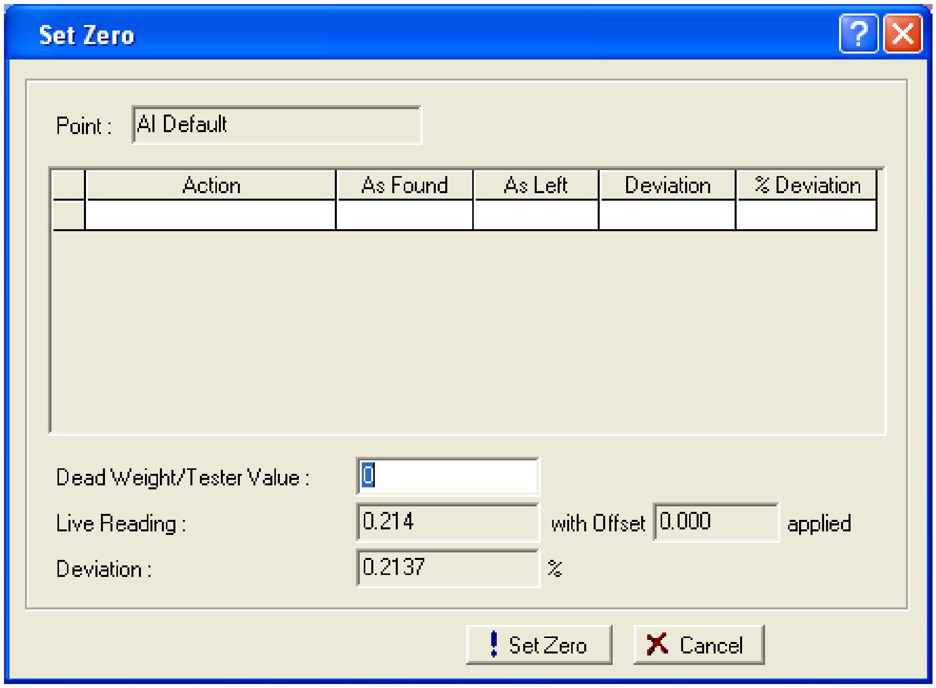


Figure 7-8. Set Zero

7. Click **Set Zero**.

For the Set Zero entry in the calibration log, ROCLINK 800 provides **As Found** and **As Left** values and calculates the **Deviation** and **% Deviation** values (between the Dead Weight/Tester Value and the Live Reading values). ROCLINK 800 also resets the value in the Dead Weight/Tester Value field to **100** and activates the **Set Span** button.

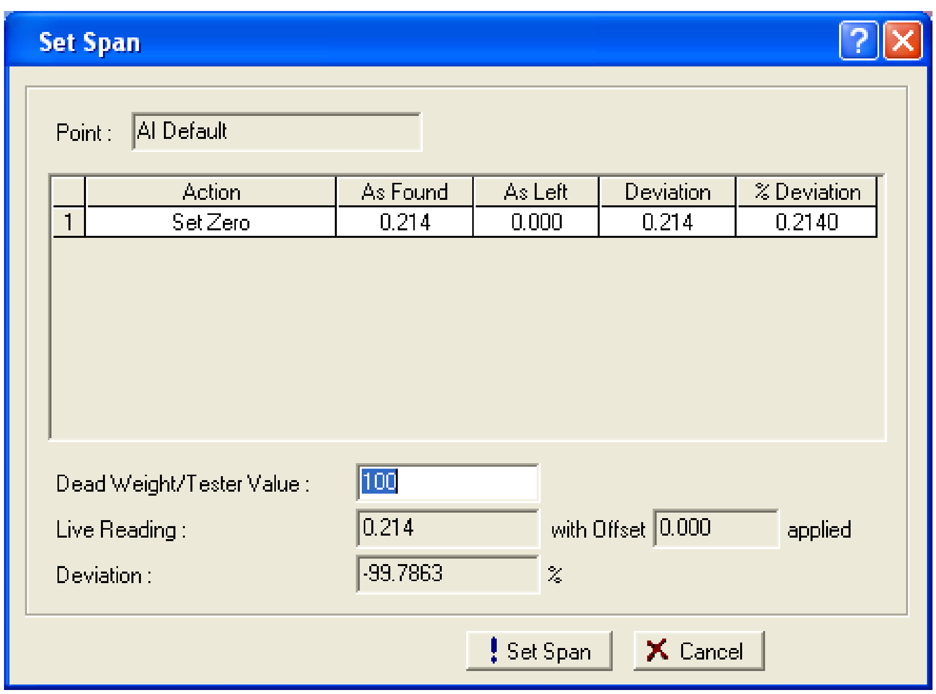


Figure 7-9. Set Zero (Log)

8. Click **Set Span**.

   ROCLINK 800 completes the Set Span entry in the calibration log and activates the **Set Mid 1** button.

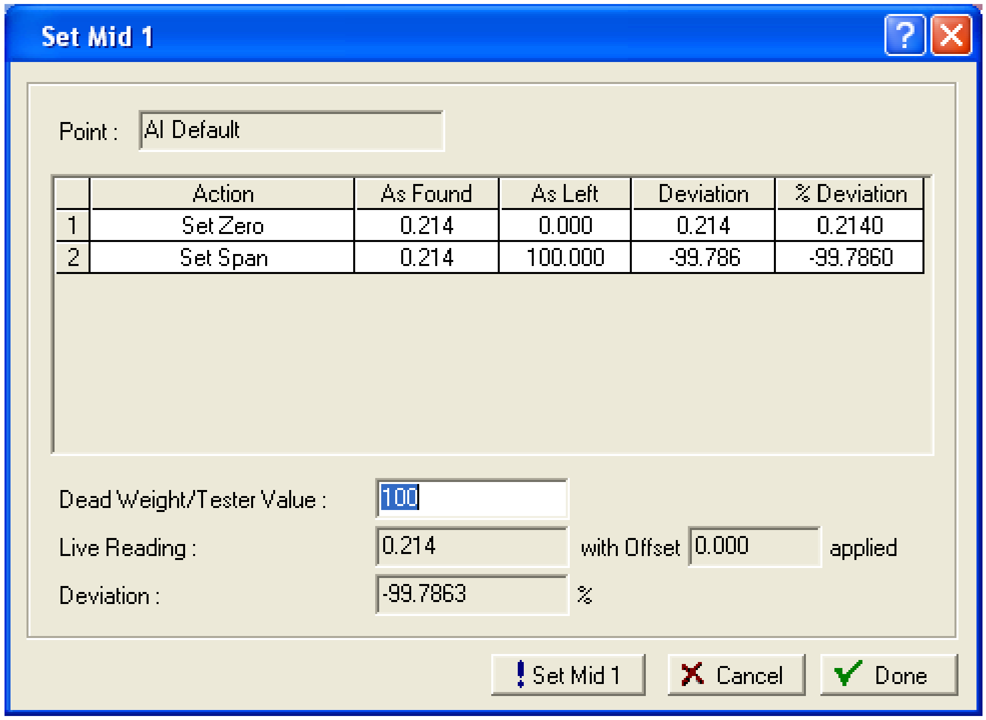


Figure 7-10 Set Span (Log)

Note: A calibration requires only two points (zero and span). Your organization determines whether additional points (midpoints 1, 2, or 3 typically at 25%, 50%, and 75% respectively) are necessary for a calibration. For this example, we set one midpoint.

---

9. Click **Set Mid 1**.

   ROCLINK 800 completes the Set Mid 1 entry in the calibration log and activates the **Set Mid 2** button.

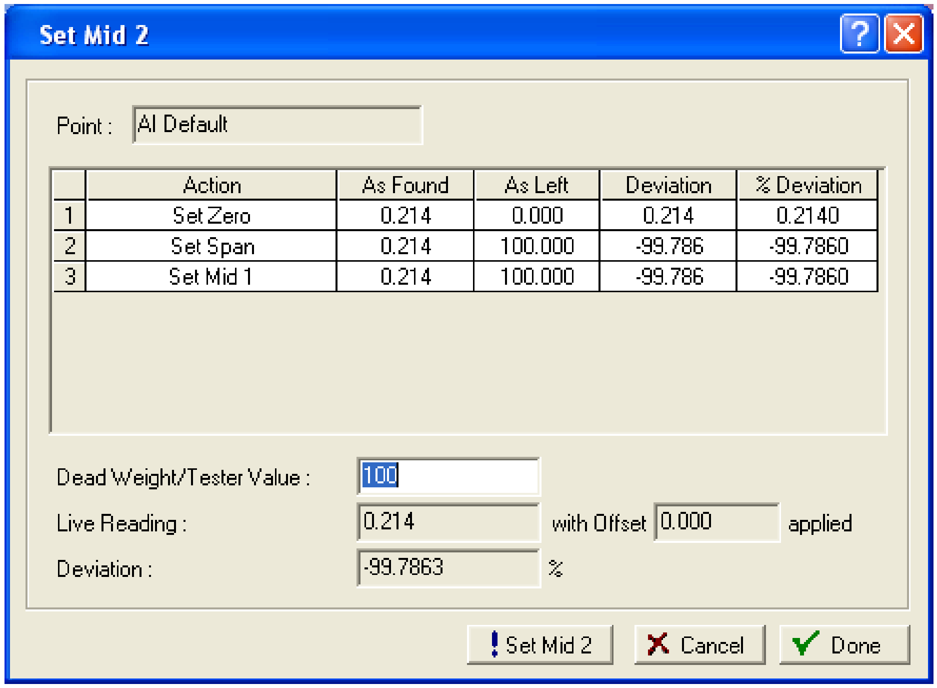


Figure 7-11. Set Midpoint 1

10. If you do not wish to configure additional midpoints, click **Done**. The AI Calibration screen displays.

When the AI Calibration screen displays, you can calibrate inputs for another AI by starting again at step 1.

AI: Alarms Tab

Use this tab to set the alarm parameters for this AI point. You also enable alarming on the tab. You **must** enable alarming to configure the limit alarms (Low, High, LoLo, HiHi, Rate, and Deadband) on this tab.

Note: To conserve alarm log space, enable alarms **only** when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each alarm to prevent the generation of false alarms.

Select the **Alarms** tab. The Alarms screen displays.

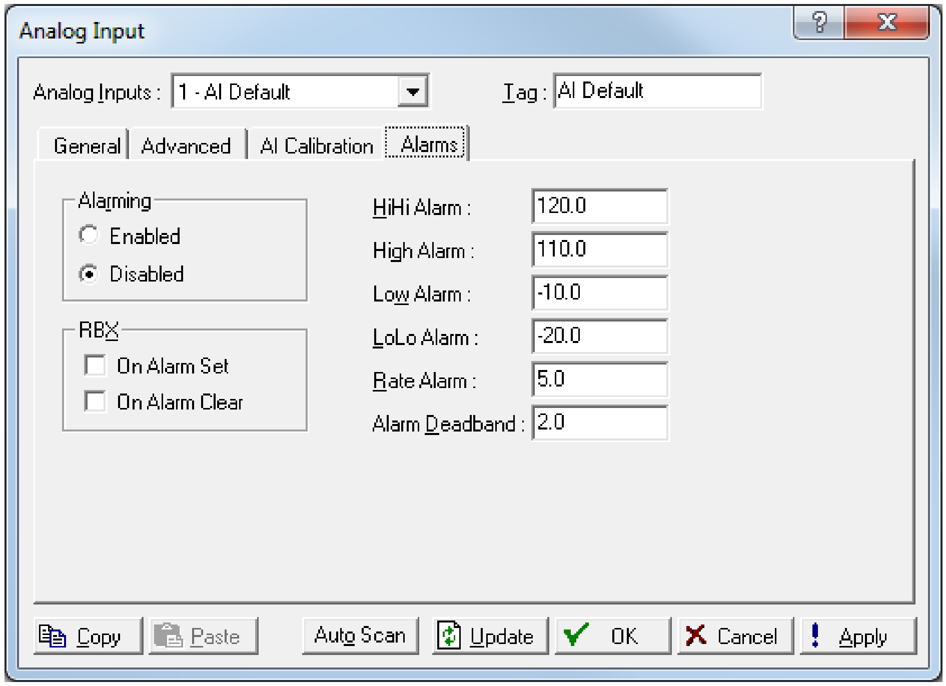


Figure 7-12. AI – Alarms tab

Field	Description
Alarming	Sets the alarm option for the selected point. Valid values are **Enabled** (configures the limit alarms - four levels, Rate, and Deadband) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you enable alarming, the system generates an alarm if you disable scanning.
RBX	Sets the Spontaneous Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are **On Alarm Set** (which generates an RBX message to the host when the point **enters** an alarm condition) and **On Alarm Clear** (which generates an RBX message to the host when the point **exits** an alarm condition). **Note:** RBX alarming requires you to configure the communications port.
HiHi Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **HiHi Alarm**. **Note:** Typically you set the value for the HiHi Alarm higher than the value for the High Alarm.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **High Alarm**.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.

Field	Description
LoLo Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **LoLo Alarm**. **Note:** Typically you set the value for the LoLo Alarm lower than the value for the Low Alarm.
Rate Alarm	Sets, in engineering units, a value that represents the maximum amount of change allowed in the calculated rate between updates before an alarm generates. If the change is equal to or greater than this value, an alarm occurs. **Note:** To disable this Rate Alarm without disabling the other alarms, set the value greater than the scan value of the analog input.
Alarm Deadband	Sets, in engineering units, an inactive zone above the Low Alarm limits and below the High Alarm limits. The Alarm Deadband prevents the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This prevents the Alarm Log from being over-filled with data.

7.1.2 Analog Output (AO) Configuration

Analog outputs are analog signals the ROC generates and sends to regulate equipment such as any analog device requiring proportional control.

Select **Configure** > **I/O** > **AO Points**. The Analog Output screen displays.

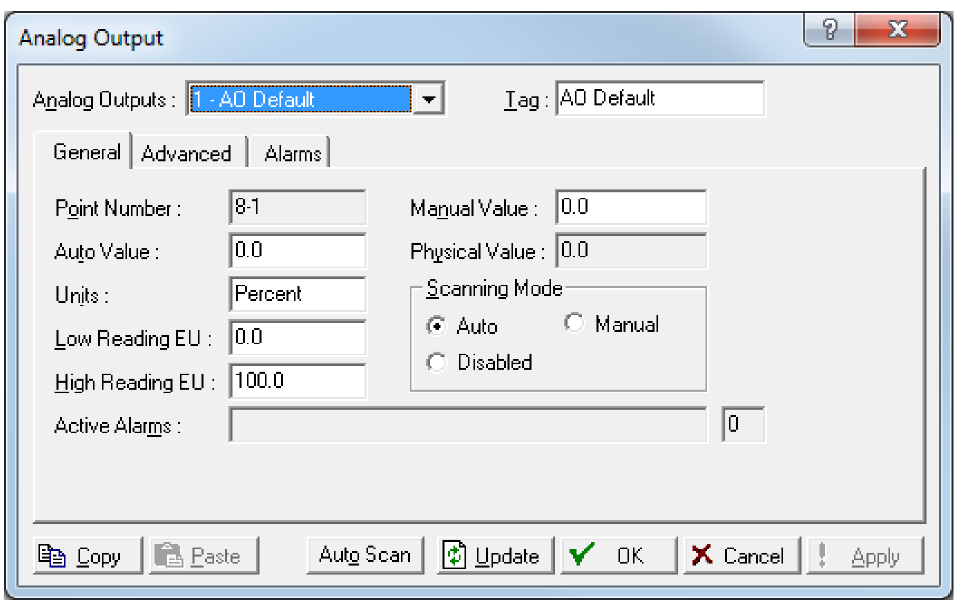


Figure 7-13. Analog Output screen

The Analog Output screen has three tabs. Use each tab to configure a component of the output:

- Use the **General tab** to set the basic parameters for the analog output point.
- Use the **Advanced tab** to configure features, such as on-restart power settings and RBX alarming.
- Use the **Alarms** tab to set the alarm parameters for the AO point.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start

AO: General Tab

Select **Configure > I/O > AO Points**. The Analog Output screen displays with the General tab active. Use this tab to set the basic parameters for the analog output point.

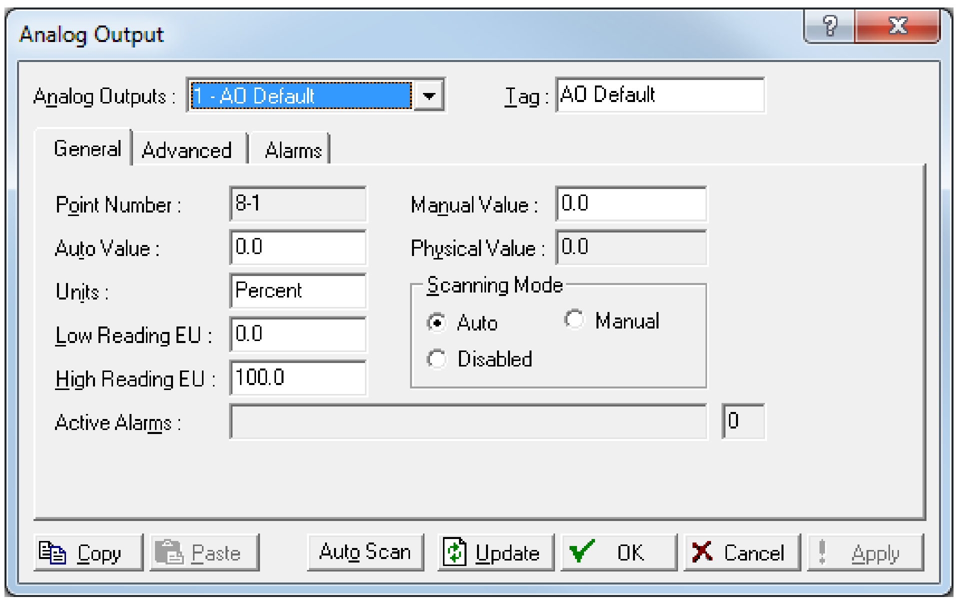


Figure 7-14. AO – General tab

Field	Description
Analog Outputs	Selects the analog output to be configured. Click ▼ to display all available analog outputs. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Provides a 10-alphanumeric characters) identifier associated with each point. **Note:** The selection in this field applies to **each** tab on this screen.
Point Number	This **read-only** field shows the rack location for this point.

Field	Description
Auto Value	Reads the value from the field device. When scanning is **disabled**, enter a value to override the output. If scanning is **enabled**, this field displays the last analog scan in engineering units.
Units	Sets the engineering units for the I/O (such as IN H2O, PSIG, MCF, degrees F, milliamps, percentage or volts).
Low Reading EU	Sets the engineering unit (EU) for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding analog signal.
High Reading EU	Sets the engineering unit (EU) for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding analog signal.
Manual Value	When the Scanning Mode is set to Manual, use **Manual Value** to enter the value instead of the Auto Value field.
Physical Value	The **read-only** field shows the current state of the AO. When the AO is in Manual Mode, this should reflect the Manual Value. When the AO is in Auto mode, this should reflect the Auto Value.
Scanning Mode	Sets the scanning option for this point. Valid values are **Auto** (automatically process the field input and display the last analog output scan in the Auto Value field), **Disabled** (do not permit any updates of the Auto Value or Manual Value fields), or **Manual** (enter the value in the Manual Value field). **Note:** If you enable alarming, the ROC generates a Manual Mode alarm when Scanning is Disabled.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear. **Note:** A read-back error indicates the AO is driving the output to a set level, but the loop is not responding. Example: An I/P converter is connected to the A/O and set to 25%. If the I/P is not connected or an open wire occurs, a read-back error would display.

AO: Advanced Tab

Use the Advanced tab to configure features such as resetting and output values for the analog output.

Select **Configure**.> **I/O** > **AO Points** > **Advanced** tab. The Advanced screen displays.

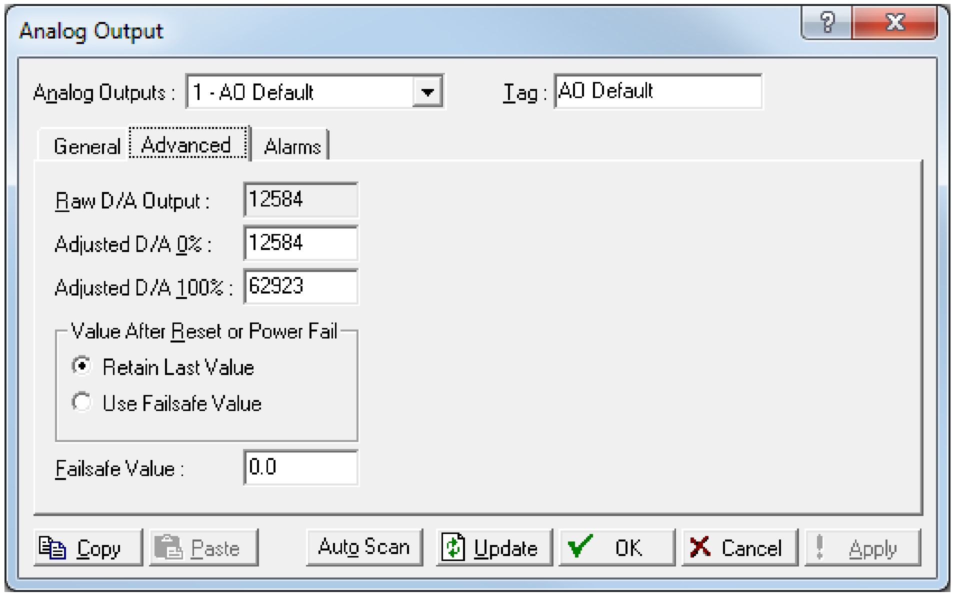


Figure 7-15. AO – Advanced tab

Field	Description
Raw D/A Output	This **read-only** field shows the current counts written to the digital-to-analog converter. The D/A value set to the AO is the raw D/A output. The default value is **0**.
Adjusted D/A 0%	Sets the count the digital-to-analog converter uses for zero percent output. This value is also used to scale the output to engineering units. The default is **0**.
Adjusted D/ A 100 %	Sets the count decoded by the digital-to-analog converter for 100 percent output. This value is also used to scale the output to engineering units.
Value After Reset or Power Fail	Sets what value the system uses on a power restart or a warm start. Valid values are **Retain Last Value** (maintain last output value) or **Use Failsafe Value** (use specified value). Retain Last Value is the **default**. **Note**: If you select **Use Failsafe Value**, you must also complete the Failsafe Value field.
Failsafe Value	If you select **Use Failsafe Value**, complete this field to indicate a value the system uses on a power restart or a warm start.

AO: Alarms Tab

Use this tab to enable or disable alarming and to indicate when RBX reporting occurs. Select **Configure > I/O > AO Points > Alarms** tab. The Alarms screen displays.

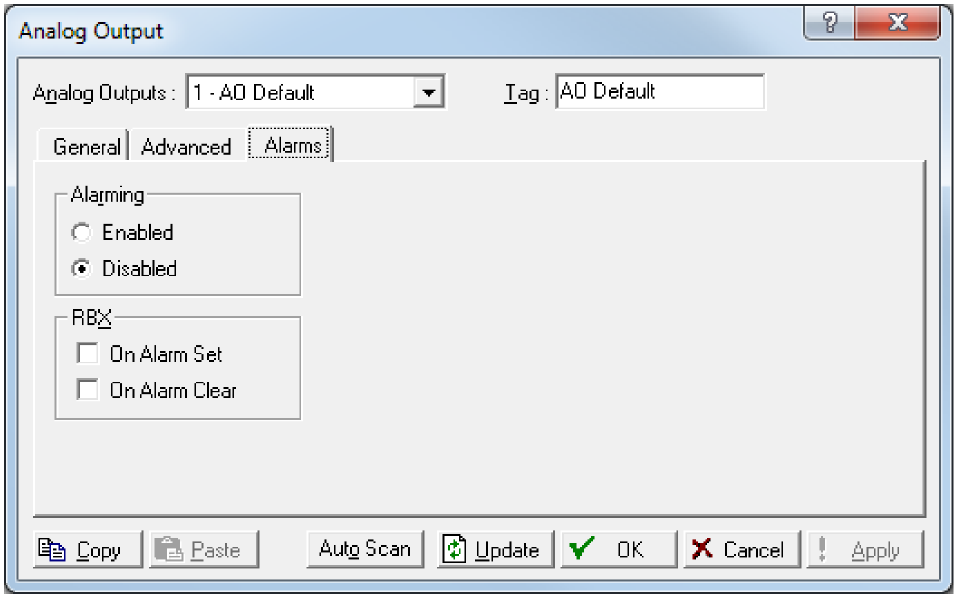


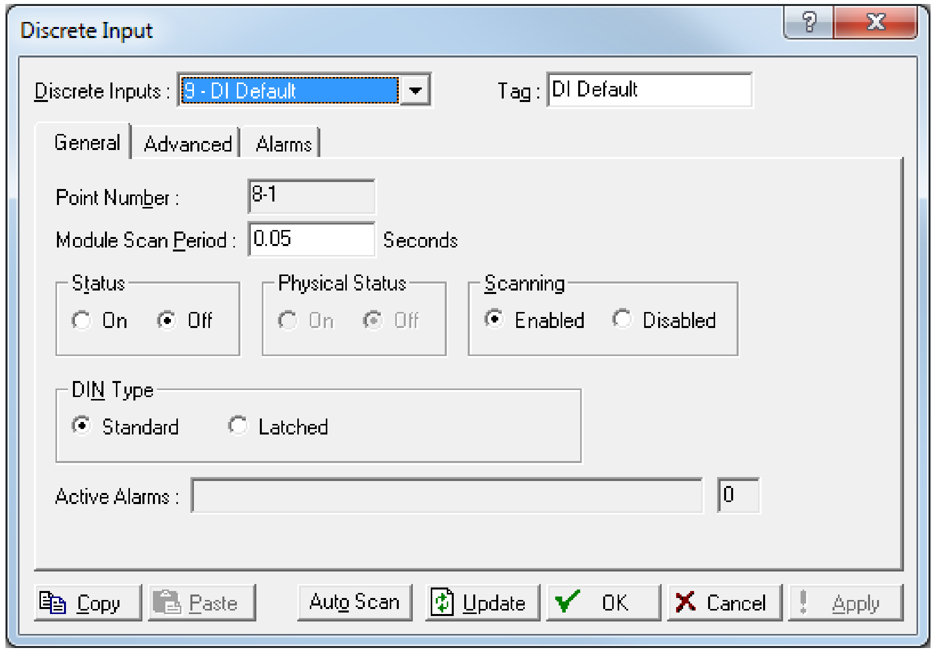
Figure 7-16. AO – Alarms tab

Field	Description
Alarming	Sets **Alarming** to generate alarms on point failure. When Alarming is Disabled, the Point Fail alarm appears in the Active Alarms field, but will not be written to the Alarm Log. To conserve Alarm Log space, enable alarms only when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one so that no false alarms generate.
RBX	Sets the **RBX Alarming** option to configure Spontaneous-Report-By-Exception (SRBX or RBX) alarming for this point. Valid values are **On Alarm Set** (which generates an RBX message to the host when the point **enters** an alarm condition) and **On Alarm Clear** (which generates an RBX message to the host when the point **exits** an alarm condition). **Note:** RBX Alarming requires you to configure the communications port.

7.1.3 Discrete Input (DI) Configuration

Discrete Input (DI) modules monitor the status of relays, open collector/open drain type solid-state switches, and other two-state devices. Each DI channel can also be software configured to function as a "latched" DI, which remains in the active state until reset. Other parameters can invert the field signal and gather statistical information on the number of transitions and the time accumulated in the on or off state.

Select **Configure > I/O > DI Points**. The Discrete Input screen displays.



The Discrete Input screen has three tabs. Use each tab to configure a component of the input.

- Use the **General** tab to set the basic parameters for the DI point.
- Use the **Advanced** tab to configure features, such as filtering, input inversion, and counter values for the discrete output.
- Use the **Alarms** tab to set the alarm parameters for this DI point.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start

DI: General Tab

Select **Configure > I/O > DI Points**. The Discrete Input screen displays with the General tab active. Use this tab to set the basic parameters for the discrete input point.

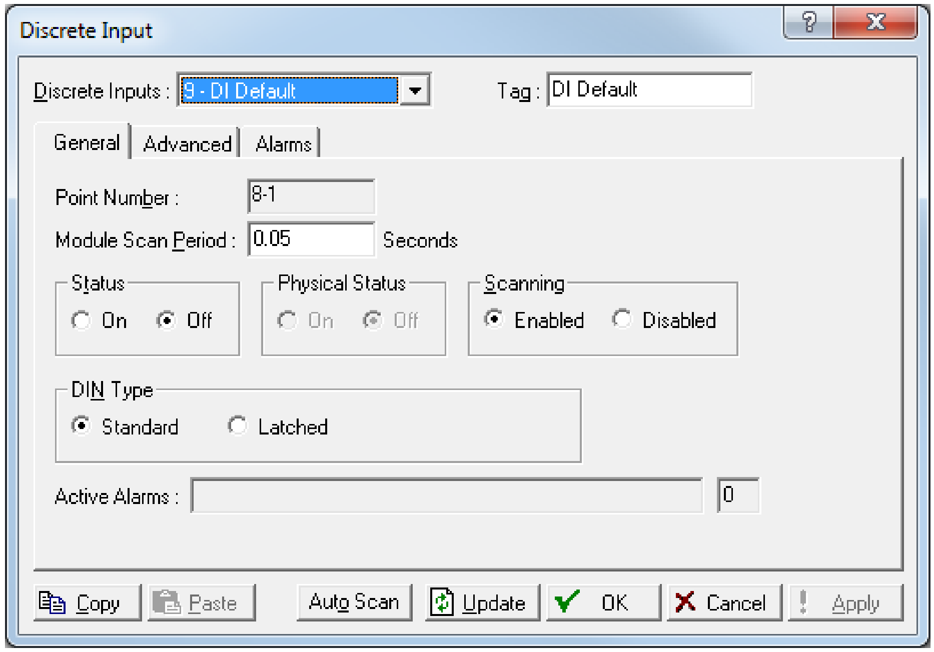


Figure 7-17. DI – General tab

Field	Description
Discrete Inputs	Selects the discrete input to be configured. Click ▼ to display all available discrete inputs. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Sets a short (10 alphanumeric characters) identifier for the point. **Note:** The selection in this field applies to **each** tab on this screen.
Point Number	This **read-only** field shows the rack location for this point.
Module Scan Period	Sets, in seconds, how frequently the system scans the input.
Status	Sets the state of the discrete input. Valid values are **On** (indicates that a contact is closed or input is on) or **Off** (indicates that a contact is open or input is off). **Off** is the **default**.
Physical Status	This **read-only** field shows the state of the hardware. **Off** normally indicates that a switch is open; **On** normally indicates that a switch is closed. This may be different from the Status if Inverting or Latching is in effect.
Scanning	Sets the scanning option for this point. Valid values are **Enabled** (automatically process the field input) or **Disabled** (do not process the input).
DIN Type	Sets how the DI functions. Valid values are **Standard** (follow the actual field input) and **Latched** (maintain the input status). During an active transition from off to on, Latched mode enables the DI to remain in the on state until you clear the Status parameter either manually or through the software.

Field	Description
Active Alarms	This **read-only** field shows any active alarms for this point. When you enable alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you disable alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear. Refer to User Interface Basics.

DI: Advanced Tab

Use the Advanced tab to configure features such as filtering, input inversion, and counter values for the discrete input.

Select **Configure** > **I/O** > **DI Points** > **Advanced** tab. The Advanced screen displays.

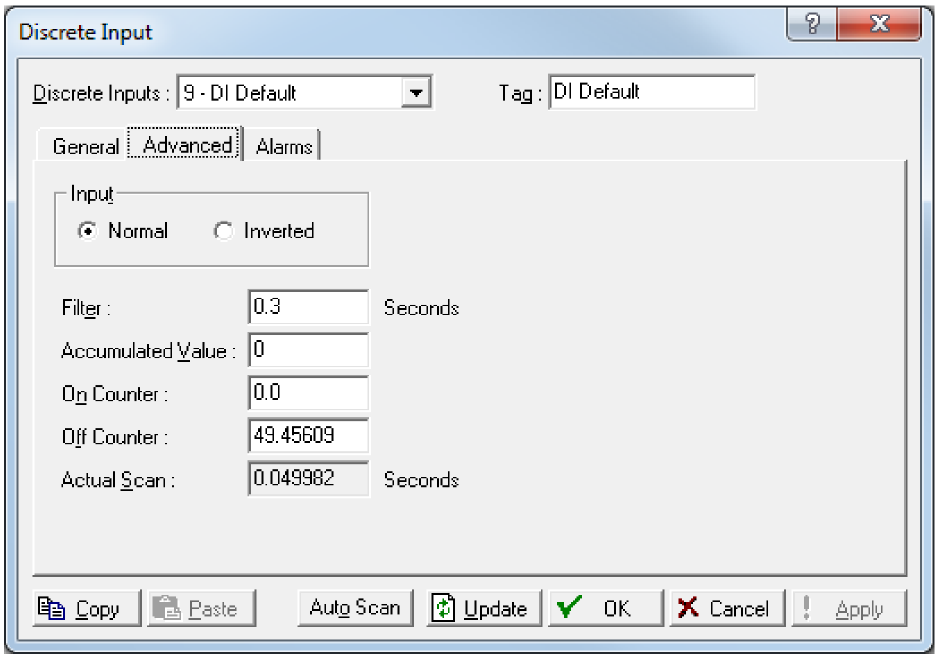


Figure 7-18. DI – Advanced tab

Field	Description
Input	Sets the state of the input. Valid values are **Normal** (field input operates normally, so that On is On) or **Inverted** (inverts the field input in the Status field so that On becomes Off and vice-versa). **Normal** is the **default**. In the Inverted state, an open circuit in the field would then be indicated as On in the Status field, and closed contacts would be indicated as Off.
Filter	Sets, in seconds, the amount of time that the discrete input must remain in the On (high) state before the device recognizes it as such. Enter a value between **0** to **255**. The discrete input returns to the Off state immediately upon detection of the On to Off transition; there is no filtering for this transition.

Field	Description
Accumulated Value	Counts the number of times the discrete input goes from Off to On. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator by entering the desired value or clear the accumulator by entering **0**.
On Counter	Counts the number of 50-millisecond periods when the Status parameter is in the On state. The On Counter is a 32-bit number that automatically rolls over when it reaches its maximum value. You can preset the On Counter by entering the desired value or clear the counter by entering **0**. **Note:** The On Counter does not function if you **disable** scanning.
Off Counter	Counts the number of 50-millisecond periods when the Status parameter is in the Off state. The Off Counter is a 32-bit number that automatically "rolls over" when it reaches its maximum value. You can preset the Off Counter by entering the desired value or clear the counter by entering **0**. **Note:** The Off Counter does not function if you **disable** scanning.
Actual Scan	This **read-only** field shows the actual amount of time in seconds that passes between scans. This number should be the same as shown for the Module Scan Period parameter if the system is not overloaded.

DI: Alarms Tab

Use the Alarms tab to configure the alarm parameters for this discrete input.

1. Select the **Alarms** tab. The Alarms screen displays.

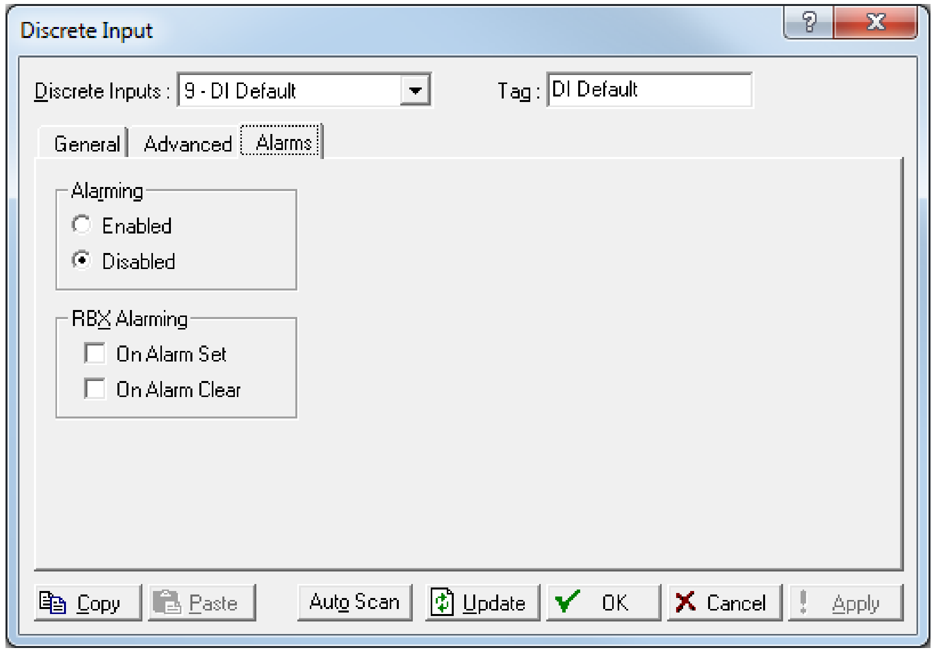


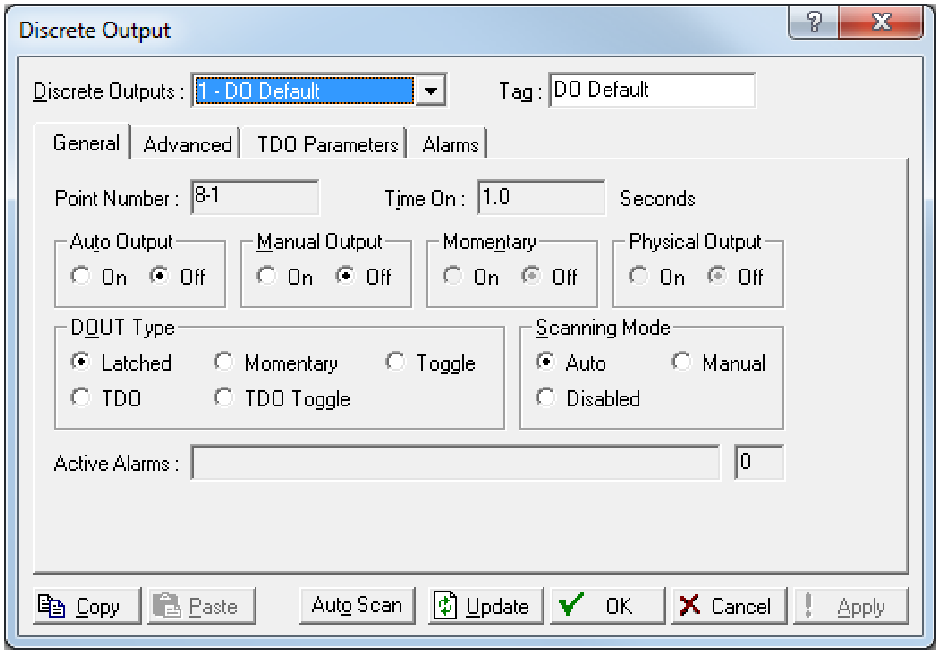
Figure 7-19. DI – Alarms tab

Field	Description
Alarming	Sets the alarm option for the selected point. Valid values are **Enabled** (generates an alarm when the point's status changes) or **Disabled** (no alarm generates). The default is **Disabled**. When you disable alarming, the Status Change alarm appears in the Active Alarms field, but is not written to the Alarms log. **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you enable alarming, the system generates an alarm if you disable scanning.
RBX Alarming	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are **On Alarm Set** (which generates an RBX message to the host when the point **enters** an alarm condition) or On Alarm Clear (which Generates an RBX message to the host when the point **exits** an alarm condition): **Note:** RBX Alarming also requires you to configure the communications.

7.1.4 Discrete Output (DO) Configuration

Discrete outputs are high/low outputs used to turn equipment on and off. You can set a discrete output to send a pulse to a specified device. You can also configure a discrete output as latched, momentary, toggle, Timed Duration Output (TDO), and TDO toggle.

Select **Configure** > **I/O** > **DO Points**. The Discrete Output screen displays.



Examine the default settings and adjust the parameters to suit your application on each of the tabs.

- Use the **General** tab to set the basic parameters for the DO point.
- Use the **Advanced** tab to configure accumulated value and state for reset for the selected DO.
- Use the **TDO Parameters** tab to configure TDO parameters.
- Use the **Alarms** tab set the alarm parameters for this DO point.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start

DO: General Tab

Select **Configure > I/O > DO Points**. The Discrete Output screen displays with the General tab active. Use this tab to configure the basic parameters for the DO point.

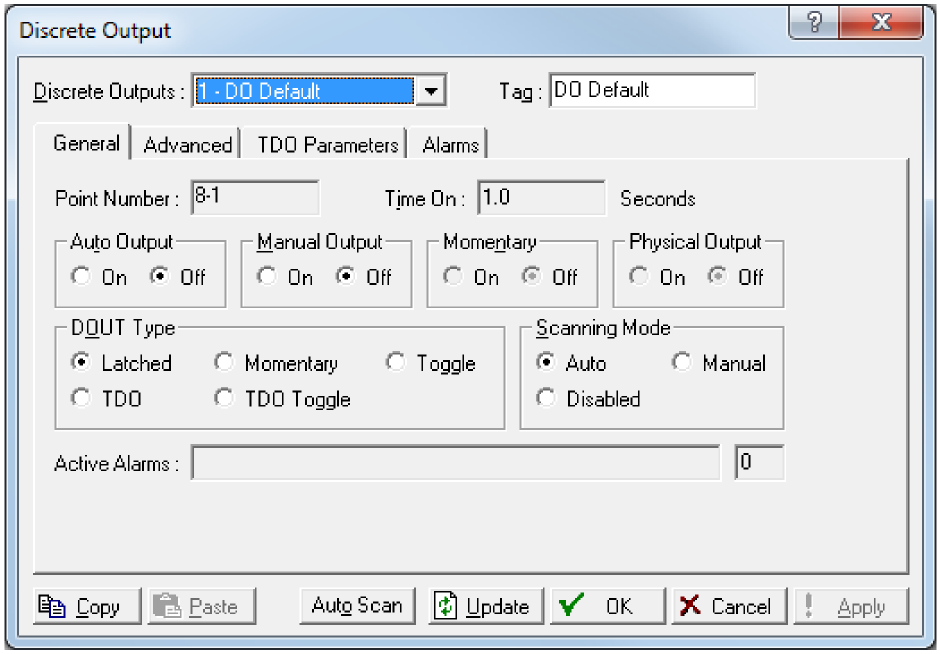


Figure 7-20. DO – General tab

Field	Description
Discrete Outputs	Selects the discrete output to be configured. Click to display all available discrete outputs. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Provides a 10-alphanumeric character identifier associated with each point. **Note:** The selection in this field applies to **each** tab on this screen.
Point Number	This **read-only** field identifies the rack location for this point.
Time On	This **read-only** field shows, in seconds, the amount of time for momentary operation. The default value is **1.0** seconds for a DO. The default value is **5** milliseconds for an ACIO DO. **Note:** In Momentary mode, this is the amount of time (in seconds) that the momentary contact is energized. In the Toggle mode, this is the time (in seconds) between switching On or Off. In the TDO and TDO Toggle modes, the TDO configuration calculates this value.
Auto Output	Indicates the state of the discrete output. Valid values are **Off** (the output is off or a switch is open) and **On** (the output is on or a switch is closed). The **default** is **Off**. .
Manual Output	Indicates the state of the discrete output. Valid values are **Off** (the output is off or a switch is open) and **On** (the output is On or a switch is closed). Select **On** and click **Apply** to force one transition of the DO.

Field	Description	
Momentary	This **read-only** field shows the state of the discrete output when the DOUT Type is set to **Momentary**. Valid values are **Off** (the output is off or a switch is open) and **On** (the output is on or a switch is closed).	
Physical Output	This **read-only** field shows the actual status of the output channel at the field terminations regardless of the DOUT Type selected.	
DOUT Type	Selects the function of this discrete output. Valid values are:	
	Latched	Changes on an active transition of the output (from off to on). The discrete output remains On until cleared by selecting Off in the Auto Output field.
	Momentary	Enables ROCLINK 800 to activate the discrete output for the amount of time defined in the **Time On** field.
	Toggle	Enables a square-wave output for which both the time on and time off are defined by the value in the **Time On** parameter. Time on and time off are equal. Use the TDO Parameters tab to define time-related parameters.
	TDO	Enables the discrete output to have a time duration between On and Off transitions based on time-related parameters configured in the TDO Parameters tab.
	TDO Toggle	Enables the discrete output to continuously repeat in a cycle defined by the value in the **Cycle Time** field on the TDO Parameters tab where the EU Value controls the on-time duration.

Field	Description
Scanning Mode	Sets the scanning type to configure how the DO is scanned. Valid values are: **Auto** – Automatically processes the field output. **Manual** – Prevents the ROC from updating the DO value; permits only manual updates of the output value. Set Manual Output to **On** and click **Apply** to override the output. **Disabled** – Prevents the ROC from updating the DO value; permits a manual process of the last output scan. . Set Auto Output to **On** and click **Apply** to override the output. **Note:** If you enable alarming, the ROC generates a Manual Mode alarm when scanning is disabled.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.

DO: Advanced Tab

Use this tab to configure accumulated value and state for reset for the selected DO.

1. Select **Configure** > **I/O** > **DO Points** > **Advanced** tab. The Advanced screen displays.

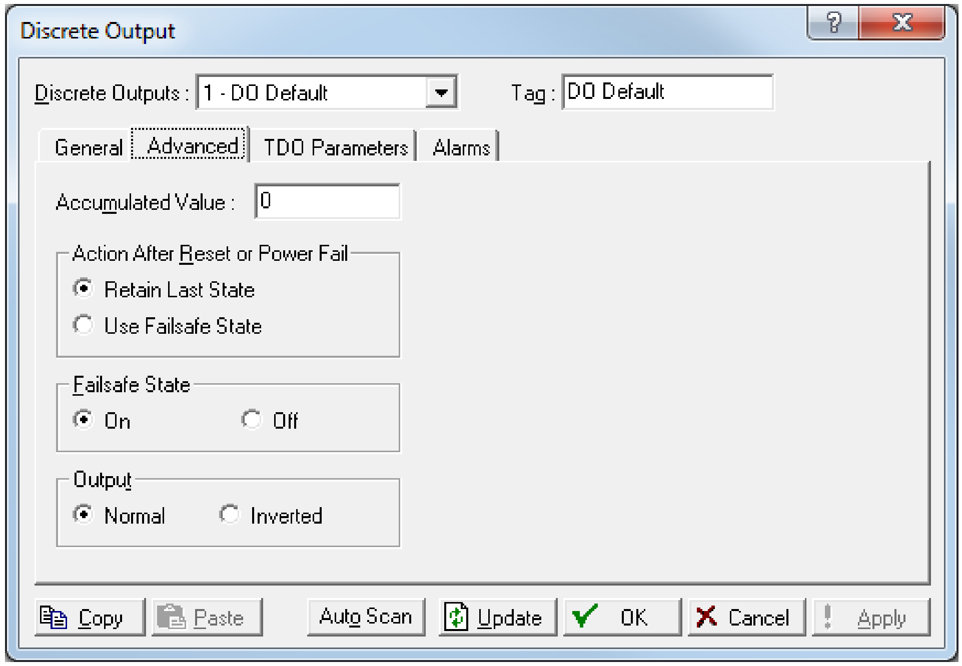


Figure 7-21. DO – Advanced tab

Field	Description
Accumulated Value	Sets a value for the accumulated number of off-to-on transitions for the discrete output. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator to a desire value or clear it by enter zero (**0**).
Action After Reset or Power Fail	Indicates how the ROC handles the discrete output relay state on power reset or failure. Valid values are **Use Failsafe Mode** (discrete output uses value set in the Failsafe State frame: On or Off) or **Retain Last Status** (ROC retains the DO state, whether off or on).
Failsafe State	Indicates whether the failsafe state is active following a reset due to a power restart or warn start. Valid values are **On** or **Off**. **Note**: If you select **On**, you must also indicate (on the General tab) whether the **Auto Output** or **Manual Output** is set to On or Off after a reset of the ROCt.
Output	Indicates the state of the DO output. Valid values are **Normal** (energizes in time on) or **Inverted** (energizes in time off). Selecting Inverted inverts **all** outputs in **any** mode. **Note:** If Failsafe State is set to On **and** Inverted is On, the Failsafe State returns to Off following a reset.

DO: TDO Parameters Tab

Use this tab to configure time duration parameters for this DO point.

Notes: To correctly configure time duration DO, ensure that you have selected **TDO** in the DOUT Type field and **Auto** as the Scanning Mode on the General tab for DO.

1. Select **Configure** > **I/O** > **DO Points** > **TDO Parameters** tab. The TDO Parameters screen displays.

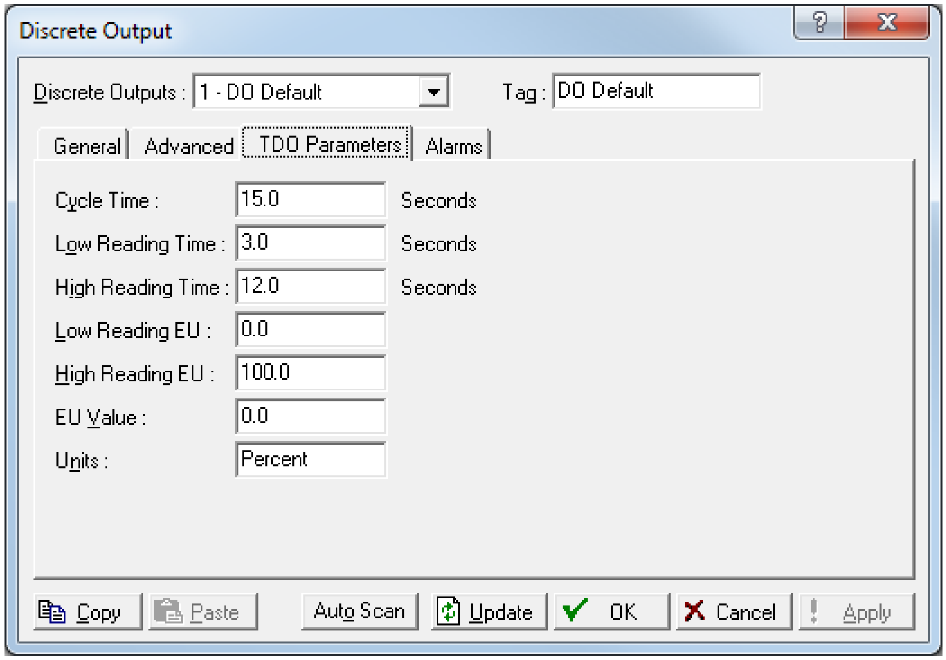


Figure 7-22. DO – TDO Parameters tab

Field	Description
Cycle Time	Sets, in seconds, the total amount of time the cycle spends in the on and off positions. The default is **15** seconds. The system uses Cycle Time to define the Off time in the TDO Toggle mode using the formula. Off Time = Cycle Time – On Time For example, a TDO is used to emulate a field instrument measuring flow. The TDO outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow. The output is repeated every 15 seconds. If the Cycle Time is less than or equal to the On Time, set the Off Time to **1** (one). Care must be taken in configuration (including other places, such as FSTs) to ensure that **the Cycle Time remains greater than the calculated On Time** for proper operation.

Field	Description
Low Reading Time	Sets, in seconds, the **Low Reading Time** (0% Count) that represents a zero percent output pulse width. The default is **3** seconds. This is the minimum amount of time that the TDO can be energized to move the motor. Set to a value that allows movement, but also provides good resolution of control.
High Reading Time	Sets, in seconds, the **High Reading Time** (100% Count) that represents a 100 percent output pulse width. The default is **12** seconds. This is the maximum amount of time that the TDO can be energized to move the motor. Normally, this is the amount of time it takes for the actuator to move the valve from fully open to fully closed.
Low Reading EU	Sets the engineering unit (EU) for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
High Reading EU	Sets the engineering unit (EU) for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
EU Value	Current value, displayed in engineering units. In TDO Toggle mode, the EU Value controls the Time On: On Time = ((EU Value – Low Reading EU) / (High Reading EU – Low Reading EU) * (High Time – Low Time)) + Low Time
Units	Sets the engineering units for the discrete output (such as percentage, IN H2O, PSIG, MCF, degrees F, milliamps, and volts).

Defining the Output Pulse

To define the TDO output pulse:

1. Select **Configure > I/O > DO Points**. The Discrete Output screen displays.
2. Select a DOUT Type of **TDO** or **TDO Toggle**.
   - **TDO (Timed Duration)** – The single-pulse output can be triggered by writing to the Status or the EU Value parameter of the DO point. This can be accomplished directly, by a PID point, or by an FST.
   - **TDO Toggle** – A continuous pulse is generated with the pulse length being controlled by writing to the EU Value parameter in the DO point. This can be accomplished directly or by an FST.
3. Click the **TDO Parameters** tab.

The output pulse from the TDO function must be defined for proper engineering unit (EU) conversion. The minimum pulse width (Low

Reading Time / 0% Count) and the maximum pulse width (High Reading Time / 100% Count) define the minimum and maximum On time of the output pulse. The values entered in the Low Reading Time and High Reading Time represent the number of seconds the output is On.

Example:
A TDO is used to emulate a field instrument measuring flow. The TDO outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow.

Low Reading Time (0% Count) = 3 seconds

High Reading Time (100% Count) = 12 seconds

Low Reading EU = 0

High Reading EU = 1000

DO: Alarms Tab

Use this tab to set the alarm parameter for this DO point. Select **Configure > I/O > DO Points > Alarms** tab. The Alarms screen displays.

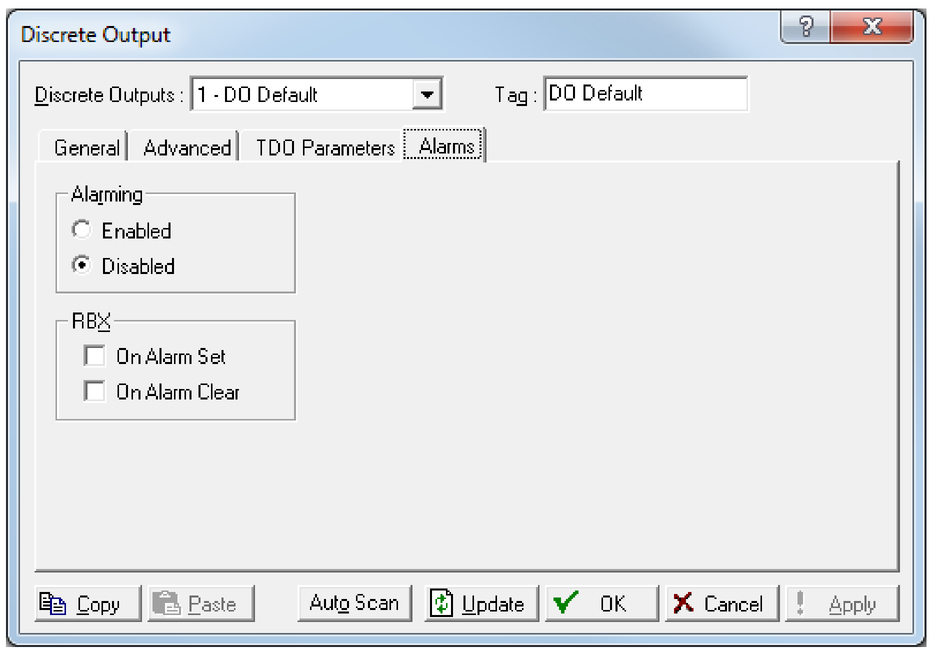


Figure 7-23. DO – Alarms tab

Field	Description
Alarming	Sets the alarm option for this point. Valid values are **Enabled** (enables alarming) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you enable alarming, the system generates an alarm if you disable scanning.
RBX	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are **On Alarm Set** (which generates an RBX message to the host when the point **enters** an alarm condition) and **On Alarm Clear** (which generates an RBX message to the host when the point **exits** an alarm condition). **Note:** RBX Alarming requires you to configure the communications port.

7.1.5 Discrete Output Relay (DOR) Configuration

The Discrete Output Relay (DOR) module provides the ROC800 with the ability to control various discrete output field devices.

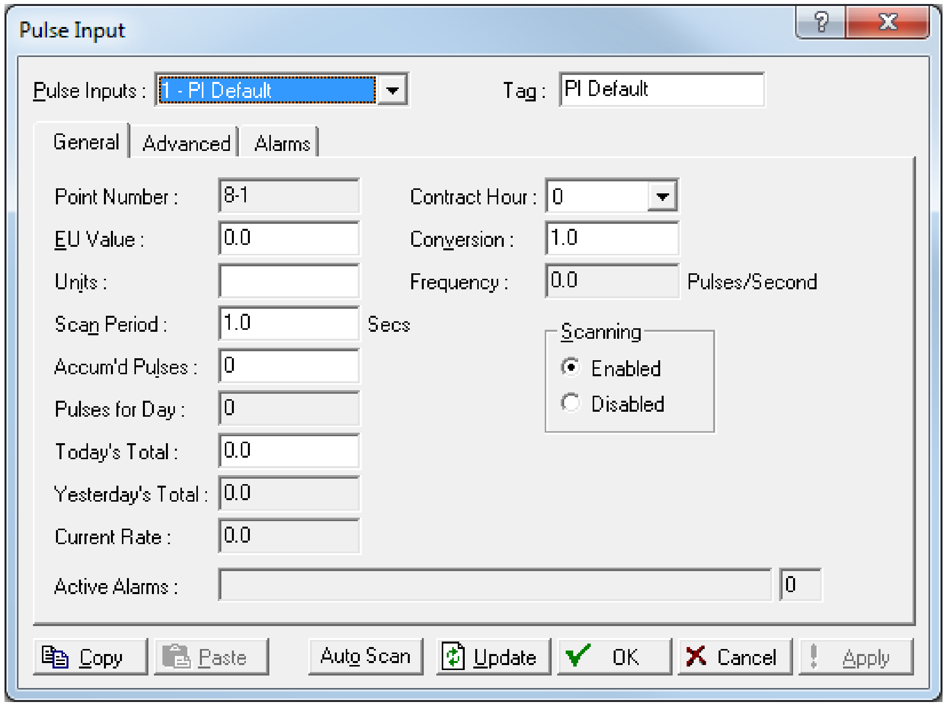
The DOR module provides six channels of discrete outputs. DOR modules use mechanical (SPST) latching relays to provide a set of normally-open dry contacts capable of switching 2 A at 32 Volts dc across the complete operating temperature. DO Relays are high/low outputs used to turn equipment on and off. You can set a discrete output to send a pulse to a specified device

You configure the DOR module as you would a DO module. The major difference occurs in how you wire the modules. For that information, refer to *Chapter 4* of the *ROC800-Series Remote Operations Controller Instruction Manual* (A6175).

7.1.6 Pulse Input (PI) Configuration

Pulse Input (PI) modules accept pulse trains (square wave signals) that measurement devices (such as turbine meters) generate. The pulse input accepts digital level on/off signals from an external device and accumulates the changes over a configured period of time. The PI can also determine a rate from the accumulated pulses over a configured period of time.

Select **Configure > I/O > PI Points**. The Pulse Input screen displays.



The Pulse Input screen has three tabs. Use each tab to configure a component of this input.

- Use the **General** tab to set the basic parameters for the PI point.
- Use the **Advanced** tab to configure features, such as EU Options, Rate Period, Rollover value, and Conversion for the pulse input.
- Use the **Alarms** tab to set the alarm parameters for this PI point.

Note: If you enable Alarming, configure the limit alarms (four levels, rate, and deadband) on the Alarms tab. By disabling alarms, you can prevent alarms from generating for this point. To conserve alarm log space, enable alarms only when necessary. If you do not plan to use all the alarms, check and adjust the value of each one to prevent the generation of false alarms.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start.

PI: General Tab

The Pulse Input screen initially displays the General tab. Use this tab to set the basic parameters for the pulse input point. Select **Configure > I/O > PI Points**.

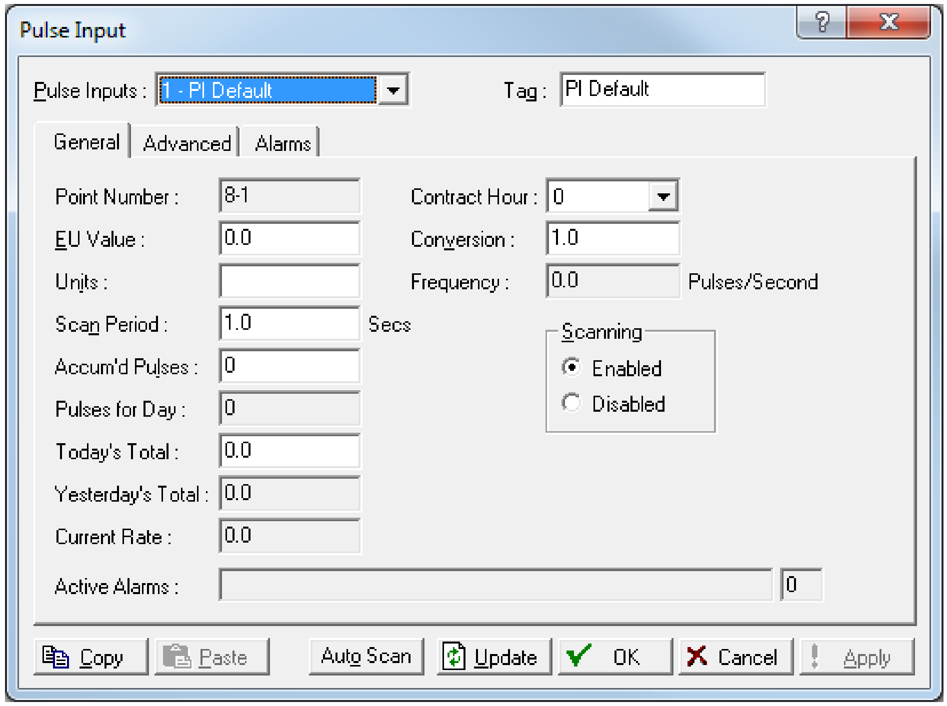


Figure 7-24. PI – General tab

Field	Description
Pulse Inputs	Selects the pulse input to configure. Click ▼ to display all available pulse inputs. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Sets a short (10 alphanumeric characters) identifier for the point. **Note:** This selection in this field applies to **each** tab on this screen.
Point Number	This **read-only** field shows the rack location (module slot and channel number) for this point.
EU Value	Sets the value for engineering units (EUs). The **EU Value** is dependent on how you set the EU Options on the Advanced tab. If you set up the PI as a Rate (Max Rollover), then the system assigns the Current Rate to the EU Value. If you set up the PI as an accumulator using Today's Total (Max Rollover), then the system assigns Today's Total to the EU Value. If you set up the PI as an accumulator using Running Total (Entered Rollover), then the EU Value corresponds to the accumulated pulses times the Conversion. The system compares the EU Value to the value entered for the Rollover Value. If the EU Value is greater than or equal to the entered Rollover Value, the system sets the EU Value here to zero.
Units	Sets the engineering units for the I/O (In H2O, PSIG, MCF, degrees F, milliamps, or volts).

Field	Description
Scan Period	Sets, in seconds, the amount of time between scans of the EU Value. The default value is **1.0** second. The system calculates this rate by counting the number of pulses during the scan interval and dividing by the time interval. To avoid highly fluctuating calculation results, typically at least 10 pulses should occur between scans at low flow conditions. For example, if a flow meter produces one pulse per second at low flow, then set the Scan Period value to a minimum of **10** seconds. **Note:** Once the system reaches the scan period, it updates the values in the Accum'd Pulses, Pulses Today, Today's Total, Yesterday's Total, and Current Rate fields.
Accum'd Pulses	Sets the number of raw counts stored in the accumulated value counter in firmware. For each scan period, the ROC determines the number of raw counts that have occurred since the last scan period and adds them to the accumulated value counter. The accumulated value rolls over to zero after reaching 16,000,000.
Pulses For Day	This **read-only** field shows the total number of pulses that the PI has received for the contract day. At the end of the contract day, the ROC zeros this field and starts over, only if being totalized in History. The Contract Hour is specified on this screen.
Today's Total	Displays the total EU Values accumulated for the current contract day, calculated by multiplying the conversion value by the accumulated pulses. The system resets this value to zero at the contract hour.
Yesterday's Total	This **read-only** field shows the total EU Value accumulated the previous contract day, calculated as the previous day's Today's Total value at the contract hour before being cleared.
Current Rate	This **read-only** field shows the calculated rate as of the most recent scan expressed in EUs per unit of time. You select time units using the Rate Period field on the Advanced tab. The system calculates the rate at the end of each scan period by multiplying the number of pulses received by the conversion value divided by the rate period.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.

Field	Description
Contract Hour	Sets the beginning of the day for the daily counted parameters. Click ▼ to display all defined contract hours.
Conversion	Indicates a conversion factor by which the system multiplies or divides the number of pulses to determine the EU value. **Note:** You specify how the system uses this value in the Conversion field on the Advance tab.
Frequency	This **read-only** field shows, in pulses/second, the frequency of incoming pulses.
Scanning	Sets the scanning option for this point. Valid values are **Enabled** (automatically process the field input and display the last pulse input scan in the Value field) or **Disabled** (permit only manual updates of the EU Value field). **Note:** If you enable alarming, the ROC generates a Manual Mode alarm when scanning is **disabled**. If you disable scanning, you must manually enter a value in the EU Value field to override the input.

PI: Advanced Tab

Use this tab to configure features, such as EU Options, Rate Period, Rollover value, and Conversion for the pulse input.

Select **Configure > I/O > PI Points > Advanced** tab. The Advanced screen displays.

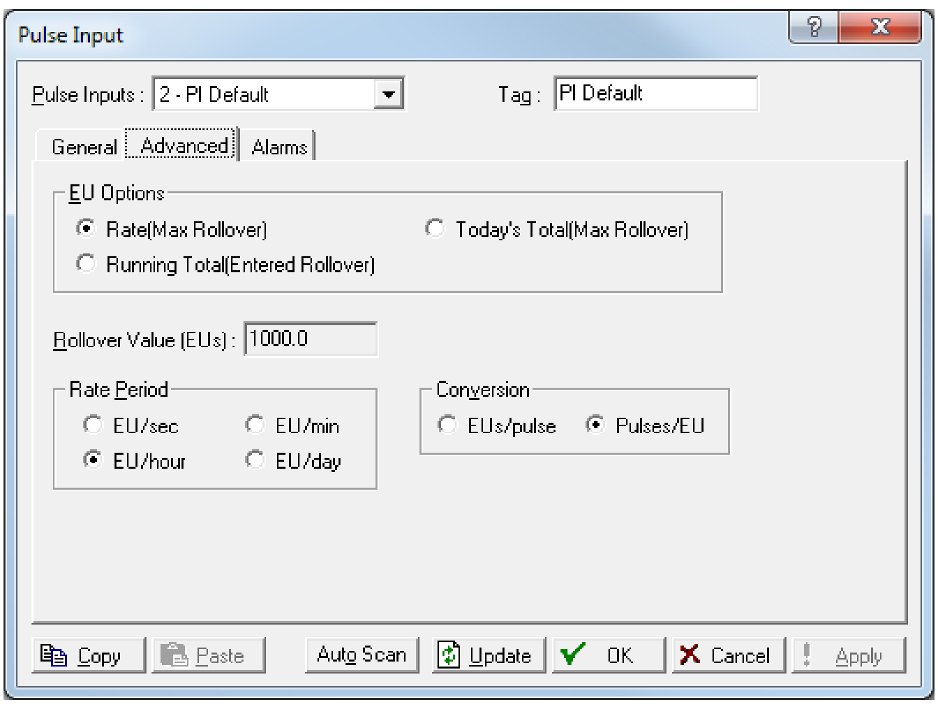


Figure 7-25. PI – Advanced tab

Field	Description	
EU Options	Sets how the system assigns the value of the engineering units (EU). Valid values are:	
	Rate (Max Rollover)	Uses the value of the Current Rate parameter (as shown on the General tab)
	Running Total (Entered Rollover)	Uses the value of Today's Total parameter (as shown on the General tab)
	Today's Total (Max Rollover)	Uses a value calculated by multiplying the accumulated pulses (shown on the General tab) by the Conversion factor. If the EU Value exceeds the Rollover value, it is cleared and starts to accumulate again from **0.**
	Note: This option **does not** clear EU values at the contract hour.	
Rollover Value (EUs)	Sets a value in EUs (not pulses) to indicate when rollover should occur. **Note:** This field is available **only** if you select **Running Total** as an EU Options value.	
Rate Period	Sets how the system calculates rates, if you selected Rate as an EU Option. Valid values are:	
	EU/sec	Calculation based on EU second totals.
	EU/hour	Calculation based on EU hourly totals.
	EU/min	Calculation based on EU minute totals.
	EU/day	Calculation based on EU daily totals.
	Note: If you select EUs/Pulse as a conversion rate and EU/min as a rate period, the system calculates Current Rate as (accumulated pulses x Conversion) ÷ (Scan Period x conversion from seconds to minutes). If you select Pulses/EU as a conversion rate and EU/hour as a rate period, the system calculates Current Rate as (accumulated pulses ÷ Conversion) ÷ (Scan Period x conversion from seconds to minutes).	
Conversion	Specifies how the number entered in the Conversion field on the PI General tab is used. Valid values are:	
	EUs/Pulse	Associates a specific number of engineering units, typically fractional parts such as 0.01, with a single pulse.
	Pulses/EU	Associates a specific number of pulses, such as 100, with one engineering unit.

PI: Alarms Tab

Use this tab to configure the alarm parameters for this PI point. You **must** enable alarming on the General tab to configure the limit alarms (Low, High, LoLo, HiHi, Rate, and Deadband) on this tab. If you disable alarming, no limit alarms generate for this point. The Point Fail alarm appears in the Active Alarms field on the General tab, but the system does not log it in the Alarms Log.

Note: To conserve alarm log space, enable alarms **only** when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one alarm to prevent the generation of false alarms

Select **Configure > I/O > PI Points > Alarms** tab. The Alarms screen displays.

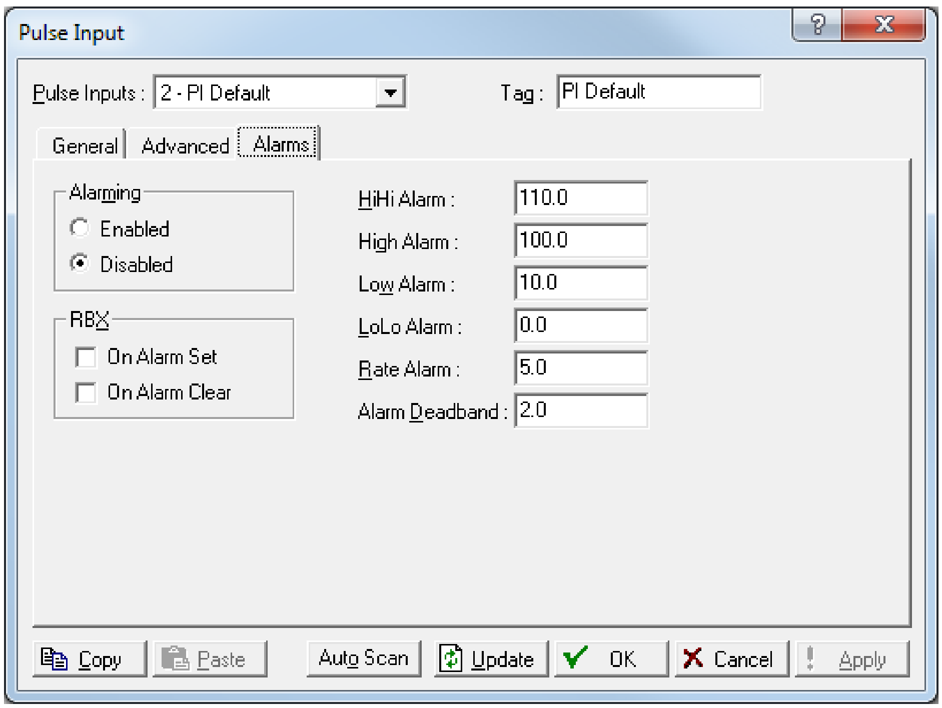


Figure 7-26. PI – Alarms tab

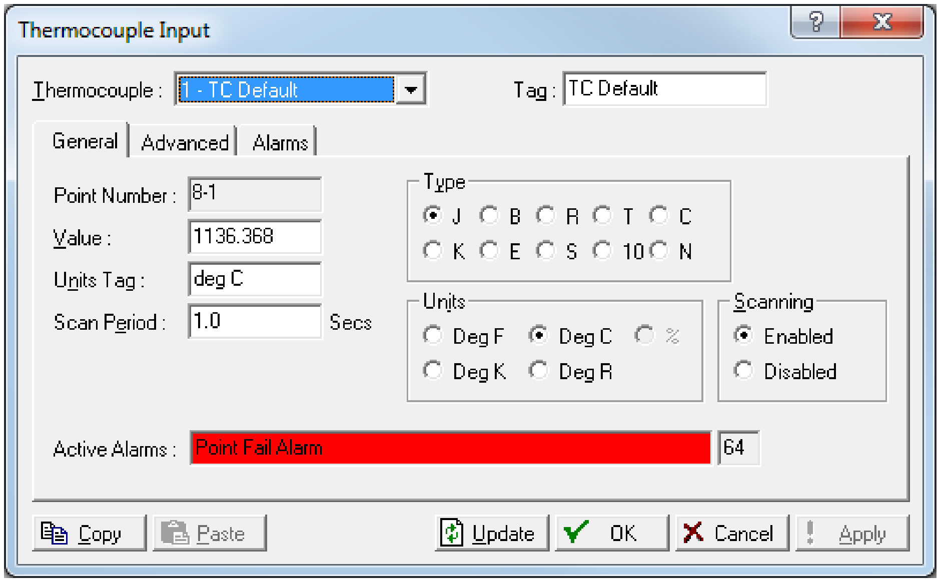
Field	Description
Alarming	Sets the alarm option for this point. Valid values are **Enabled** (configures the limit alarms - four levels, Rate, and Deadband) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you **Enable** alarming, the system generates an alarm if you disable scanning.

Field	Description
RBX	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are **On Alarm Set** (which generates an RBX message when the point **enters** an alarm condition) or **On Alarm Clear** (which generates an RBX message when the point **exits** an alarm condition). **Note:** RBX Alarming requires you to configure the the communications port.
HiHi Alarm	Sets, in engineering units, a value to which the input value must rise to generate a HiHi alarm. **Note**: Typically you set the value for the HiHi alarm higher than the value for the High Alarm.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a high alarm.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.
LoLo Alarm	Sets, in engineering units, a value to which the input value must fall to generate a LoLo alarm. **Note**: Typically you set the value for the LoLo alarm lower than the value for the Low Alarm.
Rate Alarm	Sets, in engineering units, a value that represents the maximum amount of change allowed in the calculated rate between updates before an alarm generates. If the change is equal to or greater than this value, an alarm occurs. **Note:** To disable the Rate alarm without disabling the other alarms, set the value greater than the scan value of the input.
Alarm Deadband	Sets, in engineering units, an inactive zone above the Low Alarm limit and below the High Alarm limit. The Alarm Deadband prevents the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This prevents the Alarm Log from being over-filled with data.

7.1.7 Thermocouple (TC) Input Configuration

Thermocouple (TC) Inputs monitor the extremely small voltage generated by a thermocouple sensor. These small voltages are converted to temperature values.

Select **Configure > I/O > TC Points**. The Thermocouple Input screen displays.



The Thermocouple Input screen has the following tabs. Use each tab to configure a component of the input.

- Use the **General** tab to set the basic parameters for the TC Input point.
- Use the **Advanced** tab to configure features, such as filtering and averaging for the selected TC point.
- Use the **Alarms** tab to set the alarm parameters for this TC point.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start

Thermocouple: General Tab

Select **Configure > I/O > TC Points > General** tab. to configure the basic parameters for the TC Input point.

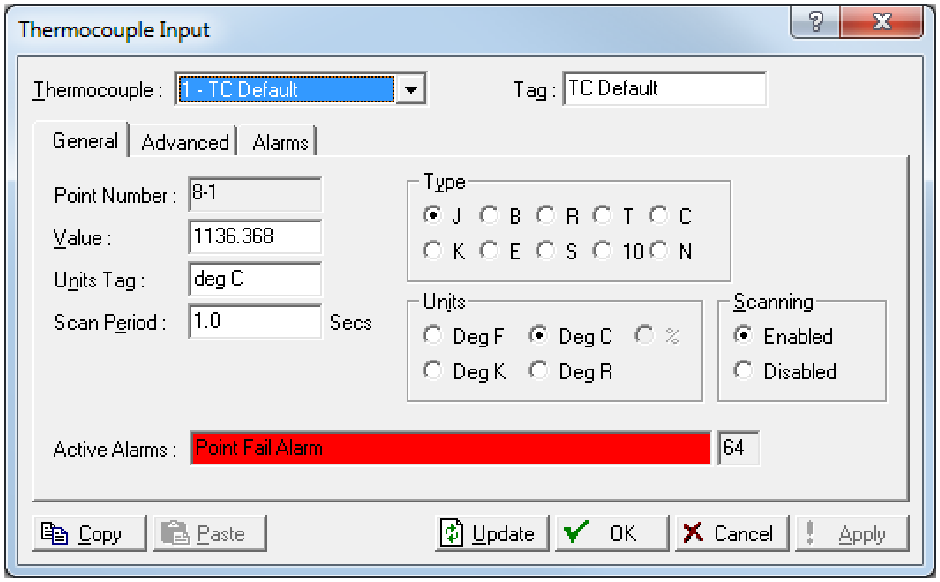


Figure 7-27. Thermocouple – General tab

Field	Description
Thermocouple	Sets the input to be configured. The inputs are listed by both number and tag. **Note:** This selection in this field applies to each tab on this screen.
Tag	Sets a 10-character string name for identification of the Point Number. **Note:** This selection in this field applies to each tab on this screen.
Point Number	Sets the value to identify the physical location of the input. The Point Number identifies the module slot. **Note:** This selection in this field applies to each tab on this screen.
Value	If Scanning is set to Disable, enter a **Value** to override the input. When Scanning is set to Enable, **Value** displays the last TC Input scan in engineering units.
Units Tag	Sets a name to display in configuration screens, reports and custom displays. This should be the same unit of measure as was chosen in the **Units Tag** field. If this field is blank, configuration screens, reports, and custom displays show a blank where the unit of measure should be.
Scan Period	Sets the amount of time between updates of the Filter value. All TC Inputs are updated based on their individual Scan Periods. The default value is **1** second. The minimum scan period allowed is 100 mSec.
Type	Sets the type of thermocouple sensor in use. For the values, refer to *Table 7-1. Thermocouple Input Type values*.
Units	Sets in which engineering unit (EU) the ROC calculates the temperature.

Field	Description
Scanning	Sets the **Scanning** option. ▪ For the input to automatically process the field input, select **Enabled** (Automatic Mode). When Scanning is set to Enabled, **Value** displays the last TC Input scan in engineering units. ▪ When Scanning is set to **Disabled** (Manual Mode), the ROC does not update the engineering unit (EU) Value. If Alarming is Enabled, an alarm generates when Scanning is set to Disabled. If Scanning is set to Disabled, enter a **Value** to override the input.
Active Alarms	This **read-only** field shows the **Active Alarms** indicating any alarms that are active for this point. When Alarming is set to Enabled, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if Alarming is Disabled, the Point Fail (hardware reports a malfunction) alarm indicator can still appear. If Alarming is set to Enabled, an alarm is generated when Scanning is disabled.

Table 7-1. Thermocouple Input Type values

TC Input Type	Accuracy/Range	25˚C	−40°C to 75° C
B	100°C to 200°C	±8°C	±16°C
	200°C to 390°C	±4°C	±8°C
	390°C to 840°C	±2°C	±4°C
	840°C to 1800°C	±1°C	±2°C
R	−50°C to 50°C	±2°C	±4°C
	50°C to 1720°C	±1°C	±2°C
S	−50°C to 50°C	±2°C	±4°C
	50°C to 1760°C	±1°C	±2°C
C	0°C to 2315°C	±0.75°C	±1.5°C
N	−270°C to −260°C	±8°C	±16°C
	−260°C to −250°C	±4°C	±8°C
	−250°C to −230°C	±2°C	±4°C
	−230°C to −150°C	±1°C	±2°C
	−150°C to 1300°C	±0.5°C	±1°C
J	−210°C to 190°C	±0.75°C	±1.5°C
	190°C to 1200°C	±0.5°C	±1°C
E	−270°C to −260°C	±3°C	±6°C
	−260°C to −225°C	±1°C	±2°C
	−225°C to −200°C	±0.75°C	±0.5°C
	−200°C to 1000°C	±0.5°C	±1°C

TC Input Type	Accuracy/Range	25˚C	−40°C to 75° C
K	−270°C to −261°C	±5°C	±10°C
	−260°C to −246°C	±2°C	±4°C
	−245°C to −180°C	±1°C	±2°C
	−179°C to −145°C	±0.75°C	±1.5°C
	−145°C to 1372°C	±0.5°C	±1°C
T	−270°C to −261°C	±4°C	±8°C
	−260°C to −251°C	±2°C	±4°C
	−250°C to −181°C	±1°C	±2°C
	−180°C to −136°C	±0.75°C	±1.5°C
	−135°C to 400°C	±0.5°C	±1°C

Thermocouple: Advanced Tab

Select **Configure > I/O > TC Points > Advanced** tab to configure features, such as filtering and averaging for the selected TC Input.

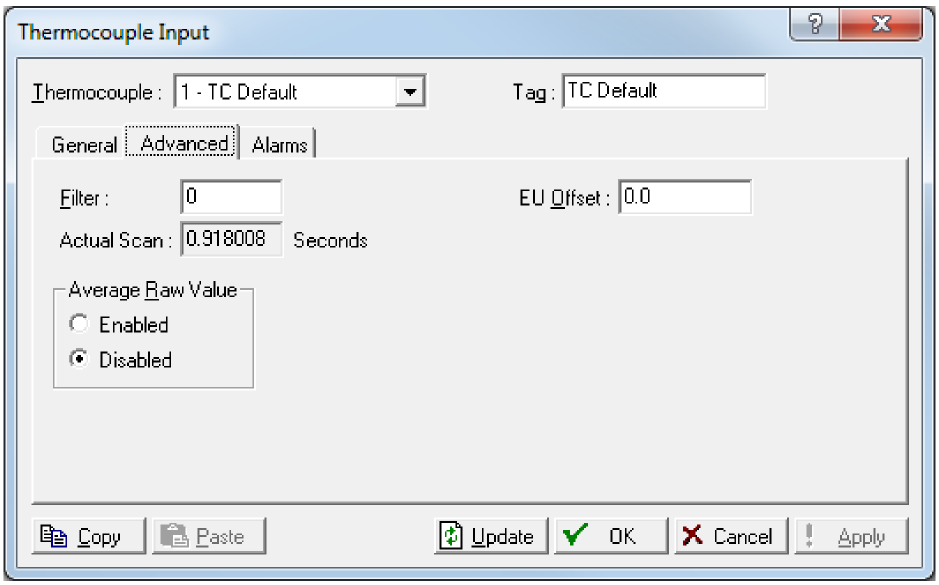


Figure 7-28. Thermocouple – Advanced tab

Field	Description
Filter	Sets a value, which is a weighted sample using a percentage of the last value, plus a percentage of the new value. The entered data is the percentage of the last value used. The filter is calculated every Scan Period by the formula: (Last Value × Entered %) + [New Value × (100 – Entered %)] = Filtered Value
Actual Scan	This **read-only** field shows the actual amount of time, in seconds, that passes between scans. This number should be the same as the Scan Period parameter if the system is not overloaded.

Field	Description
Average Raw Values	Sets how the system averages and calculates the raw readings during the Scan Period and use the outcome as the Raw A/D Input during EU calculations. For example: When Enabled, a TC Input point configured with a Scan Period of 1.5 seconds obtains a new value from the A/D every 100 milliseconds. During the Scan Period, 10 values are obtained from the A/D and summed together. At EU calculation, the values summed are divided by the Actual Scan Period display and are used as the Raw A/D Input. Disable this function to acquire instantaneous values.
EU Offset	Sets a bias the system adds to the EU Value, allowing you to set a zero shift that is applied to the entire temperature versus voltage curve.

Thermocouple: Alarms Tab

Select **Configure** > **I/O** > **TC Points** > **Alarms** tab to configure the alarm parameters for this TC point.

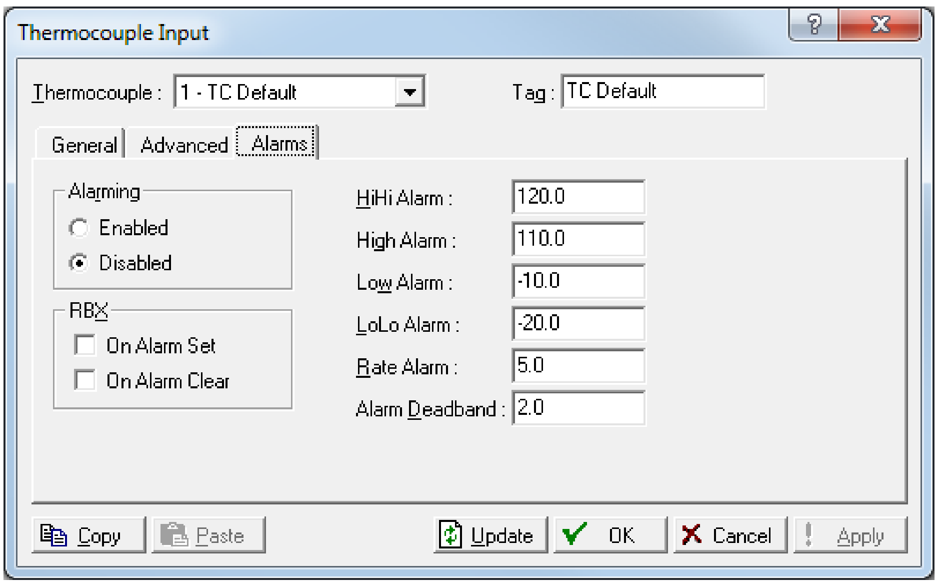


Figure 7-29. Thermocouple – Alarms tab

Field	Description
Alarming	When **Alarming** is Enabled, the limit alarms (four levels, Rate, and Deadband) are configured on the Alarms tab. When Alarming is Disabled, no limit alarms generate for this point. The Point Fail alarm appears in the Active Alarms field, but will not be logged in the Alarms Log. To conserve Alarm Log space, alarms should be enabled only when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one so that no false alarms generate.

Field	Description
RBX	If the host computer is configured to receive field-initiated calls, you can select a Report-by-Exception (RBX) option to send a Spontaneous-Report-by-Exception (SRBX) message. ▪ **On Alarm Set** – When the point enters an alarm condition, the ROC generates a RBX message. ▪ **On Alarm Clear** – When the point leaves an alarm condition, the ROC generates a RBX message. **Note:** RBX Alarming requires the communications port to be properly configured.
HiHi Alarm	Sets, in engineering units, a value to which the input value must rise to generate a HiHi Alarm. **Note:** The HiHi Alarm value is typically set higher than the High Alarm.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **High Alarm**.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.
LoLo Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **LoLo Alarm**. **Note:** The LoLo Alarm value is typically set lower than the Low Alarm.
Rate Alarm	Sets the value, in engineering units, that represents the maximum amount of change allowed between updates. If the change is equal to, or greater than this value, an alarm is generated. To disable this Rate Alarm without disabling the other alarms, the Rate Alarm value must be set greater than the Span (Range) of the TC Input.
Alarm Deadband	Sets the value, in engineering units, is an inactive zone above the Low Alarm and below the High Alarm. The purpose of the Alarm Deadband is to prevent the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This also prevents the Alarm Log from being filled with nuisance alarm trips.

7.1.8 Resistance Temperature Detector Input Configuration

RTD Inputs are analog signals generated by RTD (Resistance Temperature Detector) probes, a device to measure temperature.

Select **Configure > I/O > RTD Points**. Examine the default settings and adjust the parameters to suit your application on each of the tabs in the order given below.

- The **General** tab sets the basic parameters for the RTD Input point.

- The **Advanced** tab enables you to configure features, such as filtering, A/D conversions, and clipping for the selected RTD Input.
- The **RTD Calibration** tab is available on-line for calibration of the RTD point.
- The **Alarms** tab sets the alarm parameters for this RTD point.

After configuring a point and clicking **Apply**, use **Flash Memory Save Configuration** in the **ROC > Flags** screen to save I/O configuration to permanent memory in case you must perform a cold start.

RTD: General Tab

Select **Configure > I/O > RTD Points > General** tab to configure the basic parameters for the RTD Input point.

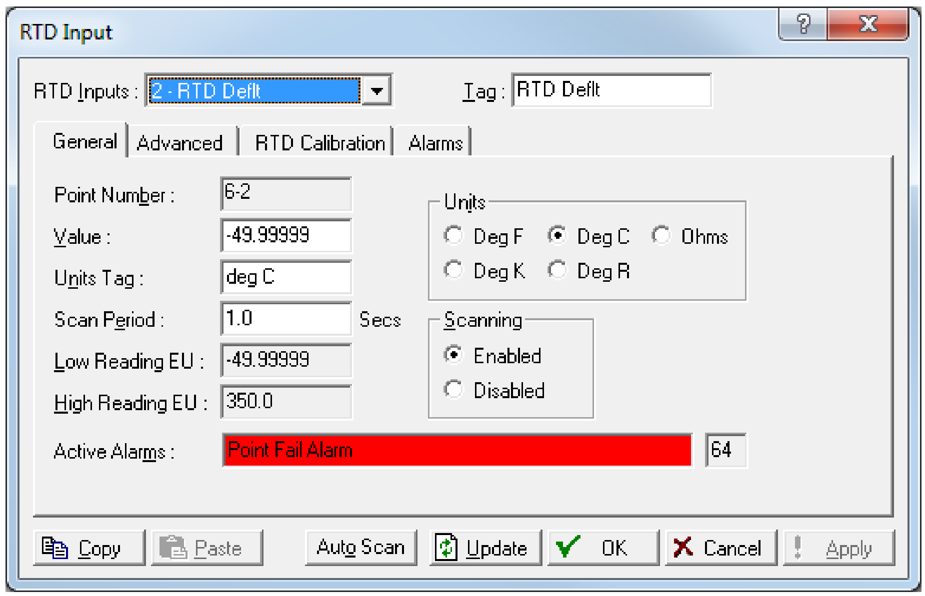


Figure 7-30. RTD – General tab

Field	Description
RTD Inputs	Sets the input to be configured. The inputs are listed by both number and tag. **Note:** This selection applies to **each** tab on this screen.
Tag	Sets a 10-character string **Tag** for identification of the point number. Any alphanumeric characters, including spaces, may be used. **Note:** This selection applies to **each** tab on this screen.
Point Number	The **read-only** field identifies the physical location of the input. The Point Number identifies the module slot – channel number.
Value	If Scanning is set to Disabled, enter a **Value** to override the RTD Input. When Scanning is set to Enabled, **Value** displays the last RTD Input scan in engineering unit.

Field	Description
Units Tag	Sets a name to display in configuration screens, reports and custom displays. This should be the same unit of measure as was chosen in the Units field. If this field is blank, configuration screens, reports, and custom displays show a blank where the unit of measure should be.
Scan Period	Sets the **Scan Period** as the amount of time between updates of the Filter value. All RTD Inputs are updated based on their individual Scan Periods. The default value is **1** second. The minimum scan period allowed is 64 mSec. ROCLINK 800 will not allow a value less than 64 mSec in this field. The scan occurs in multiples of 64 mSec, such as if you enter 0.20 sec, it will scan every 0.192 sec.
Low Reading EU	Sets the value corresponding to a 0% input.
High Reading EU	Sets the value corresponding to a 100% input.
Units	Sets the engineering units (EU) in which the ROC calculates the temperature.
Scanning	Sets the **Scanning** option. ▪ For the input to automatically process the field input, select **Enabled** (Automatic Mode). When Scanning is set to Enabled, **Value** displays the last RTD Input scan in engineering units. ▪ When Scanning is set to **Disabled** (Manual Mode), the engineering unit (EU) Value is no longer updated by the ROC. If Alarming is Enabled, an alarm generates when Scanning is set to Disabled. If Scanning is set to Disabled, enter a **Value** to override the input.
Active Alarms	This **read-only** field shows the **Active Alarms** indicating any alarms that are active for this point. When Alarming is set to Enabled, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if Alarming is Disabled, the Point Fail (hardware reports a malfunction) alarm indicator can still appear. If Alarming is set to Enabled, an alarm is generated when Scanning is Disabled.

RTD: Advanced Tab

Select **Configure > I/O > RTD Points > Advanced** tab to configure features, such as filtering, A/D conversions, and clipping for the selected RTD Input.

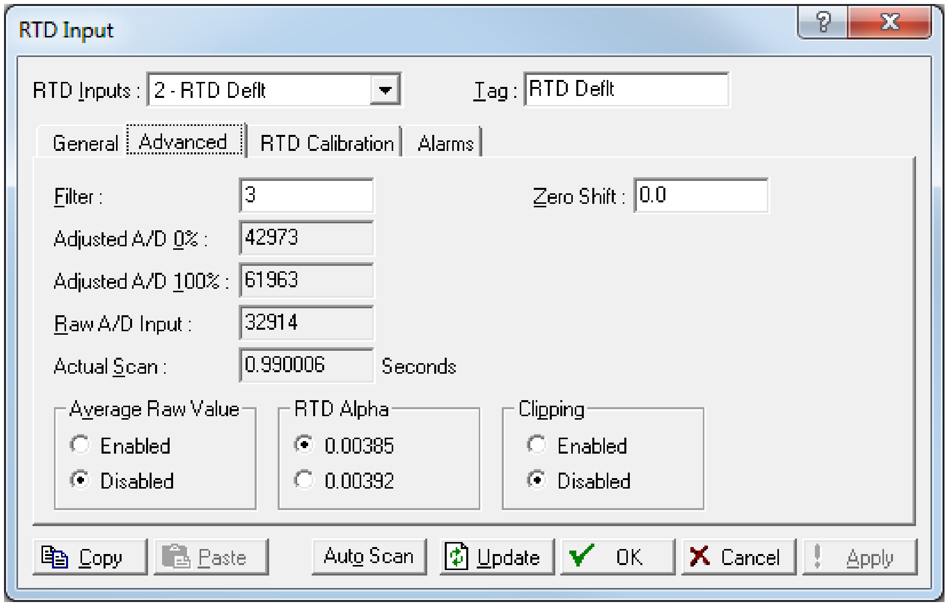


Figure 7-31. RTD – Advanced tab

Field	Description
Filter	Sets a value, which is a weighted sample using a percentage of the last value, plus a percentage of the new value. The entered data is the percentage of the last value used. The filter is calculated every scan period by the formula: (Last Value × Entered %) + (New Value × (100 – Entered %)) = Filtered Value
Adjusted A/D 0 %	This **read-only** field shows the calibrated Analog-to-Digital (A/D) reading corresponding to zero percent input. In the Calibrate function, this value is changed to set the zero percent input exactly at the Low Reading EU value to eliminate transmitter and system errors.
Adjusted A / D 100 %	This **read-only** field shows the calibrated A/D reading corresponding to 100 percent input. This value is used to convert the input to engineering units. In the Calibrate function, this value is changed to set the 100 percent input exactly at the High Reading EU value.
Raw A/D Input	This **read-only** field shows the **Raw A/D Input** displaying the current reading directly from the Analog-to-Digital converter.
Actual Scan	This **read-only** field shows the actual amount of time in seconds that passes between scans. This number should be the same as shown for the Scan Period parameter, if the system is not overloaded.

Field	Description
Average Raw Value	Sets the ROC to average and calculate the raw readings during the Scan Period and use the outcome as the Raw A/D Input during EU calculations. For example, when enabled, an RTD Input point configured with a Scan Period of 1.0 seconds obtains a new value from the A/D every 50 milliseconds. During the Scan Period, 20 values are obtained from the A/D and summed together. At EU calculation, the values summed are divided by the Actual Scan Period display and are used as the Raw A/D Input. Disable this function to acquire instantaneous values.
RTD Alpha	Sets the **RTD Alpha** of the RTD being used (0.00385 or 0.00392).
Clipping	Sets the ROC to force the Filtered EUs to stay within the range defined by the cut off limits. Set the cut off limits by using the LoLo Alarm and HiHi Alarm parameters.
Zero Shift	Sets a value if necessary to compensate for the zero shift effect on an input.

RTD: RTD Calibration Tab

Select **Configure > I/O > RTD Points > RTD Calibration** tab to select an RTD point to verify and calibrate.

Note: You can calibrate inputs at up to five points: zero, span, and up to three mid-points. You define at least and points for calibration.

The calibration routine provides Verify, Calibrate, and Zero Shift functions for RTD inputs. You can calibrate differential pressure (orifice metering may be High or Low Differential Pressure, depending on the device), static pressure, or temperature readings for each meter run.

Notes:

- During calibration, the ROC times out and resumes normal processing if it is left idle for an extended period. Calibration values are restored to the previous values, an event is logged, and you must reconnect to start calibration from the beginning.
- Click **Cancel** to exit the calibration without saving the changes. The system retains previous calibration settings and logs an event.

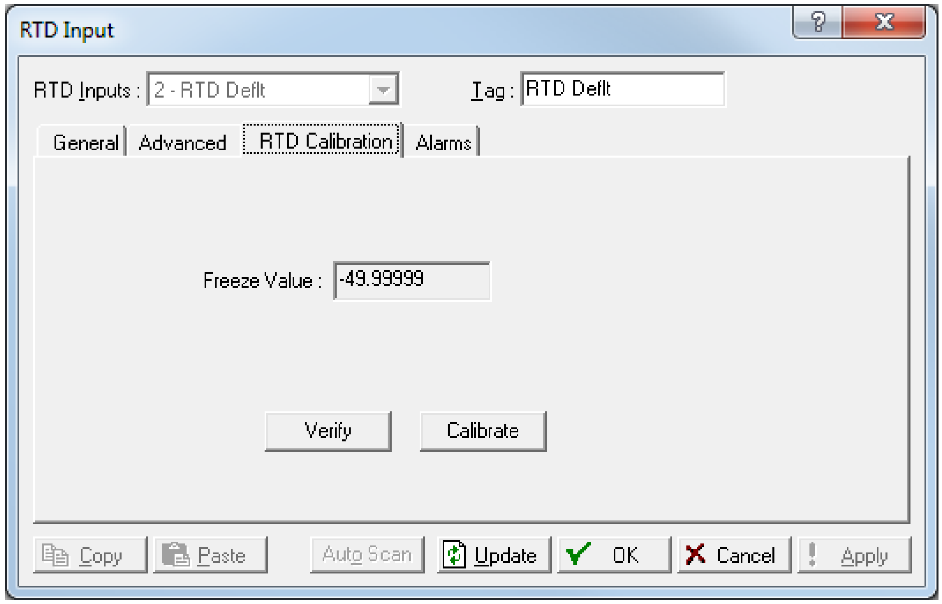


Figure 7-32. RTD – RTD Calibration tab

Field	Description	
Freeze Values	These **read-only** fields show the value received from the analog input, DVS, HART, MVS, RTD or Meter inputs when the **Update** button was last clicked. The system uses these values in ongoing processing (such as flow calculations, history logging, or control) while calibration occurs.	
Verify	Click to start the verification process.	
Calibrate	Click to begin calibration and open the Set Zero dialog opens.	
Zero Shift/Offset/RTD Bias	Click to set adjustment factors for the input. The value is sent to the device for:	
	Zero Shift	Click to zeros the static pressure effect for the differential pressure input (Set Offset).
	Offset	Click to send the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
	RTD Bias	Click to calibrate the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).
Auto Scan/Stop Scan	Click to automatically request values each second from the meter. The request continues until you click **Freeze**.	
Update Button	Click to request a value update from the input to be used as the Freeze Values.	

Verifying an RTD Input

Use this process to verify if an RTD is within the correct operating temperature limits. If the value is incorrect, calibrate the input.

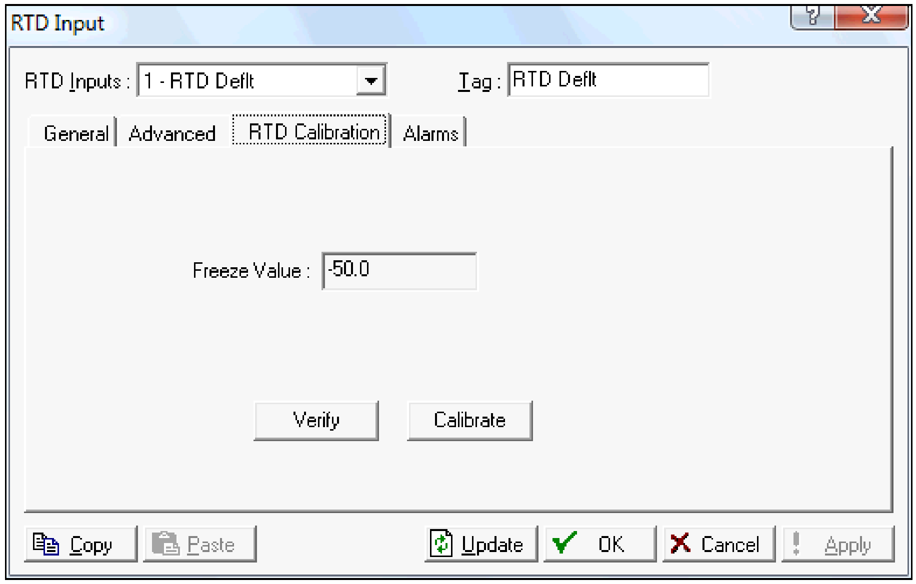


Figure 7-33. RTD Input Calibration

1. Click **Update** to request one value update from the input.

Note: The **Freeze Value** field displays the value received from the RTD input when you last clicked **Update**.

2. Disconnect the RTD sensor and connect a decade box (or comparable equipment) to the RTD terminals of the device.

Note: You can also use a pocket current source or another deadweight test input source to test this value.

3. Click **Verify**. A Verify dialog displays.
4. Complete the **Dead Weight/Tester Value** field with a value against which the test equipment verifies.
5. When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it to the value in the **Live Reading** field (obtained from the temperature probe) and calculating the percentage deviation between the two values.
6. Click **Log Verify**. ROCLINK 800 completes the first log entry on the screen.

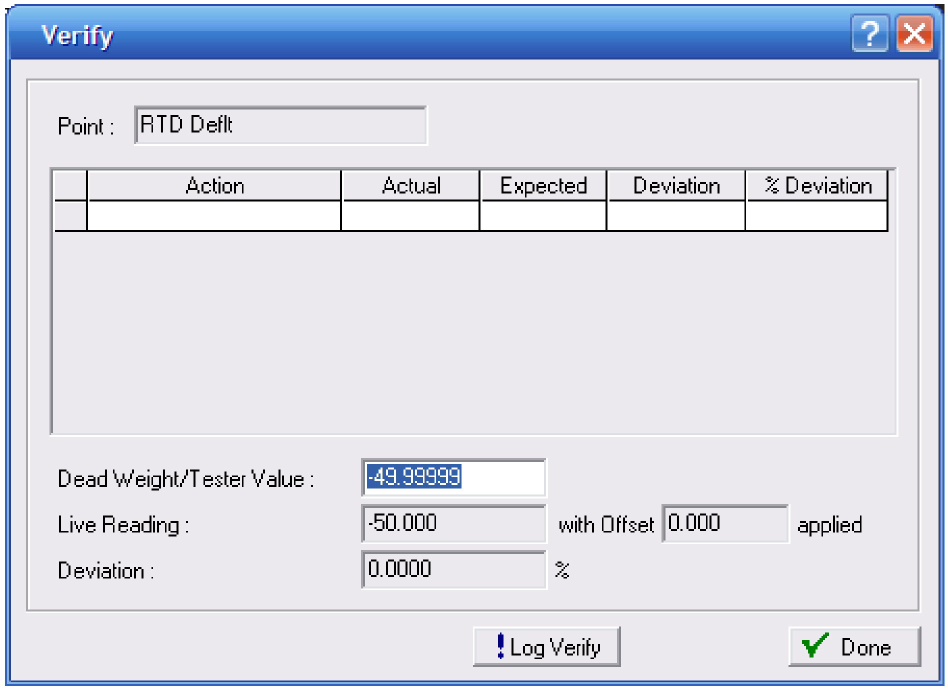


Figure 7-34. Verify

Field	Description
Action	Indicates the current action. Valid values are **Verify** or **Calibrate**.
Actual	Displays the value in the **Live Reading** field.
Expected	Displays the value in the **Dead Weight/Tester Value** field.
Deviation	Displays the amount of deviation between the actual and expected values.
% Deviation	Displays a percentage deviation between the Actual and Expected values.

7. As the live reading value changes, click **Log Verify** as many times as necessary to establish the verification log.
8. Typically you verify the same points you calibrate. Temperature might be an example (– 100, 200, 50). For each test point, you set your test equipment to produce the expected value, enter that expected value in the **Tester Value** field, wait for live input to stabilize, and then click **Log Verify**. You can verify as many points as you want.
9. Click **Done**.
10. Calibrate the input.

Calibrating an RTD Input

Use this process to calibrate an RTD.

1. Select **Configure > I/O > RTD Points > RTD Calibration** tab.
2. Select an **RTD input**.

3. Select the **RTD Calibration** tab.

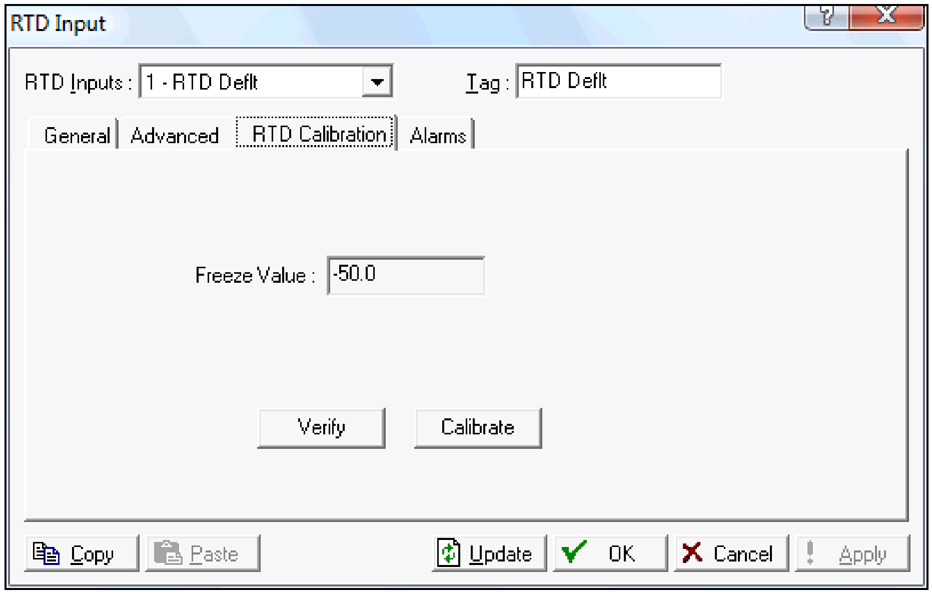


Figure 7-35. RTD Input Calibration

4. Click **Update** to request one value update from the input.

Note: The **Freeze Value** field displays the value received from the RTD input when you last clicked **Update**.

5. Disconnect the RTD sensor and connect a decade box (or comparable equipment) to the RTD terminals of the ROC

Note: You can also use a pocket current source or another deadweight test input source to test this value.

6. Click **Calibrate**. A Set Zero screen displays.

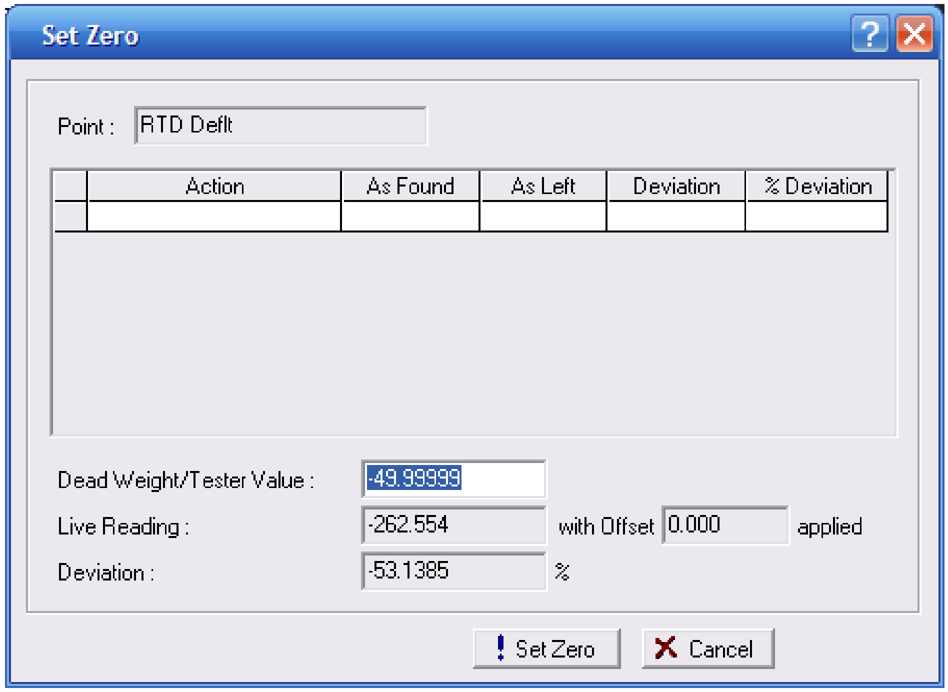


Figure 7-36. Set Zero

Note: You can click **Cancel** to exit the calibration without saving the changes. The system retains the previous calibration settings but logs the event in the event log.

7. Set test equipment to produce the expected results.
8. Complete the **Dead Weight/Tester Value** field. This value represents the low range (0%) of the instrument's measurement range.

   When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.
9. Click **Set Zero** when the live reading stabilizes. ROCLINK 800 adds the first line in the calibration log, renames the screen to **Set Span**, and changes the label on the **Set Zero** button to **Set Span**.

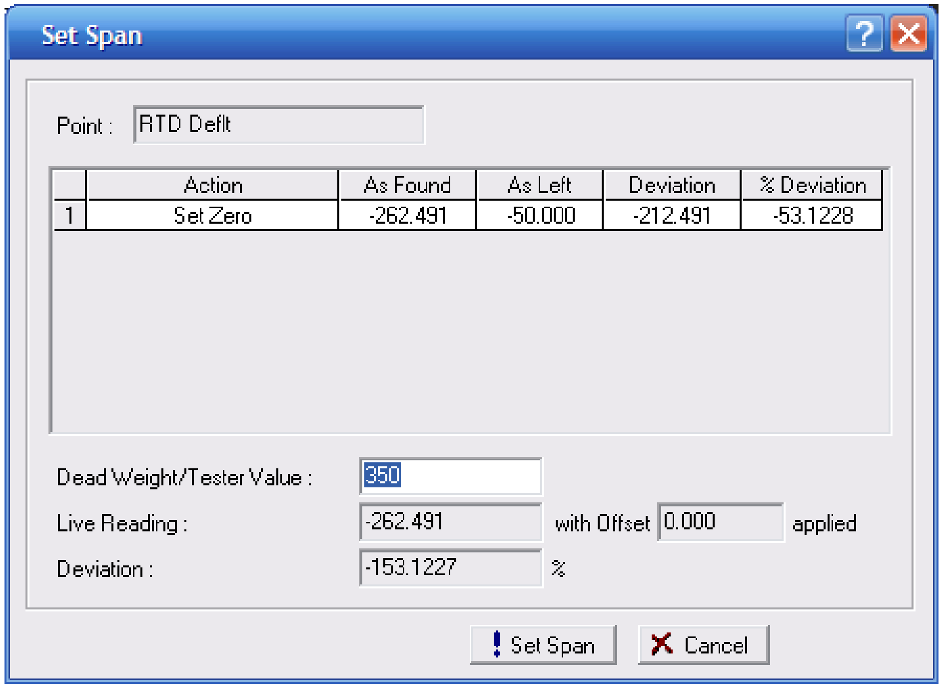


Figure 7-37. Set Span

10. Set test equipment to produce the expected results.

11. Complete the **Dead Weight/Tester Value** field with a value represents the upper limit (100% or "span") of the instrument's measurement range.

Note: ROCLINK 800 provides **350** as a default span value. Edit this default as necessary.

12. When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

13. Click **Set Span** when the live reading stabilizes. ROCLINK 800 adds the next line in the calibration log, renames the screen, and changes the label on the **Span** button to **Set Mid 1**.

Note: You can click **Done** at this point to complete the calibration or continue the calibration and define up to three calibration midpoints.

14. Set test equipment to produce the expected results.

15. Complete the **Dead Weight/Tester Value** field with the first midpoint calibration value (which in this example represents 50% of the instrument's range).

Note: ROCLINK 800 provides the previous midpoint value as a default value. Edit this default as necessary.

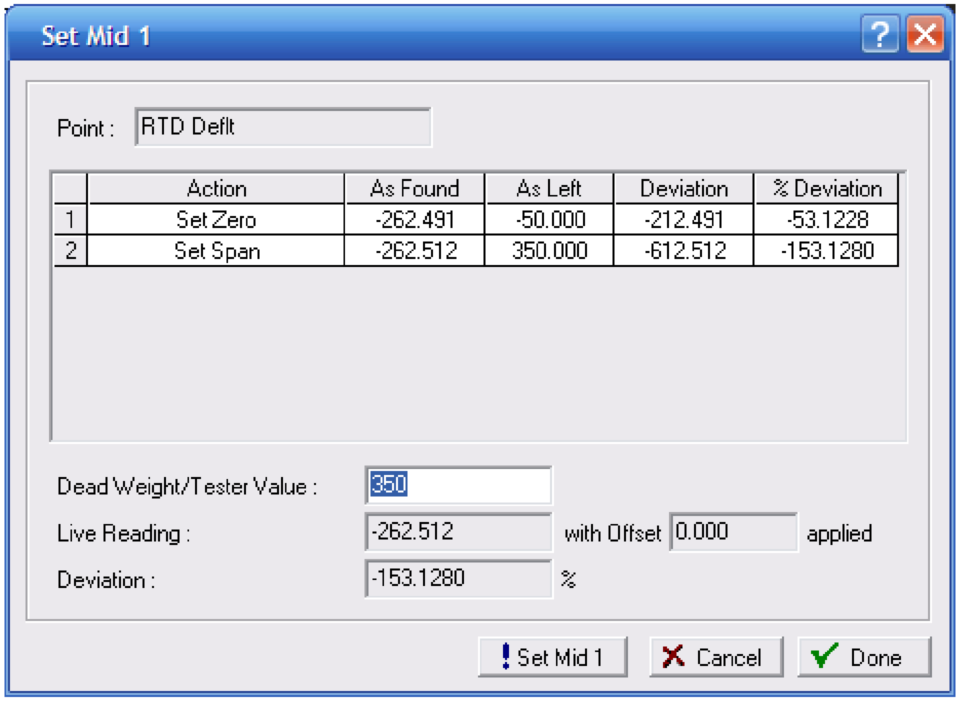


Figure 7-38. Set Midpoint 1

16. When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once per second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

17. Click **Set Mid 1** when the live value stabilizes. ROCLINK 800 adds the next line in the calibration log, renames the screen, and changes the label on the **Set Mid 1** button to **Set Mid 2**.

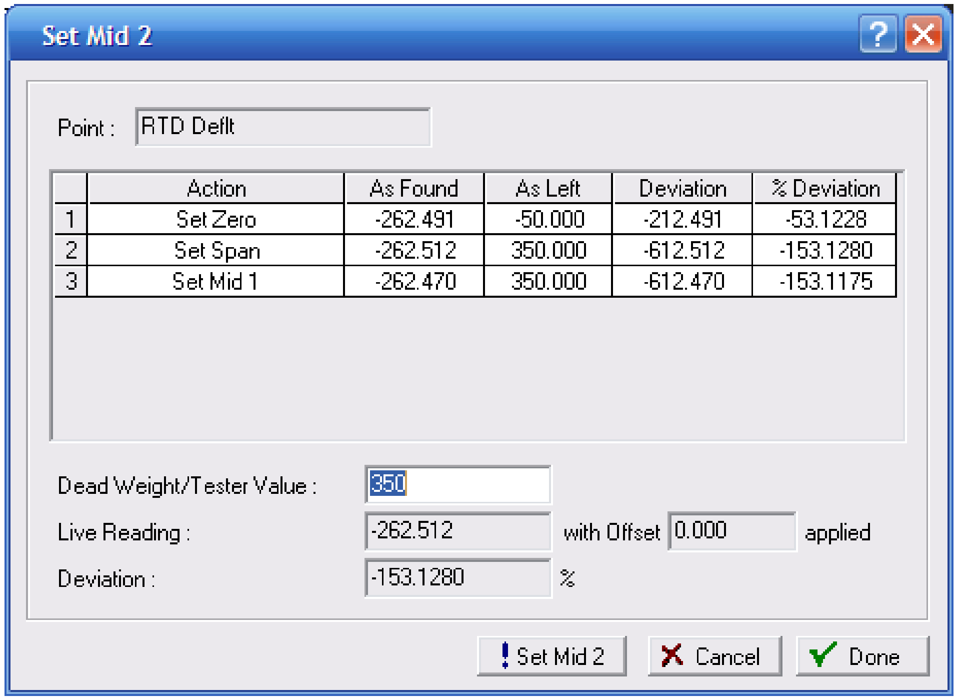


Figure 7-39. Set Midpoint 2

Note: To define up to two more midpoints, repeat steps the previous steps.

18. Click **Done** when you have sufficient calibration information. The Meter Calibration screen displays.

Note: Following a calibration, you may re-run a verification to demonstrate to the customer that the measurement results are now within contractual parameters.

RTD: Alarms Tab

Select **Configure > I/O > RTD Points > Alarms** tab to configure the alarm parameters for this RTD point.

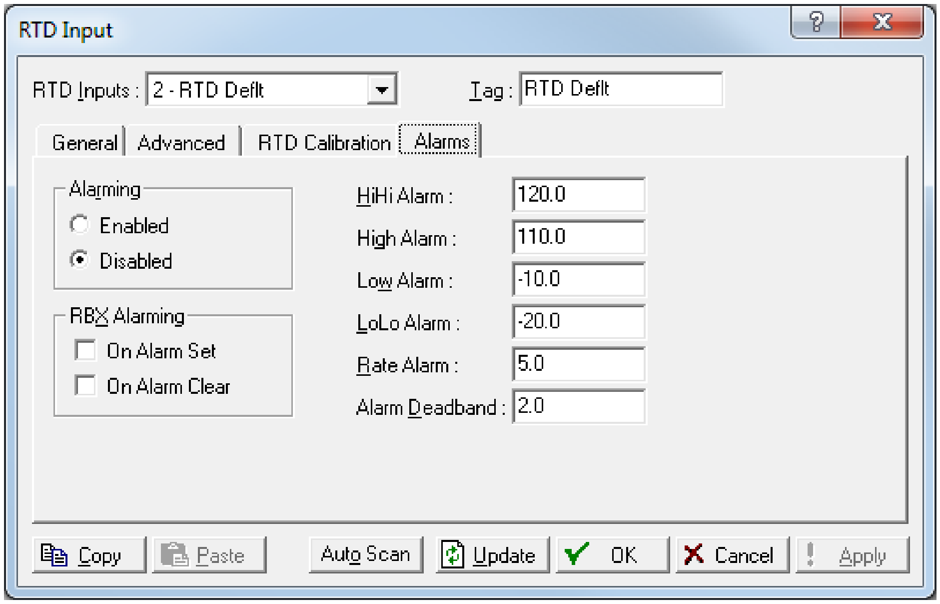


Figure 7-40. RTD – Alarms tab

Field	Description
Alarming	Sets **Alarming**, the limit alarms (four levels, Rate, and Deadband) are configured on the Alarms tab. When Alarming is Disabled, no limit alarms generate for this point. The Point Fail alarm appears in the Active Alarms field, but will not be logged in the Alarms Log. To conserve log space, alarms should be enabled only when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one so that no false alarms generate.
RBX Alarming	If you configure the host computer to receive field-initiated calls, select a Report-by-Exception (RBX) option to send a Spontaneous-Report-by-Exception message. ▪ **On Alarm Set** – When the point enters an alarm condition, the ROC generates a RBX message. ▪ **On Alarm Clear** – When the point leaves an alarm condition, the ROC generates a RBX message. **Note:** RBX Alarming requires you to properly configure the communications.
HiHi Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **HiHi Alarm**. **Note:** The HiHi Alarm value is typically set higher than the High Alarm.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **High Alarm**.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.

Field	Description
LoLo Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **LoLo Alarm**. **Note:** The LoLo Alarm value is typically set lower than the Low Alarm.
Rate Alarm	Sets the value, in engineering units, that represents the maximum amount of change allowed between updates. If the change is equal to or greater than this value, an alarm generates. To disable this Rate Alarm without disabling the other alarms, the Rate Alarm value can be set greater than the Span of the analog input.
Alarm Deadband	Sets the value, in engineering units, that is an inactive zone above the Low Alarm limits and below the High Alarm limits. The purpose of the Alarm Deadband is to prevent the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This also prevents the Alarm Log from being over-filled with data.

7.1.9 System Analog Input (AI) Configuration

Select **Configure > I/O > System AI Points**. System analog inputs are analog signals generated by sources within the ROC.

- The **General** tab sets the basic parameters for the AI Input point. Examine the default settings and adjust the parameters to suit your application on each of the tabs.
- The **Advanced** tab enables you to configure features, such as filtering, averaging, and clipping for the selected Input.
- The **Alarms** tab sets the alarm parameters for this AI point.

After configuring a point and clicking **Apply**, use **Flash Memory Save Configuration** in the **ROC > Flags** screen to save I/O configuration to permanent memory in case you must perform a cold start.

System AI: General Tab

Select **Configure > I/O > System AI Points > General** tab to configure the basic parameters for the AI Input point.

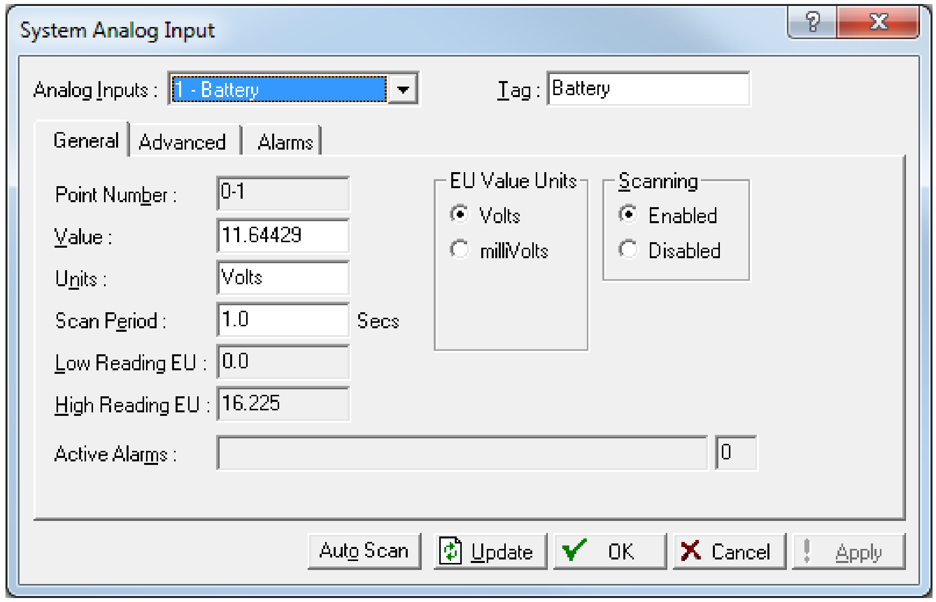


Figure 7-41. System AI – General tab

Field	Description
Analog Inputs	The ROC800L has five system analog inputs: ▪ System AI #1 = Battery. ▪ System AI #2 = Charge Voltage. ▪ System AI #3 = Module Voltage. ▪ System AI #4 = AI Default. ▪ System AI #5 = Board Temperature. **Note:** This selection in this field applies to each tab on this screen.
Tag	Sets a 10-character name for identification of the point. **Note:** This selection in this field applies to each tab on this screen.
Point Number	Because this type of input has no physical location, the **read-only** portion of the Point Number refers to module location 0. The **read-only** portion that refers to channel number is 1 to 5 for the input numbers.
Value	Sets a value to override the input if Scanning is set to Disabled. When Scanning is set to Enable, **Value** displays the last analog input scan in engineering units (EU).
Units	Sets the **Units** value. Inputs #1, #2, and #3 are in Volts. Input #5 is in Degree C.
Scan Period	Sets the amount of time between updates of the Filter value. The default value is **1** second. All System analog inputs are updated based on their individual Scan Periods.
Low Reading EU	Sets the engineering unit corresponding to zero percent input.
High Reading EU	Sets the engineering unit corresponding to 100 percent input.

Field	Description
EU Value Units	Set the system AI units to be read and written in volts, millivolts, degree F, degree C, degree K, or Degree R.
Scanning	Sets the **Scanning** option. ▪ For the input to automatically process the field input, select **Enabled** (Automatic Mode). When Scanning is set to Enabled, **Value** displays the last System AI scan in engineering units. ▪ When Scanning is set to **Disabled** (Manual Mode), the engineering unit (EU) Value is no longer updated by the ROC If Alarming is Enabled, an alarm generates when Scanning is set to Disabled. If Scanning is set to Disabled, enter a **Value** to override the input.
Active Alarms	This **read-only** field any alarms that are active for this point. When Alarming is set to Enabled, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if Alarming is Disabled, the Point Fail (hardware reports a malfunction) alarm indicator can still appear. If Alarming is set to Enabled, an alarm is generated when Scanning is Disabled.

System AI: Advanced Tab

Select **Configure > I/O > System AI Points > Advanced** tab to configure features, such as filtering, averaging, and clipping for the selected Input.

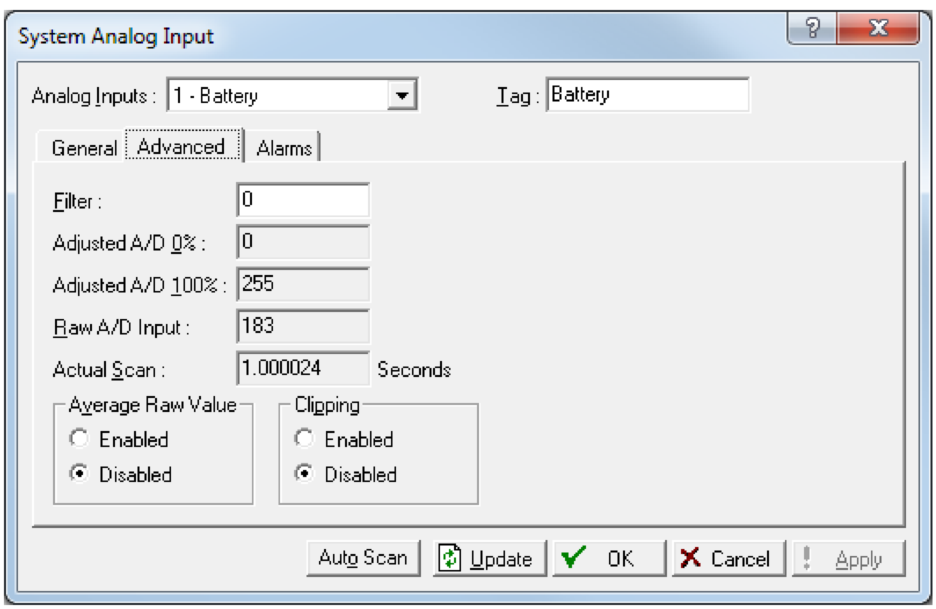


Figure 7-42. System AI – Advanced tab

Field	Description
Filter	Sets a value, which is a weighted sample using a percentage of the last value plus a percentage of the new value. The entered data is the percentage of the last value used. The Filter is calculated every Scan Period by the formula: (Last Value × Entered %) + (New Value × (100 – Entered %)) = Filtered Value
Adjusted AD 0 %	Sets the calibrated Analog-to-Digital (A/D) reading corresponding to zero percent input.
Adjusted AD 100 %	Sets the calibrated A/D reading corresponding to 100 percent input.
Raw A/D Input	This **read-only** field shows the current reading directly from the Analog-to-Digital converter.
Actual Scan	This **read-only** field shows the actual amount of time, in seconds, that passes between scans. This number should be the same as the Scan Period parameter if the system is not overloaded.
Average Raw Values	Sets the values to average and calculate the raw readings during the Scan Period and use the outcome as the Raw A/D Input during EU calculations. For example, when enabled, an analog input point configured with a Scan Period of 5 seconds obtains a new value from the A/D every second. During the Scan Period, five values are obtained from the A/D and summed together. At EU calculation, the values summed are divided by the number of samples and are used as the Raw A/D Input. Disable this function to acquire instantaneous values.
Clipping	If enabled, the software forces the Filtered EUs to stay within the range defined by the cut off limits. Select the cut off limits by using the LoLo Alarm and HiHi Alarm parameters.

System AI: Alarms Tab

Select **Configure > I/O > System AI Points > Alarms** tab to configure the alarm parameters for this AI point.

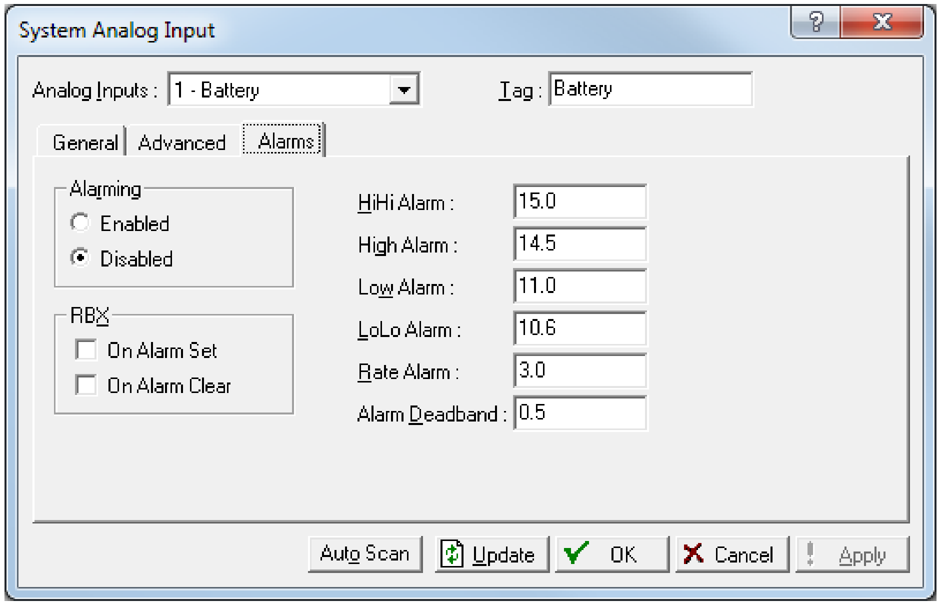


Figure 7-43. System AI – Alarms tab

Field	Description
Alarming	Sets **Alarming** for the point. If you Enable Alarming, the limit alarms (four levels, Rate, and Deadband) are configured on the Alarms tab. If you Disable Alarming, no limit alarms generate for this point. The Point Fail alarm appears in the Active Alarms field, but will not be logged in the Alarms Log. To conserve Alarm Log space, alarms should be enabled only when necessary. Even if you do not plan to use all the alarms, check and adjust the value of each one so that no false alarms generate.
RBX Alarming	If the host computer is configured to receive field-initiated calls, you can select a Report-by-Exception (RBX) option to send a Spontaneous-Report-by-Exception (SRBX) message. ▪ **On Alarm Set** – When the point enters an alarm condition, the ROC generates a RBX message. ▪ **On Alarm Clear** – When the point leaves an alarm condition, the ROC generates a RBX message. **Note:** RBX Alarming requires the communications port to be properly configured.
HiHi Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **HiHi Alarm**. **Note:** The HiHi Alarm value is typically set higher than the High Alarm.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **High Alarm**.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.

Field	Description
LoLo Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **LoLo Alarm**. **Note:** The LoLo Alarm value is typically set lower than the Low Alarm.
Rate Alarm	Sets the value, in engineering units, that represents the maximum amount of change allowed between updates. If the change is equal to or greater than this value, an alarm is generated. To disable this Rate Alarm without disabling the other alarms, the Rate Alarm value can be set greater than the Span of the analog input.
Alarm Deadband	Sets the value, in engineering units, that is an inactive zone above the Low Alarm limits and below the High Alarm limits. The purpose of the Alarm Deadband is to prevent the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This also prevents the Alarm Log from being over-filled with data.

7.1.10 Soft Points

Softpoints are global data storage areas that any ROC application can use. A softpoint may store the results of a specified calculation from an FST or an intermediate result of a specified value an FST acquires. Softpoints consist of a ten-character identifier (tag), one integer value (16-bits from 0 to 65,535), and up to 20 floating point values. The ROC supports up to 32 softpoints.

Softpoints consist of:

- 1 tag (10 character string)
- 20 floats (floating point values)
- 10 longs (32-bit)
- 10 shorts (16-bit)
- 10 bytes (8-bit)

Select **Configure > I/O > Soft Points**. The Soft Point screen displays.

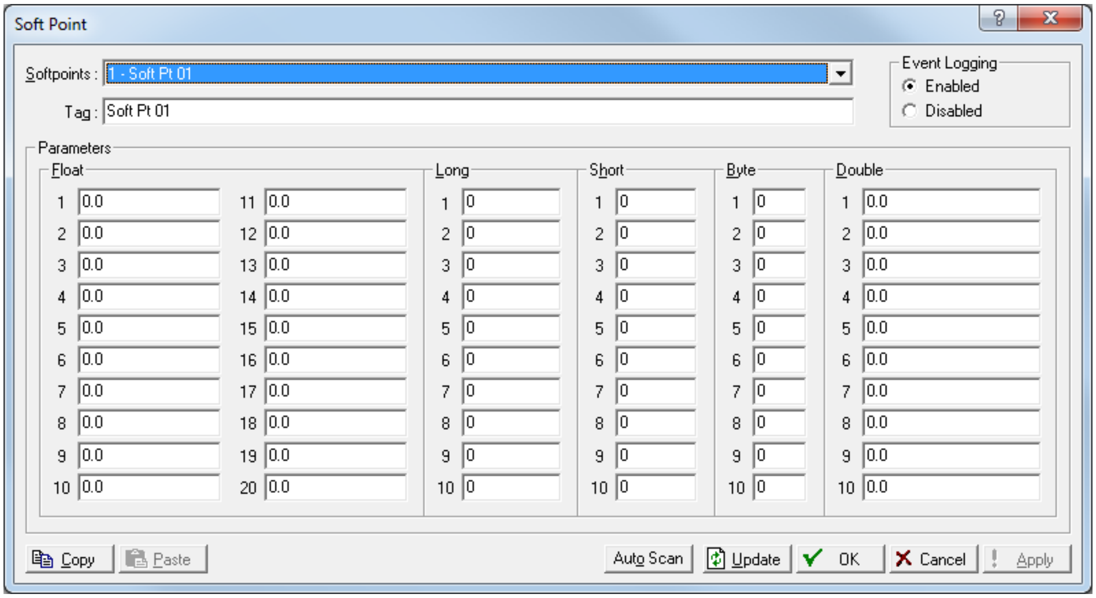


Figure 7-44. Soft Points

Note: After you successfully configure a softpoint, access the Flags screen (**ROC > Flags**) and click **Save Configuration**. This saves a configuration (and any associated softpoints) to permanent memory in case you must perform a cold start.

Field	Description
Softpoints	Sets the softpoint to configure. Click ▼ to display all available softpoints.
Tag	Sets a 10-character identifier for the softpoint.
Float and Data #1 through #20	Sets up to 20 parameters (**Data #1** to **Data #20**) to provide storage for IEEE floating point values for the softpoint.
Long	Sets long parameters to provide storage for 32-bit unsigned integer values.
Short	Sets short parameters to provide storage for 16-bit unsigned integers.
Byte	Sets byte parameters to provide storage for 8-bit unsigned values.
Double	Sets up to 10 parameters (**Data #1** to **Data #10**) to provide storage for double precision point values for the softpoint.
Event Logging	Select to enable (Enabled) logging of events for changes to the soft point parameters or select Disabled to not log Soft Point events.

7.1.11 Multi-Variable Sensor (MVS) Configuration

The MVS Sensor setup screens provide you with an interface to a multi-variable sensor, a device that measures temperature, static pressure, and differential pressure.

Because of the graphical interface, you can use the Configure option on the ROCLINK 800 menu (**Configure > I/O > MVS Sensor**), click on the MVS module graphic, or use the configuration tree.)

Note: If you change a parameter on the MVS screens, click **Write** to update the sensor configuration.

Caution **If you attempt to write data to a 4088 with the Security Switch in the ON position, ROCLINK saves the new transmitter information but is unable to write the new values to the transmitter. If you change the value in the Address field, communications fail between ROCLINK and the transmitter. Enter the transmitter address previously used in ROCLINK to regain communications. Changes made to all other fields revert to the values stored in the transmitter.**

MVS: General Tab

The Multi-Variable Sensor (MVS) screens provide you with an interface to configure a multi-variable sensor.

Note: If you have a dual-variable sensor (DVS) attached to the MVS module, you configure it as part of the MVS module.

1. Select **Configure > I/O > MVS Sensor**. The Multi-Variable Sensor screen displays, showing the General tab.

   Note: You can also access this screen by clicking the TLP Browse button on the graphic interface's I/O Points screen.

If you change a parameter, click **Write**.

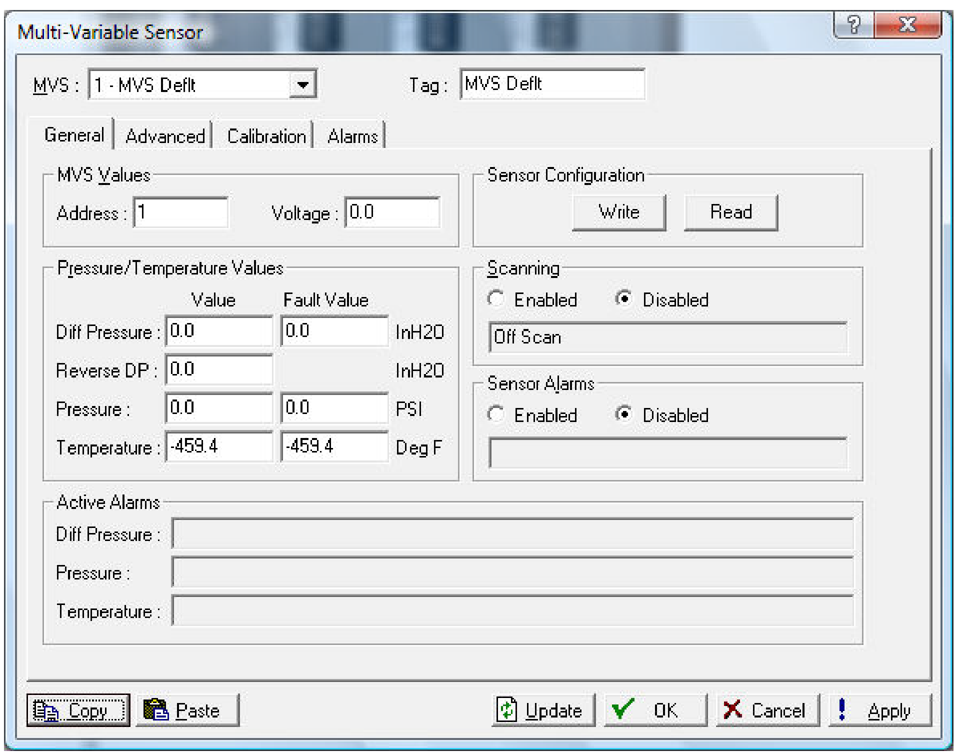


Figure 7-45. MVS Sensor – General tab

Note: If you change any values on this tab – or on the Advanced, Calibration, or Alarms tabs – **other** than the MVS or Tag fields, you must click **Write** in the Sensor Configuration field to apply those changes to the sensor configuration.

Field	Description
MVS Sensor	Sets the MVS sensor to configure. Each MVS has a unique address number to differentiate it from other MVS units, because MVS sensors can be multi-dropped.
Tag	Sets the ten-character identifier that resides in the MVS. **Note:** This selection in this field applies to each tab on this screen.
Address	Sets the unique address for this device used in the device communications protocol. The default address is **1**. If the MVS is used in the multi-drop mode, each MVS must have a unique address. Use Address **240** to poll the sensor to determine the address of the connected sensor. This is similar to polling a using Address and Group **240**. When Address **240** is used, the sensor responds with its address by updating the Address field.
Voltage	This **read-only** field shows the voltage input to the sensor. If the MVS interface version (as shown on the Advanced tab's Sensor Interface Version field) is 6 or greater, this field should read approximately **5**, which is the voltage to the microcontroller in the sensor. If the MVS interface version is less than **6**, this field shows the input voltage to the sensor. **Note:** For proper operation, the input voltage to the sensors with versions less than 6 **must** be at least 10.5 volts dc.
Sensor Configuration	Click **Write** to update the sensor with the current values on the screen or click **Read** to read the sensor's current configuration data and process variables.
Pressure / Temperature Values and Fault Values	These **read-only** fields show scaled differential pressure readings from the sensor. The units display as either InH_2O or kPa. The scaled Differential Pressure (**Reverse DP**) reading is from the sensor times a negative "1" for flow in the reverse direction. The scaled absolute Pressure (**Static Pressure**) reading from the sensor displays in either PSI or kPa. The scaled process **Temperature** reading from the sensor displays in either degrees Fahrenheit or degrees Celsius, based on global settings (**ROC > Information**). Enter **Fault Values** if you desire for the MVS to return to the values you configure upon on failure of the sensor, an input point, or communications.

Field	Description
Scanning	Sets whether the input communicates with the MVS sensor. Valid values are **Enabled** (allow communications to the MVS sensor) or **Disabled** (the system does not update information from the sensor). **Note:** The Scanning text field displays scanning status messages. Additionally, the system generates an alarm when you **Disable** scanning.
Sensor Alarming	Sets the alarm conditions of the sensor or any alarms that are active for this point. Valid values are **Enabled** (display any active failed alarms, such as point fail or sensor fail) or **Disabled** (do not display alarms). **Note:** When you enable sensor alarms, the system displays any loss of communications to the sensors by displaying an RS-485 Communications Failure. If you disable scanning, an Off Scan Mode alarm displays.
Active Alarms	These **read-only** fields indicate any alarms that are active for this point. If you **Enable** alarming, any active limit alarms (such as Low Alarm and Rate Alarm) appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear

MVS: Advanced Tab

Use the MVS Advanced screen to configure how the ROC retains information on failure, what it uses as a reference temperature, and how it reports pressure.

1. Select the **Advanced** tab. The Advanced screen displays.

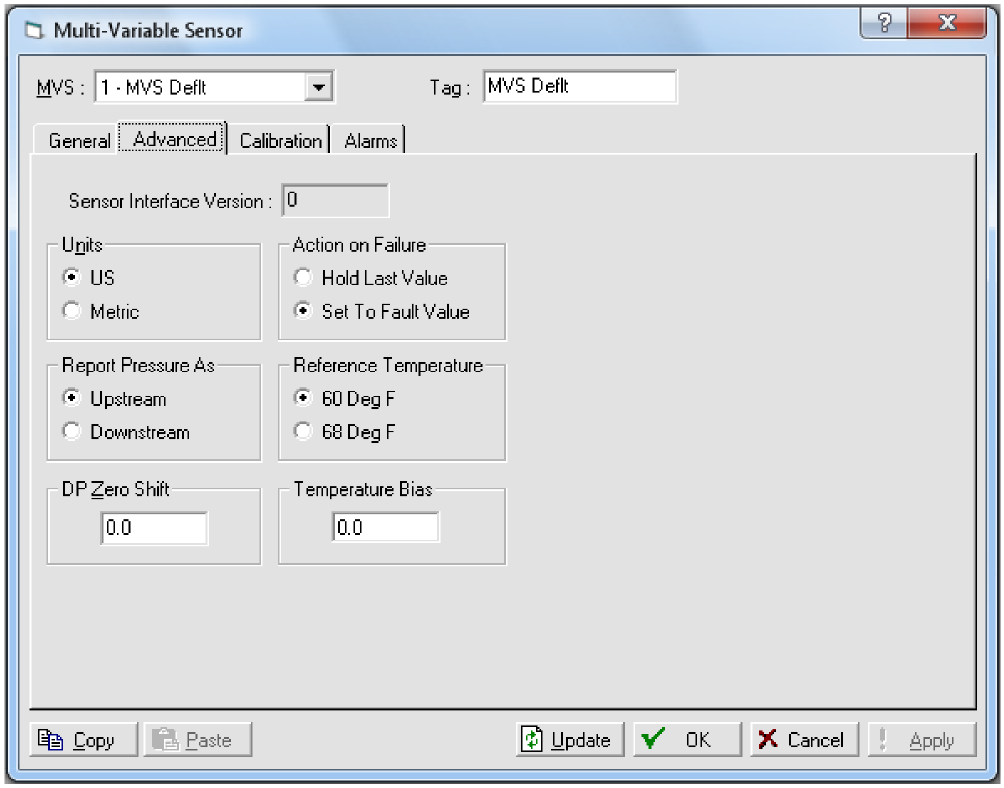


Figure 7-46. MVS Sensor – Advanced tab

Note: If you change any values, click **Write** on the General tab to save the configuration.

Field	Description
Sensor Interface Version	This **read-only** field shows the version of the sensor interface firmware for the sensor.
Units	Sets the engineering units for the process variable. If you change this value, click **Write** to update the configuration.
Action on Failure	Sets how the sensor retains values on failure of the sensor, an input point, or communications. Valid values are **Hold Last Value** (retains the last values before the failure) or **Set to Fault Value** (returns to the configured fault values). **Note:** See the Alarms tab for the Fault Value.
Report Pressure As	Sets the location of the static pressure tap in relation to the orifice and normal flow. Valid values are **Upstream** or **Downstream**. **Upstream** is the default. If you select **Downstream**, the system subtracts the Diff Pressure (DP) (in PSI) from the Static Pressure (SP) reading to obtain a Downstream Pressure measurement for archiving. For Downstream operation, adjustments to the calibration procedure may be required when setting the Span value. **Note:** If you change this value, click **Write** on the General tab to save the configuration.

Field	Description
Reference Temperature	Sets a reference temperature the sensor uses when reporting differential pressure. The default value is **60** °F (15.6 °C). The system uses this value only when you change the Units selection or when you select the Downstream option is selected in Metric units. **Note:** If you change this value, click **Write** on the General tab to save the configuration.
Zero Shift	Sets a value if necessary to compensate for the zero shift effect on an input.
Temperature Bias	Sets a difference between the live temperature reading and the entered standard temperature reading that ROCLINK 800 applies to the temperature value.

MVS: Calibration Tab

Use this tab to calibrate the MVS points.

Notes:

- You can calibrate sensors at up to five points: zero, span, and up to three mid-points. You must define **at least** zero and span points for calibration.
- During calibration, the ROC times out and resumes Normal processing if it is left idle for an extended period. Calibration values are restored to the previous values, an event is logged, and you must reconnect to start calibration from the beginning.
- Click **Cancel** to exit the calibration without saving the changes. The previous calibration settings are retained. An Event is also logged.

⚠ **Caution** **If you have an MVS transmitter, refer to *Chapter 6, Sensor/Transmitter Accessories,* in the *ROC/FloBoss Accessories Instruction Manual* (Form A4637) for the recommended way to remove or restore the device from or to working pressure during calibration. Failure to follow recommendations may damage the device.**

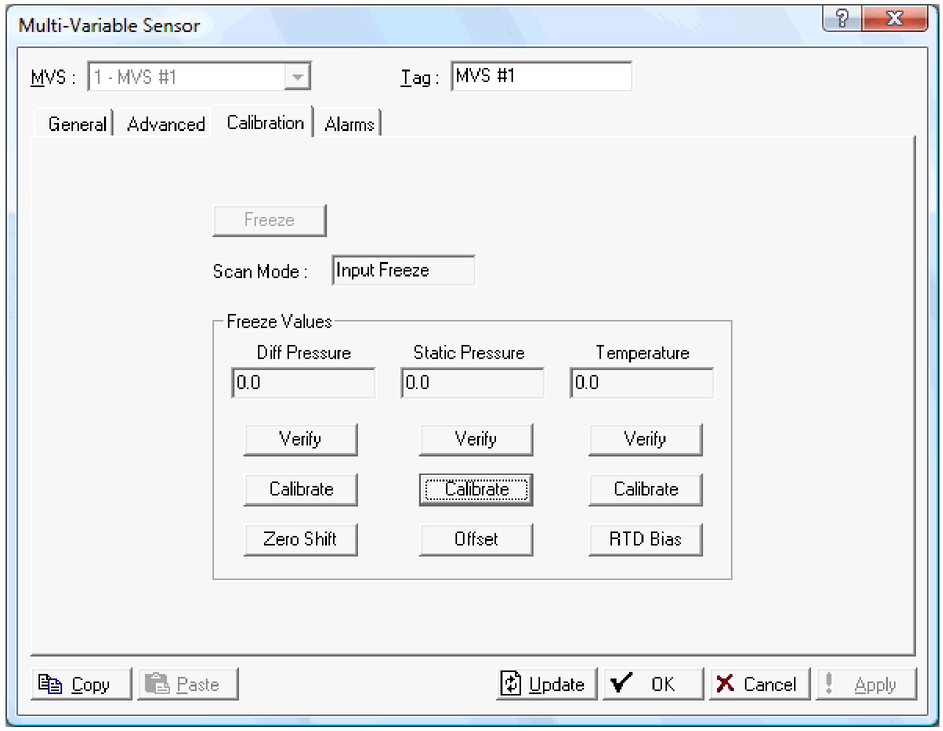


Figure 7-47. MVS Sensor – Calibration tab

Field	Description
Freeze	Click to stop the system from updating analog, MVS, DVS, HART, or temperature (RTD) inputs during verification or calibration. Once you click **Freeze**, the input is frozen at the current Freeze Values.
Scan Mode	This **read-only** field displays the current input status. **Normal Poll** indicates the system is functioning normally. After you click Freeze, the software changes to **Input Freeze** for the verification or calibration process and activates all buttons in the Freeze Values frame. **Poll Mode** is the initial communication to a sensor to gather all of the configuration data that is stored on the sensor. **Off Scan** indicates that the sensor is disabled.
Diff Pressure, Static Pressure, Temperature	These **read-only** fields show the values for the differential pressure, static pressure, and temperature received from the analog, MVS, or temperature (RTD) input. The system uses these values in ongoing processing (such as flow calculations, history logging, or control) while calibration occurs.
Verify	Click to start the verification process.
Calibrate	Click to begin calibration and open the Set Zero dialog opens.

Field	Description	
Zero Shift/Offset/RTD Bias	Click to set adjustment factors for the input. The value is sent to the device for:	
	Zero Shift	Click to zeros the static pressure effect for the differential pressure input (Set Offset).
	Offset	Click to send the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
	RTD Bias	Click to calibrate the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).
Auto Scan/Stop Scan	Click to automatically request values each second from the meter. The request continues until you click **Freeze**.	
Update Button	Click to request a value update from the input to be used as the Freeze Values.	

Verifying an MVS

Use this process to verify an MVS is within the operating or contractual limits. If the value is incorrect, calibrate the input. You can verify the differential pressure, static pressure, and the temperature of an MVS sensor.

1. Select **Configure > I/O > MVS Sensor**. The Multi-Variable Sensor screen displays.
2. Select the **Calibration** tab. The Calibration screen displays.
3. Select an **MVS** input point to calibrate.
4. Click **Update** to request one value update from the input.
5. Click **Freeze** to stop the values of the input from being updated during verification or calibration.

   Note: The **Freeze Value** field displays the value received from the MVS input when you last clicked **Update** and is the value the system uses in ongoing processing (such as flow calculations and history logging) while performing calibration.

   Review the value in the **Scan Mode** field. Valid values are **Normal Poll** (point scanning is enabled and is updated each scan period), **Off Scan** (the point is not in scanning mode), or **Input Freeze** (points are frozen).

6. If you are calibrating a temperature input, disconnect the MVS or DVS sensor and connect a decade box (or comparable equipment) to the terminals of the ROC

Note: You can also use a pocket current source or another deadweight test input source to test this value.

7. Click **Verify**. A Verify dialog displays.
8. Complete the **Dead Weight/Tester Value** field with a value against which the test equipment verifies.

   When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it to the value in the **Live Reading** field (obtained from the temperature probe) and calculating the percentage deviation between the two values.
9. Click **Log Verify**. ROCLINK 800 completes the first log entry on the screen.

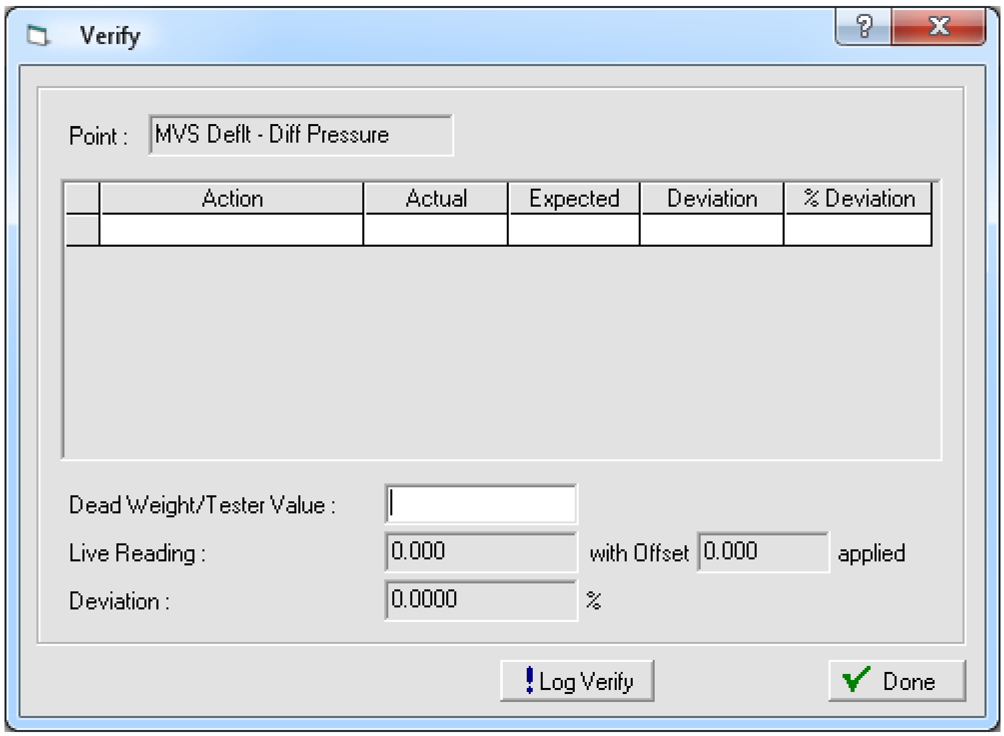


Figure7-48. Verify

Field	Description
Action	Indicates the current action. Valid values are **Verify** or **Calibrate**.
Actual	Displays the value in the **Live Reading** field.
Expected	Displays the value in the **Dead Weight/Tester Value** field.
Deviation	Displays the amount of deviation between the actual and expected values.
% Deviation	Displays a percentage deviation between the Actual and Expected values.

10. As the live reading value changes, click **Log Verify** as many times as necessary to establish the verification log.

11. Typically you verify the same points you calibrate. Temperature might be an example (– 100, 200, 50). For each test point, you set your test equipment to produce the expected value, enter that expected value in the **Tester Value** field, wait for live input to stabilize, and then click **Log Verify**. You can verify as many points as you want.

12. Click **Done**.

13. Calibrate the input if required.

Field	Description
Point	Identifies the point (differential pressure, static pressure, or temperature) being verified.
Action - Verify Fields	Shows the activity being performed as well as various values: ▪ **Actual** – Displays the current **Live Reading** value from the sensor. ▪ **Expected** – Displays the expected value as entered in the **Dead Weight/Tester Value** field. ▪ **Deviation** – Displays the difference between the expected value and the actual value. (Deviation = Expected – Actual.) ▪ **% Deviation** – Displays a percentage deviation between the Actual and Expected values. **Note:** Click **Log Verify** to add lines to this screen.
Dead Weight/Tester Value	Sets the expected value against which the system tests and calibrates. **Note:** This is the Expected value in the Action field.
Live Reading with Offset applied	This **read-only** field shows the current reading from the sensor. If you have configured an offset, the value appears in the Offset applied field.
Deviation and % Deviation	This **read-only** field shows the deviation between the Actual and Expected values, such as the difference between the live pressure or temperature reading and the measured pressure or temperature reading. (%Deviation = Deviation [(Span EU – Zero EU) x 100%]). Use this value to determine the need for calibration or adjustment.
Log Verify	Click to write the displayed data to the Event Log.

Calibrating an MVS

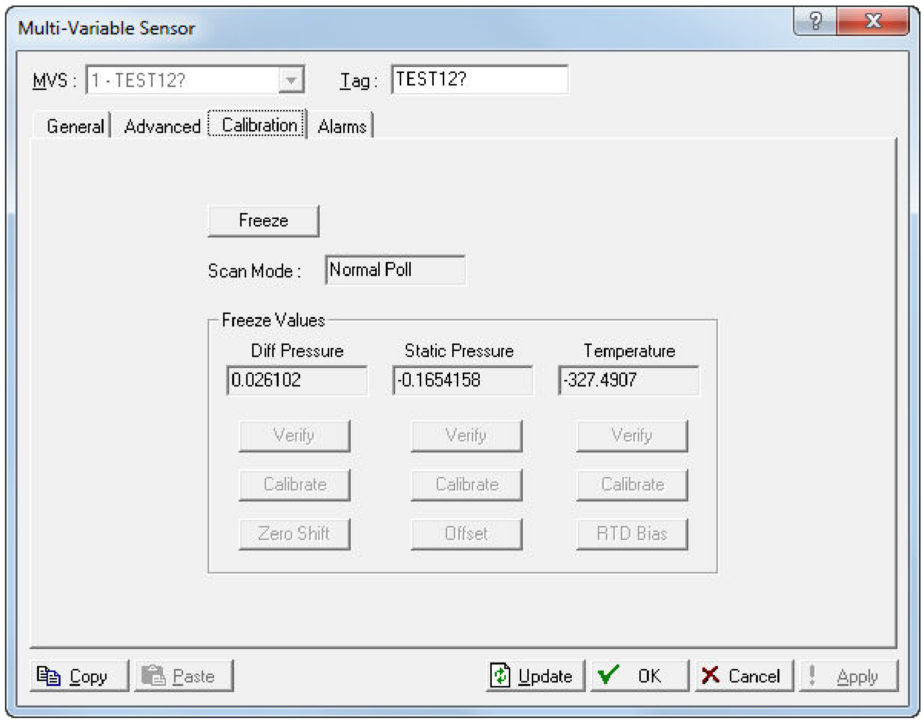
You can calibrate the differential pressure, static pressure, and temperature inputs of an MVS. ROCLINK allows you to perform either a five-point calibration on an MVS205 or 4088B or a two-point calibration on a 3095 or 4088A. The five-point calibration consists of setting the zero point, span, and up to three mid points.

The two-point calibration process consists of setting the zero point and the span. To calibrate an MVS:

Notes:

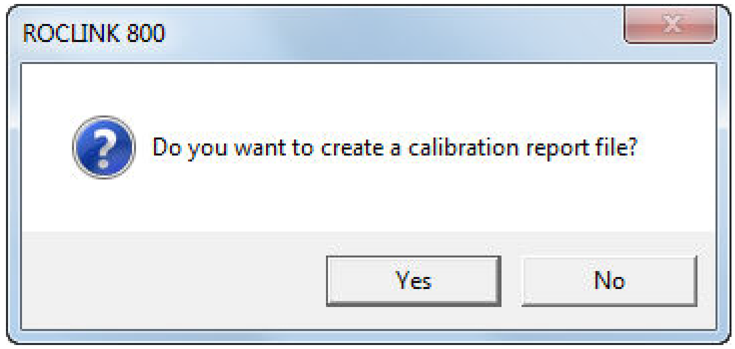
- You cannot calibrate a 4088 if the Transmitter Security switch on the device is enabled.
- The 4088 provides range checking on the input values. The calibration process fails if the input values deviate more than 10% from the expected values.
- If you have a 4088B and click **Cancel** at any time during the calibration process, you must start the calibration process over from the beginning.

1. Select **Configure > I/O > MVS Sensor > Calibration tab**. The MVS Calibration screen displays.



2. Click ▼ in the MVS drop down box to select an MVS sensor to calibrate.
3. Click **Update** to request one value update from the input.
4. Click **Freeze** to stop the input values from being updated during verification or calibration. ROCLINK asks you if you want to create a calibration report file.

Note: The **Freeze Value** field displays the value received from the MVS of DVS input when you last clicked Update and is the value the system uses in ongoing processing (such as flow calculations and history logging) while performing calibration.



5. If you click **Yes**, enter a file name and location to save the file, and click **Save**. The MVS screen displays with the values frozen, the Scan Mode field is set to **Input Freeze**, and the **Verify** and **Calibrate** buttons are activated.

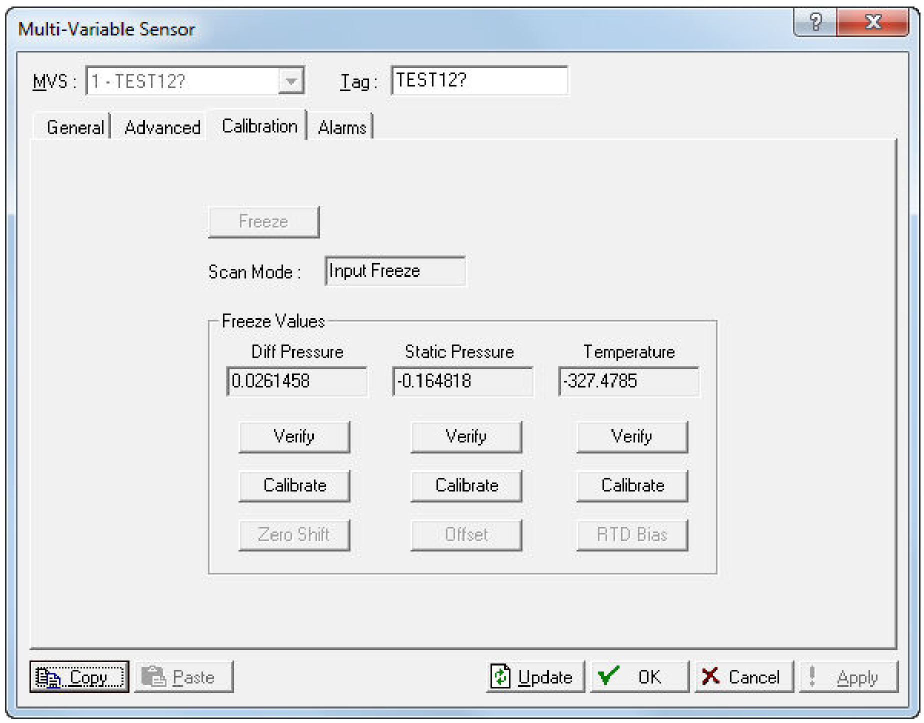


Figure 7-49. Input Freeze

6. If you are calibrating a temperature input, disconnect the MVS sensor and connect a decade box (or comparable equipment) to the terminals of the device.

Note: You can also use a pocket current source or another deadweight test input source to test this value.

7. **Calibrate** in the column of the input type you want to calibrate (Diff Pressure, Static Pressure, Temperature). A Set Zero dialog box displays.

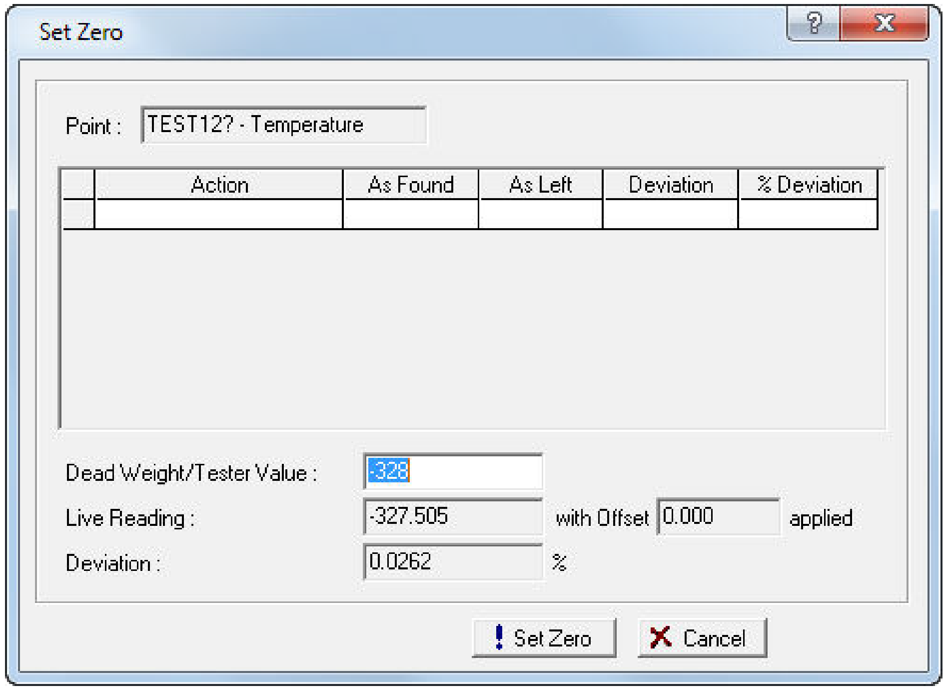


Figure 7-50. Set Zero Calibration

8. Enter a value in the **Dead Weight/Tester Value** field.

9. Click **Set Zero** to set a zero value. Note that ROCLINK 800 changes the screen name and button name to **Set Span**.

For the Set Zero entry in the calibration log, ROCLINK 800 records the **As Found** and **As Left** values and calculates the **Deviation** and **% Deviation** values (between the Dead Weight/Tester Value and the Live Reading values).

10. Enter a value in the **Dead Weight/Tester Value** field for the span and click **Set Span** to set a span value and record the values in the calibration log.

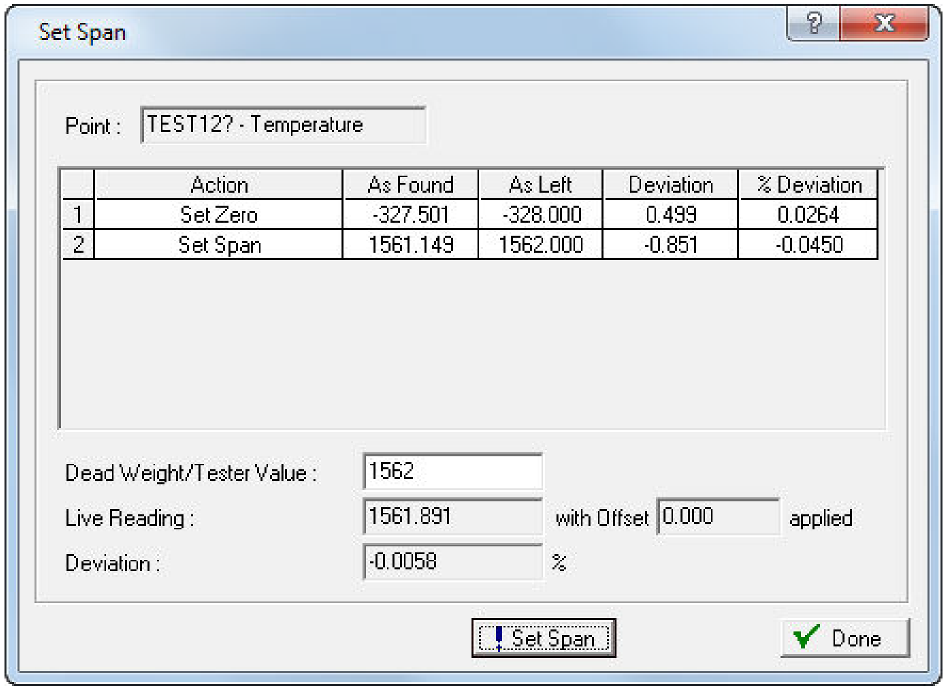


Figure 7-51. Set Span Calibration

11. **If you are calibrating a 3095, 4088A, or you do not wish to configure midpoints**, click **Done**.

    If you are calibrating an MVS205 or 4088B and wish to configure midpoints, enter a value in the **Dead Weight/Tester Value** field and click click **Set Mid 1** to define the first midpoint value. You can define up to three midpoints (typically at 25%, 50%, and 75%). Click **Done** when you finish configuring midpoints.

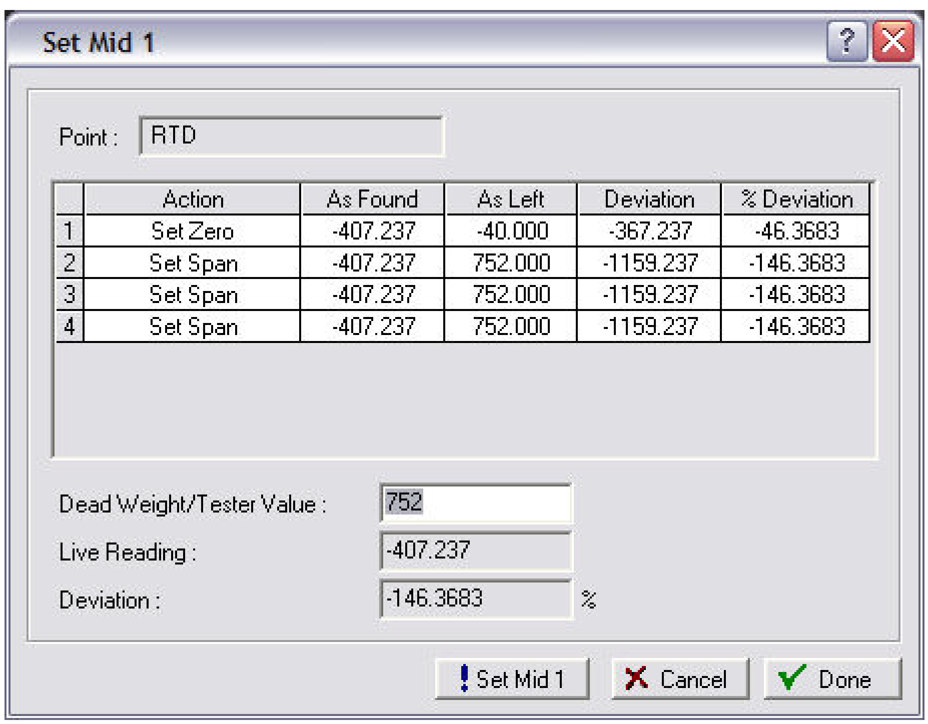


Figure 7-52. Set Mid Points

12. If the calibration results indicate that you need to adjust the sensor, click **Zero Shift/Offset/RTD Bias** (depending on the point you are adjusting). The system displays a Set Zero (Offset) screen.

Note: If calibration fails, check the communication wiring, entered values, and applied pressure.

Field		Description
Point		Identifies the point (differential pressure, static pressure, or temperature) being verified.
Calibration Fields		Shows the activity being performed as well as various values:
	Action	Indicates the current action. Valid values are **Set Zero**, **Set Span**, **Set Mid 1**, **Set Mid2**, or **Set Mid3**.
	As found	Shows the sensor's initial value.
	As Left	Shows the sensor's value after calibration
	Deviation	Shows the difference between the As Found value and the As Left value.
	% Deviation	Shows the difference between the As Found and As Left values as a percentage.
Set Zero		Calibrate the zero value (0% of range) for the in differential pressure (orifice only), static pressure, or temperature. Set the Dead Weight/Tester Value (in engineering units). This should correspond with the Low Reading EU (0% Count) and is the low value for the input. This is the input desired for the test value and is the actual value expected by the test equipment being calibrated against. For example: When calibrating temperature for an RTD input, enter the degree value associated with the resistance set up in the decade box or other equipment.
Set Span		Calibrate the span value (100% of range) for differential pressure (orifice only), static pressure, or temperature. Set the Dead Weight/Tester Value (in engineering units). This should correspond with the High Reading EU (100% Count) and is the high value to the input (the top end of the expected operating range). For static pressure on an absolute-pressure device, remember to add in the actualatmospheric pressure, for example, 300 + 14.73.

Field	Description
Set Midpoints	If desired, calibrate midpoint 1 (such as 25% of range) for the differential pressure (orifice only), static pressure, or temperature, otherwise click the Done button. Midpoints allow you to specify the low, middle, and high calibration point between the zero and span endpoints. Set the Dead Weight/Tester Value (in engineering units). If desired, calibrate Midpoint 2 (such as 50% of range) for the Differential Pressure (orifice only), Static Pressure, or Temperature. Set Midpoint 2 allows you to specify the middle calibration point between the Zero and Span endpoints. If desired, calibrate Midpoint 3 (such as 75% of range) for the Differential Pressure (orifice only), Static Pressure, or Temperature. Set Midpoint 3 allows you to specify a third point between the Zero and Span endpoints. **Note:** You can calibrate Midpoints in any order from low to high or high to low.

Sending the Differential Pressure Zero Shift (Offset)

After you have calibrated differential pressure, click **Zero Shift** to zero the static pressure effect for the differential pressure input if required.

Sending the Differential Pressure Zero Shift (Offset)

You can calibrate the differential pressure, static pressure, and temperature inputs of an MVS. ROCLINK allows you to perform either a five-point calibration on an MVS205 or 4088B or a two-point calibration on a 3095 or 4088A. The five-point calibration consists of setting the zero point, span, and up to three mid points.

The two-point calibration process consists of setting the zero point and the span. To calibrate an MVS:

Sending the Static Pressure Offset

Sets the **Offset** to send the value of the live reading to get the reading as close to zero as possible for a static pressure inputs.

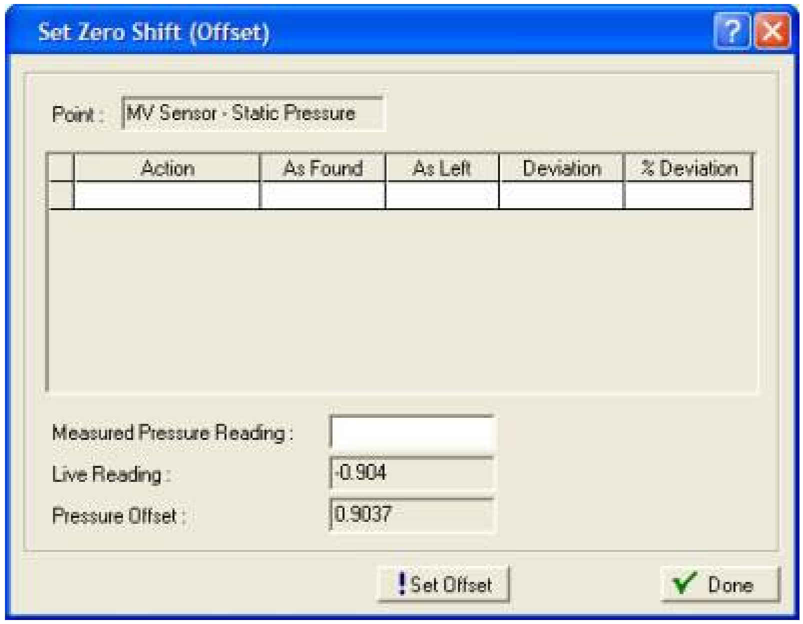


Figure 7-53. Set Zero Shift (Offset)

1. After you have calibrated static pressure, click **Offset** to calibrate the offset (shift) of static pressure if required.
2. Enter a value for the **Measured Pressure Reading**, which is the pressure as read from a calibrated pressure sensor.
3. Click **Set Offset** to send the value to the live reading to get the reading as close to the measured reading as possible.
4. Click **Done** to close the dialog.

Field	Description	
Zero Shift/Offset/RTD Bias	Click to set adjustment factors for the input. The value is sent to the device for:	
	Zero Shift	Click to zeros the static pressure effect for the differential pressure input (Set Offset).
	Offset	Click to send the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
	RTD Bias	Click to calibrate the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).
Measured Pressure Reading	Sets the pressure as read from a calibrated pressure sensor. **Note:** This field displays **only** for **static pressure** points.	

Field	Description
Pressure Offset	This **read-only** field shows the difference between the live pressure reading and the measured pressure reading that ROCLINK 800 applies to the pressure value. **Note:** This field displays **only** for static pressure points.

Sending the Temperature RTD Bias

Calibrate the offset (shift) of temperature throughout the RTD curve if required.

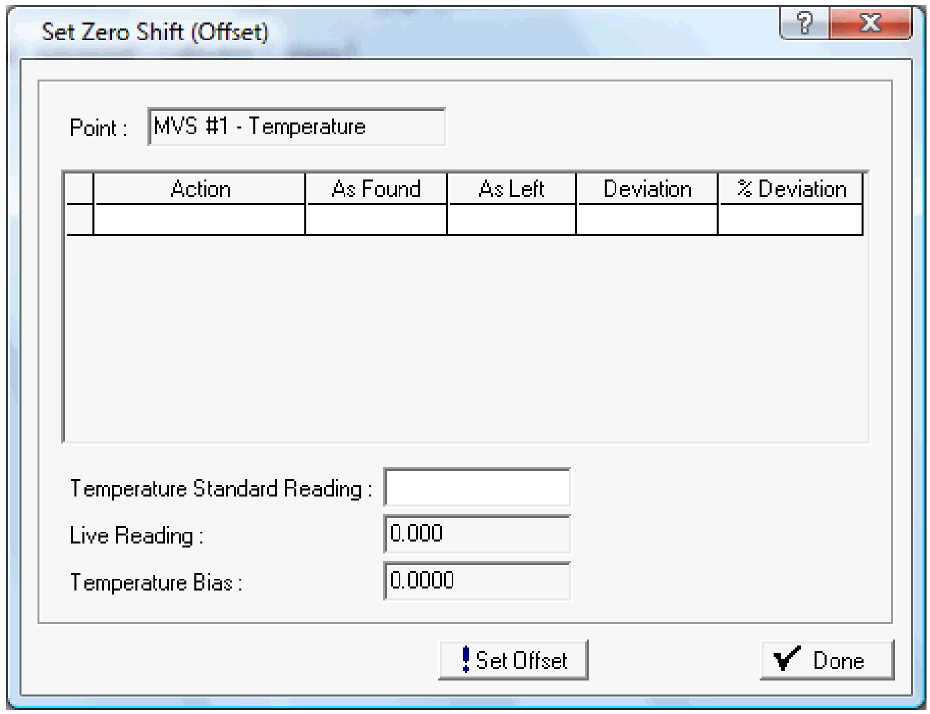


Figure 7-54. Temperature RTD Bias

1. After you have calibrated the temperature input, click **RTD Bias** to calibrate the offset (shift) of temperature throughout the RTD curve if required.
2. Enter a value for the **Temperature Standard Reading**, which is read from a calibrated temperature probe.
3. Click **Set Offset** to send the value to the live reading to get the reading as close to the measured reading as possible.
4. Click **Done** to close the dialog.

Field	Description
Temperature Standard Reading	Sets the temperature as read from a calibrated temperature probe. **Note:** This field displays **only** for temperature points.

Field	Description
Temperature Bias	This **read-only** field shows the difference between the live temperature reading and the entered standard temperature reading that ROCLINK 800 applies to the temperature value. **Note:** This field displays **only** for temperature points.

MVS: Alarms Tab

Use this tab to establish limits for differential pressure, pressure, temperature, and RBX alarms.

1. Select the **Alarms** tab. The Alarms screen displays.

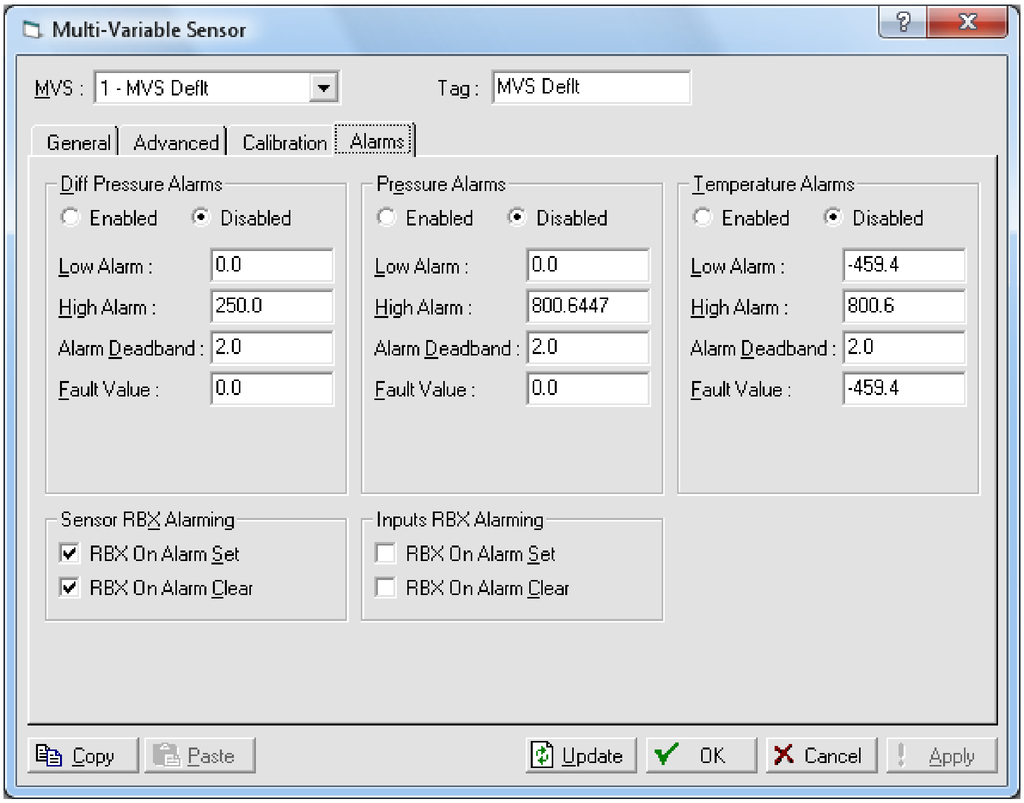


Figure 7-55. MVS Sensor – Alarms tab

Note: If you change any values, click **Write** to save the configuration.

Field	Description
Enabled/Disabled	Sets whether, for the particular input, alarms are active. Valid values: **Enabled** Configure alarms using the set parameters. **Disabled** Do not generate an alarm, regardless of configuration. The system logs alarms to the alarm log. To conserve log space, enable alarms only when necessary. **Note:** If you disable an alarm, the system does not generate an alarm for this point, regardless of the alarm configuration. Alarm statuses display in the **read-only** Status field on the General tab.
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a **Low Alarm**.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a **High Alarm**.
Alarm Deadband	Sets, in engineering units, an inactive zone above the Low Alarm limits and below the High Alarm limits. The Alarm Deadband prevents the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This prevents the Alarm Log from being over-filled with data.
Fault Value	Sets the point's value on failure. If a point fails and you have previously set the value on the Advanced tab's Action on Failure field to **Set to Fault Value**, the system uses the value entered in this field as the EU value for that point. **Note:** Fault Values are only used in Modify Limits.
Sensor / Inputs RBX Alarming	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are: ▪ **On Alarm Set** – Generates an RBX message to the host when the point enters an alarm condition. ▪ **On Alarm Clear** – Generates an RBX message to the host when the point leaves an alarm condition.

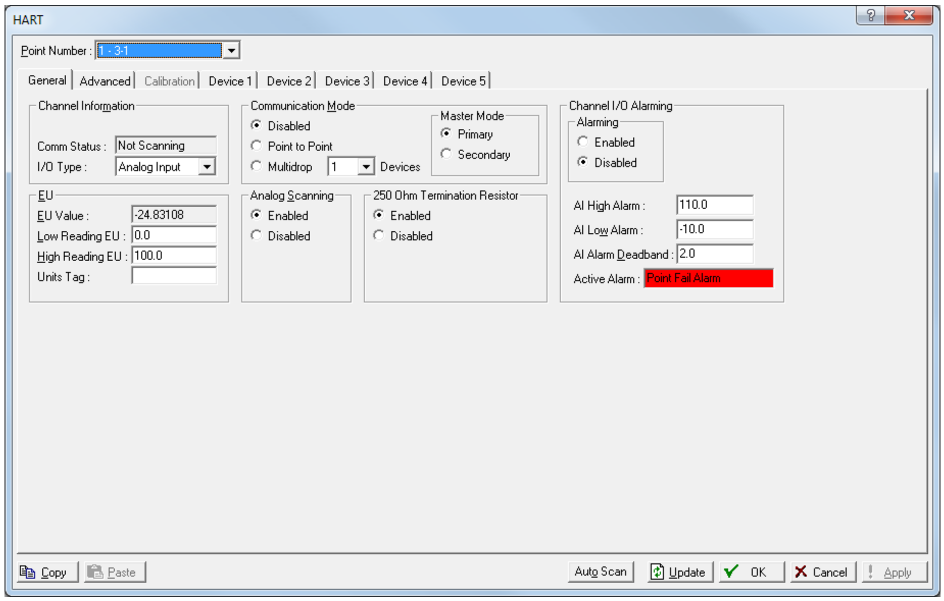
7.1.12 HART Input Configuration

The Highway Addressable Remote Transmitter (HART®) module enables the ROC800-Series to process input from field-based HART devices. Depending on your need, you can configure the HART module either as an analog input or analog output.

Series 1/Series 2 HART Modules

An earlier version ("Series 1") of the HART module is still in use. Switches on the Series 1 module's printed circuit board enable you to manually select analog input or output configurations. Series 2 HART modules use a software-selectable switch. Refer to the *ROC800-Series HART® Module* technical specifications (*ROC800:HART*) for specific physical and operational differences. As appropriate, this section notes any differences for the Series 1 HART module.

Select **Configure > I/O > HART Points**. The HART screen displays, showing the General tab by default.



The HART screen can have as many as eight tabs. Use each tab to configure a component of the module's operation.

- The **General** and Advanced tabs set parameters for the channel. Each HART module can support up to four channels.
- The **Calibration** tab enables you to calibrate the HART analog input.
- The **Device** tabs (1 through 5) set parameters specific to the devices in that channel. When you configure the module in analog output mode, each channel can support one device. When you configure the module in analog input mode, each channel can support up to five devices.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start.

HART: General Tab

Select **Configure > I/O > HART Points**. The HART screen displays with the General tab active. Use this tab to configure parameters for the channel.

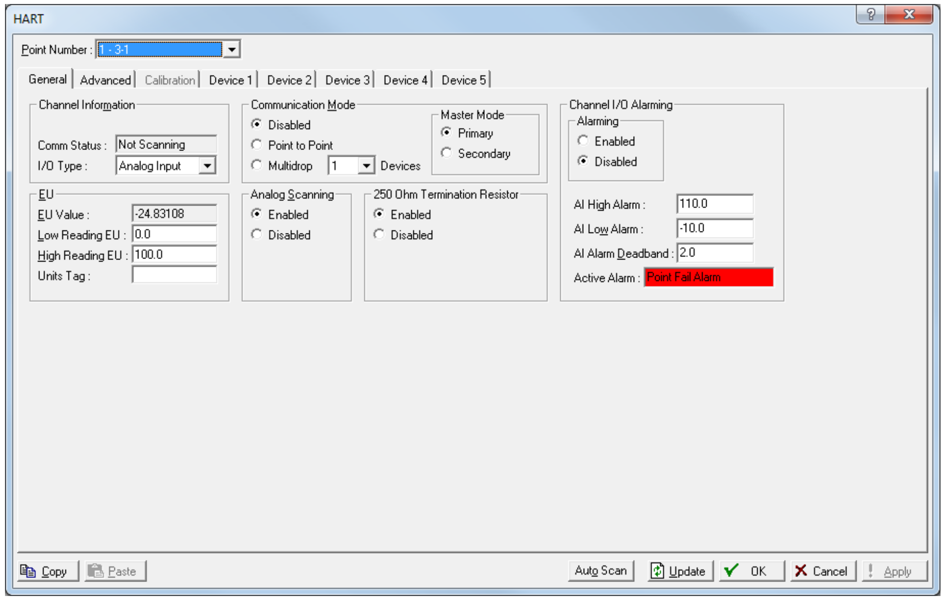


Figure 7-56. HART AI – General tab

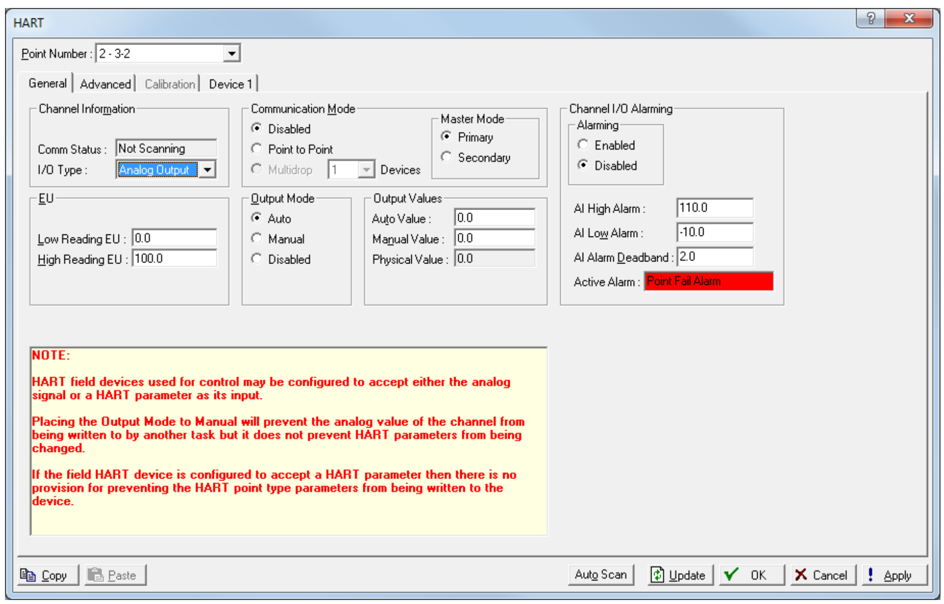


Figure 7-57. HART AO – General tab

Field	Description
Point Number	Identifies the channel and its physical location. The first number indicates the total number of installed HART points (based on the sum of all installed HART modules) in the ROC. The last two numbers indicate the point's location on a specific HART module. Click ▼ to display all available HART points. For example, **1 – 1-1** indicates the first point located on the HART module placed in slot #1 in the ROC chassis. **6 – 2-2** indicates the sixth HART point, located on the HART module placed in slot #2 in the ROC chassis. **Note:** This selection in this field applies to each tab on this screen.
Channel Version	This **read-only** field shows the version of firmware present in the HART module for this channel. **Note**: This field displays **only** if you have a Series 1 HART module installed.
Comm Status	This **read-only** field shows the status of the communications channel. **Scanning** indicates the channel is currently scanning the device(s). **Not Scanning** indicates the device is currently off-line or not communicating. **Dual Master** indicates that the channel has another master connected. Examples of other masters include a **Hand-Held Communicator** and a device that is configured to be in **Burst mode**. When in Dual Master, the ROC is not scanning the device, which allows communications between the other master and the devices. When the hand-held communicator finishes communicating with the HART device (or Burst mode was turned off in the device), normal HART module scanning automatically resumes. **Note:** The HART module does not support Burst mode. The device should not be configured in Burst mode when connected to the ROC If a device is in Burst mode, use a hand-held communicator to turn off Burst mode.
I/O Type	Click ▼ to configure the HART module as an analog input or analog output. **Note**: The Series 1 HART module requires you to manually change switches on the module itself. Refer to *Chapter 4* in the *ROC800-Series Remote Operations Controller Instruction Guide* (A6175).

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Communication Mode</td><td colspan="2">Sets the communication mode for the point. Valid values are:</td></tr>
<tr><td>Disabled</td><td>Stop all HART communication; no changes occur unless you manually enter them.</td></tr>
<tr><td>Point to Point</td><td>Enables the channel to communication with one HART device per channel and the analog signal is still representative of the measured variable.</td></tr>
<tr><td>Multidrop</td><td>Enables the channel to communications with the specified number of devices (maximum of five) that you connect to each channel in parallel. Each HART device in multi-drop mode requires 4mA and does not represent any measured variable value. With all four channels in multidrop mode, the ROC800 can support a maximum of twenty HART devices. The ROC superimposes digital communications on the analog signal that you use for powering the HART devices.
Note: Multidrop is not a valid option if you select Analog Output as an I/O Type.</td></tr>
<tr><td>Master Mode</td><td colspan="2">Sets sequencing to ensure that two masters can communicate with one slave device. Primary indicates that this HART point has priority in communications; any point set to Secondary must wait until the Primary communication has completed.</td></tr>
<tr><td>EU Value</td><td colspan="2">Sets the engineering units value of the analog input or analog output.
Note: This field does not display if you select Analog Output as the I/O Type.</td></tr>
<tr><td>Low Reading EU</td><td colspan="2">Sets the value in engineering units that corresponds to zero percent input.</td></tr>
<tr><td>High Reading EU</td><td colspan="2">Sets the value in engineering units that corresponds to 100 percent input.</td></tr>
<tr><td>Units Tag</td><td colspan="2">Provides a 10-character descriptor for the engineering units.
Note: This field does not display if you select Analog Output as the I/O Type.</td></tr>
<tr><td>Analog Scanning</td><td colspan="2">Sets analog scanning options. Valid values are Enabled (automatically process the field input) and Disabled (stop processing the field input).
Note: This field displays only if you select Analog Input as the I/O Type.</td></tr>
</table>

Field	Description
Output Mode	Identifies where the system obtains the output value. Valid values are **Auto** (system uses the value in the Auto Value field of the Output Value frame), **Manual** (system uses the value in the Manual Value field of the Output Value frame), or **Disabled** (system does not use a value). **Note**: This field displays **only** if you select **Analog Output** as the I/O Type.
250 Ohm Termination Resistor	Indicates whether the software activates a 250Ω termination resistor for the HART module. Valid only for the Series 2 HART module. **Note**: This field displays **only** if you select **Analog Input** as the I/O Type.
Output Values	Sets the actual output value the system uses, based on the setting in the Output Mode field. The system uses the value you enter in the **Auto Value** field if you also select **Auto** in the Output Mode field. The system uses the value you enter in the **Manual Value** field if you also select **Manual** in the Output Mode field. The Physical Value field is a read-only field that displays the actual value being sent. **Note**: These fields display **only** if you select **Analog Output** as the I/O Type.
Alarming	Sets alarming on the channel. Select **Enabled** to activate alarming or **Disabled** to prevent alarming. **Disabled** is the **default**.
AI High Alarm	Sets the high point for the channel alarm.
AI Low Alarm	Sets the low point for the channel alarm.
AI Alarm Deadband	Sets a deadband for the channel alarm.
Active Alarm	This **read-only** field shows any active alarms.

HART: Advanced Tab

Select **Configure > I/O > HART Points > Advanced** tab to configure parameters for the channel. Each HART module supports up to four channels.

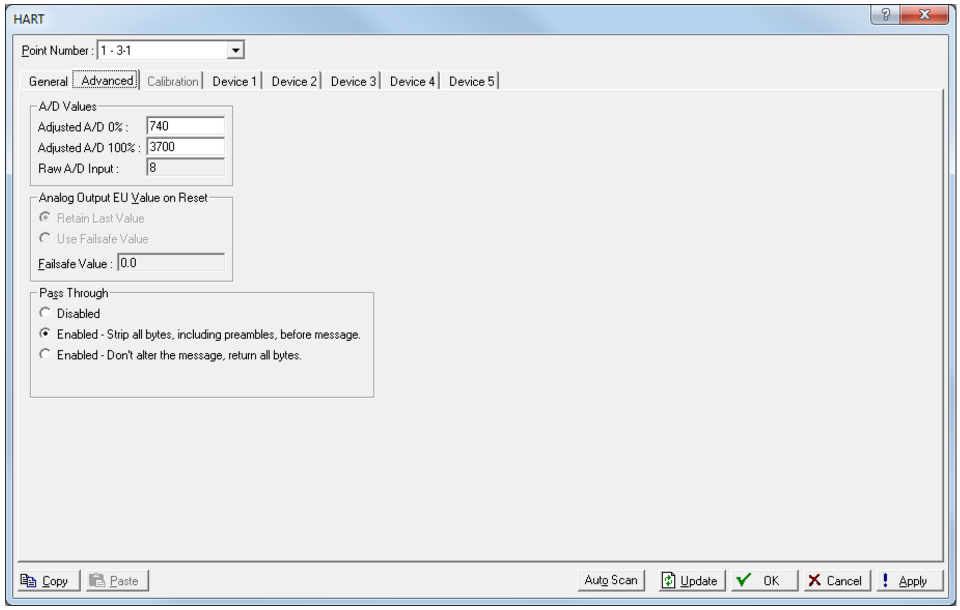


Figure 7-58. HART – Advanced tab

Field	Description
Adjusted A/D 0% or **Adjusted D/A 0%**	Sets a value to adjust the calibrated Analog-to-Digital (for AIs) or Digital-to-Analog (for AOs) reading to zero percent input. In the Calibrate function, this value is altered to set the zero percent input exactly at the Low Reading EU value to eliminate transmitter and system errors. **Note**: This is a **read-only** field for the Series 1 HART module.
Adjusted A/D 100% or **Adjusted D/A 100%**	Sets a value to adjust the calibrated Analog-to-Digital (for AIs) or Digital-to-Analog (for AOs) reading corresponding to 100 percent input. This system uses this value to convert the input to engineering units. In the Calibrate function, this value is altered to set the 100 percent input exactly at the High Reading EU value. **Note**: This is a **read-only** field for the Series 1 HART module.
Raw A/D or D/A Input	This **read-only** field shows the current reading directly from the Analog-to-Digital (for AIs) or Digital-to-Analog (for AOs) converter.
Analog Output EU Value on Reset	Indicates the value the system uses on reset. When you select **Retain Last Value**, use the last EU value for the channel after a reset or a warm start. If you select **Use Failsafe Value**, enter a value to use after a reset or warm start.

Field	Description
Pass Through	Sets how communications pass from a host device through the ROC and on to the HART devices. The communications must be in ROC Plus protocol (typically for Opcode 120 requests). Valid values are **Disabled** (no pass through occurs), **Enabled – Strip** (strip all preamble bytes in HART protocol) or **Enabled – Don't** (leave the entire message intact). For the Series 1 HART Module, the Timeout field enables you to enter, in milliseconds, the amount of time the system pauses between the end of the pass through communication and the restarting of polling of the HART device.

HART: Calibration Tab

Select **Configure** > **I/O** > **HART Points** > **Calibration** tab to calibrate a HART channel that is acting as an analog input HART inputs support a two-point calibration routine.

Note: You can access and run Calibration **only** when the channel is in **Point to Point** mode or the device poll mode is **Skip This Device**.

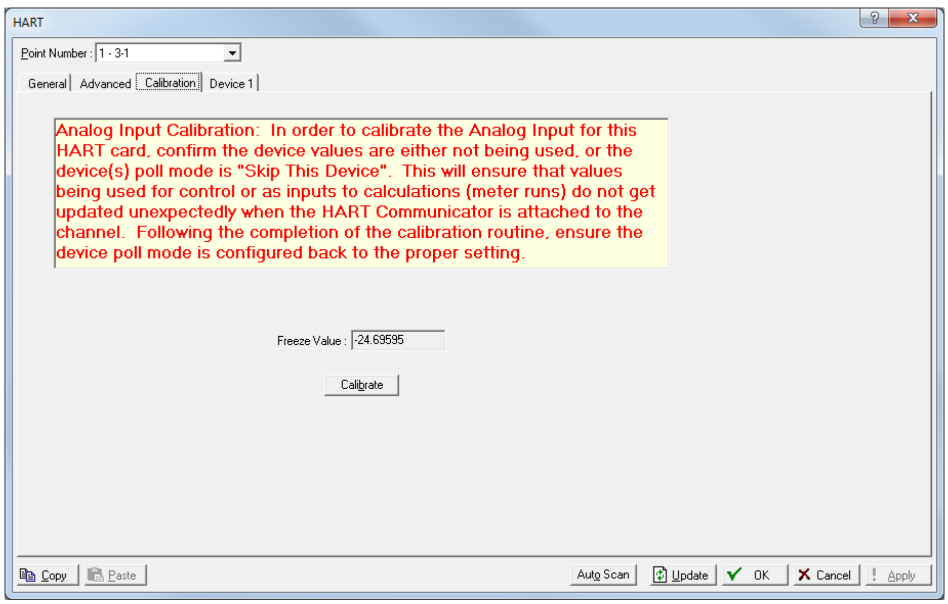


Figure7-59. HART – Calibration tab

Field	Description
Freeze Value	This **read-only** field shows the value received from inputs when the **Update** button was last clicked. The system uses these values in ongoing processing (such as flow calculations, history logging, or control) while calibration occurs.
Calibrate	Click to begin calibration and displays the Set Zero dialog.

Calibrating a HART Input

Use this process to calibrate an HART that is outside the temperature limits.

1. Select a HART **Point Number** to calibrate.
2. Verify that the **Communication Mode** on the **General** tab is set to **Point-to-Point**.
3. Click the **Device** tab and verify that the **Poll Mode** is set to **Skip This Device**.
4. Click the **Calibration** tab.

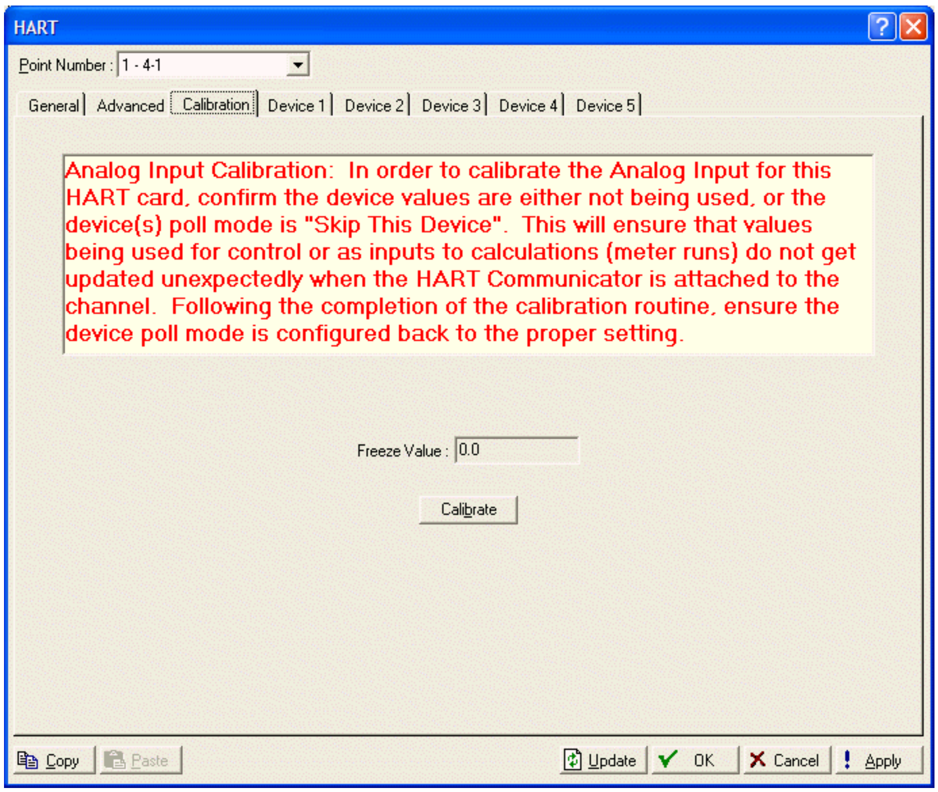


Figure 7-60. HART Input Calibration

5. Click **Calibrate.** A Set Zero screen displays.

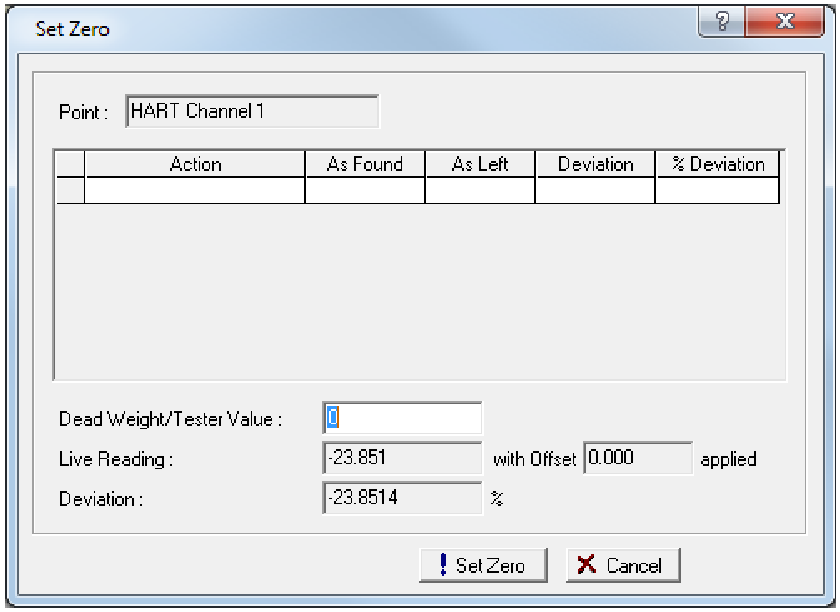


Figure 7-61. Set Zero Menu

Note: You can click **Cancel** to exit the calibration without saving the changes. The system retains the previous calibration settings but logs the event in the event log.

6. Complete the **Dead Weight/Tester Value** field. This value represents the low range (0%) of the instrument's measurement range.

   When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

7. Click **Set Zero** when the live reading stabilizes. ROCLINK 800 adds the first line in the calibration log, renames the screen to **Set Span**, and changes the label on the **Set Zero** button to **Set Span**.

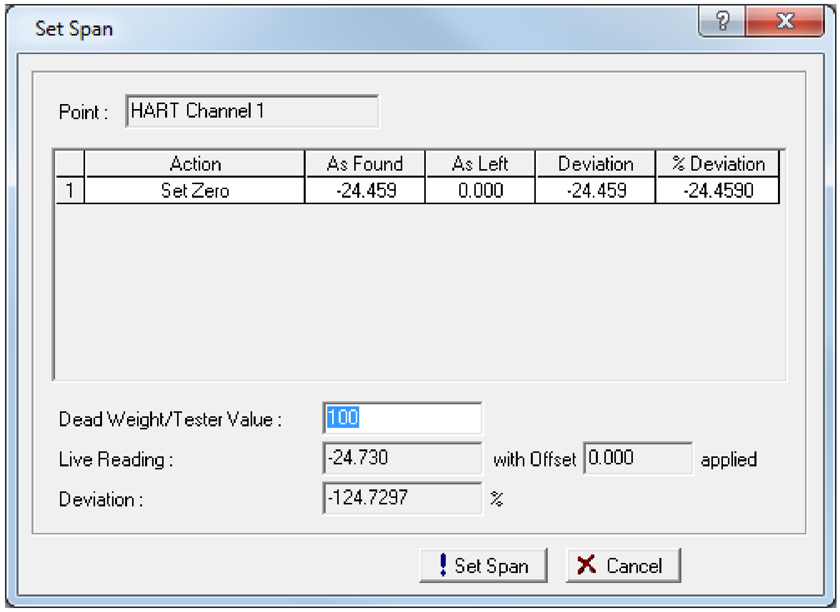


Figure 7-62. Set Span

8. Set test equipment to produce the expected results.
9. Complete the **Dead Weight/Tester Value** field with a value represents the upper limit (100% or "span") of the instrument's measurement range.

   When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

   For the Set Zero entry in the calibration log, ROCLINK 800 records the **As Found** and **As Left** values and calculates the **Deviation** and **% Deviation** values (between the Dead Weight/Tester Value and the Live Reading values).
10. Click **Set Span** when the live reading stabilizes.
11. Click **Done**.

When the Calibration tab displays, the calibration routine is complete.

Note: Following a calibration, you may re-run a verification to demonstrate to the customer that the measurement results are now within contractual parameters.

HART: Device Tab

Select **Configure > I/O > HART Points > Device** tabs to configure parameters specific to the devices in that channel. Each channel in analog output mode can support one device. Each channel in analog input mode can support up to five devices.

If you select **Point to Point** as the communications mode on the General tab, the Device 1 tab presents device information. If you select **Multidrop** as the communications mode, each Device tab corresponds to the HART Tag (Point Number) defined for the ROC to poll.

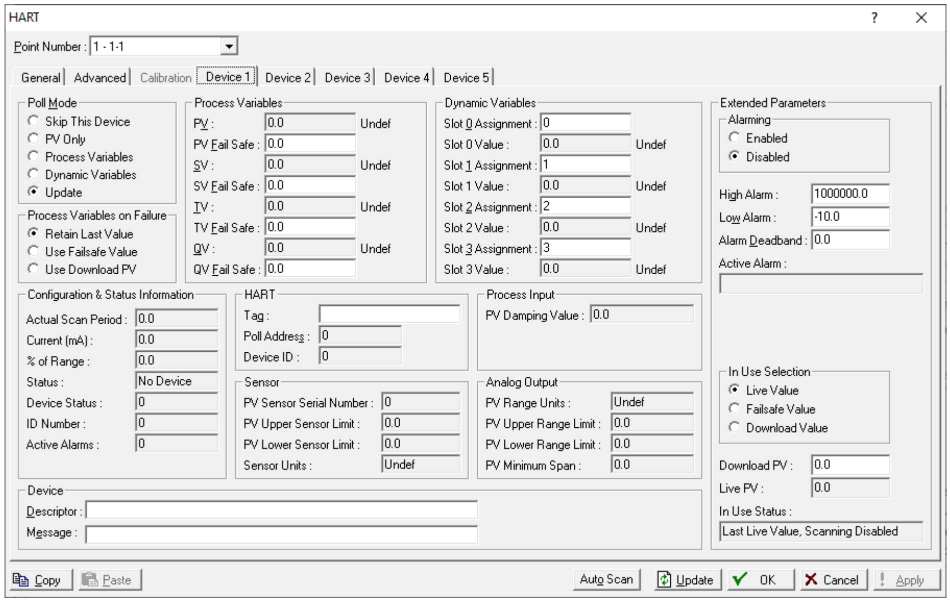


Figure7-63. HART – Device tab

Field		Description
Poll Mode		Sets the polling behavior for this device. Valid values are:
	Skip this Device	Removes this device from the polling sequence
	PV Only	Poll only the Primary Variable value.
	Process Variables	Poll values for all of the Process Variables (primary, secondary, tertiary, and quaternary).
	Dynamic Variables	Poll only the values for the four Slot Variables.
	Update	Updates the device's static information. Static information includes transmitter ranges, units, tag, descriptor, PV limits, and ranges.
Process Variables on Failure		Sets the values to use after a failure, if you have set the value in the In Use Selection frame to **Live Value**. Valid values are:
	Retain Last Value	Use the last values for the process variables.
	Use Failsafe Value	Use the value entered as the Failsafe Value.
	Use Download PV	Use the value entered in the Download PV field in the Extended Parameters frame; the other process values use their failsafe values.

Field	Description
Actual Scan Period	This **read-only** field shows the actual amount of time in seconds that passes between scans.
Current (mA)	This **read-only** field shows the current, in milliamps, reported by the device.
% of Range	This **read-only** field shows the percentage of the range currently being reported by the device.
Status	This **read-only** field shows the state of the device. This field displays either **No Device**, **Communicating**, or **Comm Error**.
Device Status	This **read-only** field shows the response status code from the device. Refer to the documentation from the transmitter manufacturer for more information.
ID Number	This **read-only** field shows a 3-byte globally unique address of the device.
Active Alarms	This **read-only** field shows any alarms that are being sent from the device. These are not entered in the Alarm Log.
Descriptor	Provides up to 16 alphanumeric characters of information (in addition to the device Tag) to more specifically describe the device.
Message	Defines a message (up to 32 alphanumeric characters in length) sent to and stored in the device.
PV	This **read-only** field shows the value of the Primary Process Variable.
PV Fail Safe	Sets the value to use as the Primary Variable, after a failure if you select **Use Failsafe Value** in the Process Variables on Failure frame.
SV	This **read-only** field shows the value of the Secondary Process Variable.
SV Fail Safe	Sets the value to use as the Secondary Variable after a failure if you select **Use Failsafe Value** in the Process Variables on Failure frame.
TV	This **read-only** field shows the value of the Tertiary Process Variable.
TV Fail Safe	Sets the value to use as the Tertiary Variable after a failure if you select **Use Failsafe Value** in the Process Variables on Failure frame.
QV	This **read-only** field shows the value of the Quaternary Process Variable.
QV Fail Safe	Sets the value to use as the Quaternary Variable after a failure if you select **Use Failsafe Value** in the Process Variables on Failure frame. .
Tag	Sets the name for the HART device to identify it throughout the configuration. The tag should be 10 characters or less. When in Multidrop mode, the tag must be unique for every device.

Field	Description
Poll Address	This **read-only** field shows the address used for this HART device. In Point to Point mode, the Poll Address is 0. In Multidrop mode, the system uses addresses between 1 and 5.
Device ID	This **read-only** field shows the coded ID that reflects the manufacturer of the device, the device type, and the device ID.
PV Sensor Serial Number	This **read-only** field shows the serial number of the sensor.
PV Upper Sensor Limit	This **read-only** field shows the upper limit on the sensor.
PV Lower Sensor Limit	This **read-only** field shows the lower limit on the sensor.
Sensor Units	This **read-only** field shows the units of measure for the upper and lower sensor limits.
Slot Assignment (0 through **3)**	Sets the value (0, 1, 2, or 3) to determine which variable in that slot to request.
Slot Value (0 through **3)**	These **read-only** fields show the value (0, 1, 2 or 3) of the variable requested from that slot. The **read-only** units defined in the device displays to the right of this field.
PV Damping Value	This **read-only** field shows the damping value reported by the device for the Primary Variable.
PV Range Units	This **read-only** field shows the units of measure for the analog output minimum span and upper and lower range limits.
PV Upper Range Limit	This **read-only** field shows the maximum value in the analog output range.
PV Lower Range Limit	This **read-only** field shows the minimum value in the analog output range.
PV Minimum Span	This **read-only** field shows the minimum sensor span.
Alarming	Activates alarms for this device. Valid values are **Enabled** (active alarms) or **Disabled** (prevent alarms for this device). The **default** is **Disabled**.
High Alarm	Sets a high value limit for alarms for this device.
Low Alarm	Sets a low value limit for alarms for this device.
Alarm Deadband	Sets a deadband
Active Alarm	This **read-only** field shows any current alarms for this device.
In Use Selection	Indicates the value the system uses for the primary value while in operation. Valid values are:
	Live Value – Use the value from the device. If device fails, use value specified in PV Fail Safe field.
	Failsafe Value – Sets PV value to the value entered in the PV Fail Safe field.
	Download Value – Sets PV value to the value entered in the Download PV field.

Field	Description
Download PV	Sets a specific value the system uses if you select **Use Download PV** in the Dynamic Variables on Failure frame.
Live PV	This **read-only** field shows the live primary variable for the device.
In Use Status	This **read-only** field shows the current In-use settings.

7.1.13 Alternating Current I/O (ACIO) Configuration

The Alternating Current I/O module (ACIO) enables the ROC to control various AC output field devices and to monitor various AC input field values. The ROC809 supports up to nine ACIO modules. The ROC827 can support up to 27 ACIO modules.

Field	Description
ACIO Channel Number	Sets the channel on the ACIO module that you desire to configure. **Note:** This selection in this field applies to **each** tab on this screen.
ACIO Tag	Sets the **Tag**, which includes up to 10 characters to identify the Point being defined in the I/O screen. Any alphanumeric characters, including spaces, may be used. **Note:** This selection in this field applies to **each** tab on this screen.
ACIO Channel Mode	This **read-only** field shows the DIP switch on the ACIO module is positioned Output mode or Input mode. The ACIO module has one bank of six DIP switches, which controls the input/output status of each of the six channels. Placing a switch in the ON position sets the corresponding channel to output mode. Placing a switch in the OFF position sets the channel to input mode. Dual-color light-emitting diodes (LEDs) indicate the current status for each channel. Red means AC is being output. Green means AC has been detected on an input channel. **Note:** This selection in this field applies to each tab on this screen.
ACIO Power In	This **read-only** field shows if the AC power is currently present at the AC IN channel. **Note:** This selection in this field applies to each tab on this screen.

ACIO (Discrete Output): General Tab

In output mode, the module provides up to six channels for switching discrete AC. Each channel uses a solid-state normally open relay rated at 1.5 Amps. Any AC switched out is directly related to the AC switched in. You can configure the module as latched, toggled, momentary, or Timed Duration Outputs (TDOs). Other parameters report the approximate load, overcurrent conditions, and AC input status. Discrete outputs can be configured to either retain the last value on reset or a user-specified fail-safe value.

Select **Configure > I/O > ACIO Module > General** tab to configure the basic properties for the Alternating Current I/O module discrete output.

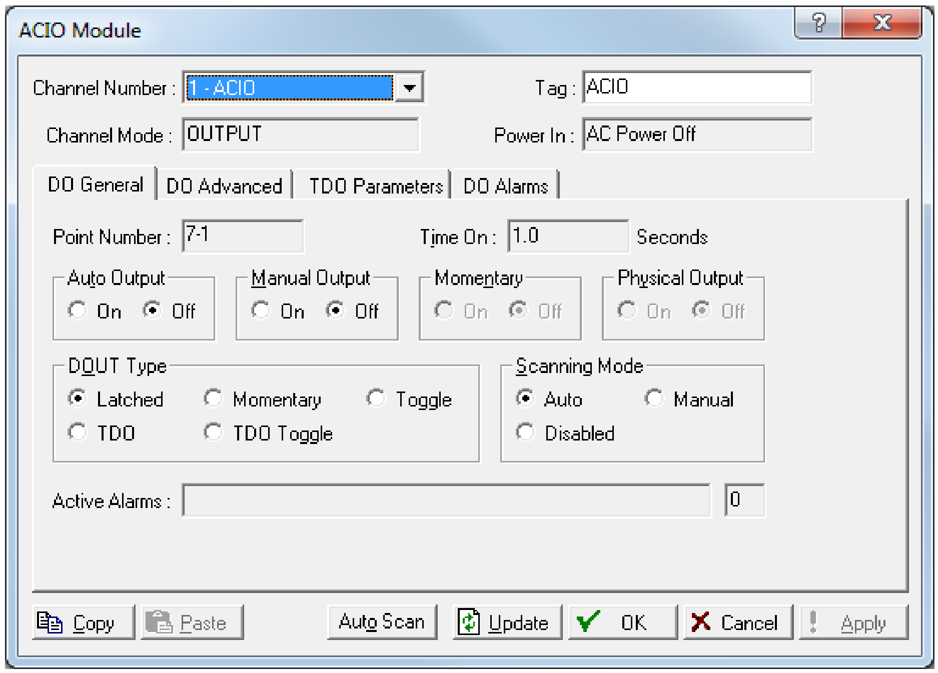


Figure7-64. ACIO (Discrete Output) – General tab

Field	Description
Discrete Outputs	Selects the discrete output to be configured. The outputs are listed by both Point Number and Tag. **Note:** This selection in this field applies to each tab on this screen.
Time On	Sets, in seconds, the amount of time for momentary operation. The default value is **1** second for a DO. The default value is **5** milliseconds for an ACIO DO. **Note:** In Momentary mode, this is the amount of time (in seconds) that the momentary contact is energized. In the Toggle mode, this is the time (in seconds) between switching On or Off. In the TDO and TDO Toggle modes, the TDO configuration calculates this value.

Field	Description	
Auto Output	Indicates the state of the discrete output. **Off** indicates that the output is Off or that a switch is open; **On** indicates that the output is On or that a switch is closed.	
Manual Output	This field indicates the state of the discrete output. Off indicates that the output is Off or that a switch is open; On indicates that the output is On or that a switch is closed. Select On and click Apply to force one transition of the DO.	
Momentary	This **read-only** field shows the state of the discrete output when the DOUT Type is set to Momentary. **Off** indicates that the output is Off or that a switch is open; **On** indicates that the output is On or that a switch is closed.	
Physical Output	This **read-only** field shows the actual status of the output channel at the field terminations regardless of the DOUT Type selected.	
DOUT Type	Selects the function of this discrete output. Valid values are:	
	Latched	Changes on an active transition of the output (from off to on). The discrete output remains On until cleared by selecting Off in the Auto Output field.
	TDO or Time Duration	Enables the discrete output to have a time duration between On and Off transitions based on time-related parameters configured in the TDO Parameters Tab.
	Momentary	Enables ROCLINK 800 to activate the discrete output for the amount of time defined in the **Time On** field.
	Toggle	Enables a square-wave output for which both the time on and time off are defined by the value in the **Time On** parameter. Time on and time off are equal. Use the TDO Parameters Tab to define time-related parameters.
	TDO Toggle	Enables the discrete output to continuously repeat in a cycle defined by the value in the **Cycle Time** field on the TDO Parameters Tab where the EU Value controls the on-time duration.

Field	Description
Scanning or Scanning Mode	Sets the scanning type to configure how the DO is scanned. Valid values are or **Auto** (automatically process the last output scan) or **Disabled** (permit only manual updates of the output). **Manual** (manually permit a process of the last output scan). **Note:** If you enable alarming, the ROC generates a Manual Mode alarm when scanning is disabled. ▪ For the output to automatically process the field output, select **Auto**. ▪ When Scanning Mode is set to **Disabled** or **Manual**, the DO is no longer updated by the *ROC ▪ When the Scanning Mode is set to **Manual**, set **Manual Output** to On and click **Apply** to override the output. ▪ When Scanning Mode is set to **Disabled**, set **Auto Output** to On and click **Apply** to override the output.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.

ACIO (Discrete Output): Advanced Tab

Select **Configure > I/O > ACIO Module > Advanced** tab to configure the advanced properties for the Alternating Current I/O module discrete output.

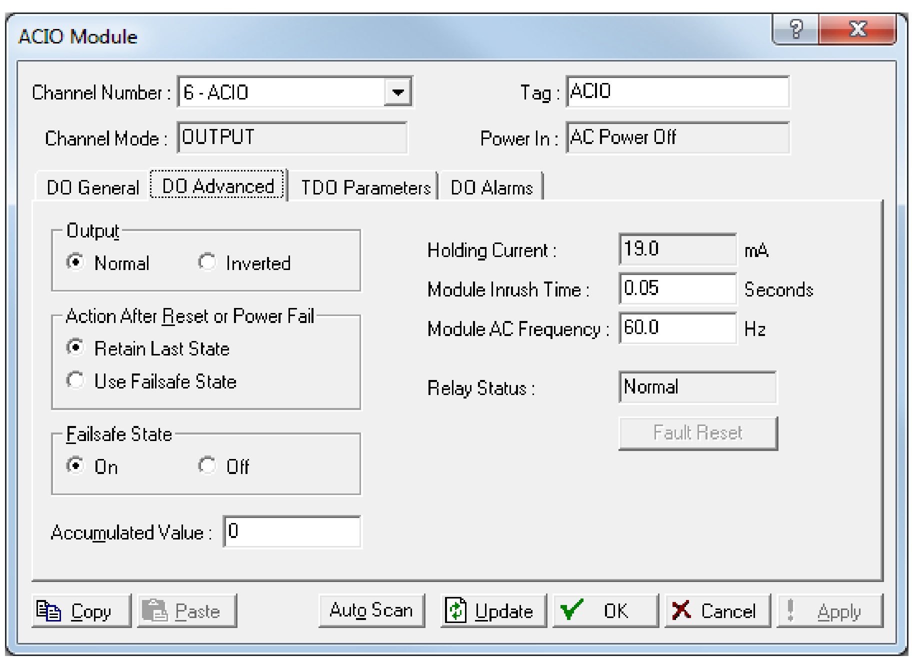


Figure 7-65. ACIO (Discrete Output) – Advanced tab

Field	Description
Output	Set to **Inverted** or **Normal** to define the action of the discrete output value. Normal output energizes in Time On and Inverted output energizes in off time. **Note:** Selecting Inverted inverts **all** outputs in any mode. If you set **both** Failsafe State **and** Inverted to On, the Failsafe State returns to/ Off on a reset.
Action After Reset or Power Fail	Sets the **Action After Reset or Power Fail** parameter to determine the value for the output after a reset or power failure. The DO can retain the last values before the reset or power failure. If u**se Failsafe State** is selected, you must specify whether the **Auto Output** or **Manual Output** is set to On or Off after a reset of the ROC, such as a power restart or a warm start.
Failsafe State	Sets the **Action After Reset or Power Fail** parameter to determine the value for the output after a reset or power failure. The DO can retain the last values before the reset or power failure. If u**se Failsafe State** is selected, you must specify whether the **Auto Output** or **Manual Output** is set to On or Off after a reset of the ROC, such as a power restart or a warm start.
Accumulated Value	Sets a value for the accumulated number of off-to-on transitions for the discrete output. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator to a desire value or clear it by enter zero (**0**).
Holding Current	This **read-only** field shows the current approximate load value of the output in milliamps.
Module Inrush Time	Sets devices you connect to the ACIO module to draw more than 1.5A(rms) for the **Module Inrush Time** you select. This parameter assumes 60hz AC.
Module AC Frequency	Sets the frequency of the AC input to ensure the correct functionality of fault detection.
Relay Status	This **read-only** field shows the current status of the output: ▪ **Normal** – The relay is healthy. ▪ **Fault** – A fault condition has occurred on this channel, the channel has been shut down and may not be re-enabled without first resetting this parameter ▪ **Failure** – A relay failure has been detected. This is a physical failure. This module must be repaired by the factory.
Relay Status	Click the **Fault Reset** button to reset the output after a fault.

ACIO (Discrete Output): TDO Parameters Tab

Select **Configure > I/O > ACIO Module > TDO Parameters** tab to configure the Timed Duration Output parameters for the Alternating Current I/O module discrete output.

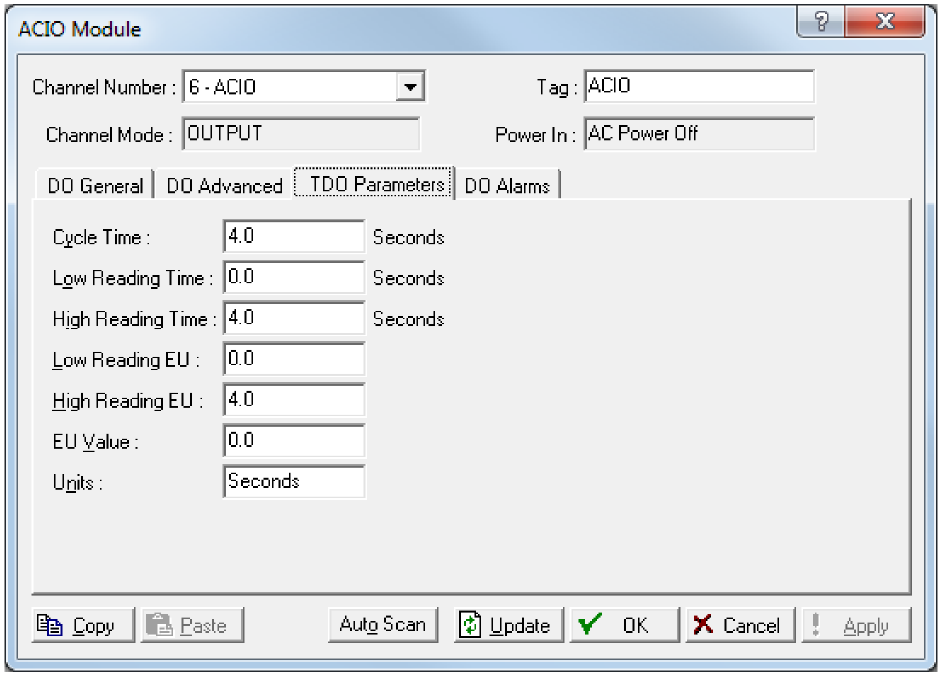


Figure 7-66. ACIO (Discrete Output) – TDO Parameters tab

Field	Description
Cycle Time	Sets, in seconds, the total amount of time the cycle spends in the on and off positions. The default is **15** seconds. The Cycle Time entry is used to define the OFF time in the TDO Toggle mode. The OFF time is calculated by the formula: Off Time = Cycle Time – On Time **Example:** A TDO is used to emulate a field instrument measuring flow. The TDO outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow. The output is repeated every 15 seconds. If the Cycle Time is less than, or equal to the On Time, the OFF time is set to one. Care must be taken in configuration (including other places, such as FSTs) to ensure that **the Cycle Time remains greater than the calculated On Time** for proper operation.
Low Reading Time	Sets the **Low Reading Time** (0% Count) in seconds that represents a zero percent output pulse width. The default is **3** seconds. This is the minimum amount of time that the TDO can be energized to move the motor. Set to a value that allows movement, but also provides good resolution of control.

Field	Description
High Reading Time	Sets the **High Reading Time** (100% Count) in seconds that represents a 100 percent output pulse width. The default is **12** seconds. This is the maximum amount of time that the TDO can be energized to move the motor. Normally, this is the amount of time it takes for the actuator to move the valve from fully open to fully closed.
Low Reading EU	Sets the engineering unit (EU) for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
High Reading EU	Sets the engineering unit (EU) for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
EU Value	Current value, displayed in engineering units. In TDO Toggle mode, the EU Value controls the Time On: On Time = ((EU Value – Low Reading EU) / (High Reading EU – Low Reading EU) * (High Time – Low Time)) + Low Time
Units	Sets the engineering units for the discrete output (such as percentage, IN H2O, PSIG, MCF, degrees F, milliamps, and volts).

ACIO (Discrete Output): DO Alarms Tab

Select **Configure > I/O > ACIO Module > DO Alarms** tab to configure the alarm properties for the Alternating Current I/O module discrete output.

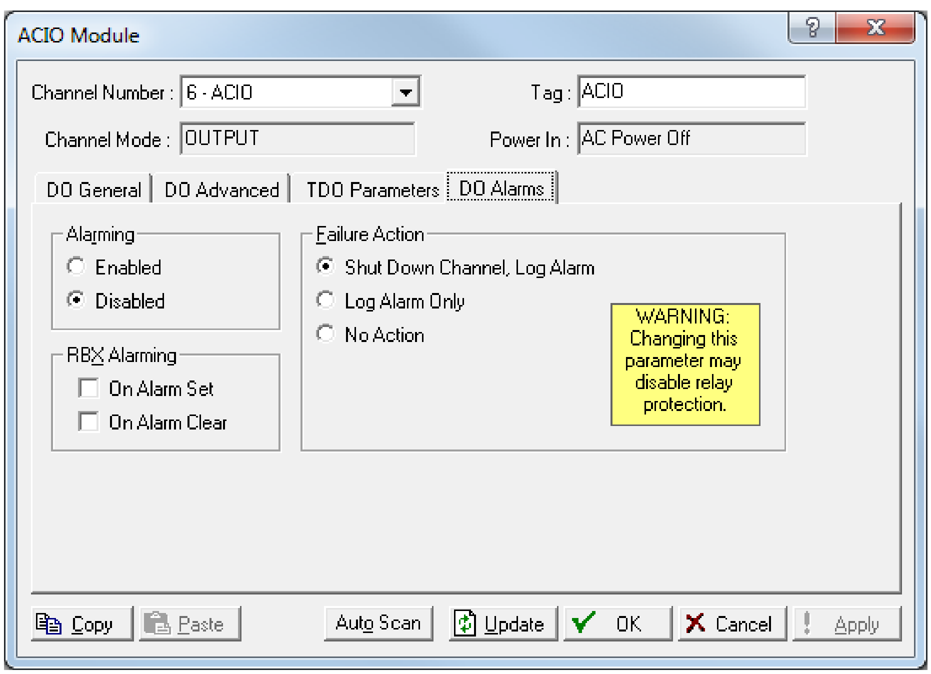


Figure 7-67. ACI (Discrete Output) – DO Alarms tab

Field	Description
Alarming	Sets the alarm option for this point. Valid values are **Enabled** (enables alarming) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you enable alarming, the system generates an alarm if you disable scanning.
RBX Alarming	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are: ▪ **On Alarm Set** - Generates an RBX message to the host when the point enters an alarm condition. ▪ **On Alarm Clear** - Generates an RBX message to the host when the point leaves an alarm condition. **Note:** SRBX Alarming requires the communications port to be configured.
Failure Action	Sets the action to perform upon alarm detection: ▪ **Shut Down Channel, Log Alarm** – Shuts down the DO and logs an alarm event. ▪ **Log Alarm Only** – Leaves the DO in alarm state and logs an alarm event. ▪ **No Action** – No action performed upon alarm detection.

ACIO (Discrete Input): DI General Tab

You can configure each channel as an AC input/detector. Each channel can detect the presence of an AC signal between 90 and 265 Vrms at 47 to 63 Hz. In discrete input mode the module monitors the status of various AC sources. Each channel can also be software-configured to function as a latched DI, which remains in active state until reset. Other parameters can invert the field signal and gather statistical information on the number of transitions and the time accumulated in the on or off state. The fastest time that each channel within the module can be read is 50 times per second.

Select **Configure > I/O > ACIO Module > DI General** tab to configure the basic properties for the Alternating Current I/O module discrete input.

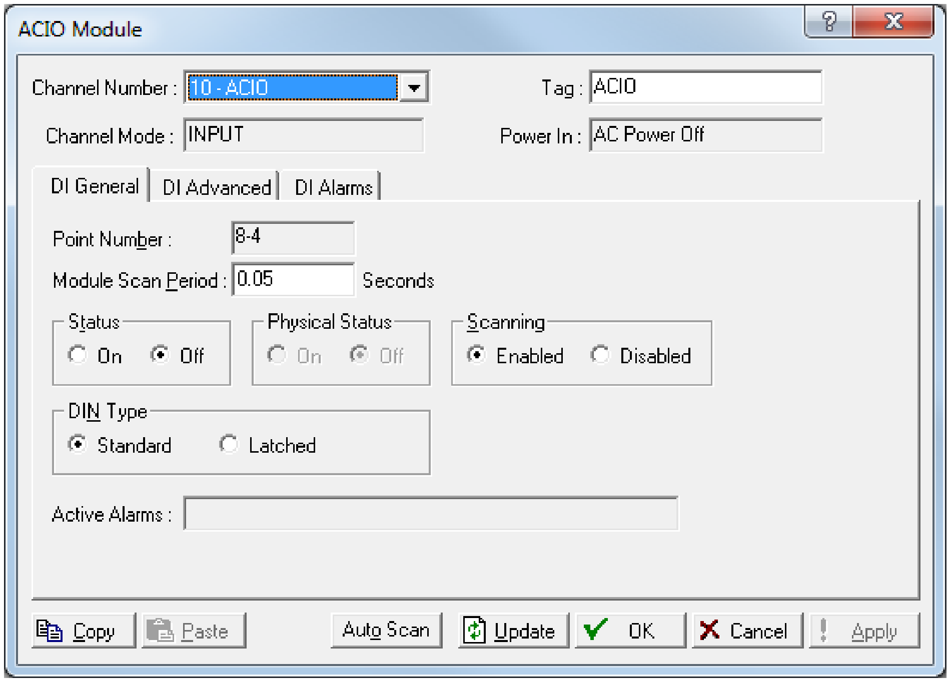


Figure 7-68. ACIO (Discrete Input) – DI General tab

Field	Description
Point Number	This **read-only** field identifies the rack location for this point.
Scan Period	Sets, in seconds, how frequently the system scans the input.
Status	Sets the state of the discrete input. Valid values are **On** (indicates that a contact is closed or input is on) or **Off** (indicates that a contact is open or input is off).
Physical Status	This **read-only** field shows the state of the hardware. **Off** normally indicates that a switch is open; **On** normally indicates that a switch is closed. This may be different from the Status if Inverting or Latching is in effect.
Scanning	Sets the scanning option for this point. Valid values are **Enabled** (automatically process the field input) or **Disabled** (do not process the input).
DIN Type	Sets how the DI functions. Valid values are: ▪ **Standard** – Follow the actual field input. ▪ **Latched** – Maintains the input status. For example, in an active transition from off to on, the DI remains in the on state until you clear the Status parameter either manually or through the software.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear. Refer to User Interface Basics.

ACIO (Discrete Input): DI Advanced Tab

Select **Configure > I/O > ACIO Module > DI Advanced** tab to configure the advanced properties for the Alternating Current I/O module discrete input.

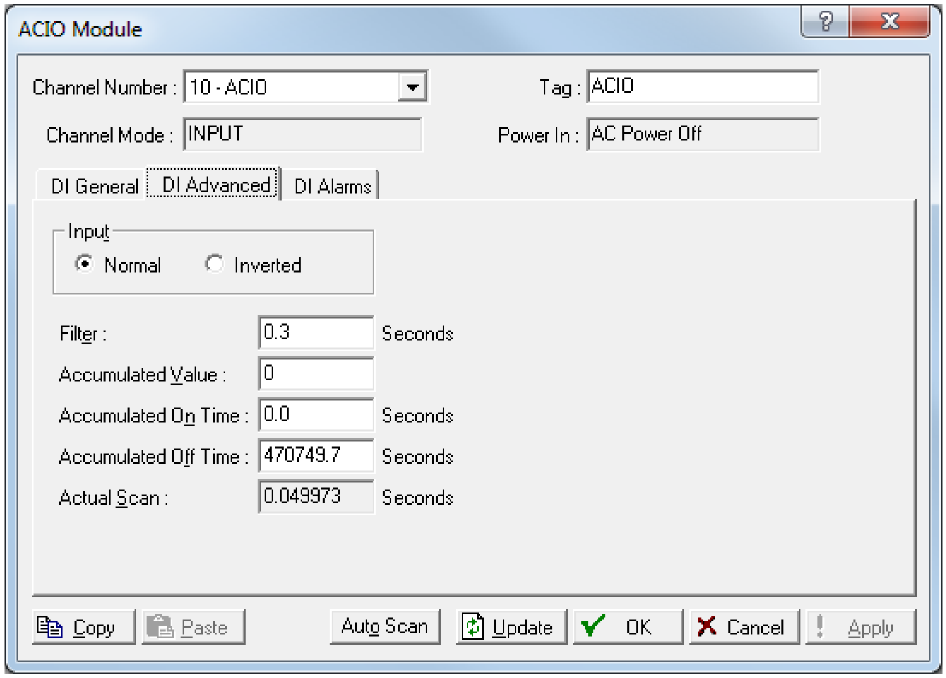


Figure 7-69. ACIO (Discrete Input) – DI Advanced tab

Field	Description
Input	Sets the state of the input. Valid values are **Normal** (field input operates normally, so that On is On) or **Inverted** (inverts the field input in the Status field so that On becomes Off and vice-versa). In the Inverted state, an open circuit in the field would then be indicated as On in the Status field, and closed contacts would be indicated as Off.
Filter	Sets, in conjunction with the Filter Intervals field, the amount of time that the discrete input must remain in the On (high) state before the device recognizes it as such. Enter the **Filter** value as a valid between **0** to **255**. The discrete input returns to the Off state immediately upon detection of the On to Off transition; there is no filtering for this transition.
Accumulated Value	Counts the number of times the discrete input goes from Off to On. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator by entering the desired value or clear the accumulator by entering **0**.

Field	Description
On Counter	Counts the number of 50-millisecond periods when the Status parameter is in the On state. The On Counter is a 32-bit number that automatically "rolls over" when it reaches its maximum value. You can preset the On Counter by entering the desired value or clear the counter by entering **0**. **Note:** The On Counter does not function if you **disable** scanning.
Off Counter	Counts the number of 50-millisecond periods when the Status parameter is in the Off state. The Off Counter is a 32-bit number that automatically "rolls over" when it reaches its maximum value. You can preset the Off Counter by entering the desired value or clear the counter by entering **0**. **Note:** The Off Counter does not function if you **disable** scanning.
Actual Scan	This **read-only** field displays the actual amount of time in seconds that passes between scans. This number should be the same as shown for the Scan Period parameter if the system is not overloaded.

ACIO (Discrete Input): DI Alarms Tab

Select **Configure > I/O > ACIO Module > DI Alarms** tab to configure the alarm properties for the Alternating Current I/O module discrete input.

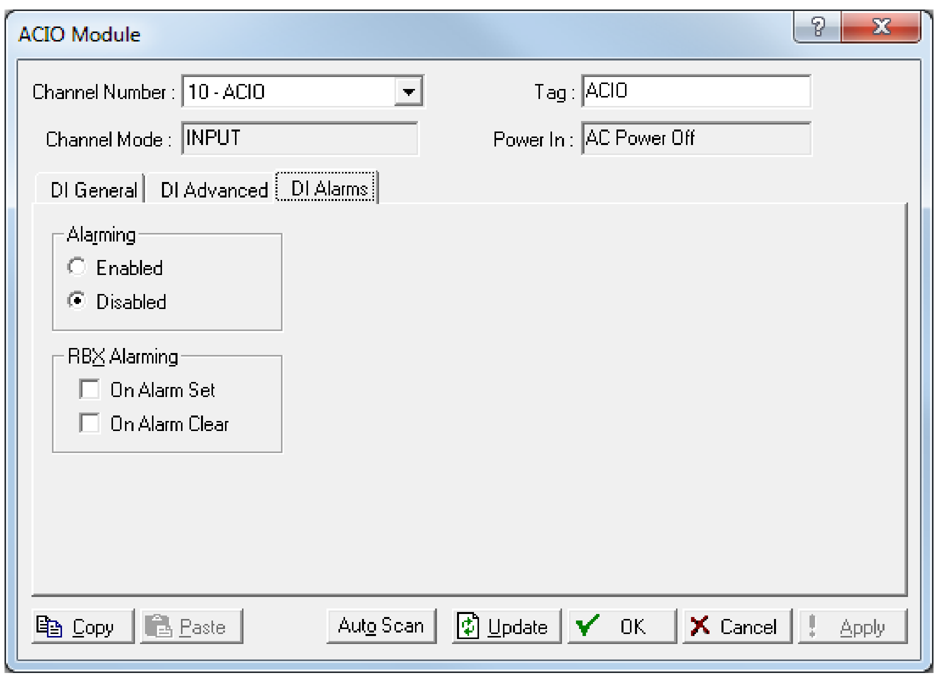


Figure 7-70. ACIO (Discrete Input) – DI Alarms tab

Field	Description
Alarming	Generate alarms on point status change. When Alarming is **Disabled**, the Status Change alarm appears in the Active Alarms field but is not written

Field	Description
	to the Alarm Log. **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you Enable alarming, the system generates an alarm if you disable scanning.
RBX Alarming	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are: ▪ **On Alarm Set** – Generates an RBX message to the host when the point **enters** an alarm condition. ▪ **On Alarm Clear** – Generates an RBX message to the host when the point **leaves** an alarm condition. **Note:** RBX Alarming also requires the communications port to be properly configured for RBX Alarming.

7.1.14 Advanced Pulse Module (APM) Configuration

The optional Advanced Pulse Module (**APM**) for the ROC allows you to implement pulse-based I/O calculations and control for applications. The APM detects and counts pulses with advanced customizable pulse I/O.

You can configure the APM to function as:

- Simple four-point pulse input.
- Advanced pulse input or densitometer with API checking.
- Pulse output.
- Interface with third-party proving applications.

Custom APM Modes

Many configurations of the APM are possible. You can use the APM to provide generic pulse input, pulse output, densitometer support, and turbine meter support.

Pulse Inputs You can configure up to four generic pulse inputs on channels 1 through 4. When APM is used as a generic four pulse input module, API fidelity checking is not available. The pulse inputs are **read-only**, non-resettable pulse accumulation counters.

Pulse Outputs APM can support one pulse output on channel 4 (PI-4/PO) that represents the current flow as a frequency or as a pulse per engineering unit of accumulated product. A hardware switch configures this channel and the status (PI or PO) displays in the Configuration fields. You can configure the pulse output to support the indication of total by an external counter using API integrity checking Level D.

Densitometer APM supports densitometer frequency inputs (Solartron models) on channel 3 that provides a frequency in the range of 0 to 10 KHz as a pulse input.

API Standards

APM also supports dual pulse chronometry for use in small volume provers. You can select API levels A through E and Marker Pulse for pulse integrity checking. API alarms occur if any of the API level checking has failed, such as a phase alarm or same channel alarm. ROCLINK also supports Marker Pulses. API standards are in accordance with the American Petroleum Institute *Manual of Petroleum Measurement Standards Chapter 5.5*, August 1987.

Note: Level D checking requires a mechanical counter be present.

Pulse Counting between Detector Switch Trips

You can configure pulse counts to occur on a single pulse input and not on a pair of pulses. If communication is lost during a prove, the proving application is notified of this condition to signify that the pulse accumulations are invalid.

Master Meter Provers

APM supports master meter provers in that the APM can accept a software detector switch simulation to start and stop pulse counting. APM accumulates whole pulses between the software detector switch triggers for both the meter being proved and the master meter.

Note: While pulse interpolation is not required for the master meter proving, interpolated pulses are always provided.

Detector Switches

APM support two detector switches that gate the accumulation of pulses during a prove. APM recognizes a detector switch trigger at any change in state of a detector switch. APM starts the accumulation of whole pulses between detector switches at the first detector switch transition and stops the accumulation at the second detector switch transition. APM implements a detector switch filter time so as to not misinterpret "noise" after a detector switch transition as another transition. The APM displays the pulse counts and the interpolated pulse counts.

Examples of APM configurations include:

	Ch 1	Ch 2	Ch 3	Ch 4	Detector 1 & 2
Config 1	PI	PI	PI	PI	Always Present
Config 2	PI	PI	PI	PO	Always Present
Config 3	PI	PI	Densitometer Input	PI	Always Present
Config 4	PI	PI	Densitometer Input	PO	Always Present
Config 5	PI	PI	API Pair 2	–	–
–	**Ch 1 and Ch 2**		**Ch 3**	**Ch 4**	**Detector 1 & 2**
Config 6	API Pair 1		PI	PI	Always Present
Config 7	API Pair 1		Densitometer Input	PI	Always Present
Config 8	API Pair 1		Densitometer Input	PO	Always Present
–	**Ch 1 and Ch 2**		**Ch 3 and Ch 4**		**Detector 1 & 2**
Config 9	API Pair 1		API Pair 2		Always Present

APM Switches

The Advanced Pulse Module has several switches you can set for specific actions.

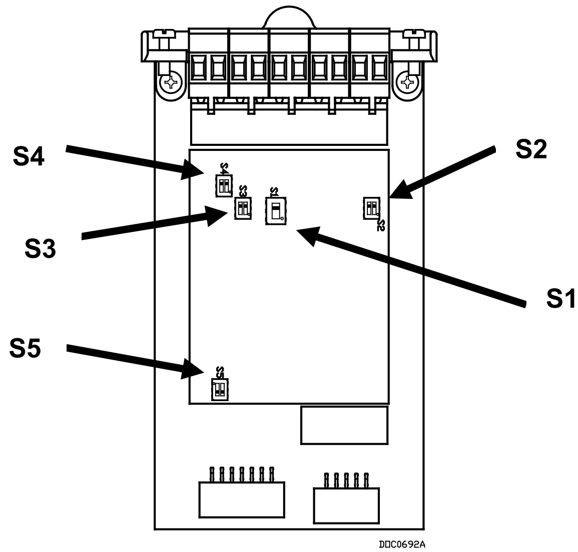


Figure7-71. APM Switches

Table 7-2. APM Hardware Switches

Switch Number	Left/Right Side [1]	Channel	Channel	Switch Position [1]
S1	–	1 = Standard PI	–	Up
S1	–	1 = Densitometer	–	Down
S2	Left	1 = In [2]	1 = Out [3]	Up
S2	Right	2 = In	2 = Out	Up
S3 [4]	Left	3 = In	3 = Out	Up
S3	Right	4 = In	4 = Out	Up
S4	Left	Detector switch 2 = In	Detector switch 2 = Out	Up
S4	Right	Detector switch 1 = In	Detector switch 1 = Out	Up
S5	Left	4 = Pulse Output	–	Up
S5	Left	4 = Pulse Input	–	Down
S5 [5]	Right	–	–	–

[1] Descriptors (up/down/right/left) assume that module terminal blocks face upward and daughter board is visible.
[2] **In** = Pull-up resistor is in the circuit.
[3] **Out** = Pull-up resistor is not in the circuit.
[4] If S1 is down, this switch is non-functional.
[5] Right side of switch 5 currently not used.

APM: Pulse Input Tab

Select **Configure > I/O > Advanced Pulse Module**. The Pulse Input tag displays by default. Use this tab to configure the pulse input parameters for the Advanced Pulse Module point. You can configure up to four generic pulse inputs on channels 1 through 4. API fidelity checking is not available when you use the APM as a generic four pulse input module.

You can configure the module as a two point pulse input for two pulse pairs. The pulse inputs are **read-only**, non-resettable pulse accumulation counters.

APM supports a Micro Motion (formerly Solartron) densitometer on channel 3 that provides a frequency in the range of 0 to 10 KHz as a pulse input.

The four pulse input channels have a number of applications. When used with dual pulse turbine meters, then you can use the APM to create two API 5.5, level B, C, D, and E compliant pairs, while Level (Pair) also supports API Level A. Both levels support marker pulses.

Channel 3 can provide the hardware filtering to support the frequency input from a Micro Motion (formerly Solartron) 7835/7845 densitometer. This hardware filtering is switched into channel 3 by a hardware switch located on the module.

Channel 4 can be designated as either a pulse input or a pulse output.

The pulse input can support up to 5-kilohertz inputs. When connected as pulse inputs, the APM module processes the PI signals from pulse-generating devices and provides a calculated rate and an accumulated pulse total. The PI is most commonly used to interface to relays or open collector/open drain type solid-state devices.

The pulse input can interface to either self-powered or ROC-powered devices with signals up to 5 kilohertz. With the pull-up resistor "in," the PI supports externally powered open collector and open drain devices as well as externally powered contact closure devices. If the pull-up resistor is "out," then pulse inputs supports 0 to 3 volts dc through 0 to 12 Volts dc sourced square wave input signals. Refer to *Table 7-2. APM Hardware Switches*.

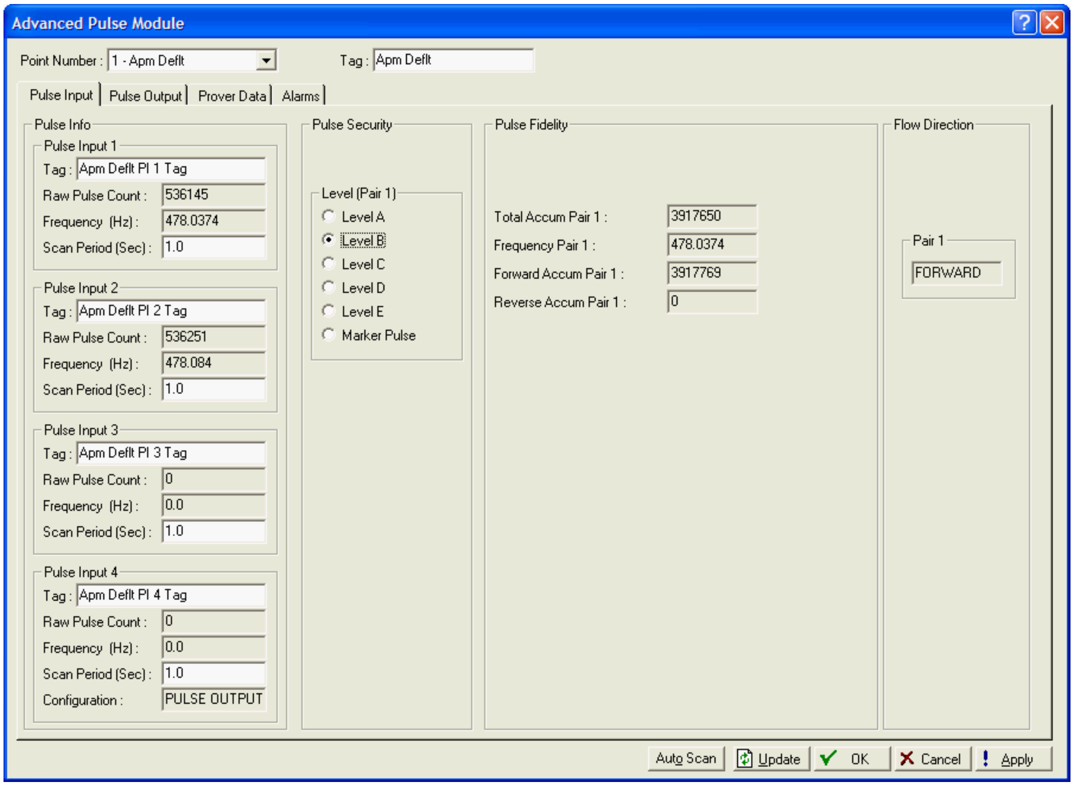


Figure 7-72. APM – Pulse Input tab

Note: This screen displays various fields based on the options you select. Consequently, it is not possible for one screen image to display all options.

Field	Description
Point Number	Sets the Advanced Pulse Module Point Number to configure. **Note:** This selection applies to **each** tab on this screen.
Tag	Sets a 10-character alphanumeric identifier for each point. **Note:** This selection applies to **each** tab on this screen.
Pulse Info (Pulse Input 1 through **Pulse Input 4)**	
Tag	Sets a 20-character identifier for the pulse input being configured.
Raw Pulse Count	This **read-only** field shows the raw number of pulses.
Frequency	This **read-only** field shows, in hertz, the frequency of incoming pulses.
Scan Period	Sets the time period, in seconds, in which the system evaluations the parameters associated with the pulse input.

Field	Description
Configuration	This **read-only** field shows the configuration (Pulse Input or Pulse Output) of the terminal for channel 4. **Note:** For the APM to function as a pulse output on channel 4, you must manually set the S3 switch. Refer to *Table 7-2. APM Hardware Switches*.
Pulse Security Level (Pair 1)	The APM supports different field devices based on various hardware switch settings. You can “pair” pulse inputs for use with API 5.5 compliant Pulsed Data Fidelity and Integrity algorithms. Pulse Input 1 and Pulse Input 2 share the Pulse Fidelity Level (Pair 1) configuration. Likewise, Pulse Input 3 and Pulse Input 4 share the Pulse Fidelity Level (Pair 2) configuration. Options for pulse fidelity checking (integrity security) are Level A through Level E for Level (Pair 1). API standards are in accordance with the American Petroleum Institute *Manual of Petroleum Measurement Standards Chapter 5.5*, August 1987. Both levels also support Marker Pulse options for Pulse Fidelity.
Level A	This level of fidelity checking requires a dual pulse train and two Pulse Inputs. Level A performs continuous monitoring, detection, and corrections of errors as it compares one pulse train against the other. Continuous comparison of the pulse trains for missing pulses as well as simultaneous pulses occurs. In the event of missing pulses, the system simulates the missing pulses and adds them to the pulse accumulations. The system detects simultaneous interfering pulses but does not include them toward the total pulse count. If you enable alarming, the same channel alarm count increments in the event of missing pulses, the phase alarm count increments in the event of simultaneous pulses, and the total alarm count increments in both cases. You can use the alarm threshold to set a lower frequency limit below which alarms based on these bad pulses do not generate.

Field	Description
Level B	This level of fidelity checking requires a dual pulse train. Two pulse inputs enable Level B to perform continuous monitoring, detecting, and warning of errors (alarming), as it compares one pulse train against the other. Continuous comparison of the pulse trains for the number, frequency, phase, and sequence occur. Level B security provides warning of transients and other spurious influences and protection against functional errors and failures. Simultaneous interfering pulses are detected and indicated. If the pulses delivered are lost or gained on either channel (PI1/PI2 or PI3/PI4), a differential counter API warning occurs. Refer to the discussion of the Alarms tab. If the frequency of the pulses falls below 101 Hz, the APM defaults to a simulated Level C until the frequency increases above 111 Hz.
Level C	This level of fidelity checking requires a dual pulse train. Two pulse inputs enable Level C to automatically detect and warn when errors occur, as it compares one pulse train against the other at approximately one-second intervals. Comparison of the pulse trains occurs automatically but not continuously. Level C security provides protection against functional errors and failures. If the pulses delivered become numerically out of step, a differential counter API warning occurs. Refer to the discussion of the Alarms tab.
Level D	This level of fidelity checking uses only a single pulse train and requires only one pulse input. Level D allows manual detection of errors, as the results of the pulse train calculations are compared by an operator against a mechanical readout (user supplied) at specified intervals. The manual error monitoring is at specified intervals by methods of comparison and provides amplification and frequency limiting, pulse shaping, and common mode inference rejection. The readout is visually checked against an independent totalizing system. Level D security provides protection against functional errors and failures.
Level E	This level of fidelity checking uses only a single pulse train and individual pulses using one pulse input. Level E is a straightforward totalizer system. The pulses are counted, but the system does not perform error detection; integrity depends solely on the quality of the equipment. Level E provides amplification and frequency limiting, pulse shaping, and common mode inference rejection. The system does not provide built-in provisions for error monitoring.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Marker Pulse</td><td>This level of fidelity checking adds an option to the level checking for each pair, Check Pulse Verification. When set, the first pulse input of the pair is the standard pulse input and the second input of the pair is the check pulse input. You configure the check pulse as a configurable number of standard pulses, on a repeating basis. There are two additional accumulators, the first is an accumulation of standard pulses that updates at the time the system receives the check pulse. For example, if the system receives the check pulse every 500 pulses, this accumulator updates to 500, 1000, 1500, and so forth. The second accumulator is the difference between the expected standard pulses at the check pulse and the actual number. For example, if the system receives the check pulse every 500 pulses and the system receives the check pulse at 499, this accumulator would read –1. If the system receives the next pulse at 1002, it would then read 2.
An alarm bit is available and set when the difference between the expected and actual standard pulses exceeds a user configured deadband. You can also trigger a reset, resetting the two accumulators and restarting the check pulse verification upon the first check pulse the system receives.</td></tr>
<tr><td>Pulse Fidelity</td><td>The Level options you select define which of the following fields display.</td></tr>
<tr><td>Total Accum Pair (1 and 2)</td><td>This read-only field shows the accumulated number of pulses (forward and backward) through the API level checks for pulse pair 1 and 2.
Note: This field displays only when you select Level A, B, or C for pair 1 or 2.</td></tr>
<tr><td>Frequency Pair (1 and 2)</td><td>This read-only field shows, in pulses/second, the frequency of incoming pulses on Pair 1 or Pair 2. These values assume the API level is set the same for both pairs under the Pulse Security frame.
<table>
<tr><th>Pulse Security</th><th>2-Pulse Inputs</th><th>4-Pulse Inputs</th></tr>
<tr><td>Level A</td><td>2000 Hz</td><td>N/A</td></tr>
<tr><td>Level B</td><td>4000 Hz</td><td>2000 Hz</td></tr>
<tr><td>Level C</td><td>8000 Hz</td><td>4500 Hz</td></tr>
<tr><td>Level D/E</td><td>9000 Hz</td><td>5500 Hz</td></tr>
</table>
Note: This field displays only when you select Level A, B, or C for pair 1 or 2.</td></tr>
<tr><td>Forward Accum Pair (1 and 2)</td><td>This read-only field shows the accumulated number of forward pulses through the API level checks for pulse pair 1 and 2.
Note: This field displays only when you select Level B or C for pair 1 or 2.</td></tr>
</table>

Field	Description
Reverse Accum Pair (1 and **2)**	This **read-only** field shows the accumulated number of reverse pulses through the API level checks for pulse pair 1 and 2. **Note**: This field displays **only** when you select Level **B** or **C** for pair 1 or 2.
Bad Pulse Counter	This **read-only** field shows the number of bad pulse pairs the system receives before setting the API Pair 1 alarm status when using API Level A. **Note**: This field displays **only** when you select Level **A** for pair 1.
Alarm Threshold	Sets the number of bad pulse pairs the system can receive before setting the API Pair 1 alarm status when using API Level A. **Note**: This field displays **only** when you select Level **A** for pair 1.
Reset Threshold	Sets the number of good pulse pairs the system can receive before clearing the API Pair 1 alarm status. **Note**: This field displays **only** when you select Level **A** for pair 1.
Alarm Inhibit Frequency	Sets a frequency below which the pair 1 alarm status no longer sets. Existing alarms clear either if you select **Reset Alarm Count** in the Action Below Alarm Inhibit Frequency frame **or** if the number of good pulse pairs the system receives falls below the good pulse threshold for Pair 1. **Note**: This field displays **only** when you select Level **A**.
Action Below Alarm Inhibit Frequency	Indicates whether the number of bad pulse pairs contributing towards the Pair 1 bad pulse threshold and the existing alarm bits clear when the frequency falls below the low frequency cutoff for pair 1. Valid values are **Retain Alarm Count** (does not clear the alarm) and **Reset Alarm Count** (clears the alarms). **Note**: This field displays **only** when you select Level **A**.
Flow Pulses per Marker Pulse (Pair 1 and **2)**	Sets the number of flow pulses to expect between each marker pulse. The default is **1000**. **Note**: This field displays **only** when you select **Marker Pulse** for pair 1 or 2.
Alarm Pulse Deadband	Sets the deviation of flow pulses from expected pulses at a marker pulse that must occur before the system triggers the Marker Pulse alarm. The default is **5**. **Note**: This field displays **only** when you select **Marker Pulse** for pair 1 or 2.
Flow Pulse Accum at Marker Pulse	This **read-only** field shows the accumulation of flow pulses, updated whenever the system receives a marker pulse. **Note**: This field displays **only** when you select **Marker Pulse** for pair 1 or 2.

Field	Description
Flow Pulses Drift from Expected	This **read-only** field shows the drift from expected flow pulse value, updated whenever the system receives a marker pulse. **Note**: This field displays **only** when you select **Marker Pulse** for pair 1 or 2.
Reset Marker Pulse Values	Click to reset the flow pulse accumulation and flow pulse drift for pair 1 or pair 2. Applies only when using Marker Pulse level checking. **Note**: This button displays **only** when you select **Marker Pulse** for pair 1 or 2.
Flow Direction (Pair 1 and **2)**	This **read-only** field shows the direction of flow. Direction of flow is based on 180 degrees out of phase for the first and second pair of pulses. Forward indicates less than 180 degrees; Reverse indicates more than 180 degrees. The Forward and Reverse designators assume 90 degrees out-of-phase. **Note**: This field displays **only** if you select Level **B** for pair 1 or 2.

APM: Pulse Output Tab

Select **Configure > I/O > Advanced Pulse Module > Pulse Output** tab to configure the pulse output parameters for the APM point. The output signal occurs by switching a NPN transistor. The transistor output can also be an open collector or have the pull-up resistor included with a switch. This transistor can provide up to a 300 hertz signal, switching up to 200 milliamps at maximum of a nominal 24 Volts dc.

APM supports one pulse output on channel 4 (PI-4/PO) representing the current input flow rate as a frequency or as a pulse per engineering unit of accumulated product. A hardware switch configures this channel and the status (PI or PO) displays in the Configuration fields.

Note: For the APM to function as a pulse output on channel 4, the S3 switch on the APM module must be manually set with the pull-up out. Refer to *Table 7-2. APM Hardware Switches*.

You can configure the pulse output to support the indication of total by an external counter using API integrity checking Level D.

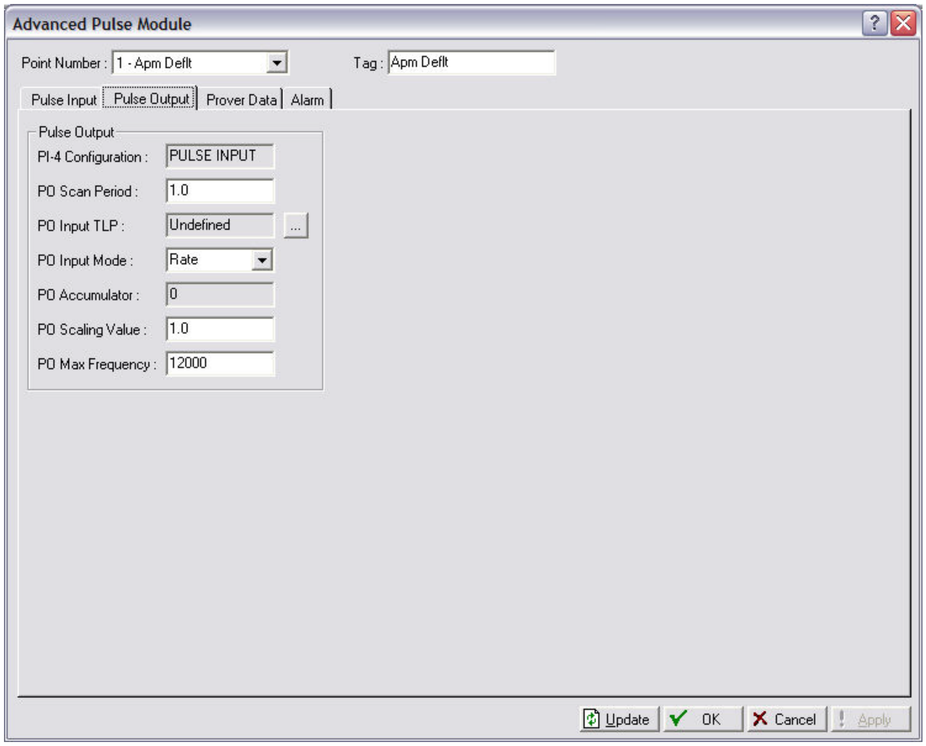


Figure 7-73 APM – Pulse Output tab

Field	Description
PI-4 Configuration	This **read-only** field shows the configuration of the PI-4/PO terminal of the APM. A hardware switch configures this value. **Note:** For the module to support a pulse output on channel 4, you must manually set the left S5 switch in the up position. Refer to *Table 7-2. APM Hardware Switches*.
PO Scan Period	Sets, in seconds, how often the firmware evaluates the inputs to determine how many pulses to send out. All other output pulses are at a 50% duty cycle.
PO Input TLP	Sets the value of the input TLP. The value is depends on you configure the PO Input mode (as a rate or an accumulation). Click the TLP button to set the input to be used in calculating the output pulses.
PO Input Mode	Sets the interpretation of the Input TLP. Valid values are **Rate** (calculates the integrated rate by multiplying the time and rate to determine the quantity, and then by subtracting the new accumulated value from the old accumulated value to determine the pulse output value) or **Accumulation** (sets a constant accumulation value against which you can define a PO Scaling Value for adjustments, so that the old value minus the new value represents the accumulated change value or the pulse output value).
PO Accumulator	This **read-only** field shows the accumulated number of pulses sent out.

Field	Description
PO Scaling Value	Sets the value the system applies to the accumulated pulse value based on the value in the PO Input Mode field.
PO Max Frequency	Sets the maximum number of pulses per second that can be output by the pulse output (in Hz). If the calculated number of pulses exceeds this value, those pulses are placed in the buffer. For example, if you set the PO Max Frequency to 20, no more than 20 pulses are sent out within the Scan Period time.

APM: Prover Data Tab

Select **Configure > I/O > Advanced Pulse Module > Prover Data** tab to configure the proving related parameters so the ROC can interface with an external (user supplied) prover application.

The APM module can accept a hardware or software detector switch simulation to start and stop counter pulses. APM accumulates whole pulses between the software detector switch triggers for meters being proved. Hardware detector switches are used for displacement provers and software detector switches are used for master meters.

In all configurations, high-speed interrupt driven detector switch inputs are supported for use in proving applications. These inputs are designed for use with normally closed contact relays, drives with interrupt-based close-to-open solid-state switch transitions, and other two-state devices. You can wire the detector input channels with individually wired detector switches or detector switches that are wired in series from the prover on the same cable.

APM supports detector switch inputs that gate the accumulation of pulses during a prove. APM recognizes a detector switch trigger at any change in state of a detector switch. APM starts the accumulation of whole pulses between detector switches at the first detector switch transition and stops the accumulation at the second detector switch transition. APM implements a detector switch filter time so as to not misinterpret "noise" after a detector switch transition as another transition.

Proving occurs on a single pulse input and not on a pair of pulses. APM module supports a "reset" to signal the APM module that it needs to clear the old totals and get ready to count pulses. If communication is lost during a prove, the proving application is notified of this condition to signify that the pulse accumulations are invalid.

Note: The APM module always calculates the pulse interpolation value for the pulse between detectors. Pulse interpolation standards are in accordance with the American Petroleum Institute *Manual of Petroleum Measurement Standards Chapter 4.6*, May 1999.

During a meter proving operation, detector inputs start and stop the accumulated pulse counts, a positive-to-negative transition on either detector input generates a time-stamped interrupt with the 30-megahertz on-board processor. This interrupt is used in the pulse accumulation between the detectors as well as the pulse interpolation calculations for use with small volume provers.

When a displacement prover is used, the installed prover device uses the detector switch pulse count to acquire the whole (full) meter count pulses and interpolated pulses. Pulse interpolation determines if a trip occurred before or after a trip per the American Petroleum Institute's *Manual of Petroleum Measurement Standards Chapter 4 - Proving Systems, Section 6 - Pulse Interpolation*.

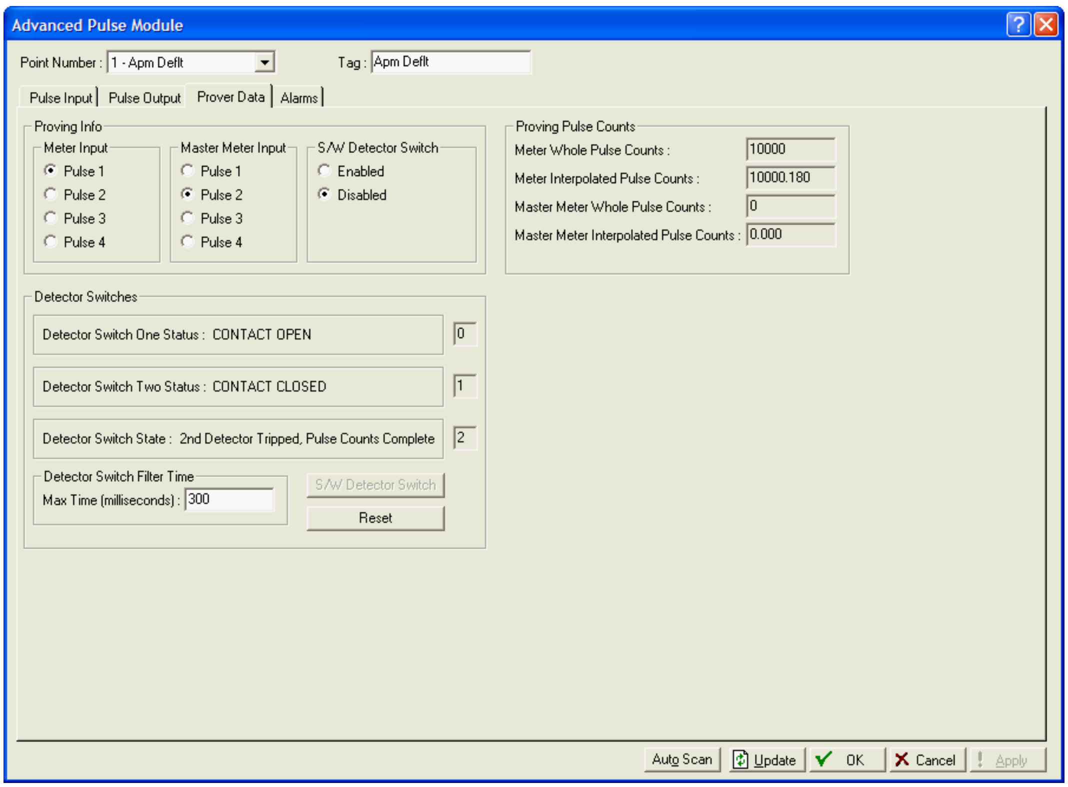


Figure 7-74. APM – Prover Data tab

Field	Description
APM DET and SW LEDs	Indicates, using light-emitting diodes (LEDs) on the APM module, the current status for each channel of the module. The DET and SW LEDs indicate the status of the detector switches: ▪ **Both LEDs blink simultaneously** – APM has no firmware resident in the module. Refer to *Update Firmware*. ▪ **LEDs toggle blink** – APM is in the process of programming the flash memory. Do not remove the module or power down the ROC. ▪ **Both LEDs are solid** – APM is in the process of erasing the flash memory. Do not remove the module or power down the ROC. ▪ **LEDs blink independently** – APM is transmitting or receiving pulses on the detector switches.
Meter Input	Sets the pulse input to use for the Meter Prove. Hardware detector switches are used for displacement provers. This is the pulse to view at the meter gate to acquire the count.
Master Meter Input	Sets the pulse input to use for the Master Meter Prove. Select this option when you are using another meter to provide the pulse counts and not an actual displacement prover. Software detector switches are used for master meters, so the Master Meter Input is only valid if the S/W Det. Switch Enabled field is set to Enable.
S/W Detector Switch	Sets the proving for use with a Master Meter or tank prover. APM supports two detector switches which gate the accumulation of pulses.
Detector Switch One/Two Status	These **read-only** fields show the current physical open or closed contact status of the detector switches. Options include **Contact Open** or **Contact Closed**.
Detector Switch State	This **read-only** field shows the current state of the detector switch indicating what the trip is doing: ▪ **Reset** has been received and the APM is expecting a detector switch transition. ▪ **Counting** indicates a detector switch transition has occurred and the APM is currently counting whole pulses. ▪ **Complete** indicates another detector switch transition has occurred and the Prove Run is complete. All values will be stored until the next reset. The values in the Proving Pulse Counts frame are valid to use in calculations. ▪ **Invalid Data** indicates the accumulator does not contain valid values. This can be either at a power up or if you lost communication during a prove and the accumulators have been reset to zero.

Field	Description
Detector Switch Filter Time	Sets, in milliseconds, the time allotted after a detector switch triggers but before the next trigger occurs. This is a de-bounce filter for the detector switches to ensure that any "noise" is filtered out and is not read as another detector switch trigger. This is the maximum filter time for how long the trip waits before the pulses are read again.
S/W Detector Switch	Sets to start and stop the software detection switch from counting pulses for a Master Meter or tank prove. Once the APM receives a trigger, the APM automatically resets to idle. Click **Reset** before starting a Master Meter prove. **Note:** Use **only** if the S/W Detector Switch is **Enabled**.
Reset Button	Notifies the APM to clear values in the Proving Pulse Counts frame and prepare to read the trip counter pulses. All accumulated pulse values and alarms are cleared. Accumulation of whole pulses starts at the first detector switch transition and stops at the second detector switch transition.
Meter Whole Pulse Counts	This **read-only** field shows the actual number of whole pulses accumulated between detector switches for a Meter Input. Click **Reset** to clear this value.
Meter Interpolated Pulse Counts	This **read-only** field shows the actual number of interpolated pulses accumulated between detector switches for a given pulse input. Click **Reset** to clear this value.
Master Meter Whole Pulse Counts	This **read-only** field shows the actual number of whole pulses accumulated between detector switches for a Master Meter Input. Click **Reset** to clear this value.
Master Meter Interpolated Pulse Counts	This **read-only** field shows the actual number of interpolated pulses accumulated between detector switches for a given pulse input. Click **Reset** to clear this value.

Starting a Prove for a Displacement Prover

To start a prove when using a displacement prover:

1. Select the **Point Number** of the Advanced Pulse Module.
2. Select the **Pulse** to use in the **Meter Input** field.
3. Set the **Max Time** for the **Detector Switch Filter**.
4. Click **Apply**.
5. Click **Reset**.

Starting a Prove for a Master Meter

To start a prove when using a master meter:

1. Select the **Point Number** of the APM.
2. Select the **Pulse** to use in the **Master Meter Input** field.

3. Select **Enable** in the **S/W Det. Switch Enabled** field.
4. Set the **Max Time** for the **Detector Switch Filter**.
5. Click **Apply**.
6. Click **Reset**.
7. Click **S/W Detector Switch**.

APM: Alarms Tab

Select **Configure > I/O > Advanced Pulse Module > Alarms** to configure the alarming parameters for the Advanced Pulse Module point.

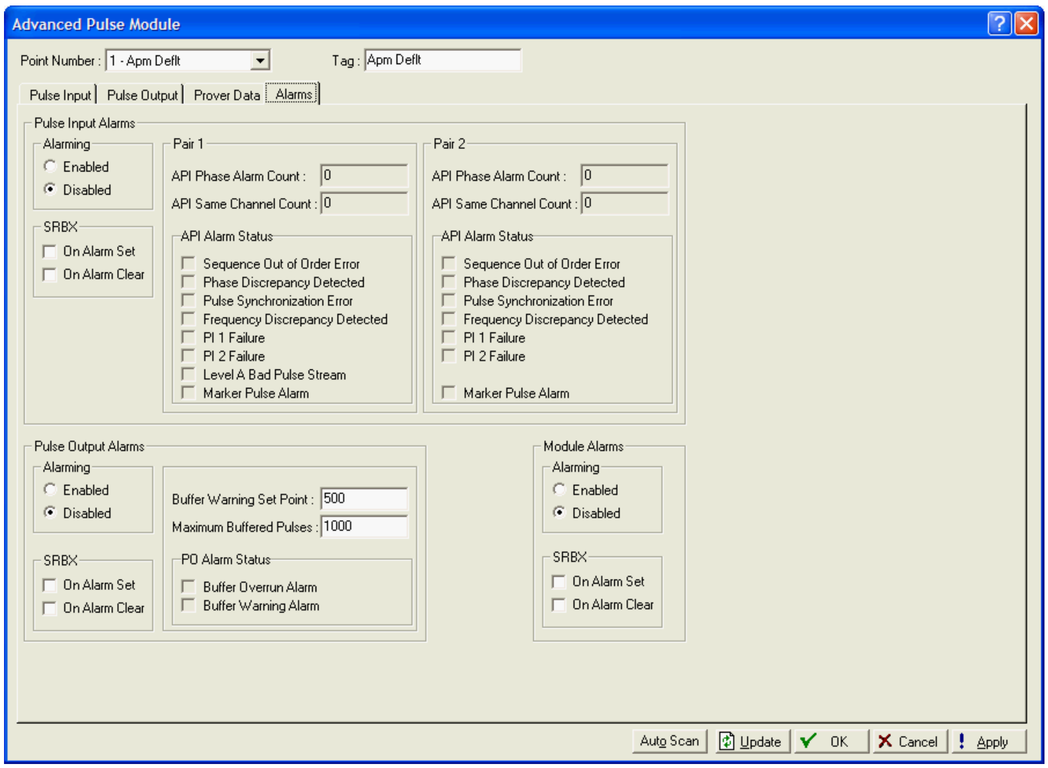


Figure 7-75. APM – Alarms tab

Field	Description
PI Alarming	Sets **Alarming** for this point. If **Alarming** is set to Enabled, alarms are written to the Alarm Log. These are the API pulse fidelity alarms when performing dual pulse integrity checking on a pair of pulses. Specifically sequenced out of order, phase discrepancy, pulse synchronization, frequency discrepancy, and pulse failure alarms. These alarms are all dependent on what level of security is being used.

Field	Description
PI SRBX	Sets the **SRBX Alarming** option to configure Spontaneous-Report-By-Exception (SRBX) alarming for this point. ▪ **On Set** – The point enters an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. ▪ **On Clear** – The point leaves an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. **Note:** SRBX Alarming requires the communications port to be configured.
API Alarm Status	API Level Alarm Status indicating the failure error for the alarm. **Note:** These are updated in real time
API Phase Alarm Count	This **read-only** field shows the total number of phase alarms.
API Same Channel Count	This **read-only** field shows the total number of the same channel alarms.
Pulse Output Alarms	PO alarms safeguard against the loss of too many pulse counts. Certain devices cannot read the pulse counts as fast as they are produced; thus, loosing pulse counts. The APM module buffers and tracks pulse counts to ensure the pulse count values read are the same as the actual pulse counts that are output. The buffer fields enable you to determine how many lost pulses can occur before an alarm is triggered. When enabled, enter a value in the **Buffer Warning Set Point** field. This is the maximum buffered pulses allowed before the buffer warning alarm is triggered. The value in the **Maximum Buffered Pulses** field is the maximum buffered pulses allowed. If the number of pulses requested to send out exceeds the Maximum Number of Buffered Pulses an alarm occurs and you essentially lose any pulses greater than the value set in this field.
PO Alarming	Sets **Alarming** for this point. If Alarming is set to Enabled, alarms are written to the Alarm Log. These alarms are for the pulse output of the APM and are used when the PO begins to buffer pulses. There are two alarms, a buffer warning and a buffer overflow. When the warning alarm is present, it indicates that the buffer is being filled and it has passed a user specified set point. If the overflow has occurred, indicates that the buffer is filled up and pulses are being lost.

Field	Description
PO SRBX	Sets the **SRBX Alarming** option to configure Spontaneous-Report-By-Exception (SRBX) alarming for this point. ▪ **On Set** – The point enters an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. ▪ **On Clear** – The point leaves an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. **Note:** SRBX Alarming requires the communications port to be configured.
PO Alarm Status	This **read-only** field shows the type of alarm for a pulse output.
Buffer Warning Set Point	Sets the maximum buffered pulses allowed before the buffer warning alarm is triggered. This must be less than the Maximum Buffered Pulses allowed.
Maximum Buffer Pulses	Sets the **maximum buffered pulses** allowed. If the number of pulses requested to send out exceeds the Maximum Number of Buffered Pulses an alarm occurs and you essentially lose any pulses greater than the value set in this field.
APM Module Alarming	Sets **Alarming** for this point. If **Alarming** is set to Enabled, alarms are written to the Alarm Log. These are module only alarms. In other words, alarms which are related to the module as a whole. Currently only one alarm is available, which is a point fail alarm. If there is a malfunction with the APM, specifically a loss of communication between the module and the ROC800L, then this alarm will be set.
Module SRBX	Sets the **SRBX Alarming** option to configure Spontaneous-Report-By-Exception (SRBX) alarming for this point. ▪ **On Set** – The point enters an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. ▪ **On Clear** – The point leaves an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host. **Note:** SRBX Alarming requires the communications port to be configured.
PO Alarm Status	This **read-only** field displays the type of alarm for a pulse output.

APM: EU Data Tab

Select **Configure > I/O > Advanced Pulse Module > EU data** to configure the engineering units (EU) for each pulse input, set the module contract hour, and view totals.

Note: This tab applies only to channels with Pulse Security set to Level E. You configure Pulse Security on the Pulse Input tab.

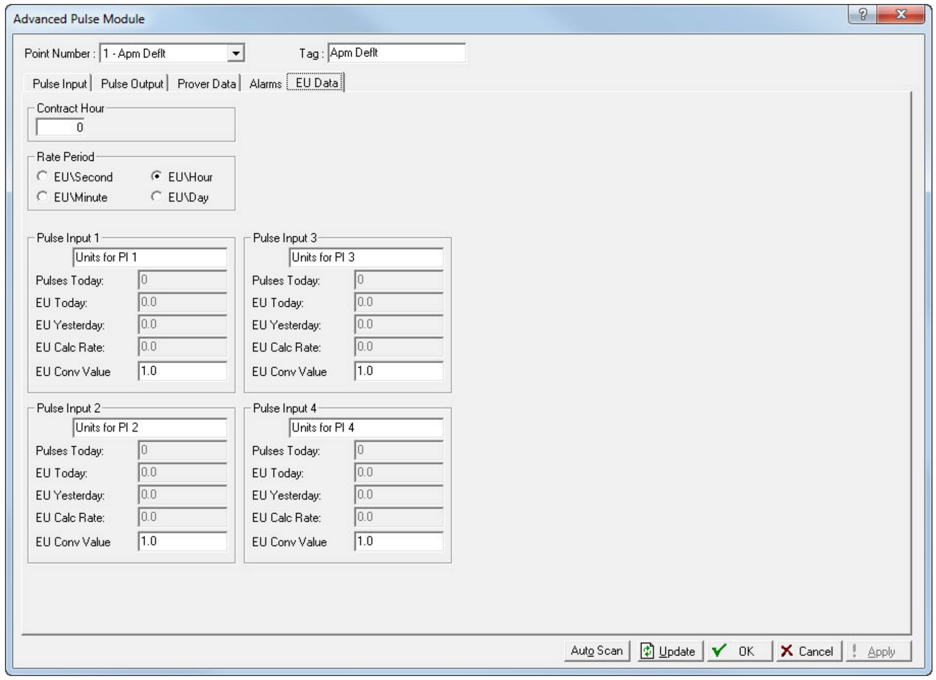


Figure 7-76. APM – EU Data tab

Field	Description
Contract Hour	Sets the channel on the ACIO module that you desire to configure. **Note:** This selection in this field applies to **each** tab on this screen.
Rate Period	Sets how the system calculates rates. Valid values are:
EU/Sec	Calculation based on EU second totals.
EU/Min	Calculates based on EU minute totals.
EU/Hour	Calculation based on EU hourly totals.
EU/Day	Calculation based on EU day totals.
	Note: The system calculates Current Rate as (accumulated pulses ÷ conversion) ÷ (scan period x conversion to correct time).
Pulse Input 1-4	Sets a short (20-alphanumeric characters) identifier for the engineering units used for each pulse input.
Pulses Today	This read-only field displays the total number of pulses that the PI has received for the contract day. At the end of the contract day, it zeros and starts over, only if being totalized in History. The Contract Hour is specified on this screen.
EU Today	Displays the total EU Values accumulated for the current contract day, calculated by multiplying the conversion value by the accumulated pulses. The system resets this value to zero at the contract hour.

Field	Description
EU Yesterday	This read-only field shows the total EU Value accumulated the previous contract day, calculated as the previous day's Today's Total value at the contract hour before being cleared.
EU Calc Rate	This read-only field shows the calculated rate as of the most recent scan expressed in EUs per unit of time. You select time units using the Rate Period field on the Advanced tab. The system calculates the rate at the end of each scan period by dividing the number of pulses received by the conversion value divided by the rate period.
EU Conv Value	Sets a conversion factor that the system divides the number of pulses by to determine the rate.

7.1.15 Virtual Discrete Output (VDO) Configuration

Virtual DO points do not require an output to an I/O module. Virtual DOs are like a soft point or FST register but for a discrete on or off event. You configure the number of virtual DO points you desire in ROC > Information > Virtual DO Points field. You configure a Virtual DO to reference an FSTs to indicate a status without a physical I/O card present. Other applications include using Virtual DO with the Foundation Fieldbus User Program to link FF application block inputs and outputs to points in the ROC.

Select **Configure > I/O > Virtual DO Points**. The Virtual Discrete Output screen displays. Examine the default settings and adjust the parameters to suit your application on each of the tabs.

- Use the **General** tab sets the basic parameters for the DO point.
- Use the **Advanced** tab enables you to configure accumulated value and state for reset for the selected DO.
- Use the **TDO Parameters** tab allows configuration of TDO parameters.
- Use the **Alarms** tab sets the alarm parameters for this DO point for a ROC800L.

Save Configuration

After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start.

Virtual DO: General Tab

The Discrete Output screen initially displays the General tab. Use this tab to configure the basic parameters for the DO point. Select **Configure > I/O > DO Points**.

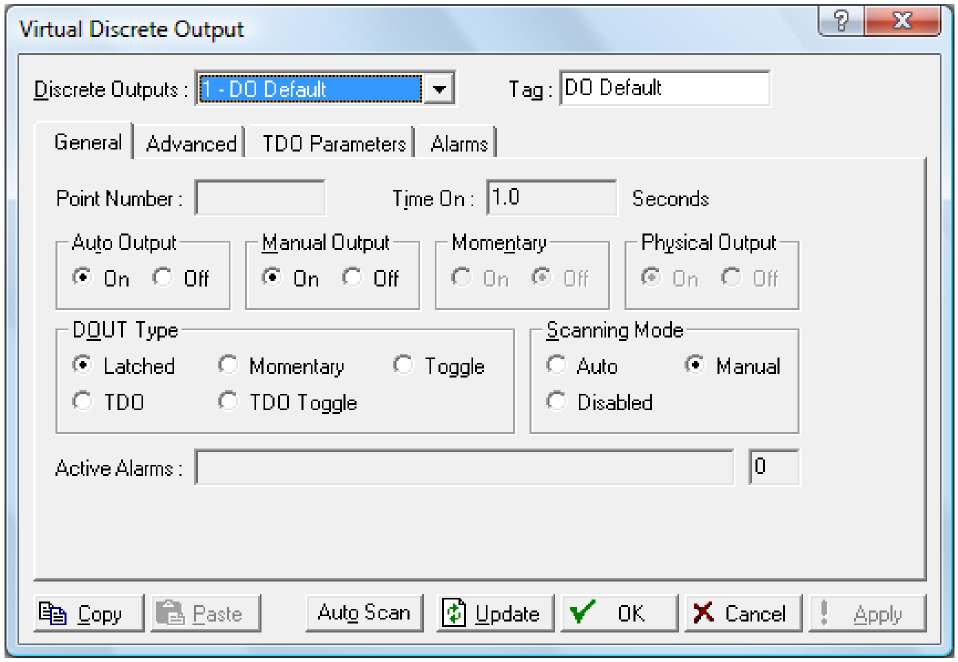


Figure 7-77. Virtual DO – General tab

Field	Description
Discrete Outputs	Selects the discrete output to be configured. The outputs are listed by both Point Number and Tag. **Note:** This selection applies to **each** tab on this screen.
Tag	Sets a short (10 alphanumeric characters) identifier for the point. **Note:** This selection applies to **each** tab on this screen.
Point Number	This **read-only** field identifies the rack location for this point.
Time On	Sets, in seconds, the amount of time for momentary operation. The default value is **1** second for a DO. The default value is **5** milliseconds for an ACIO DO. **Note:** In Momentary mode, this is the amount of time (in seconds) that the momentary contact is energized. In the Toggle mode, this is the time (in seconds) between switching On or Off. In the TDO and TDO Toggle modes, the TDO configuration calculates this value.
Auto Output	Indicates the state of the discrete output. **Off** indicates that the output is Off or that a switch is open; **On** indicates that the output is On or that a switch is closed.
Manual Output	This field indicates the state of the discrete output. Off indicates that the output is Off or that a switch is open; On indicates that the output is On or that a switch is closed. Select On and click Apply to force one transition of the DO.

Field	Description	
Momentary	This **read-only** field indicates the state of the discrete output when the DOUT Type is set to Momentary. **Off** indicates that the output is Off or that a switch is open; **On** indicates that the output is On or that a switch is closed.	
Physical Output	This **read-only** field indicates the actual status of the output channel at the field terminations regardless of the DOUT Type selected.	
DOUT Type	Selects the function of this discrete output. Valid values are:	
	Latched	Changes on an active transition of the output (from off to on). The discrete output remains On until cleared by selecting Off in the Auto Output field.
	TDO or Time Duration	Enables the discrete output to have a time duration between On and Off transitions based on time-related parameters configured in the TDO Parameters Tab.
	Momentary	Enables ROCLINK 800 to activate the discrete output for the amount of time defined in the **Time On** field.
	Toggle	Enables a square-wave output for which both the time on and time off are defined by the value in the **Time On** parameter. Time on and time off are equal. Use the TDO Parameters Tab to define time-related parameters.
	TDO Toggle	Enables the discrete output to continuously repeat in a cycle defined by the value in the **Cycle Time** field on the TDO Parameters Tab where the EU Value controls the on-time duration.

Field	Description
Scanning or Scanning Mode	Sets the scanning type to configure how the DO is scanned. Valid values are or **Auto** (automatically process the last output scan) or **Disabled** (permit only manual updates of the output). **Manual** (manually permit a process of the last output scan). **Note:** If you enable alarming, the ROC generates a Manual Mode alarm when scanning is disabled. ▪ For the output to automatically process the field output, select **Auto**. ▪ When Scanning Mode is set to **Disabled** or **Manual**, the DO is no longer updated by the ROC ▪ When the Scanning Mode is set to **Manual**, set **Manual Output** to On and click **Apply** to override the output. ▪ When Scanning Mode is set to **Disabled**, set **Auto Output** to On and click **Apply** to override the output.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.

Virtual DO: Advanced Tab

Use this tab to configure accumulated value and state for reset for the selected DO.

1. Select **Configure > I/O > Virtual DO Points > Advanced** tab. The Advanced screen displays.

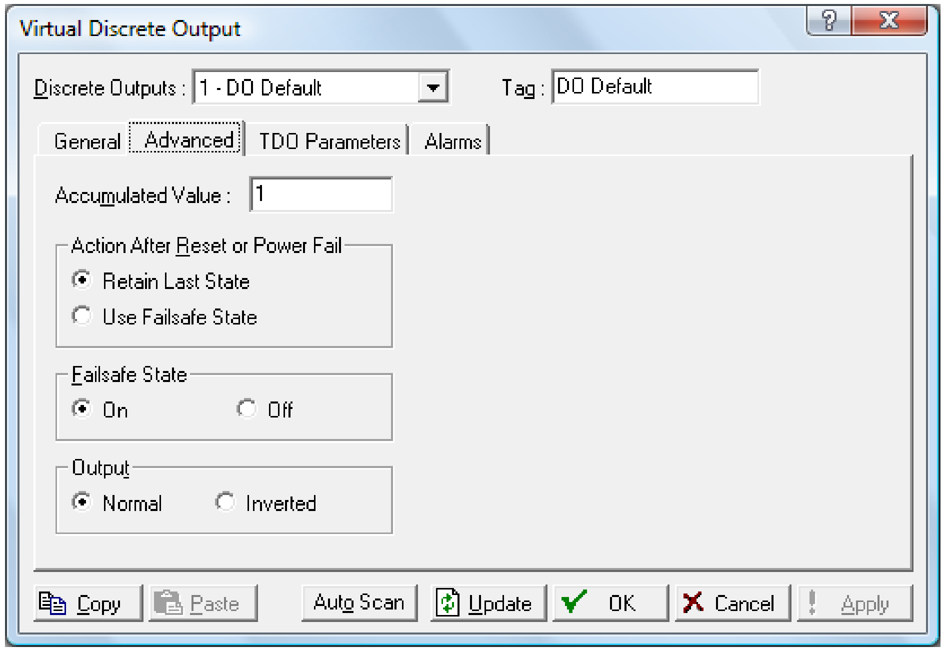


Figure 7-78. Virtual DO – Advanced tab

Field	Description
Accumulated Value	Sets a value for the accumulated number of off-to-on transitions for the discrete output. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator to a desire value or clear it by enter zero (**0**).
Action After Reset or Power Fail	Indicates how the ROC handles the discrete output state on resets or power failures. Valid values are **Retain Last State** (use current description) or **Use Failsafe Status**. The default is **Retain Last State**.
Failsafe State	Specifies, if you select the **Use Failsafe State** option, whether the system sets the virtual direct output on or off following a reset or power failure. The default value is **On**.
Output	Indicates whether the virtual DO is **Normal** or **Inverted**. The default value is **Normal**.

Virtual DO: TDO Parameters Tab

Use this tab to configure time duration parameters for this DO point.

Note: This tab **does not** display if you choose **Latched** in the DOUT Type field on the General tab.

1. Select **Configure** > **I/O** > **Virtual DO Points** > **TDO Parameters** tab. The TDO Parameters screen displays.

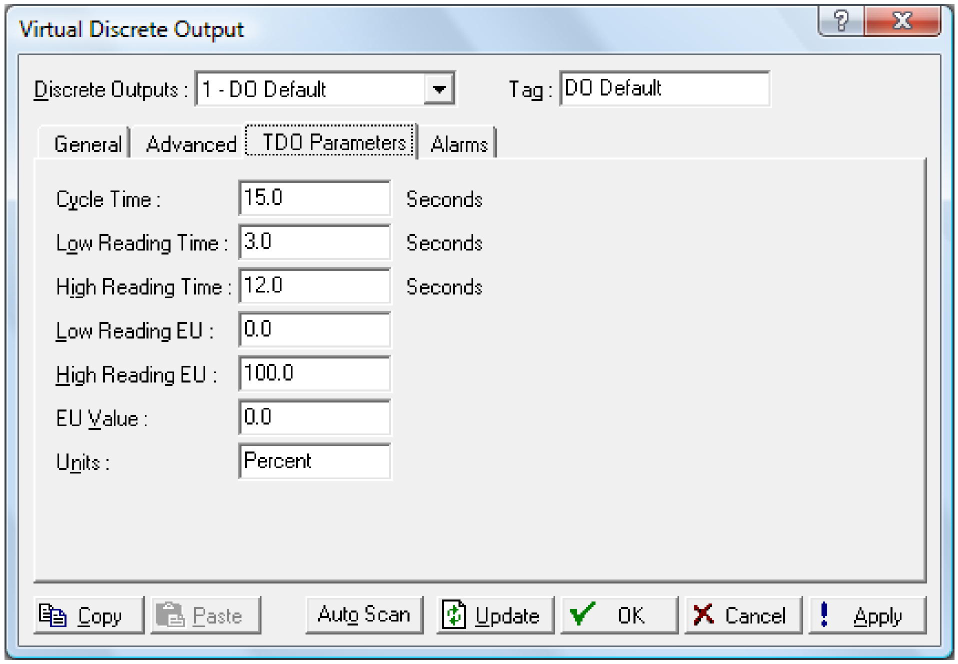


Figure 7-79. Virtual DO – TDO Parameters tab

Field	Description
Cycle Time	Sets, in seconds, the total amount of time the cycle spends in the on and off positions. The default is **15** seconds. The Cycle Time entry is used to define the OFF time in the TDO Toggle mode. The OFF time is calculated by the formula: Off Time = Cycle Time – On Time **Example:** A TDO is used to emulate a field instrument measuring flow. The TDO outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow. The output is repeated every 15 seconds. If the Cycle Time is less than, or equal to the On Time, the OFF time is set to one. Care must be taken in configuration (including other places, such as FSTs) to ensure that **the Cycle Time remains greater than the calculated On Time** for proper operation.
Low Reading Time	Sets the **Low Reading Time** (0% Count) in seconds that represents a zero percent output pulse width. The default is **3** seconds. This is the minimum amount of time that the TDO can be energized to move the motor. Set to a value that allows movement, but also provides good resolution of control.

Field	Description
High Reading Time	Sets the **High Reading Time** (100% Count) in seconds that represents a 100 percent output pulse width. The default is **12** seconds. This is the maximum amount of time that the TDO can be energized to move the motor. Normally, this is the amount of time it takes for the actuator to move the valve from fully opened to fully closed.
Low Reading EU	Sets the engineering unit (EU) for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
High Reading EU	Sets the engineering unit (EU) for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal.
EU Value	Current value, displayed in engineering units. In TDO Toggle mode, the EU Value controls the Time On: On Time = ((EU Value – Low Reading EU) / (High Reading EU – Low Reading EU) * (High Time – Low Time)) + Low Time
Units	Sets the engineering units for the discrete output (such as percentage, IN H2O, PSIG, MCF, degrees F, milliamps, and volts).
TDO Time On	The TDO Parameters tab allows configuration of TDO parameters when one of the DOUT Types TDO (Timed Duration) or TDO Toggle is selected in the discrete outputs screen. The Time On field is located on the general discrete outputs tab. The Time On field is calculated from the entered EU Value and the previous definitions of Low Reading Time, High Reading Time, Low Reading EU, and High Reading EU entered in the TDO Parameters screen. The calculation formulas are:

EU Span = High Reading EU Value – Low Reading EU

Count Span = High Reading Time (100% Count) – Low Reading Time (0% Count)

$$\text{On Time} = \frac{(\text{Entered EU Value} \times \text{Count Span})}{\text{EU Span}} + \text{Low Reading Time (0\% Count)}$$

Defining the Output Pulse

To define the TDO output pulse:

1. Select **Configure** > **I/O** > **DO Points** or **DO Relay Points** or **Virtual TDO**.
2. Select a DOUT Type of **TDO** or **TDO Toggle** in the discrete outputs dialog.

- **TDO (Timed Duration)** – The single-pulse output can be triggered by writing to the Status or the EU Value parameter of the DO point. This can be accomplished directly, by a PID point, or by an FST.
- **TDO Toggle** – A continuous pulse is generated with the pulse length being controlled by writing to the EU Value parameter in the DO point. This can be accomplished directly or by an FST.

3. Click the **TDO Parameters** tab.

The output pulse from the TDO function must be defined for proper engineering unit (EU) conversion. The minimum pulse width (Low Reading Time / 0% Count) and the maximum pulse width (High Reading Time / 100% Count) define the minimum and maximum ON time of the output pulse. The values entered in the Low Reading Time and High Reading Time are the number of seconds the output is ON.

Example:
A TDO is used to emulate a field instrument measuring flow. The TDO outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow.

Low Reading Time (0% Count) = 3 seconds

High Reading Time (100% Count) = 12 seconds

Low Reading EU = 0

High Reading EU = 1000

Virtual DO: Alarms Tab

Select **Configure > I/O > Virtual DO Points > Alarms** tab to configure the alarm parameters for this DO point.

1. Select the **Alarms** tab. The Alarms screen displays.

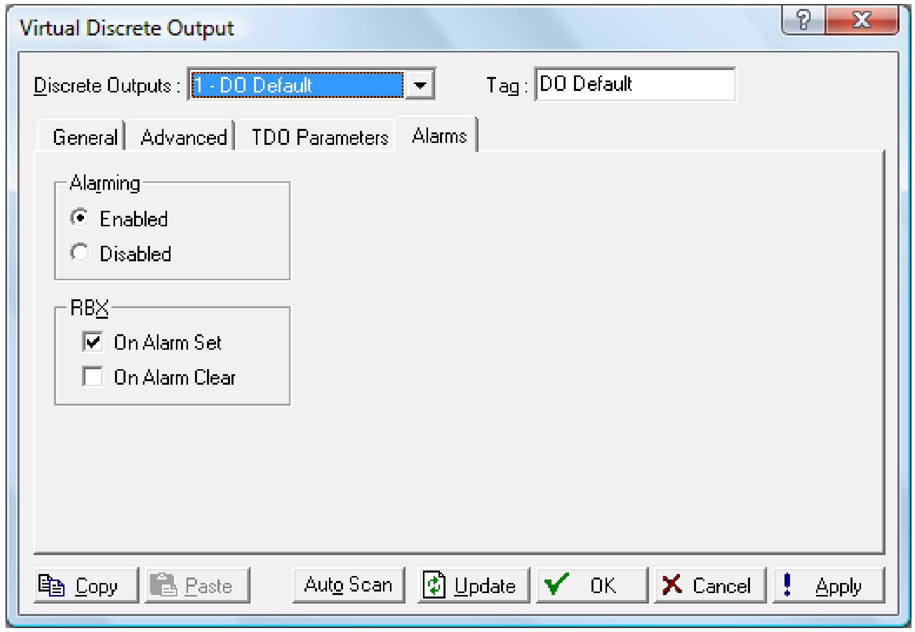


Figure 7-80. Virtual DO – Alarms tab

Field	Description
Alarming	Sets the alarm option for this point. Valid values are **Enabled** (enables alarming) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you enable alarming, the system generates an alarm if you disable scanning.
RBX Alarming	Sets the Spontaneous-Report-by-Exception (SRBX or RBX) alarming for this point. Valid values are: ▪ **On Alarm Set** - Generates an RBX message to the host when the point enters an alarm condition. ▪ **On Alarm Clear** - Generates an RBX message to the host when the point leaves an alarm condition. **Note:** SRBX Alarming requires the communications port to be configured.

7.1.16 IEC62591 module

Note: This option is not currently available for the ROC800L.

7.2 Control Menu

Use the Control menu options to configure FST Registers, Radio Power Control, DS800, Sampler/Odorizer, and PID Loops.

7.2.1 FST Registers

Use the FST Registers screen to configure FST registers and add timers and other execution controls.

Select **Configure > Control > FST Registers**. The FST Registers screen displays.

The FST Registers screen has two tabs. Use each tab to configure a component of the FST.

- Use the **General** tab to configure and enable the FST registers.
- Use the **Advanced** tab to add timers, execution controls, and other features to the FSTs.

Note: After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save I/O configuration to permanent memory in case you must perform a cold start.

Field	Description
FST	Sets the FST sensor to configure. Click ▼ to display all available FSTs. **Note:** The selection in this field applies to each tab on this screen.
Tag	Sets the ten-character identifier for the FST. **Note:** The selection in this field applies to each tab on this screen.

FST Registers: General Tab

The FST Registers screen initially displays the General tab. Use this tab to enable and configure the FST registers.

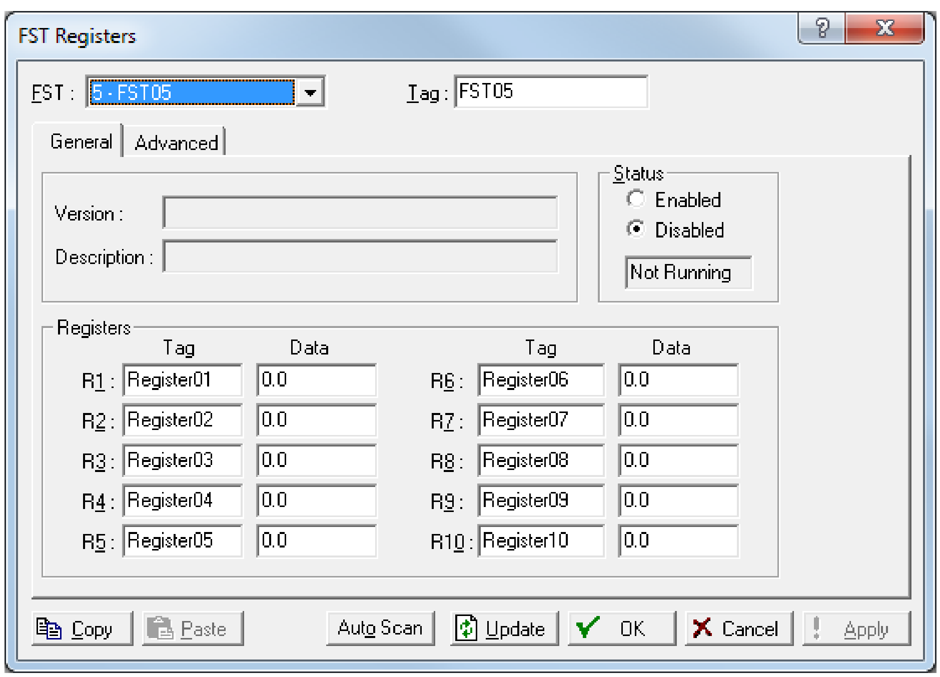


Figure 7-81. FST Registers – General tab

Field	Description
Version	This **read-only** field shows the version (if assigned) of the FST on download.
Description	This **read-only** field shows the description (if assigned) of the FST on download.
	Sets the current state and enables you to start or stop the FST. Valid values are **Enabled** (FST is active) or **Disabled** (FST is not active). **Note:** If you change the value in this field, click **Apply**.
Registers #1 to #10	Provides up to 10 storage points for FST floating point values. Use FST registers to store calculated or manually-entered values. You can also those values from one FST to another. For example, an FST can write values to the registers and also read the values stored in the FST Register storage points. Registers may be read from, or written to, any FST configured for the ROC

FST Registers: Advanced Tab

Select **Configure > Control > FST Registers > Advanced** tab to add timers, execution controls, and other features to the FSTs.

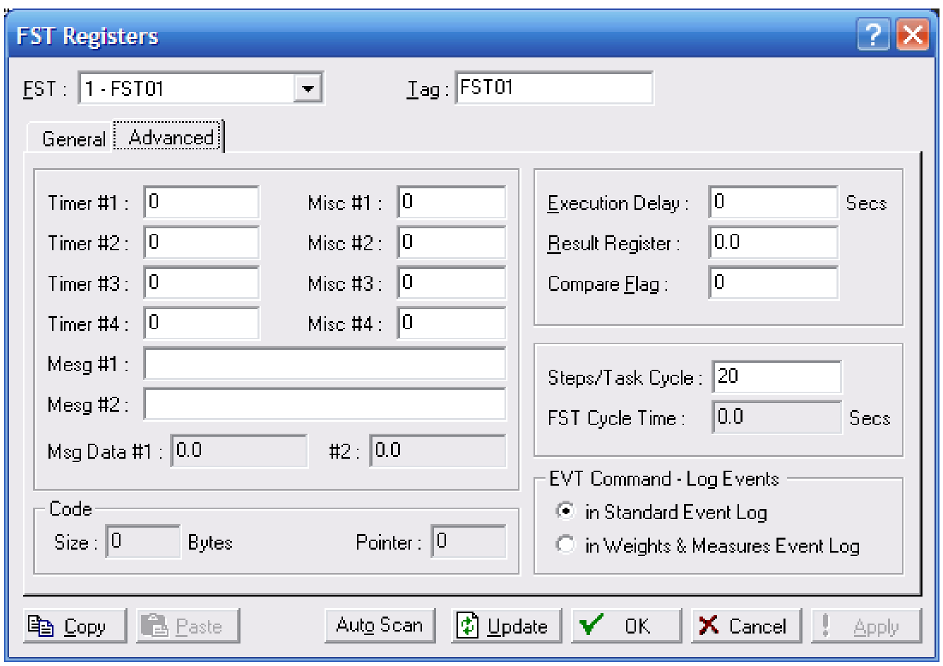


Figure 7-82. FST Registers – Advanced tab

Field	Description
Timer #1 through #4	Sets up to four countdown timers that signal certain periods or times have elapsed. You set the time, and the FST updates the time. These four timers, when set to values greater than **0**, decrement by 1 every cycle time. The scan period determines the cycle times. Cycle time equals:

Field	Description
Misc #1 to #4	Sets up to four unsigned 8-bit integers (with valid values from 0 to 255) the FST can use for global storage.
Mesg #1 and Mesg #2	Provides two 30-character fields for storing messages that display in the FST Message area.
Msg Data #1 and Msg Data #2	Displays any values associated with the messages.
Execution Delay	Sets a period, in seconds, between the execution of successive FST command steps. The default is **0** seconds. The **minimum** delay is **0.1**.
Results Register	Sets a special-purpose register that stores the floating point result from the most currently executed command. The Result Register (RR) may also be known as the Signal Value Analog (SVA).
Compare Flag	Sets a special-purpose 8-bit register that stores an integer representing the numbers 0 through 255. The logic commands manipulate the Compare Flag. The Compare Flag may also be known as the Signal Value Discrete (SVD).
FST Steps/Task Cycle	Sets the number of tasks (steps) that you desire the FST to complete in the amount of time set in the FST Cycle Time (in seconds) field, which is configured in the FST Editor Monitor Display.
FST Cycle Time	This **read-only** field shows the amount of time in seconds in which an FST will cycle as set in the FST Editor Monitor Display.
EVT Command - Log Events	Set in which log the FST Event (EVT) command creates a file. Select in Standard Event Log to record the event in the main Events Log. Select in Weights & Measures Event Log to record the event in the Weights & Measures Event Log if the register is related to a weight or measurement event.
Code Size Bytes	This **read-only** field shows the number of bytes the FST uses.
Code Pointer Byte	This **read-only** field shows the pointer byte for the FST. **Note:** Use FST Monitor within the FST Editor to monitor these operations.

7.2.2 Proportional, Integral, and Derivative (PID)

Proportional, Integral, and Derivative (PID) controls enable you to provide smooth and stable operation for feedback control loops that employ a regulating device, such as a control valve or a motor. The typical use for PID is to control a process variable to a setpoint.

PID is the most common control methodology in process control. PID is a continuous feedback loop that keeps the process flowing normally by taking corrective action whenever any deviation from the desired value (setpoint) of the process variable (rate of flow, temperature, voltage, and such) occurs. An "error" occurs when an operator manually changes the setpoint or when an event (such as a valve opening or closing) or a disturbance changes the load, thus causing a change in the process variable.

The PID controller receives signals from sensors and computes corrective action to the actuators from a computation based on the error (proportional), the sum of all previous errors (integral) and the rate of change of the error (derivative).

Enabling PID Loops

Before you can configure a PID loop, you must first enable the ROC to recognize them.

1. Select **ROC > Information**. The Device Information screen displays.
2. Select the **Points** tab. The Points screen displays.
3. Complete the **PIDs Active** field with the number of PIDs you want to configure.

   Note: The **read-only** Maximum field shows the maximum number of PIDs you can define.

4. Click **Apply** to save the value and then **OK** to close the Device Information screen and return to the ROCLINK 800 menu.

PID Overview

Select **Configure > Control > PID Loop**. In a given PID point, two separate PID loops are available: Primary and Override. In Primary Only mode, the Override Control loop is disabled, leaving only the Primary Control loop active.

The PID control loop can use either one analog output or two discrete outputs to control the regulating device. If discrete output control is to be used, one DO will provide open/forward control and the other DO provides close/reverse control.

Each active PID loop acquires the Process Variable input and calculates the change in output required to maintain its Setpoint. If Override Control is enabled, the calculation result that is applied to the output depends upon whether the High or Low Override Type Select is chosen.

If the output type is analog, the selected change in output is added to the current value of the output. If the output type is discrete, the change in output is sent to one of the two discrete outputs. The magnitude of the correction determines the amount of time that an output is energized. If the correction is positive, it is routed to the open/forward DO. If the correction is negative, it is sent to the close/reverse DO.

One application of Override PID control allows pressure control to Override flow control when the pressure exceeds a Setpoint value. For example: The output of the Primary flow control loop would be selected until the pressure input approaches the Override Setpoint of 700 PSIG. As the pressure input approaches its Setpoint, the pressure loop tries to close the valve and take over control at the point when the output calculated by the pressure loop is less than the output calculated by the flow loop. Control returns to the Primary flow control loop, when the change in output required to maintain the Override Setpoint no longer outweighs the flow loop's attempts to maintain its Setpoint.

Through the use of an FST, you may implement a switchover algorithm. When the input exceeds a predetermined switchover value, the FST can switch the mode to Override only. When the FST determines that the input value is no longer in a critical range, the PID mode can be switched back to Primary only.

PID Loop: General Tab

Select **Configure** > **Control** > **PID Loop**. The PID Loop screen initially displays the General tab. Use this screen to configure general PID loop parameters.

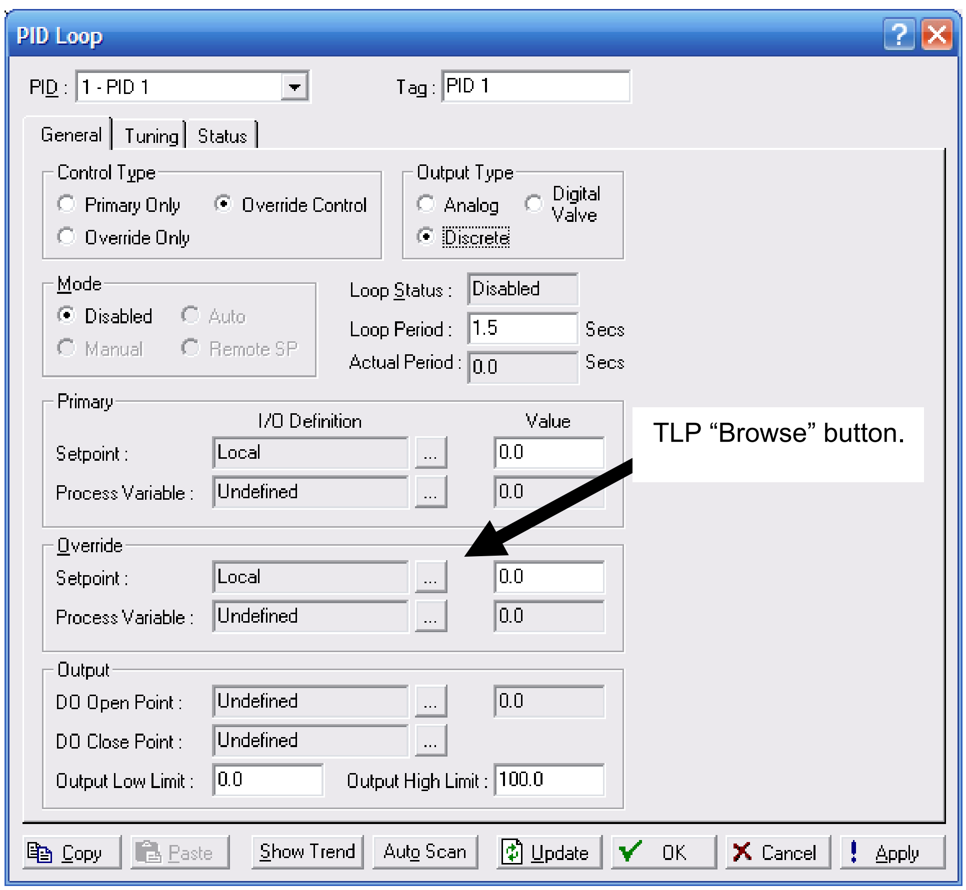


Figure 7-83. PID – General tab

Field	Description
PID	Selects the PID point to configure. Click ▼ to display all available PIDs. **Note:** This selection applies to **each** tab on this screen.
Tag	Sets the ten-character identifier for the PID. **Note:** This selection applies to **each** tab on this screen.
Control Type	Sets the control type for PID loop. Valid values are: ▪ **Primary Only** – Sets the Primary loop as the only active loop. The system uses the output the Primary loop calculates to adjust the control output. ▪ **Override Only** – Sets the Override loop as the only active loop. The system uses the output the Override loop calculates to adjust the control output. **Note:** This control type is used mainly for tuning the Override loop or when loop selection is controlled by an FST or other logic external to the PID algorithm. ▪ **Override Control** – Sets both the Primary and Override loops as active. The system compares the outputs from the two loops and uses either the lesser or greater of the two outputs (based on the selection in the Override Type Select field) to adjust the control output.
Output Type	Sets the output type for the PID loop. Valid values are **Analog** (the system writes the PID output to the assigned analog output point EU value) or **Discrete** (the system writes the PID output to the assigned DO Open Point EU value if the change in output is positive or writes to the assigned DO Close Point EU value if the change in output is negative). Any discrete outputs must be configured as Timed Duration Outputs (TDO). **Digital Valve** (the system writes the PID output to the assigned ACIO or DO point EU value).

Field	Description
Mode	Sets the **Mode** for the PID Loop: ▪ **Disabled** – No loops are active and the PID output parameter is not written to the assigned control output. ▪ **Manual** – No loops are active and the system writes the PID output parameter to the assigned control output, allowing you to adjust the output as required. ▪ **Auto** – PID loops are active as configured under Control Type; you enter the setpoint of the loops and the system automatically sends any change in the calculated output to the configured output point. ▪ **Remote SP** – PID loops are active as configured under Control Type. The Setpoint of the loops are read from the Setpoint I/O Definition.
Loop Status	Indicates which loop (Primary or Override) is currently selected or disabled.
Loop Period	Sets, in seconds, the period of time between executions of the PID algorithm. This is the amount of time between executions from the beginning of one execution to the beginning of the next. **Note:** If you select Override Control, both loops executed in this time period.
Actual Period	This **read-only** field shows the actual amount of time (in seconds) from the beginning of the last execution of the loop to the beginning of the current execution of the loop.
Primary Setpoint	Set an input using the TLP Browse button or enter a **Value** for controlling the Primary PID loop's Process Variable. **Note:** This field **does not** display if you select **Override Only** as a Control Type.
Primary Process Variable	Click the TLP Browse button to select a process variable for the Primary PID Loop or enter a value to use for comparison to the Primary Setpoint.
Override Setpoint	Set an input using the TLP Browse button or enter a Value for controlling the Override PID loop's Process Variable. **Note:** This field **does not** display if you select Primary Only as a Control Type.
Override Process Variable	Click the TLP Browse button to select a process variable for the Override PID Loop or enter a value to use for comparison to the Primary Setpoint.
Output Point	Click the TLP Browse button to select an analog output point for the loop. **Note:** This field displays **only** if you select **Analog** as an Output Type on the General tab.

Field	Description
DO Open Point	Click the TLP Browse button to select a discrete output open point for the loop. The DO Open Point and DO Close Point values, respectively, open or close the valve or other device. You must configure these values as TDO (Time Duration Output) discrete output mode. **Note:** This fields display **only** if you select **Discrete** as an Output Type on the General tab.
DO Close Point	Click the TLP Browse button to select a discrete output close point for the loop. The DO Open Point and DO Close Point values, respectively, open or close the valve or other device. You **must** configure these values as TDO (Time Duration Output) discrete output mode. **Note:** This field display **only** if you select **Discrete** as an Output Type on the General tab.
Output Low Limit	Sets the low limit for the analog or discrete output. If a change in output causes the current value to drop below this value, the system sets the output to this value.
Output High Limit	Sets the high limit for the analog or discrete output. If a change in output causes the current value to rise above this value, the system sets the output to this value.
Show Trend / Hide Trend	Click **Show Trend** to display a graphical representation of the PID output and process variable in reference to the set point over time. Use the graph to assist in tuning the control loop. When you hover over the trend line, the number on the left updates indicating the SP, PV, and Output at the point in time. Click **Pause** to stop the update and **Continue** to restart the scanning.

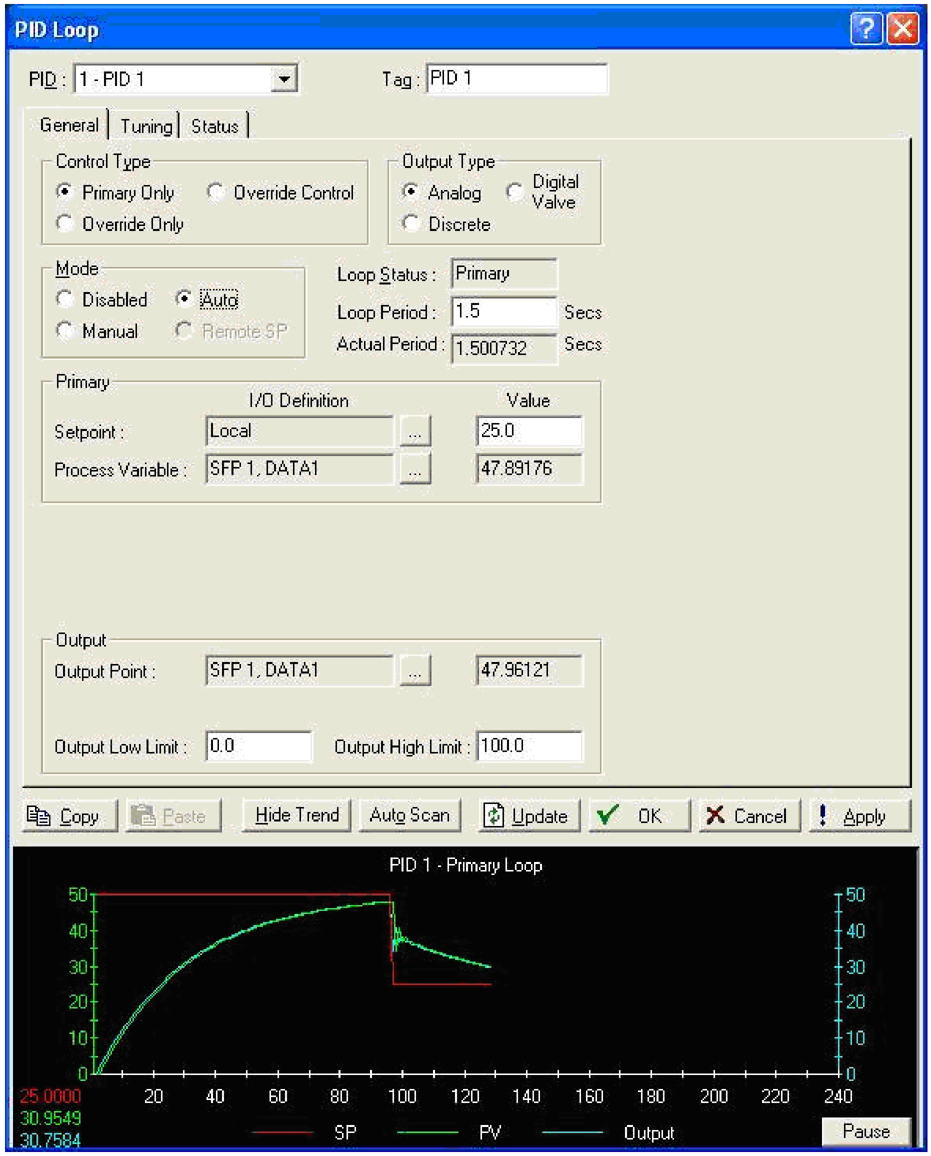


Figure 7-84. PID Loop - Show Trend/Hide Trend

PID Loop: Tuning Tab

Select **Configure > Control > PID Loop > Tuning** tab to set Tuning parameters for the PID Loop.

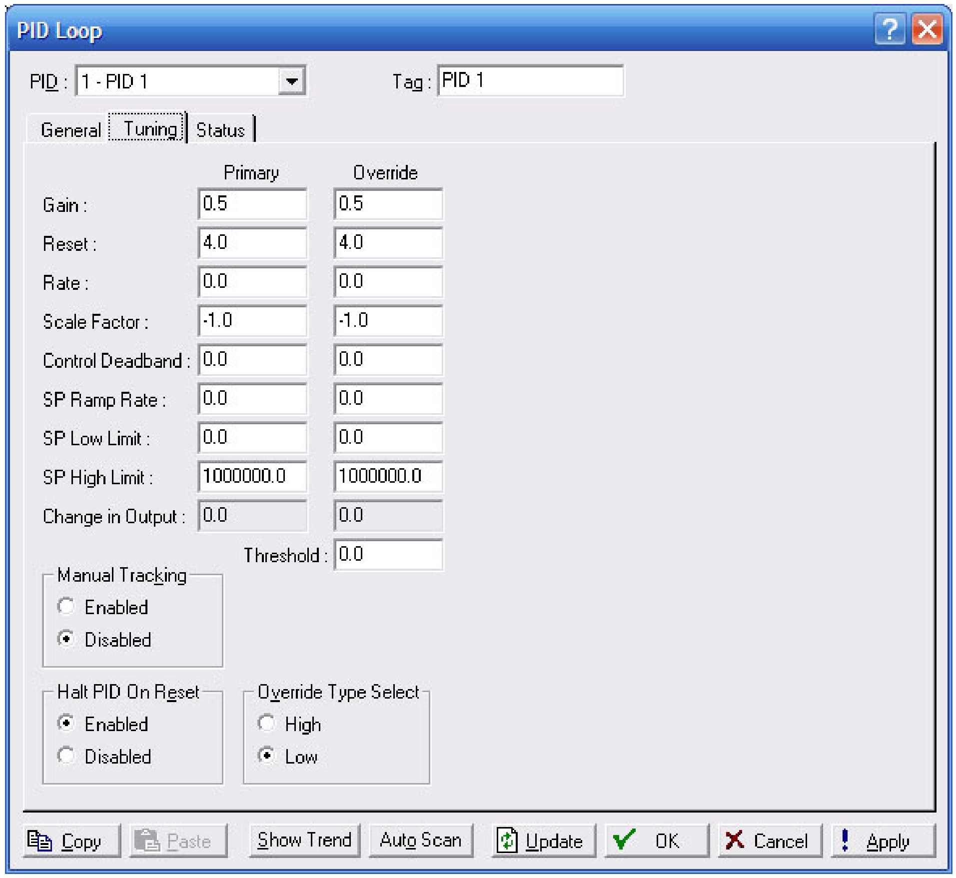


Figure 7-85. PID Loop – Tuning tab

Field	Description
Gain	Sets proportional gain as the ratio of the change in output to the change in the error.
Override Type Select	Sets the control output for the Override Type. Valid values are **High** (system selects as the control output the higher of the Primary Output Change value or the Override Output Change value) or **Low** (system selects as the control output the lesser of the Primary Output Change value or the Override Output Change value).
Reset	Sets integral gain or reset as the ratio of the change in output to the change in the integral of the error with respect to time. This value is in terms of repeats per minute. Typically calculated as either (Primary Process Variable – Primary Setpoint) or (Override Process Variable – Override Setpoint).
Rate	Sets the derivative gain or rate as the ratio of the change in output to the change in the error **with respect to time**. This value is in terms of minutes. Typically calculated as (Primary Process Variable Primary Setpoint) or (Override Process Variable Override Setpoint).

Field	Description
Scale Factor	Sets values representing the ratio of the output span to input (Process Variable) span. The sign of the number specifies the action of the loop output: negative for reverse action or positive for direct action.
Primary Control Deadband	Sets a "window" around the setpoint for the Primary PID. When the process variable is within this window, the system does not recalculate a change in output. If you enter **5**, the deadband is a region of 5 units above and 5 units below the setpoint in which the process variable can move without affecting the output.
Override Control Deadband	Sets a "window" around the setpoint for the Override PID. When the process variable is within this window, the system does not recalculate a change in output. If you enter **5**, the deadband is a region of 5 units above and 5 units below the setpoint in which the process variable can move without affecting the output.
Primary SP Ramp Rate	Sets the maximum rate at which the Primary PID setpoint can ramp to a new value. Maximum rate is in EU per minute where engineering units are the units of the process variable.
Override SP Ramp Rate	Sets the maximum rate at which the Override PID setpoint can ramp to a new value. Maximum rate is in EU per minute where engineering units are the units of the process variable.
SP Low Limit	Sets the **SP Low Limit** as the lowest allowed value for the Setpoint.
SP High Limit	Sets the **SP High Limit** as the highest allowed value for the Setpoint.
Change in Output	This **read-only** field shows the calculated change in output from the associated loop. You define these values on the **Inputs/Outputs** tab. **Note:** If you select **Primary Only** as a Control Type, the Override Output Change field **does not** display. If you select **Override Only** as a Control Type, the Primary Output Change field **does not** display.
Threshold	Sets the threshold to prevent premature selection of the Override loop. If the Override process variable is outside of this threshold on the safe side of the Override setpoint, the system always selects the Primary loop. However, if the Override process variable is within the threshold of the Override setpoint or is on the unsafe side of that setpoint, the system can select the Override loop. **Note:** If you set the override Threshold to **0.0**, the system uses the high/low value of the Override Type Select field (defined on the General tab) to select the appropriate change, regardless of the error in the Override loop.

Field	Description	
Manual Tracking	Sets how the system tracks setpoint and process variable values in moving between Auto and Manual Modes (defined on the General tab). Valid values are **Enabled** (sets the Primary loop's setpoint equal to the process variable when the PID point is in Manual mode) or **Disabled** (does not equalize these values). This is typically used to eliminate a value "bump" when transferring from Manual to Auto mode.	
Halt PID on Reset	Sets the status of the PID control loop following a power restart or a warm start. Valid values are **Enabled** (activate the PID loop) or **Disabled** (do not activate the PID loop).	
	Enabled	Do not activate the PID loop.
	Disabled	Activate the PID loop.
Override Type Select	Sets the control output for the Override Type. Valid values are **High** (system selects as the control output the higher of the Primary Output Change value or the Override Output Change value) or **Low** (system selects as the control output the lesser of the Primary Output Change value or the Override Output Change value).	

PID Loop: Status Tab

Select **Configure > Control > PID Loop > Status** tab to view the Status of the Primary and Output values.

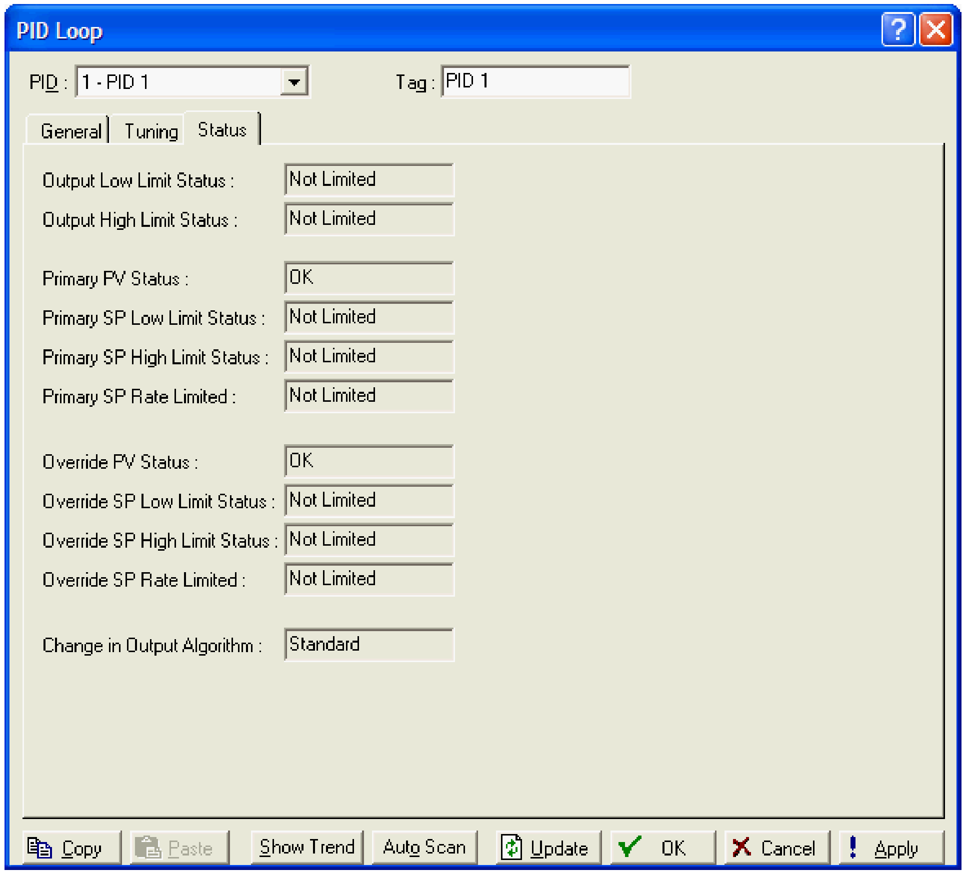


Figure 7-86. PID Loop – Status tab

Field	Description
Output Low Limit Status	This **read-only** field shows, when a PID loop is enabled, whether the output of the Primary PID loop has been clipped by the low output limit. Valid values are **Limited** or **Not Limited**.
Output High Limit Status	This **read-only** field shows, when a PID loop is enabled, whether the output of the Primary PID loop has been clipped by the high output limit. Valid values are **Limited** or **Not Limited**.
Primary PV Status	This **read-only** field shows, when a PID loop has been enabled, the status of the Primary loop's Process Variable data. Valid values are **OK**, **Questionable Data**, or **Invalid TLP**.
Primary SP Low Limit Status	This **read-only** field shows whether the setpoint of the Primary PID loop has been clipped by the low Setpoint limit. Valid values are **Limited** or **Not Limited**.
Primary SP High Limit Status	This **read-only** field shows t whether the setpoint of the Primary PID loop has been clipped by the high Setpoint limit. Valild values are **Limited** or **Not Limited**.
Primary SP Rate Limited	This **read-only** field shows whether the setpoint of the Primary PID loop is currently being limited by the maximum Setpoint change rate (as defined by SP Ramp Rate on the Tuning tab).

Field	Description
Override PV Status	This **read-only** field indicates the status of the Override loop's Process Variable data. Valid values are **OK**, **Questionable Data**, or **Invalid TLP**.
Override SP Low Limit Status	This **read-only** field shows t whether the setpoint of the Override PID loop has been clipped by the low Setpoint limit. Either Limited or Not Limited displays.
Override SP High Limit Status	This **read-only** field shows whether the setpoint of the Override PID loop has been clipped by the high Setpoint limit. Either Limited or Not Limited displays.
Override SP Rate Limited	This **read-only** field shows whether the setpoint of the Override PID loop is currently being limited by the maximum Setpoint change rate (as defined by the SP Ramp Rate on the Tuning tab).
Change in Output Algorithm	This **read-only** field shows the algorithm the system uses for the PID. Valid values are **Standard** (*Change in Output = SF x PG x (errCng + (IG x ALP x err) + (DG x △RPC))* or **Digital** (*Change in Output = SF x IG x err),* where: SF = user-entered Scale Factor PG = user-entered Proportional Gain IG = user-entered Integral Gain DG = user-entered Derivative Gain errCng = Error Change (error – last error) ALP = Actual Loop Periop, measured in minutes Err = error (Process Variable – Setpoint) △RPC = Delta Rate of Process Variable Change (Rate of PV Change – Last Rate of PV Change)

Example PID Configuration

The following example describes how to configure a PID point and associated inputs and outputs to implement flow control with pressure override to protect against over-pressuring the line.

In this example, the Primary process variable (Primary PV) is the volumetric flow rate per day obtained from an orifice meter run point. The system obtains the Override process variable (Override PV) from the static pressure value from an MVS or analog input. Both the Primary and Override loops require you to define a setpoint (the value at which you wish to control the loop). The example describes the process for setting up either discrete or analog control for the control output.

If a **4 to 20 mA signal** to an **I/O converter** controls the control valve:

- Configure an analog output with the appropriate Low and High Reading EU (engineering units). The units can either be in terms of the valve position (0 to 100%) or in terms of flow capacity (0 to 1000 MCF/Day).
- Set the Output Type on the PID screen to Analog.
- On the Inputs/Outputs tab, define an output point TLP using as an analog input, the desired Logical Number, and EU Value parameter.

If a **motorized actuator on the valve** controls the control valve:

- Configure two discrete output points for the open and close contacts as TDO (Time Duration Output) DOUT types. Set the Low Reading Time to the minimum amount of time (in seconds) the TDO can be energized to move the motor. Set the High Reading Time to the amount of time (in seconds) the TDO must be energized for full travel. Set the Low and High Reading EU values. The units can either be in terms of the valve position (0 to 100%) or in terms of flow capacity (0 to 1000 MCF/Day).
- Set the Output type on the PID screen to Discrete. Under DO Open Point and DO Close Point, select a TLP with Point Type of **Discrete Outputs**, the desired logical number, and EU Value parameter.
- Configure the PID point with a Control Type of Override Control. This causes available fields to appear on the PID screen to enter the I/O definition of the process variable and setpoint for both the Primary and Override loops. Select a TLP with Point Type of Orifice Meter Run Values, the desired Logical Number, and a parameter of Flow Rate Per Day for the Primary process variable. For the Override process variable, select a TLP with Point Type of MVS, the desired Logical Number, and a parameter of SP Reading. Leave the Setpoint I/O Definition undefined, because you enter the values. The setpoint for the Primary loop is the desired amount of flow per day. The setpoint for the Override loop is the pressure value where control should switch to the override loop. Set the Loop Period in seconds, typically one-fourth of the time required for the actuator to move the valve from fully open to fully closed.
- On the Tuning tab, select the Override Type Select of Low. This selects the lower of the change in outputs from the primary and secondary loops. As the pressure approaches the Override setpoint, the pressure (Override) loop pinches back the output. At the point that the pressure loop requests an output change less than the flow (primary) loop, the output from the pressure loop is selected and controls the valve. Set the Scale Factor for each of the Primary and Override loops as (span of output)/(span of input).

Both loops have scale factors, which permit the control action to close the valve when the process variable is above the setpoint. With the scale factor set according to the above formula, the initial settings for gain, reset, and rate produce stable control (under most circumstances). Gain controls the magnitude of the initial change in output for a given change in the process variable (or setpoint). Reset controls the magnitude of the change in output based on the continuing difference between the process variable and the setpoint over time. You can then adjust these values to produce the desired control actions.

7.2.3 Radio Power Control

Select **Configure > Control > Radio Power Control** to conserve battery power to a radio or any other communicating device.

Radio power is controlled either by the DTR signal or by a discrete output. Because there are separate Radio Control points for COM1 and COM2, radio power cycling for COM1 can be configured differently from that for COM2, including independent timer values and separate output controls using the Output Definitions options.

For each Radio Power Control point, the power cycling can be configured to automatically change three times a day. During each of these three periods, called Zone 1, Zone 2, and Zone 3, the ON and OFF times can be set up to operate at various intervals to conserve battery power. The figure below is a graphical depiction of how the power control operates within each time "zone".

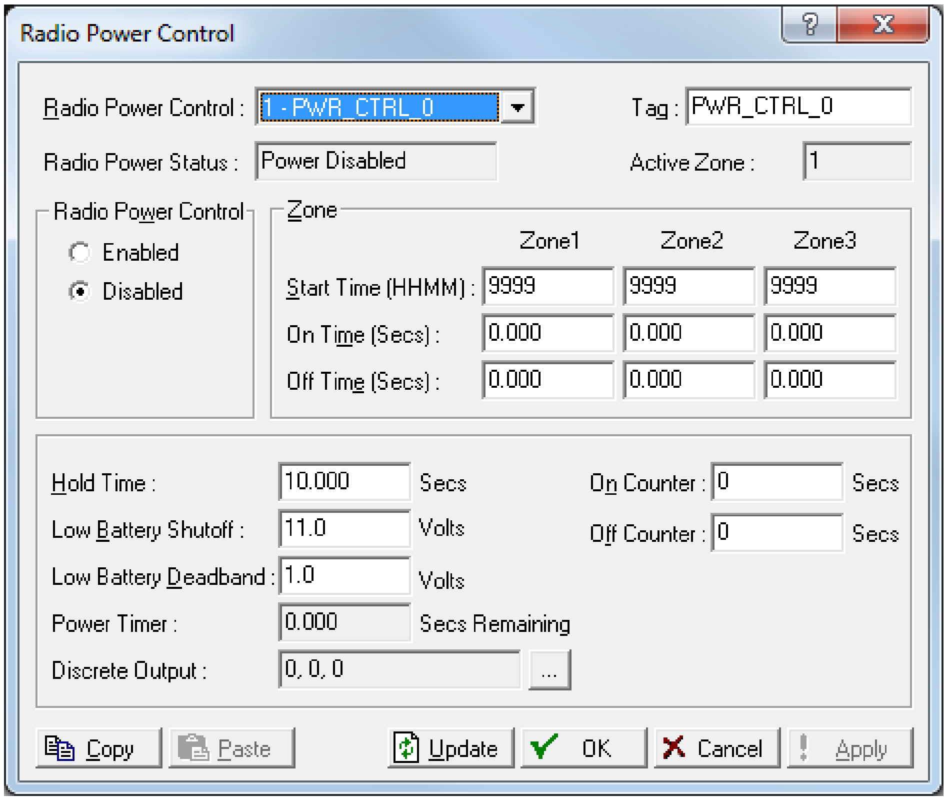


Figure 7-87. Radio Power Control

During the ON time:

- The power output DO is switched to **ON**. DTR signal for the Comm Port is activated.
- Communications may occur.

During the OFF time:

- The power output DO is set to **OFF**. DTR signal for the Comm Port is in-activated.
- Communications may not occur.

If communications occur during the ON time, the ON time is extended by the Hold Time. The DO and DTR signal remains ON and receive interrupts remain enabled for the duration of the Hold Time.

When you **Enable** the Radio Power Control parameter, radio power cycling is activated. The Low Battery Shutoff parameter allows power cycling to be automatically disabled whenever the input voltage to the ROC falls below the specified threshold.

To use Radio Power Control, select **Configure > Radio Power Control**.

After configuring the Radio Control points, click **Apply**. Save the configuration to programmable memory using the **Flash Memory Save Configuration** function in the **ROC > Flags** screen.

Field	Description
Radio Power Control Point	Selects a point to configure.
Tag	Sets a 10-character name to identify this point with its respective comm port.
Radio Power Status	Indicates the current status of the Power Control function of Power Enabled (On), Power Disabled (Off), or RBX.
Active Zone	This **read-only** field shows which zone is currently activated for determining the Start Time, On Time, and Off Time. Some of the On Time is also used by the radio during power-up initialization of the receiver, causing part of the On Time to be unavailable for receiving requests.
Radio Power Control	Enables or disables the Radio Power Control function.
Zone	Sets the **Zone** parameters to indicate when Radio Power Control is active and inactive for various Zones. **Start Time** in hours and minutes (HHMM) that the respective Zone begins. Time is expressed in local time, 24-hour clock. For example: "1500" under Zone 2 means that the associated On Time and Off Time are used beginning at 3:00 p.m. The Zone is active unit the start time for the next zone is encountered. **On Time** during a control cycle when the output is in the ON state. **Off Time** during a control cycle that the output is in the OFF state. **Note:** The On Time and Off Time alternate throughout the period the zone is active.

Field	Description
Hold Time	Sets the time that the output remains ON after detection of communications activity in Seconds or Minutes depending on the Time Units mode. This value applies to all Zones. When communications occur during the On Time, the On Time is extended by the Hold Time. The DTR signal and discrete output remain in the ON state. If a Spontaneous-Report-by-Exception (SRBX) message needs to be sent to the host computer, the radio power will be turned on for the Hold Time allowing the SRBX message to be transmitted. The Hold Time should be configured for a length of time long enough to allow the ROC to receive a response back from the host.
Low Battery Shutoff	Sets a value that specifies the voltage at which Power Control is automatically disabled. The voltage being sensed is the System AI Battery Input voltage (0 to 1). The Low Battery Shutoff parameter allows power cycling to be automatically disabled whenever the input voltage to the ROC falls below the specified threshold. The default value is 11 volts. Radio Power Control is automatically enabled again when the input voltage rises up to this value.
Low Battery Deadband	Sets the value to add to the Low Battery Shutoff to determine when the Radio Power Control function is enabled again and allows the DO to turn on when needed.
Power Timer	This **read-only** field shows the amount of time (On Time, Off Time, or Hold Time) that the Radio Control is currently using. The value is the number of seconds or minutes remaining.
Discrete Output	Sets which DO point to use to power the radio.
On Counter	Sets the value to indicate the cumulative time that the Power Control has been in the ON state in seconds or minutes.
Off Counter	Sets the value to indicate the cumulative time that the Power Control has been in the OFF state in seconds or minutes.

7.2.4 Sampler/Odorizer

Use the **Sampler/Odorizer** to set up a discrete output (DO) channel of the ROC800L to send and control the timing and duration of a pulse output to another device, such as an odorizer (odor injector).

Note You can also control a gas sampler. Enable the Sampler points on the **ROC > Information** screen.

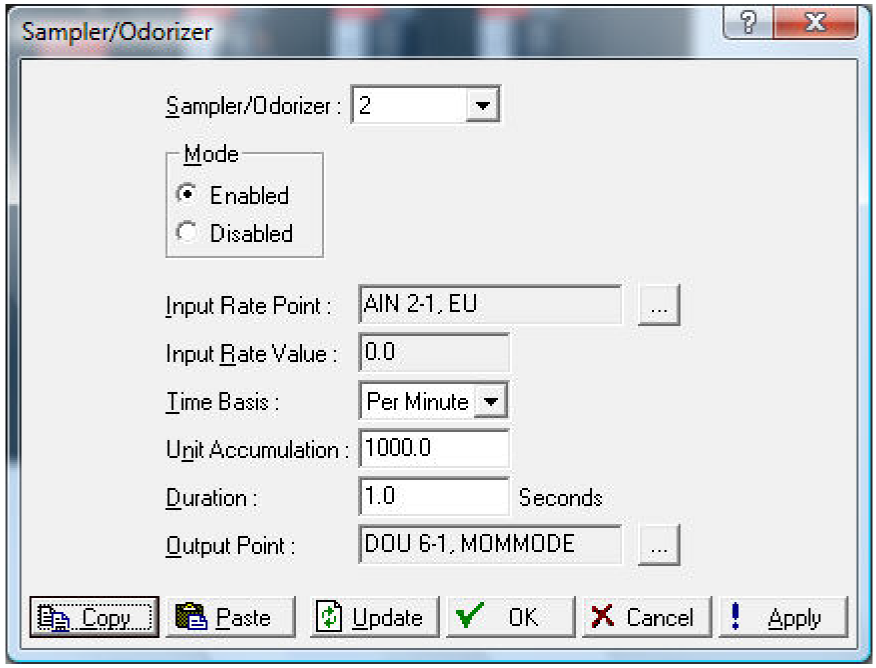


Figure 7-88. Sampler/Odorizer

Field	Description
Sampler/Odorizer	Sets the specific number of the Sampler or Odorizer (**Sampler/Odorizer**) to configure.
Mode	Sets how the DO to sends a signal when the specified flow conditions are met.
Input Rate Point	Sets the input point from which to acquire the rate. Click the TLP Browse button to display a Select TLP dialog you use to define the point.
Input Rate Value	This **read-only** field shows the value of the current Input Rate Point selected. The unit of measure for the Input Rate Value and Unit Accumulation will be the same as the unit of the input point selected for Input Rate Point.
Time Basis	Sets the time base for which the Input Rate Point is integrated: every second, minute, hour, or day.
Unit Accumulation	Sets when an output pulse generates. The Input Rate Value is integrated over the Time Basis. When the total matches the Unit Accumulation value, a pulse is generated for the duration specified in the duration field.
Duration	Sets, in seconds, how long the output pulse will be on. This is how long the DO stays ON. The DO is turned on for the amount of time set in the Duration field every time the Unit Accumulation value is exceeded.
Output Point	Sets the DO point to be used. Click the TLP Browse button to display a Select TLP dialog you use to define the point.

7.2.5 DS800 Development Suite Software

The DS800 Software Suite provides additional functionality for the ROC800L. For more information on DS800 programs, refer to the online help that accompanies the DS800 Development Suite or the *DS800 Development Suite User Manual* (part D301174X012).

DS800: General Tab

Select **Configure > Control > DS800**. The General tab displays by default. This screen provides parameters related to the DS800 application. It is good practice to check these settings prior to downloading a DS800 application.

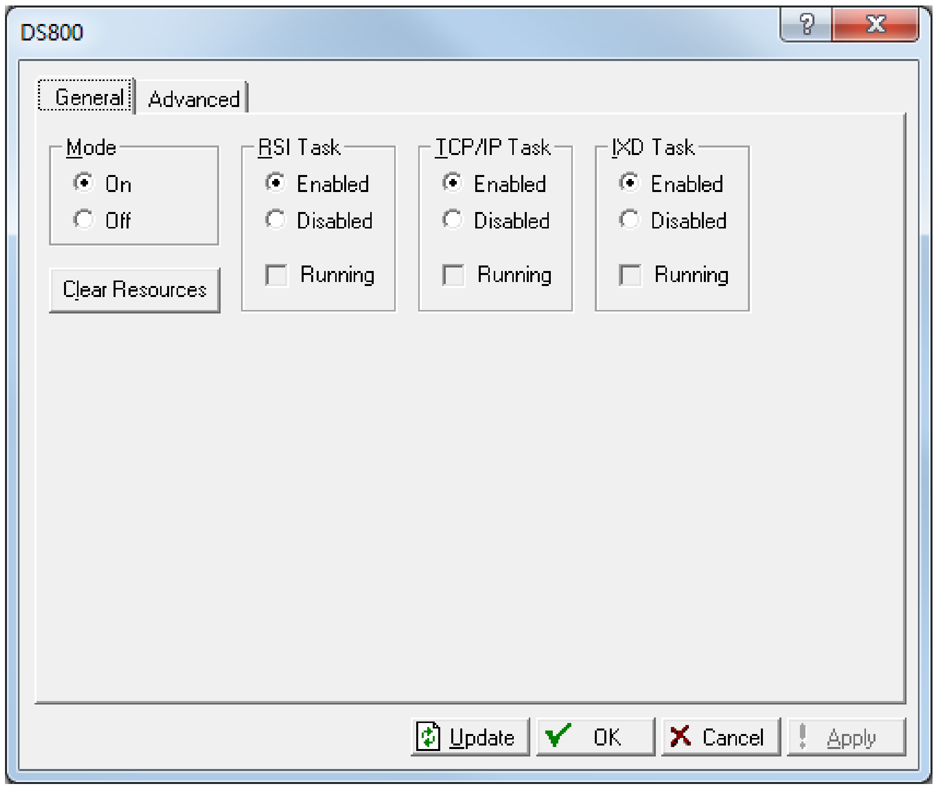


Figure 7-89. DS800 – General tab

Field	Description
Mode	Enables the execution of all DS800 resources loaded into the ROC.
RSI Task	Sets whether you are communicating via serial communications for downloading and debugging DS800 applications. Distributed applications (multiple resource projects) are not supported over serial links.
TCP/IP Task	Sets whether you are communicating via Ethernet.
IXD Task	Enables the download of resources to a ROC. This would only be Disabled to save processor time, if there were NO bindings between resources using the HSD network.

Field	Description
Clear Resources	Click **Clear Resources** to remove all downloaded resources from the ROC800L unit's permanent storage. This does not affect or stop a currently executing resource, because this resource was copied to RAM before it is started. The resources reside in RAM until you perform a restart, until a Warm Start occurs at the ROC800L, or you set the the Mode on the DS800 screen to Off. When you set the **Mode** to On or restart the ROC800L, only the resources downloaded to the ROC after the Clear Resources button was pressed attempt to start.

DS800: Advanced Tab

Select **Configure** > **Control** > **DS800** > **Advanced**. This screen displays information about each of the resources running in the ROC. Up to four resources can be running in each ROC.

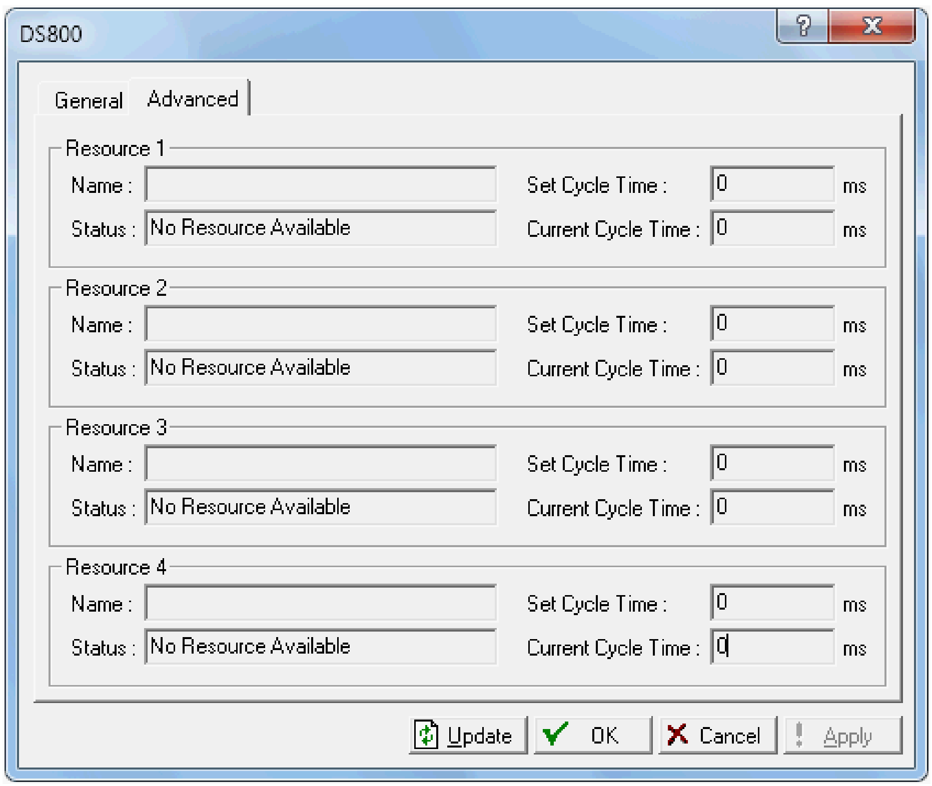


Figure 7-90. DS800 – Advanced tab

Field	Description
Name	Provides a description of the resource.

Field	Description
Status	Shows the resource's current state. Valid values are: ▪ Fatal Error. ▪ No resource running. ▪ Stored resource available (Resource loaded in the ROC, but not running). ▪ Resource is running in normal mode of operation. ▪ Resource is running in a cycle by cycle debug mode that allows a single execution of the resource. ▪ Resource is running in a debug mode and is currently stopped at a breakpoint.
Set Cycle Time	Shows the frequency, in milliseconds, that the resource has been defined to run. This is the beginning of one execution to the beginning of the next execution.
Current Cycle Time	Shows the actual execution time, in milliseconds, of the resource. This is from the beginning to the end of one execution.

7.3 History Segment Configuration

Select **Configure > History Segments**. The number of History Points available in each Segment is determined by the History Segment Configuration screen. Once the History Segment has been configured, you may configure the History Points in each Segment.

Note: Assign only **one** station per history segment.

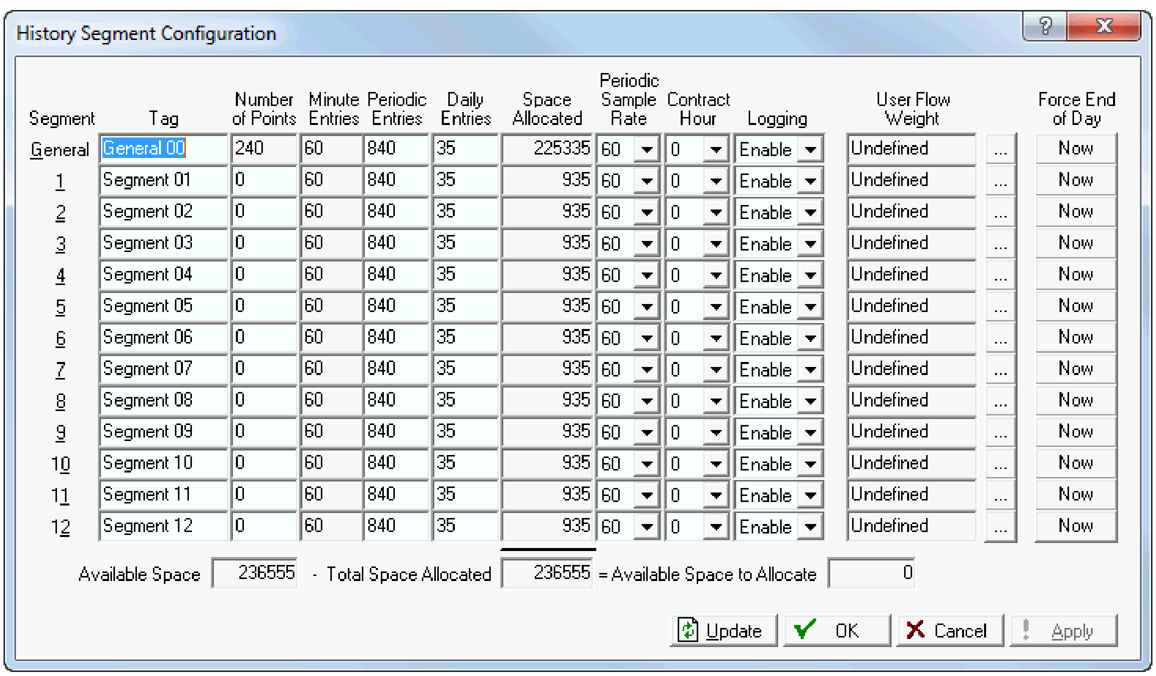


Figure 7-91. History Segments

For a ROC800L, you can distribute history points among history segments 1 through 13 and the General History Segment. For each history segment, you can configure the number of periodic history values archived, the frequency of archiving the periodic values, the number of daily values archived, and the contract hour for each Segment. The number of minute values is fixed at 60. Additionally, you can enable or disable logging and force the logging of daily values on a per Segment basis. In addition, you can enable or disable logging and force the logging of a daily value on a per-segment basis.

In history segments 1 through 13, the number of points in the segment is configurable. The maximum total number of points available for all history points in all segments is 240, but may be less depending on the number of periodic and daily values configured. The number of points in the general history segment is determined by the system, based on remaining memory. All history points in a segment share the same time stamps, with one time stamp allotted for each of the minute, periodic, and daily logs available in that segment.

You can tie history segments 1 through 13 to meter stations by configuring the history segment under **Meter > Setup > Station**. This allows the history segment to inform the station when the contract hour has occurred so that the station can maintain daily and monthly accumulations, and to retrieve the appropriate flow dependency and flow weighting factors. This also allows the station to inform the history segment that a configuration parameter has changed, and therefore periodic values need to be logged, per API Section 21.1.

Once you configure the history segment you can configure the points in each segment.

Note: The required points for AGA3 and AGA7 calculation methods are not pre-configured. You should begin the configuration of an AGA calculated Meter Run by configuring those points. Refer to *Section 7.4.3, Configuring History for EFM Reporting.*

Field	Description
Tag	Sets a name for each segment that will identify the group of historical points that will be archived there.

Field	Description
Number of Points	Sets the number of history points required for segments 1 through 10 for a ROC800L Series1 or 1 through 13 for a ROC800L Series 2. For a ROC800L Series 1 device, the maximum number of **200** points is based on 60 minute values, 840 periodic values logged hourly (35 days x 24 hours per day) and 35 daily values for a total of 187,000 history values. Each Segment also has storage allotted for the time stamp values with a default of 935 time stamps per Segment (60 minute times stamps + 840 periodic time stamps + 35 daily time stamps) x 11 Segments for a total of 10,285 time stamp values. The 197,285 Available Space shown on the ROCLINK 800 History Segment Configuration screen indicates the total of history and time stamp values. Space Allocated = (Number of Points + 1) x (Minute Entries + Periodic Entries + Daily Entries) For a ROC800L Series 2 device, the maximum number of **240** points is based on 60 minute values, 840 periodic values logged hourly (35 days x 24 hours per day) and 35 daily values for a total of 187,000 history values. Each Segment also has storage allotted for the time stamp values with a default of 935 time stamps per Segment (60 minute times stamps + 840 periodic time stamps + 35 daily time stamps) x 14 Segments for a total of 13,090 time stamp values. ***The 197,285 Available Space shown on the ROCLINK 800 History Segment Configuration screen indicates the total of history and time stamp values.*** Space Allocated = (Number of Points + 1) x (Minute Entries + Periodic Entries + Daily Entries)
Minute Entries	This **read-only** field displays the number of entries in the minute log for this segment.
Periodic Entries	Sets the desired number of points in the Periodic (hourly) log. The Number of Entries (in the Periodic log) multiplied by the Periodic Sample Rate (minutes) will give the number of minutes before the periodic log begins to write over itself.
Daily Entries	Sets the desired number of **Daily Entries** in the Daily log.
Space Allocated	This **read-only** field displays how many history and time stamp entries are currently allocated by this segment.

Field	Description
Periodic Sample Rate	Sets the **Periodic Sample Rate** (minutes). This indicates how often a time-stamped value will be written to the Periodic Log. If this Segment is tied to a meter Station, an entry will also be written whenever a configuration change is made to a Station or meter that is part of that Station. All options for Periodic Sample Rates are evenly distributed into 60, and logging will be synchronized with the top of the hour.
Contract Hour	Sets the time when the daily values are logged. If this segment is tied to a meter station, this will also be the **Contract Hour** for the station and will be the time that daily and monthly (if it is the first of the month) accumulations will be reset. Additional entries will be made if Force End of Day is exercised for this segment.
Logging	Sets to enable or disable logging for all history points in the segment. Select User to indicates that the segment if for user program history.
User Flow Weight	Sets the input point from which to acquire the weight by which history points of the appropriate archive type within this segment will be averaged. This is typically a dynamic value, such as an accumulator or flowrate. **Notes**: ▪ This field applies **only to liquid meters**. Typical gas meter run history configurations do not make use of this feature. ▪ When using the Liquid Meter history configuration wizard for the ROC800L, this field will be automatically populated. ▪ **Only** history points with an Archive Type of **Avg - User Weighted** are averaged using this value. If no history points are configured or planned to be configured with this archive type, the User Flow Weight selection should be left undefined.
Force End of Day	Sets each segment to force logging of entries in the daily log for all history points in the segment.
Available Space	This **read-only** field displays the total number of history and time stamp entries possible. The maximum number of entries is **236,555**.
Total Space Allocated	This **read-only** field displays the number of history and time stamp entries allocated to all the segments.
Available Space to Allocate	This **read-only** field displays the number of entries unallocated. This number is the Available Space minus the Space Allocated.

7.4 History Point Configuration

The History options allow you to copy and store to the historical database data values and calculated variables stored in the current value database. You configure the historical database to log only the values that need to be logged. The system logs values in the standard (minute, hourly, daily) time base of the ROC, unless you use FST control. By using the FST Editor utility, you can use an FST to control the period under which the data is logged.

Note:

- Configure the History Points for each meter run to allow the EFM Report utility to properly access data.
- Configure gas meter history in segments 1-12 so that a segment number corresponds to a station number (that is, meter history for station 1 is in segment 1, and so on). This allows configuration changes to trigger archive records in accordance with API 2.1 guidelines.

Field	Description
Archive Type	Sets the **Archive Type** to specify how the logged value is calculated; included are some special purpose types for FST control. ▪ **Disabled/ Undefined** – Point not configured. ▪ **Avg – Flow Dependant Linear** – Discards samples when there is no measurable flow and performs a straightforward (linear) average of the remaining samples to compute the minute and hour values. This is the default method for calculating the average for the flow input and is the simplest and most commonly used method. For **differential** meters with analog input values, no flow conditions are defined as the differential pressure meter input less than or equal to the Low Flow Cutoff. For **pulse** meters with a pulse input values, no flow conditions are defined as the no flow time elapsing without receiving a pulse. A linear average of all samples is performed if there is no flow during the logging period. ▪ **Avg – Flow Dependant Formulaic** – Discards samples for periods when there is no flow (like the Flow-Dependent Linear method), but when calculating the average, this method typically takes the square root of each sample before averaging the samples together and then squares the result. This formulaic method typically produces a slightly lower value than the linear method. ▪ **Avg – Flow Weighted Linear** – Determines a relative "weight" for each sample (without discarding any samples) by first multiplying the

Field	Description
	sample by a flow value (see below) and then calculates a linear average by dividing the sum of the flow-weighted sample by the sum of the flow values. This results in minute and hourly values that are more reflective of short periods of high flow. **Note:** The flow value used when calculating the relative weight for each sample is based on your meter type: **DP Meter** = Square root of the differential pressure measured during the sample period **Turbine/Auto-Adjust Meter** = Uncorrected volume flow rate measured during the sample period **Coriolis Meter** = Mass flow rate measured during the sample period ▪ **Avg – Flow Weighted Formulaic** – Combines the flow-weighting action with the formulaic averaging technique, both of which were described previously. ▪ **Avg – User Weighted** – Other flow weighted averaging archive types will weigh values against the gas flow from the associated gas meter run.Ave – User Weighted allows for the creation of flow weighted averages using any arbitrary user selected input point as the weighting factor. This technique multiplies a one-second sample of the configured User Flow Weight TLP (Configure>History Segments) by a one-second sample of the value and then divides the answer by the total accumulation over the time period (minute, hour or day).History points using this method will have a value of zero if no flow is accumulated during the time period, and therefore no weight. **Note:** This archive type is used only with liquid meters.Typical gas meter run history configurations do not make use of this feature. ▪ **Avg – Linear** – Averages one-second samples to compute minute, periodic, and daily values. ▪ **Accumulate/Second** – Sums one-second samples of a per second rate value over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/second. ▪ **Accumulate/Minute** – Converts the one-second samples of a per minute rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/minute. ▪ **Accumulate/Hour** – Converts the one-second samples of a per hour rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive

Field	Description
	type when the History Point being archived is a rate in EUs/hour. ▪ **Accumulate/Day** – Converts the one-second samples of a per day rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/day. ▪ **Current Value** – Logs a snapshot of the current sampled value. ▪ **Totalize** – Logs the difference between the current value at the end of the period and the current value at the last logging interval. ▪ **Minimum Value –** Archive the minimum value read. ▪ **Maximum Value –** Archive the maximum value read. ▪ **FST Time - Minute** – Allocates space for the FST to write time-stamps to the periodic archive using the WTM command. **Note:** The number of periodic entries in the segment determines the number of time-stamps that can be written. The value takes the format MM: DD: HH:MM. The FST determines which index in the periodic archive to write to independently of the current index for the segment. ▪ **FST Time - Second** – Allocates space for the FST to write time-stamps to the periodic archive using the WTM command. **Note:** The number of periodic entries in the segment determines the number of time-stamps that can be written. The value takes the format DD: HH:MM:SS. The FST determines which index in the periodic archive to write to independently of the current index for the segment. ▪ **FST Data** – Allocates space for the FST to write values to the periodic archive using the WDB command. **Note:** The number of periodic entries in the segment determines the number of values that can be written. The FST determines which index in the periodic archive to write to independently of the segment's current index. ▪ **User Program Time** – This Archive Type should only be used as instructed in the respective user program documentation. ▪ **User Program Data** – This Archive Type should only be used as instructed in the respective user program documentation. You may enter a **User Description** of the selected Archive Point for identification

Field	Description
	purposes. Once you have determined what archive type to use, set the archive point by clicking the TLP Browse button that displays at the right-hand side of each Archive Point field. This displays a Select TLP dialog you use to configure the associated TLP.
Archive Point	Sets the point to enter in history. Click the TLP Browse button to display a Select TLP dialog you use to define the point type, logical number, and parameter to be archived.
Point Tag	This **read-only** field displays the name of the **Tag** associated with the Archive Point you selected.
User Description	Sets a description of the history point that you are storing. For example, you may enter Units or Engineering Units.
Current Value	This **read-only** field shows the last historical value recorded.
Last Daily Value	This **read-only** field shows the last daily historical value recorded.

7.4.1 History

The **Configure > History Points** option allows you to setup the History Points for any numeric parameter in the ROC to archive and to select which archiving method to use for each parameter.

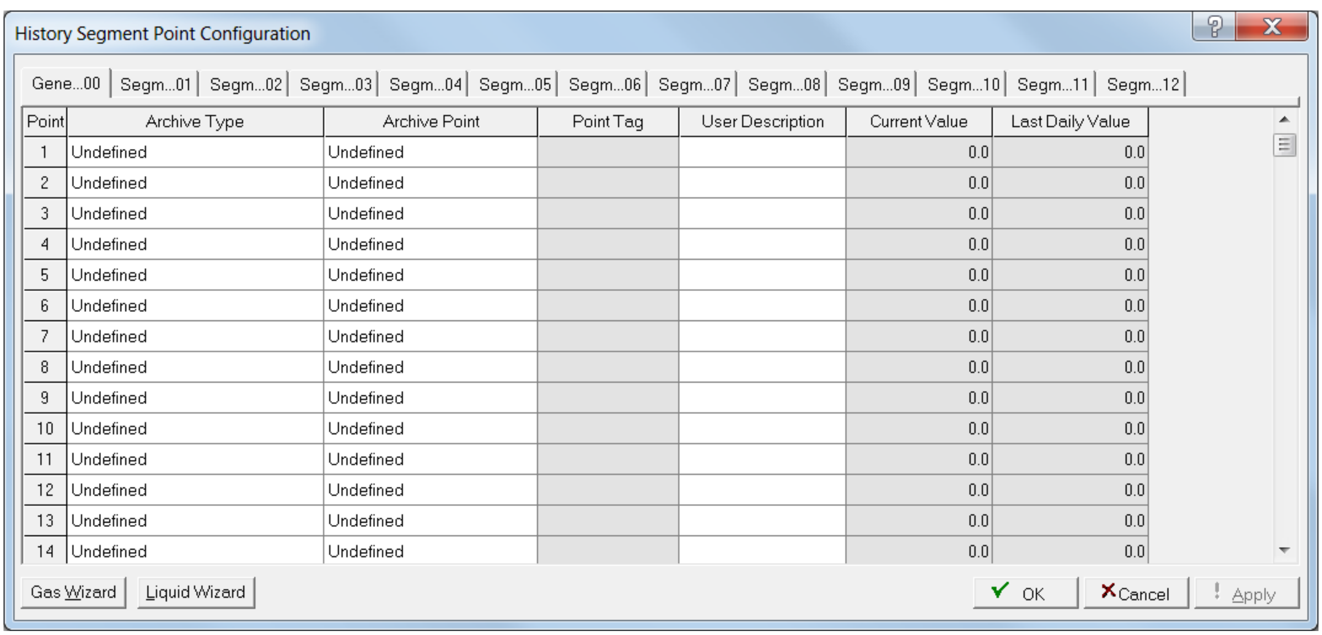


Figure 7-92. History Segment Point Configuration – General tab

The historical database can be configured to log only the values that you require to be logged. The values are logged in the standard (minute-hourly-periodic-daily) time base of the ROC, unless FST control is used. By using the FST Editor utility, the period at which the data is logged can be placed under FST program control. Periodic history can be configured for 1 to 6 minutes, 10 minutes, 15 minutes, 30 minutes, or in 60-minute frequencies.

The ROC maintains the following types of historical databases:

- Minimum/Maximum (Min/Max) Database.
- Minute Database.
- Periodic (Hourly) Database.
- Hourly Database.
- Daily Database.

The Min/Max Database is for viewing only and cannot be saved to a disk file.

Note: The time stamp used for standard logging of historical values reflects the time at the end of the period, not at the beginning. For example, data collected from 8:00 to 9:00 is time-stamped 9:00.

History values can be collected from the ROC via ROCLINK 800 or other third-party host systems. From the **View > History** selection, you can view history directly from the device or from a previously saved disk file.

The required History Points for AGA3 and AGA7 calculation methods are not pre-configured. You should begin the configuration of an AGA calculated Meter Run by configuring those points. Make sure that the History Points for each Meter Run are configured to allow the EFM Report utility to properly access data. Refer to *Section 7.4.3, Configuring History for EFM Reporting*.

Several options are available for the type of history values archived (Archive Type). Linear averaging is available for all parameters. Meter run and Station parameters may be averaged using one of the four averaging techniques recommended in API Section 21.1 (flow dependent linear, flow dependent formulaic, flow weighted linear, and flow weighted formulaic).

Parameters that represent a rate (engineering units/time period) may be accumulated (integrated) to give total values when the time period of the rate is specified. Parameters that represent an accumulated total can be totalized to give total values by taking the difference between the value at the end of the current logging period and the value at the end of the previous logging period. Finally, the current value of any parameter can be logged at the end of each logging period.

Note: In previous products, the totalize Archive Type was intended to be used for parameters that return to zero at contract hour. The Totalize Archive Type is intended to be used for parameters that represent on-going accumulators.

Field	Description
Archive Type	Sets the **Archive Type** to specify how the logged value is calculated; included are some special purpose types for FST control. ▪ **Disabled/ Undefined** – Point not configured. ▪ **Avg – Flow Dependant Linear** – Discards samples when there is no measurable flow and performs a straightforward (linear) average of the remaining samples to compute the minute and hour values. This is the default method for calculating the average for the flow input and is the simplest and most commonly used method. For **differential** meters with analog input values, no flow conditions are defined as the differential pressure meter input less than or equal to the Low Flow Cutoff. For **pulse** meters with a pulse input values, no flow conditions are defined as the no flow time elapsing without receiving a pulse. A linear average of all samples is performed if there is no flow during the logging period. ▪ **Avg – Flow Dependant Formulaic** – Discards samples for periods when there is no flow (like the Flow-Dependent Linear method), but when calculating the average, this method typically takes the square root of each sample before averaging the samples together and then squares the result. This formulaic method typically produces a slightly lower value than the linear method. ▪ **Avg – Flow Weighted Linear** – Determines a relative "weight" for each sample (without discarding any samples) by first multiplying the sample by a flow value (square root of the differential pressure measured during the sample period) and then calculates a linear average by dividing the sum of the flow-weighted sample by the sum of the flow values. This results in minute and hourly values that are more reflective of short periods of high flow. ▪ **Avg – Flow Weighted Formulaic** – Combines the flow-weighting action with the formulaic averaging technique, both of which were described previously. ▪ **Avg – Linear** – Averages one-second samples to compute minute, periodic, and daily values. ▪ **Accumulate/Second** – Sums one-second samples of a per second rate value over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/second.

Field	Description
	▪ **Accumulate/Minute** – Converts the one-second samples of a per minute rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/minute. ▪ **Accumulate/Hour** – Converts the one-second samples of a per hour rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/hour. ▪ **Accumulate/Day** – Converts the one-second samples of a per day rate value to a per second rate and sums them over the logging interval to compute the archived value. Select this archive type when the History Point being archived is a rate in EUs/day. ▪ **Current Value** – Logs a snapshot of the current sampled value. ▪ **Totalize** – Logs the difference between the current value at the end of the period and the current value at the last logging interval. ▪ **Minimum Value –** Archive the minimum value read. ▪ **Maximum Value –** Archive the maximum value read. ▪ **FST Time - Minute** – Allocates space for the FST to write time-stamps to the periodic archive using the WTM command. **Note:** The number of periodic entries in the segment determines the number of time-stamps that can be written. The value takes the format MM: DD: HH:MM. The FST determines which index in the periodic archive to write to independently of the current index for the segment. ▪ **FST Time - Second** – Allocates space for the FST to write time-stamps to the periodic archive using the WTM command. **Note:** The number of periodic entries in the segment determines the number of time-stamps that can be written. The value takes the format DD: HH:MM:SS. The FST determines which index in the periodic archive to write to independently of the current index for the segment. ▪ **FST Data** – Allocates space for the FST to write values to the periodic archive using the WDB command. **Note:** The number of periodic entries in the segment determines the number of values that can be written. The FST determines which index in the periodic archive to write to independently of the segment's current index.

Field	Description
	▪ **User Program Time** – This Archive Type should only be used as instructed in the respective user program documentation. ▪ **User Program Data** – This Archive Type should only be used as instructed in the respective user program documentation. You may enter a **User Description** of the selected Archive Point for identification purposes. Once you have determined what archive type to use, set the archive point by clicking the TLP button that displays at the right-hand side of each Archive Point field. This displays a Select TLP dialog you use to configure the associated TLP.
Archive Point	Sets the point to enter in history. Click the TLP Browse button to display a Select TLP dialog you use to define the point type, logical number, and parameter to be archived.
Point Tag	This **read-only** field displays the name of the **Tag** associated with the Archive Point you selected.
User Description	Sets a description of the history point that you are storing. For example, you may enter Units or Engineering Units.
Current Value	This **read-only** field shows the last historical value recorded.
Last Daily Value	This **read-only** field shows the last daily historical value recorded.

7.4.2 History Wizard

Use the History Wizard to define up to 240 standard history points.

Note: For linear meter runs, the gas history wizard configures the single precision point 116,x,31. If you require additional resolution, you can replace that point type with the double precision point type 116,x,44.

1. Select **Configure > History Points**. When the History Segment Point Configuration screen displays, click **Gas Wizard**. The Gas Meter History Configuration Wizard screen displays.
2. Click ▼ in the **Select Meter** to select the meter to configure.
3. Select the **Starting History** where you desire to store the history data.

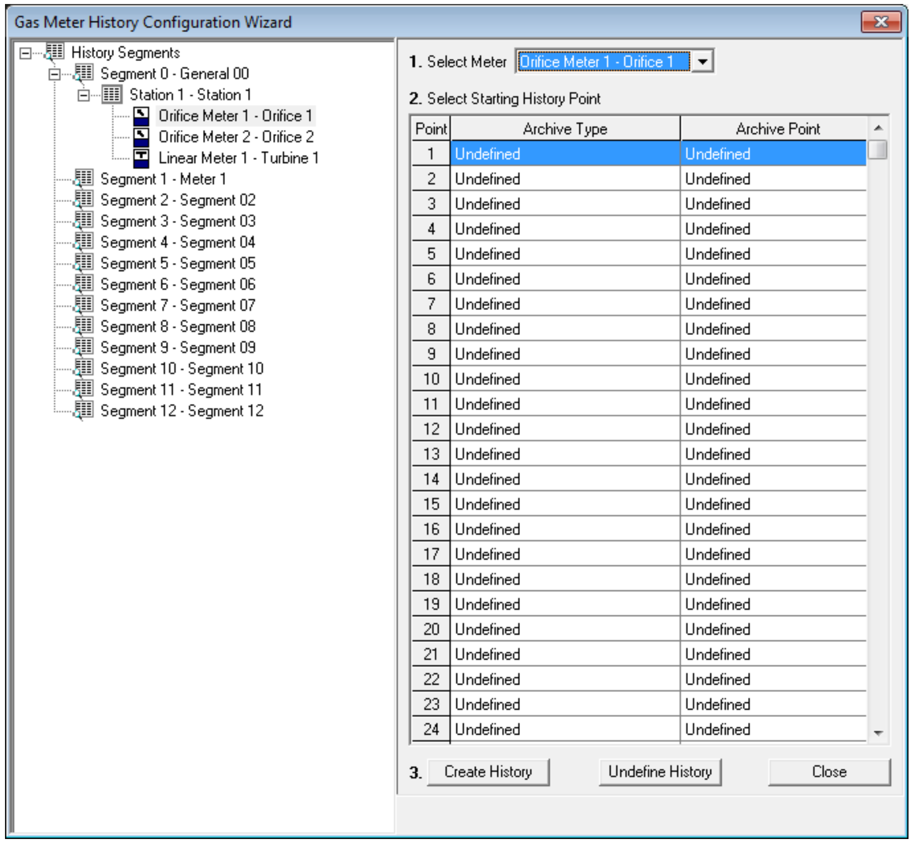
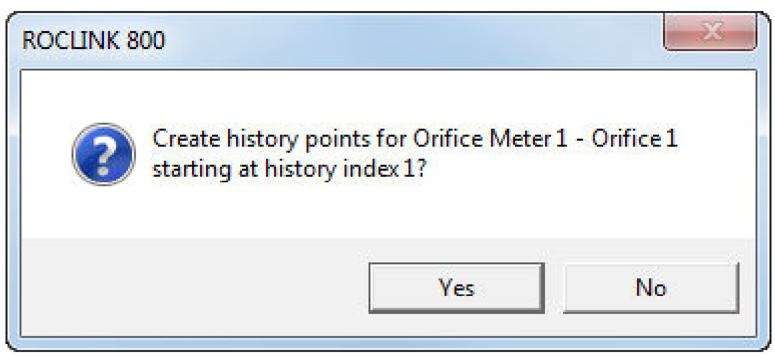


Figure 7-93. History Point Configuration

4. Click the **Create History** button and a confirmation message displays.



5. Click **Yes** and the associated Archive Points display in the History Wizard screen.

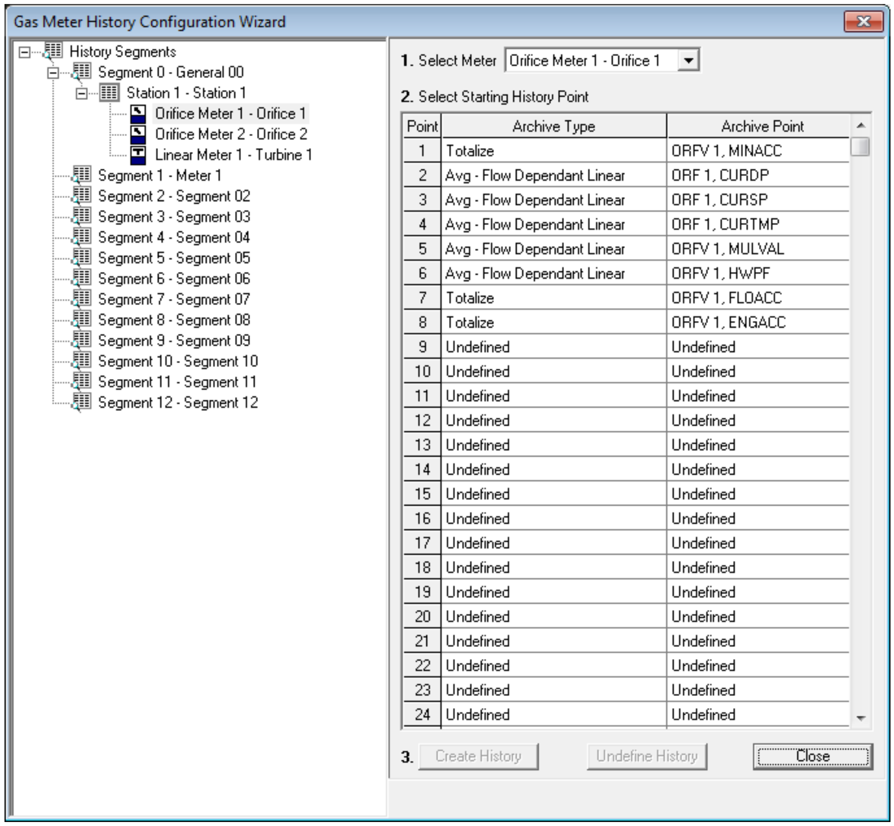


Figure 7-94. Gas Meter History Wizard- Create History Completed

6. Click **Close**.

7.4.3 Undefining a Gas History Point

To undefine a history point:

1. Select **Configure > History Points**. When the History Segment Point Configuration screen displays, click **Wizard**. The Meter History Configuration Wizard screen displays.

Note: Select the **point** to delete.

2. Click **Undefine History**.
3. Click **Yes** in the confirmation prompt.

7.4.4 Liquid Meter History Configuration Wizard

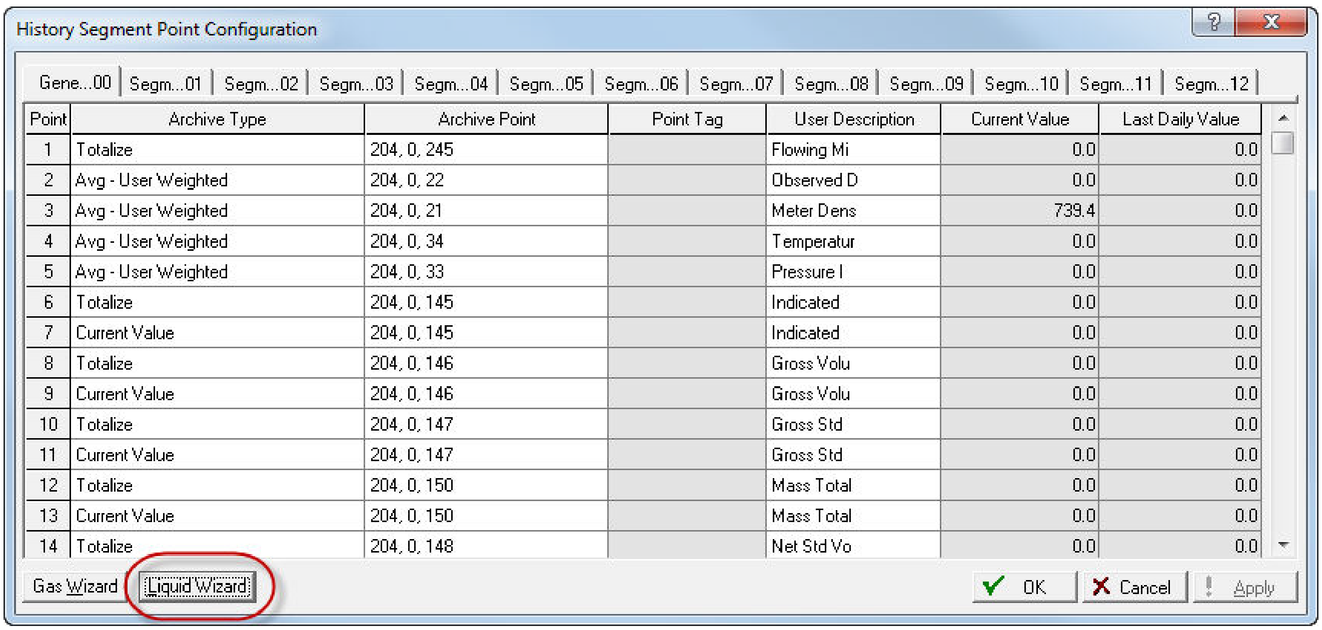
Use the Liquid Meter History Configuration Wizard to define up to 240 Standard History points. Basic liquid history consists of 32 points and basic liquid history plus composition history consists of 53 points. If you have six meter runs, you do not have enough available history points to archive both basic and composition information (6 x 53 > 240).

Consequently, configure each segment to contain only history points for a single meter. This allows you to maintain a single flow weight per history segment (and provide correct liquid flow weighted averages). If you configure six meters, you should also configure six history segments.

Notes:

- You **must** configure history segments **before** completing the liquid meter history configuration wizard. For more information on configuring history segments, refer to *Section 7.3*, *History Segment Configuration*.
- Each liquid meter **must** be associated with a history segment. You can assign a meter to a specific history segment using the Link This Meter to field on the *General* tab of the Liquid Meter screen.

1. Select **Configure > History Points**. The History Segment Point Configuration screen displays.



2. Click the **Liquid Wizard** button. The Liquid History Wizard screen displays.

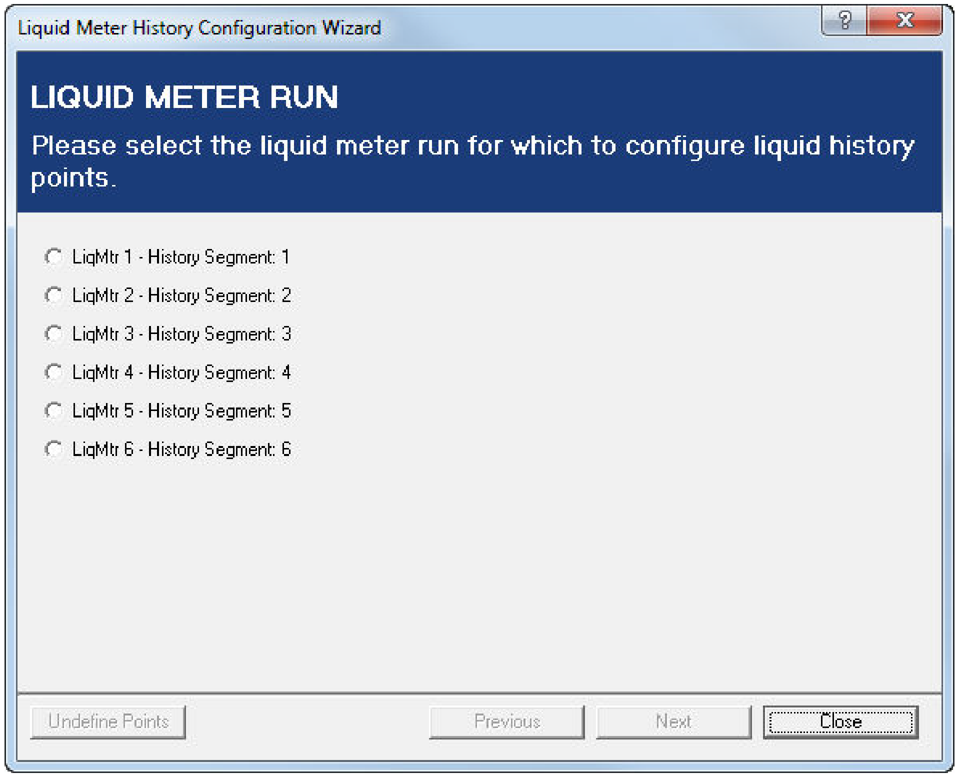


Figure 7-95. Liquid Meter History Configuration Wizard – Liquid Meter Run

3. Select the **Liquid Meter** that you desire to configure and click **Next.**

Note: History points for a densitometer associated with the meter may or may not be configured by the history wizard depending on the configuration of the liquid meter run. The history wizard configures history points for the observed density, the observed density temperature, and the observed density pressure if the meter run has a directly assigned density interface or is associated with a station that has an assigned density interface. If densitometer history points should be configured for this meter but the wizard indicates that they will not be, first assign a densitometer to the liquid meter run and then return to the liquid meter history configuration wizard.

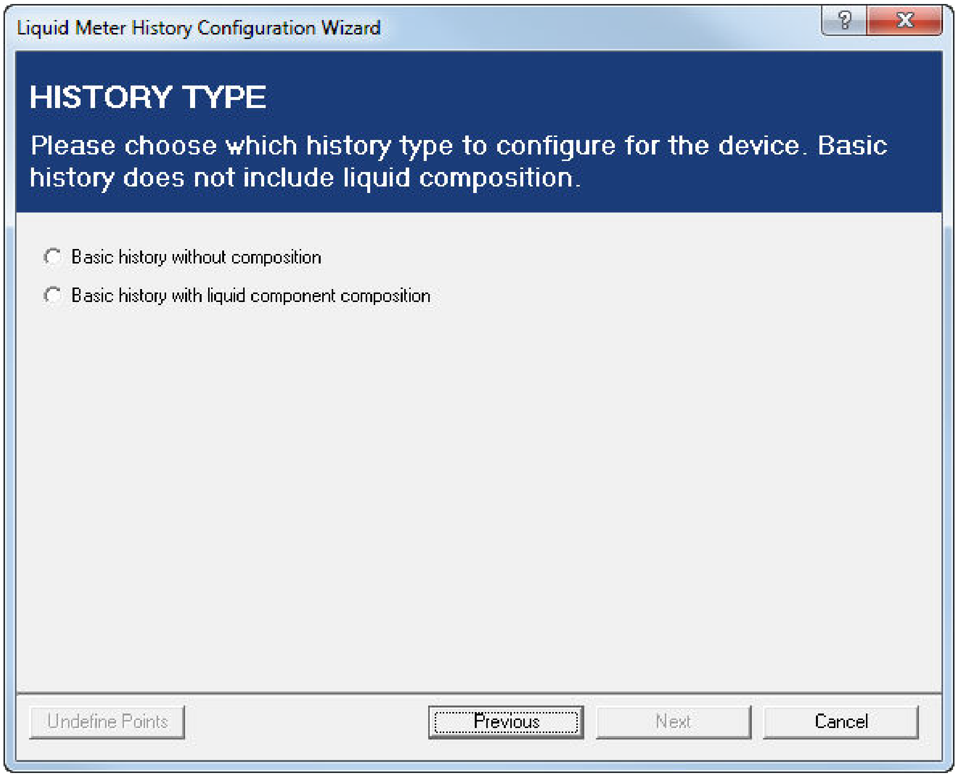


Figure 7-96. Liquid Meter History Configuration Wizard – History Type

4. Select the **History Type** you desire to configure and click **Next**. Valid options are:

Option	Description
Basic history without composition	This option includes parameters necessary for **all** liquid meters and consists of 32 points. Configured points include:

Point Type	Parameter	Archive Type	Description
204	245	Totalize	Flowing Minutes Accumulation
204	22	Avg - User Weighted	Observed Density
202	6	Avg - User Weighted	Density Temperature Value
202	8	Avg - User Weighted	Density Pressure Value
202	3	Avg - User Weighted	Raw Density Input Value
204	21	Avg - User Weighted	Meter Density
204	34	Avg - User Weighted	Temperature Input Value
204	33	Avg - User Weighted	Pressure Input Value
204	145	Totalize	Indicated Quantity Total Accum

Option	Description			
	204	145	Current Value	Indicated Quantity Total Accum
	204	146	Totalize	Gross Volume Total Accum
	204	145	Current Value	Indicated Quantity Total Accum
	204	146	Totalize	Gross Volume Total Accum
	204	146	Current Value	Gross Volume Total Accum
	204	147	Totalize	Gross Std Volume Total Accum
	204	147	Current Value	Gross Std Volume Total Accum
	204	150	Totalize	Mass Total Accumulation
	204	150	Current Value	Mass Total Accumulation
	204	148	Totalize	Net Std Volume Total Accum
	204	148	Current Value	Net Std Volume Total Accum
	204	149	Totalize	BSW Volume Total Accum
	204	149	Current Value	BSW Volume Total Accum
	204	35	Avg - User Weighted	BSW Percent Value
	204	40	Avg - User Weighted	CSW
	204	184	Totalize	Raw Pulses Total Accumulation
	204	184	Current Value	Raw Pulses Total Accumulation
	202	9	Avg - User Weighted	Density Correction Factor
	204	75	Avg - User Weighted	Meter Factor in use
	204	74	Avg - User Weighted	K Factor in use
	204	243	Avg - User Weighted	Vapor Pressure
	204	44	Avg - User Weighted	CTL Base to Alternate
	204	45	Avg - User Weighted	CPL Base to Alternate

Option	Description			
	204	46	Avg - User Weighted	CTPL Base to Alternate
	204	39	Avg - User Weighted	CCF
Basic history with composition	This option includes the basic history points listed above and additional compositional history points. Basic history with composition consists of 53 points and is applicable only to light hydrocarbon measurement. Additional compositional history points include:			
	Point Type	**Parameter**	**Archive Type**	**Description**
	203	119	Avg - User Weighted	Carbon Dioxide (CO2)
	203	117	Avg - User Weighted	Nitrogen (N2)
	203	105	Avg - User Weighted	Methane (C1)
	203	106	Avg - User Weighted	Ethane (C2)
	203	107	Avg - User Weighted	Propane (C3)
	203	109	Avg - User Weighted iso-	Butane (iC4)
	203	108	Avg - User Weighted n-	Butane (nC4)
	203	111	Avg - User Weighted	iso-Pentane (iC5)
	203	110	Avg - User Weighted	n-Pentane (nC5)
	203	104	Avg - User Weighted	neo-Pentane (neoC5)
	203	112	Avg - User Weighted	Hexane (C6)
	203	113	Avg - User Weighted	Heptane (C7)
	203	124	Avg - User Weighted	Octane (C8)
	203	125	Avg - User Weighted	Nonane (C9)
	203	126	Avg - User Weighted	Decane (C10)
	203	114	Avg - User Weighted	Ethylene
	203	115	Avg - User Weighted	Propylene
	203	118	Avg - User Weighted	Oxygen (O2)
	203	128	Avg - User Weighted	Water (H2O)
	203	120	Avg - User Weighted	Hydrogen Sulfide (H2S)

Option	Description			
	203	127	Avg - User Weighted	Helium (He)

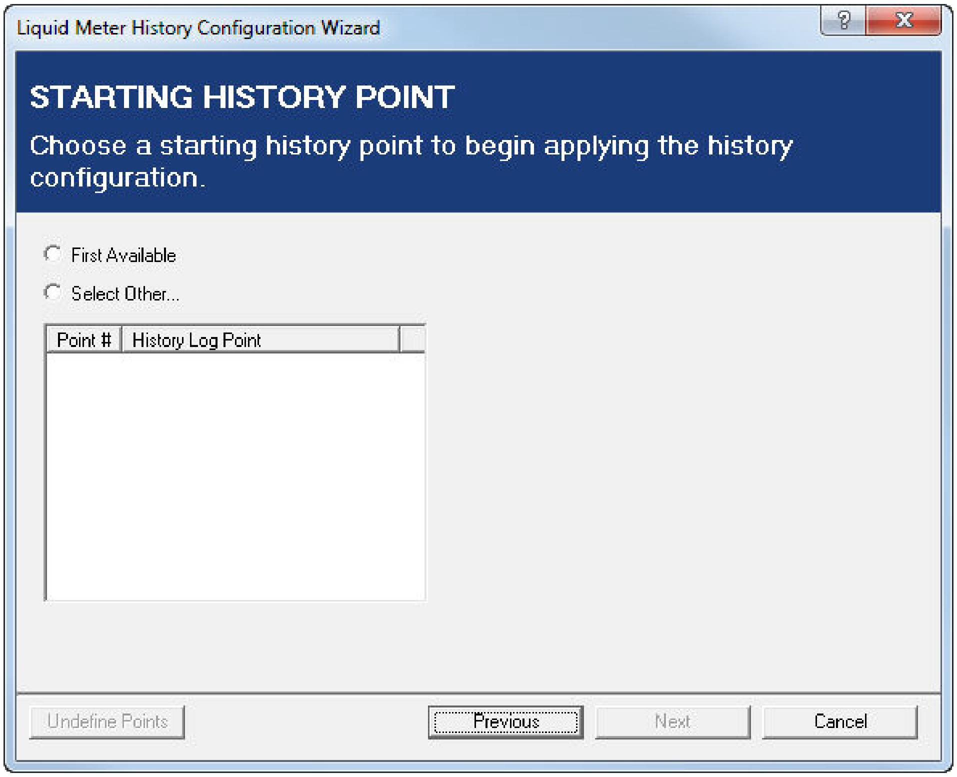


Figure 7-97. Liquid Meter History Configuration Wizard – Starting History Point

5. Select the starting history point and click **Next** .

Option	Description
First Available	The system automatically selects the first undefined history point as the starting history point. **Note:** This option overwrites any history points that are configured after the starting history point. For example, if you have configured history points 1 through 10 and 13 through 40 in the ROC, the system configures liquid history starting with history point 11 (the first available history point) and continues sequentially for 32 (basic history without composition) or 53 (basic history with composition) points. This results in history points 13 through 40 being overwritten.

Option	Description
Select Other	Allows you to manually select the starting history point. **Note:** This option overwrites any history points that are configured after the starting history point. For example, if you have configured history points 1 through 10 and 13 through 40 in the ROC and select history point 11 as the starting history point, the system configures liquid history starting with history point 11 (the starting history point) and continues sequentially for 32 (basic history without composition) or 53 (basic history with composition) points. This results in history points 13 through 40 being overwritten.

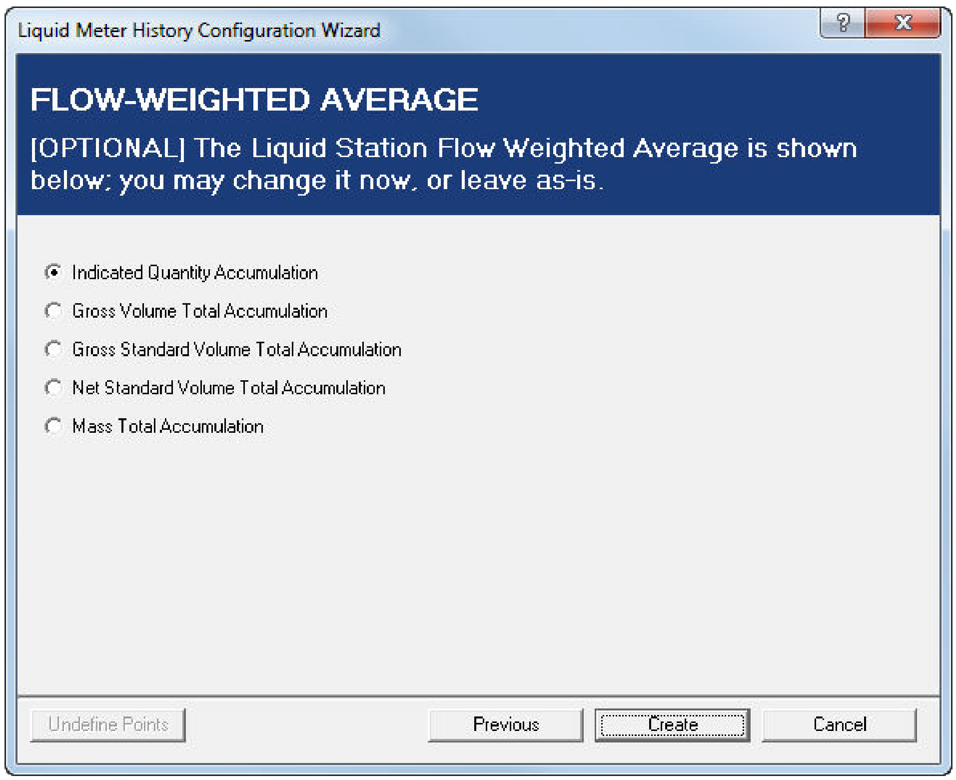


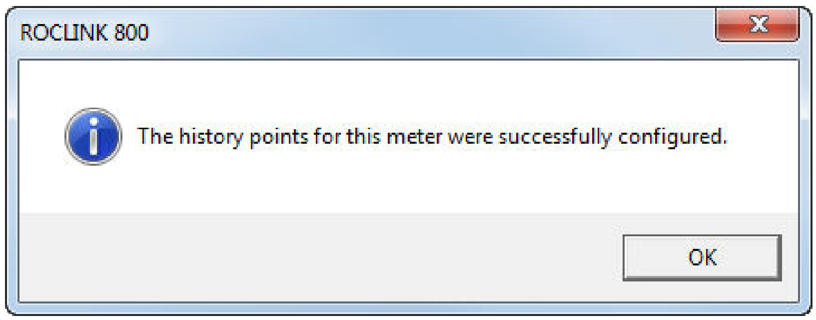
Figure 7-98. Liquid Meter History Configuration Wizard – Flow Weighted Average

6. Select the method for calculating the flow-weighted average for the meters. Valid options are:

Option	Description
Indicated Quantity Accumulation	The volume or mass read directly from the meter at flowing conditions without any correction.
Gross Volume Total Accumulation	The volume at flowing conditions corrected for meter factor.

Option	Description
Gross Standard Volume Total Accumulation	The volume at base conditions corrected for meter performance.
Net Standard Volume Total Accumulation	The volume at base conditions corrected for meter performance and non-merchantable quantities, such as sediment and water.
Mass Total Accumulation	Either the indicated mass corrected for meter performance (if a mass meter type is selected) or the mass value calculated from the gross volume and flowing density.

7. Click the **Create** button. A progress bar displays in the Liquid Meter History Configuration Wizard screen showing the Archive Types and the associated Archive Points. When the progress completes, a confirmation message displays.

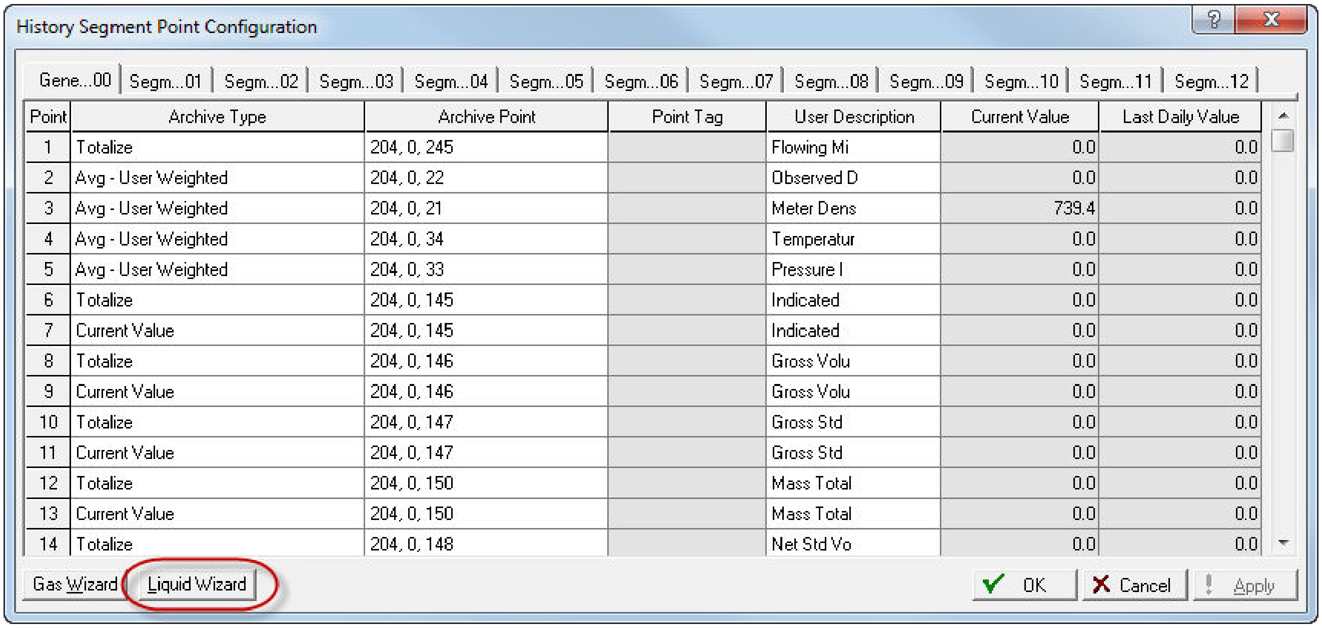


8. Click **OK.**
9. Click the **Close** button.

7.4.5 Undefining a Liquid History Point

To undefined a liquid history point.

1. Select **Configure** > **History Points** > **Liquid Wizard** button. The Liquid History Wizard screen displays.



2. Select the **Liquid Meter** that you desire to delete.

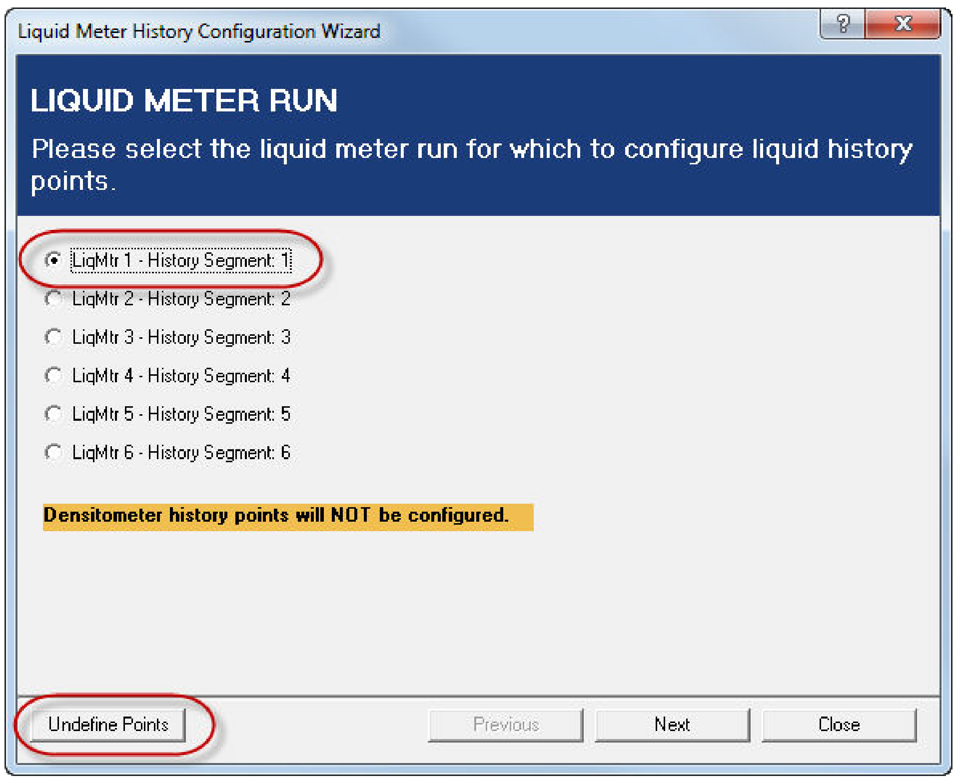
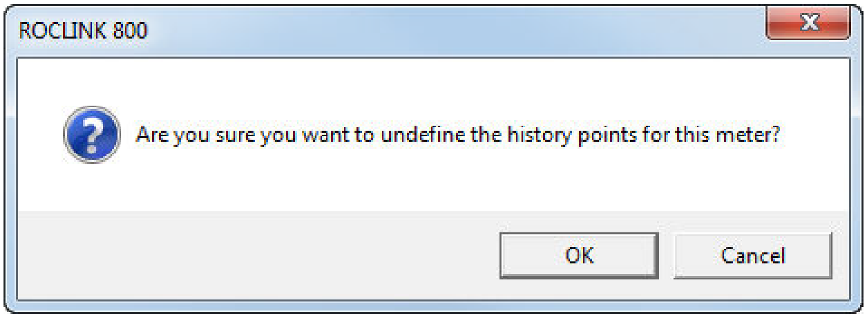


Figure 7-99. Liquid Meter History Configuration Wizard – Liquid Meter Run

3. Click the **Undefine Points** button. A confirmation message displays.



4. Click **OK** in the confirmation prompt.
5. Click the **Close** button.

7.4.6 Configuring History for EFM Reporting

ROCLINK 800 software has the ability to create an EFM (Electronic Flow Measurement) Report file that contains all the configuration, alarms, events, and history logs associated with the Stations and Meter Runs in the ROC This file then becomes the custody transfer audit trail. To collect the periodic and daily history logs required for the EFM Report file, a specific list of Station and Meter Run parameters must be configured for historical archiving. The **History Points must be configured for each Meter Run**. The required parameters to archive vary depending on the type of meter run (orifice or turbine).

Note: ROC800L units do not have any flow parameters factory-configured into History Points.

Station that has live inputs for gas quality data, the heating value, specific gravity, and the gas composition of any components that are being updated should be configured as History Points. The Archive Type should be any of the four meter averaging techniques: Flow Weighted Linear, Flow Weighted Formulaic, Flow Dependent Linear, or Flow Weighted Formulaic.

All History Points for a Station and the Meter Runs that belong in that Station must reside in the same History Segment. The order or database number of these History Points is not critical; the EFM Reports utility will search for them.

7.4.7 Orifice EFM History Points

For an orifice meter run, the following history points must be configured for EFM Reports. For each of the eight parameters listed, select one Archive Type and Point Type.

Table 7-3.Orifice EFM History Points

Archive Type	Point Type	Parameter	Description
Totalize	ORFV (Orifice Meter Run Values)	MINACC (Minutes Accumulated)	Flowing Minutes
Avg (Flow Dependent Linear)	ORF (Orifice Meter Run	CURDP (DP)	Differential

Archive Type	Point Type	Parameter	Description
Avg (Flow Dependent Formulaic)	Configuration)		Pressure
Avg (Flow Weighted Linear)			
Avg (Flow Weighted Formulaic)			
Avg (Flow Weighted Linear)	ORF (Orifice Meter Run Configuration)	CURSP (SP)	Static Pressure
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Avg (Flow Weighted Linear)	ORF (Orifice Meter Run Configuration)	CURTMP (TMP)	Temperature
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Avg (Flow Weighted Linear)	ORFV (Orifice Meter Run Values)	HWPF (Pressure Extension)	Pressure Extension
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Avg (Flow Weighted Linear)	ORFV (Orifice Meter Run Values)	MULVAL (Multiplier Value)	Multiplier Value
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Totalize	ORFV (Orifice Meter Run Values)	FLOACC (Flow Accumulated)	Volume
Totalize	ORFV (Orifice Meter Run Values)	ENGACC (Energy Accumulated)	Energy

7.4.8 Turbine EFM History Points

For a Linear Meter Run, the following History Points must be configured for EFM Reports. For each of the eight parameters listed, select one Archive Type and Point Type.

Table 7-4. Turbine EFM History Points

Archive Type	Point Type	Parameter	Description
Totalize	TRBV (Linear Meter Run Values)	MINACC (Minutes Accumulated)	Flowing Minutes
Totalize	TRBV (Linear Meter Run Values)	PULSETDY (Pulses Accumulated)	Raw Pulses
Avg (Flow Weighted Linear)	TRB (Linear Meter Run Configuration)	CURSP (SP)	Static Pressure
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Avg (Flow Weighted Linear)	TRB (Linear Meter Run Configuration)	CURTMP(TMP)	Temperature
Avg (Flow Weighted Formulaic)			
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Avg (Flow Weighted Linear)	TRBV (Linear Meter Run	MULTVAL (Multiplier	Multiplier Value

Archive Type	Point Type	Parameter	Description
Avg (Flow Weighted Formulaic)	Values)	Value)	
Avg (Flow Dependent Linear)			
Avg (Flow Dependent Formulaic)			
Totalize	TRBV (Linear Meter Run Values)	UNACC (Uncorrected Accumulated)	Uncorrected Volume
Totalize	TRBV (Linear Meter Run Values)	FLOACC (Flow Accumulated)	Volume
Totalize	TRBV (Linear Meter Run Values)	ENGACC (Energy Accumulated)	Energy

7.5 Opcode Table

Use the Opcode table to group data being polled for more efficient communications. You can assign parameters from different point types to the Opcode table data points, which can substantially reduce the number of polls from a host computer.

Note: Use of the term "opcode" in this context **does not** refer to the operator identification codes in ROC protocols.

1. Select **Configure** > **Opcode Table**. The Opcode Table Settings screen displays.
2. Review the fields for your organization's values.
3. Click **Apply** if you change any parameters on this screen.

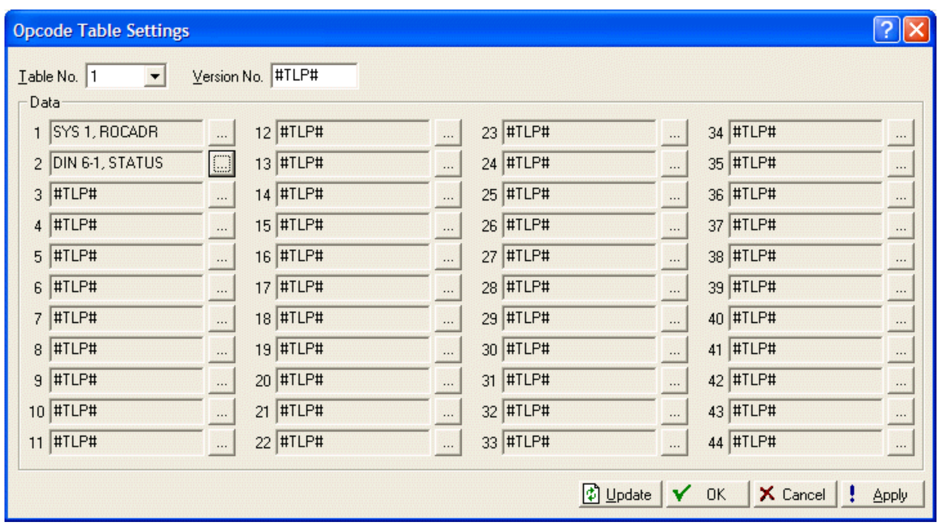


Figure 7-100. Opcode Table Settings

Field	Description
Table No.	Selects an Opcode table.

Field	Description
Version No.	Associates a version number with the Opcode table. By default, the version number (a floating point number) is one less than the number of the Opcode table. **Note:** If you change the configuration of data points, update the version number of the table.
Data	Assigns a value to each Opcode data point. Click the TLP Browse button to display a Select TLP dialog. Use the dialog to map values into the Opcode table data point. If a host computer asks for a specific Opcode data point, the ROC returns the value that is referred by the mapped TLP.

7.6 Modbus Communications

This section describes how to configure the ROC to communicate using the Modbus protocol and integrate the ROC and Modbus devices into the same host/slave system.

The ROC800L can act as a slave or a host device and does not require a user program.

The Modbus Master mode of operation, which is enabled by selecting the correct port owner designation in the **ROC > Comm Ports** screen, allows the ROC800L to simulate a Master device that can poll other Modbus devices for data and stores the data in TLP locations within the ROC800L. The TLPs can be virtually any location with in the ROC, such as softpoints, FST Registers, User Program TLPs, and point types (AGA or I/O). You can map Modbus Registers to any TLP with the correct data types and conversions configurations.

The ROC800L can also send commands to set outputs and write data to a Slave device. COMM1, COMM2, COMM3, COMM4, and COMM5 support Modbus Host in the ROC800L. Modbus Host is not supported on the LOI (Local Port). For more information on Modbus Master configuration and functionality, refer to the discussion of the Modbus Master Table tab.

In Slave mode, the data link between the Host device and the ROC800L can use any of the communications ports. When using a dialup modem, you can only designate communications to switch between ROC or Modbus Slave. The Ethernet port can always recognize Modbus messages. The system limits Modbus TCP/IP slave connections to six.

Note: For more information about Modbus communications on the Ethernet port, refer to *Chapter 3, Section 3.4.1, Configuring TCP/IP Communications on the Ethernet Port*.

Any serial or modem communications port configured with a Port Owner of ROC Plus Protocol/Modbus Slave (**ROC > Comm Ports**) automatically determines if the incoming communication request is in ROC Protocol or Modbus Protocol. The ROC responds using the same protocol as the incoming request.

The Ethernet communications port automatically determines if the incoming communications request is in ROC Protocol, Modbus RTU encapsulated in TCP/IP, or Modbus TCP/IP Protocol. The ROC responds using the same protocol as the incoming request.

7.6.1 Modbus Configuration

Use this option to set basic Modbus communication parameters. The General tab sets the basic communication parameters. The Scale Values tab allows you to enter eight low and high floating-point scale values with one low and high integer values for converting floating-point numbers to a scaled integer. Select **Configure > Modbus > Configuration**. The Modbus Configuration screen displays.

Use the following tabs to configure a Modbus component.

- Use the **General** tab to configure Modbus communication parameters.
- Use the **Scale Values** tab to convert floating point numbers to scaled integers.
- Use the **Master Table** tab to map Modbus registers to specific TLP numbers.
- Use the **Master Modem** tab to configure the ROC to communicate to multiple Slave devices through modems and phone lines.
- Use the **Registers tab** to map Modbus registers to specific TLP numbers.
- Use the **History Table** tab to configure the Periodic and Daily history values, Event records, and Alarm records for retrieval through Modbus Protocol, using Function Code 03.

Note: After you configure a point and click **Apply**, click **Flash Memory Save Configuration** (on the **ROC > Flags** screen) to save the configuration to permanent memory in case you must perform a cold start.

Modbus: General Tab

The Modbus Configuration screen initially displays the General tab. Use this tab to configure basic Modbus communication parameters.

1. Select **Configure > Modbus > Configuration**. The Modbus Configuration screen displays.
2. Review the fields for your organization’s values.

Note: This screen initially displays with **Local Port** as the default comm port. The example screen uses the RS-485 choice so that all the possible fields on this screen display.

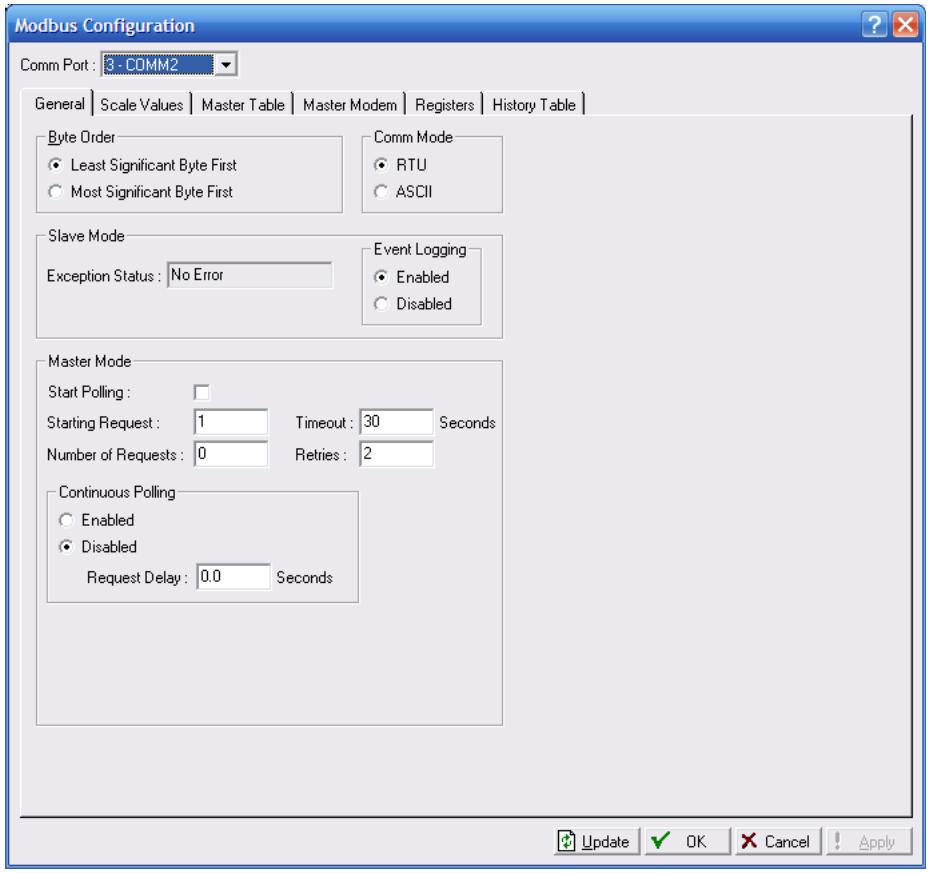


Figure 7-101. Modbus Configuration – General tab

Field	Description
Comm Port	Selects a comm port to configure. Click ▼ to display all defined comm ports. **Note:** This screen's Master Mode frame **does not** display if you select either **Local Port** or **LCD Port** as a comm port option.
Comm Mode and Modbus Type	Sets the communications mode for the selected comm port. The Modbus protocol supports two modes of transmission, **ASCII** and **RTU**. **RTU** is the default. **Note:** You must configure all devices in the same communications network with the same mode of transmission. Additionally, In either ASCII or RTU mode, the transmitting device places the Modbus message into a frame that has a known beginning and ending point. ▪ **ASCII** – **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange mode represents each 8-bit byte of data as two ASCII characters that are the hexadecimal representation of the value. This allows the messages to be read with the use of a dumb terminal, but uses twice as many characters as the RTU mode. Each character sent is composed of a start bit, 7 or 8 data bits, and

Field	Description
	one or two stop bits with Even, Odd, or No parity. ASCII mode uses Longitudinal Redundancy Checking (LRC) error checking. ▪ **RTU** – **R**emote **T**erminal **U**nit mode allows for greater character density and better data throughput than ASCII for the same baud rate. Each message is transmitted in a continuous stream. Data is sent in 8-bit binary characters. RTU mode uses Cyclic Redundancy Check (CRC) error checking. By default, RTU is enabled. In either mode, ASCII or RTU, a Modbus message is placed by the transmitting device into a frame that has a known beginning and ending point.

ASCII Message Framing					
Begin of Frame	Address	Function	Data	LRC Error Check	End
:	2 Chars	2 Chars	N Chars	2 Chars	CRLF
RTU Message Framing					
Begin of Frame	Address	Function	Data	CRC Error Check	End
T1-T2-T3-T4	1 Byte	1 Byte	N * 1 Byte	2 Bytes	T1-T2-T3-T4

Field	Description
Byte Order	Sets the order of data bytes in a transmission or requests, which can be reversed. This only affects the Data field of a Modbus message and has no effect on the data bytes for Function Codes 01, 02, and 05. Valid values are **Least Significant Byte First** (places the Least Significant Byte first; this is the default value) and **Most Significant Byte First** (places the Most Significant Byte first).
Exception Status	This **read-only** field shows the error message for the last Modbus message received. **Note:** This field applies only in Slave mode.
Event Logging	Sets whether the system writes to the Event log all parameter changes made via Modbus. Valid values are **Enabled** (logs all events) or **Disabled** (does not log events). **Enabled** is the default.
Start Polling	Controls whether the system begins a Modbus Master polling sequence. The default is off. The system clears this field when the polling sequence completes. **Note:** You must have previously selected **Modbus Master** as the port owner on the Comm Port screen (**ROC > Comm Ports**). The ROC begins polling at the value defined in the Starting Request field and proceeds through the entries in the table.
Starting Request	Sets a beginning value from which the Modbus Master polling sequence begins. This number corresponds to a line number on the Modbus Master Table associated with this comm port.

Field	Description
Number of Requests	Sets the total number of requests the Modbus Master makes for this polling sequence. This value specifies the total number of lines in the Master tables on which to execute the polls. The default value **0** prevents the polling from occurring. **Note:** You can define up to three Modbus Master tables for this comm port. The tables are contiguous. If you indicate more requests that are on a single table, the system accesses the second or third table to complete the request.
Timeout	Sets the amount of time, in seconds, that the Master (Host) waits to receive a valid message after the ROC or sends a request to a device. **Note:** Do not enter **0** (zero) in this field.
Retries	Sets the number of times (after the initial try) that the Master ROC attempts to establish communications with the specified device before reporting a timeout error. Valid values are between **0** and **25**; the default is **2**.
Modbus Continuous Polling	Indicates whether the system continually executes the Modbus Master polling sequence. Valid values are **Enabled** (polling occurs continually) or **Disabled** (polling occurs only as requested). **Note:** Use the **Request Delay** field to schedule the continual polling.
Request Delay	Sets a delay time, in seconds, between polling request sequences. This field is valid **only** when you enable Continuous Polling. **Note:** The system considers each line in a Modbus Master Table as a request.

Modbus: Scale Values Tab

Use the Scale Values tab to define eight low and high floating-point scale values, each with a low and high integer values, used to convert floating-point numbers to a scaled integer.

Select **Configure > Modbus > Configuration > Scale Values** tab.

The system uses integer scale values and the float scale values in conjunction with one another whenever you use the Convert Code 1 through 8. In older Modbus devices, the system exchanged data without applying scaling using raw A/D counts sent between devices.

Scaling factors allow values to be exchanged between Modbus, emulating raw, unscaled values. For example, a 4 to 20 mA loop might have a raw A/D value in which 4 mA equaled 800 counts and 20 mA equaled 4095 counts. At midrange (12 mA), the raw A/D count would be 2448. If this AI signal was representative of a 0 to 250 pound pressure, 4 mA would equal 800 counts (or 0 PSIG), 20 mA would equal 4095 counts (or 250 PSIG), and midrange at 12 mA would equal 2448 counts (or 125 PSIG).

Convert Codes 1 to 8 support both reads and writes.

1. Select **Configure** > **Modbus** > **Configuration** > **Scale Values** tab. The Scale Values screen displays.

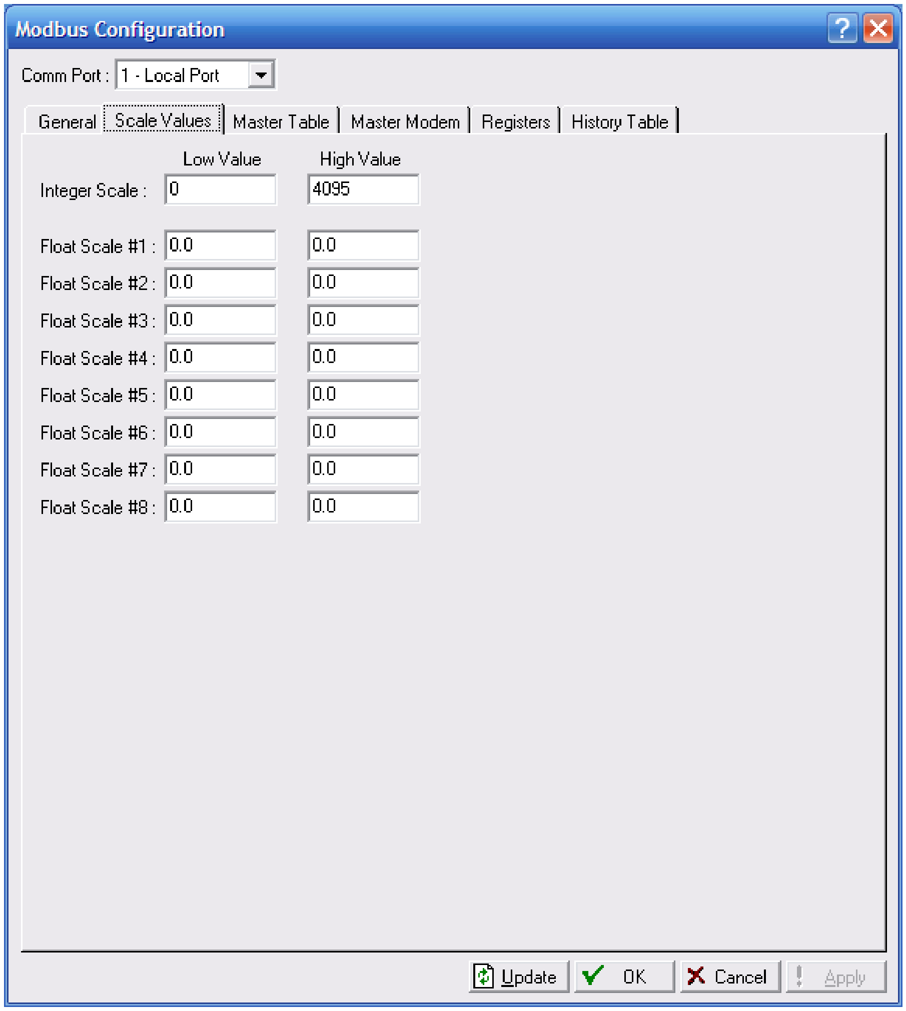


Figure 7-102. Modbus Configuration – Scale Values tab

Field	Description
Integer Scale - Low and High Values	Sets values the system uses to scale analog I/O to integer values with an implied decimal point. The **Low Value** determines the low integer scaling that represents the data and the **High Value** represents the highest integer value used to scale the data. The **High Value** and **Low Value** fields are signed integers and can range from – 32768 to 32767.

Field	Description
Float Scale #	Scales data in conjunction with the Low and High Integer Scale values. Provide high and low values for each float scale #. For host systems that do not accept floating-point numbers, you can specify eight sets of floating-point ranges for values. This allows the host to read and set floating-point values (such as PID setpoints, softpoint values, and flow values) as integer values. The system converts floating-point values to integers by configuring a register or range of registers with the Conversion field set in the Modbus Registers definition configuration to a Convert Code from 1 to 8.

The system uses the following equations to convert **floating point values to integers**:

- Float Range = High Value Float Scale – Low Value
- Float Scale (for example, 100.0 = 120.0 – 20.0)
- Integer Range = High Value Integer Scale – Low Value Integer Scale (for example, 6000 = 7000 – 1000)
- Adjusted Reading = Float Reading – Low Value Float Scale (for example, 50.0 = 70.0 – 20.0)
- Integer = [(Integer Range x Adjusted Reading) Float Range] + Low Integer Scale (for example, 3500 = [(6000 x 50.0) 100.0] + 1000)

The system uses the following equations to convert **integers to floating point values**:

- Float Range = High Value Float Scale – Low Value
- Float Scale (for example, 100.0 = 120.0 – 20.0)
- Integer Range = High Value Integer Scale – Low Value Integer Scale (for example, 6000 = 7000 – 1000)
- Adjusted Integer = Integer Sent – Low Value Integer
- Scale (for example, 3000 = 4000 – 1000)
- Float Value = [(Adjusted Integer x Float Range) Integer Range] + Low Float Scale (for example, 70.0 = [(3000 x 100) 6000] + 20)

Modbus: Master Table Tab

The Modbus Master mode of operation allows a ROC to simulate a master device that can poll other devices for data and to store that data within the ROC in any valid TLP. The ROC can also send commands to set outputs and write data to a slave device.

You can configure the Modbus Master functionality on the EIA-232 (RS-232), EIA-485 (RS-485), Ethernet (COMM1) and modem communications ports (COMM2 to COMM5).

Each command can transmit or receive up to 240 bytes of data. ROCLINK 800 supports Modbus function codes 1, 2, 3, 4, 5, 6, 15, and 16. Function codes 1 to 4 **request** data from slaves, while function codes 5, 6, 15, and 16 **transmit** data to a slave device.

Each master request you configure uses data read from or written to registers defined in the Modbus Registers table. When using Modbus function codes 1 to 4, the ROC reads data from a slave device and writes it to the TLP specified in the Modbus Registers table. When using Modbus function codes 5, 6, 15, and 16, the ROC reads data from the TLP specified in the Modbus Registers table and writes it to the slave device.

You can use an FST or User C program to schedule Modbus master requests. Enable the comm port on the Comm Port screen (**ROC > Comm Ports**). Set the Start Polling option on the Modbus Configuration screen (**Configure > Modus > Configuration**) if continuous polling is desired. Alternately, you can manage, enable, or disable master polling using a control application. Using FSTs, the ROC can dial other Modbus slave devices at regular intervals.

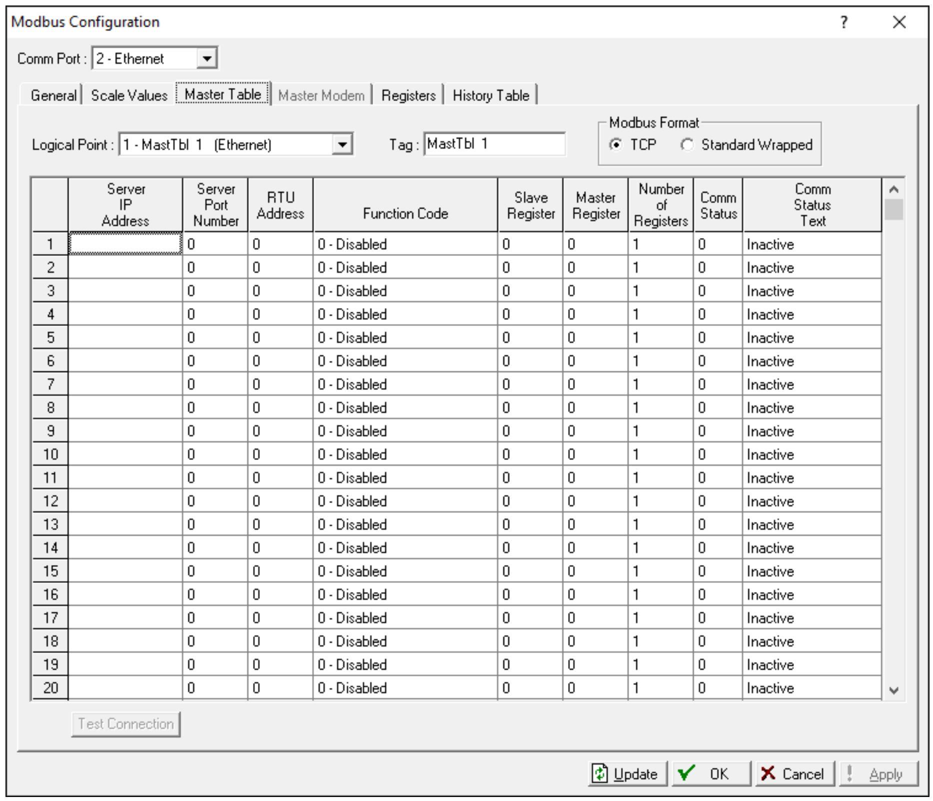


Figure 7-103. Modbus Configuration - Master Table

Field	Description
Logical Point	Sets the logical point of the communication port. **Note:** You can configure the Modbus Master functionality on the EIA-232 (RS-232), EIA-485 (RS-485), and modem communications ports (COMM1 to COMM5). The LOI (Local Port) port does not support Modbus Master communications.
Tag	Sets a 10-character alphanumeric identifier for the master table.

Field	Description	
Modbus Format	Sets the format of Modbus messages sent from this device. Possible options are: **Note:** This field displays **only** if you select the Ethernet port in the Comm Port drop-down list.	
	TCP	Adds a 6 byte header to Modbus messages, and then encapsulates it for transmission over TCP/IP. This is the default. The header consists of the following: ▪ A 2 byte transaction ID that increments for each packet sent. ▪ A 2 byte protocol ID. The protocol ID for Modbus is 0. ▪ A 2 byte indicator of the packet length.
	Standard Wrapped	Encapsulates Modbus messages for transmission over TCP/IP. **Note**: Use this option **only** with legacy devices that do not support the additional header added with the TCP format.
Server IP Address	Specifies the IP address of the device to be polled. **Note:** This field displays **only** if you select the Ethernet port in the Comm Port drop-down list.	
Server Port Number	Specifies the IP port number of the device to be polled. **Note:** This field displays **only** if you select the Ethernet port in the Comm Port drop-down list.	
RTU Address	Sets the RTU address for the slave device to be queried.	
Function Code	Sets the Modbus function code to be sent to the slave device. Select the field and click ▼ to display all valid function codes.	
Slave Registers	Sets the starting register number from which data is drawn from the slave device.	
Master Registers	Sets the starting register number into which data is stored on the master device.	
Number of Registers	Sets the total number of registers to poll.	
Comm Status	This **read-only** field shows the status of the query. Refer to *Table 7-4*.	

Table 7-5. Status of Host Request or Command

Status	Description
0	Inactive or Start of Transmission
1	Receive Timeout Error
2	Received Address Check
3	Received Function Number Check
4	Number of expected bytes Check
5	Receiving Slave Response
6	CRC or LRC Check
7	CRC or LRC Check
8	Valid Slave Response
128	Write Device Data Error
129	Access Device Data Error
130	Host Function Table Error
131	Transmit Timeout Error
144	Transmit or Receive Buffer Overflow
145	Invalid Function Number in Request

Modbus: Master Modem Tab

Select **Configure > Modbus > Master Modem**. As a Modbus Master, the ROC may have to communicate to multiple slave devices through modems and phone lines. The Modbus Master Modem screen provides the necessary parameters to configure the modems and map RTU Addresses to phone numbers.

Only COMM1 to COMM5 support Modbus Master functionality, the LOI (Local Port) port does not.

This communications point associates a Modbus Slave RTU Address to their respective phone numbers (Connect Command). Up to six different Modbus Slaves can be dialed up through one Communications Port. The ROC will retry three times to establish a connection with a Slave.

Configuring a Modbus Host

Use this process to configure a Modbus host:

1. Configure **ROC > Comm Port**.
2. Define the **Modbus Registers** within the Host by mapping them to TLPs. Define Modbus Registers that will "hold" the information that will be transmitted and received by the Host.
3. Define the polling sequence to designate with which Modbus devices (**RTU Addresses**) are communicated and what **Slave Registers** will be read to and which **Master Registers** (Host) will be written out by the Host.
4. Select **Configure** > **Modbus** and configure the Modbus to format the data correctly.

5. Select **Configure** > **Modbus** > **Master Modem**.

6. Initiate the polling by setting the **Modbus Master Modem** parameters.

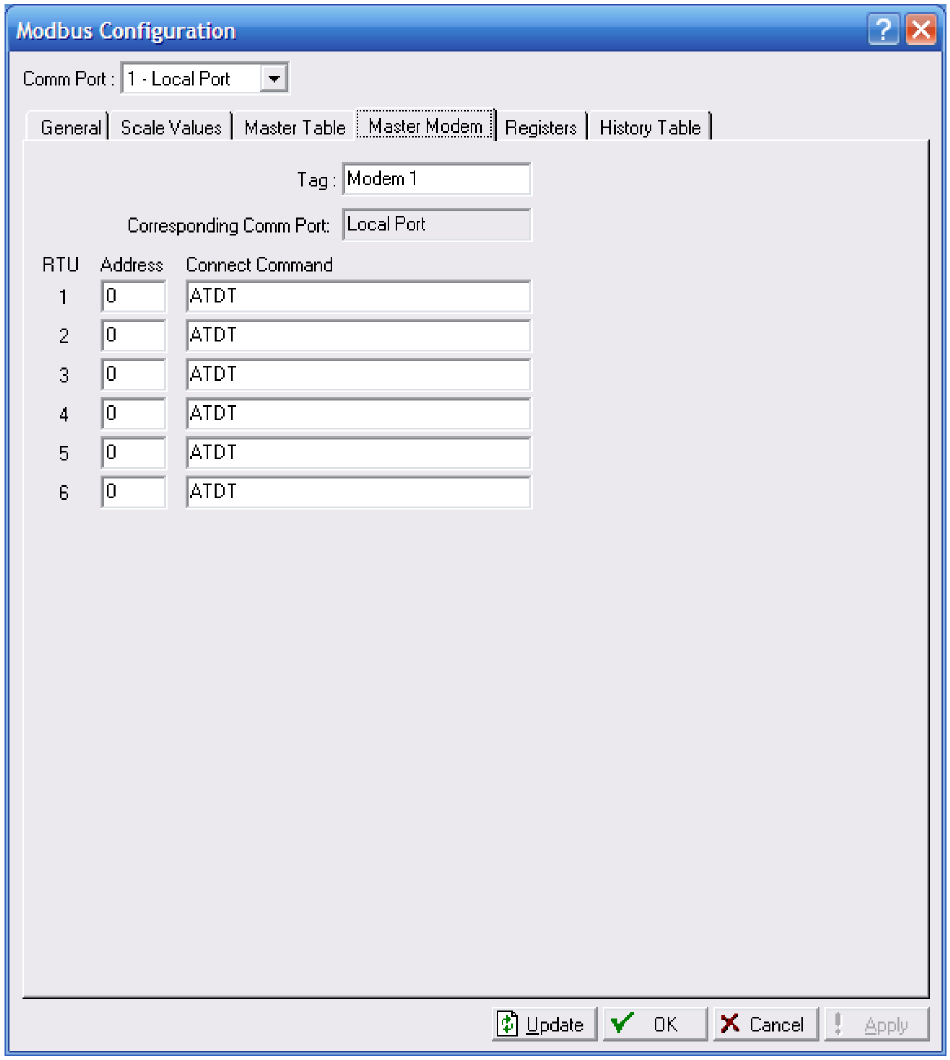


Figure 7-104. Modbus Configuration - Master Modem tab

Field	Description
Tag	Sets a 10-character identifier for the master modem.
Corresponding Comm Port	Sets the communications port with which to associate the master modem port.
RTU Address	Sets the **RTU Address** of the slave device to be associated with the Connect Command. Up to six different Modbus slave devices can be dialed up through one communications port.
Connect Command	Sets the **Connect Command** (telephone number) to be sent to the slave device.

Modbus: Registers Tab

Select **Configure** > **Modbus** > **Registers** tab.

Use Modbus Register tables to map Modbus registers to specific TLP numbers. You can map one line in the Modbus Register table to more than one register or TLP pair by using either Point Indexing or Parameter Indexing.

- **Point Indexing** maps the starting register to the selected TLP. Subsequent registers (through the ending register) map to the same point type and parameter and increment the **point logical** number.
- **Parameter Indexing** maps the starting register to the selected TLP. Subsequent registers, (through the ending register) map to the same point type and point logical number and increment the **parameter** number.

Point Indexing Example

When using **Point Indexing** the configuration of:

Starting Register	Ending Register	Device Parameter(s)	Indexing	Conversion
100	103	AIN, 4-1, EU	Point	0

specifies four registers (100, 101, 102, and 103) that are mapped to a group of analog input (AIN) values in engineering units (EU) starting at the analog input in the fourth module location, first position (4-1).

- Register 100 = EU of AIN point in location 4-1.
- Register 101 = EU of AIN point in location 4-2.
- Register 102 = EU of AIN point in location 4-3.
- Register 103 = EU of AIN point in location 4-4.

Parameter Indexing Example

When using **Parameter Indexing** the configuration of:

Starting Register	Ending Register	Device Parameter(s)	Indexing	Conversion
109	114	FST 1, R1	Parameter	1

specifies six registers (109, 110, 111, 112, 113, and 114) that are mapped to a group of FST 1 parameters starting at FST Register 1.

- Register 109 = Register 1 of FST Point Number 1.
- Register 110 = Register 2 of FST Point Number 1.
- Register 111 = Register 3 of FST Point Number 1.
- Register 112 = Register 4 of FST Point Number 1.
- Register 113 = Register 5 of FST Point Number 1.
- Register 114 = Register 6 of FST Point Number 1.

Use conversion code 1 (Float to Integer, Float Scale 1) to convert the floating point value to an integer before the response message returns to the host. Once you map a register, you can reference it in any Modbus request, providing the data type of the TLP is appropriate for the Function Code.

Notes:

- If the native ROC data type does not meet the requirements of the Modbus host device, conversion codes are available to convert the data to the required data type. Refer to *Table 7-6, Modbus Convert Codes* .
- You can select to have the mapping apply to all ROC communication ports or on a selected port only.

When a device receives a Modbus request, it searches for the referenced register(s). If it finds a register number match, it builds a response based on the device point type and parameter configured in the table. If the device cannot find a register number match, it returns an error message.

1. Select **Configure** > **Modbus** > **Registers**. The Modbus Registers screen displays.
2. Review the fields for your organization's values.

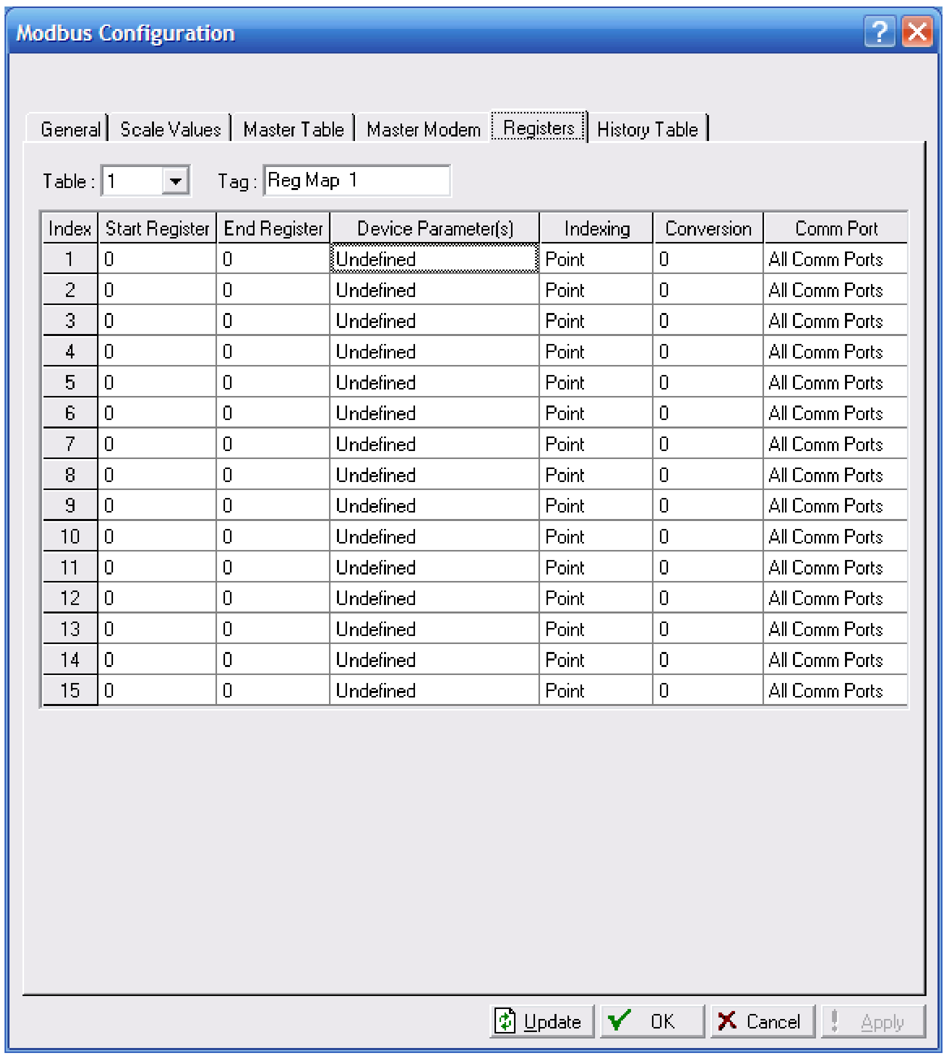


Figure 7-105. Modbus Configuration – Registers tab

Field	Description
Table	Selects a table to which you map registers. Each table entry can define multiple registers by using either Point Indexing or Parameter Indexing. By making the registers continuous (when the Start Register address of a new line is one greater than the End Register address of the previous line) you can create a continuous data table for Modbus Function Codes 3, 4, or 16 up to the limit of 240 bytes per request. This type of data table allows access to all its data with one request. Map Periodic (Hourly) or Daily History Index registers to the TLP for the Periodic Index (Point Type 124, Parameter 5) or Daily Index (Point Type 124, Parameter 6).
Tag	Sets a 10-character alphanumeric identifier for this table.
Modbus Function Codes	Sets a Modbus function. Valid values (and meanings) are:

Code	Meaning	Action
01	Read Logic Coil Status	Obtain current status (ON/OFF) of a group of logic coils (outputs).
02	Read Discrete Input Status	Obtain current status (ON/OFF) of a group of discrete inputs.
03	Read Output Registers (Holding)	Obtain current binary value in one or more holding registers.
04	Read Input Registers	Obtain current binary value in one or more input registers.
05	Force Single Logic Coil	Force logic coil to a state of ON or OFF. Acknowledge Alarm or Event request.
06	Preset Single Holding Register	Place a specific binary value into a holding register.
15	Force Multiple Logic Coils	Force a series of consecutive logic output coils to defined ON or OFF states.
16	Preset Multiple Holding Registers	Place specific binary values into a series of consecutive holding registers.

Start Register	Sets the first data register in the address span. Any number from 0 to 65535 is valid. You can duplicate register numbers as long as you assign them to **separate** communication ports. Number the tables from smallest to largest. In certain Modbus Host devices, the register 40101 is actually transmitted as "100". The value "100" should be placed in this field as the ROC uses the actual number sent by the Host. For example, the Host device requests the Starting Register 500 through Ending Register 700. The Starting Register is 400 and the Ending Register is 700. All register numbers requested by the Host (500 through 700) are valid and would be responded to because the requested register

Field	Description
	numbers match or fall in between the Starting Register and Ending Register numbers (400 through 700).
End Register	Sets the last register in the address span. Compute the value for this field by adding the total number of registers used to the Start Register number and subtracting 1.
Device Parameter	Defines the parameter of the point types to set or to acquire. Be aware of the different data types (Character, Integer, Long, Float) and the size of the data types. Use the TLP button to select parameters. This field indicates the type of data associated with an address (defined by the Start Register through the End Register). When the host requests a valid range of register numbers, the function code tells the slave what to do and between which registers (Start Register through End Register).
Indexing	Sets a block of register values as successive Logical Point Numbers or Parameters without having to define each separately. Valid values are **Point Indexing** or **Parameter Indexing**. **Point Indexing** maps the Start Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Point Type and Parameter and increment the point Logical Number. **Parameter Indexing** maps the Start Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Point Type and point Logical Number, and increment the Parameter Number.
Conversion	Sets the type of conversion performed (if any) on data before it is either sent to the Host or written to the ROC The conversions are used to allow for differences in data types between the Master and Slave devices. Conversion Codes affect Function Codes 3, 4, 6, 8, and 16.
Comm Port	Sets the comm port affected by the register. Register numbers should be unique for any given communications port. Registers may be duplicated, as long as they are assigned to separate ports. If a register number is duplicated within the port, the first occurrence is used.

Modbus: History Table Tab

Use this tab to configure the Modbus History. Select **Configure > Modbus > History**. The History Table screen displays.

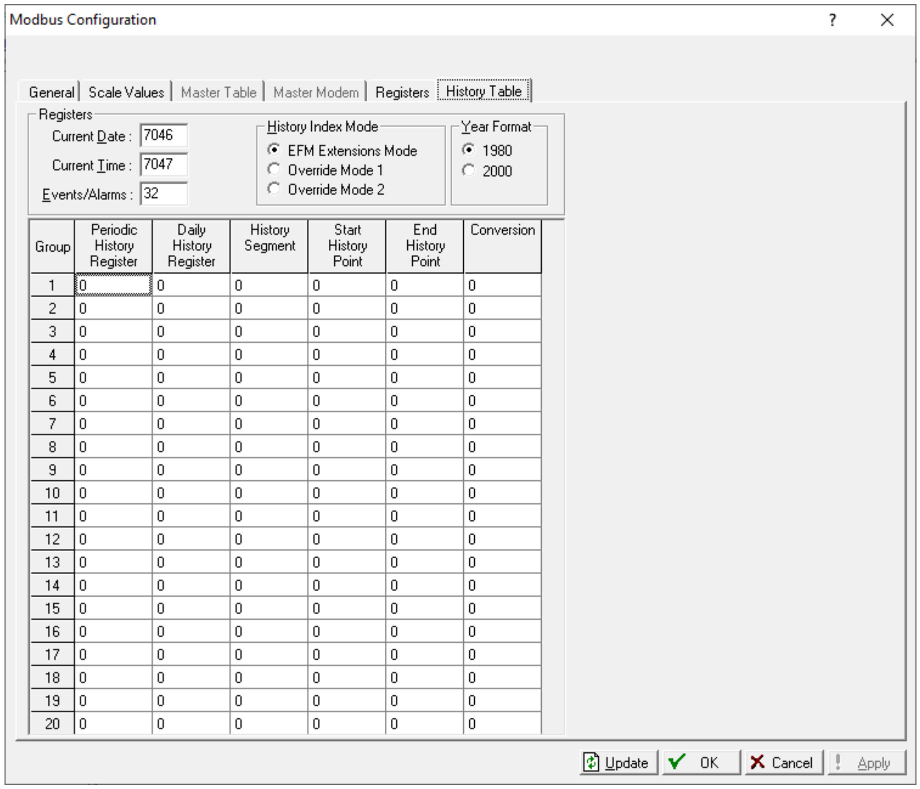


Figure 7-106. Modbus Configuration - History Table tab

The Modbus History Table allows the Periodic and Daily history values, Event records, and Alarm records to be configured for retrieval through Modbus Protocol, using Function Code 03. Three registers are defined to retrieve the current date in the ROC, the current time in the ROC, and the Event/Alarm records. The Modbus History Table also allows the Periodic and Daily registers to be defined for up to twenty groups of History Points.

Note: Before you configure the Modbus History, configure the **Configure > History Segments** and **Configure > History Points**.

The **Event Registers** and **Alarm Registers** are Modbus Register Numbers used to acquire the **Current Date** value, **Current Time** value, and **Event Log** and **Alarm Log**. Enter registers or use the defaults. Using the defaults is highly recommended. The Current Date and Current Time values identify the current date and time from the ROC and may be most useful when you desire the date and time as floating point numbers in the format of DDMMYY and HHMM. For more information on the Modbus retrieval of the Event Log and Alarm Log, refer to *Section 7.6.4, Modbus Events & Alarms*.

Select **Configure > Modbus > History**. Communications functionality allows the Periodic (Hourly) and Daily history values and Event/Alarm records to be retrieved through Modbus protocol using Function Code 03.

Each historical record contains a time and date stamp with all history archives or values for which the Register Number is configured.

The Modbus Function Code 03 and the History Archive Register are used to collect the archived data. Two separate Modbus registers indicate the current Periodic (Hourly) and Daily history index. These can be configured on the Modbus Registers screen as the Periodic (Hourly) History Index Register and the Daily History Index Register for the Segment being referenced (subtract 1 to get the last archived value). These indexes identify the current history archive at which data is about to be logged.

When the ROC receives a Function Code 03 request referencing the Periodic History Index (commonly Register 7161) or Daily History Index (commonly Register 7160), the value returned is interpreted as an index into the specified History Log. The Host reads the indexes and then compares the index to the last polled history index that the Host maintains and decides whether to request history.

If the Host decides to request history, the reply message contains the date and time stamp and historical values configured for the specified Register for that index.

The response message contains two floating-point values for the time and date stamp of the history archive and floating point values for each of the defined History Points for that History Archive Register.

The date stamp for history uses the current year and does **not** figure the number of years since 1980. For example, if the current year is 2007, the year (YY) for the date stamp would be 07.

History collection is mapped on the Modbus History Table.

Field	Definition
Current Date	Sets the register number to acquire the current date. The default is **7046**.
Current Time	Sets the register number to acquire the current time. The default is **7047**.
Events/Alarms	Sets the Modbus Register Number to acquire the most current **Event** and **Alarms Log entry**. The default is **32**.
History Index Mode	Sets the **History Index Mode**. Internally, the History Index is stored as the location in the historical database where the next record will be written, accounting for rollover based on the total number of records configured. It is a zero-based index. For example, if there are 35 daily entries configured, valid indexes are **0** to **34**. The History Index Mode allows you to modify the History Index value and history record returned as follows: ▪ **EFM Extensions Mode** – History Index will be returned as one less than the internal History Index, accounting for rollover (the index to the most recent data record written). History data will be returned for the index requested. For

Field	Definition
	example, if there are 35 daily entries, valid indexes are 0 to 34. If the internal index is 5, 5 represents the index where the next record will be written. A request for the current index will return 4 (one less) and a request for data at index 4 will return the last record written at index 4. ▪ **Override Mode 1** – History Index will be returned as stored internally in the historical database (index to the next record to be written) and history data values will be returned for the index requested. For example, if there are 35 daily entries, valid indexes are 0 to 34. If the internal index is 5, 5 represents the index where the next record will be written. A request for the current index will return 5 and the host must request data at index 4 to get the most recent record. ▪ **Override Mode 2** – History Index will be returned as stored internally in the historical database (index to the next record to be written), but the history values returned will be for one less than the index requested, accounting for rollover. For example, if there are 35 daily entries, valid indexes are 0 to 34. If the internal index is 5, 5 represents the index where the next record will be written. A request for the current index will return 5, but a request for history values at index 5 will actually return values at index 4. In addition, this mode will return history values at the last valid index if an index of greater than or equal to the number of records is requested. For example, if there are 35 daily entries, valid indexes are 0 to 34. A request for history values at index 35, 36, 37, and so on will return history values at index 34.
Year Format	Sets the reference date for time stamp conversion for Modbus EFM Events & Alarms. Valid values are **1980** and **2000.**

Table 7-6. Modbus History, Event, and Alarm Functionality

Function Code	Register Field	Data Field	Description
05	32 – Event/Alarm Register	Ignored	After Events and Alarms have been returned, there must be an acknowledgment made so that the same Events and Alarms are not returned on the next request.
03	703 – Daily History	Daily History Archive Register Index (0 to 34)	Response contains two floating point values for the time and date stamp of the history archive (time stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined History Points for that History Archive Register.
03	704 – Hourly History	Hourly or Periodic History Archive	Response contains two floating point values for the time and date stamp of the history archive (time

Function Code	Register Field	Data Field	Description
		Register Index (0 to 839)	stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined History Points for that History Archive Register.
03	X – Extended History	Extended History Archive Register Index (0 to Max)	Response contains two floating point values for the time and date stamp of the history archive (time stamp = HHMMSS and date stamp = MMDDYY) and floating point values for each of the defined History Points for that History Archive Register.

1. The Hourly (periodic) Index, Daily Index, Event, and Alarm Log data fields are used to address a history index number.
2. The Event and Alarm Log record consists of the bytes shown in *Table 7-11, Modbus Event and Alarm Log Contents*. A breakdown of the bit map in Byte 1-2 is given in *Table 7-12, Event & Alarm Change Bit Map Contents*.

Field	Description
Group	Sets a contiguous group of history points from a single segment. You can access the values through a Modbus function code 03 request for a user-defined Modbus register. Twenty groups are available.
Periodic and Daily History Registers	Sets the Modbus Register Number to acquire the group of history points defined in the Start History Point and End History Point fields. One Register (commonly Register 704) can retrieve periodic data and another Register (commonly Register 703) can retrieve daily data for the Group of History Points. The time Period for the Periodic history is set on the **Configuration > History Segment** configuration screen (if the Period is set as 60, this will be Hourly history).
History Segment	Sets a segment from which the ROC acquires the history. Make sure you configure this segment through the **Configure > History Segments** screen. The General Segment displays on this table as **0**.
Starting History Point	Sets the starting history point (first retrieved history point) for a group of points, you define in the Register Number field. You must complete both this field and the Ending History Points field. The value in the Ending History Points field must be different and larger than this value.
Ending History Point	Sets the ending history point (last retrieved history point) for a group of points, as defined in the Register Number field. You must complete both this field and the Starting History Points field, and the value in the Starting History Points field must be different and smaller than this value.

Field	Description
Conversion	Sets the type of data conversion (if any) before the data returns to the host or is written to the ROC Conversions allow the unit's floating point values to transmit or receive as integer values. *Table 7-12, Event & Alarm Change Bit Map Contents* lists the Convert Codes.

7.6.2 Modbus Conversion Codes

Modbus conversion codes convert data into a format that is compatible to a Modbus device.

Use the Conversion field (located on either the Modbus Registers or Modbus History screen) to specify the type of conversion you require, if any, on the data before it is either sent to the host/slave or written to the ROC. Conversions account for differences in data types between the master and slave devices.

Conversion codes 65 to 72 allow a 4-byte IEEE formatted floating-point number to be sent or received in two Modbus registers with the byte orders configurable. A check is made to ensure that an even number of registers is requested, that the Start Register number does not begin in the middle of a register pair, and that the number of registers does not exceed the number of registers you configure.

Modbus Convert Codes

The Modbus Conversion field corresponds to every register or range of registers set up. The Conversion field parameter specifies the type of conversion required, if any, on the data before it is sent to the master or before it is written to the ROC.

The conversions are used to allow integer values to be transmitted and received instead of floating-point values. The conversions only affect Function Codes 02, 03, 04, 06, and 16. The following table describes the type of conversion to take place on the register or range of registers:

Table 7-7. Modbus Convert Codes

Convert Code	Description	Slave Function	Definition
0	No Conversion	N/A	N/A
1	Float to Signed Integer, Float Scale 1	3,4	The Float to Signed Integer conversion changes the ROC floating point data to a two-byte signed integer for transmission. The number of the Conversion Code specifies which floating point scaling value is to be used for the conversion.
2	Float to Signed Integer, Float Scale 2	3,4	
3	Float to Signed Integer, Float Scale 3	3,4	
4	Float to Signed Integer, Float Scale 4	3,4	

Convert Code	Description	Slave Function	Definition
5	Float to Signed Integer, Float Scale 5	3,4	
6	Float to Signed Integer, Float Scale 6	3,4	
7	Float to Signed Integer, Float Scale 7	3,4	
8	Float to Signed Integer, Float Scale 8	3,4	

Conversion codes 1 through 8, Float to Signed Integer are calculated as:

Integer = [(Integer Range x Adj Reading)]/Float Range] + Low Integer Scale

Where:

Float Range = High Float Scale — Low Flow Scale

Integer Range = High Integer Scale — Low Integer Scale

Adj Reading = Float Reading — Low Flow Scale

Convert Code	Description	Slave Function	Definition
9	Any Type to Signed Long with 1 Implied Decimal Place	3,4,6,16	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	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	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	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	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	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	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	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 Signed Long with 1 Implied Decimal Place	3,4,6,16	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).
18	Any Type to Signed Long with 2 Implied Decimal Places	3,4,6,16	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).

Convert Code	Description	Slave Function	Definition
19	Any Type to Signed Long with 3 Implied Decimal Places	3,4,6,16	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).
20	Any Type to Signed Long with 4 Implied Decimal Places	3,4,6,16	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).
21	Any Type to Signed Long with 5 Implied Decimal Places	3,4,6,16	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).
22	Any Type to Signed Long with 6 Implied Decimal Places	3,4,6,16	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).
23	Any Type to Signed Long with 7 Implied Decimal Places	3,4,6,16	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).
24	Any Type to Signed Long with 8 Implied Decimal Places	3,4,6,16	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).
25	Any Type to Float, No Scaling	3,4,6,16	Changes any ROC data type (except an ASCII tag) to a four-byte floating point without scaling. The conversion is typically performed using a type cast. This is for both transmitting and receiving.
26	Any Type to Signed Short Integer	3,4,6,16	Changes any ROC data type (except an ASCII tag) to a two-byte signed short integer. This is for both transmitting and receiving.
27	Any Type to Signed Long Integer	3,4,6,16	Changes any ROC data type (except an ASCII tag) to a four-byte signed long integer. This is for both transmitting and receiving
28	Any Type to Unsigned Short Integer	3,4,6,16	Changes any ROC data type (except an ASCII tag) to a two-byte unsigned signed short integer. This is for both transmitting and receiving.
29	Any Type to Unsigned Long Integer	3,4,6,16	Changes any ROC data type (except an ASCII tag) to a four-byte unsigned long integer. This is for both transmitting and receiving.
30 to 36	No Conversion	N/A	N/A
37	Unsigned Byte to Packed Bit	3,4,6,16	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
38 to 40	No Conversion	N/A	N/A
41	Any Type to Signed Short Implied 1	3,4,6,16	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	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	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	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).

Convert Code	Description	Slave Function	Definition
45	Any Type to Signed Short Implied 5	3,4,6,16	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	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	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	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	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	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	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	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	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	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	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	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 0, 1, 2, 3	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 0-1-2-3. Note: 0 = Byte MSB and Byte 3 = LSB
58	Any Type to Signed Long 1, 0, 3, 2	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 1-0-3-2. Note: 0 = Byte MSB and Byte 3 = LSB
59	Any Type to Signed Long 2, 3, 0, 1	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 2-3-0-1. Note: 0 = Byte MSB and Byte 3 = LSB
60	Any Type to Signed Long 3, 2, 1, 0	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 3-2-1-0. Note: 0 = Byte MSB and Byte 3 = LSB

Convert Code	Description	Slave Function	Definition			
61	Any Type to Unsigned Long 0, 1, 2, 3	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 0-1-2-3. Note: 0 = Byte MSB and Byte 3 = LSB			
62	Any Type to Unsigned Long 1, 0, 3, 2	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 1-0-3-2. Note: 0 = Byte MSB and Byte 3 = LSB			
63	Any Type to Unsigned Long 2, 3, 0, 1	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 2-3-0-1. Note: 0 = Byte MSB and Byte 3 = LSB			
64	Any Type to Unsigned Long 3, 2, 1, 0	3,4,6,16	Response is similar to dual register floating point conversions. Dual register: byte order 3-2-1-0. Note: 0 = Byte MSB and Byte 3 = LSB			
65 to 72	IEEE Floating Point Number	3,4,16	Conversion Codes 65 to 72 allow a four-byte IEEE 754 formatted floating point number to be sent or received in two Modbus registers with the byte orders configurable. Since these conversions require two registers. A check is made to ensure that an even number of registers is requested, that the starting register number does not begin in the middle of a register pair, and that the number of registers does not exceed the number of registers configured.			
			Byte 0	**Byte 1**	**Byte 2**	**Byte 3**
			seee eeee	emmm mmmm	mmmm mmmm	mmmm mmmm
			Where s = sign bit, e = exponent bit, m = mantissa bit **Note**: Each conversion code is listed individually below.			
65	IEEE Floating Point Number	3,4,16	Places byte 0 and byte 1 in register XXXXXX and places byte 2 and byte 3 in register XXXXXX + 1.			
			Register XXXXXX	byte 0, byte 1		
			Register XXXXXX + 1	byte 2, byte 3		
66	IEEE Floating Point Number	3,4,16	Places byte 0 and byte 1 in register XXXXXX and places byte 2 and byte 3 in register XXXXXX + 1. Same as conversion code 65 regardless of MSB 1st flag.			
			Register XXXXXX	byte 0, byte 1		
			Register XXXXXX + 1	byte 2, byte 3		
67	IEEE Floating Point Number	3,4,16	Places byte 0 and byte 1 in register XXXXXX and places byte 2 and byte 3 in register XXXXXX + 1.			
			Register XXXXXX	byte 0, byte 1		
			Register XXXXXX + 1	byte 2, byte 3		
68	IEEE Floating Point Number	3,4,16	Places byte 0 and byte 1 in register XXXXXX and places byte 2 and byte 3 in register XXXXXX + 1. Same as conversion code 67 regardless of MSB 1st flag.			
			Register XXXXXX	byte 1, byte 0		
			Register XXXXXX + 1	byte 3, byte 2		
69	IEEE Floating Point Number	3,4,16	Places byte 2 and byte 3 in register XXXXXX and places byte 0 and byte 1 in register XXXXXX + 1.			
			Register XXXXXX	byte 2, byte 3		
			Register XXXXXX + 1	byte 0, byte 1		

Convert Code	Description	Slave Function	Definition	
70	IEEE Floating Point Number	3,4,16	Places byte 2 and byte 3 in register XXXXXX and places byte 0 and byte 1 in register XXXXXX + 1. Same as conversion code 69 regardless of MSB 1st flag.	
			Register XXXXXX	byte 2, byte 3
			Register XXXXXX + 1	byte 0, byte 1
71	IEEE Floating Point Number	3,4,16	Places byte 3 and byte 2 in register XXXXXX and places byte 1 and byte 0 in register XXXXXX + 1.	
			Register XXXXXX	byte 3, byte 2
			Register XXXXXX + 1	byte 1, byte 0
72	IEEE Floating Point Number	3,4,16	Places byte 3 and byte 2 in register XXXXXX and places byte 1 and byte 0 in register XXXXXX + 1. Same as conversion code 71 regardless of MSB 1st flag.	
			Register XXXXXX	byte 3, byte 2
			Register XXXXXX + 1	byte 1, byte 0
73	Double 01, 23, 45, 67, Disregard MSB flag	3,4,6,16	Places byte 0 and byte 1 in register XXXXXX, places byte 2 and byte 3 in register XXXXXX + 1, places byte 4 and byte 5 in register XXXXXX + 2, and places byte 6 and byte 7 in register XXXXXX + 3. This places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 0, byte 1
			Register XXXXXX + 1	byte 2, byte 3
			Register XXXXXX + 2	byte 4, byte 5
			Register XXXXXX + 3	byte 6, byte 7
74	Double 23, 01, 67, 45, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 2, byte 3
			Register XXXXXX + 1	byte 0, byte 1
			Register XXXXXX + 2	byte 6, byte 7
			Register XXXXXX + 3	byte 4, byte 5
75	Double 45, 67, 04, 23, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 4, byte 5
			Register XXXXXX + 1	byte 6, byte 7
			Register XXXXXX + 2	byte 0, byte 1
			Register XXXXXX + 3	byte 2, byte 3
76	Double 67, 45, 23, 04, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 6, byte 7
			Register XXXXXX + 1	byte 4, byte 5
			Register XXXXXX + 2	byte 2, byte 3
			Register XXXXXX + 3	byte 0, byte 1

Convert Code	Description	Slave Function	Definition	
77	Double 10, 32, 54, 76, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 1, byte 0
			Register XXXXXX + 1	byte 3, byte 2
			Register XXXXXX + 2	byte 7, byte 6
			Register XXXXXX + 3	byte 5, byte 4
78	Double 35, 10, 76, 54, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 3, byte 2
			Register XXXXXX + 1	byte 1, byte 0
			Register XXXXXX + 2	byte 7, byte 6
			Register XXXXXX + 3	byte 5, byte 4
79	Double 54, 76, 10, 32, Disregard MSB flag	3,4,6,16	Places byte 0 and byte 1 in register XXXXXX, places byte 2 and byte 3 in register XXXXXX + 1, places byte 4 and byte 5 in register XXXXXX + 2, and places byte 6 and byte 7 in register XXXXXX + 3. This places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 5, byte 4
			Register XXXXXX + 1	byte 7, byte 6
			Register XXXXXX + 2	byte 1, byte 0
			Register XXXXXX + 3	byte 3, byte 2
80	Double 76, 54, 32, 10, Disregard MSB flag	3,4,6,16	Places an 8-byte double value into four 2-byte registers to allow double values to be transmitted. Ignores the Byte Order field in the Modbus Configuration screen.	
			Register XXXXXX	byte 7, byte 6
			Register XXXXXX + 1	byte 5, byte 4
			Register XXXXXX + 2	byte 3, byte 2
			Register XXXXXX + 3	byte 1, byte 0
81	ASCII	3,4,6,16	Breaks an ASCII string parameter into multiple 2-byte registers. Number of registers id dependent upon the size of the string. Supports strings of 3, 7, 10, 12, 20, 30, and 40 bytes. Odd sized strings are padded with a space character.	
82 to 255	No conversion	N/A	N/A	

7.6.3 Modbus Events and Alarms

To view the Modbus Event Log and Alarm Log, select **Configure > Modbus**. Select the **History Table** tab. The History Table displays.

The record formats for the event log and alarm log are the same size and have similar contents. The first word in a record is a bit map in which bit 9 indicates if the log record is an Event (1) or an Alarm (0). The meanings of the other bits are specific to either the Event or the Alarm Log records. Refer to *Table 7-12, Event & Alarm Change Bit Map Contents*.

The ROC supports the Modbus with EFM extensions method for retrieving alarms and events. When the ROC receives a Function Code 03 request referencing defined Events and Alarms Register (usually 32), the ROC begins to collect records from first the Event Log and then the Alarm Log, starting where the last poll left off. The ROC collect records until **either** there are not any more new events, alarms, **or** it collects the maximum of 12 records. The ROC sends the information back to the Host, which in return replies with Function Code 05, referencing the same Events and Alarms Register, indicating that the points have been received and that the Host is ready for the next 12 records.

The following paragraphs detail how ROCLINK 800 places event log and alarms log information in Modbus event and alarm messages and how (or what) is generated upon the event or alarm condition.

Normal Event Record

A normal event record has the format:

Bit Map		Register		Time as float				Date as float				Old Value as float				New Value as float			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

System Text Events

When you set the System Command Change Bit (bit 7) in the Operator Change Bit Map of the Event, it sets the Register number for all System Command Change events will be set to the Event/Alarm Register number (default is **32**).

Bit Map		Register		Time as float			Date as float					Code	Text						
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ROCLINK 800 uses this format for the following event codes:

- 144 Initialization Sequence
- 146 Initialize From Defaults
- 147 ROM CRC Error
- 148 Database Initialization
- 150 Program Flash
- 248 Text Message
- 249 Download Configuration
- 250 Upload Configuration
- 251 Calibration Timeout
- 252 Calibration Cancel
- 253 Calibration Success

FST Events

For FST events, the code is the FST number (1 to 6). Unused will be set to zero.

Bit Map		Register		Time as float				Date as float				Code		Unused		Value as float			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Time-related System Events

The time is the number of seconds since January 1, 1970. Unused will be set to zero.

Bit map		Register		Time as float				Date as float				Code		Unused		Time as time_t			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Events are formatted as:

- 145 All Power Removed
- 200 Clock Set

Alarms

Use the Alarms table to determine the alarming source. The Register number for all unmapped Alarms will be set to the Event/Alarm Register number (default is **32**).

Follows is a normal alarm record format:

Bit map		Register		Time as float				Date as float				Value as float				Unused			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Unmapped Parameter Alarms

If the alarming point is not mapped to a Modbus Register, identifying the point using the following table. The TLP will be the source TLP of the alarm. The type will be set to 1

Bit Map	Register	Time as float	Date as float	Value as float	TLP	Type

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

FST Alarms

If the Alarm is an FST Alarm, ROCLINK 800 uses the following format. The FST Number is the source FST Number that generated the alarm. Unused is set to zero and the type is set to 2.

Bit Map		Register		Time as float				Date as float				Value as float				FST#	Unused		Type
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

User Text Alarms

A User Text alarm uses the following format. Text is filled in with seven bytes of User Text and the Type will be set to 3.

Bit Map		Register		Time as float				Date as float				Text							Type
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

User Value Alarms

If the alarm is a User Value Alarm, the following format will be used. Unused will be set to zero and the Type will be set to 4.

Bit Map		Register		Time as float				Date as float				Value as float				Unused			Type
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Reading Events and Alarms Register

The Modbus request to read the Event Log and Alarm Log uses the standard read Function Codes 03 or 04 and the Register Number defined in the History Access configuration. In this request, the number of Registers is included to maintain format compatibility, but is ignored by the receiving ROC.

Twenty bytes are returned for each event and alarm in the response. Up to 12 events and alarms can be returned in a single response. If no events and alarms have occurred since the last collection, the response contains 0 data bytes.

For the date stamp in the events and alarms returned, the year (YY) is really the number of years since 1980. For example, if the current year is 2007, the year (YY) for the date stamp would be 27.

Following is an example of a request for events and alarms with the history access event/alarm register defined as 32 (0x0020 hex).

Table 7-8. Host Event/Alarm Request Example Message

Message Field	Device Address	Function Code	Register Offset	Num Reads (ignored)		Error Check	
Bytes	1	1	2	2		2	
TX Order			MS LS	MS	LS	LS	MS
Value	01H	03H	00H 20H	00H	01H	CRC-16	

The following example shows a response returning three events and alarms.

Table 7-9. Event/Alarm Response Example Message

Message Field	Device Address	Function Code	Byte Count	Data		Error Check
Bytes	1	1	1	(20 bytes per event or alarm)		2
TX Order				Integers — MS	LS	LS MS
				Floats — Selectable		
Value	01H	03H	3CH	CRC-16		

Acknowledging Events and Alarms

After the host has correctly received event and alarm data, it transmits an acknowledgement message to the ROC to clear these events and alarms from the Modbus buffer.

Until it receives that acknowledgement message, the ROC continues to send the same event and alarm records to the host. The Modbus acknowledgement (to clear the Event Log and Alarm Log buffer) uses Function Code 05 and the Register Number defined in the History Access configuration. In this request, the data value is always one (1).

Table 7-10. Event and Alarm Acknowledgement Response Example Message

Message Field	Device Address	Function Code	Register		Data		Error Check	
Bytes	1	1	2		2		2	
TX Order	MS	LS	MS	LS	MS	LS	MS	LS
Value	01H	05H	00H	20H	FFH	00H	CRC-16	

Table 7-11. Modbus Events and Alarms Log Contents

Byte	Contents of Event Log Record	Contents of Alarm Log Record
1 to 2	Operator change (Event Log) bit map (16-bit integer). See *Table 7-12, Event & Alarm Changes Bit Map Contents.*	Alarm change bit map (16-bit integer). See *Table 7-12, Event & Alarm Changes Bit Map Contents.*
3 to 4	Modbus Register number of variable (16-bit integer)	Modbus Register number of variable (16-bit integer)
5 to 8	Time Stamp (HHMMSS; 32-bit floating point)	Time Stamp (HHMMSS; 32-bit floating point)
9 to 12	Date Stamp (MMDDYY; 32-bit floating point)	Date Stamp (MMDDYY; 32-bit floating point)
13 to 16	Previous value of variable (32-bit floating point)	Current (alarmed) value of variable (32-bit floating point)
17 to 20	Current (New) value of variable (32-bit floating point)	Unused at the current time (zero filled when transmitted to the Master)

Table 7-12. Event & Alarm Change Bit Map Contents”

Bit	Operator Change Bit Map	Alarm Change Bit Map
0	Fixed value – change to an EU value on an I/O point in Manual Mode	Not Used
1	Zero scale – change to the 0% Adjusted on an AO or AI	Not Used
2	Full scale – change to the 100% Adjusted on an AO or AI	Not Used
3	Operator entry work value – change to any parameter other than those described	Not Used
4	Boolean fixed bit – change to Status in DO or DI	Not Used
5	Fixed/variable flag – change to Manual Mode for an I/O point	Manual Alarm
6	Table entry change – change to Modbus Function Tables	Status Change Alarm
7	System command change – events logged by system (Power up)	No Flow Alarm
8	Not Used	Point Fail Alarm
9	Operator change (Event Log) identifier bit	0 for Alarm
10	Low Low Limit – change to Low Low Alarm parameter	Low Low Alarm
11	Low Limit – change to Low Alarm parameter	Low Alarm
12	High Limit – change to High Alarm parameter	High Alarm
13	High High Limit – change to High High Alarm parameter	High High Alarm
14	Rate of Change Limit – change to Rate Alarm parameter	Rate Alarm
15	Not Used	Set/Clear Alarm (1 = Set or 0 = Clear)

7.7 Transaction History

Use the Transaction History Configuration screen in the ROC800L to configure the points stored in transaction history logs. Transaction history is used to store a set of information that occurs at a user selected event and does not necessarily occur on a periodic basis. A transaction can represent items such as a batch report, a prove report, or a calibration report.

You can configure transaction history logs for up to 10 transaction sets, and you can configure a maximum of 100 points for each transaction history log. You can also configure the number of transaction history logs stored in the device and how long the system retains the transaction history logs.

Transaction History information is stored in battery backed-up non-volatile memory, and is intended to survive a power cycle, warm start or cold start event. All transaction history configuration and data can be cleared, via the **ROC > Flags > Clear > History Configuration and Data** feature. Transaction History is also cleared upon a firmware update.

To access this screen:

1. Select **Configure** > **Transaction History**. The Transaction History Configuration screen displays:

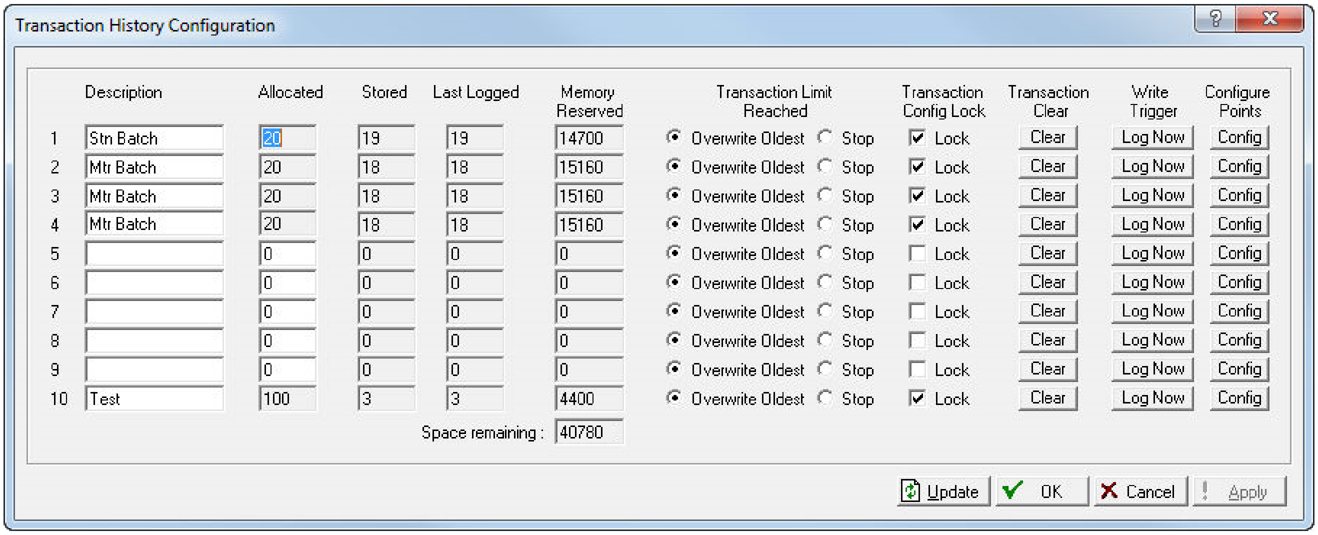


Figure 7-107. Transaction History Configuration

2. Review the values in the following fields:

Field	Description
Description	Enter a name, up to ten alphanumeric characters, for the transaction set.
Allocated	Sets a limit on the total number of transaction history entries stored in device memory for the selected transaction set.
Stored	This **read-only** field shows the total number of transaction history entries currently stored in device memory for the selected transaction set. **Note:** The number of transaction history entries is limited by the value in the Allocated field.
Last Logged	This **read-only** field shows the total number of entries logged for the selected transaction. This number increments by one each time transaction history is logged.
Memory Reserved	Shows, in bytes, the amount of memory required to log the required transactions for the set.
Space Remaining	Shows, in bytes, the amount of memory available in the device for all transaction sets. **Note:** This value must be greater than or equal to zero to lock a transaction for use.
Transaction Limit Reach	Sets how the system responds when the number of transactions stored in device memory exceeds the value entered in the Allocated field. Valid values are **Overwrite Oldest** (the system overwrites the oldest log with the new log) or **Stop** (the system prevents the ability to log further transactions).

Field	Description
Transaction Config Lock	Locks the configuration of the selected transaction. Once a configuration is locked, only changes to the transaction description are allowed. **Notes:** ▪ Unlocking the transaction set configuration clears all transactions stored for that set. ▪ You **must** lock the transaction configuration before logging transactions.
Clear	Click to erase the transaction history logs for the selected transaction set.
Log Now	Click to immediately store the selected transaction to device memory. **Note:** Logging a transaction requires locking the transaction configuration.
Config	Click to open the Transaction Points Configuration screen and configure which points are stored in the selected transaction history set.

7.7.1 Configuring Transaction History

To configure the transaction history:

1. Select **Configure** > **Transaction History** from the menu bar in ROCLINK 800. The Transaction History Configuration screen displays:

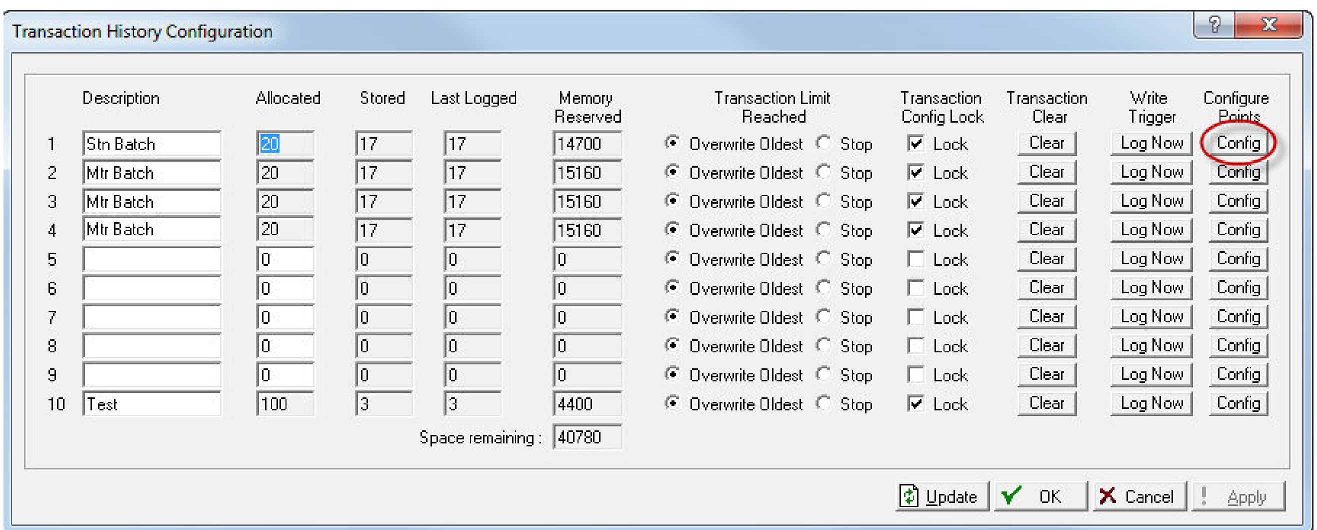


Figure 7-108. Transaction History Configuration

2. Select **Config**. The Transaction Points Configuration screen displays:

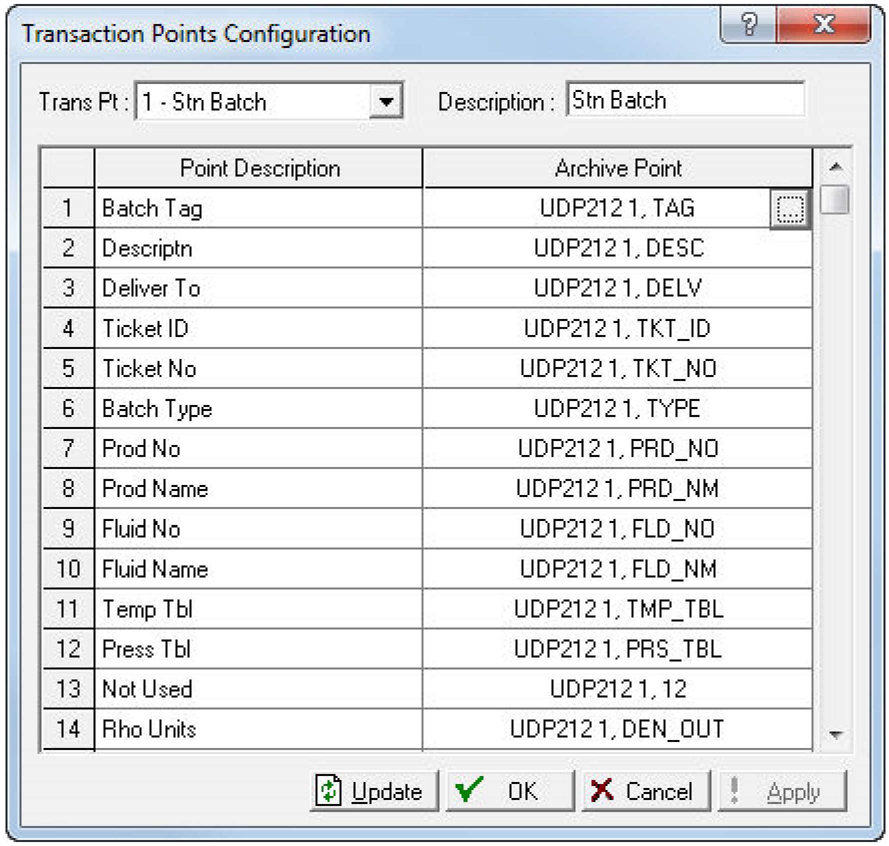


Figure 7-109. Transaction Points, Configuration

3. The Trans Pt field displays the selected transaction history set (1 through 10). In the Description field, **enter** a description (up to ten alphanumeric characters) for the selected transaction history set.

4. Select the Archive Point field and click the TLP button. The select TLP dialog displays:

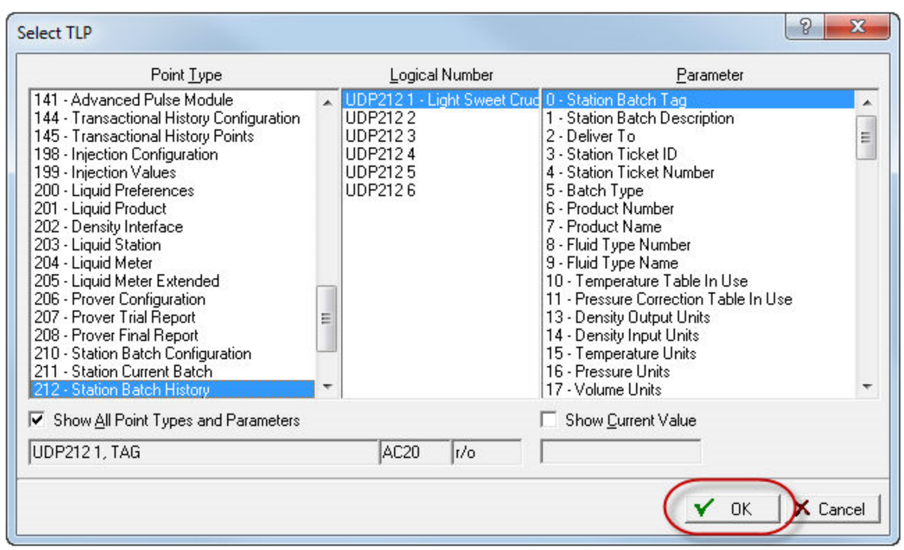


Figure 7-110. Select TLP Dialog

5. Navigate to the parameter you want to be logged and click **OK**.

6. In the Point Description field, **Enter** a description (up to ten alphanumeric characters) for the selected parameter.

7. Repeat steps four through six for each parameter you want logged in the transaction history.

8. When you are finished adding parameters, click **OK** to return to the Transaction history Configuration screen:

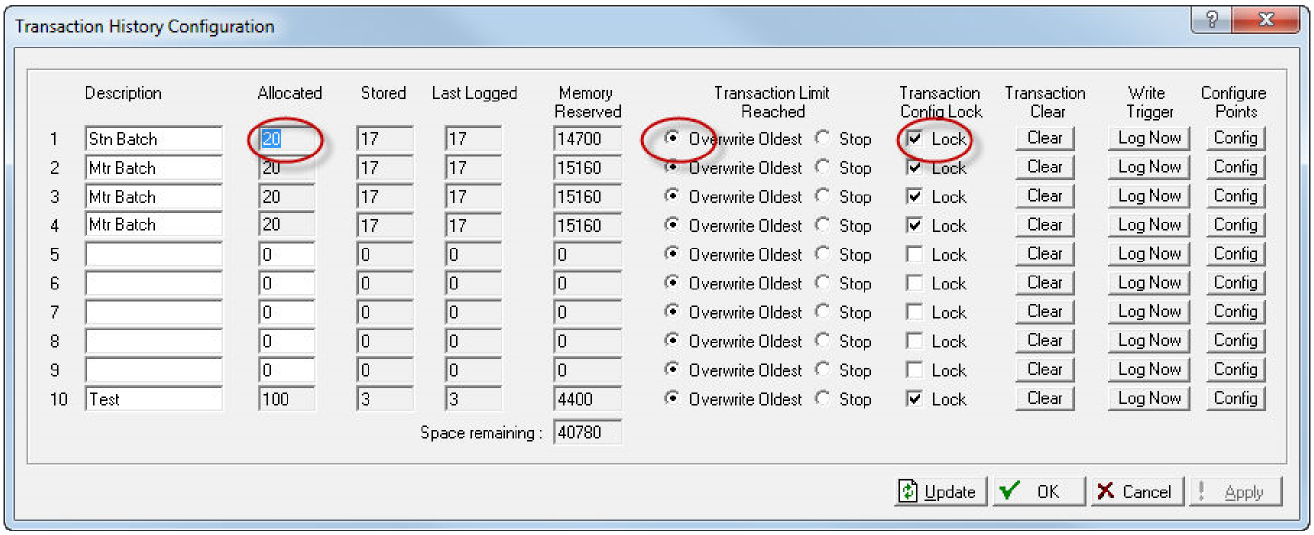


Figure 7-111. Transaction History Configuration

9. In the Allocated field, set the number of transaction history logs you want to store in devices memory.

Notes:

- The Memory Reserved field displays the amount of memory reserved for storing the select transaction history logs.
- The Space Remaining field displays the amount of memory available in your device.

10. In the Transaction Limit Reached field, select how you want the system to respond when the number of transactions stored in device memory exceeds the value entered in the Allocated field. Valid values are **Overwrite Oldest** (the system overwrites the oldest log with the new log) or **Stop** (the system prevent the ability to log further transactions).

11. When you have finished configuring the transaction history log, select **Transaction Config Lock** to prevent any further configuration changes to the selected transaction history log except for updating the description.

Note: After you have locked the transaction history set, clearing the Transaction Config Lock field erases the selected transaction history logs. For more details, refer to *Section 7.7.2, Clearing Transaction History*.

7.7.2 Logging Transaction History

Unlike periodic history, which automatically creates an hourly and daily record of the configured points, transaction history does not automatically log a set of data on its own. Instead, an external mechanism, such as a FST (Function Sequence Table), DS800 (IEC 61131 Program), User C program, SCADA host system, or manual trigger is needed to record a transaction set.

To manually create a transaction history log:

1. Select **Configure** > **Transaction History** from the menu bar in ROCLINK 800. The Transaction History Configuration screen displays:

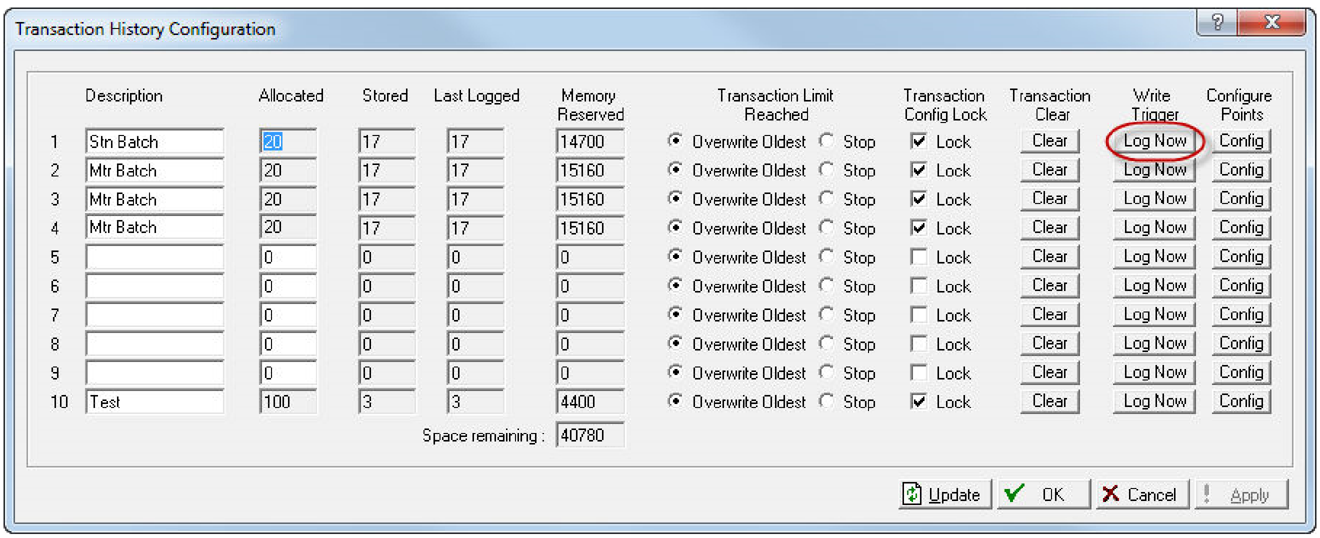
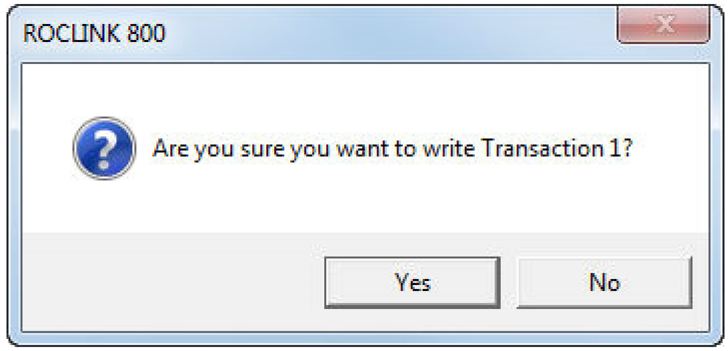


Figure 7-112. Transaction History Logging

2. Select **Log Now** in the row of the transaction history set you want to log. A confirmation message displays.

Note: The transaction configuration **must** be locked to perform this action.



3. Click **Yes**. The Transaction History Configuration screen displays.

Note: The value in the Last Logged field increments by one, and the value in the Stored field increments by one if you have not reached the limit entered in the Allocated field.

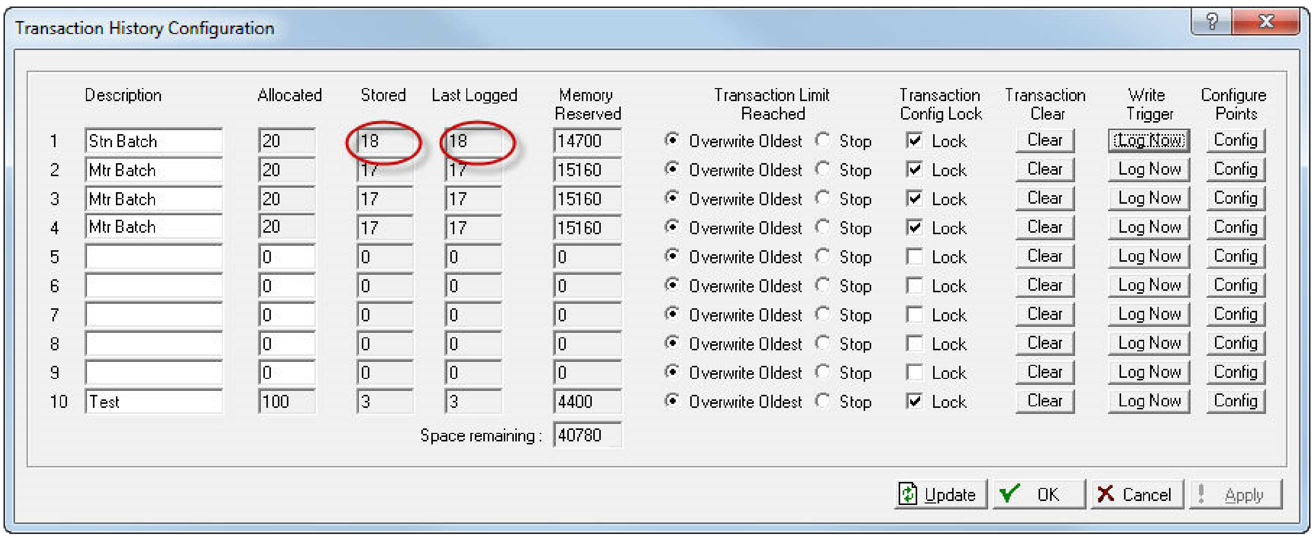


Figure 7-113. Transaction History Configuration, Stored and Last Logged

7.7.3 Clearing Transaction History

You can clear the transaction history logs stored in device memory for a transaction set.

To clear the transaction history logs:

1. Select **Configure** > **Transaction History** from the menu bar in ROCLINK 800. The Transaction History Configuration screen displays:

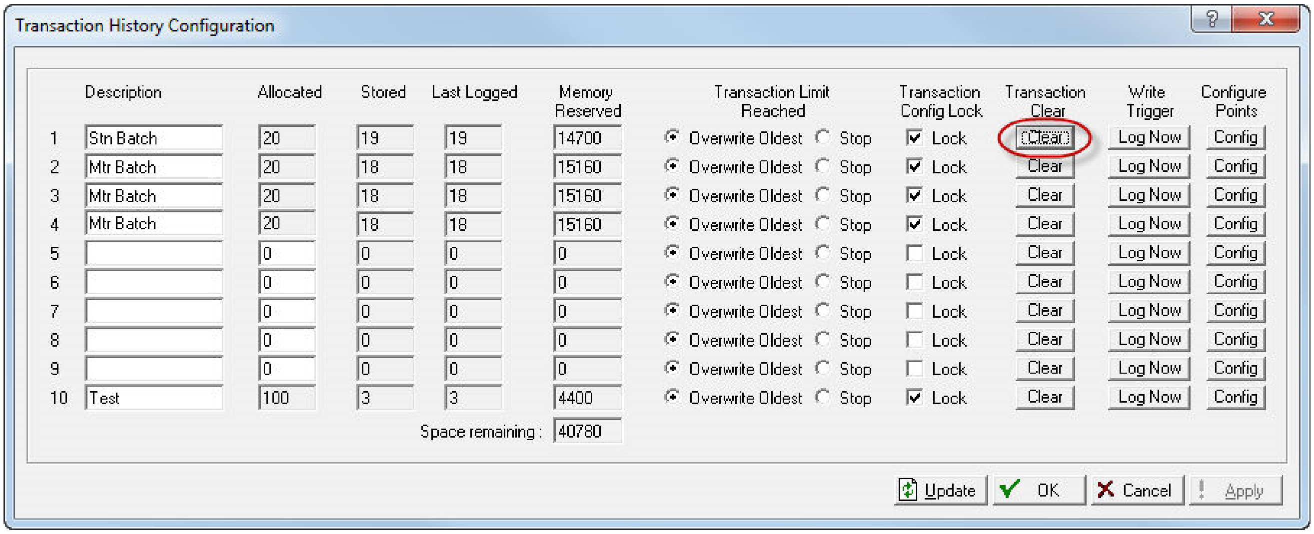
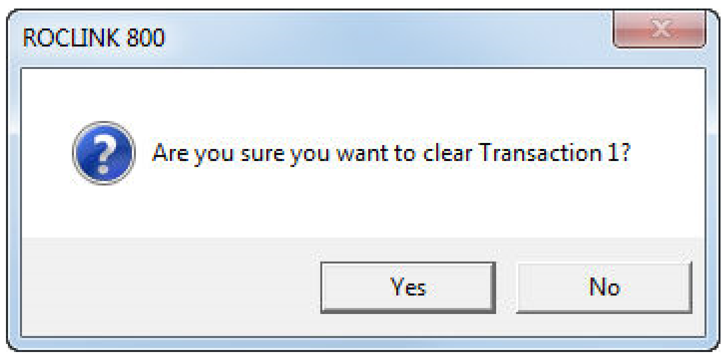


Figure 7-114. Transaction History Configuration, Transaction Clear

2. Select **Clear** in the same row as the transaction history set you want to clear. A confirmation screen displays:



3. Click **Yes** to clear the transaction history logs stored in device memory. The Transaction History Configuration screen displays showing a confirmation message. The value in the Stored field returns to 0 when the display updates.

Chapter 8 – The Gas Meters Menu

In This Chapter

Use the Gas Meters menu to define, configure, and calibrate meter runs; review meter runs; and perform plate changes for orifice and linear (turbine, PD, ultrasonic, Coriolis) meters.

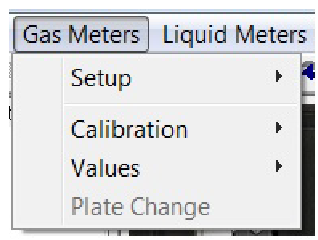


Figure 8-1. Gas Meters Menu

8.1 Setup

Use Gas Meters Setup to configure meter runs and stations. The Gas Meters configuration screens contain the functions directly associated with measuring and logging flow, including setup of American Gas Association (AGA), American Petroleum Institute (API), or International Standards Organization (ISO) calculation configuration parameters, and calibrating the meter depending on the device that you are configuring.

The ROC800L organizes meter runs into stations. The 12 meter runs can be grouped among the 12 stations in any combination. Meters are assigned to stations in the **Gas Meters > Setup > Orifice Meter** or **Linear Meter** screens. Meter runs belong in the same station when they have the same gas data, calculation methods, and base/contract conditions.

Refer to *Table 8-1* for the defaults in Metric and US engineering units.

Table 8-1. Meter Run Engineering Units (EU)2345

Flow Parameter	U.S. Units	Metric Units
Meter Input (AGA3)	Inches H_2O	kPa
Meter Input (AGA7) – Volume	MCF/day	km^3/day
Meter Input (AGA7) – Mass	lb/hour	kg/hour
Static Pressure	PSIG or PSIA	kPaG or kPaA
Temperature	Deg F	Deg C
Instantaneous Volume/Hour	CF/hour	m^3/hour
Instantaneous Volume/Day	MCF/day	km^3/day
Instantaneous Energy/Hour	Btu/hour	MJ/hour
Instantaneous Energy/Day	MMBtu/day	GJ/day
Volume Flow Today/Yesterday	MCF	km^3
Energy Today/Yesterday	MMBtu	GJ
Viscosity	lb/ft-sec	cP
Diameters	Inches	Millimeters
Elevation	Feet	Meters
Inst Mass/Hour	lb/hour	kg/hour
Inst Mass/Day	Mlb/day	tonnes/day
Mass Flow Today/Yesterday	Mlb	tonnes
Density	lb/CF	kg/m^3
Heating Value	Btu/CF or Btu/lb	MJ/m^3 or MJ/kg

8.1.1 Station Configuration

To configure a station, select a station icon in the configuration tree menu or select **Gas Meters> Setup > Station**. Configure stations before configuring the meter runs.

Meters are assigned to stations in the **Gas Meters > Setup > Orifice** or **Linear** screens. Meter runs belong in the same station when they have the same gas data, calculation methods, and base/contract conditions. Each station may be given a unique tag, and each meter may be given a unique tag and meter description.

If you are using constant gas quality data from a lab analysis report, then all 12 stations can be employed. If you are using live gas quality data from a gas chromatograph, no more than ten stations are recommended.

Note: Contract hours can be set differently for each station in **Configure > History Segments**.

- Use the **General** tab to set basic parameters that all the meter runs assigned to a station have in common.

- Use the **Gas Quality** tab to set the gas information parameters. The Gas Quality tab defines the mole percentages of twenty-one gas components, as well as the Heating Value Basis, the Heating Value, and the Specific Gravity.
- Use the **Advanced** tab to configure a number of additional parameters that affect the flow calculation.
- Use the **Alarms** tab to configure alarming parameters for station flow rates.

Notes:

- After configuring a station and clicking **Apply**, use **Flash Memory Save Configuration** in the **ROC > Flags** screen to save station configuration to permanent memory in case you must perform a cold start.
- If other stations have similar characteristics, use the copy and paste buttons to simplify configurations.

Station Setup: General Tab

Use the General tab to set basic parameters that all the meter runs in the station have in common. The General tab displays when you first access the Station Setup screen.

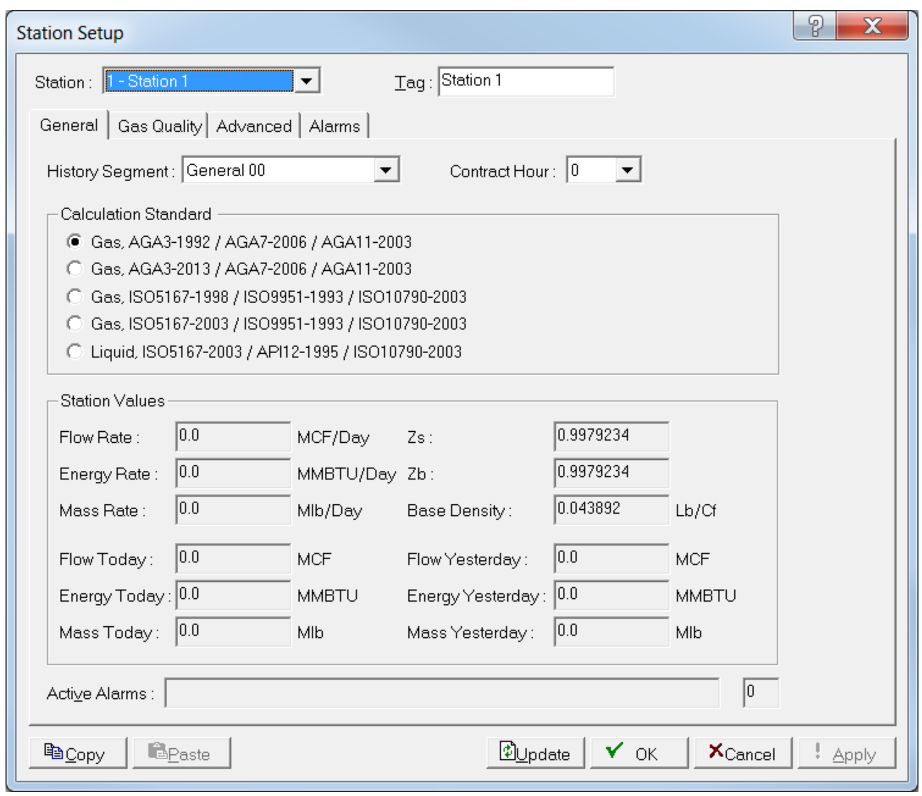


Figure 8-2. Station Setup – General tab

1. Review the following fields for your organization's values.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Station</td><td colspan="2">Sets the station to configure. This lists all active stations.
Note: The selection in this field applies to each tab on this screen.</td></tr>
<tr><td>Tag</td><td colspan="2">Sets a (10 alphanumeric character) identifier for the point.
Note: The selection in this field applies to each tab on this screen.</td></tr>
<tr><td>History Segment</td><td colspan="2">Sets the history segment in the historical database that you use to configure history points for the meters in this station.
Note: Assign only one station per history segment.</td></tr>
<tr><td>Contract Hour</td><td colspan="2">Sets the time when the daily values are logged. If this segment is tied to a meter station, this will also be the contract hour for the station and will be the time that daily and monthly (if it is the first of the month) accumulations will be reset. Additional entries will be made if Force End of Day is exercised for this segment.
Note: The contract hour for the station may also be set in the Configure > History Segment screen.</td></tr>
<tr><td rowspan="2">Calculation Standard</td><td colspan="2">Sets the set of calculation standards that are to be used for orifice, gas linear meters, and mass linear meters in this station. There is only one edition of AGA and ISO flow calculations. Calculation standards include:</td></tr>
<tr><td>Gas, AGA3-92/AGA7-96/AGA11-2003</td><td>American Gas Association (AGA) standard for gas flow through an orifice, a linear meter, and a mass (Coriolis) meter.
Select Gas, AGA3-92/AGA7-1996/AGA11-2003 for the station when you want AGA 3 calculations for all orifice meters in the station and AGA 7 calculations for all turbine meters and all mass (Coriolis) meters in a station.</td></tr>
</table>

Field	Description	
	Gas, ISO5167-98/ISO9951-93/ISO10790-2003	International Standard Organization (ISO) standard for gas flow through an orifice, a linear meter, and a mass (Coriolis) meter. Select Gas, ISO5167-98/ISO9951-93/ISO10790-2003 for all orifice meters in the station and ISO9951 calculations for all turbine meters and all mass (Coriolis) meters in a station. **Note:** ISO9951 calculations are identical to AGA 7 calculations.
	Liquid, ISO5167-98/API 12-95/ISO10790-1999	ISO and API (American Petroleum Institute) standards for liquid flow through an orifice, a linear meter, and a mass (Coriolis) meter. Select Liquid, ISO5167-98/API 12-95/ISO10790-1999 for all orifice meters with an expansion factor set to 1.0. Linear volumetric meters will calculate a corrected volume using user-entered/calculated pressure and temperature correction factors. Mass (Coriolis) meters calculate a corrected volume form the Mass Flow Rate and the Base Density.
	Gas, ISO5167-2003/ISO9951-93/ISO10790-2003	International Standard Organization (ISO) standard for gas flow through an orifice, a linear meter, and a mass (Coriolis) meter in circular cross-section conduits running full. Select Gas, ISO5167-2003/ISO9951-93/ISO10790-2003 for all orifice meters in the station and ISO9951 calculations for all turbine meters and all mass (Coriolis) meters in a station with circular cross-section conduits running full. **Note:** ISO9951 calculations are identical to AGA 7 calculations.

Field	Description
	Note: For linear volumetric meters using API 12, the user-entered/calculated pressure and temperature correction factors, as well as the base density and flowing density values, need to be supplied by a FST, User C program, a host computer, a DS800 program, or manually entered from a custom display. The FPV Method parameter (see *Section 8.1.1.3, Station Setup Advanced tab)* must be set to User so the density values can be entered.
Flow Rate	This **read-only** field shows the volume flow rate at base condition in MCF/day or km^3/day.
Energy Rate	This **read-only** field shows the energy rate at base conditions in mmBtu/day or GJ/day.
Mass Rate	This **read-only** field shows the mass rate conditions in Mlb/day or tonnes/day.
Flow Today	This **read-only** field shows the total accumulation of flow for the current contract day in MCF or km^3.
Energy Today	This **read-only** field shows the total accumulation of energy for the current contract day in mmBtu or GJ.
Mass Today	This **read-only** field shows the total mass for the day in Mlb or Tonnes.
Zs	This **read-only** field shows the represents the compressibility at standard conditions.
Zb	This **read-only** field shows the represents the compressibility at base conditions.
Base Density	This **read-only** field shows the represents the density of the measured fluid at base conditions in lbm/ft^3 or kg/m^3.
Flow Yesterday	This **read-only** field shows the total accumulation of flow for the previous contract day in MMCF or km^3.
Energy Yesterday	This **read-only** field shows the total accumulation of energy for the previous contract day in MMBtu or GJ.
Mass Yesterday	This **read-only** field shows the total accumulation of mass for the previous contract day in Mlb or tonnes.
Active Alarms	This **read-only** field shows the active alarms displaying the current alarm conditions at the station.

2. Click **Apply** if you change any parameters on this screen.
3. Proceed to the Station Setup's Gas Quality tab.

Station Setup: Gas Quality Tab

Use the Gas Quality tab to set the parameters for the gas information. The Gas Quality tab defines the mole percentages of twenty gas components, as well as the Heating Value Basis, the Heating Value, and the Specific Gravity.

1. Select the **Gas Quality** tab. The Gas Quality tab screen displays.

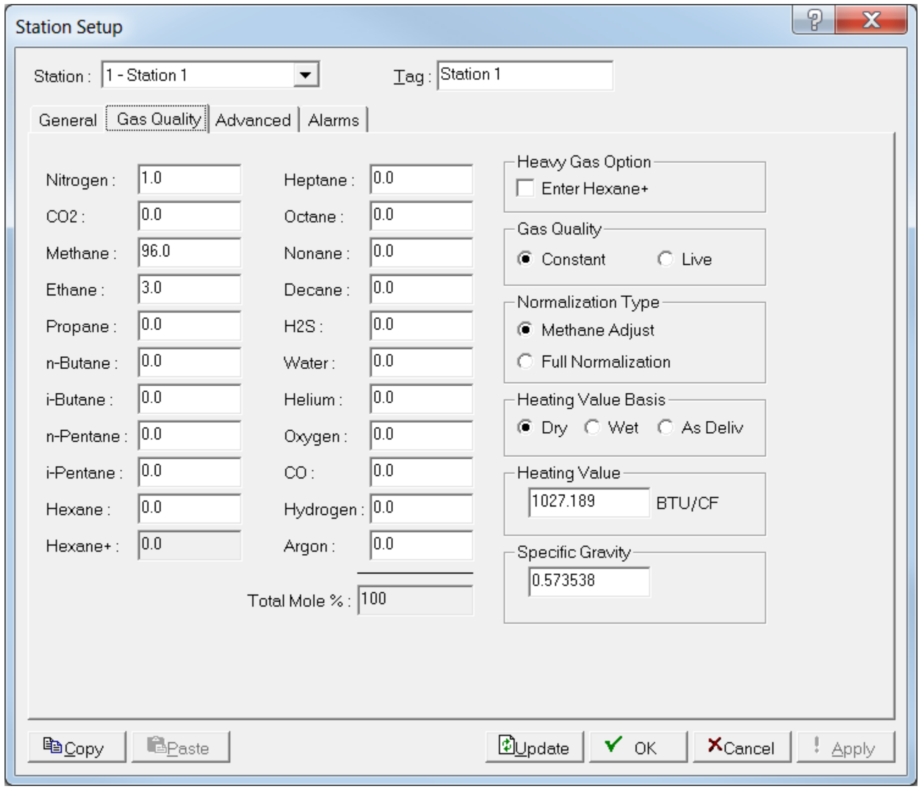


Figure 8-3. Station Setup – Gas Quality tab

2. Review the following fields for your organization's values.

Field	Description
Gas Component	Sets the mole percent of each gas component present in the gas for this station. This value is required to calculate the compressibility of gas using the AGA 8 detailed method.
Total Mole %	If the AGA 8 detailed method is selected, this **read-only** field should equal 100% after you enter all the component mole percentages.

Field	Description
Heavy Gas Option	Sets the option to separate the heavy gas percentage (C6+) into individual components in the mole percentages for n-Hexane, n-Heptane, n-Octane, n-Nonane, and n-Decane. To enter heavy gases, select the Heavy Gas Option and enter the percentage of heavy gases under Hexane+. In the Advanced tab, enter the amount of each heavy gas. The mole percentages in the Heavy Gas Distribution fields on the Advanced tab **must equal 100%**. If the total percentage of the distribution among the five heavier components is less than 100%, Hexane is increased to make the total add up to 100%. If the total percentage of the distribution is greater than 100%, reduction occurs in the following order: Decane > Nonane > Octane > Heptane > Hexane until the total is equal to 100%.
Gas Quality	Indicates the source for determining gas quality readings. Valid values are **Live** (readings come from a gas chromatograph or are periodically downloaded from a host) or **Constant** (manually enter the gas composition and changes are entered in the Event Log).
Normalization Type	Sets what action is taken if the total of the gas mole percentages do not add up to 100%. Valid values are **Methane Adjust** (automatically adjust the Methane component up or down to compensate for the difference if the total does not equal 100%) or **Full Normalization** (adjust each component if the total does not equal 100%).
Heating Value Basis	Indicates the basis for determining the entered heating value. Valid values are **Dry** (no water vapor present in the gas), **Wet** (saturated water vapor present in the gas), or **As Delivered** (may contain some water vapor) for the Heating Value Basis. This field does not affect the flow or energy calculations, and is for accounting purposes only.
Heating Value	Sets the gross volumetric heating value of the measured fluid at base conditions. For gas, this value represents the real heating value, rather than the ideal heating value.
Base Density Option	Indicates either a specific gravity (relative density) or the molecular weight for calculating base density.

3. Click **Apply** if you change any parameters on this screen.
4. Proceed to the Station Setup's Advanced tab.

Station Setup: Advanced Tab

Use the Advanced tab to configure a number of additional parameters that affect the flow calculation.

1. Select the **Advanced** tab. The Advanced tab screen displays.

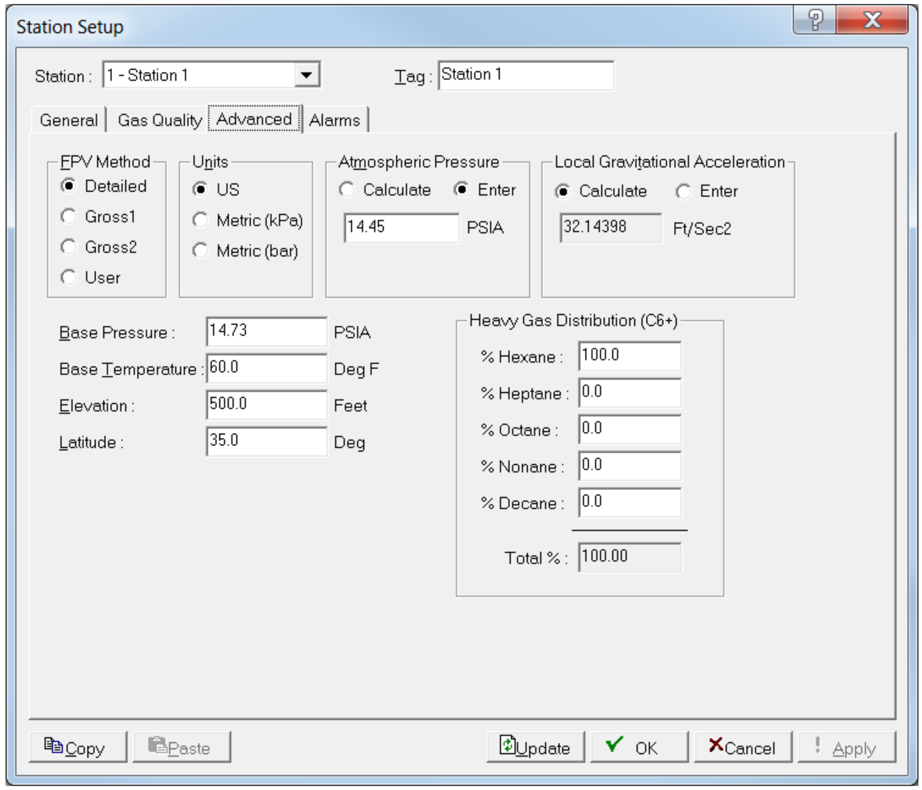


Figure 8-4. Station Setup – Advanced tab

2. Review the following fields for your organization's values.

Field	Description	
FPV Method	Sets the method of determining a compressibility factor for AGA8 calculations. Value values are:	
	Detailed	Requires the natural gas composition in mole percent to be entered.
	Gross I	Uses the specific gravity of the natural gas; the real gas gross heating value per unit volume; and the mole % of CO_2 as the quantity of non-hydrocarbon components.
	Gross II	Uses the specific gravity of the natural gas; the real gas gross heating value per unit volume; and the mole % of CO2 and the mole % of N2 as the quantity of non-hydrocarbon components.

Field	Description
	User Requires the base compressibility, standard compressibility, flowing compressibility, base density, and flowing density values to be entered. These values become Read/Write enabled and may be obtained from a non-calculated source. The values may come from a User C program, FST, host computer, DS800 program, or a custom display. If none of these sources provide values, the last value will be held. **Notes:** ▪ If either Gross Method is chosen, manually enter the Specific Gravity and Heating Value in the Gas Quality screen. For Gross Method I, the Heating Value is required only for calculating the gas energy flow. ▪ The Detailed method provides the highest accuracy in a broader range of measurement conditions; however, one of the Gross methods can be used when: o Temperature is between 0 and 54°C (32 and 130°F). o Pressure is between 0 and 8274 kPa (0 and 1200 psia). o Gas composition is within the normal range as defined in the 1992 AGA8 report. Use Gross methods for applications with a more specific range of measurement conditions.
Units	Sets either **US** (English), **Metric (kPa)**, or **Metric (bar)** units for calculations (Refer to Figure 8-X). The difference between Metric (kPa) and Metric (bar) is the pressure units used in calculations. If you select Metric (kPa), the calculation expects all pressure inputs to be in kPa (such as kPa for the static pressure input). If you select Metric (bar), the calculation expects all pressure inputs to be in bar (such as bar for the static pressure input and millibar for the differential pressure input). **Note:** If you change this selection, remember that any existing entered values do not automatically convert to the newly selected pressure units.
Atmospheric Pressure	Sets the value of the atmospheric pressure (absolute) at the metering location. Valid values are **Calculate (**the value is calculated based on the Elevation) or **Enter (**type a value for the pressure). The units of measurement are in PSIA (US) or kPa (Metric). If entered, the value must be greater than zero.

Field	Description
Local Gravitational Acceleration	Sets the gravitational acceleration at the metering location. Valid values are **Calculate** (the value is calculated from the Elevation and Latitude) or **Enter** (type a value for the acceleration). The units of measurement are in ft/sec^2 or M/sec^2. If entered, the value must be greater than zero.
Base Pressure	Sets the flow measurement base pressure specified in the gas contract. The pressure units are in PSIA, or kPa for Metric.
Base Temperature	Sets the flow measurement base temperature specified in the gas contract. The temperature units are in degrees Fahrenheit or degrees Celsius.
Elevation	Sets the elevation or altitude of the metering location. The units are in feet or meters.
Latitude	Sets the geographic latitude of the metering location. The units are in degrees and minutes, separated by a decimal point. For example: 46.15.
Heavy Gas Distribution	Set the mole percentages of heavy gas distribution (hydrocarbons Hexane and heavier) if the Heavy Gas Option was enabled on the Gas Quality tab. The mole percentages in the Heavy Gas Distribution fields **must equal 100%**. If the Total % of the distribution among the five heavier components is **less than 100%**, Hexane is increased to make the Total % add up to 100%. If the Total % of the distribution is **greater than 100%**, reduction occurs in the following order: Decane > Nonane > Octane > Heptane > Hexane until the total is equal to 100%.
Maintenance Lock	Set the station's meter runs to be to maintenance mode. Valid values are **Locked** (do not allow the station's meter runs to enter maintenance mode) or **Unlocked** (allow the station's meter runs to enter maintenance mode.)

3. Click **Apply** if you change any parameters on this screen.
4. Proceed to the Station Setup's Alarms tab.

Station Setup: Alarms Tab

Use the Alarms tab to configure station-wide alarming parameters. You can either enable or disable alarming for each station. Alarms can be configured for the individual meter runs and the stations. This generates meter-specific and station-wide alarm conditions.

If you enable alarms, the alarms can be configured using the Alarms tab and are logged to the Alarm Log. To conserve log space, alarms should be enabled only when necessary. If you disable alarms, no alarm generates for this point, regardless of the alarm configuration. Alarm conditions display in the Active Alarms fields located in the Station Configuration General tab.

Even if you do not plan to use all of the alarms, check and adjust the value of each alarm so that the system does not generate false alarms.

1. Select the **Alarms** tab. The Alarms screen displays.

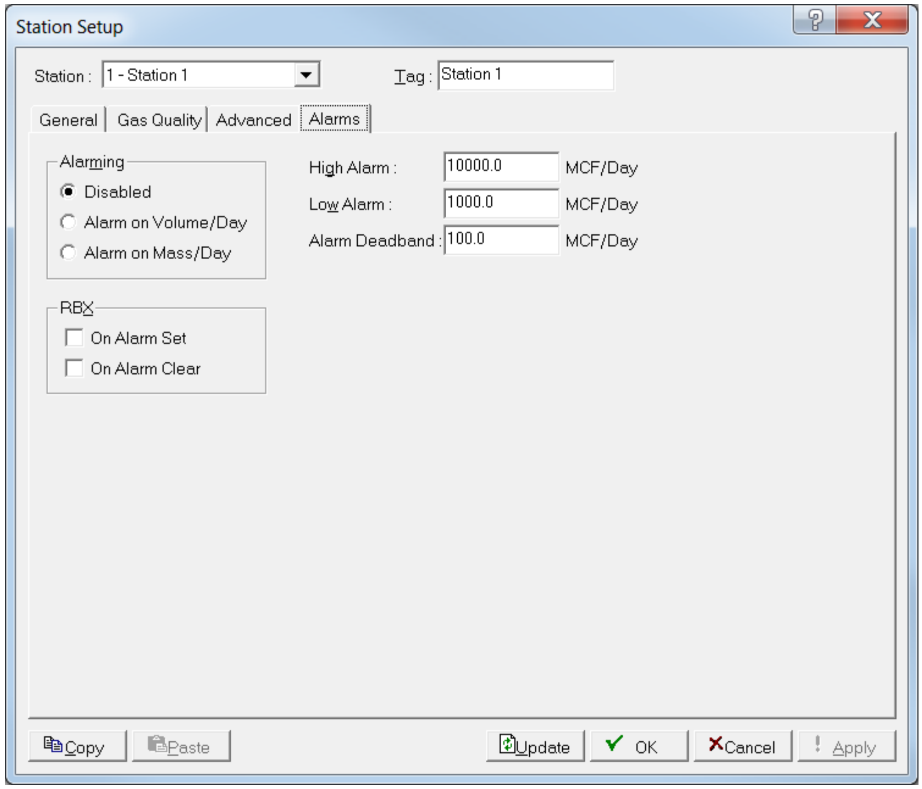


Figure 8-5. Station Setup – Alarms tab

2. Review the following fields for your organization's values.

Field	Description	
Alarming	Sets Alarming as:	
	Disabled	No alarms occur for this station.
	Alarm on Volume/Day or **MCF/Day**	Alarm values occur based on volumetric flow rate per day.
	Alarm on Mass/Day or **Mlb/Day**	Alarm values occur based on mass flow rate per day.
High Alarm	Sets the High Alarm limit value, in engineering units (EU), to which the **Volumetric** or **Mass Flow Rate** value must rise to generate a High Alarm. The Mass units assumed for the input are MCF per day (1000 ft^3/day) or cubic meters per day (m^3/day). The Volumetric units assumed for the input are MLb per day (1000 lb/day) or tonnes per day (1000 kg/day).	

Field	Description
Low Alarm	Sets the Low Alarm limit value, in engineering units, to which the Volumetric or Mass Flow Rate value must fall to generate a Low Alarm. The units assumed for the input are MCF per day (1000 ft^3/day) or cubic meters per day (m^3/day). The Volumetric units assumed for the input are MLb per day (1000 lb/day) or tonnes per day (1000 kg/day).
Alarm Deadband	Sets the value, in engineering units that the flow value must be above the Low Alarm limit and below the High Alarm limit before the alarm clears. The purpose of the Alarm Deadband is to prevent the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit.
RBX	Sets the RBX Alarming option to configure Spontaneous-Report-by-Exception (SRBX) alarming for this point. Valid values are **On Alarm Set** (The point enters an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host) or **On Alarm Clear** (The point leaves an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host). **Note:** SRBX Alarming requires the communications port to be properly configured.

3. Click **Apply** if you change any parameters on this screen.
4. Click **OK** to return the ROC800-Series graphic.
5. This completes the process of configuring the station. Proceed to *Section 8.1.2, Gas Meters Setup Configuration*.

8.1.2 Gas Meters Setup Configuration

To configure the meter runs, select **Gas Meters** > **Setup** > **Orifice Meter** or **Linear Meter** or click on the meter icon in the configuration tree to open the Gas Meters Setup screen.

Configure the parameters on each tab as pertains to your application.

- Set up the Stations in the **Gas Meters > Setup > Station** tab.
- Use the **General** tab to set basic parameters for the meter.
- Use the **Inputs** tab to define the field inputs for differential pressure (AGA3), uncorrected volume or mass (AGA7), static pressure, and temperature to be used in the flow calculation.
- Use the **Advanced** tab to specify additional parameters for the meter.
- Use the **Alarms** tab to set Alarm parameters for the meter.

- Use the **Calibration Factors** tab to display parameters that allow the selection and calculation of optional flow adjustment factor to compensate for the difference in condition between the meter location and the location where the calibration instruments were certified.
- Use the **Calibration Factors** tab to configure parameters that allow select and calculation of optional flow adjustment factor to compensate for the difference in condition between the meter location and the location where the calibration instruments were certified.
- If the Linear Meter Input Type on the General tab was configured to Mass, use the **Mass Meter Press Effect** tab to setup pressure settings.

Note: After configuring a meter and clicking **Apply**, use **Flash Memory Save Configuration** in the **ROC > Flags** screen to save I/O configuration to permanent memory in case you must perform a cold start.

Meter Setup: General Tab

Use the General tab to define basic parameters for the Gas Meters. The General tab displays when you first access the Gas Meters Setup screen.

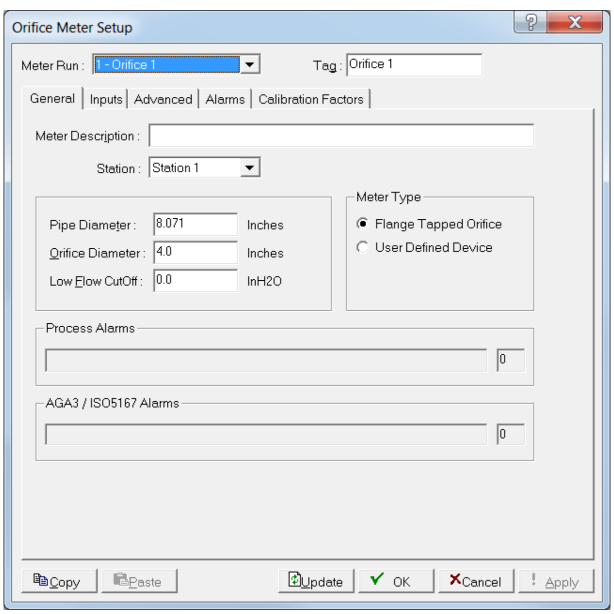


Figure 8-6. Meter Setup (Orifice) – General tab

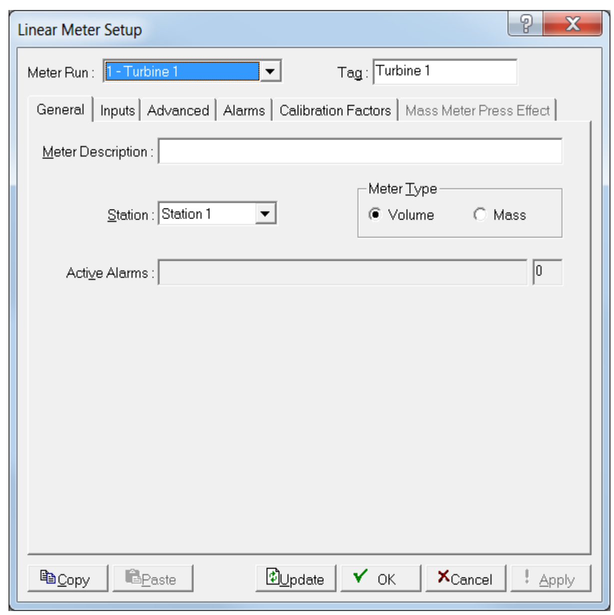


Figure 8-7. Meter Setup (Linear) – General tab

1. Review the following fields for your organization's values.

Field	Description
Meter Run	Selects the number of the meter to be configured. **Note:** The selection in this field applies to each tab on this screen.

Field	Description
Meter Tag	Sets a short (10 alphanumeric characters) identifier for the meter. **Note:** The selection in this field applies to each tab on this screen.
Meter Description	Sets a unique description, up to 30 alphanumeric characters in length that further identifies or provides information about this meter.
Station	Sets the station in which this meter belongs.
Pipe Diameter	Sets the inside diameter for the pipe near the orifice plate in this meter run. The units are inches or millimeters. **Note:** This field displays **only** for an **orifice** meter.
Orifice Diameter	Sets the diameter of the orifice plate in this meter run. The units are inches or millimeters. **Note:** This field displays **only** for an **orifice** meter.
Low Flow Cutoff	Sets the low flow cutoff point. When the differential pressure value of the metering device is less than this value, the system sets the calculated flow rate to zero and, if alarming is enabled, records a No Flow alarm in the Alarm Log. For the **AGA3-92** or **ISO5167-2003** standard, this value is in terms of inches of water column or kPa. For the **AGA7-96** standard, this value is in terms of MCF/Day.
Meter Type	Sets the meter type that you are configuring. Select **Flange Tapped Orifice** or **User Defined Device**, for a ROC800-Series with an orifice meter type. Valid values are **Volume** (volume metering device) or **Mass** (Micro Motion Coriolis Mass Meter or similar mass meter).
Process or Active Alarms	This **read-only** field shows the active Process or Active Alarms. For example, Low indicates that the calculated flow is below the Low Alarm limit. Other alarms can include High, No Flow, and Manual Mode.
AGA3/ISO5167 Alarms	This **read-only** field shows the AGA3/ISO5167 Alarms indicating any current alarms. For example, Low indicates that the flow is below the Low Alarm limit. Other alarms can include High, No Flow, and Manual Mode.

2. Click **Apply** if you change any parameters on this screen.
3. Proceed to the Gas Meters Setup's Inputs tab.

Meter Setup: Inputs Tab

Use the Inputs tab to define the field inputs for differential pressure, uncorrected volume, static pressure, and temperature, which the system uses in the flow calculation.

1. Select the **Inputs** tab. The Inputs screen displays.

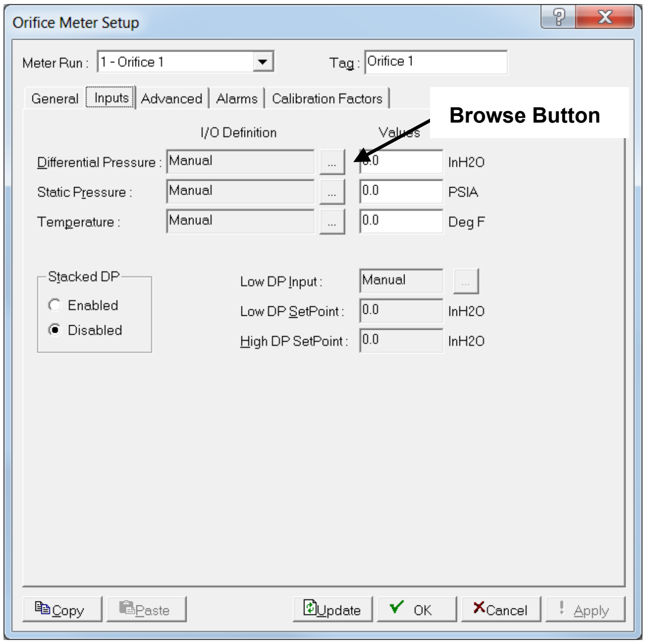


Figure 8-8. Meter Setup (Orifice) – Inputs tab

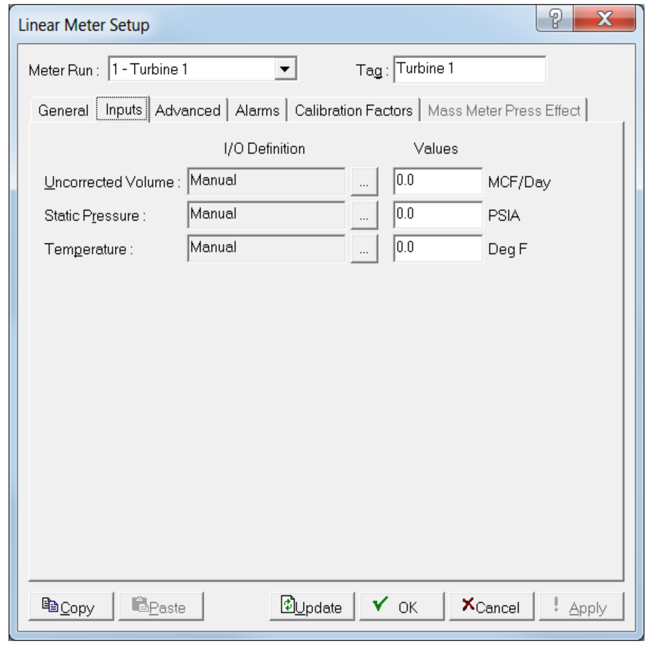


Figure 8-9. Meter Setup (Linear) – Inputs tab

Note: Which screen displays depends on the calculation standard you selected on the General tab.

2. Review the following fields for your organization's values.

Field	**Description**
Differential Pressure	Sets the input that senses the differential pressure (or high differential pressure, if you enabled Stacked DP). Click the Browse button to display a Select TLP dialog box you use to assign the input. The system assumes the units for the input to be inches of water column (In H_2O) or kPa. If Manual appears, use the Values field to enter an engineering units value for the meter input. Otherwise, the Values field indicates the current input value. **Note:** This field displays **only** for an **orifice** meter.
Uncorrected Volume	Sets the input that senses the input from a turbine meter (typically pulses). Click the Browse button to display a Select TLP dialog box you use to assign the input. The units assumed for the input are MCF per day (1000 ft^3/day) or 1000 cubic meters per day (kM^3/day) if the Metric conversion is enabled. If Manual appears, the Values field can be used to enter an engineering units value for the meter input. Otherwise, the Values field indicates the current input value, based on non-adjusted pulses from the turbine meter. **Note:** This field displays **only** for a **linear** meter.

Field	Description
Static Pressure	Sets the input that senses static pressure. Click the Browse button to display a Select TLP dialog box you use to assign the input. The system assumes the units for the input to be PSIG/PSIA or kPaG/kPaA. If Manual appears, use the Values field to enter a engineering units value for the static pressure input. Otherwise, the Values field indicates the current input value.
Temperature	Sets the input that senses the temperature of the flowing gas. Click the Browse button to display a Select TLP dialog box you use to assign the input. The system assumes units for the input to be degrees Fahrenheit or degrees Celsius. If Manual appears, use the Values field to enter an engineering units value for the temperature input. Otherwise, the Values field indicates the current input value.
Stacked DP	Enables the use of standard differential pressure transmitters for low and high pressure ranges. Valid values are Enabled (use stacked DP transmitters) or Disabled (do not allow use of stacked DP transmitters). **Note:** This field displays **only** for an **orifice** meter.
Low DP Input	Sets the input for monitoring low differential pressure. Click the Browse button to display a Set TLP dialog box you use to assign the input. You must **Enable** the Stacked DP parameter to use this input or you can leave this input in Manual Mode when you **Disable** Stacked DP. **Note:** This field displays only for an **orifice** meter.
Low DP Setpoint	Sets the differential pressure point at which the system switches over to the low differential pressure input. When the High DP input is active and the High DP reading drops below this value, the Low DP input becomes the active input. The system assumes the units for this input to be inches of water column (In H_2O) or kPa. **Note:** This field displays **only** for an **orifice** meter.
High DP Setpoint	Sets the differential pressure point at which the system switches over to the high differential pressure input. When the Low DP input is active and the Low DP reading rises above this setpoint, the High DP input becomes the active input. The system assumes the units for this input to be inches of water column (In H_2O) or kPa. **Note:** This field displays **only** for an **orifice** meter.

3. Click **Apply** if you change any parameters on this screen.

4. Proceed to the Gas Meters Setup's Advanced tab.

Meters Setup: Advanced Tab

Use the Advanced tab to specify additional meter parameters.

1. Select the **Advanced** tab. The Advanced screen displays.

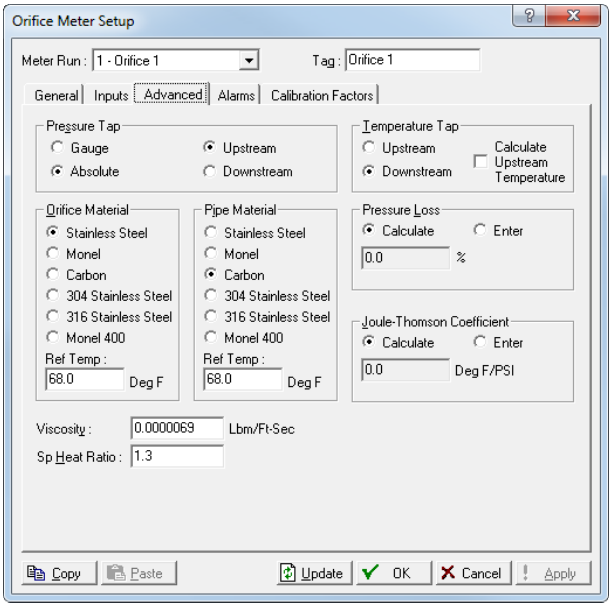


Figure 8-10. Meter Setup (Orifice) – Advanced tab

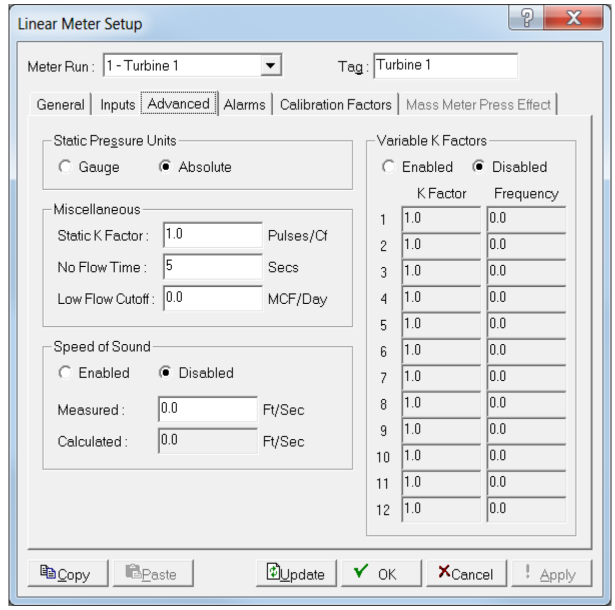


Figure 8-11. Meter Setup (Linear) – Advanced tab

2. Review the following fields for your organization's values.

Field	Description	
Pressure Tap	Indicates the pressure tap type and location for this meter run. Valid values are:	
	Gauge or Absolute	Indicates the type of pressure tap. This choice must match the static pressure type as actually measured by the sensor. Order the MVS sensor, DVS sensor, or other pressure transmitter to provide absolute or gauge measurements.
	Upstream or Downstream	Indicates the location of the static pressure tap in relation to the orifice and normal flow. **Upstream** is the default. **Note:** This field displays **only** for an **ISO5167 or AGA3** calculations.

Field	Description
Static Pressure Units	Sets **Absolute** or **Gauge** for calculations used in this meter run. This choice must match the static pressure type is actually measured by the sensor. The MVS sensor, DVS sensor, or other pressure transmitter can be ordered to provide either absolute or gauge measurements. **Note:** This field displays **only** for an **orifice** meter.
Orifice Material	Indicates the material from which the orifice is made. Nearly all natural gas applications use stainless steel orifice plates. You must also complete the **Ref Temperature** field. This indicates the reference temperature at which the bore diameter of the orifice plate was measured, expressed in degrees Fahrenheit or degrees Celsius. **Note:** This field displays **only** for **ISO5167** or **AGA3** calculations.
Pipe Material	Indicates the material from which the orifice meter tube material is made. Nearly all natural gas applications use carbon steel meter tube. You must also complete the **Ref Temperature** field. This indicates the reference temperature at which the internal diameter of the pipe was measured, expressed in degrees Fahrenheit or degrees Celsius. **Note:** This field displays only for **ISO5167** or **AGA3** calculations.
Viscosity	Sets the dynamic viscosity of the flowing gas. Units of measure either Lbm/Ft-Sec (US Units) or cP (Metric Units).
Sp Heat Ratio	Sets the specific heat ratio of the gas (defined as the specific heat of the gas at constant pressure divided by the specific heat of the gas at constant volume). Accepted practice for natural gas applications is to use a value of 1.3, which was used to develop the expansion factor tables in the *AGA 3 Report – Part 3*. If entered, the value must be greater than zero.
Static K Factor	Sets the Static K Factor for the turbine linear meter constant in counts/pulses per unit volume or mass, such as 4 pulses per cubic foot or 235 pulses/ft^3. The volume units are in pulses ft^3 or pulses m^3. The mass units are pulses lb or pulses kg. The Static K-factor cannot be less than zero.
No Flow Time	Sets the No Flow Time. This is the amount of time without a pulse after which the ROC declares a No Flow condition. The flow cutoff is the analog signal lower limit; below this limit a no flow condition exists.

Field	Description
Low Flow Cutoff	Sets the low flow cutoff value. When the value of the uncorrected volume input is less than or equal to the low flow cutoff value, the calculated flow is set equal to zero. A No Flow alarm is recorded in the Alarm Log if Alarming is Enabled. The units are MCF/Day (1000 cubic feet per day) and the metric units are km^3/day (1000 cubic meters per day). This parameter is only used if the uncorrected volume input selected is **not** a pulse input point type.
Speed of Sound	Sets the status of the speed of sound calculation. If Enabled, the system calculates AGA10 feet per second or meter per second based on the Pressure, Temperature, and Gas Composition. AGA8 Detail Method must be selected and a full Gas Composition entered to calculate the Speed of Sound. For diagnostic purposes, Speed of Sound measures may be read through a serial connection to an ultrasonic flow meter and stored under the **Measured Speed of Sound** to be compared to the **Calculated** value.
Variable K Factor	Sets the K Factor values at multiple input frequencies, if the Variable K Factor is enabled. If the Variable K Factor is disabled, a static factor will be used. The K factor is used in the flow calculations to convert raw pulses to either Volume or Mass. This conversion may vary with flow rate and Variable K Factors allow you to specify flow rates as indicated by Frequency. The K Factor values cannot be less than zero. Up to twelve K Factor and Frequency values can be entered.
Temperature Tap	Indicates the location of the temperature tap for this meter run. Valid values are: **Upstream** (the default) and **Downstream**. If you select Downstream, the system displays the Calculate Upstream Temperature option. Leave that option blank to indicate that you do not require a calculation, or click the option to display the Joule-Thompson Coefficient field and specify how the system calculates upstream temperature. **Note:** This field displays only if you select ISO5167-2003 as a Calculation Standard on the General tab.
Maintenance Mode	Sets the maintenance mode status. Valid values are **Enabled** (allow the meter to be set to maintenance mode) and **Disabled** (do not allow the meter to be set to maintenance mode).

Field	Description
Joule-Thomson Coefficient	Sets how the system obtains the value for the Joule-Thompson coefficient used in upstream temperature calculations. Valid values are Calculate (the default) or Enter (use a specific value). If you click Enter, the system enables the coefficient value field. The specific coefficient value must be greater than zero. **Note:** This field displays only if you select ISO5167-2003 as a Calculation Standard on the General tab and check the Calculate Upstream Temperature field in the Temperature Tap frame.

3. Click **Apply** if you change any parameters on this screen.
4. Proceed to *Gas Meters Setup Alarms Tab*.

Meters Setup: Alarms Tab

Use the Alarms tab to configure alarm parameters. You can either enable or disable alarming for each meter run. You can configure alarms for the individual meter runs and identify meter-specific alarm conditions.

If you enable alarms, the system logs alarms on the alarm log. To conserve log space, enable alarms only when required. If you disable alarms, the system does not generate an alarm for this point, regardless of the alarm configuration. However, the system displays alarm conditions in the Active Alarms field located in the Meter Setup General tab or the Station Configuration General tab.

Even if you do not plan to use all the alarms, check and adjust the value of each alarm to prevent the generation of false alarms.

1. Select the **Alarms** tab. The Alarms screen displays.

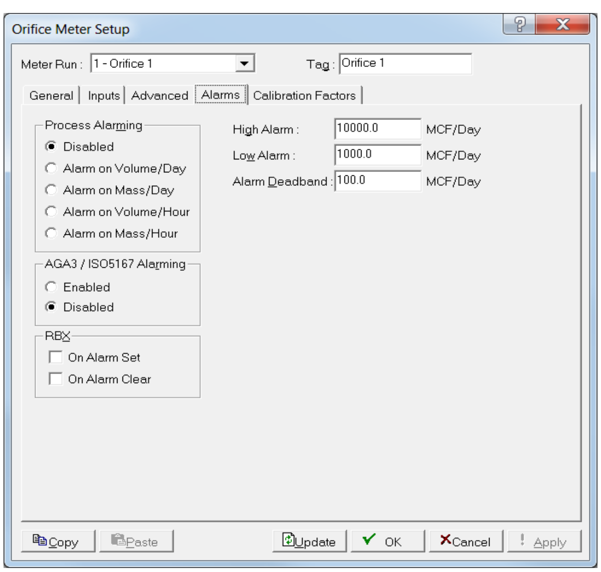


Figure 8-12. Meter Setup (Orifice) – Alarms tab

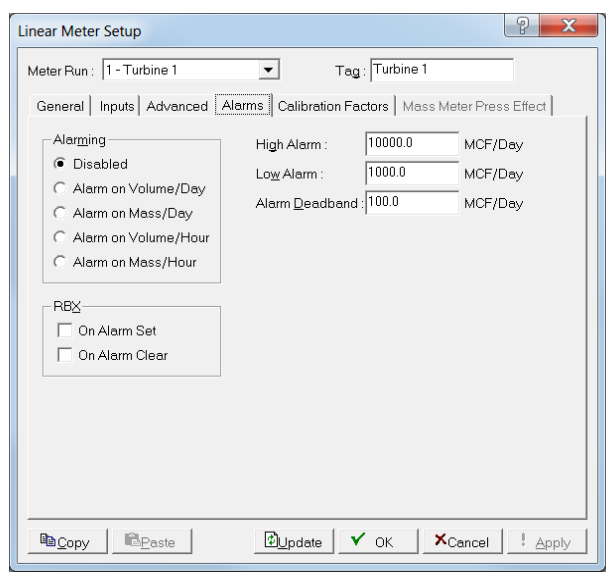


Figure 8-13. Meter Setup (Linear) – Alarms tab

2. Review the following fields for your organization's values.

Field	Description	
Process Alarming / Alarming	Sets the alarming option for the selected meter.. Enabled alarms can be based on either the Corrected Volume Flow Rate per Day, the Corrected Volume Flow Rater per Hour, the Mass Flow Rate per Day, or the Mass Flow Rate per Hour. Valid values are:	
	Disabled	No alarms occur for this station.
	Alarm on Volume/Day	Alarm values occur based on volume per day. Units are MCF/day or km^3/day.
	Alarm on Mass/Day	Alarm values occur based on mass per day. Units are Mlb/day or tonnes/day
	Alarm on Volume/Hour	Alarm values occur based on volume per hour. Units are CF/hour or m^3/hour.
	Alarm on Mass/Hour	Alarm values occur based on mass per hour. or lb/hour
AGA3/ISO5167 Alarming	Sets the alarm option for this point. Valid values are **Enabled** (configures the limit alarms - high, low, and Deadband) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm may appear in the Active Alarms field, but is not logged in the Alarms file. If you Enable alarming, the system generates an alarm if you disable scanning.	
RBX Alarming	Sets the Spontaneous Report-by-Exception (RBX or SRBX) alarming options for the meter run. Valid values are **On Alarm Set** (When the point **enters** an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host) or **On Alarm Clear** (When the point **leaves** an alarm condition, the ROC generates a Spontaneous-Report-by-Exception message to the host).	
High Alarm	Sets the value to which the calculated flowrate must rise to generate a high alarm. Units are dependent upon the alarm selected.	
Low Alarm	Sets the value to which the calculated flowrate must fall to generate a low alarm. Units are dependent upon the alarm selected.	
Alarm Deadband	Sets a value that defines an inactive zone above the Low Alarm limits and below the High Alarm limits. This deadband prevents the system from setting and clearing the alarm continuously when the input value is oscillating around the alarm limit. Units assumed for the input are MCF per day (1000 ft^3/day) or cubic meters per day (m^3/day).	

3. Click **Apply** if you change any parameters on this screen.
4. Proceed to the Gas Meters Setup's Calibration Factors tab.

Meter Setup: Calibration Factors Tab

Use the Calibration Factors tab to define instrument-specific parameters that can affect calibration of the meter inputs.

1. Select the **Calibration Factors** tab. The Calibration Factors screen displays.

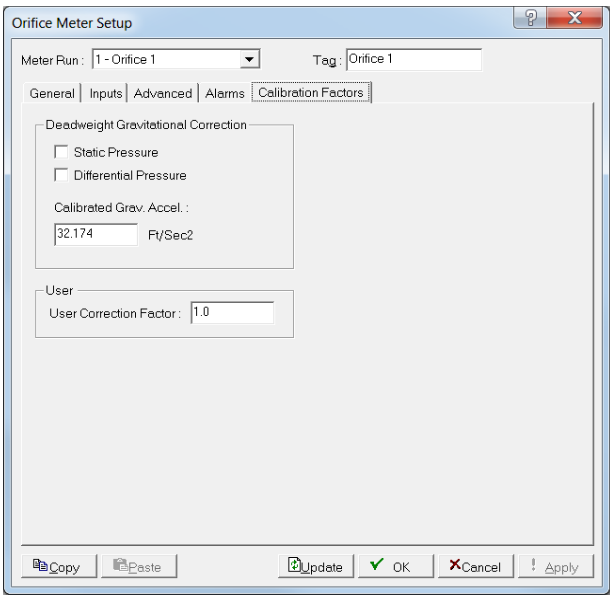


Figure 8-14. Meter Setup (Orifice) – Calibration Factors tab

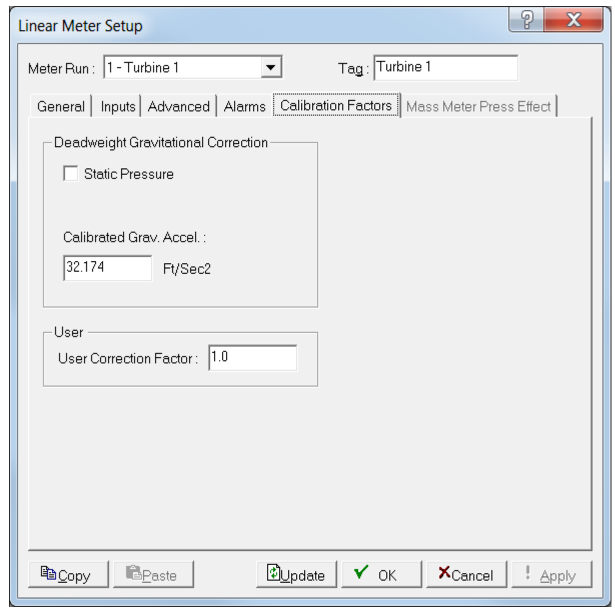


Figure 8-15. Meter Setup (Linear) – Calibration Factors tab

2. Review the following fields for your organization's values.

Field	Description
Deadweight Gravitational Calibration	Sets when the factor Fpwl is used to correct for the effect of local gravity on the weights of a deadweight calibrator. The calibrator weights are usually sized for use at a standard gravitational force or at some specified gravitational force. A correction factor must then be applied to correct the calibrations to the local gravitational force.

Field	Description
Deadweight Gravitational Calibration: Static Pressure	Sets whether any corrections occur for local gravity's effects on dead weight calibrations to static pressure. The system multiplies the factor Fpwl by the base volume flow equation. The system uses the factor Fpwl to correct for the effect of local gravity on the weights of a dead weight calibrator, which are usually sized for use at a standard gravitational force or at some specified gravitational force. A correction factor must then be applied to correct the calibrations to the local gravitational force. **Note:** When a dead weight calibrator is used for the differential pressure **and** the static pressure, both must be corrected for local gravity. This involves using Fpwl twice.
Deadweight Gravitational Calibration: Diff Pressure	Sets whether any corrections occur for local gravity's effects on dead weight calibrations to differential pressure. **Note:** This field displays **only** for an **orifice** meter. For each selection, the system multiplies the factor Fpwl by the base volume flow equation once for each selection. The system uses the factor Fpwl to correct for the effect of local gravity on the weights of a dead weight calibrator, which are usually sized for use at a standard gravitational force or at some specified gravitational force. A correction factor must then be applied to correct the calibrations to the local gravitational force. When a dead weight calibrator is used for the differential pressure **and** the static pressure, both must be corrected for local gravity. This involves using Fpwl twice.
Calibrated Grav. Accel.	Sets a gravitational acceleration value if the tester value differs from the indicated value. The system assumes the units to be Ft/Sec ^{2} or m/Sec ^{2}.
User Correction Factor	Sets a factor the system multiplies by the base volume flow equation to make a desired adjustment to the flow. **Note:** If you use the default value of **1**, the system does not apply any correction.

3. Click **Apply** if you change any parameters on this screen.
4. Proceed to the Gas Meters Setup's Mass Meter Press Effect tab.

Meter Setup: Mass Meter Press Effect Tab

If the Linear Meter Input Type on the General tab was configured to Mass, use the Mass Meter Press Effect tab to setup pressure settings.

Note: You must select Mass as the Linear Meter Input Type on the General tab to access the Mass Meter Press Effect screen.

1. Select the **Mass Meter Press Effect** tab. The Mass Meter Press Effect screen displays.

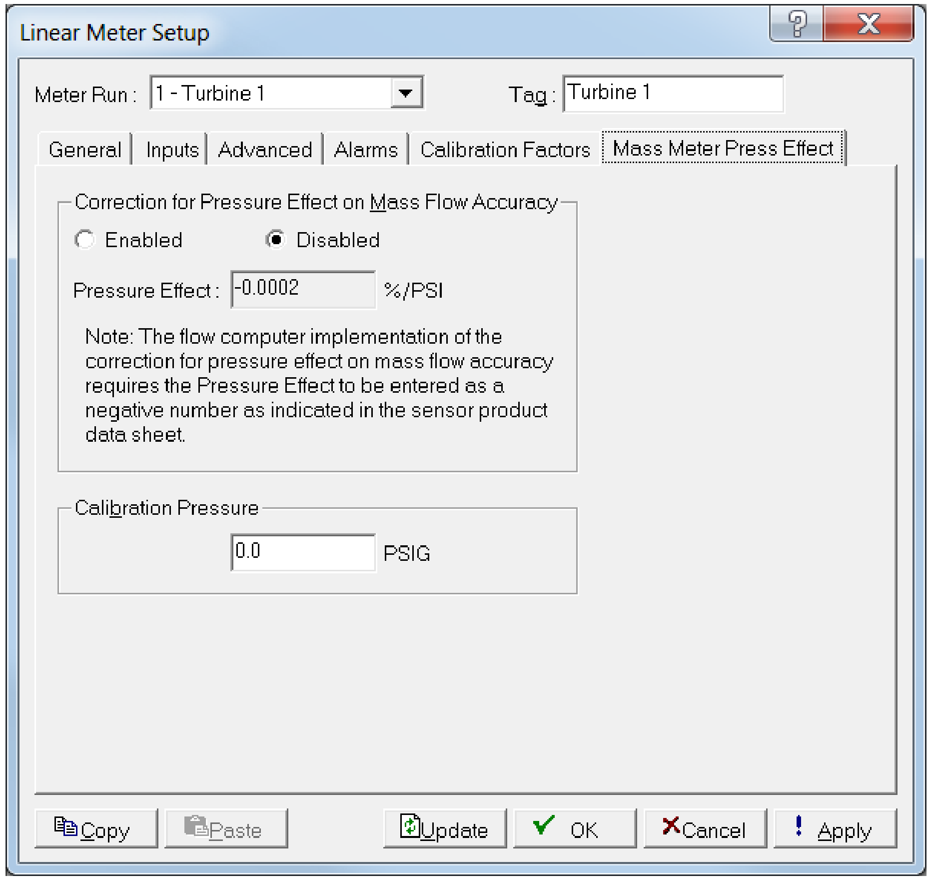


Figure 8-16. Meter Setup (Linear) – Mass Meter Press Effect tab

2. Review the following fields for your organization's values.

Field	Description
Correction for Pressure Effect on Mass Flow Accuracy	Sets the Correction for Pressure Effect on Mass Flow Accuracy when the mass input requires compensation for process pressure on the Coriolis tube. If Correction for Pressure Effect on Mass Flow Accuracy is Enabled, enter a Pressure Effect in percent per PSI.
Pressure Effect	If Correction for Pressure Effect on Mass Flow Accuracy is Enabled, enter a pressure correction **Pressure Effect** in percent per PSI. This value is supplied by the manufacturer of the mass meter.
Calibration Pressure	Sets the pressure of the mass meter as calibrated in PSI.

3. Click **Apply** if you change any parameters on this screen.
4. Click **OK** to return to the ROC800-Series graphic.
5. This completes the process of configuring the station. Proceed to *Section 8.2, Gas Meters Calibration Basics*.

8.2 Gas Meters Calibration Basics

Use the Calibration option to verify the accuracy of your input within contractual parameters, to calibrate those inputs to desired parameters, or to establish calculation adjustment factors to assure the inputs are within desired parameters.

The Calibration routine provides verify, calibrate, and zero shift/offset/RTD Bias functions for AI, MVS, DVS, and RTD inputs. You can calibrate Differential Pressure (orifice metering may be high or low differential pressure, depending on the device), static pressure, or temperature readings are available for each meter run. Calibration parameters include zero, span, and up to three midpoints.

The system automatically logs all new calibration values in the Event Log and optionally to a calibration log.

Select **Gas Meters** > **Calibration** > **Orifice Meter** or **Linear Meter**. The Meter Calibration screen displays.

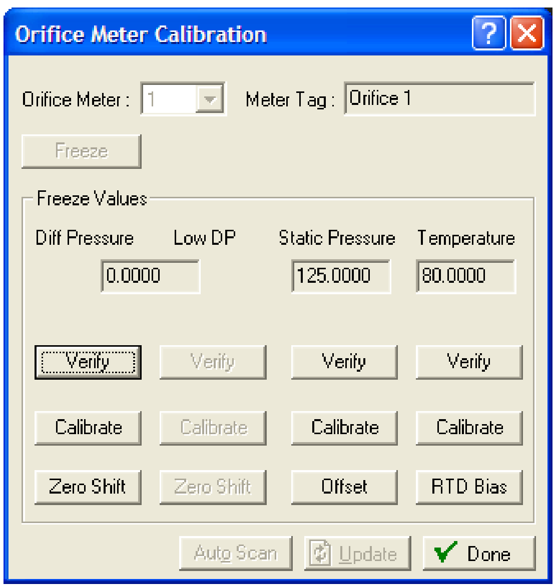


Figure 8-17. Meter Calibration (Orifice)

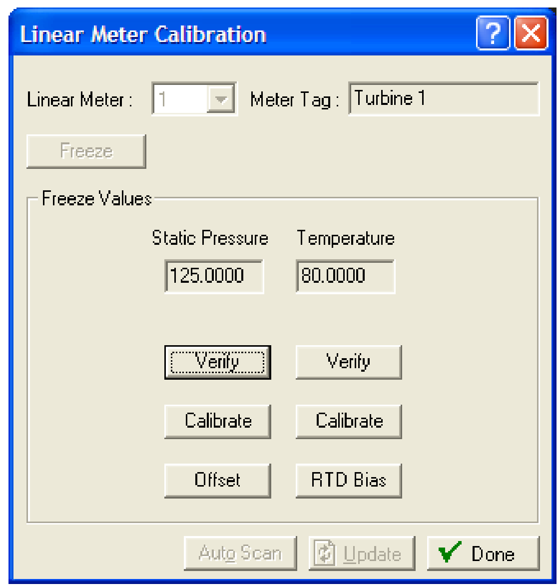


Figure 8-18. Meter Calibration (Linear)

Notes:

- ROCLINK 800 removes input categories from the Freeze Values frame of this screen depending on the selected meter. For orifice meters, you can calibrate differential pressure, static pressure, and temperature inputs. For a turbine meter, you can calibrate static pressure and temperature inputs. When calibrating stacked differential pressure, you can calibrate either high differential pressure (Diff Pressure) input or low differential pressure (Low DP) input.

- During calibration, the ROC times out and resumes normal processing if it is left idle for an extended period of time. Calibration values are restored to the previous values, an event is logged, and you must reconnect to start calibration from the beginning.
- Click Cancel to exit the calibration without saving the changes. The previous calibration settings are retained. An Event is also logged.

Field	Description	
Meter	Selects the meter for verification or calibration. Click ▼ to display all defined meter runs.	
Meter Tag	This **read-only** field shows the short description associated with the selected meter.	
Freeze Button	Click to stop the system from updating meter data, analog, DVS, MVS, or temperature (RTD) inputs during verification or calibration.	
Freeze Values	These **read-only** fields show the value received from the analog input, DVS, HART, MVS, RTD or Meter inputs when the **Update** button was last clicked. The system uses these values in ongoing processing (such as flow calculations, history logging, or control) while calibration occurs.	
Verify	Click to start the verification process.	
Calibrate	Click to begin calibration. When this button is pressed, the Set Zero dialog box opens.	
Zero Shift/Offset/RTD Bias	Click to set adjustment factors for the input. The value is sent to the device for:	
	Zero Shift	Zeros the static pressure effect for the differential pressure input (Set Offset).
	Offset	Sends the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
	RTD Bias	Calibrates the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).
Auto Scan/Stop Scan	Click to automatically request values each second from the meter. The request continues until you click **Freeze**.	
Update Button	Click to request a value update from the input to be used as the Freeze Values.	

8.2.1 Verifying an Input

To verify an input:

1. Select **Meter** > **Calibration** > **Orifice Meter** or **Linear Meter**. The Meter Calibration screen displays.

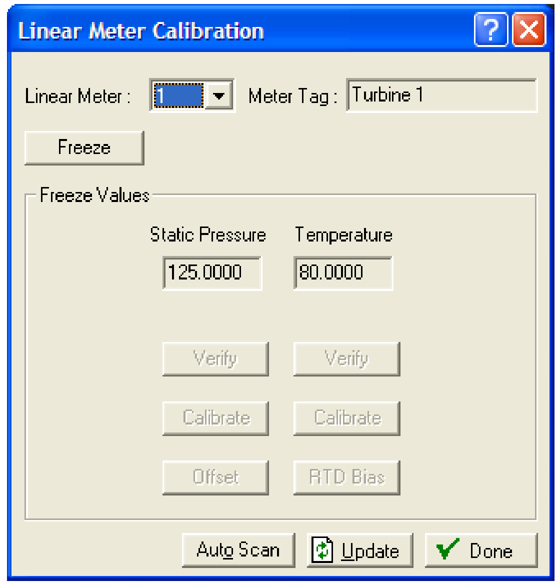


Figure 8-19. Linear Meter Calibration

2. Select a **Meter** input to verify.

Note: ROCLINK 800 retains or removes the appropriate inputs from the Meter Calibration screen. The following example verifies a temperature sensor for a turbine meter.

3. Click **Freeze**. ROCLINK 800 displays a dialog asking if you want to create a calibration report file.

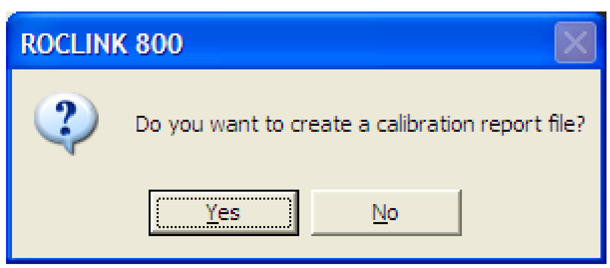


Figure 8-20. Calibration Report File

4. Click **Yes** to display a Save As dialog box and specify a storage location for the report, which you can review later. Click **No** to proceed with verification without generating a report. ROCLINK 800 displays the Meter Calibration screen with frozen values and active buttons.

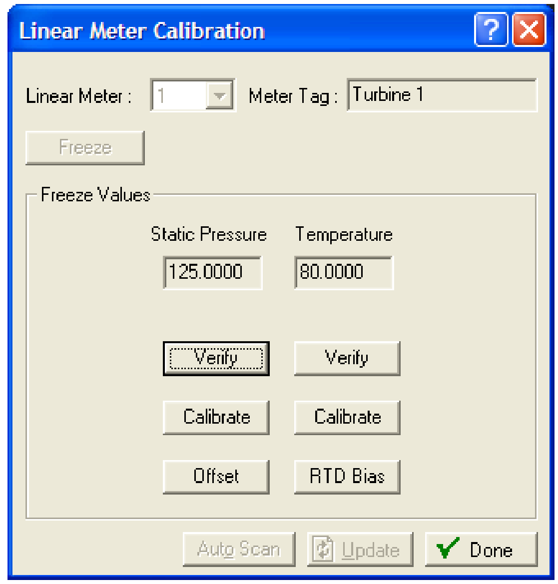


Figure 8-21. Linear Meter Calibration – Frozen Values

5. Click **Verify**. A Verify screen displays.

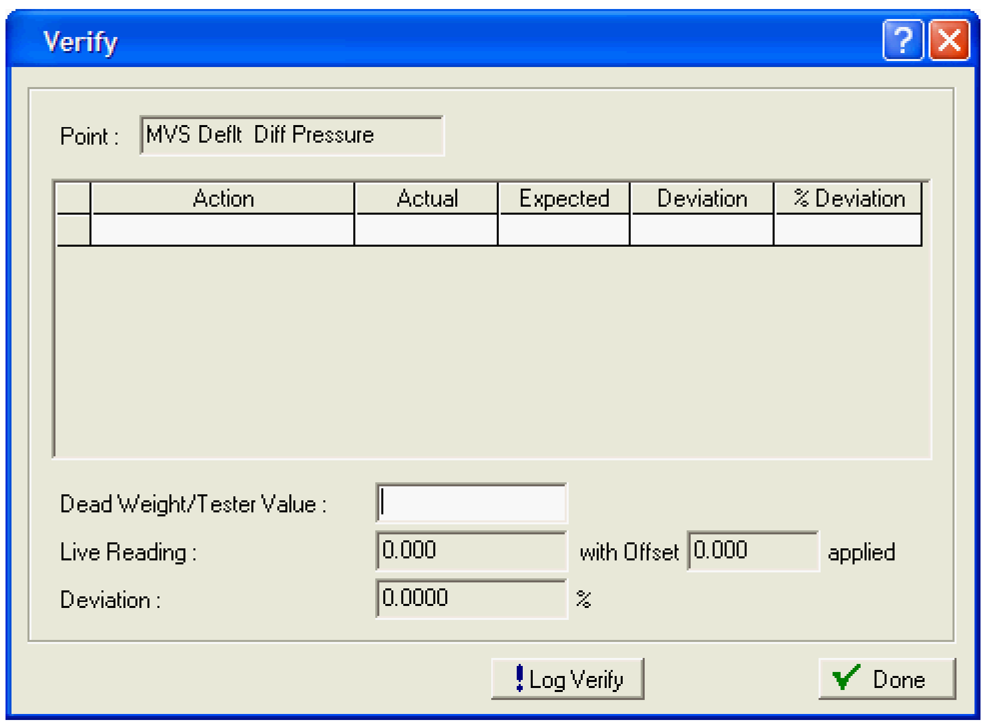


Figure 8-22. Verify

Field	Description
Point	This **read-only** field shows the point (differential pressure, static pressure, or temperature) being verified.
Action	Indicates the current action. Valid values are **Verify** or **Calibrate**.
Actual	Displays the value in the Live Reading field.

Field	Description
Expected	Displays the value in the Dead Weight/Tester Value field.
Deviation	Displays the amount of deviation between the actual and expected values.
% Deviation	Displays a percentage deviation between the Actual and Expected values.
Dead Weight/Tester Value	Sets the expected value against which the system tests and calibrates. **Note:** This is the Expected value in the Action field.
Live Reading with Offset applied	This **read-only** field shows the current reading from the sensor. If you have configured an offset, the value appears in the Offset applied field.
Deviation and % Deviation	This **read-only** field shows the deviation between the Actual and Expected values, such as the difference between the live pressure or temperature reading and the measured pressure or temperature reading. (%Deviation = Deviation [(Span EU – Zero EU) x 100%]). Use this value to determine the need for calibration or adjustment.
Log Verify	Click to write the displayed data to the Event Log.

6. Complete the **Dead Weight/Tester Value** field with a value against which the test equipment verifies.

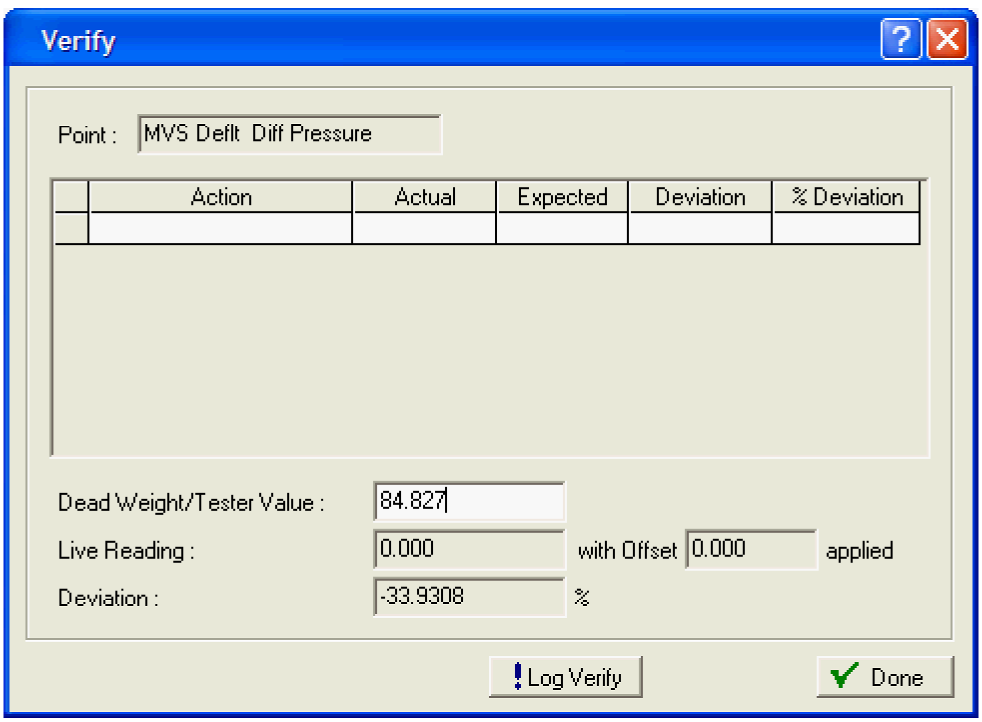


Figure 8-23. Dead Weight/Tester Value

When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it to the value in the **Live Reading** field (obtained from the temperature probe) and calculating the percentage deviation between the two values.

7. Click **Log Verify**. ROCLINK 800 completes the first log entry on the screen.

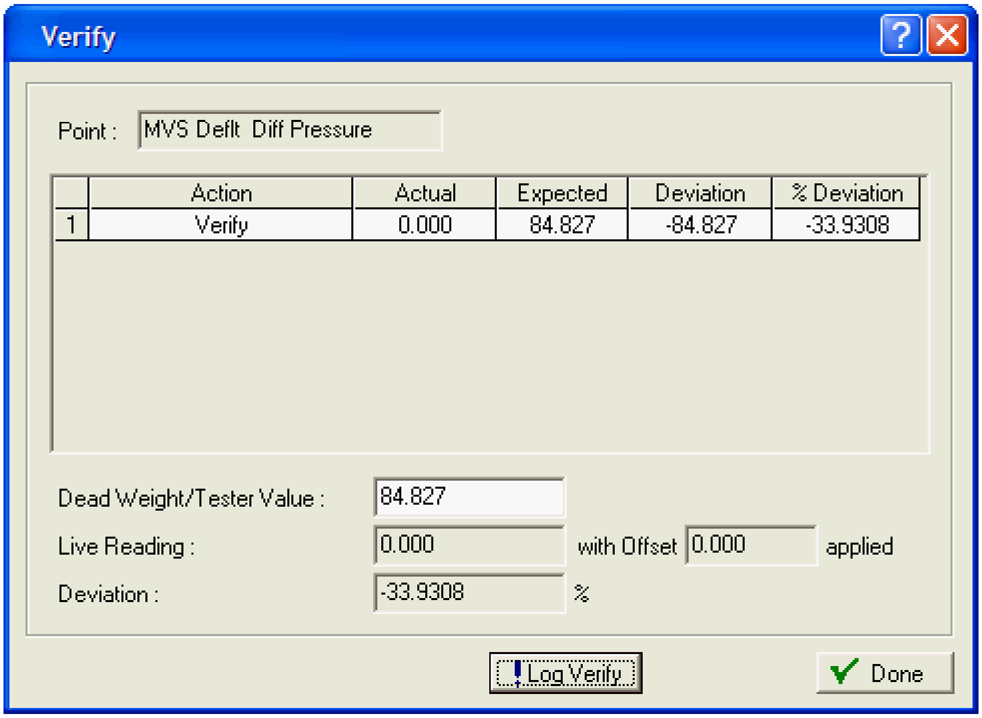


Figure 8-24. Verify Log Entry

8. As the live reading value changes, click **Log Verify** as many times as necessary to establish the verification log.

Typically you verify the same points you calibrate (zero, span, and mids). Temperature might be an example (– 100, 200, 50). For each test point, you set your test equipment to produce the expected value, enter that expected value in the **Tester Value** field, wait for live input to stabilize, and then click **Log Verify**. You can verify as many points as you want.

Note: If you have chosen to save the verification log, ROCLINK 800 saves it in the location you specified in step 4.

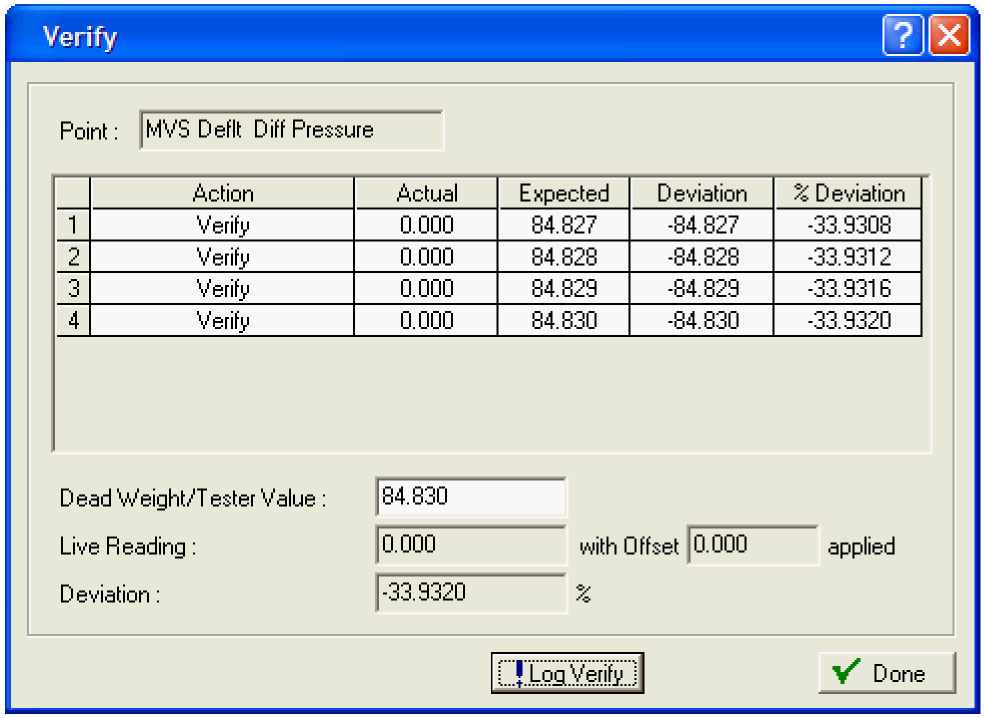


Figure 8-25. Verify Log Entry

9. Review the verification log and determine whether the results are within contractual limits. If they are not, you may need to calibrate the temperature probe. See *Section 8.2.2, Calibrating an Input Example.*

10. Click **Done**. The Meter Calibration screen displays.

8.2.2 Calibrating an Input Example

Following verification, you may determine that the input needs to calibrate. A standard calibration requires you to define a zero and a span point; you can also define up to three midpoints that can represent 25%, 50%, and 75% of the span.

⚠ **Caution**

If you are calibrating a pressure input, isolate the sensor from the process. Set up the pressure calibrator and make the necessary connections to the sensor.

If you are calibrating a temperature input, disconnect the RTD sensor and connect a decade box (or compatible equipment) to the device's RTD terminal.

Note: You can exit a calibration without saving the changes. The system retains the previous calibration settings but logs the event in the event log.

To calibrate an input (in this example, the static pressure input):

1. Select **Gas Meters > Calibration > Orifice Meter or Linear Meter**. The Meter Calibration screen displays.

2. Select a **Meter** input to calibrate.

Note: ROCLINK 800 retains or removes the appropriate inputs from the Meter Calibration screen. The following example calibrates a static pressure sensor for a turbine meter.

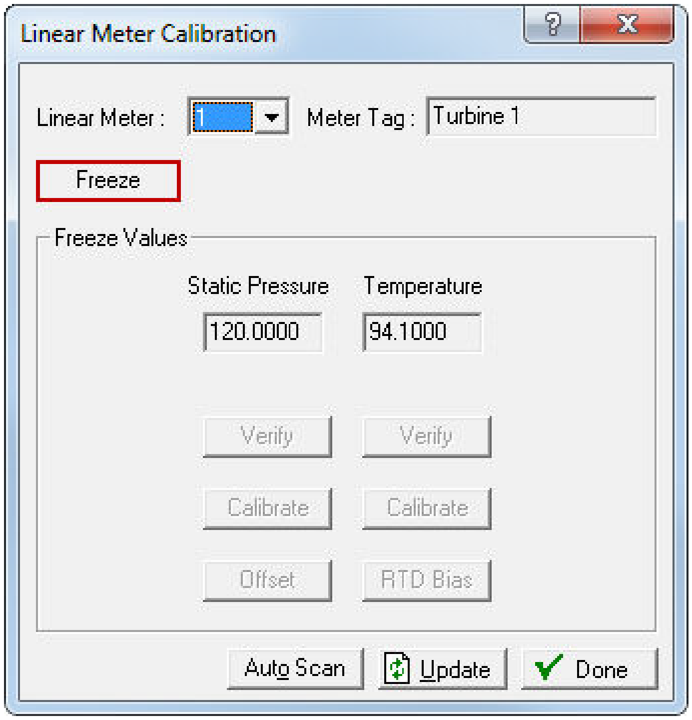


Figure 8-26. Linear Meter Calibration

3. Click **Freeze**. ROCLINK 800 displays a dialog asking if you want to create a calibration report file using the original format or the BLM format.

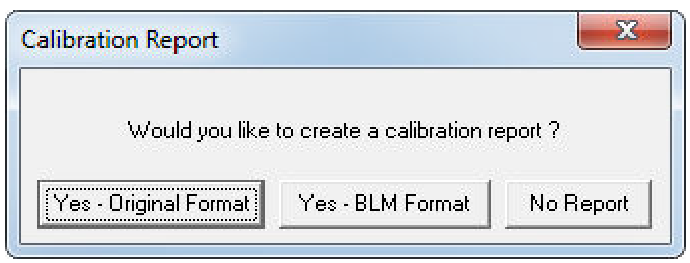


Figure 8-27. Calibration Report File

4. Select one of the following choices:

- Click **Yes-Original Format** to display a Save As dialog box and specify a storage location for the report, which you can review later.
- Click **Yes-BLM Format** to display a Save As dialog box, specify a storage location for the report, and then display the BLM Report Required Information screen and input the required information. The BLM format allows you to enter site, calibration equipment, tester, and witness information that

appears on your calibration report. You can also copy this information from a previous BLM Format calibration report to the current report on the BLM Report Required Information screen.

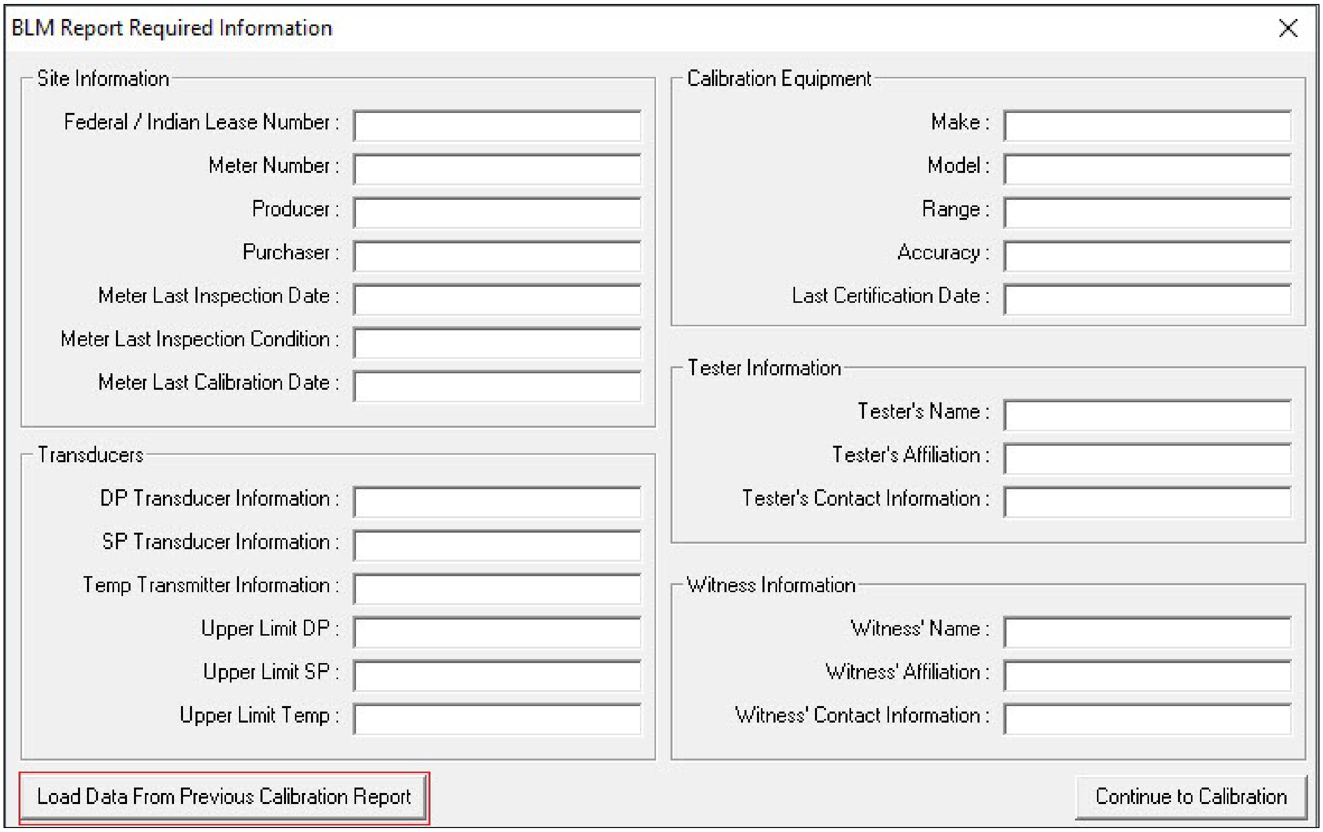


Figure 8-28. BLM Report Required Information

- Click **No Report** to proceed with verification without generating a report. ROCLINK 800 displays the Meter Calibration screen with frozen values and active buttons.

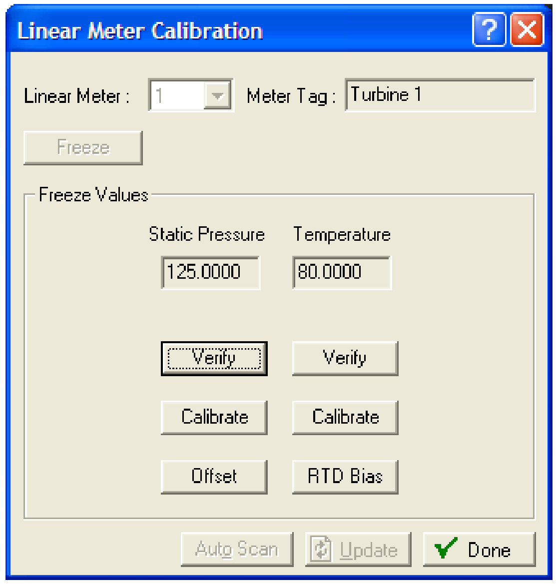


Figure 8-29. Calibration – Frozen Values

5. Click **Calibrate**. A Set Zero screen displays.

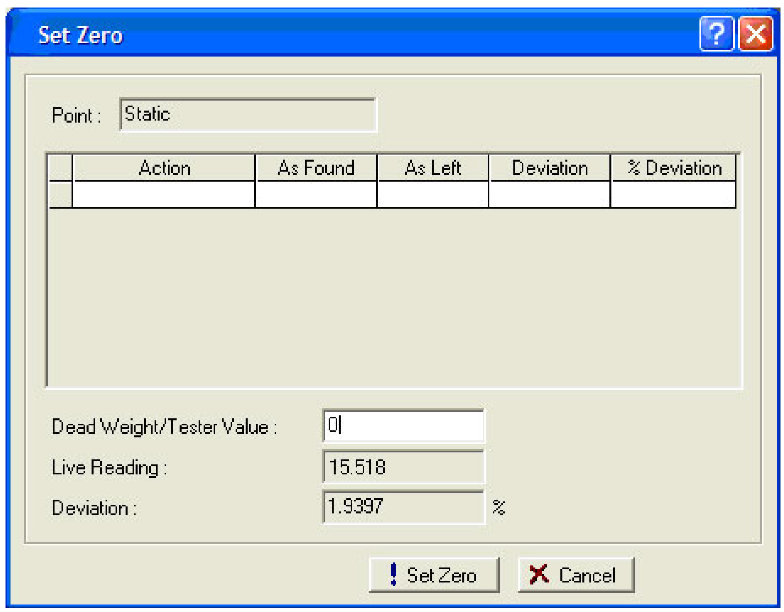


Figure 8-30. Set Zero

Note: You can click **Cancel** to exit the calibration without saving the changes. The system retains the previous calibration settings but logs the event in the event log.

Field	Description
Point	This **read-only** field identifies the point (differential pressure, static pressure, or temperature) being verified.
Action	Shows the activity being performed. Valid values are Set Zero, Set Span, Set Mid 1, Set Mid 2, and Set Mid 3

Field	Description
As Found	Shows the sensor’s initial value.
As Left	Shows the sensor’s value after calibration.
Deviation	Shows the difference between the As Found value and the As Left value.
% Deviation	Shows the difference between the As Found and As Left values as a percentage.
Set Zero	Calibrate the zero value (0% of range) for the in differential pressure (orifice only), static pressure, or temperature. This should correspond with the Low Reading EU (0% Count) and is the low value for the input. Set the **Dead Weight/Tester Value** (in engineering units). This is the input desired for the test value and is the actual value expected by the test equipment being calibrated against. For example: When calibrating temperature for an RTD input, enter the degree value associated with the resistance set up in the decade box or other equipment.
Set Span	Calibrate the span value (100% of range) for differential pressure (orifice only), static pressure, or temperature. Set the **Dead Weight/Tester Value** (in engineering units). This should correspond with the High Reading EU (100% Count) and is the **high value** to the input (the top end of the expected operating range). For **static pressure** on an absolute-pressure device, remember to add in the actual atmospheric pressure, for example, 300 + 14.73.
Set Midpoints	If desired, calibrate midpoint 1 (such as 25% of range) for the differential pressure (orifice only), static pressure, or temperature, otherwise click the **Done** button. Midpoints allow you to specify the low, middle, and high calibration point between the zero and span endpoints. Set the **Dead Weight/Tester Value** (in engineering units). If desired, calibrate Midpoint 2 (such as 50% of range) for the Differential Pressure (orifice only), Static Pressure, or Temperature. Set Midpoint 2 allows you to specify the middle calibration point between the Zero and Span endpoints. If desired, calibrate Midpoint 3 (such as 75% of range) for the Differential Pressure (orifice only), Static Pressure, or Temperature. Set Midpoint 3 allows you to specify a third point between the Zero and Span endpoints. **Note:** You can calibrate Midpoints in any order from low to high or high to low.

6. Set test equipment to produce the expected results.

7. Complete the **Dead Weight/Tester Value** field. This value represents the low range (0%) of the instrument's measurement range.

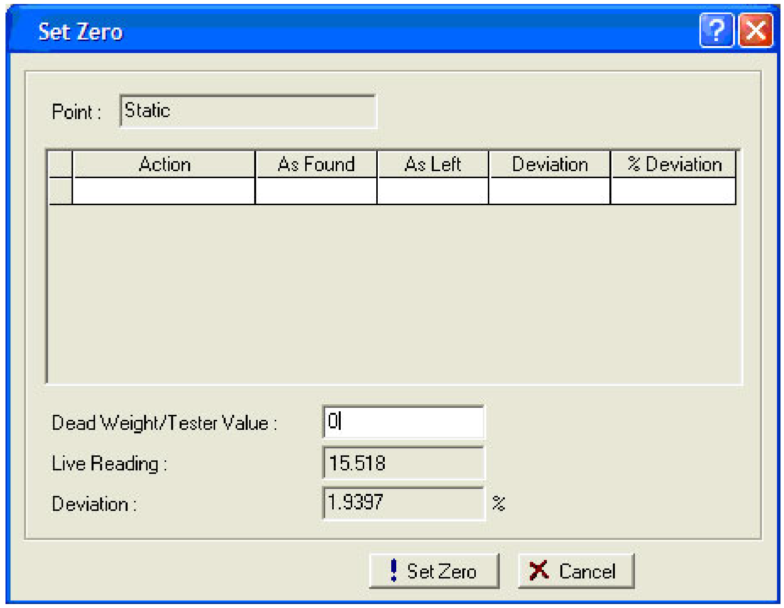


Figure 8-31. Dead Weight/Tester Value

When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

8. Click **Set Zero** when the live reading stabilizes. ROCLINK 800 adds the first line in the calibration log, renames the screen to **Set Span**, and changes the label on the **Set Zero** button to **Set Span**.

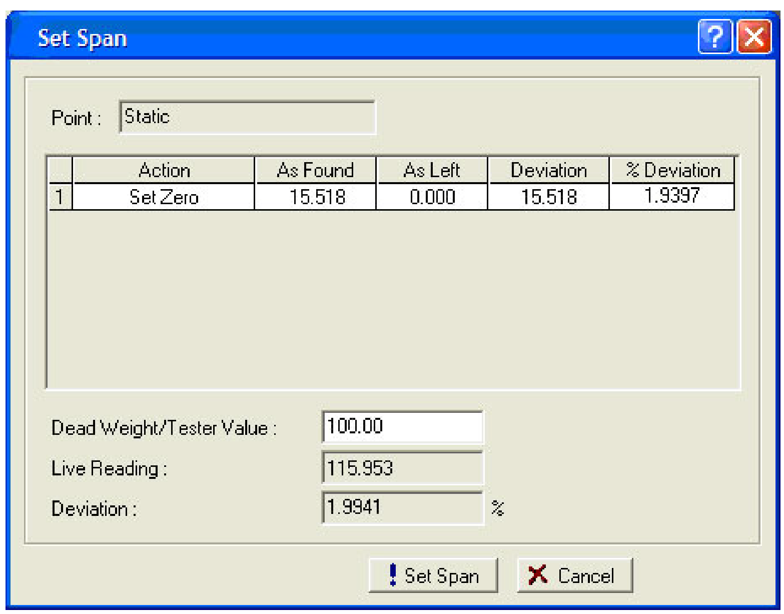


Figure 8-32. Set Span

9. Set test equipment to produce the expected results.

10. Complete the **Dead Weight/Tester Value** field with a value represents the upper limit (100% or "span") of the instrument's measurement range.

Note: ROCLINK 800 provides **100** as a default span value. Edit this default as necessary.

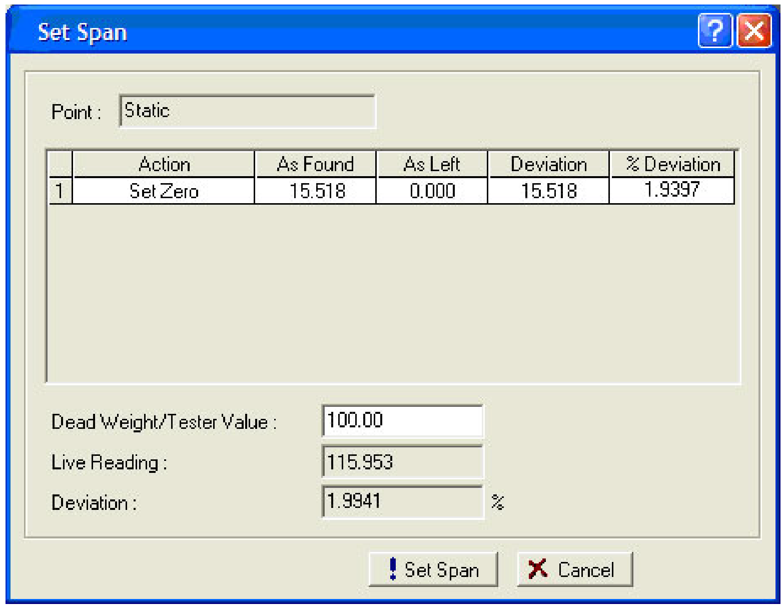


Figure 8-33. Set Span

When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once each second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

11. Click **Set Span** when the live reading stabilizes. ROCLINK 800 adds the next line in the calibration log, renames the screen, and changes the label on the **Span** button to **Set Mid 1**.

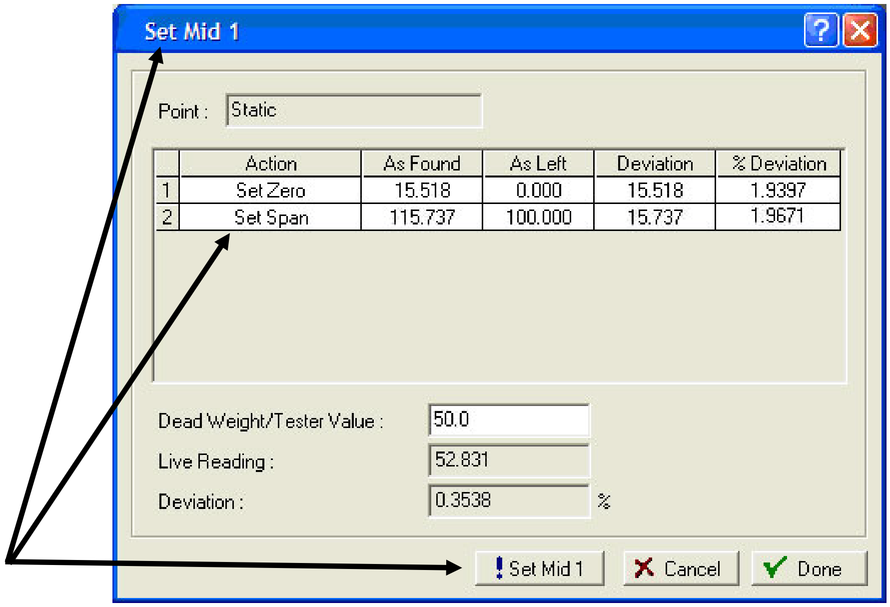


Figure 8-34. Set Span

Note: You can click **Done** at this point to complete the calibration or continue the calibration and define up to three calibration midpoints.

---

12. Set test equipment to produce the expected results.

13. Complete the **Dead Weight/Tester Value** field with the first midpoint calibration value (which in this example represents 50% of the instrument's range).

Note: ROCLINK 800 provides the previous midpoint value as a default value. Edit this default as necessary.

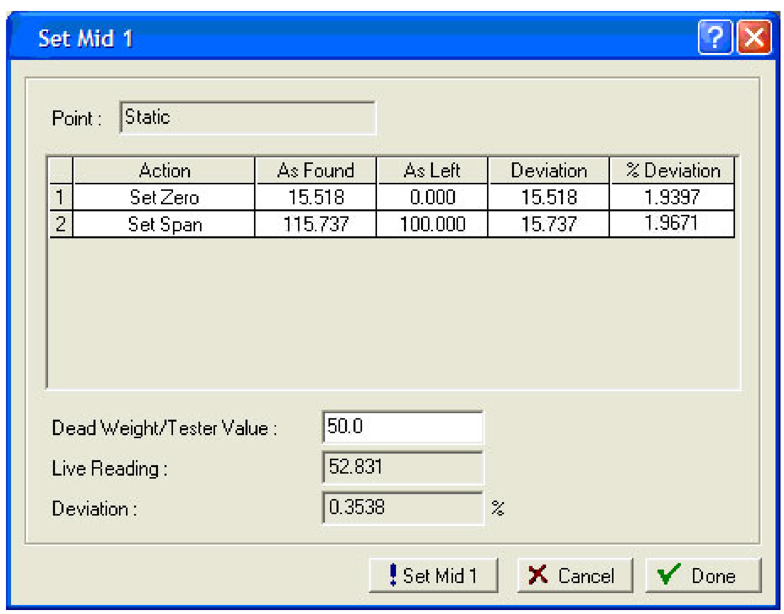


Figure 8-35. Set Midpoint 1

When you enter a value in the **Dead Weight/Tester Value** field, ROCLINK immediately begins comparing it once per second to the value in the **Live Reading** field (obtained from the static pressure sensor) and calculating the percentage deviation between the two values.

14. Click **Set Mid 1** when the live value stabilizes. ROCLINK 800 adds the next line in the calibration log, renames the screen, and changes the label on the **Set Mid 1** button to **Set Mid 2**.

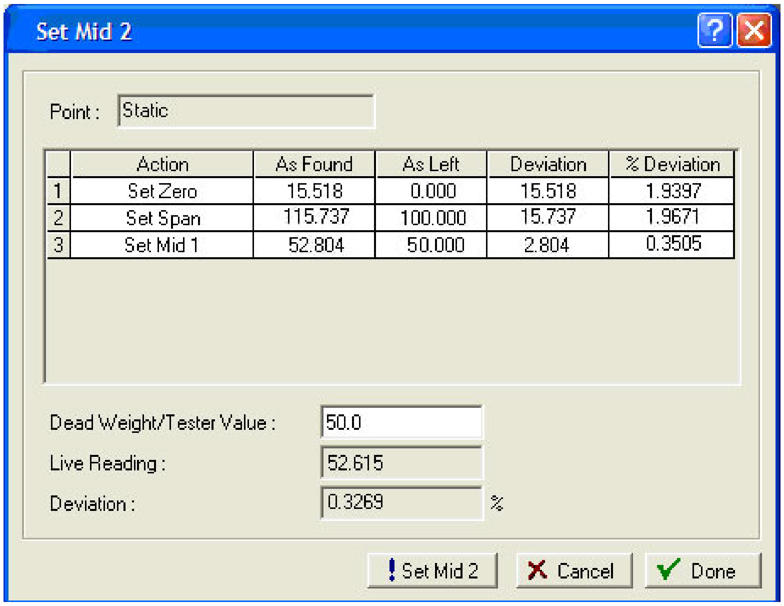


Figure 8-36. Set Midpoint 2

Note: To define up to two more midpoints, repeat steps 13 and 14.

15. Click **Done** when you have sufficient calibration information. The Meter Calibration screen displays.

Note: Following a calibration, you may re-run a verification to demonstrate to the customer that the measurement results are now within contractual parameters.

8.2.3 Zero Shift/Offset/RTD Bias

Use these buttons on the Meter Calibration screen to make adjustments to calibrated values. These allow you to adjust the calibrations at flowing conditions. The following example shows a zero shift adjustment.

Note: Because these adjustments can affect the contractual delivery of product, exercise caution in using these options.

1. From the Meter Calibration screen, click **Offset**. The Set Zero Shift (Offset) screen displays.

Figure 8-37. Set Zero Shift

Field	Description
Zero Shift	Click to zero the static pressure effect for the differential pressure input (Set Offset).
Offset	Click to send the value of the live reading to set the reading as close to zero as possible for a static pressure inputs (Measured Pressure Reading).
RTD Bias	Click to calibrate the offset (shift) of temperature throughout the RTD curve (Temperature Standard Reading).
Measured Pressure Reading	Sets the pressure as read from a calibrated pressure sensor. **Note:** This field displays **only** for static pressure points.
Pressure Offset	This **read-only** field shows the difference between the live pressure reading and the measured pressure reading that ROCLINK 800 applies to the pressure value. **Note:** This field displays **only** for static pressure points.

2. Complete the **Measured Pressure Reading** field with a line pressure value obtained from an independent pressure measurement device and begin monitoring the value in the Pressure Offset field. Each second the system compares the live reading against the value you enter. When the value in the Pressure Offset field stabilizes, click **Set Offset**. ROCLINK 800 sets the pressure offset and adds a line to the calibration log.

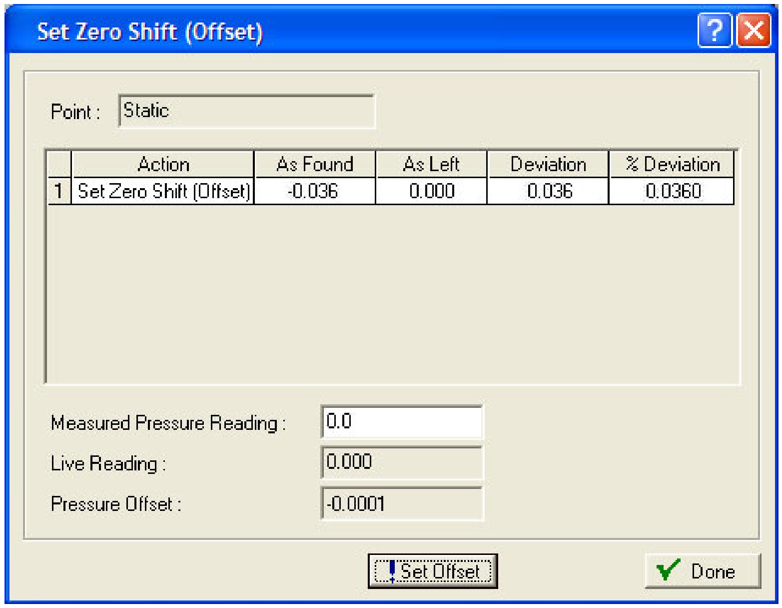


Figure 8-38. Set Zero Shift

3. The system then reflects this offset as an adjustment in calculations and lists this value on the AI Calibration Values screen (**Utilities > AI Calibration Values**).

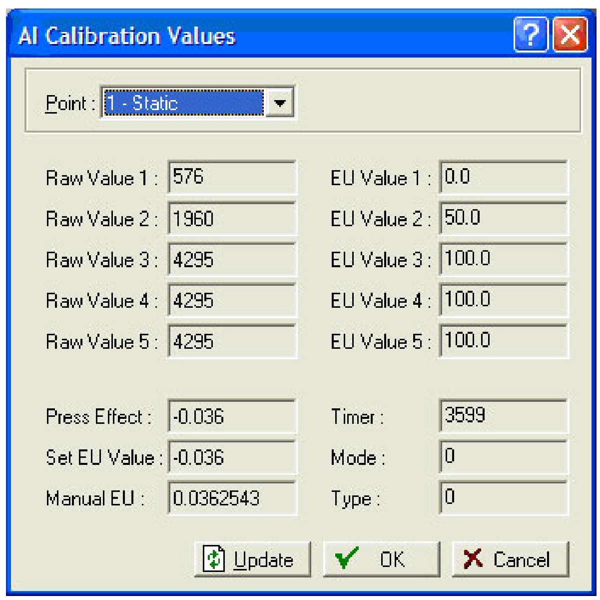


Figure 8-39. AI Calibration Values

Sending the Differential Pressure Zero Shift (Offset)

After you have calibrated differential pressure, click **Zero Shift** to zero the static pressure effect for the differential pressure input if required.

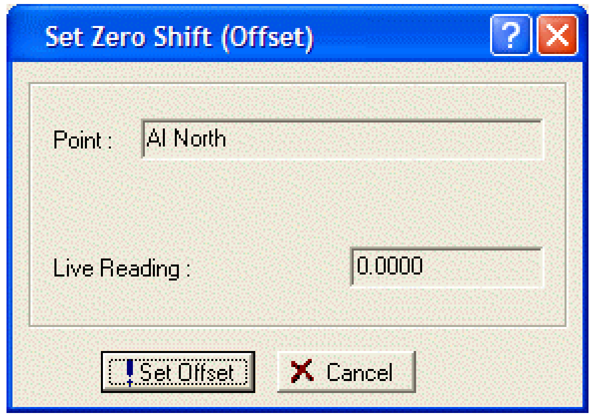


Figure 8-40. Set Zero Shift (Offset)

1. After you have calibrated differential pressure, click **Zero Shift** to zero the static pressure effect for the differential pressure input if required.
2. Apply the typical line pressure to both the high and low side of the sensor.
3. Click **Set Offset** to send the value to the live reading to get the reading as close to zero as possible.
4. Click **Done** or **Cancel** to close the dialog box.

Sending the Static Pressure Offset

Sets the **Offset** to send the value of the live reading to get the reading as close to zero as possible for a static pressure input.

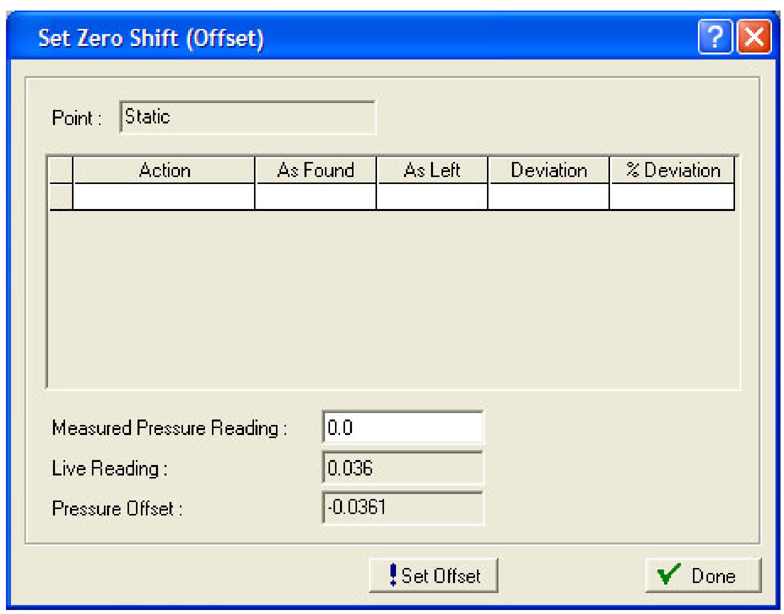


Figure 8-41. Set Zero Shift (Offset)

1. After you have calibrated static pressure, click **Offset** to calibrate the offset (shift) of static pressure if required.

2. Enter a value for the **Measured Pressure Reading**, which is the pressure as read from a calibrated pressure sensor.
3. Click **Set Offset** to send the value to the live reading to get the reading as close to the measured reading as possible.
4. Click **Done** to close the dialog box.

Sending the Temperature RTD Bias

Calibrate the offset (shift) of temperature throughout the RTD curve if required.

1. After you have calibrated the temperature input, click **RTD Bias** button on to calibrate the offset (shift) of temperature throughout the RTD curve if required. The Set RTD Bias screen displays.

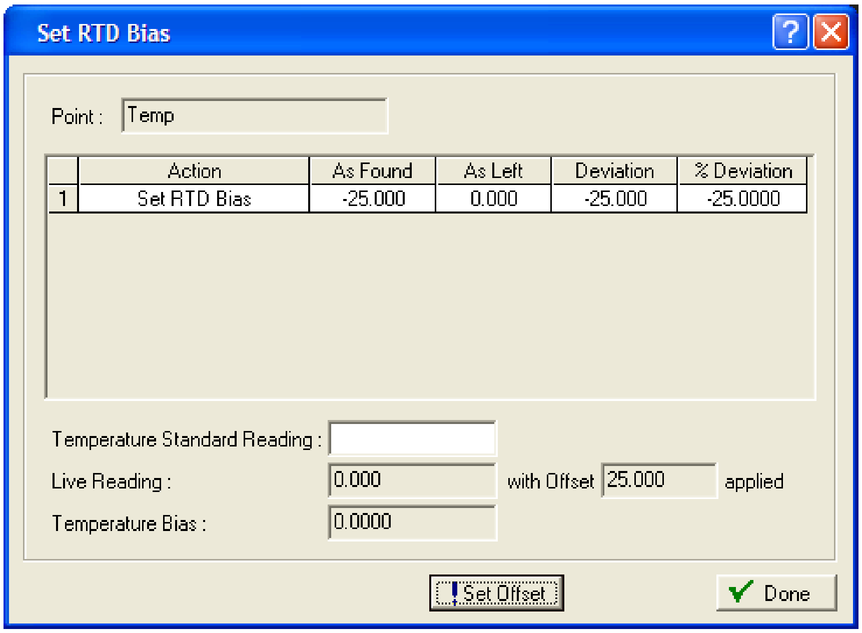


Figure 8-42. Set RTD Bias

Field	Description
Temperature Standard Reading	Sets the temperature as read from a calibrated temperature probe. **Note:** This field displays **only** for temperature points.
Live Reading	This **read-only** field shows the live temperature reading.
With Offset Applied	This **read-only** field shows the live temperature reading with the calibrated offset applied.
Temperature Bias	This **read-only** field shows the difference between the live temperature reading and the entered standard temperature reading that ROCLINK 800 applies to the temperature value. **Note:** This field displays **only** for temperature points.

2. Enter a value for the **Temperature Standard Reading**, which is read from a calibrated temperature probe.
3. Click **Set Offset** to send the value to the live reading to get the reading as close to the measured reading as possible.
4. Click **Done** to close the dialog box.

8.3 Gas Meters Values

The Gas Meters Values screen displays a variety of values from the orifice or linear meter. You can use these for diagnostics or monitoring. Select either **Gas Meters > Values > Orifice Meter** or **Gas Meters > Values > Linear Meter**. The meter values screen displays.

8.3.1 Gas Meters Values: Values Tab

Use the Values tab to view a variety of values from the selected meter. The Values tab displays when you first access the Meter Values screen.

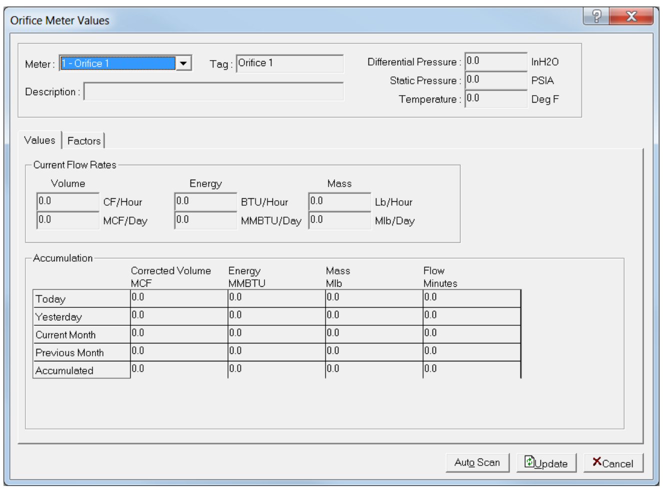


Figure 8-43. Meter Values (Orifice) – Values tab

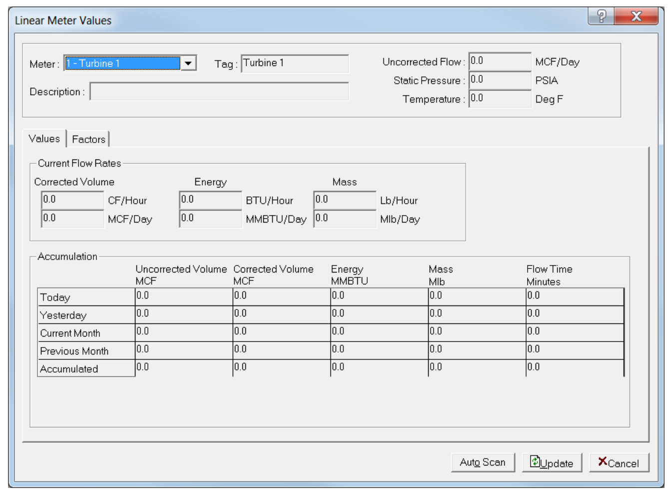


Figure 8-44. Meter Values (Linear) – Values tab

1. Review the following fields for your organization's values.

Field	Description
Meter	Selects the meter that you wish to monitor. Click ▼ to display all defined meter runs.
Tag	This **read-only** field shows the short description associated with the selected meter.
Description	This **read-only** field shows the description associated with the selected meter.
Differential Pressure (orifice)	This **read-only** field shows the differential pressure value for the selected meter run.
Uncorrected Flow (linear)	This **read-only** field shows the uncorrected flow value for the selected meter run.
Static Pressure	This **read-only** field shows the static pressure value for the selected meter run.

Field	Description
Temperature	This **read-only** field shows the temperature value for the selected meter run.
Current Flow Rates	These **read-only** fields display the current Flow Rate, Energy Rate, and Mass Rate.
Accumulation	The **read-only** field shows the accumulated flow, energy, flowing minute, and mass values.

2. Click ▼ select a defined orifice or turbine meter.
3. Review the screen's contents. You can click **Update** to refresh the display on demand or **Auto Scan** to start updating the display once per second.
4. Proceed to *Section 8.3.2* to view the Meter Factors tab.

8.3.2 Gas Meters Values: Factors Tab

Use the Factors tab to view meter factor values for the selected meter run.

1. Select the **Factors** tab. The Factors screen displays.

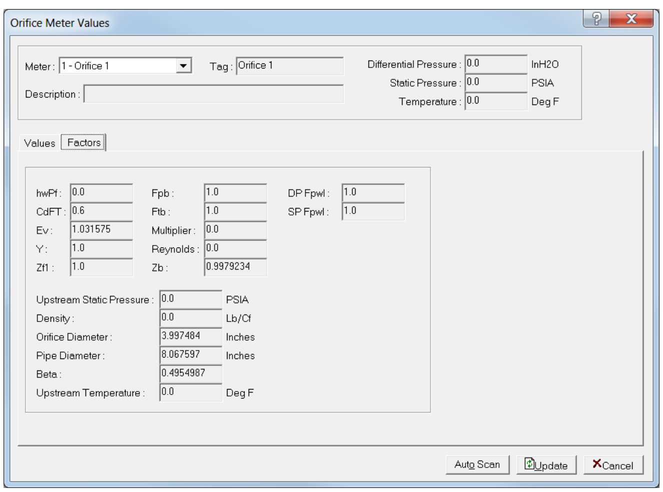


Figure 8-45. Meter Values(Orifice) – Factors tab

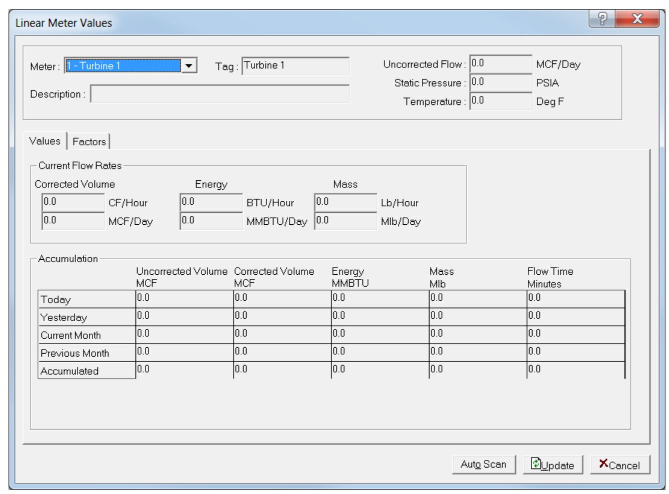


Figure 8-46. Meter Values (Linear) – Factors tab

2. Review the following fields for your organization's values.

Field	Description
Factors	The **read-only** fields show current status of calculated and entered parameters of the meter. These values are calculated by the firmware.

3. Review the screen's contents. You can click **Update** to refresh the display on demand or **Auto Scan** to start updating the display once per second.

8.4 Plate Change

The Plate Change option allows you to change the size of an orifice plate under flowing or non-flowing conditions.

1. Select **Gas Meters > Plate Change**. The Plate Change field displays.

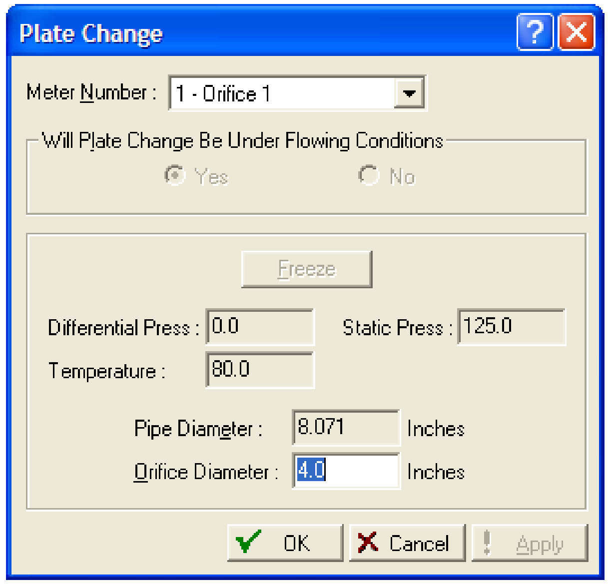


Figure 8-47. Plate Change

2. Review the following fields for your organization's values.

Field	Description
Meter Number	Sets the meter number to be changed. Click ▼ to display all defined meters.
Will Plate Change…	Indicates the conditions during the plate change. Valid values are **Yes** (plate change occurs during flowing conditions) or **No** (plate change occurs during non-flowing conditions). **Note:** If you choose **Yes**, you can freeze inputs for the duration of the plate change.
Freeze	Click to freeze input values for the duration of the plate change. **Note:** This button is active **only** if you are performing the plate change under flowing conditions. The system holds all I/O values in manual mode at the current value. Click **OK** to return values to an active state at the completion of the plate change.
Differential Press	This **read-only** field shows the frozen differential pressure value during the plate change.
Static Press	This **read-only** field shows the frozen static pressure value during the plate change.
Temperature	This **read-only** field shows the frozen temperature value during the plate change.

Field	Description
Pipe Diameter	This **read-only** field shows the size of the pipe diameter for the selected meter.
Orifice Diameter	Sets, in inches or millimeters, the exact size of the orifice diameter of the new plate.

3. Click ▼ to select the correct **Meter Number** for the meter run you are changing.
4. Select **Yes** if the plate change occurs during flowing conditions. You will be allowed to freeze the inputs for the duration of the plate change process. Click **No** for non-flowing conditions.
5. Click **Freeze** if you are performing the plate change under flowing conditions, the dialog box shows you the freeze value of each meter input (for the purpose of calculating gas flow) while the change occurs. All I/O values are held in manual mode at the current value. The values are returned to an active state after clicking **OK** in the plate change dialog box.
6. Set the exact size of the **Orifice Diameter** (inches or millimeters) of the new plate.
7. Click **Apply** if you change any parameters on this screen.
8. Click **OK** when you complete the plate change. If you have frozen values, this returns system values to flowing conditions.

Chapter 9 – The Liquid Meters Menu

In This Chapter

The user programs for the ROC800L – Liquid Calculations, Batching, Batch Queue, Proving, and Reporting – are factory-loaded. These programs enable the ROC800L to perform liquid flow calculations and corrections, batch control, proving, and reporting, and make the ROC800L ideal for fiscal measurement, custody transfer, batching, and meter proving. The options on the Liquid Meters menu – Preferences, Product, Density Interface, Station, and Meter – enable you to configure the major components of the system. You must use the directory tree to access the optional programs (Batching, Batch Queue, Proving, and Reporting), which may or may not be applicable to your organization. .

Note: This chapter assumes you have a general knowledge of liquid measurement and meter proving.

9.1 Overview

The ROC800L software measures all of the recognized API hydrocarbon groups:

- **Group A** – Crude Oils.
- **Group B** – Refined Products (gasoline, jet fuel, diesel fuel).
- **Group C** – Special Applications.
- **Group D** – Lubricating Oils.
- **Group E** – Light Hydrocarbons.

The ROC800L monitors, measures, and controls equipment in a plant or remote environment. The ROC800L is ideal for any application requiring flow computation; Proportional, Integral, and Derivative (PID) control loops; logic sequencing control; and up to six liquid meter runs. Two versions of the ROC800L are available: the ROC809L (with nine module slots) and the ROC827L (which is expandable from three to 27 module slots). –

Factory-installed user programs provide the American Petroleum Institute (API) calculations, in accordance with Manual for Petroleum Measurement Systems (MPMS). The user programs perform the following functions:

- **Liquid Calculations:** Accurately measures liquids flowing through a meter, and performs volume corrections based on density, temperature, and pressure measurements.
- **Batching:** Allows you to configure and schedule multiple batches to record and control the flow of a liquid. Batch accuracy is improved through the retroactive calculation and re-calculation using user-defined variables.
- **Proving:** Performs meter proving by operating a 4-way control valve, calculating a new meter factor, and storing meter factor information on up to 24 products for each of up to six meters. The ROC supports unidirectional, bidirectional, large volume, small volume, and master meter proving.
- **Reporting:** Generates printable reports in compliance with API MPMS Chapter 12.2.2, 12.2.3, and 21.2. User-designed reports can be created using ROCLINK 800 Configuration Software.

The liquid calculations comply with the latest API recommendations which include:

- **Double Math Precision:**
  The flow calculations occur in accordance with the double precision math recommendations of the GPA and API in MPMS, 2004 version as presented in IEEE Standard 754 (1985).

- **Temperature Compensation:**
  The software compensates for variations in flowing temperature from the reference temperature you select. The system has the ability to accept an input from an RTD or a transmitter with a 4 to 20 mA signal and compensate flow calculations for changes in temperature in accordance with ASTM-D1250-80, ASTM D1250-04, API 2540-80 and API MPMS Chapter 11.1, 2004 tables, including 6A, 6B, 6C, 6D, 24, 24A, 24B, 24C, 24D, 54A, 54B, 54C, 54D, 54E, 60A, 60B, 60D, and GPA TP27.
- **Pressure Compensation:**
  The software compensates for variations in flowing pressure from the reference pressure you select. The system has the capability to accept a 4-to-20 mA or HART® signal from a pressure transducer and compensate flow calculations for volumetric changes due to changes in pressure per the following standards and tables: API, MPMS Sections 11.2.1, 11.2.2, 11.2.1(M) 11.2.2(M) Automatic Pressure Compensation
- **Pulse Integrity:**
  Provides continuous monitoring of the pulse inputs and an error indication from the pulse transmission for a dual pulse turbine meter. The Advanced Pulse Module (APM) allows the Liquid Calculation User Programs to sense pulse integrity in accordance with (API, MPMS Chapter 5.5 level A, B, C, D or E) and monitors pulse performance.
- **Density Compensation:**
  The software compensates for variations in densities based on a signal from a live densitometer. The ROC800L accepts signals from 4-to-20 mA, pulsed, or frequency input from a density measuring device such as a Solartron 7835/7845, UGC, or Sarasota densitometer. Tables used for density corrections include 5A, 5B, 5D, 23A, 23B, 23D, 53A, 53B, 53D, 53E, 59A, 59B, and 59D.

Point Types

The following point types are associated with the ROC800L user programs:

- Point Type 200 – Liquid Preferences
- Point Type 201 – Liquid Products
- Point Type 202 – Density Interface
- Point Type 203 – Liquid Station
- Point Type 204 – Liquid Meter
- Point Type 206 – Prover Configuration
- Point Type 207 – Prover Trial Data
- Point Type 208 – Prover Report Data
- Point Type 210 – Station Batch Configuration
- Point Type 211 – Station Batch Current
- Point Type 212 – Station Batch History
- Point Type 213 – Meter Current Batch
- Point Type 214 – Meter Batch History

- Point Type 215 – Batch Queue Configuration
- Point Type 216 – Batch Queue
- Point Type 219 – Reporting

Refer to the *ROC800L Protocol Specifications Manual* (Form A6294) for further information on these point types.

9.1.1 Software Components

To use the ROC800L successfully, you must configure the component programs (accessed through the Liquid Meters option on the ROCLINK 800 menu bar), ideally in the sequence described in this chapter.

The LiquidCalcs User Program provides flow rates, totals, and flow weighted averages for liquid hydrocarbon measurement, as well as calculated densities and correction factors for audit trail and calculation verification.

Figure 9-1 shows the relationships of the software components.

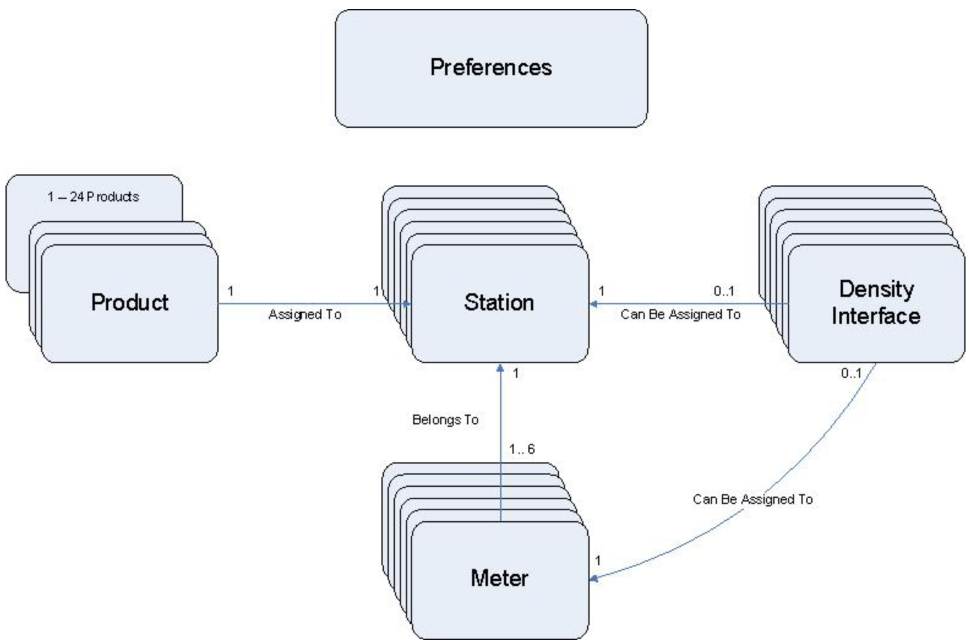


Figure 9-1. Liquid Measurement Configuration

Component	Description
Preferences	When you configure the Liquid Calculations User Program, preferences are the first software component you define. Preferences are global and affect the entire system. Define Preferences on the Liquid Preferences screen.
Product	A product is the fluid flowing through the meter. You assign products to stations. You can only assign one product to any one station at a time.
Station	You can assign up to six meters to a station. You assign the product at the station level, so all meters belonging to the same station use the same product.

Component	Description
Meter	The system supports up to six meters (or streams). Each meter must belong to a station. You can assign all six meters to a single station, or you can assign each meter to its own unique station. This is important because the product that the meter is flowing is inherited from the station. You can configure up to 24 products that any meter can use.
Density	You configure a density interface to represent a densitometer or other density measurement device. You can assign a density interface to either a station or a meter. The system supports up to six density interfaces. This allows each meter to have a dedicated densitometer. A densitometer at the station level, so all meters assigned to the station will share the same density interface.

9.2 Liquids Meters Menu

The Liquid Meters option on the ROCLINK 800 menu bar enables you to easily access the major components of the Liquid Calculations programs:

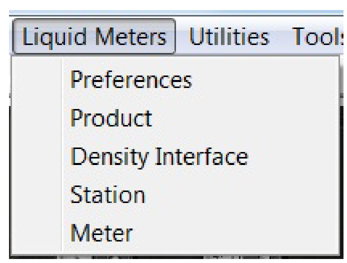


Figure 9-2. Liquid Meters Menu

9.2.1 Preferences

Use the Liquid Meters Preferences screen to define global selections for the ROC800L Liquid Applications software. To configure, select **Liquid Meters > Preferences** from the menu.

Note: You can also access this option using the Directory Tree.

Preferences: General Tab

Use the Liquid Preferences General screen to define global Liquid Units Selections for both stations and meters, such as the Calculation Period, measurement units for process inputs, process outputs, process variables, flow rate, volume, and mass units.

Note: The ROC800L allows you to select various units of measurement for each type of process variable. This selection is in effect for all stations and meters.

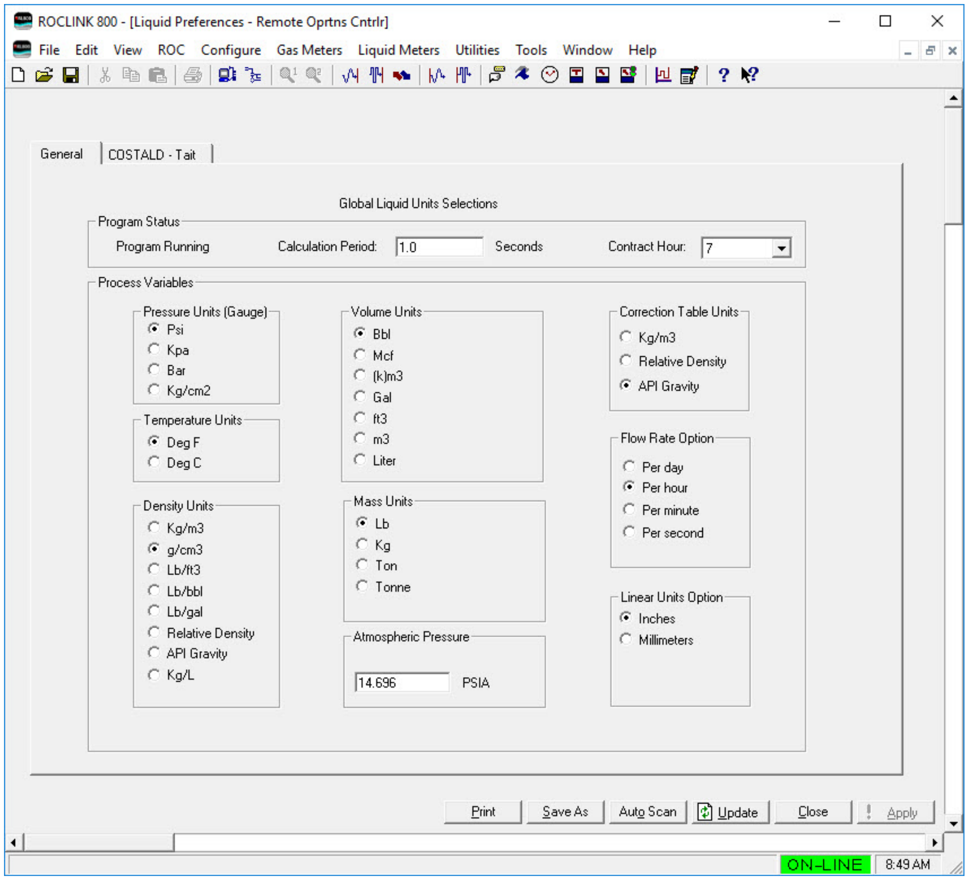


Figure 9-3. Preferences – General tab

Field	Definition	
Program Status	This **read-only** field indicates the current status of the Liquid Calcs user program:	
	Program Not Running	Start the user program
	Program Running	Program is ready to configure
	License key not available	Install a LiquidCalcs license key to use the program
Calculation Period	Sets how frequently the program performs density and volume correction factor calculations and how often the ROC800L updates accumulators and flow rates. Valid values are 0.25 to 5 seconds. The default is **1.0**. This does have an impact on processor loading. API 21.2 specifies the calculations should be done at least every 5 seconds.	

Field	Definition
Contract Hour	Sets the contract hour for all liquid stations and meter runs. The contract hour you select on this screen overrides any change you make to the contract hour on the History Segment Configuration screen for liquid stations and meters. **Note:** This setting does not change the contract hour you select on the History Segments Configuration screen for gas stations or meter runs.
Pressure Unit (Gauge)	Sets the units of measurement to use with pressure on process inputs. Regardless of selection, all pressure units represent a gauge pressure, rather than an absolute pressure. Valid selections include: **Psi** (default), **kPa**, **Bar**, and **Kg/cm2**. The units for pressure apply to all pressure values in the ROC800L unit, including line pressure, vapor pressure, and any flow weighted pressure averages.
Temperature Units	Sets the units of measurement for use with temperature on process inputs. Valid selections are **Deg F** and **Deg C**. The default is **Deg F**. The unit of measurement for temperature applies to all temperature input values and temperature flow weighted averages. The exception is the base temperature, which is a selection at the station level, so it is possible to have input temperature in Deg C with a base temperature of 60 Deg F. **Note:** If you select **User Selected** in the **Base Temperature** field (Liquid Turbine > Volume Correction Tab), the units of measurement that you select in the **Temperature Units** field (Deg F or Deg C) **must match** the units of measurement in the **Base Temperature** filed (Liquid Turbine > Volume Correction Tab).
Density Units	Sets the units of measurement for all density values, both process inputs (observed density) and calculated outputs (base density and meter density). Valid selections are **Kg/m3**, **g/cm3**, **Lb/ft3**, **Lb/Bbl**, **Lb/gal**, **Relative Density**, **API Gravity**, and **Kg/L**. The default is **Kg/m3**. Relative Density is the density of the fluid divided by the density of water, in like units, and so as a ratio is unit-less. API Gravity is a historical representation of relative density, usually for crude oil, and uses the calculation: *API Gravity = (141.5 / RelativeDensity) – 131.5* The units are referred to as degrees API. All density input values are in the units you select and all calculated density values display in the same units, regardless of the native density units of the calculation. Conversions are done as necessary to do the appropriate calculation.

Field	Definition
Volume Units	Sets the units for indicated volume, gross volume, gross standard volume, and net standard volume accumulations. Volume Units also defines the numerator of the flow rates of these quantities with the denominator you define in the flow rate option. For example, if you select m3 for volume units and you select a flow rate option of “hour”, the volume flow rates display in units of m3/hr. Valid selections are **Bbl**, **Mcf**, **(k)m3**, **Gal**, **ft3**, **m3**, and **Liter**. The default is **Bbl**.
Mass Units	Sets the units for accumulated mass quantities and along with the flow rate option defines the units for mass flow rates. Valid selections are **Lb** (default), **Kg**, **Ton** (short), and **Tonne**.
Correction Table Units	Historically, multiple temperature correction tables were available to use based on different density units and/or base temperatures. Set the density units to determine which table to use. This selection is only valid for applications using the 1980 API standard for temperature correction (Chapter 11.1 – 1980). For a 60 Deg F base temperature, there were two sets of tables – one using API gravity (Tables 5/6) and one using relative density (Tables 23/24). This selection allows you to select which table to use (although they give identical results). At a base temperature of 15 Deg C or 20 Deg C, the correction table units you select should always be **kg/m3**. For applications using the 2004 API standard (Chapter 11.1 – 2004), this selection is ignored. Valid selections are: **Kg/m3** – Use Tables 53, 54, 55, 59, and 60. **Relative Density** – Use Tables 23 and 24. **API Gravity** – Use Tables 5 and 6.
Flow Rate Option	Sets the time basis for all flow rate parameters. Valid selections are **Per day**, **Per hour**, **Per minute**, and **Per second**. The default is **Per day**.
Linear Unit Option	Sets the units that display on the meter spool factor screen for Rotor Hub Area, Wall Thickness, and Meter Radius. Internally, however, it is not used as it is only important that the units of these three parameters “cancel out” – that is, the wall thickness must be in the same units of length as the meter radius, and the Rotor Hub Area must be in that unit squared. Changing this option between inches and millimeters changes the meter spool factor units between feet and meters. Valid selections are **Inches** and **Millimeters**. The default is **Inches**.

Preferences: COSTALD-Tait Tab

COSTALD-Tait is a method of density and volume correction for use with light hydrocarbons (such as liquid propane or other natural gas liquids) for which the composition is known The COSTALD (COrresponding STates Liquid Density) equation combined with the Tait equation allow calculation of a flowing density at operating pressure and temperature as well as a base density to determine a volume correction factor (VCF). The ROC uses the properties you configure on this screen only in this calculation. All stations and all meters you configure to use COSTALD-Tait use the information you enter in this screen. The COSTALD-Tait information you configure are the properties of the various components that make up a light hydrocarbon mixture.

Note: Modify these values only if a new physical constants standard is released.

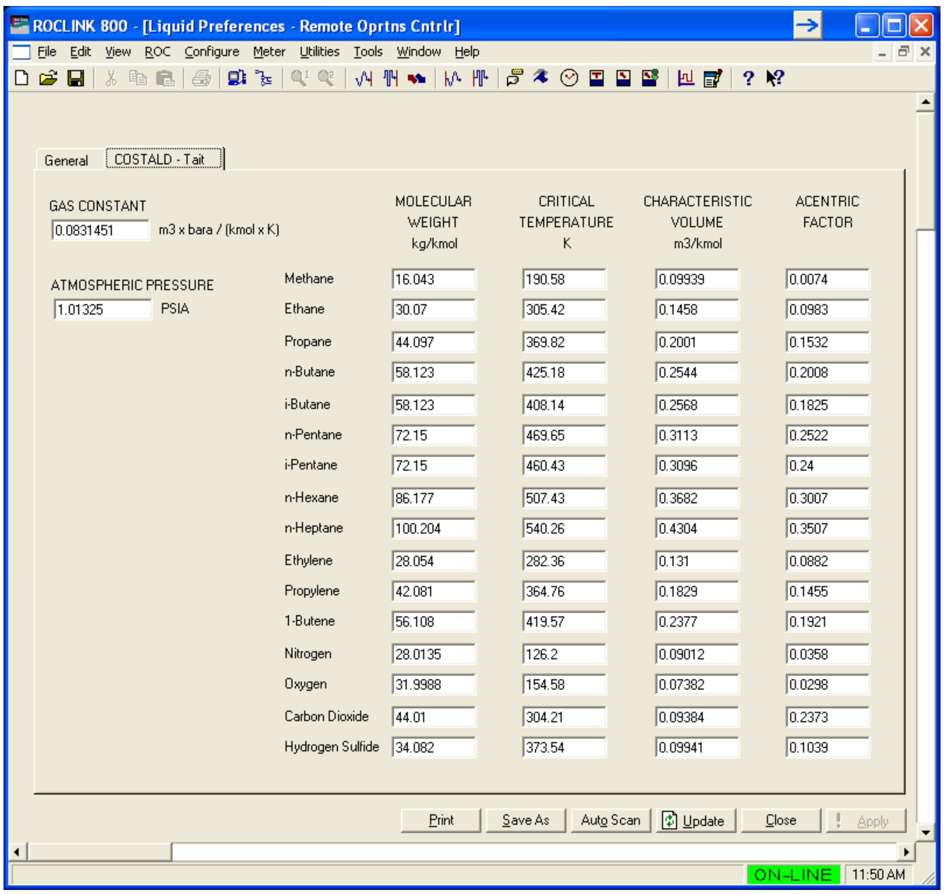


Figure 9-4. Preferences – COSTALD-Tait tab

Field	Description
Gas Constant	Sets the Gas constant for use in COSTALD-Tait calculations in m3 x bara / (kmol x K).
Atmospheric Pressure	Sets the value of the atmospheric pressure (absolute) at the metering location. The value must be greater than zero, and is expressed in the configured pressure units.
Molecular Weights	Sets the Molecular Weight of the gas in kg/kmol.
Critical Temperature	Sets the Critical Temperature above which a gas cannot be liquefied, regardless of the pressure applied in K.
Characteristic Volume	Sets the Characteristic Volume in the gas in m3/kmol.
Acentric Factor	Sets the Acentric Factor to set the measure of the non-sphericity (acentricity) of the gas for use in COSTALD-Tait calculations.

9.2.2 Product

Select **Liquid Meters** > **Product** to define products and their fluid properties. A product flows through one or more meters that make up a station. In liquid pipeline applications, the product that flows through a given station may need to change dynamically. To facilitate this need for flexibility, the product definition is separate from the station definition and you assign the product to the station. At this point, you define all the products that might ever need to be measured, even if you currently do not assign them to a station.

The Liquid Product screen displays, showing the Product Definition tab.

Product: Product Definition Tab

Use this tab to provide general information about a product. You can define up to 24 products.

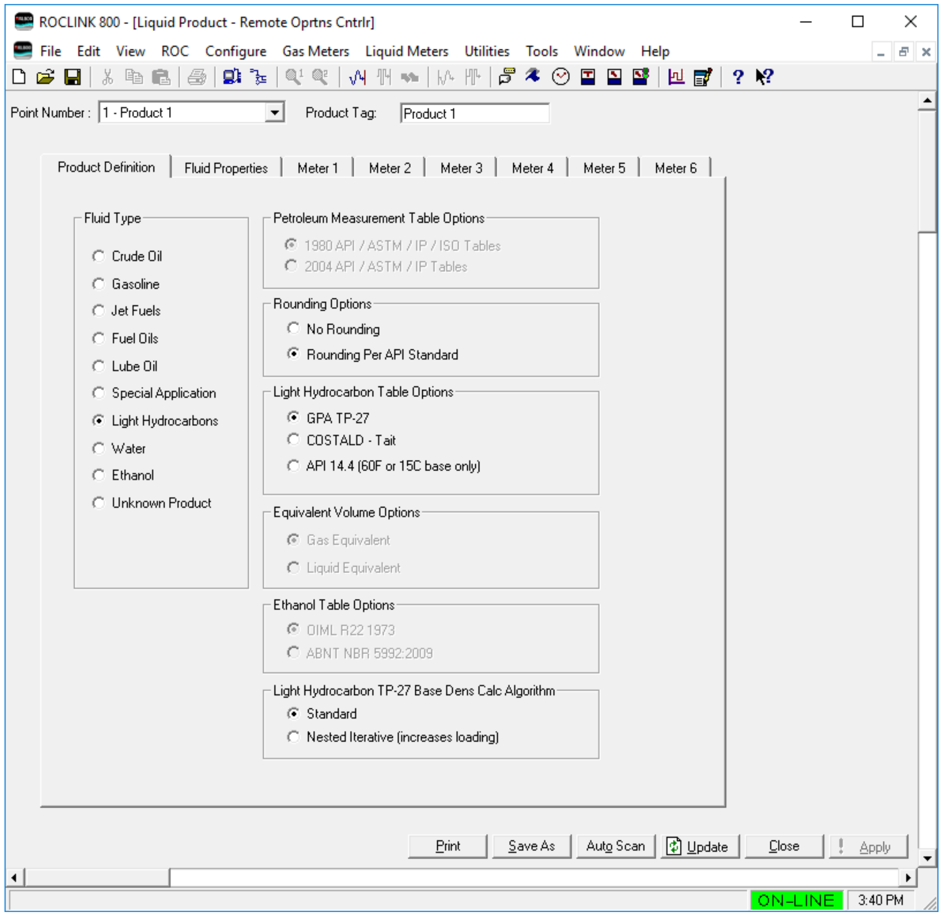


Figure 9-5. Product – Product Definition tab

Field	**Description**
Fluid Type	Sets the specific type of fluid to associate with this product number. The default is **Unknown Product**. The first five fluid categories (Crude Oil, Gasoline, Jet Fuel, Fuel Oil, and Lube Oil) are covered by API Chapter 11.1 with density ranges as:

Fluid Type		**Density Range (kg/m3)**
Crude Oil		610.6 to 1163.5
Refined Products	Fuel Oils	838.3127 to 1163.5
	Jet Fuels	787.5195 to 838.3127
	Transition Zone	770.3520 to 787.5195
	Gasolines	610.6 to 770.3520
Lubricating Oils		800.9 to 1163.5

For these fluids, API provides coefficients that allow the coefficient of thermal expansion (alpha)

Field	Description
	to be calculated from the base density. The temperature correction factor (CTL) is then calculated from the temperature difference between flowing and base conditions and the calculated alpha. The Transition Zone is not a selectable fluid type, but a density range that has it own coefficients. Either Jet Fuels or Gasolines use these coefficients if the base density falls into this range. Special application fluids are also covered by API Chapter 11.1 and use the same equation to calculate CTL, but the user must supply the coefficient of thermal expansion (alpha). If you select a crude oil, gasoline, jet fuel, fuel oil, lube oil, or special application fluid, you will be able to select between the 1980 and the 2004 version of the API 11.1 standard. Light hydrocarbons fall into the relative density range of 0.35 to .688 @ 60F (349.6556 to 687.323 kg/m3) and are covered by either GPA TP-27 (API 11.2.4) or COSTALD-Tait. TP-27 does not depend on knowing the exact composition, but is based on finding where the density falls between two reference fluids, so this is best used with a mixture of Natural Gas Liquids (NGLs) / Liquefied Petroleum Gases (LPGs) of limited components that are close in molecular weight. COSTALD-Tait allows you to enter the exact composition and to use it where there are many different components of widely varying molecular weight. You can see there is some overlap with the gasoline and crude oil ranges above. Condensation from gas wells is typically treated as crude oil, as long as the base density is above 610.6 kg/m3. **Note:** Unknown fluid is used by the ROC800L for error conditions only, such as after a loss of power in a continuous batching application, where it may be uncertain what fluid is currently flowing through the station. The program does not perform correction calculations if you select Unknown Product as the Fluid Type (CTL and CPL = 1.0).
Petroleum Measurement Table	Sets the petroleum measurement table option to associate with the type of fluid. **Note:** The Liquid Measurement Application program currently supports the 1980 & 2004 versions for API/ASTM/IP Volume Correction Tables as well as ISO 91.1 & ISO 91.2.
Rounding Options	Sets to use API Standard rounding for volume correction factors. When you select **No Rounding**, no rounding is done on intermediate or final calculated variables, and values display in full double precision. When you select **Rounding Per API Standard**, calculation outputs are rounded

Field	Description
	according to the appropriate API standard (API MPMS Chapter 11 and 12). **Note**: Other User programs (including batching and proving) modify their behavior according to what you select for this option.
Light Hydrocarbon Table Options	Sets the light hydrocarbon measurement table option to use for volume correction. **Note:** This option is available only if you select **Light Hydrocarbons** as the Fluid Type.
Equivalent Volume Options	Selects the volume equivalents when the product selection is a light hydrocarbon and the calculation is API 14.4. Valid options are Gas Equivalent (show the component volumes as a gas equivalent volume) or Liquid Equivalent (show the component volumes as a liquid equivalent volume). **Note:** This option is **only** available if you select **Light Hydrocarbons** as the Fluid Type and **API 14.4** as the Light Hydrocarbon Table Options.
Ethanol Table Options	Sets the ethanol measurement table option to use for density determination and volume correction. Valid options are OIML R22 1973 or ABNT NBR 5992. **Note:** This option is **only** available if you select **Ethanol** as the Fluid Type.
Light Hydrocarbon TP-27 Base Dens Calc Algorithm	Sets how the system calculates base density. Valid options are: **Standard** – This method uses API standards to calculate CTL (API 11.2.4), equilibrium pressure (API 11.2.5), and CPL (API 11.2.2). API 11.2.4 is used to determine base density from an observed density and observed temperature. The base density calculated from this procedure is then adjusted for pressure using an iterative calculation of vapor pressure and CPL. This is the **default**. **Nested Iterative** – The same methods are used as the Standard option, but all three methods are calculated in an iterative procedure to converge on the base density. Because API 11.2.4 is itself an iterative procedure, this method uses significantly more CPU bandwidth. **Note:** This option is **only** available if you select **Light Hydrocarbons** as the Fluid Type and **GPA TP-27** as the Light Hydrocarbon Table Options.

Product: Fluid Properties Tab

Use this tab to set compressibility and density options for the selected fluid.

Note: Alarm limits set in this screen apply if you assign this product to a station with a density input that you assign to either a station or to a meter you associate to the station AND you enable alarms on that density input.

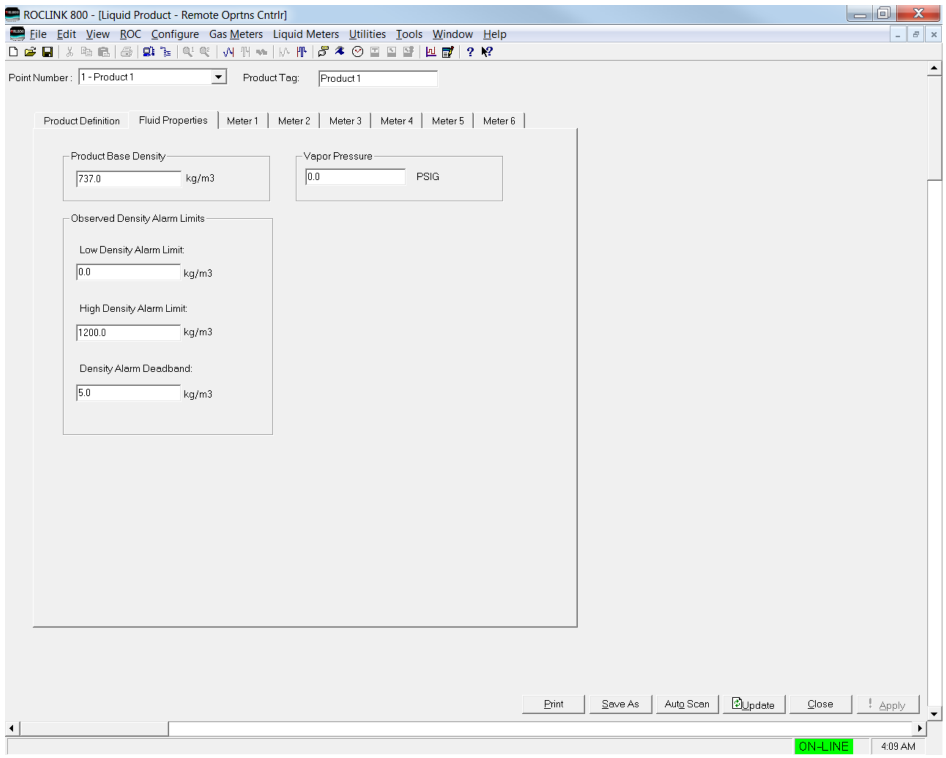


Figure 9-6. Product – Fluid Properties tab

Field	Definition
Product Base Density	Sets a density for the Fluid Type you select at contract (base) temperature and pressure in the density units you select. If you select a type of live density measurement or a COSTALD-Tait calculation method, the user program calculates the Product Base Density, but the user program may still use this value as a default, so ensure you use a reasonable value for the fluid you are measuring. **Note**: If you do not configure another densitometer or other density source, this static value is the base density.
Low Density Alarm Limit	Sets a low density limit to trigger low alarms at the Density Interface for the **measured** density you associate with this product.
High Density Alarm Limit	Sets a high density limit to trigger high alarms at the Density Interface for the **measured** density you associate with this product.

Field	Definition
Density Alarm Deadband	Sets an alarm deadband for the Density Interface when this product is in use.
Vapor Pressure	Sets the Vapor Pressure for the current Fluid Type product in pressure units you set. The vapor pressure is the equilibrium vapor pressure (bubble point) of the fluid at the flowing temperature. The equilibrium pressure is the minimum pressure at which bubbles of gas appear in a liquid. You enter this value or the user program calculates it if you select the COSTALD-Tait Light Hydrocarbon Table Option. For liquids with equilibrium vapor pressure less than atmospheric pressure (0 psig or 14.696 psia), this value will be set to 0.0, which includes all fluid types except light hydrocarbons. The user program calculates the pressure correction factor (CPL) as a function of the pressure difference between the flowing pressure and this pressure.
User Entered Alpha	Sets the coefficient of thermal expansion factor for use in calculation of the correction of the effect for temperature on a liquid (CTL). This number displays with an implied multiplier of 1000. For example, if you wish to enter a coefficient of thermal expansion factor of 0.0004181 per degrees F, enter **0.4181** into this field. API MPMS Chapter 11.1 2004 allows for a range of 0.000230 up to 0.000930 when using degrees F, and a range of 0.000414 up to 0.001674 when using degrees C. When using API MPMS Chapter 11.1 1980, the standard allows for a range of 0.000270 up to 0.000930 when using degrees F, and 0.000486 up to 0.001674 when using degrees C. **Note**: This option is **only** available if you select **Special Application** as a Fluid Type on the General tab.

Product: Meter (1 - 6) Tabs

Use the Meter tabs to configure meter factor and K-factor management on a per product basis, for each meter. The parameters on the Meter 1 through Meter 6 tabs show proving data from the six liquid meters from the last time they were proved while measuring this product. Generally, the proving application writes to these parameters and you do not need to alter them.

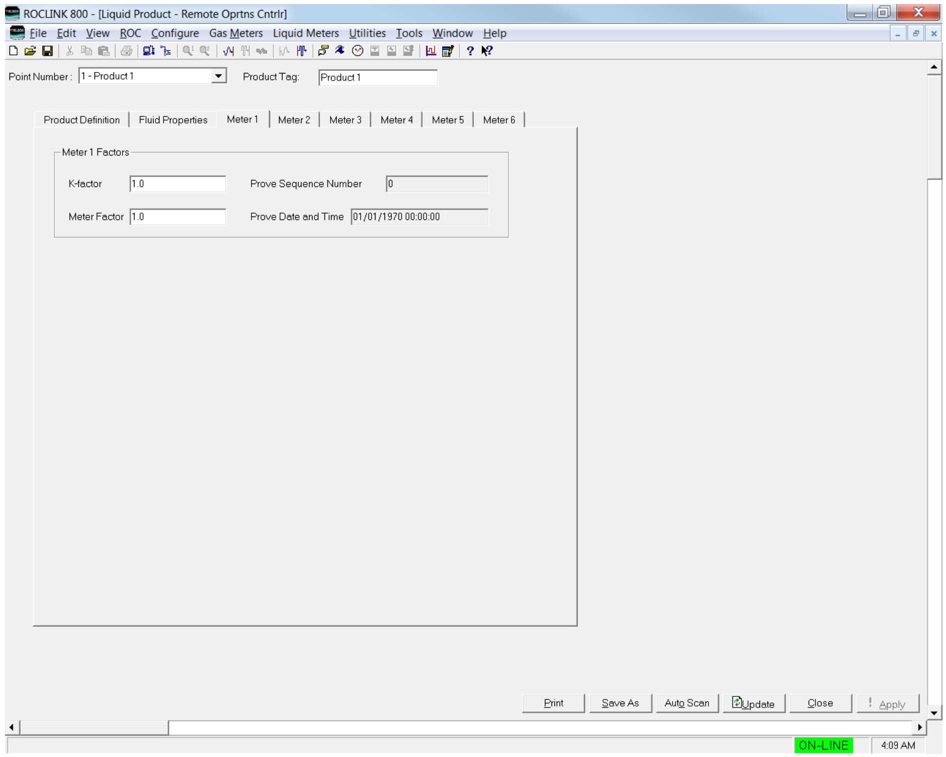


Figure 9-7. Product – Meter tab

Field	Description
K-Factor	Sets the value of the K-factor for this product on the indicated meter.
Meter Factor	Sets the value of the meter factor for this product on the indicated meter.
Prove Sequence Number	This **read-only** field shows the prove sequence identifier for this meter factor and/or K-factor for the selected meter. This field populates when the Proving program accepts a prove.
Prove Date and Time	This **read-only** field shows the time and date stamp of the last successful prove for this meter flowing this product. This field populates when the Proving program accepts a prove.

9.2.3 Density Interface

Use the Liquid Density Interface screen to define settings for up to seven densitometers. The Liquid Density Interface allows you to set up a live density input (typically referred to as an “observed density” in the

API standards). Most in-line densitometers provide the density input as a frequency and the manufacturers provide an equation for calculating the density from the periodic time (1/frequency) and a set of coefficients that are unique to each unit and display on a calibration sheet with the densitometer. In addition to the periodic time, most of the equations also take into account the effect of pressure and temperature. This is a correction for the effect of temperature and pressure on the **densitometer** (included in the densitometer equations), not to be confused with the correction for the effect of temperature and pressure on the **liquid** (CTL and CPL).

In addition to frequency densitometers, you can use the Density Interface to accept analog density signals that you calibrate in the density units you select. You can manually enter density input values or they can be written from a host computer based on a density measurement reported elsewhere.

This screen includes tabs to define constants for Micro Motion, ITT Barton, UGC, and Sarasota densitometers.

Note: The system does not calculate Density Interface until you assign it to a meter or station.

To access this screen, select **Liquid Meters** > **Density Interface.** The Liquid Density Interface screen displays, showing the General tab.

Density Interface: General Tab

Use this screen and its tabs to specify a broad range of density-specific parameters.

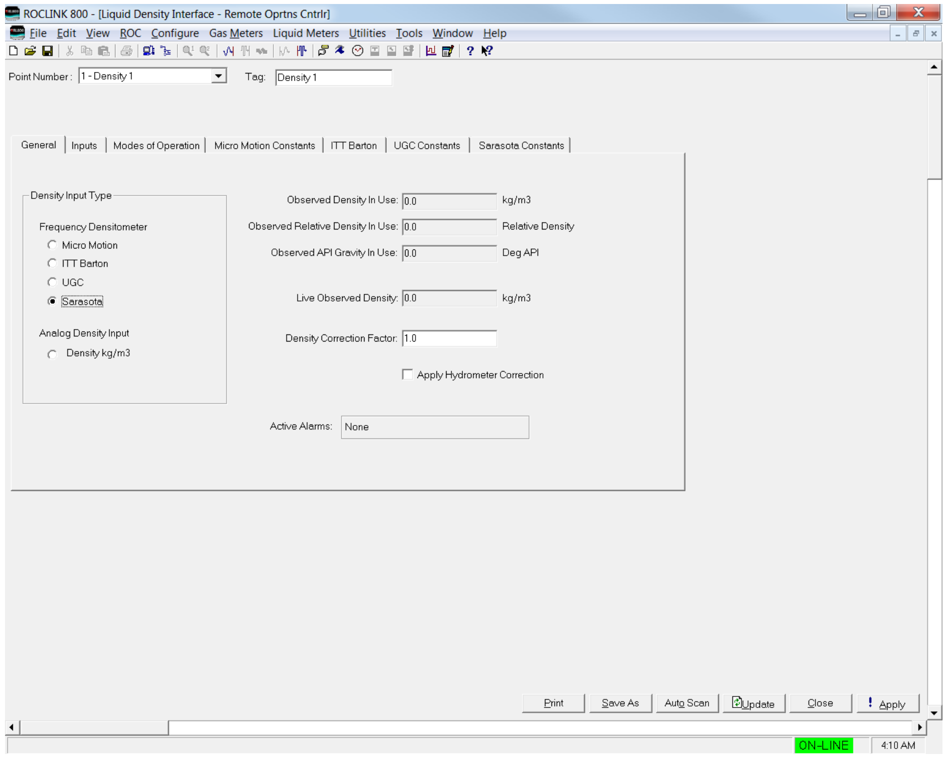


Figure 9-8. Density Interface –General tab

Field	Description
Point Number	Selects the Density Interface for which you desire to configure or view. Click ▼ to display additional Density Interface points. **Note:** The selection in this field applies to **each** tab on this screen.
Tag	Provides identification of the Density Interface point. **Note:** The selection in this field applies to **each** tab on this screen.

Field	Description
Density Input Type	Sets the specific kind of densitometer to associate with this point number. Select the density input type. Micro Motion (formerly Solartron), ITT Barton, UGC (Chandler) and Sarasota are the brands of densitometers currently supported as a frequency input, but any density source that provides a 4 to 20 mA signal proportional to the density can also be read. It is always expected that an analog density input source will be in the density units you select. Select the **Analog Density Input** for either a 4 to 20 mA input or for a density that you manually enter. **Frequency Densitometer** indicates the type of density input interface: ▪ Micro Motion. ▪ ITT Barton. ▪ UGC. ▪ Sarasota. **Analog Density Input** depends on the type of Density Units you define on the Liquid Preference screen. **Note:** You must install an Advanced Pulse Module (APM) or Pulse Input Module (PI) to use a frequency densitometer.
Observed Density In Use	This **read-only** field shows the observed density to associate with the densitometer. This value is compensated for pressure and temperature effect on the densitometer (if applicable) and the density correction factor has been applied. The density is displays in the units you select. This is the observed density value in use by the calculation, and may be a live measured value, or a manually entered value, depending on the Density Interface mode of operation.
Observed Relative Density In Use	This **read-only** field shows the observed density in use displayed in units of relative density or specific gravity for reference.
Observed API Gravity In Use	This **read-only** field shows the observed density in use displayed in units of API gravity for reference.
Live Observed Density	This **read-only** field displays the calculated or analog density value in the Density Units you select, after compensation for pressure and temperature effect on the densitometer (if applicable) and the density correction factor have been applied. Depending on the mode and failure state of the input, the ROC800L may not use this value as the observed density in the calculation.
Density Correction Factor	Sets the multiplier value to correct the observed density provided by a pycnometer or similar device.

Field	Description
Apply Hydrometer Correction	Set to apply the glass hydrometer correction factor. For more information, refer to the *API Manual of Petroleum Measurement Standards, Chapter 9*. This hydrometer correction is necessary if the observed density is measured with a glass hydrometer and you enter the density value as a manual value, in which case a correction must be made for the difference in temperature between the temperature of the liquid and the temperature at which the hydrometer was calibrated.
Active Alarms	This **read-only** field shows any active alarms for this point. When you **Enable** alarming, the limit alarms (such as Low Alarm and Rate Alarm) that are active appear. Even if you **Disable** alarming, the Point Fail (hardware reports a malfunction) alarm and Manual (Scanning Disabled) indicators can still appear.

Density Interface: Inputs Tab

Use this tab to set up density, temperature, and pressure input information for the densitometer you select.

If the density input is from a densitometer that produces a frequency, the density input typically comes from an APM or PI module. You use the third channel of the APM to interface to a Micro Motion (formerly Solartron) densitometer, but the other types of densitometers can use the frequency from any of the channels. If there is a pressure and/or temperature measurement at the densitometer, assign those inputs in the I/O Definition fields. The ROC800L calculates and displays a periodic time in the appropriate units for the densitometer type you select.

The Density Interface can be put in test mode and you can enter a frequency to validate the densitometer equations. To access this screen, select the **Inputs** tab. The Inputs screen displays.

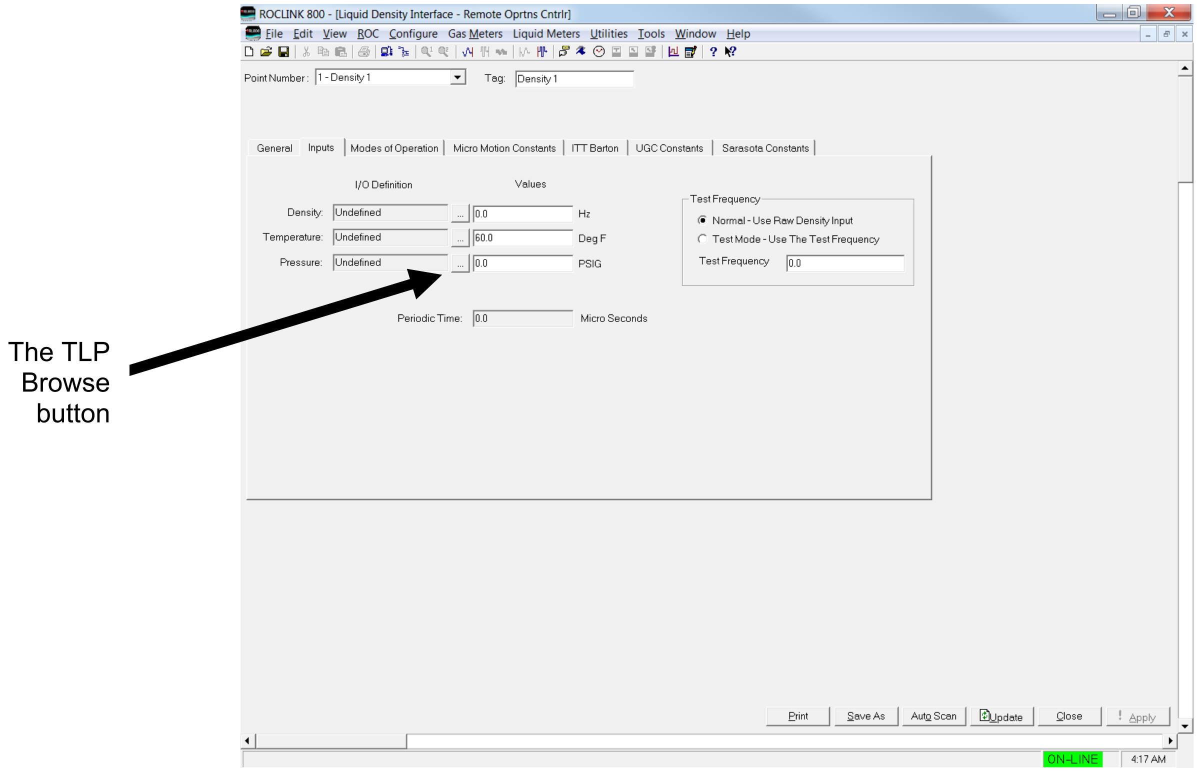


Figure 9-9. Density Interface – Inputs tab

Field	Description
Density	Assigns the point type, logical, and parameter (TLP) of the density I/O value for the selected densitometer. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. Valid selections include: ▪ Pulse Input Frequency. ▪ APM Various Parameters. ▪ Analog Input EU Value. ▪ FST Registers. ▪ Soft Point Floats. **Note:** If you select Undefined (0, 0, 0) for the density input, you can manually enter a value for the density. Otherwise, the program displays the value for the currently selected input.

Field	Description
Temperature	Assigns the point type, logical, and parameter (TLP) for the temperature I/O value for the selected densitometer. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. Valid selections include: ▪ Analog Input EU Value ▪ RTD EU Value ▪ MVS Temperature Reading ▪ HART Variable ▪ FST Registers ▪ Soft Point Floats **Note:** If you select Undefined (0, 0, 0) for the temperature input, you can manually enter a value for the temperature. Otherwise, the program displays the value for the currently selected input.
Pressure	Assigns the point type, logical, and parameter (TLP) of the pressure I/O value for the selected densitometer. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. Valid Selections include: ▪ Analog Input EU Value ▪ HART Variable ▪ FST Registers ▪ Soft Point Floats **Note:** If you select Undefined (0, 0, 0) for the pressure input, you can manually enter a value (in PSI) for the static pressure. Otherwise, the program displays the value for the currently selected input.
Periodic Time	The read-only field shows the time between pulse wave peaks if you use a densitometer to obtain density providing a frequency input. For most densitometer types, this value is in microseconds. For ITT densitometers, this value is in milliseconds.
Test Frequency	Select to use **Normal** raw density input values or enter a frequency value to use to calculate density when in **Test Mode**. Use this feature to verify densitometer calculations during factory acceptance tests or similar. This provides for easy verification of densitometer calculations.

Density Interface: Modes of Operation Tab

Use this tab to configure modes of operation, failover values, and alarming options. To access this screen, select the **Modes of Operation** tab. The Modes of Operation screen displays.

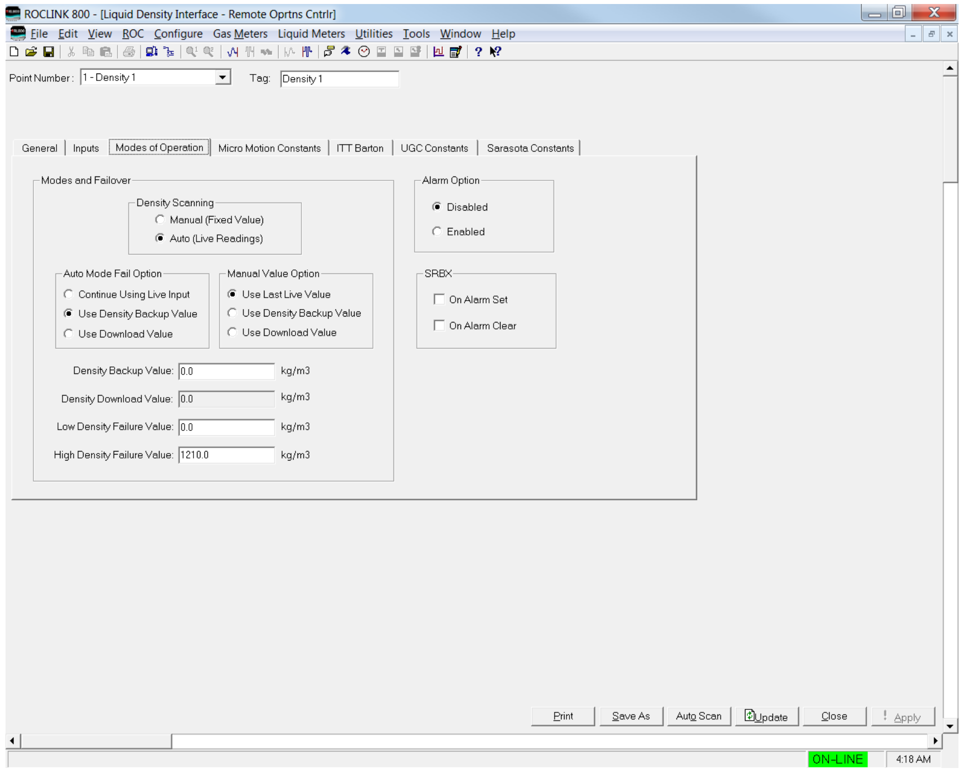


Figure 9-10. Density Interface – Modes of Operation tab

Field	Description
Density Scanning	Indicates whether the system uses a live reading or a fixed value for the observed density. Valid values are **Manual** (use the value specified in the Manual Value Option frame for the Observed Density In Use value on the General tab) or **Auto** (use the value in the Live Observed Density field on the General tab). The **default** is **Auto**.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Auto Mode Fail Option</td><td colspan="2">Sets the source for the Observed Density In Use field when Density Scanning mode is set to Auto and the Live Observed Density fails (falls below the density failure low limit or above the density failure high limit). Valid values are:</td></tr>
<tr><td>Continue Using Live Input</td><td>Continue using observed density from the live reading of the input.</td></tr>
<tr><td>Use Density Backup Value</td><td>Set the observed density to the Density Backup Value</td></tr>
<tr><td>Use Download Value</td><td>Set the observed density to the Density Download Value

Note: The only difference between the Use Density Backup Value option and the Use Download Value option is that the Use Download Value can be written to without creating an event to allow a host computer to update this value frequently without filling up the Event Log.</td></tr>
<tr><td rowspan="4">Manual Value Option</td><td colspan="2">Sets the source for the In Use Observed Density field when Density Scanning mode is set to Manual (Fixed Value). Valid values are:</td></tr>
<tr><td>Use Last Live Value</td><td>Set the observed density interface to the last live value and freezes the value</td></tr>
<tr><td>Use Density Backup Value</td><td>Set the observed density to the Density Backup Value</td></tr>
<tr><td>Use Download Value</td><td>Set the observed density to the Density Download Value

Note: The only difference between the Use Density Backup Value option and the Use Download Value option is that the Use Download Value can be written to without creating an event to allow a host computer to update this value frequently without filling up the Event Log.</td></tr>
<tr><td>Density Backup Value</td><td colspan="2">Sets a density value to use as the observed density value if the densitometer fails or you put the Density Scanning in Manual mode. Set the value of the units in Liquid Preferences > General tab.
Note: Usage is dependent on Auto Model Fail Option and Manual Value Option selection.</td></tr>
</table>

Field	Description
Density Download Value	Indicates the vaalue of a remotely downloaded density value to use as the observed density value if the densitometer fails or the density input enters off scan. Set the value of the units on the General tab of the Liquid Preferences screen. **Note:** The program does not log changes to this parameter to the event log.
Low Density Failure Value	Displays the densitometer's failure low value in selected units. Set the value of the units on the General tab of the Liquid Preferences screen.
High Density Failure Value	Displays the densitometer's failure high value in selected units. Set the value of the units on the General tab of the Liquid Preferences screen.
Alarm Option	Sets the alarm option for this point. Valid values are **Enabled** (generates limit alarms) or **Disabled** (does not generate limit alarms). **Note:** The Point Fail alarm and Override alarm always appear in the Active Alarms field if applicable, but the program does not log the alarm unless you enable the Alarm Option.
SRBX	Sets the **SRBX** Alarming option to configure Spontaneous-Report-by-Exception alarming for this point. Valid values are **On Alarm Set** (generates an SRBX message when the point **enters** the alarm condition) or **On Alarm Clear** (generates an SRBX message when the point **exits** the alarm condition). **Note:** SRBX alarming requires you to configure the communications port.

Density Interface: Micro Motion Constants Tab

Use this tab to set up constant values for Micro Motion densitometers and enter the coefficients from the calibration sheet provided with their densitometer unit.

Notes:

- You can enter values on this screen **only** if you select **Micro Motion** as the Density Input Type on the General tab.
- The manufacture provides the calibration densitometer constants. Calibration sheets display in either metric or imperial units.

To access this screen, select the **Micro Motion Constants** tab. The Micro Motion Constants screen displays.

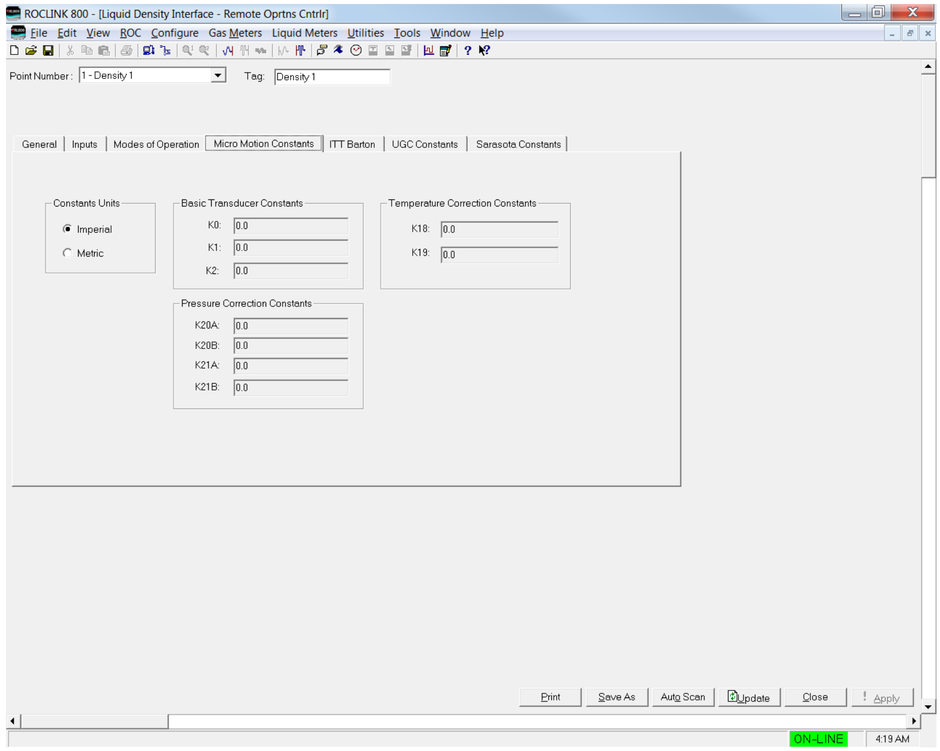


Figure 9-11. Density Interface – Micro Motion Constants tab

Field	Description
Constant Units	Selects the engineering units for the densitometer constants provided with the calibration sheet as either **Imperial** or **Metric**. If you have a calibration sheet with constants given in terms of ˚F and PSI, select **Imperial**. If you have a calibration sheet with constants given in terms of ˚C and bar, select **Metric**. This selection is independent of the units that you select for measurement under Liquid Preferences and only applies to the densitometer constants.
Basic Transducer Constants	Sets the three specific transducer constant values from the calibration certificate to calculate flowing density for the Micro Motion densitometer.
Pressure Correction Constants	Sets the four specific pressure correction constant values from the calibration certificate to calculate pressure compensation for the Micro Motion densitometer.
Temperature Correction Constants	Sets the two specific temperature constant values from the calibration certificate to calculate temperature compensation for the Micro Motion densitometer.

Density Interface: ITT Barton Tab

Use this tab to set up constant values for ITT Barton densitometers and enter the coefficients from the calibration sheet provided with their densitometer unit. The ITT Barton algorithm does not include temperature or pressure correction.

Notes:

- You can enter values on this screen **only** if you select **ITT Barton** as the Density Input Type on the General tab.
- The manufacture provides the calibration densitometer constants. Constants should be entered as ºC and Bar.

To access this screen, select the **ITT Barton** tab. The ITT Barton screen displays.

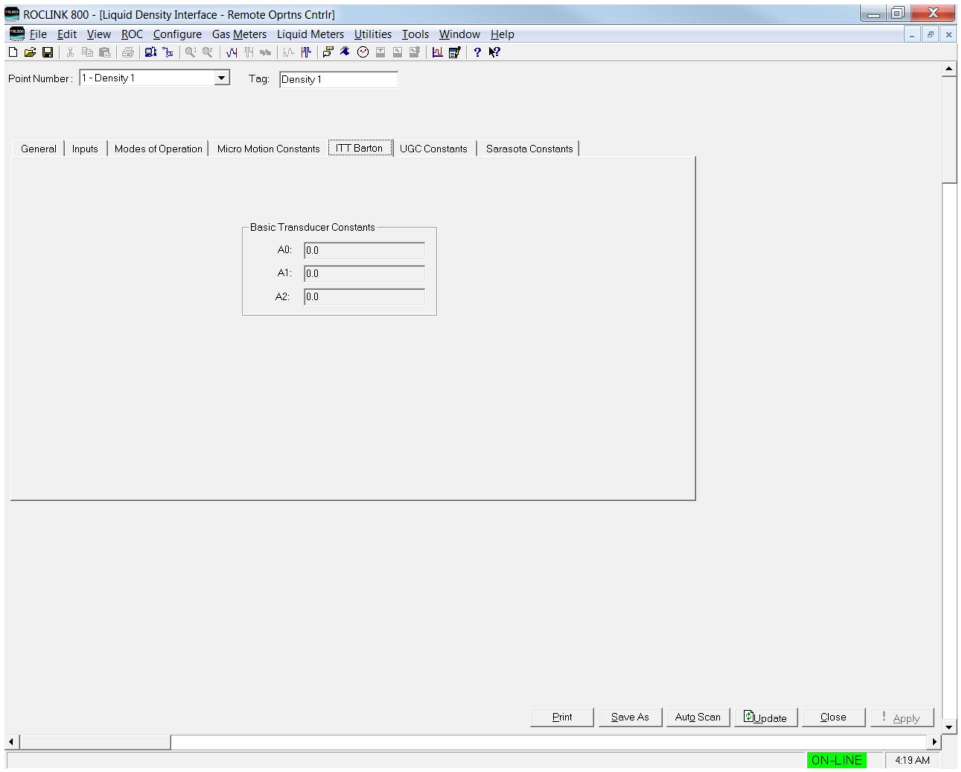


Figure 9-12. Density Interface – ITT Barton tab

Field	Description
Basic Transducer Constants	Sets up to three specific transducer constant values from the calibration certificate to calculate flowing density for the ITT Barton densitometer. Values are in terms of ˚C and Bar.

Density Interface: UGC Constants Tab

Use this tab to set up constant values for UGC densitometers and enter the coefficients from the calibration sheet provided with their densitometer unit.

Note: You can enter values on this screen **only** if you select **UGC** as the Density Input Type on the General tab.

To access this screen, select the **UGC Constants** tab. The UGC Constants screen displays.

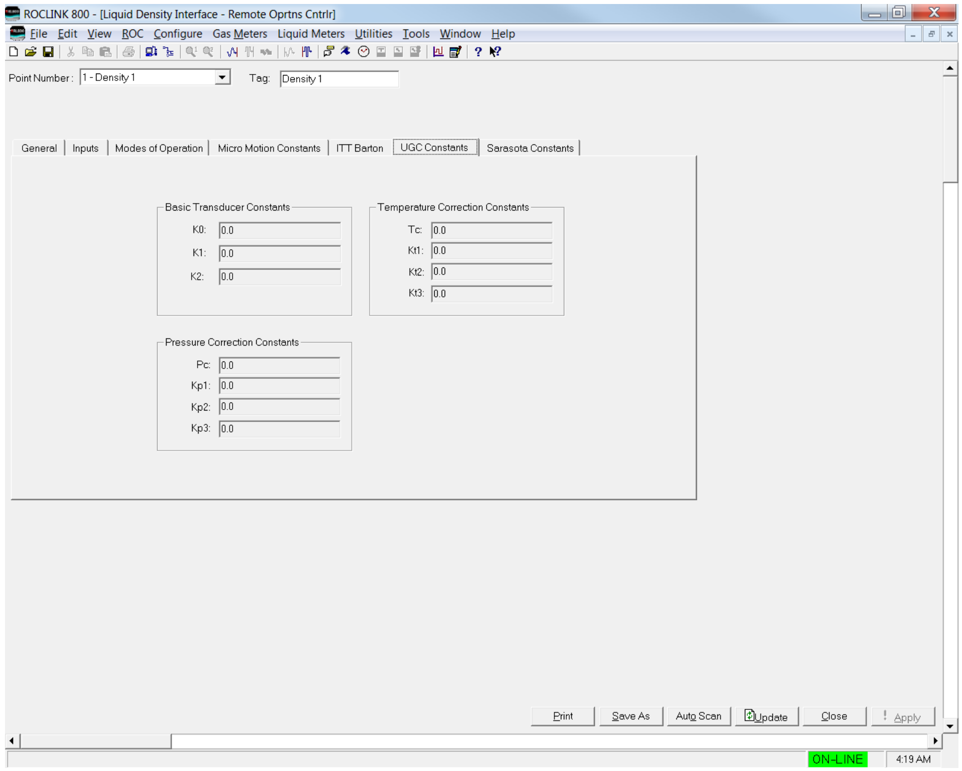


Figure 9-13. Density Interface – UGC Constants tab

Field	Description
Basic Transducer Constants	Sets the three specific transducer constant values from the calibration certificate to calculate flowing density for the UGC densitometer. Values are in ˚F and PSIG.
Pressure Correction Constants	Sets the four specific pressure correction constant values from the calibration certificate to calculate pressure compensation for the UGC densitometer. Values are in ˚F and PSIG.
Temperature Correction Constants	Sets the two specific temperature constant values from the calibration certificate to calculate temperature compensation for the UGC densitometer. Values are in ˚F and PSIG.

Density Interface: Sarasota Constants Tab

Use this tab to set up constants values for Sarasota densitometers and enter the coefficients from the calibration sheet provided with their densitometer unit.

Notes:

- You can enter values on this screen **only** if you select **Sarasota** as the Density Input Type on the General tab.
- The manufacture provides the calibration densitometer constants. Calibration sheets may be provided in either metric or imperial units.

To access this screen, select the **Sarasota Constants**. The Sarasota Constants screen displays.

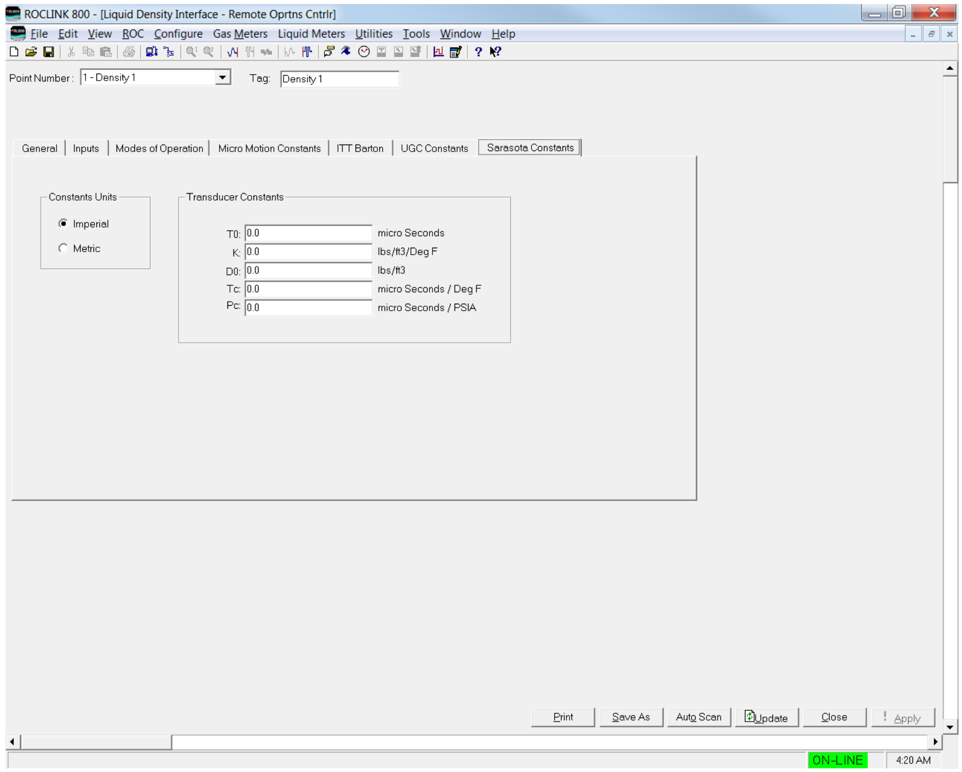


Figure 9-14. Density Interface – Sarasota Constants tab

Field	Description	
Transducer Constants	Sets the five specific transducer constant values from the calibration certificate to calculate flowing density for the Sarasota densitometer:	
	T0	Set the calibration constant of spool in microseconds.
	K	Set the calibration constant of spool in lbs/ft3/deg F or kg/m3/deg C
	D0	Set the calibration constant of spool in lbs/ft3 or kg/m3
	Tc	Set the temperature coefficient of spool in microseconds/deg F or microseconds/deg C
	Pc	Set the pressure coefficient of spool in microseconds/psia or microseconds/bara

9.2.4 Station

Use this screen to define settings (general, volume correction, alarms, flow rates, flow totals, and accumulation totals) for up to six stations. A station is a group of one or more meters that measure the same fluid and calculate flow using the same standards and the same reference conditions.

The ROC800L supports up to six liquid meter runs and up to six stations. You can group meter runs and stations in any combination. Typically, you associate meter runs with a station if the meter runs have common parameters, such as fluid type and base temperature.

Grouping similarly configured meter runs with stations provides significant benefits in batching, configuration, and reporting. For example, you can configure parameters at the station level. The system then applies those configuration parameters to all meters belonging to the station, reducing configuration time.

Occasionally, you need to take a meter out of service and remove the meter from a batch for maintenance purposes. For this reason, it is best to group meters into stations. By including two or more meters in a station, you can "valve off" and shut-in a meter, while the others continue to measure the flow.

To access this screen, select **Liquid Meters** > **Station**. The Liquid Station screen displays, showing the General tab.

Station: General Tab

Use this tab to provide general information about the liquid station.

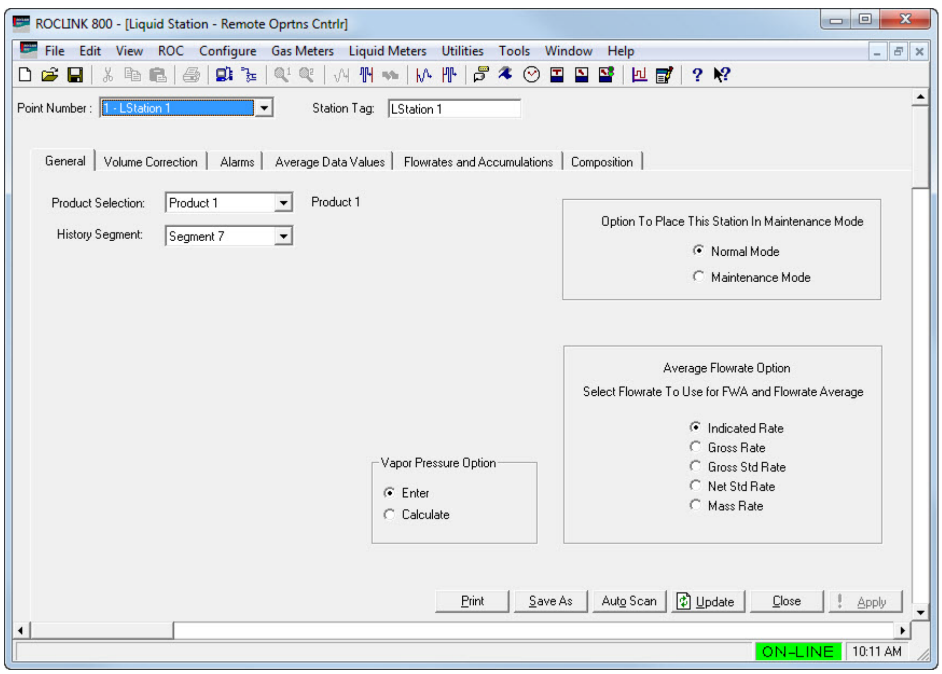


Figure 9-15. Station – General tab

Field	Description
Point Number	Selects the station to configure. Click ▼ to display all available stations. **Note:** The selection in this field applies to **each** tab on this screen.

Field	Description
Station Tag	Sets a 20-character name to identify the station. **Note:** The selection in this field applies to **each** tab on this screen.
Product Selection	Select the product that is flowing through the station. Click ▼ to display all available products to define. If you use the Batch Queuing program, this field sets the product as it changes through the pipeline. Otherwise, you set this product. **Note:** The Product Tag description of the product displays to the right of this field.
Option to Place This Station In Maintenance Mode	Indicates whether meters that are part of this station can be placed in maintenance mode. This option is a permissive only. You must go to the individual meter to actually put the meter in maintenance mode. Valid selections are **Normal Mode** (you cannot place meters in this station in Maintenance Mode) or **Maintenance Mode** (you can place meters in Maintenance Mode). When a meter is in Maintenance Mode you may still receive signals and pulses from the meter, but those values do not indicate real product passing through the meter. Because of this, the standard accumulators do not increment.
Average Flowrate Option	Sets which of the quantity flow rates the ROC800L uses for flow weighted averaging (FWA) of inputs and to calculate the average flowrate.
Vapor Pressure Option	Selects if the vapor pressure for the fluid should be user entered or calculated according to GPA TP-15. This value effects the calculation of the pressure correction factor (CPL). If calculated is selected, the vapor pressure will be determined by the live density and temperature. If entered is selected, the user entered value configured at the associated liquid product will be used. **Note:** This option only applies when measuring a fluid type of light hydrocarbons. If the station's product selection is any other fluid type, then no vapor pressure will be calculated.

Station: Volume Correction Tab

Use this tab to define volume correction calculation specifics for the station. To access this screen, select the **Volume Correction** tab. The Volume Correction screen displays.

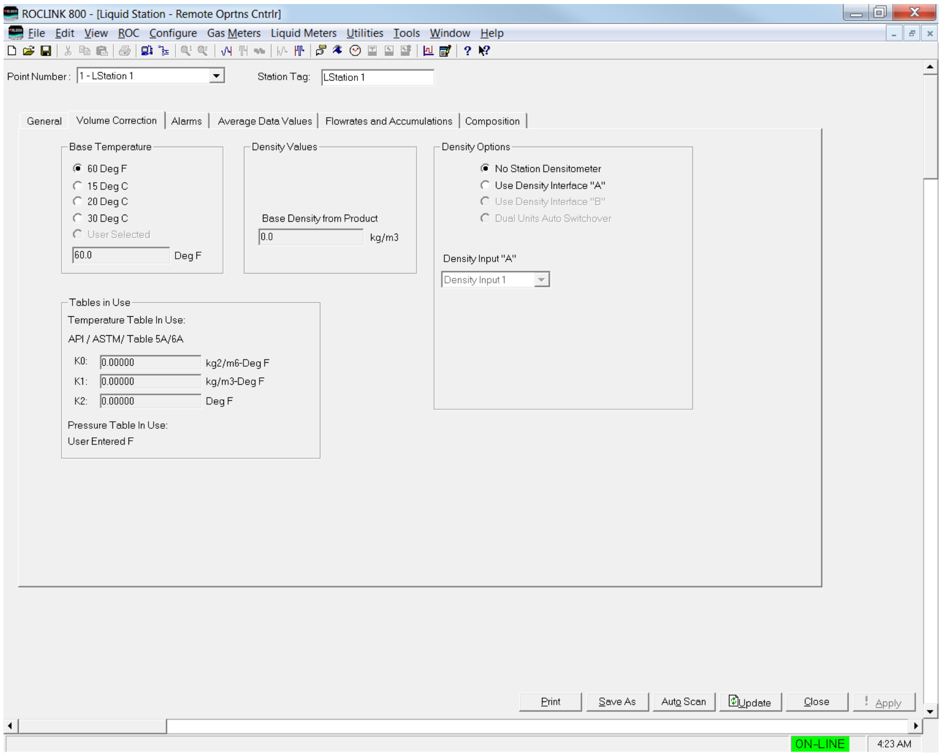


Figure 9-16. Station – Volume Correction tab

Field	Description
Base Temperature	Select the base temperature, as specified by contract or organizational policy, expressed as degrees Fahrenheit or degrees Celsius. Valid values are 60 Deg F, 15 Deg C, 20 Deg C, 30 Deg C, or User Selected. **Note:** ▪ User Selected displays only if you select 2004 API / ASTM / IP Tables in the Petroleum Measurement Table Option field (Liquid Product > Product Definition Tab). ▪ If you select User Selected in the Base Temperature field (Liquid Turbine > Volume Correction Tab), the units of measurement that you select in the Temperature Units field (Deg F or Deg C) must match the units of measurement in the Base Temperature field (Liquid Turbine > Volume Correction Tab).

Field	Description
Tables in Use	This **read-only** field shows the specific temperature and pressure tables the program uses when calculating density and volume correction. The standards depend on the selections you make in the Product screen and on the Base Temperature you select. Where appropriate, the constants associated with the selected standard also display. **Note:** The tables in use are auto-selected based on Liquid Preferences, Base Density, Base Temperature, Product type, and Petroleum Measurement Table options.
Observed Density	This **read-only** field shows the observed density from the density interface. **Note:** This field displays only if you select a Use Densitometer option in the Density Options frame.
Base Density	This **read-only** field shows the base density. If you select No Station Densitometer in the Density Options field, this field shows the assigned product's base density from the Liquid Product screen’s Fluid Properties tab (Product Base Density field). If you select a Use Densitometer option in the Density Options field, this field shows the base density as calculated from the observed density.
Density Options	Sets the density to use when calculating volume correction. Valid selections are **No Station Densitometer** (uses the density you set in the Liquid Product > Fluid Properties tab's Product Base Density field) or **Use Density Interface "A" (calculates a base density from the observed density)**. Select the value in the Density Input "A" drop-down list box to determine how the station calculates base density.
Density Input	Selects a density input for the station's observed density reading if you select **Use Densitometer A** in the Density Options field. Click ▼ to display all available density inputs.

Station: Alarms Tab

Use this tab to define alarms for the selected station. Since there are multiple flow rate parameters for the different quantities, you have the choice to have no flowrate alarming or alarms based on any of the flowrate parameter values. If enabled, you can then set the standard high, low limits and alarm deadband. This screen also displays any current active alarms. These alarms can generate a Spontaneous-Report-by-Exception (SRBX) message on set or clear.

To access this screen, select the **Alarms** tab. The Alarms screen displays.

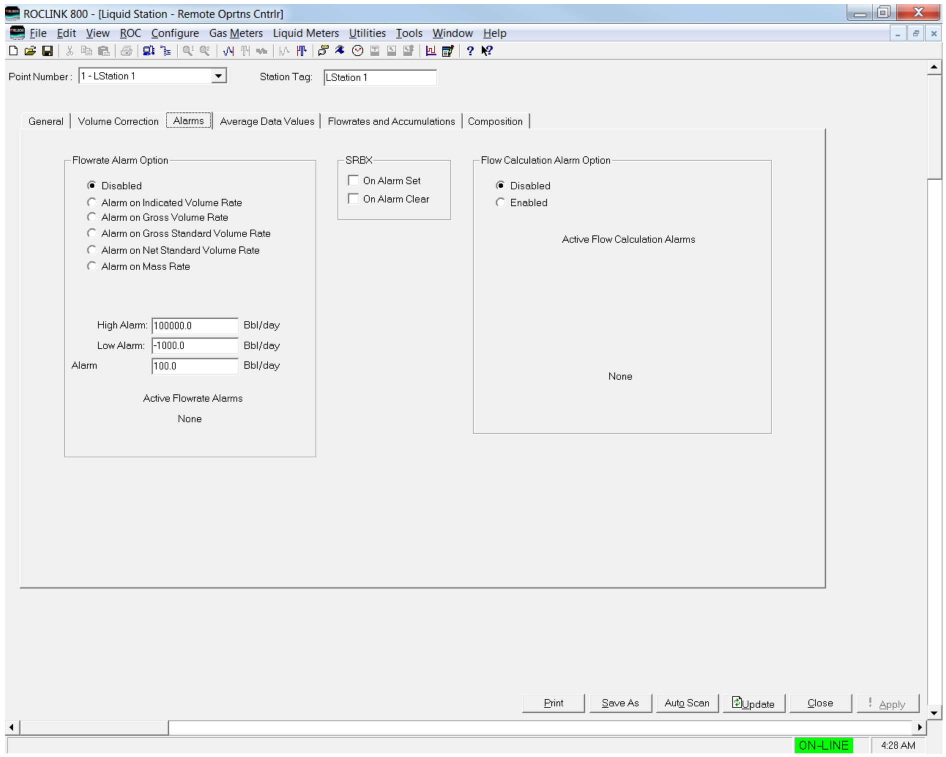


Figure 9-17. Station – Alarms tab

Field	Description	
Flowrate Alarm Option	Sets the quantity flow rate checked. The default is **Disabled**. For each option, the system resets the units on the High Alarm, Low Alarm, and Alarm Deadband fields according to the selections on the Liquid Preferences screen. Valid values are:	
	Disabled	No alarms generate. This is the **default**.
	Alarm on Indicated Volume Rate	Generate an alarm if the Indicated volume (Pulses / K-factor) reaches the user-defined high and low alarm values.
	Alarm on Gross Volume Rate	Generate an alarm if the gross volume (Indicated Volume * Meter Factor) reaches the user-defined high and low alarm values
	Alarm on Gross Standard Volume Rate	Generate an alarm if the gross standard volume (Gross Volume * CTL * CPL) reaches the user-defined high and low alarm values.

Field	Description	
	Alarm on Net Standard Volume	Generate an alarm if the net standard volume (Gross Standard Volume * Base Sediment and Water) reaches the user-defined high and low alarm values
	Alarm on Gross Mass Rate	Generate an alarm if the mass (Indicated Mass * Meter Factor or Gross Volume * Flow Density) reaches the user-defined high and low alarm values.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a High Alarm.	
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a Low Alarm.	
Alarm Deadband	Sets, in engineering units, a value that defines an inactive zone above the Low Alarm limits and below the High Alarm limits. The alarm is set when it reaches the Low or High Alarm limit, but a Low Alarm does not clear until it gets above the (Low Alarm limit + Alarm Deadband) and a High Alarm does not clear until it gets below the (High Alarm limit – Alarm Deadband). This deadband prevents the system from setting and clearing the alarm continuously when the input value is oscillating around the alarm limit.	
SRBX	Sets what activity generates a Spontaneous Report by Exception (SRBX). Valid selections are **On Alarm Set** (generate a message when a point **enters** an alarm condition) and **On Alarm Clear** (generate a message when a point **exits** an alarm clears).	
Flow Calculation Alarm Option	Sets whether the system generates flow calculation alarms and sends them to the Alarm Log. This alarm is based on pressure, temperature, or density values outside the bounds of the selected calculation standard for the selected fluid. Possible flow calculation alarms and the limits that apply when using the API 2004 standard are:	
	Temperature Out Of Bounds	The temperature of the observed density (densitometer) is outside the allowed range. Degrees F: –58.0 to 302.0 Degrees C: –50.0 to 150.0
	Pressure Out Of Bounds	The pressure of the observed density (densitometer) is outside the allowed range. psig: 0 to 1500.0 barg: 0 to 103.4 kPag: 0 to 1.034×10^4

Field	Description	
	Observed Density Out Of Bounds	The observed density is outside the allowed range. This only applies when you select a meter based density interface point.
	Base Density Out Of Bounds	The calculated base density is outside the allowed range
	Convergence Error	The maximum iterations to calculate the base density have been exceeded
	Refined Product Alarm	When using a refined product fluid type (Gasoline, Jet Fuels, Fuel Oils), the base density has drifted into the transition zone. Fuel Oils: $838.3127 \le \rho60 \le 1163.5$ kg/m3 Jet Fuels: $787.5195 \le \rho60 \le 838.3127$ kg/m3 Transition Zone: $770.3520 \le \rho60 \le 787.5195$ kg/m3 Gasolines: $610.6 \le \rho60 \le 770.352$ kg/m3
	Alpha Out of Bounds	When using the special applications fluid type, the user entered coefficient of thermal expansion (alpha) is greater then the range allowed by the standard. Per deg F: $230.0x10^{-6}$ to $930.0x10^{-6}$ Per deg C: $414.0x10^{-6}$ to $1674.0x10^{-6}$
	Note: This is only applicable if any volume correction calculations are done at the station, so it only applies to configurations where the station has a densitometer.	

Station: Average Data Values Tab

Displays the average flowrate and the flow-weighted average (FWA) for the pressure, temperature, observed and base densities for the previous day and hour at the station level.

To access this screen, select the **Average Data Values** tab. The Average Data Values screen displays.

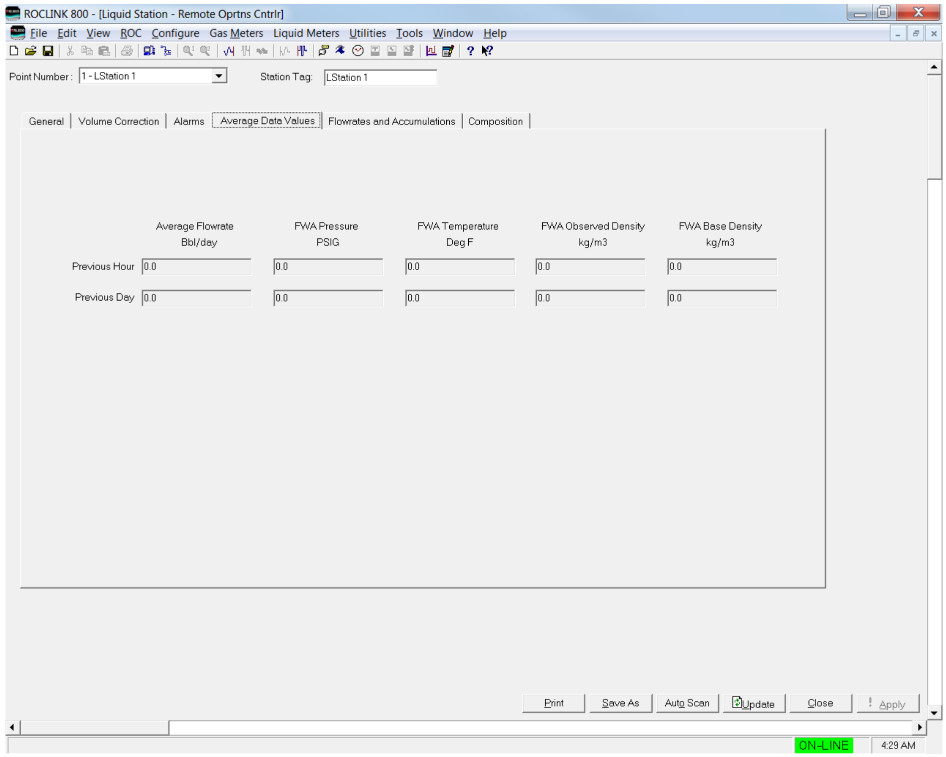


Figure 9-18. Station – Average Data Value tab

Field	Description
Average Flowrate	These **read-only** fields show the average flowrate calculated as a linear average of the selected station for the previous contract hour and day. This value is time weighted, not flow weighted. Which flowrate it represents depends on the Average Flowrate Option selected on the General tab.
FWA Pressure	These **read-only** fields show the flow weighted average pressure for the previous contract hour and day. The flow weighted average (FWA) values are actually a linear average of the meter flow weighted averages that are part of this station.
FWA Temperature	These **read-only** fields show the flow weighted average temperature for the previous contract hour and day. The flow weighted average (FWA) values are actually a linear average of the meter flow weighted averages that are part of this station.
FWA Observed Density	These **read-only** fields show the flow weighted average observed density for the previous contract hour and day. The flow weighted average (FWA) values are actually a linear average of the meter flow weighted averages that are part of this station.

Field	Description
FWA Base Density	These **read-only** fields show the flow weighted average base density for the previous contract hour and day. The flow weighted average (FWA) values are actually a linear average of the meter flow weighted averages that are part of this station.

Station: Flowrates and Accumulations Tab

This tab shows the instantaneous station flow rates for all the quantities, which is calculated as a simple sum of the meter flow rates that are a part of this station.

For each quantity, a current hour, previous hour, current day, previous day, current month, previous month, and non-resettable total display. These are each calculated by independently accumulating the incremental flow for each of the meters in the station. The non-resettable totals roll over according to the Rollover Value set in the Double Precision Accumulator frame on the Device Information screen (**ROC** > **Information** > General tab).

The Total Accum field displays the total of the column since calculations began at the station.

To access this screen, select the **Flowrates and Accumulations** tab. The Flowrates and Accumulations screen displays.

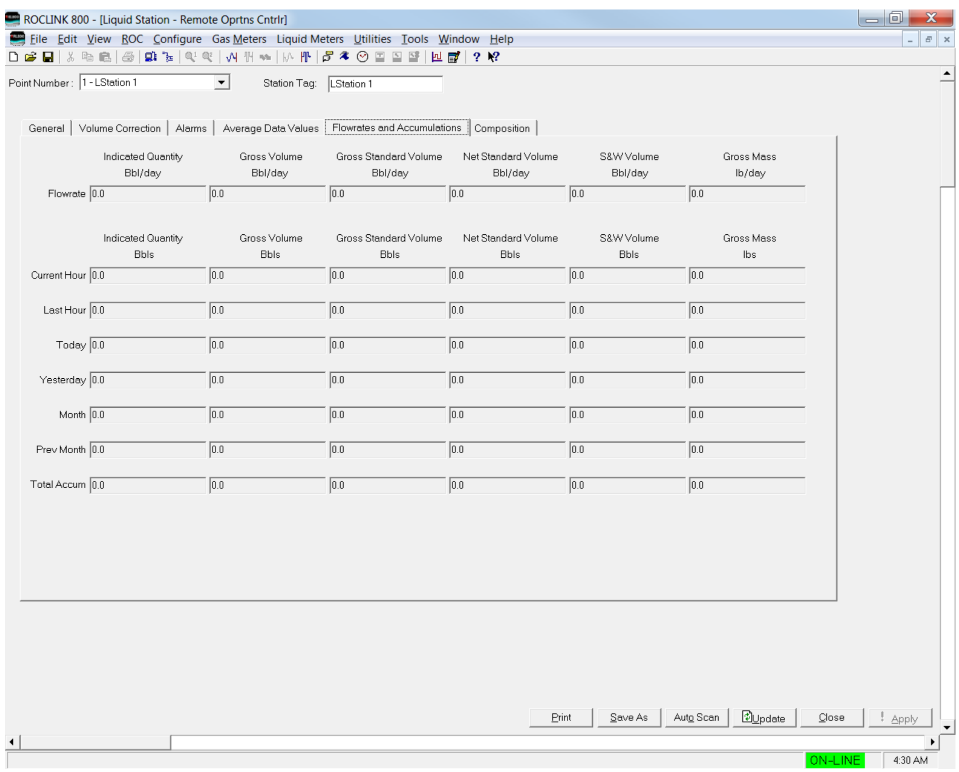


Figure 9-19. Station – Flowrates and Accumulations tab

Field	Description
Indicated Quantity	The indicated quantity is the volume or mass read directly from the meter at flowing conditions, without any correction. These **read-only** fields show the sum of the indicated quantity flowrates for the meters in this station and the current accumulation of indicated quantity for the station on an hourly, daily, monthly, and total basis. This may be a mass value or a volume value, depending on the configured meter type on the inputs tab. You define volume units, flow rate units, and mass units in the Liquid Preferences General Tab.
Gross Volume	The Gross Volume is the volume at flowing conditions, corrected for meter factor. These **read-only** fields show the sum of the gross volume flowrates for the meters in this station and the current accumulation of gross volume for the station on an hourly, daily, monthly, and total basis. The system calculates the current Gross Volume (GV) flow total value by multiplying the Indicated Volume (IV) flow total by the Meter Factor (MF). You define volume and flow rate units in the Liquid Preferences General tab.
Gross Standard Volume	Gross Standard Volume is the volume at base conditions, also corrected for meter performance. These **read-only** fields show the sum of the gross standard volume flowrates for the meters in this station and the accumulation of gross standard volume for the station on an hourly, daily, monthly, and total basis. The system calculates the current Gross Standard Volume (GSV) flow total value by multiplying the Gross Volume (GV) flow total by the correction factor for the temperature of the liquid (CTL) and the correction factor for the pressure of the liquid (CPL). You define volume and flow rate units in the Liquid Preferences General tab.
Net Standard Volume	Net Standard Volume is the volume at base conditions, corrected for meter performance and non-merchantable quantities, such as sediment and water. These **read-only** fields showscreen the sum of the net standard volume flowrates for the meters in this station and the accumulation of net standard volume for the station on an hourly, daily, monthly, and total basis. Applies to crude oil applications only. The system calculates the current Net Standard Volume (NSV) flow total by multiplying the Gross Standard Volume (GSV) flow total by the base Sediment and Water (S&W) volume flow total. You define volume units and flow rate units in the Liquid Preferences General tab.

Field	Description
S&W Volume	S&W Volume is the volume of non-merchantable quantities, such as sediment and water. These **read-only** fields show the sum of S&W flowrates for the meters in this station and the accumulation of S&W volume for the station on an hourly, daily, monthly, and total basis. The system calculates the current Sediment and Water (S&W) volume flow value by subtracting the Net Standard Volume (NSV) flow total from the Gross Standard Volume (GSV) flow total. You define volume units on the General tab of the Liquid Preferences screen.
Gross Mass	Gross Mass represents either an indicated mass corrected for meter performance (if a mass meter type is selected) or a mass value calculated from the gross volume and flowing density. These **read-only** fields show the sum of gross mass flowrates for the meters in this station and the accumulation of mass for the station on an hourly, daily, monthly, and total basis. You define mass units on the General tab of the Liquid Preferences screen.

Station: COSTALD-Tait Tab

Note: This tab is applicable only if the product assigned to this station has a Light Hydrocarbon fluid type and you have selected COSTALD – Tait as the Light Hydrocarbon Table Option (see the Product Definition tab on the Liquid Product screen). If you are not using COSTALD-Tait calculations, then you can ignore this tab.

Unlike other liquid volume correction standards that start from a known density value (either at base conditions or flowing conditions) to calculate an unknown density at another set of conditions, COSTALD-Tait calculates the density directly based on the exact composition of the liquid. If you do not know the exact composition, you **cannot** use COSTALD-Tait.

The percentage of the various components that make up the liquid is not always the same for every station. The composition you enter here applies to **all** meters in this station.

To help verify calculations for the mixture, the system displays critical temperature and critical pressure. A calculated base density can also be used to correct the measured mass or volume to the volume at base conditions.

For example, to measure certain turbine meters with a product that is 70% propane, 20% Ethane, 10% Methane. Group those meters in the same station and configure that station's composition in this screen. To measure a separate meter with a product that is 90 % Methane, 4% Ethane, 2% Propane, and such, select a different station to which that meter belongs and configure that station with a different composition.

To access this screen, select the **COSTALD – Tait** tab. The COSTALD – Tait screen displays.

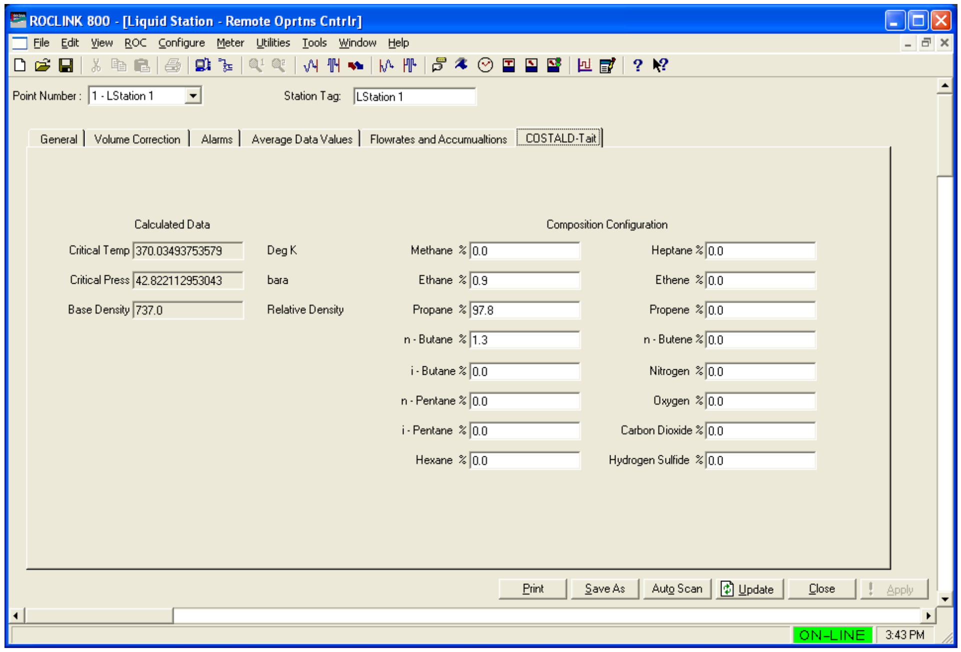


Figure 9-20. Station – COSTALD-Tait tab

Field	Description
Critical Temp	This **read-only** field shows the critical temperature of the light hydrocarbon mixture.
Critical Press	This **read-only** field shows critical pressure of the light hydrocarbon mixture.
Base Density	This **read-only** field shows the current value of the fluid density at the base temperature and equilibrium pressure for the fluid. Use this value to correct the measured mass or volume to volume at base conditions.
Composition Configuration	Sets the compositional configuration of the liquid. Enter the mole percentage of each component. **The total value must equal 100%**.

9.2.5 Meter

Use the Meter screens to define meter-specific settings for up to six linear liquid meters. A liquid meter point represents data from one physical linear meter, including flow, flow weighted averages, correction factors and totals. The input to the flow computer from the meter may be in the form of pulses representing either volume or mass or may come from a 4 to 20 mA signal representing a flow rate of either volume or mass.

To understand the options available for the meter, you need to understand the concept of volume correction in general. Mass does not change with pressure and temperature but we measure fluids by volume, which does vary with pressure and temperature. Therefore, in order not to have your product worth less on cold days, fluids are bought and sold based on a corrected or standard volume, where the volume is calculated at some agreed upon pressure and temperature, which is the next best thing to mass. Most of the calculations require a density at some known temperature and pressure as an input. Of course, fluids are actually measured at widely varying pressures and temperatures and sometimes densities are measured at that same temperature and pressure and sometimes at a different temperature and pressure, so everything has to be converted to the agreed upon base conditions, thus the need for volume correction.

The temperature and pressure that the density is measured at is typically referred to as “observed” conditions, the agreed upon contract temperature and pressure as “base” conditions, and the conditions at the meter as “alternate” or “line” conditions. When you see references to “Observed to Base”, it is referring to the calculations involved in converting a density from the conditions it was measured at to the base conditions. When you see references to “Base to Alternate” or “Base to Line”, it is referring to calculations involved in converting a density at base conditions to a density at alternate / meter / line conditions, which is the heart of volume correction, as the ratio of meter density to base density is the volume correction factor. Multiplying the measured volume at the meter by the volume correction factor gives you the base or standard volume. In older versions of the standards, correction for temperature (CTLm) was considered separately (and covered by separate standards) than the correction for pressure (CPLm). Most, but not all, newer standards combine the temperature and pressure correction factors into a single term (CTPLm) also referred to as a VCF (volume correction factor).

To access this screen, select **Liquid Meters** > **Meter** from the menu. The Liquid Meter screen displays, showing the General tab.

Meter: General Tab

Use this tab (which displays when you access the Liquid Meter screen) to enter general information about the meter, configure its status and mode, and setup the relationships between meters and stations.

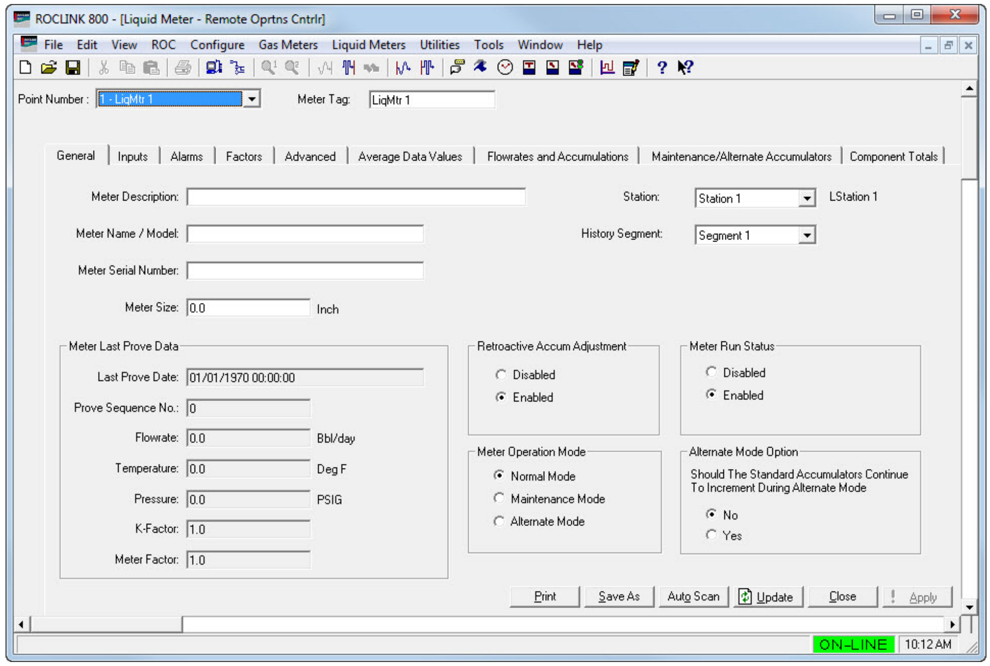


Figure 9-21. Meter – General tab

Field	Description
Point Number	Select a meter to configure or view. Click ▼ to display all available meters. **Note:** This selection applies to **each** tab on this screen.
Meter Tag	Sets a 20-character name for identification of the point. **Note:** This selection in this field applies to **each** tab on this screen.
Meter Description	Sets a unique description, up to 30 alphanumeric characters in length, which further identifies or provides information about this meter.
Meter Name/Model	Sets a unique description, up to 20 alphanumeric characters in length, which further identifies or provides information about this meter, such as the model name or number.
Meter Serial Number	Sets a unique number, up to 20 alphanumeric characters in length, to identify this exact meter.
Meter Size	Sets the size of the meter. The user program does not use this value in any calculations, but you can use it for reports.
Station	Sets the station to configure. This lists all active stations.
History Segment	Sets the history segment in the historical database that you use to configure history points for the meters in this station.
Last Prove Date	This **read-only** field shows the date of the last successful prove for this meter. The Proving program populates this field when you accept a

Field	Description
	completed prove.
Prove Sequence No.	This **read-only** field shows the sequence number of the last prove for this meter. The Proving program populates this field when you accept a completed prove.
Flowrate	This **read-only** field shows the flow rate of the last successful prove for this meter. The Proving program populates this field when you accept a completed prove.
Temperature	This **read-only** field shows the temperature of the last successful prove for this meter. The Proving program populates this field when you accept a completed prove.
Pressure	This **read-only** field shows the pressure of the last successful prove for this meter. The Proving program populates this field when you accept a completed prove.
K-Factor	This **read-only** field shows the K-factor of the last successful prove for this meter. The Proving program populates this field when you accept a completed prove.
Meter Factor	This **read-only** field shows the Meter Factor of the last successful prove for this meter. The Proving program populates this field when you accept a completed prove.
Retroactive Accum Adjustment	Adjusts meter volumes when a retroactive K-factor or meter factor is applied to a batch. Valid values are **Enabled** (accept adjustment from batch, the **default**) or **Disabled** (do not adjust totals). This option allows the same adjustment that is made to the batch to be made to the hourly, daily, monthly, and non-resettable totals for the meter as well. If the Batching program is not in use or is not set to perform retroactive calculations, this selection has no effect. This option applies **only** if the Batching program is running and set to perform retroactive adjustments in the Station Batch > Control tab > **Retroactive Recalculation Option** field. **Note:** Using this option can cause temporary negative values if the adjustment is done at the beginning of an accumulation period.
Link This Meter To	Selects the station to which the meter belongs. The station assignment determines the type of fluid flowing through the meter and the calculation standard used, as well as the base temperature for the volume correction. Click ▼ to display available stations.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Meter Run Status</td><td colspan="2">Sets the state of the meter run. Valid values are Enabled (indicates that the meter run is on, the default) or Disabled (indicates that the meter run is off). If you disable a meter run, it does not read any of the assigned inputs, perform any flow calculations, perform accumulations, or write to any of the outputs. Disable a meter to reduce loading when you connect less than six meter runs to the unit. Do not use this option to place a meter run temporarily out of service, as outputs are not zeroed.</td></tr>
<tr><td rowspan="5">Meter Operation Mode</td><td colspan="2">Set the operating mode for this meter to determine which set of accumulators update as the flow increments. Valid selections include:</td></tr>
<tr><td>Normal Mode</td><td>Standard hourly, daily, monthly, and non-resettable accumulators meter accumulators update.</td></tr>
<tr><td>Maintenance Mode</td><td>Flow accumulates in special maintenance accumulators and NOT in the standard accumulators. There must be no flow and the station permissive must be set in order to put a meter in Maintenance Mode and there must be no flow to take a meter out of Maintenance Mode. The purpose of Maintenance Mode is to allow you to inject test pulses or signals without affecting the custody transfer numbers and is always done under actual conditions of no flow.</td></tr>
<tr><td>Alternate Mode</td><td>Flow accumulates in a separate set of accumulators (alternate accumulators), but there is no criteria for going into or out of Alternate Mode. Standard accumulators may continue to increment, depending on Alternate Mode Option selected below.</td></tr>
<tr><td colspan="2">Note: When placing a meter into Maintenance mode, you must first place the associated station into maintenance mode.</td></tr>
<tr><td>Alternate Mode Option</td><td colspan="2">Indicates whether, in Alternate mode, the Standard accumulators continue to increment. Valid values are No (standard totals do not increment) or Yes (standard totals increment).</td></tr>
</table>

Meter: Inputs Tab

Use this tab to set if the meter will be mass based (Coriolis) or volume based (Turbine, Positive Displacement, or such) and to assign the meter input points for the meter element (pulses / flowrate), meter temperature, meter pressure and sediment and water (S&W) meter. You also configure the meter density option, which determines if the meter has its own dedicated densitometer / density input, or if it should use the density value from the associated station. Finally, you can configure the optional meter spool calculation, which results in the use of CTS (correction for temperature on the meter) and CPS (correction for pressure on the meter) factors.

To access this screen, select the **Inputs** tab. The Inputs screen displays.

The TLP Browse button

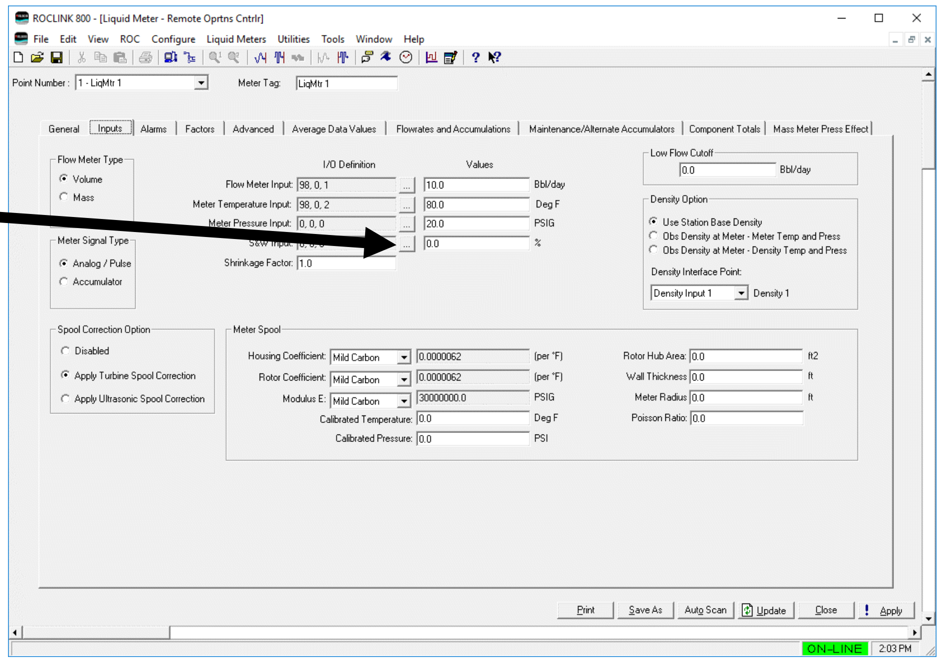


Figure 9-22. Meter – Inputs tab

Field	Description
Flow Meter Type	Indicates if the I/O definition for the raw flow signal (pulse or analog) represents volume or mass. If you select **Mass** (typically a Coriolis meter), then input pulses or an analog flowrate represents mass. If you select **Volume** (typically a linear, positive displacement meter or Coriolis meter with volume based pulses), then input pulses or an analog flowrate represents a volume. Regardless of the selection, mass and all volume quantities calculate, this is just an indication of the input type. If the raw flow signal is a pulse, this selection changes the units of the K-factor (pulses/volume units or pulses/mass units where volume and mass units are defined under Liquid Preferences).

Field	Description
Meter Signal Type	Sets the raw flow signal. Valid values are **Pulse/Analog** or **Accumulator**. **Notes:** ▪ If you select **Pulse/Analog**, the ROC800L uses the rate input you configure in the Flow Meter Input field for calculations. ▪ If you select **Accumulator**, the ROC800L uses the accumulator input you configure in the Accumulator Input field for calculations.
Flow Meter Input I/O Definition	Sets the TLP for the raw flow signal (usually a pulse input frequency from a PI or APM point, but can be an analog signal). Click the TLP Browse button to display the Select TLP screen and define your TLP selection. **Note:** If you select **Undefined** for the I/O definition, manually enter a value in the Value field. Otherwise, the current value for the input you select displays.
Meter Temperature Input	Sets the input from which to acquire the temperature value. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. **Note:** If you select **Undefined** for the I/O definition, manually enter a value in the Value field. Otherwise, the current value for the input you select displays.
Meter Pressure Input	Sets the input from which to acquire the pressure value. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. **Note:** If you select **Undefined** for the I/O definition, manually enter a value in the Value field. Otherwise, the current value for the input you select displays.
S&W Input	Sets the input from which to acquire the sediment and water (S&W) value. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. **Note:** If you select **Undefined** for the I/O definition, manually enter a value in the Value field. Otherwise, the current value for the input you select displays.
Shrinkage Factor	Sets the shrinkage factor, which is used to account for volume losses due to evaporation. This value acts as a simple multiplier in the volume calculation, and is applied to the gross standard volume to calculate a net standard volume. **Note:** Because this value is a multiplier, a value of to 1.0 will disable any effect.

Field	Description
Accumulator Input I/O Definition	Sets the TLP for the raw flow signal when the Meter Signal Type is set to Accumulator. Click the TLP Browse button to display the Select TLP screen and define your TLP selection. **Note:** If you select **Undefined** for the I/O definition, manually enter a value in the Value field. Otherwise, the current value for the input you select displays.
Accumulator Rollover Value	Sets the accumulator rollover value. This field indicates the rollover value for the accumulator input and applies only when you select Accumulator in the Meter Signal Type field.
Low Flow Cutoff	Sets the minimum acceptable flowrate. The system sets any input flowrate below this value to zero. Raw pulses always accumulate, but other quantities do not increment below the low flow cutoff.
Density Option	Sets the source of the density for use in volume correction calculations of this meter. Valid selections are: **Use Station Base Density** — No densitometer at the meter, use density you define with the station. A base to alternate calculation occurs using the meter temperature and pressure as the alternate conditions. If there is no live density reading (station acquires a base density from the product you assign) or you assign the live density reading at the station level (so the station calculates a base density), select this option at the meter.

Field	Description	
	Use Density at Meter - Meter Temp and Press	Use values from densitometer with observed to base density calculation using the meter temperature and pressure as the observed density conditions. In most cases where the meters have individual live density measurement, there is only one temperature measurement and one pressure measurement to cover both the density and the meter. In this case, select this option at the meter. This means that the meter density is set equal to the observed density and only an observed to base calculation is performed.
	Use Density at Meter - Density Temp and Press	In some cases, the live density measurement have separate pressure and temperature measurement from the meter. This means that an observed to base calculation will be done using the temperature and pressure that you associate with the assigned density point and a base to alternate calculation will be done using the meter temperature and pressure. Use values from densitometer with observed to base density calculation using the density temperature and pressure as the observed density conditions.
	Note: If you select **Use Density at Meter - Density Temp and Press** or **Use Density at Meter - Density Temp and Press**, you must associate a value in the Density Interface Point field.	
Density Interface Point	Select to associate a density input if you select **Use Density at Meter - Density Temp and Press** or **Use Density at Meter - Density Temp and Press** in the Density Options field. Click ▼ to display Density Interface Point.	

Field	Description	
Spool Correction Option	Select to apply a meter spool correction calculation. When selected, the system calculates a CTS (correction factor for the effect of temperature on the meter spool) and CPS (correction factor for the effect of pressure on the meter spool). These correction factors apply to the gross volume flowrate. If not selected, the system sets CTSm and CPSm to 1.0.	
	Disabled	No spool correction is applied.
	Apply Turbine Spool Correction	Select to manually enter parameters associated with spool correction factors for turbine meters.
	Apply Ultasonic Spool Correction	Select to manually enter parameters associated with spool correction factors for ultrasonic meters.
Meter Spool	All of the fields in the Meter Spool frame apply to the calculation of correction factors for the effect of temperature and pressure on the actual meter spool (body) and are abbreviated as CTSm (correction for effect of temperature on steel at the meter) and CPSm (correction for the effect of pressure on steel at the meter). These are rarely used, because you compare most liquid meters against a calibrated prover on a regular basis (and the prover performs this sort of correction) and you adjust either the meter factor or K-factor to compensate. So, theoretically, only use these options if you not proving the meter. **Note:** These fields appear **only** if you select either **Apply Turbine Spool Correction** or **Apply Ultrasonic Spool Correction** in the Spool Correction Option field.	
	Housing Coefficient	Indicates the material used in the meter housing to determine the linear temperature expansion coefficient. The coefficient is used in the calculation of CTSm. Click ▼ to select a material. This represents how much the meter housing expands or contracts with temperature. If you select a material, the program applies the correct coefficient for the selected material in the appropriate temperature units. If you select **User Entered**, enter the coefficient value in the field.

Field	Description	
	Rotor Coefficient	Indicates the material used in the meter rotor blades to determine the linear temperature expansion coefficient. The coefficient is used in the calculation of CTSm. Click ▼ to select a material. This represents how much the turbine rotor expands or contracts with temperature. If you select a material, the program applies the correct coefficient for the material in the temperature units. If you select **User Entered**, enter the coefficient value in the field.
	Modulus E	Select the type of material for the Youngs modulus of elasticity for the meter housing. The coefficient is used in the calculation of CPSm. This represents how much the meter housing expands or contracts with pressure. As the calculation is also based on the meter housing material, select the same material selected for the Housing Coefficient. If you select a material, the program applies the correct coefficient for the material in the appropriate temperature units. If you select **User Entered**, enter the coefficient value in the field.
	Calibrated Temperature	Sets the temperature of the meter the last time the meter was either calibrated in a lab or proved with a calibrated volume from either a prover or master meter. If you use the Proving program to prove the meter, this value updates automatically. Values are in Deg F or Deg C.
	Calibrated Pressure	Sets pressure of the meter the last time the meter was either calibrated in a lab or proved with a calibrated volume from either a prover or master meter. If you use the Proving program to prove the meter, this value updates automatically. Values are in PSI, kPa, bar, or kg/cm2.

Field	Description
Rotor Hub Area	Indicates, in ft2 or m2, the area of the rotor hub. The system uses this value to determine the geometry of the meter in order to calculate the effect of pressure on the volume of the meter. This value displays on the meter calibration sheet and in the CPSm calculation.
Wall Thickness	Indicates, in inches or cms, the thickness of the meter housing. The system uses this value to determine the geometry of the meter in order to calculate the effect of pressure on the volume of the meter. This value displays on the meter calibration sheet and in the CPSm calculation.
Meter Radius	Indicates, in inches or cms, the radius of the meter housing. The system uses this value to determine the geometry of the meter in order to calculate the effect of pressure on the volume of the meter. This value displays on the meter calibration sheet and in the CPMs calculation.
Poisson Ratio	Indicates the Poisson ratio (dimensionless). The system uses this value to determine the geometry of the meter in order to calculate the effect of pressure on the volume of the meter. This value displays on the meter calibration sheet and in the CPSm calculation.

Meter: Alarms Tab

Use this tab to define alarms for the meter you select. Since there are multiple flow rate parameters for the different quantities, you have the choice to have no flowrate alarming or alarms based on any of the flowrate parameter values. If enabled, you can then set the standard high, low limits and alarm deadband. This screen also displays any current active alarms. These alarms can generate a Spontaneous-Report-by-Exception (SRBX) message on set or clear.

To access this screen, select the **Alarms** tab. The Alarms screen displays.

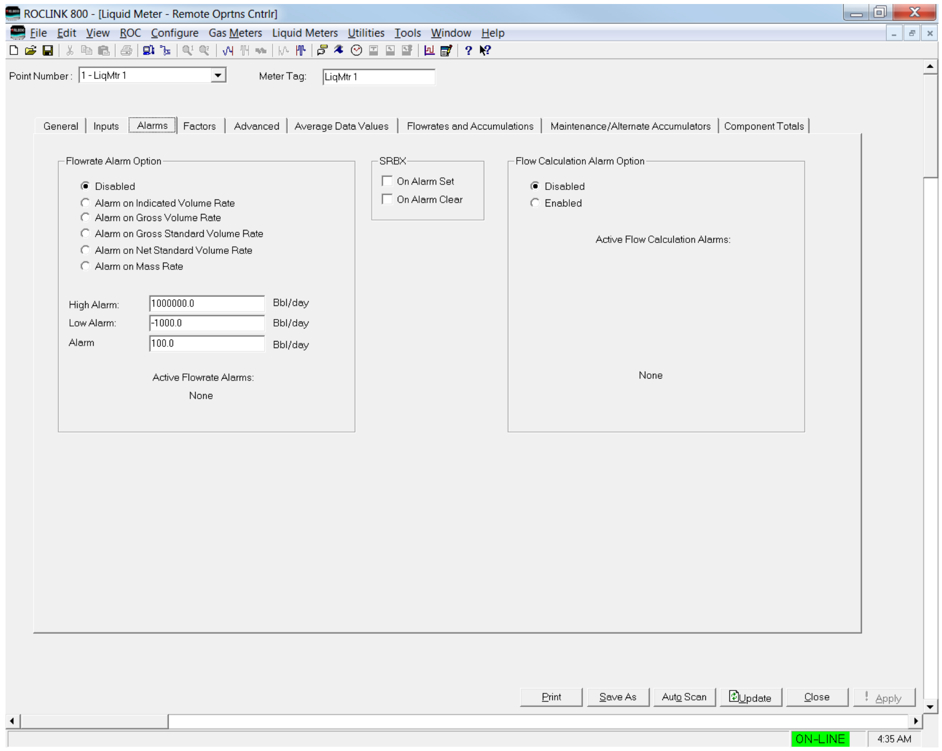


Figure 9-23. Meter – Alarms tab

Field	Description	
Flowrate Alarm Option	Set which quantity flow rate is checked against the alarm limits or to disable alarming completely. For each option, the system resets the units on the High Alarm, Low Alarm, and Alarm Deadband fields according to the selections on the Liquid Preferences screen.	
	Disabled	No alarms generate. This is the **default**.
	Alarm on Indicated Volume Rate	An alarm generates if the Indicated volume (Pulses / K-factor) reaches the user-defined high and low alarm values.
	Alarm on Gross Volume Rate	An alarm generates if the gross volume (Indicated Volume * Meter Factor) reaches the user-defined high and low alarm values.
	Alarm on Gross Standard Volume Rate	An alarm generates if the gross standard volume (Gross Volume * CTL * CPL) reaches the user-defined high and low alarm values.

Field	Description	
	Alarm on Net Standard Volume	An alarm generates if the net standard volume (Gross Standard Volume * Base Sediment and Water) reaches the user-defined high and low alarm values.
	Alarm on Gross Mass Rate	An alarm generates if the gross mass (Indicated Mass * Meter Factor or Gross Volume * Flow Density) reaches the user-defined high and low alarm values.
High Alarm	Sets, in engineering units, a value to which the input value must rise to generate a high alarm.	
Low Alarm	Sets, in engineering units, a limit value to which the input value must fall to generate a low alarm.	
Alarm Deadband	Sets, in engineering units, a value that defines an inactive zone above the Low Alarm limits and below the High Alarm limits. The alarm is set when it reaches the Low or High Alarm limit, but a Low Alarm does not clear until it gets above the (Low Alarm limit + Alarm Deadband) and a High Alarm does not clear until it gets below the (High Alarm limit – Alarm Deadband). This deadband prevents the system from setting and clearing the alarm continuously when the input value is oscillating around the alarm limit.	
SRBX	Indicates the activity that generates a Spontaneous Report by Exception (SRBX) alarm. Valid values are **On Alarm Set** (generate a report when an alarm **sets**) and **On Alarm Clear** (generate a report when an alarm **clears**).	
Flow Calculation Alarm Option	Indicates whether the system generates and sends alarms to the Alarm Log. This alarm is based on pressure, temperature, or density values outside the bounds of the selected calculation standard for the selected fluid. Below are the possible flow calculation alarms, and the limits that apply when using the API 2004 standard.	
	Temperature Out Of Bounds	The temperature of the observed density (densitometer) is outside the allowed range. Degrees F: –58.0 to 302.0 Degrees C: –50.0 to 150.0
	Pressure Out Of Bounds	The pressure of the observed density (densitometer) is outside the allowed range. psig: 0 to 1500.0 barg: 0 to 103.4 kPag: 0 to 1.034×10^{4}

Field	Description	
	Observed Density Out Of Bounds	The observed density is outside the allowed range. This only applies when you select a meter based density interface point.
	Base Density Out Of Bounds	The calculated base density is outside the allowed range.
	Convergence Error	The maximum iterations to calculate the base density have been exceeded.
	Refined Product Alarm	When using a refined product fluid type (Gasoline, Jet Fuels, Fuel Oils), the base density has drifted outside of the expected range for the selected fluid. Fuel Oils: 838.3127 ≤ ρ60 ≤ 1163.5 kg/m3 Jet Fuels: 787.5195 ≤ ρ60 ≤ 838.3127 kg/m3 Transition Zone: 770.3520 ≤ ρ60 ≤ 787.5195 kg/m3 Gasolines: 838.3127 ≤ ρ60 ≤ 1163.5 kg/m3
	Alpha Out of Bounds	When using the special applications fluid type, the user entered coefficient of thermal expansion (alpha) is greater then the range allowed by the standard. Per deg F: 230.0×10^{-6} to 930.0×10^{-6} Per deg C: 414.0×10^{-6} to 1674.0×10^{-6}

Meter: Factors Tab

Use this tab to configure Meter Factor and K-factor in the flow calculation for the meter.

The K-factor converts pulses from the flow meter (turbine, positive displacement (PD), Coriolis, ultrasonic, and such) into either volume or mass units and so it displays units of pulses / EU where EU depends on the volume / mass selection for the flow meter type and selected volume or mass units on the Liquid Preferences screen. For a typical turbine meter, for example, the quantity is “Indicated Volume” (what the meter is “indicating”) is calculated as pulses / K-factor. You can adjust the indicated volume by multiplying by the meter factor (and spool correction factors) to obtain the quantity “Gross Volume”. Some adjustments to the indicated volume for the meter body variances in some way, but are still talking about the volume of liquid at flowing conditions.

There are two entirely different ways for using the K-factor and / or the meter factor. When you prove a meter (compared to a certified volume of some sort), you can adjust either the K-factor or the meter factor to compensate for differences between the meter indicated volume and the certified volume. In the United States, typically, you enter the K-factor once based on a factory calibration of the meter and these adjustments are made by changing the meter factor. In other parts of the world, it is common not to use a meter factor at all (set to 1.0) and adjust the K-factor. Other options relate to whether proving is done at one flow rate or multiple flow rates (single versus curve) and whether or not the product through the meter varies (pipeline applications) so that you store the meter factor / K-factor history for each meter on a product by product basis.

To access this screen, select the **Factors** tab. The Factors screen displays.

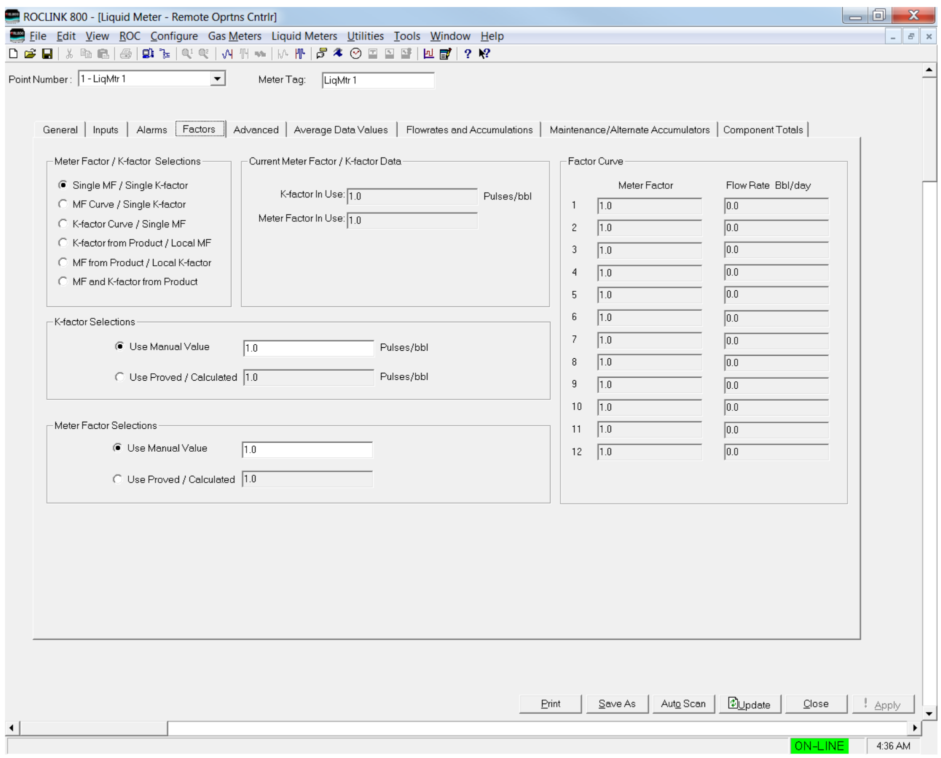


Figure 9-24. Meter – Factors tab

Field	Description
Meter Factor / K-Factor Selections	Sets how the system uses K-factors or meter factors in the flow calculation. Valid values are:

Field	Description	
	Single MF / Single K-factor	Uses a single Meter Factor and a single K-factor for the meter. This is the default value. This is the simplest choice and means that a value for the meter factor and a value for the K-factor are fixed for all flow rates and the values are taken from the last prove or an entered value. Select this option when using either the K-factor or meter factor proving, as long as neither the K-factor or meter factor will vary with flow rate or product.
	MF Curve / Single K-factor	A meter factor calculates for the current flow rate based on a linear interpolation of the meter factor versus flow rate values entered under the Factor Curve heading, but the K-factor will be fixed. Select this option when using meter factor proving if proving is done at multiple flow rates.
	K-factor Curve / Single MF	A K-factor calculates for the current flow input frequency based on a linear interpolation of the meter factor versus frequency values entered under the Factor Curve, but the meter factor will be a single value from the last prove or entered value. The K-factor curve can come from multiple proves at different flow rates with a meter factor of 1.0 (K-factor proving) or the K-factor curve can come from factory calibration and a single meter factor from a prove (meter factor proving).
	K-factor from Product / Local MF	The K-factor is taken from the meter history kept for each product and so it will use the last K-factor proved for this meter for the product currently flowing through the meter. The meter factor will be fixed and use the value entered from this screen (normally at 1.0 since the K-factor is varying). This option would typically be selected, then, for K-factor proving when the product through the meter is varying (pipeline applications).

	MF from Product / Local K-factor	The meter factor will be taken from the meter history kept for each product and so will use the last meter factor proved from this meter for the current product flowing through the meter. The K-factor will be fixed and use the value entered from this screen. This option would typically be selected, then, for meter factor proving when the product through the meter is varying (pipeline applications).
	MF and K-factor from Product	Both the meter factor and K-factor are taken from the meter history kept for each product. This option would typically be used if the meter had a different factory calibrated K-factor for different products and meter factor proving is being done and the product through the meter is varying (pipeline applications).
Current Meter Factor / K-Factor Data		These **read-only** fields display the current K-factor input value or the current meter factor value. The **K-factor in Use** field shows the linear meter constant (K-factor) value the system uses for this meter. Units are in Pulse / Unit Volume and must match the units that you select for the Volume Type on the Liquid Preferences screen. The **Meter Factor in Use** field shows the meter factor (obtained by dividing the quantity of fluid the proving system measured by the quantity the meter indicates during proving) the system uses for this meter. **Note:** This field is available only if you select **Single MF / Single K-factor, MF Curve / Single K-factor** or **MF from Product / Single K-factor** in the Meter Factor/K-factor Selections field.
Factor Curve		Sets up to 12 points for the factor curve. If you select **MF Curve / Single K-factor**, define up to 12 points (pairs of meter factor and flow rate) on the curve. The system calculates a meter factor for use in the flow equation by linear interpolation of the current indicated flow rate. If you select **K-factor Curve / Single MF**, define up to 12 points (pairs of K-factor and frequency) on the curve. The system calculates a K-factor for use in the flow equation by linear interpolation of the current flow meter input frequency. **Meter Factor**: If you select **K-factor Curve, Single Meter Factor**, this parameter is the linear meter

Field	Description
	constant (K-factor) in pulses per unit volume for the associated frequency in Hz. If you select **Meter Factor Curve, Single K-factor**, this parameter is the dimensionless meter factor (MF) for the associated indicated volume flow rate. **Flow Rate:** If you select **K-factor Curve, Single Meter Factor**, this parameter is the frequency in Hz that corresponds with the associated K-factor. If you select **Meter Factor Curve, Single K-factor**, this parameter indicates volume flow rate that corresponds with the associated meter factor.
Options for Selecting the In Use K-Factor	Selects the K-factor value used in calculations. Valid values are **Use Manual Value** (enter a value in the field) or **Proved/Calculated** (use the value value acquired from a prove). To override the K-factor calculated from the factor curve or obtained from the last prove of the meter while still retaining that proved/calculated value, you can enter a separate manual K-factor value and select which value the system actually uses in the calculation.
Options for Selecting the In Use Meter Factor	Selects the meter factor value used in calculations. Valid values are **Use Manual Value** (enter a value in the field) or **Proved/Calculated** (use the value acquired from a prove). To override the meter factor calculated from the factor curve or obtained from the last prove of the meter while still retaining that proved / calculated value, you can enter a separate manual meter factor value and select which value the system actually uses in the calculation.

Meter: Advanced Tab

Use this tab to review correction factors, density values, and density source for the selected meter. The Liquid Calculations User Program uses these intermediate values to calculate the volume and mass flow rates and totals, typically for use in calculation verification.

To access this screen, select the **Advanced** tab. The Advanced screen displays.

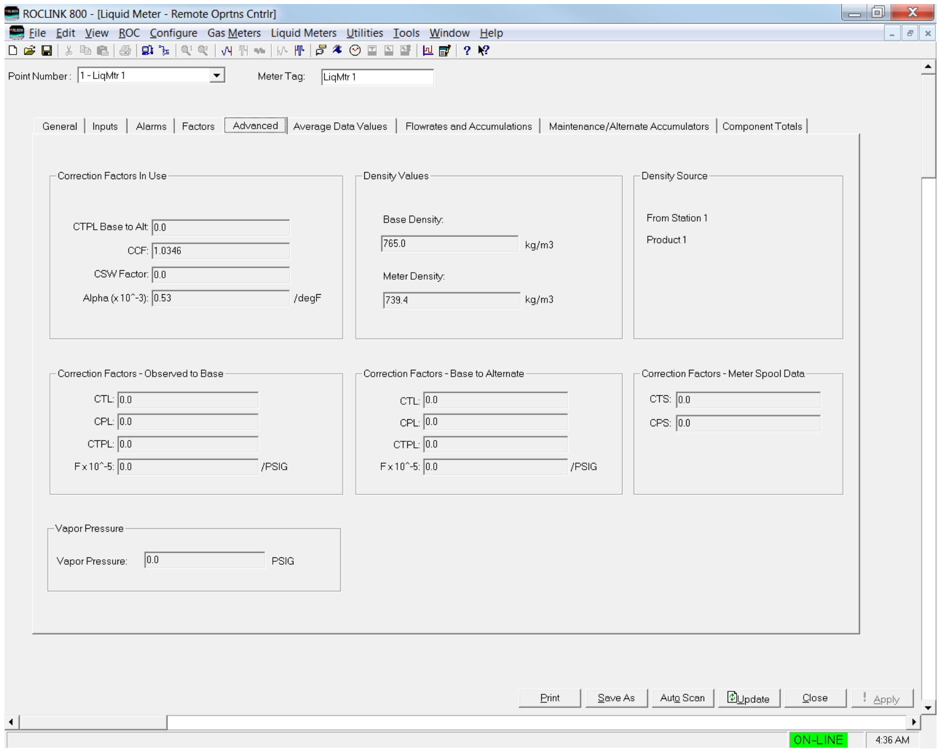


Figure 9-25. Meter – Advanced tab

Field	Description
Correction Factors In Use	These **read-only** fields display the values of factors the program uses in the flow calculation, rounded to the actual number of decimal places used in the calculation.
CTPL Base to Alt	This **read-only** field shows the current Correction for the Temperature and Pressure of the Liquid (CTPL) between base to alternate (line / meter) conditions for the meter. It is also referred to as the Volume Correction Factor (VCF). **Note:** This field is **only** applicable for API/ASTM/IP 2004 tables and GPA TP27.
CCF	This **read-only** field shows the current Combined Correction Factor (CCF) for the meter. This value is the CTPL or VCF multiplied with the meter factor in use.
CSW Factors	This **read-only** field shows the correction factor for sediment and water.
Alpha (x 10^-3)	This **read-only** field shows the coefficient of thermal expansion coefficient of the liquid the program uses to calculate the effect of temperature on the liquid. This number displays with an implied multiplier of 1000.
Base Density	This **read-only** field shows the base density. This is the density at base conditions (60.0 deg F/ 0.0 psig, or 15 deg C / 0.0 barg, and such).
Meter Density	This **read-only** field shows the current meter density. This is the density at the meter conditions (meter temperature and meter pressure).
Density Source	This **read-only** frame shows the density values the program uses in the volume correction calculation and where the density values come from.
Correction Factors Observed to Base	These **read-only** fields display the intermediate factors the program uses to calculate a base density from an observed density. If there is no live density measurement and the user program uses an entered base density, these fields do not display. These values unround to allow for verification of the calculation.
CTL - Observed to Base	This **read-only** field shows the correction for observed temperature to base conditions.
CPL - Observed to Base	This **read-only** field shows the correction for observed pressure to base conditions.
CTPL - Observed to Base	This **read-only** field shows the correction for observed temperature and pressure to base conditions.
F x 10^5- Observed to Base	This **read-only** field shows the correction factor for the compressibility of a liquid in the meter at normal operating temperatures. This number displays with an implied multiplier of 1,000,000.

Field	Description
Correction Factors Base to Alternate	These **read-only** fields display intermediate factors the user program uses to calculate a meter density and volume correction factor from a base density. These values unround to allow for verification of the calculation. **Note:** These fields are applicable **only** for API/ASTM/IP 2004 tables and GPA TP27.
CTL	This **read-only** field shows the correction for base temperature to alternate conditions.
CPL	This **read-only** field shows the correction for base pressure to alternate conditions.
CTPL	This **read-only** field shows the correction for base temperature and pressure to alternate conditions.
F x 10^5	This **read-only** field shows the base compressibility factor to alternate conditions.
Correction Factors Meter Spool Data	These **read-only** fields display the correction factors for the spool. All of the fields in the Meter Spool frame apply to the calculation of correction factors for the effect of temperature and pressure on the actual meter spool (body) and are abbreviated as CTSm (correction for effect of temperature on steel at the meter) and CPSm (correction for the effect of pressure on steel at the meter). **Note:** These fields contain calculated values **only** if you select **Apply Meter Spool Correction** on the Input tab of the Liquid Meter screen. Otherwise these values are **not** applied to the flow rates and accumulation.
CTS	Correction factor for the effect of temperature on the meter spool.
CPS	Correction factor for the effect of pressure on the meter spool.
Vapor Pressure	This **read-only** field displays the vapor pressure (or equilibrium pressure) in use for the meter, which is used in pressure correction. This value is either calculated by the program, or user entered, depending on the option selected at the associated station. **Note:** Calculation of the vapor pressure value is **only** applicable when the fluid type is light hydrocarbon.

Meter: Average Data Values Tab

This tab displays the average flowrate and the flow-weighted average (FWA) for the pressure, temperature, observed density, base density, meter factor, K-factor, and various correction factors. Average data values are available for the Previous Hour, Current Hour, Previous Day, and Current Day. The user program calculates the average flowrate as a linear average of the meter quantity flowrate. The other values are flow weighted averages (FWA) and are flow weighted based on that same quantity. The daily values are reset on contract hour, which follows the contract hour of the general history segment. These values are flow weighted against the rate selected for the Average Flowrate Option on the associated Station > General tab.

To access this screen, select the **Average Data Values** tab. The Average Data Values screen displays.

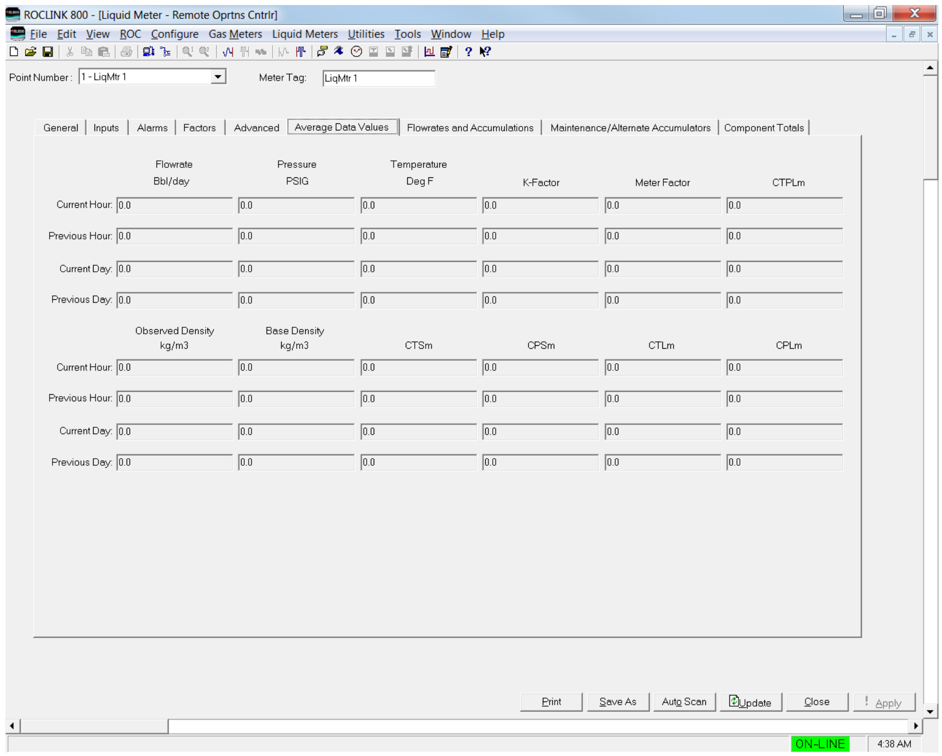


Figure 9-26. Meter – Average Data Values tab

Field	Description
Flowrate	These **read-only** fields show the average flowrate for the hour, previous hour, contract day and previous day. This field represents the Average Flowrate Option selected on the General tab of the Liquid Station screen.
Pressure	These **read-only** fields show the flow weighted average pressure for the hour, previous hour, contract day and previous day.
Temperature	These **read-only** fields show the average temperature for the hour, previous hour, contract day and previous day.
K-Factor	These **read-only** fields show the average K-factor for the hour, previous hour, contract day and previous day.
Meter Factor	These **read-only** fields show the average meter factor for the hour, previous hour, contract day and previous day.
Observed Density	These **read-only** fields show the average

Field	Description
	observed density for the hour, previous hour, contract day and previous day.
Base Density	These **read-only** fields show the average base density for the hour, previous hour, contract day and previous day.
CTSm	These **read-only** fields shows the flow weighted average CTSm for the hour, previous hour, contract day and previous day.
CPSm	These **read-only** fields show the flow weighted average CPSm for the hour, previous hour, contract day and previous day.
CTLm	These **read-only** fields shows the flow weighted average CTLm for the hour, previous hour, contract day and previous day.
CPLm	These **read-only** fields shows the flow weighted average CPLm for the hour, previous hour, contract day and previous day.

Meter: Flowrates and Accumulations Tab

Use this tab to review instantaneous meter flow rates for all the quantities for the station.

The Flowrate fields display the current value as read by the meter at that point in time.

For each quantity, there is also available a Current Hour, Previous Hour, Current Day, Previous Day, Current Month, Previous Month, and non-resettable Total Accumulation. The daily values reset on contract hour, which follows the contract hour of the general history segment. The non-resettable totals rollover at the Double Precision Accumulator Rollover Value found on the ROC > Information > General tab.

With a volume meter (pulse based), the system calculates flowrate values as:

$$IV = \frac{Pulses}{Kfactor}$$

$$GV = IV \times MeterFactor$$

$$GSV = GV \times CTPL$$

$$S\&W = GSV \times S\&W\%$$

$$NSV = GSV - S\&W$$

$$MASS = GV \times MeterDensity$$

With a mass meter (pulse based), the system calculates flowrate values as:

$$IM = \frac{Pulses}{Kfactor}$$

$$Gross\ Mass = IM \times MeterFactor$$

$$GV = Gross\ Mass\ /\ Meter\ Density$$

$$GSV = GV \times CTPL$$

$$S\&W = GSV \times S\&W\%$$

$$NSV = GSV - S\&W$$

To access this screen, select the **Flowrates and Accumulations** tab. The Flowrates and Accumulations screen displays.

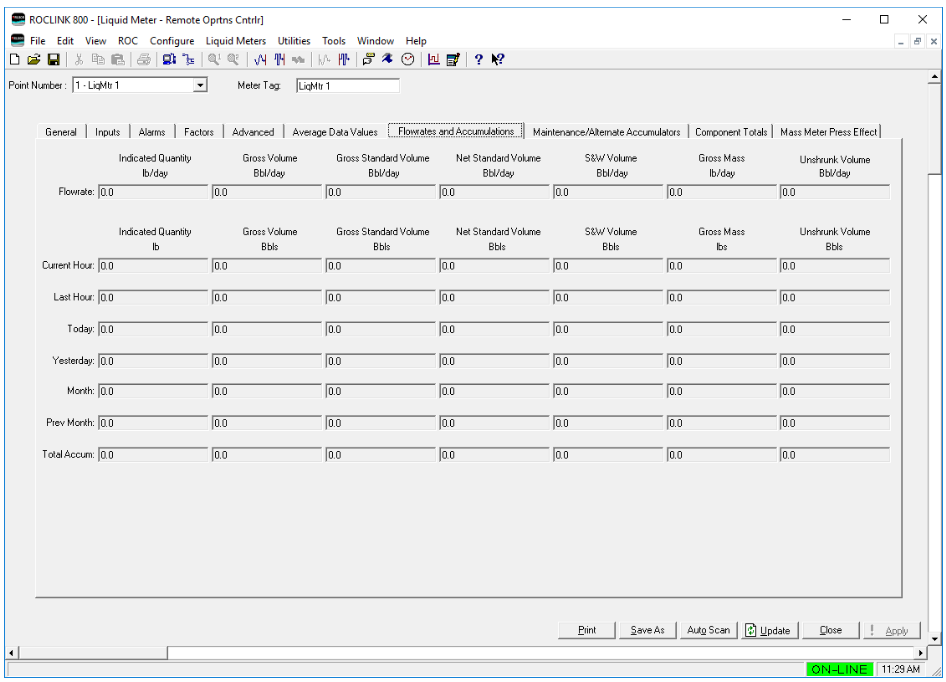


Figure 9-27. Meter – Flowrates and Accumulations tab

Field	Description
Indicated Quantity	These **read-only** fields show the sum of the indicated quantity flowrates for the meter and the current accumulation of indicated quantity for the meter on an hourly, daily, monthly, and total basis. The indicated quantity is the volume or mass read directly from the meter at flowing conditions, without any correction. This may be a mass value or a volume value, depending on the Flow Meter Type you select on the Inputs tab. Define volume units, flow rate units, and mass units on the General tab of the Liquid Preferences screen.

Field	Description
Gross Volume	These **read-only** fields show the sum of the gross volume flowrates for the meter and the current accumulation of gross volume for the meter on an hourly, daily, monthly, and total basis. The Gross Volume is the volume at flowing conditions, corrected for meter factor. The system calculates the current Gross Volume (GV) flow total value by multiplying the Indicated Volume (IV) flow total by the Meter Factor (MF). You define volume and flow rate units in the Liquid Preferences General tab.
Gross Standard Volume	These **read-only** fields show the sum of the gross standard volume flowrates for the meter and the accumulation of gross standard volume for the meter on an hourly, daily, monthly, and total basis. Gross Standard Volume is the volume at base conditions, also corrected for meter performance. The system calculates the current Gross Standard Volume (GSV) flow total value by multiplying the Gross Volume (GV) flow total by the correction factor for the temperature of the liquid (CTL) and the correction factor for the pressure of the liquid (CPL). You define Volume and Flowrate Units in the Liquid Preferences General tab.
Net Standard Volume	These **read-only** fields show the sum of the net standard volume flowrates for the meter and the accumulation of net standard volume for the meter on an hourly, daily, monthly, and total basis. Net Standard Volume is the volume at base conditions, corrected for meter performance and non-merchantable quantities, such as sediment and water. It applies only to crude oil applications. The system calculates the current Net Standard Volume (NSV) flow total by multiplying the Gross Standard Volume (GSV) flow total by the base Sediment and Water (S&W) volume flow total. You define Volume Units and Flowrate Units in the Liquid Preferences General tab. **Note:** This field **does not** appear if you select **API 14.4** in the Light Hydrocarbon Table Options field on the Liquid Product screen.
Component Summed	These **read-only** fields show the sum of all component flowrates for the meter and the current accumulation of component flowrates for the meter on an hourly, daily, monthly, and total basis. **Note:** This field appears **only** if you select **API 14.4** in the Light Hydrocarbon Table Options field on the Liquid Product screen.

Field	Description
S&W Volume	These **read-only** fields show the sum of S&W flowrates for the meter and the accumulation of S&W volume for the meter on an hourly, daily, monthly, and total basis. S &W Volume is the volume of non-merchantable quantities, such as sediment and water. The system calculates the current Sediment and Water (S&W) volume flow value by subtracting the Net Standard Volume (NSV) flow total from the Gross Standard Volume (GSV) flow total. You define Volume Units in the Liquid Preferences General tab.
Gross Mass	These **read-only** fields show the sum of gross mass flowrates for the meter and the accumulation of mass for the meter on an hourly, daily, monthly, and total basis. Gross Mass represents either an indicated mass corrected for meter performance (if a mass meter type is selected) or a mass value calculated from the gross volume and flowing density. You define Mass Units in the Liquid Preferences General tab.
Unshrunk Volume	These **read-only** fields show the sum of the unshrunk volume flowrates for the meter and the current accumulation of unshrunk volume for the meter on an hourly, daily, monthly, and total basis.

Meter: Maintenance/Alternate Accumulators Tab

Use this tab to view accumulations for data acquired during maintenance or alternate modes. When in maintenance mode, any flow the user program measures increments the maintenance mode accumulators instead of the standard accumulators (Flowrates and Accumulations Tab). When in alternate mode, any flow the user program measures increments the alternate mode accumulators and optionally, the standard accumulators as well.

To access this screen, select the **Maintenance/Alternate Accumulators** tab. The Maintenance/Alternate Accumulators screen displays.

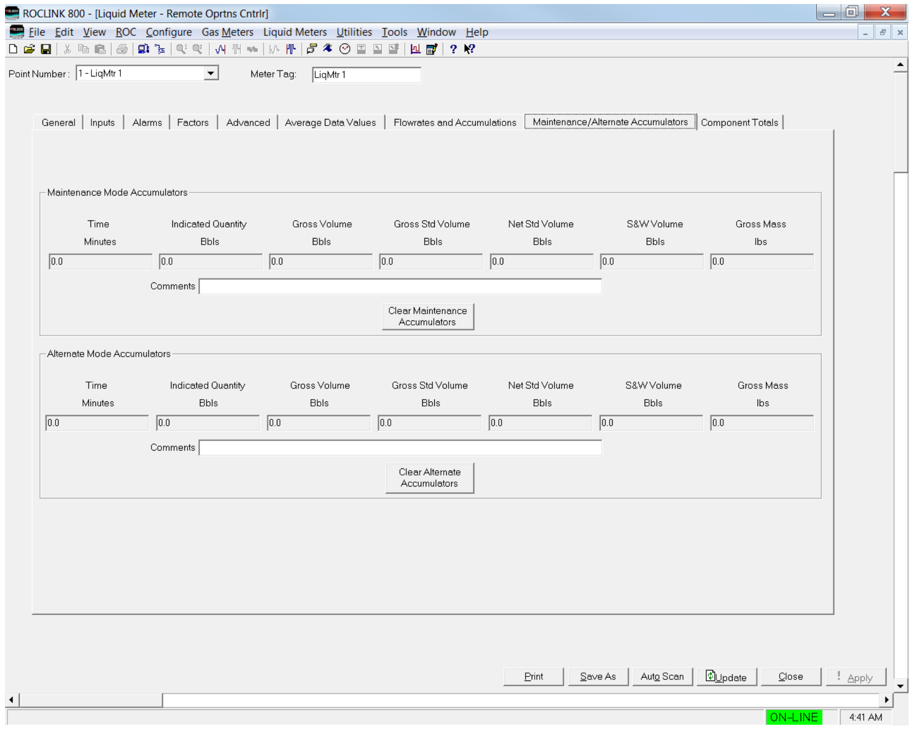


Figure 9-28. Meter – Maintenance/Alternate Accumulators tab

Field	Description
Time Minutes	These **read-only** fields show the elapsed time in minutes spent in maintenance or alternate mode.
Indicated Quantity	These **read-only** fields show the indicated volume or indicated mass total. Define the volume or mass units in the General tab of the Liquid Preferences screen.
Gross Volume	These **read-only** fields show the accumulation of volume at flowing conditions, corrected for Meter Factor. Define the volume units in the General tab of the Liquid Preferences screen.
Gross Std Volume	These **read-only** fields show the accumulation of volume at flowing conditions, corrected for Meter Factor. Define the volume units in the General tab of the Liquid Preferences screen.
Net Std Volume	These **read-only** fields show the accumulation of volume at base conditions, corrected for Meter Factor and BSW. Define the volume units in the General tab of the Liquid Preferences screen.
S&W Volume	These **read-only** fields show the accumulation of volume of non-merchantable quantities, such as sediment and water, in volume units you select while in maintenance or alternate mode
Gross Mass	These **read-only** fields show the accumulation of mass, in volume units you select while in maintenance or alternate mode.

Field	Description
Comments	Provides a 40-character field in which you can note the reason for placing the meter into maintenance mode or alternate mode.
Clear Maintenance Accumulators or **Clear Alternate Accumulators**	Click to clear the respective accumulator values and set them to 0.0.

Calculation Alarm Range Limits

The calculation standards implemented in the Liquid Calculations user program often indicate the range for which the inputs (such as temperature, pressure, density, etc.) are valid. When the inputs to the calculation exceed the published limits, the accuracy of the results becomes questionable. In this case of out-of-range inputs, the calculation continues and a calculation alarm is raised.

A flow calculation alarm is provided at the Liquid Meter. If enabled, it provides an indication if any of the inputs to the calculation in use exceed these ranges. The ranges of the values which will raise a calculation alarm vary, depending on the calculation in use. No calculation alarms are provided for the fluid type of ethanol.

API MPMS 11.1 1980

The following ranges are as described in American Petroleum Institute, Manual of Petroleum Measurement Standards Chapter 11.1 1980. This standard covers the API commodities groups of Crude Oil, Refined Products, Special Application Products, and Lubricating Oils.

The input ranges specified in this section are valid when one of the above fluid types is selected, and the liquid product the measurement table option is set to **1980 API / ASTM / IP / ISO Tables**.

Notes:

- **Odd** numbered tables are **Observed to Base**.
- **Even** numbered tables are **Base to Alternate**.

Table 5A

Selections:

- Observed density units – API
- Base Temperature – 60 F
- Product – Crude Oil

API	Temperature in °F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 100	0 to 200

Table 5B Selections:

- Observed density units – API
- Base Temperature – 60 F
- Product – Refined Products

API	Temperature in °F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 100	0 to 200

Table 5D Selections:

- Observed density units – API
- Base Temperature – 60 F
- Product – Lube Oil

API	Temperature in °F
-10.0 to 45.0	0 to 300

Table 6A Selections:

- Base density units – API
- Base Temperature – 60 F
- Product – Crude Oil

API	Temperature in °F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 100	0 to 200

Table 6B Selections:

- Base density units – API
- Base Temperature – 60 F
- Product – Refined Product

API	Temperature in °F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 85	0 to 200

Table 6C Selections:

- Base density units – API
- Base Temperature – 60 F
- Product – Special

Thermal coefficient expansion x 10^-6	Temperature in °F
270 to 510	0 to 300
510 to 530	0 to 250
530 to 930	0 to 200

Table 6D

Selections:

- Base density units – API
- Base Temperature – 60 F
- Product – Lube Oil

Density API	Temperature in °F
-10.0 to 45.0 API	0 to 300 F

Table 23A

Selections:

- Observed density units – Relative Density
- Base Temperature – 60 F
- Product – Crude Oil

Relative Density 60/60F	Temperature in °F
0.8250 to 1.0760	0 to 300
0.7795 to 0.8250	0 to 250
0.6110 to 0.7795	0 to 200

Table 23B

Selections:

- Observed density units – Relative Density
- Base Temperature – 60 F
- Product – Refined Products

Relative Density 60/60F	Temperature in °F
0.8250 to 1.0760	0 to 300
0.7795 to 0.8250	0 to 250
0.6535 to 0.7795	0 to 200

Table 23D

Selections:

- Observed density units – Relative Density
- Base Temperature – 60 F
- Product – Lube Oil

Density API	Temperature in °F
0.801699716713881 To 1.16460905349794 Relative	0 to 300 F

Table 24A

Selections:

- Base density units – Relative Density
- Base Temperature – 60 F
- Product – Crude Oil

Relative Density 60/60F	Temperature in °F
0.8250 to 1.0760	0 to 300
0.7795 to 0.8250	0 to 250
0.6110 to 0.7795	0 to 200

Table 24B Selections:

- Base density units – Relative Density
- Base Temperature – 60 F
- Product – Refined Product

Relative Density 60/60F	Temperature in °F
0.8250 to 1.0760	0 to 300
0.7795 to 0.8250	0 to 250
0.6535 to 0.7795	0 to 200

Table 24C Selections:

- Base density units – Relative Density
- Base Temperature – 60 F
- Product – Special

Thermal coefficient expansion x 10^-6	Temperature in °F
270 to 510	0 to 300
510 to 530	0 to 250
530 to 930	0 to 200

Table 24D Selections:

- Base density units – Relative Density
- Base Temperature – 60 F
- Product – Lube Oil

Density API	Temperature in °F
0.801699716713881 To 1.16460905349794 Relative	0 to 300 F

Table 53A Selections:

- Observed density units – Kg/m3
- Base Temperature – 15C
- Product – Crude Oil

Density Kg/M3	Temperature in °C
610 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 53B Selections:

- Observed density units – Kg/m3
- Base Temperature – 15C
- Product – Refined Products

Density Kg/M3	Temperature in °C
653 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 53D Selections:

- Observed density units – Kg/M3
- Base Temperature – 15C
- Product – Lube Oil

Density API	Temperature in °C
800.0 to 1164.0 kg/m3	-20.0 to 150.0 deg C

Table 54A Selections:

- Base density units – Kg/m3
- Base Temperature – 15C
- Product – Crude Oil

Density Kg/M3	Temperature in °C
610 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 54B Selections:

- Base density units – Kg/m3
- Base Temperature – 15C
- Product – Refined Products

Density Kg/M3	Temperature in °C
653 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 54C Selections:

- Base density units – Kg/m3
- Base Temperature – 15C
- Product – Special

Thermal coefficient expansion x 10^-6	Temperature in °C
486 to 918	-18 to 150
918 to 954	-18 to 125
954 to 1674	-18 to 90

Table 54D Selections:

- Base density units – Kg/M3
- Base Temperature – 15C
- Product – Lube Oil

Density API	Temperature in °C
800.0 to 1064.0 kg/m3	20.0 to 150.0 deg C

Table 59A

Selections:

- Observed density units – Kg/m3
- Base Temperature – 20C
- Product – Crude Oil

Density Kg/M3	Temperature in °C
610 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 59B

Selections:

- Observed density units – Kg/m3
- Base Temperature – 20C
- Product – Refined Products

Density Kg/M3	Temperature in °C
653 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 59D

Selections:

- Observed density units – Kg/m3
- Base Temperature – 20C
- Product – Lube Oil

Density in Kg/M3	Temperature in °C
800 to 824	-18 to 125
824 to 1164	-18 to 150

Table60A

Selections:

- Base density units – Kg/m3
- Base Temperature – 20C
- Product – Crude Oil

Density Kg/M3	Temperature in °C
610 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 60B

Selections:

- Base density units – Kg/m3
- Base Temperature – 20C
- Product – Refined Products

Density Kg/M3	Temperature in °C
653 to 778	-18 to 95
778 to 824	-18 to 125
824 to 1075	-18 to 150

Table 60D

Selections:

- Base density units – Kg/m3
- Base Temperature – 20C
- Product – Lube Oil

Density Kg/M3	Temperature in °C
800 to 824	-18 to 125
824 to 1164	-18 to 150

API MPMS 11.1 2004

The following ranges are as described in American Petroleum Institute, Manual of Petroleum Measurement Standards Chapter 11.1 2004. This standard covers the API commodities groups of Crude Oil, Refined Products, Special Application Products, and Lubricating Oils.

The input ranges specified in this section are valid when one of the above fluid types is selected, and the liquid product the measurement table option is set to **2004 API / ASTM / IP Tables**.

	Crude Oil	Refined Products	Lubrication Oils
Base Density			
kg/m3 @ 60°F	610.6 to 1163.5		800.9 to 1163.5
Relative Density @ 60°F	0.61120 to 1.16464		0.80168 to 1.1646
API Gravity @ 60°F	100.0 to -10.0		45.0 to -10.0
kg/m3 @ 15°C	611.16 to 1163.79	611.16 to 1163.86	801.25 to 1163.85
kg/m3 @ 20°C	606.12 to 1161.15	606.12 to 1160.62	798.11 to 1160.71
Observed Density			
kg/m3 @ 60°F	470.5 to 1201.8	470.4 to 1209.5	714.3 to 1208.3
Relative Density @ 60°F	0.47096 to 1.20298	0.47086 to 1.21069	0.715 to 1.20949
API Gravity @ 60°F	168.948 to -13.8758	169.0118 to -14.6246	66.40111 to -14.5086
Temperature			
°C	-50.00 to 150.00		
°F	-58.0 to 302.0		
Pressure			
psig	0 to 1500		
kPa (gauge)	0 to 1.034 X 104		
bar (gauge)	0 to 103.4		
Coefficient of Thermal Compressibility (α60)			

	Crude Oil	Refined Products	Lubrication Oils
per °F		230.0 X 10-6 to 930.0 X 10-6	
per °C		414.0 X 10-6 to 1674.0 X 10-6	

GPA TP-27 Alarm Ranges

The following ranges are as described in the Gas Producers Association, Technical Publication 27. This standard covers commodities that are considered to be light hydrocarbons.

The input ranges specified in this section are valid when the in-use fluid type is set to Light Hydrocabons, and the Light Hydrocabon option on the Product page is set to **GPA TP-27**.

Table 23E

Selections:

- Observed density units – Relative Density
- Base Temperature – 60 F
- Product – Light Hydrocarbon

Observed Density Relative	Temperature in °F
0.21 to 0.74	-50.8 to 199.4

Table 24E

Selections:

- Base density units – Relative Density
- Base Temperature – 60 F
- Product – Light Hydrocarbon

Base Density Relative	Temperature in °F
0.35 to 0.688	-50.8 to 199.4

Table 53E

Selections:

- Observed density units – Kg/M3
- Base Temperature – 15C
- Product – Light Hydrocarbon

Observed Density Kg/M3	Temperature in °C
349.6556 to 687.323008	-46.0 to 93.0

Table 54E

Selections:

- Base density units – Kg/M3
- Base Temperature – 15C
- Product – Light Hydrocarbon

Base Density Kg/M3	Temperature in °C
209.79336 to 739.27184	-46.0 to 93.0

Table 59E Selections:

- Observed density units – Kg/M3
- Base Temperature – 20C
- Product – Light Hydrocarbon

Observed Density Kg/M3	Temperature in °C
349.6556 to 687.323008	-46.0 to 93.0

Table 60E Selections:

- Base density units – Kg/M3
- Base Temperature – 20C
- Product – Light Hydrocarbon

Base Density Kg/M3	Temperature in °C
209.79336 to 739.27184	-46.0 to 93.0

9.3 Batching (Batching_800L)

Use the Batching program to configure batches to record the flow of a liquid. Batches are totals (measured quantity of product) over a specific time frame or measurement based. You can create batches at the station or meter level. For example, you can use batches to record loading of a vessel or truck, daily production, or a pipeline shipment.

The Batching user program:

- Is optional.
- Requires you to configure the Liquid Calcs User Program first.
- Provides totals for non-periodic, interruptible time periods, and periodic intervals.
- Provides Detailed information – Flow weighted averages, times, ticket info, and such.
- Recalculations of completed batches.
- Generates Batch Tickets Quantitative Transaction Reports (QTRs) and Bills of Lading (BOL).

Configure batches to record the flow of a liquid based on how and when the batch starts and stops. Batches start by external controls, manual controls, or by flow detection including on demand; run for a fixed quantity of fluid; or scheduled on an hourly, daily, weekly, monthly or an accumulated basis. If a meter has flow without an associated running batch, then an “unauthorized” batch starts.

You stop batches using external controls, manual controls, reaching a timed event, or exceeding a measurement quantity based on a sensor input, such as total accumulated flow, level, or other user configured event.

Use the batch configuration screens to set up either one-time batches or reoccurring batches, if you select the Continuous Batching Enabled option. Simple reoccurring batches are batches for which the basic information and batch start/stop conditions do not change (for example, a production station that requires a daily batch that completes at a specified contract hour or changes products that the line pushes through the pipeline every three days).

Time-based batches end when the user-specified time passes. Time based batches generally use the Continuous Batching option to have an on-going series of timed batches. The period of a batch can span hours, days, weeks, or months.

Measurement based batches end after the batch has exceeded a user-specified quantity of product. You can configure an alert to trigger when the batch nears completion.

Externally automated batches begin and end based on a discrete input, a Modbus register mapped parameter, or other user-defined TLPs. A batch starts when the “Batch Start” parameter is equal to a non-zero value. The batch continues until the “Batch End” parameter is equal to a non-zero value.

You can manually start and stop batches. You can start one or all batches manually, and the batch runs until you manually end the batch.

Notes:

- Batches use a first come first serve (FIFO) approach to starting and ending. You can always stop a time or measurement based batch with manual or external controls.
- You can configure how the batch handles changes to the Meter Factor or K-factor. By default, the Meter Factor or K-factor affects each sample of the flow and averages. If you enable the Retroactive Recalculation Option, a change in the Meter Factor or K-factor affects the total flow by applying the new value to the entire batch.

Batch Totals

Batching has the following totaling characteristics:

- **Batch does no direct measurement.**
  - Use of Liquid Calcs non-resettable totals.
- **Total = Ending – Starting**
- **Total batch values provided for:**
  - Indicated Volume or Mass.
  - Gross Volume.
  - Gross Standard Volume.
  - Net Standard Volume.
  - Sediment and Water Volume.
  - Gross Mass.

Example:

Starting Accumulator = 54,105.45 bbl

Ending Accumulator = 54,605.45 bbl

Total barrels for the batch?

54,605.45 – 54105.45 = 500.0 bbl

Volume Calculations

Batching uses the following volume calculations:

- **Indicated Volume** (IV) = Pulses / K-Factor
- **Gross Volume** (GV) = IV * MF
- **Gross Standard Volume** (GSV) = GV * CTL * CPL
- **Sediment & Water Volume** (SWV) = GSV * S&W Percent
- **Net Standard Volume** (NSV) = GSV – SWV
- **Gross Mass** (Mass) = GV * Meter Density

Batch Maintenance

Occasionally, you need to take a meter out of service and remove the meter from a batch for maintenance purposes. For this reason, it is best to group meters into stations. By including two or more meters in a station, you can "valve off" and shut off a meter, while the others continue to measure the flow.

When a meter is in maintenance mode, you may still be receiving signals and pulses from the meter, but those values do not indicate real product passing thru the meter. Because of this, ROCLINK does not add measurements of the "flow" to the true accumulations.

When you enable maintenance mode, the normal totals do not increment, but the maintenance mode totals do.

Note: You must place the associated station in maintenance mode before placing the meter in maintenance mode.

9.3.1 Station Batch Configuration

Use these screens to configure how to manage batches. The program allows up to 6 meter based batches to run at any time. Each batch is tied to the Liquid Meter of the same number (Batch 1 is associated with Meter 1, Batch 2 is associated with Meter 2, and so on). Although it is possible to configure all batches similarly, each batch is unique and runs independent of others.

To access this screen from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #3, Batching_800L**.
3. Double-click **Display #210, Station Batch Configuration**.
4. Double-click **#1, Station Batch 1**. The Station Batch Configuration screen displays, showing the General tab.

Station Batch Configuration: General Tab

Use the Batch Configuration screen to define basic batch information for up to six batches.

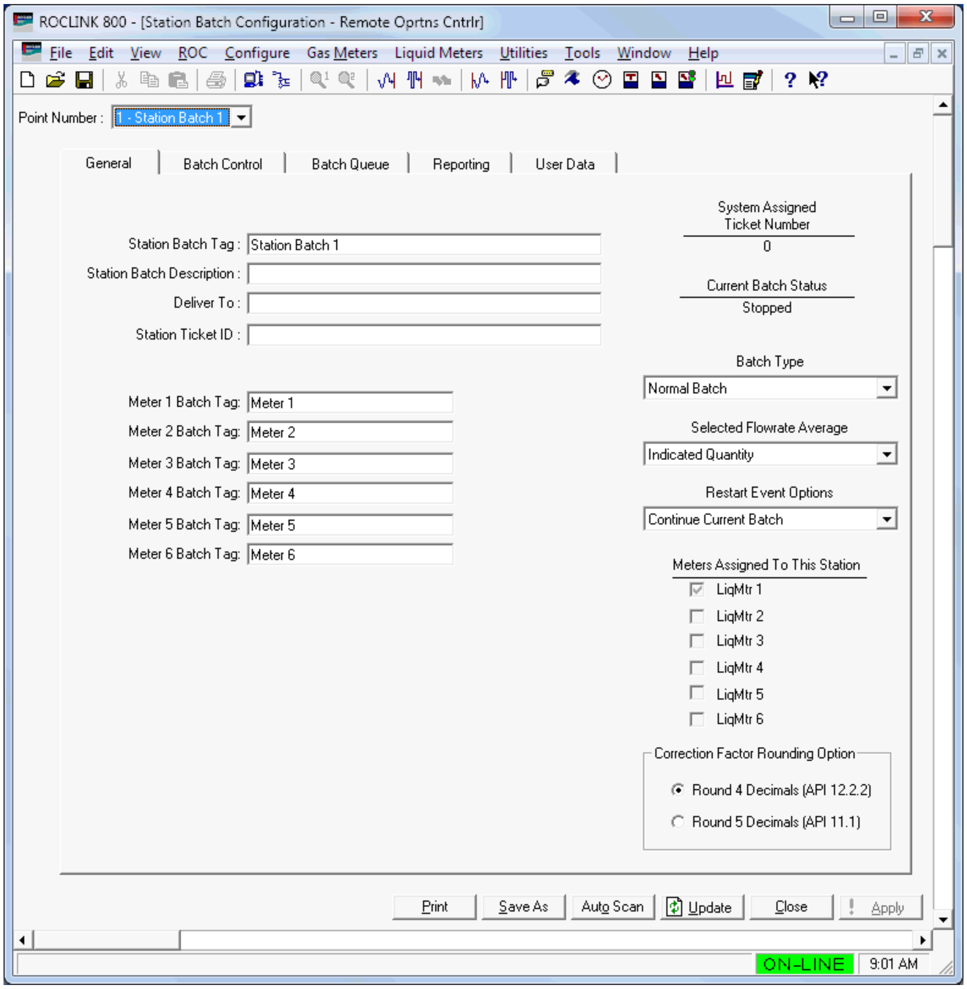


Figure 9-29. Station Batch Configuration – General tab

Field	Description
Point Number	Select the station batch to configure. Click ▼ to display all defined station batches. **Note**: This selection in this field applies to **each** tab on this screen.
Station Batch Tag	Sets a short (up to 20 alphanumeric characters) identifier to define the name of the station batch.
Station Batch Description	Sets a detailed description (up to 40 alphanumeric characters) to identify the station batch. This field is for informational purposes, and you do not have to use it.
Deliver To	Sets a delivery description (up to 40 alphanumeric characters) to where you deliver the liquid for the station batch. This field is for informational purposes, and you do not have to use it.

Field	Description
Station Ticket ID	Sets a name or numeric value (up to 20 alphanumeric characters) to identify the station batch. Enter a value meaningful to your organization. This field is for informational purposes, and you do not have to use it.
Meter 1 to 6 Batch Tag	Sets a name (up to 20 alphanumeric characters) to identify the meter associated with the station batch. This tag copies to the meter level information for use by the batch.
System Assigned Ticket Number	This **read-only** field shows the system-assigned unique identification number for this batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Current Batch Status	This **read-only** field shows the status of the current batch. Valid values are **Running** (the current batch is running) or **Stopped** (the current batch is stopped). **Note**: When a batch is running, certain fields are unavailable to prevent you from accidentally modifying critical configuration information.
Batch Type	Indicates the category of the batch. Valid values are: **Normal Batch** – Standard batch type, indicating nothing unusual. **Maintenance** – Treated as normal. Can indicate an abnormal batch. **Unauthorized** – Detected flow started this batch. **Note:** This option is for reporting purposes only. It does not affect the operation of the batch.
Selected Flowrate Average	Selects the flowrate average value the system uses for all meters in this station. Valid values are: ▪ Indicated Quantity. ▪ Gross Volume. ▪ Gross Standard Volume. ▪ Net Standard Volume. ▪ BSW Volume. ▪ Mass. **Note:** This option also selects which type of flowrate you use for the average flowrate for all meters in this station.
Restart Event Options	Indicates the action the system takes if a restart occurs during an active batch. “Restart” means the unit stopped or started the program, or the system encountered a warm start, a cold start, or a power cycle. Valid values are **Continue Current Batch** (continue with current batch) and **End Current Batch / Start New Batch** (stop the current batch and start a new batch)..

Field	Description
Meters Assigned To This Station	This **read-only** field shows the meters assigned to this station. The meter-to-station assignment is not configurable in the Batching program. You define this relationship in the Liquid Calcs program.
Correction Factor Rounding Options	Selects the resolution the system uses when rounding correction factors (such as CTL or CPL). **Note:** This option applies **only** if the associated liquid product in use for the station has the rounding option enabled. If rounding is not enabled, then this option has no effect.
	Round 4 Decimals (API 12.2.2) Correction factors will be rounded to 4 decimal places of resolution (X.XXXX), in accordance with API 12.2.2.
	Round 5 Decimals (API 11.1) Correction factors will be rounded to 5 decimal places of resolution (X.XXXXX), in accordance with API 11.1.

Station Batch Configuration: Batch Control Tab

Use this tab to set times, measurement types, and recalculation options for batch control.

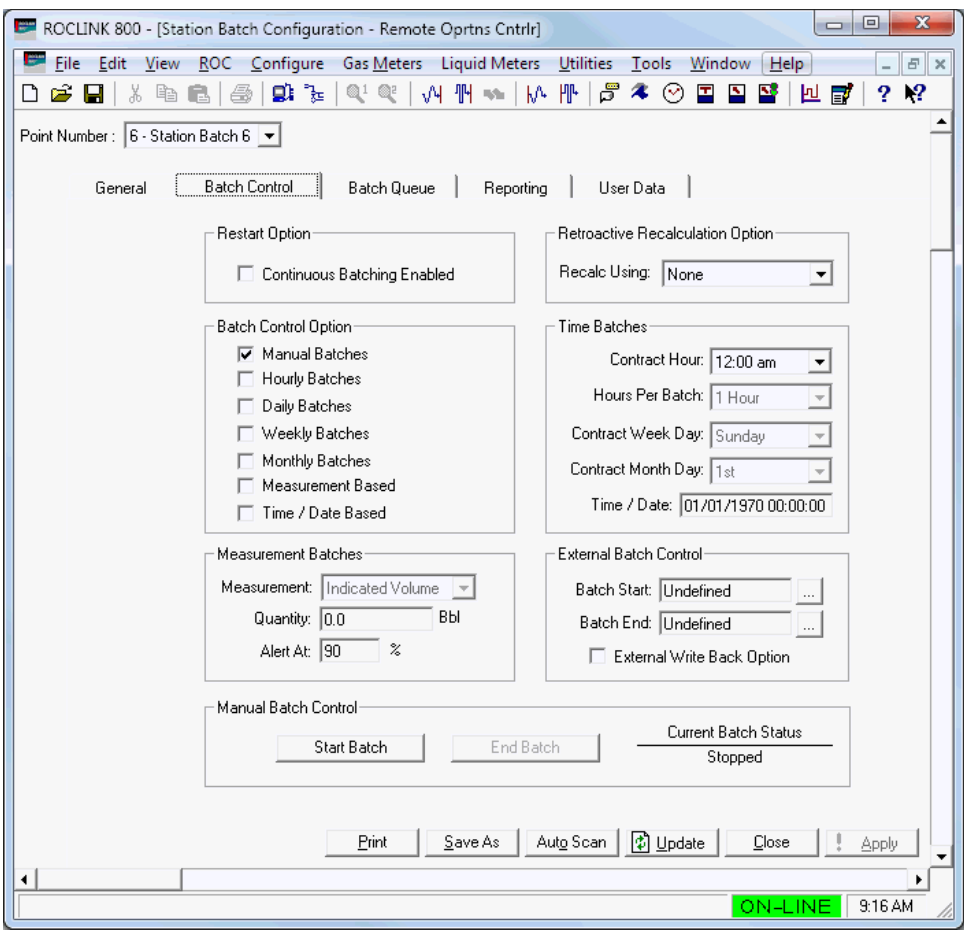


Figure 9-30. Station Batch Configuration – Batch Control tab

Field	Description
Point Number	Select the Station Batch that you desire to configure or view. Click ▼ to display the Station Batch you desire to configure. **Note**: This selection in this field applies to each tab on this screen.
Restart Option	Select the **Continuous Batching Enabled** option if you intend for a batch to be in progress at all times. When you enable this option, at the conclusion of a batch, the next batch starts immediately. There will be no idle period between batches. For example, if you intend to have reoccurring daily batches (one for each day), you must enable this option. Do not select this option if you desire to have idle periods of time in-between batches, for example when loading a truck or vessel.
Batch Control Option	The use the Batch Control Option to set which algorithm the system uses to determine the conclusion of the batch. Time-based batches end when the user-specified time passes and generally are used in conjunction with the continuous batching enabled option, providing a series of on-going timed batches. The period of a batch can be defined as hours, days, weeks, months, or be measurement based. You may also use an exact time occurring in the future to use to determine the period of the batch (Time/Date Based Batches). All methods require a manual start. Once started, the batch continues until the configuration criteria you set is met. You may select multiple options. If you select more them one option, then the batch stops at whichever criteria is met first. For example, if you select both monthly batches and measurement based batches, and the month ends before the batch reaches the specified measurement quantity, then the batch concludes at the end of the month. You may stop batches manually, even if you do not select the manual batches option. Valid values are: **Manual Batches** – Batches stop only at manual commands. **Hourly Batches** – Batches stop based on the value in the Contract Hour field and the value in the Hours Per Batch field. **Daily Batches** – Batches stop based on the value in the Contract Hour field.

Field	Description	
	Weekly Batches	Batches stop based on the value in the Contract Hour and Contract Week Day fields.
	Monthly Batches	Batches stop based on the value in the Contract Hour and Contract Month Day fields.
	Measurement Based	Measurement batches stop once the batch flow total reaches the values you specify using the Measurement Batches fields.
	Time/Date Based	Batch stops at the time and date you enter.
Measurement	Sets the flowrate to monitor when you use measurement-based batches. Click ▼ to display all valid options.	
Quantity	Set the measurement amount that triggers the batch to stop. The batch continues until it reaches this amount (volume or mass). Use for measurement-based batches.	
Alert At	Enter a percentage (from 0 to 100) for measurement-based batches. Once a batch exceeds this percentage, an alert occurs. You can use an HMI (Human Machine Interface) or an external host application to view the alert status.	
Retroactive Recalculation Option	Select to recalculate the volume of a batch if a factor change occurs during the batch. When a retroactive recalculation occurs, a newly proved factor applies retroactively to the entire batch, and the totals adjust accordingly. The adjustments only apply to the batches in progress. Valid values are:	
	None	No retroactive calculation will occur, a new factor is put into use only going forward from the time of the factor change.
	Meter Factor Once	Only the first change to the meter factor during the batch will result in a retroactive adjustment of the totals for that meter.
	K Factor Once	Only the first change to the K-factor during the batch will result in a retroactive adjustment of the totals for that meter.

Field	Description	
	Meter Factor Multiple	Any change to the meter factor during the batch will result in a retroactive adjustment. Only the last adjustment will apply to the batch totals.
	K Factor Multiple	Any change to the k factor during the batch will result in a retroactive adjustment. Only the last adjustment will apply to the batch totals.
	Notes: ▪ Refer to *Retroactive Recalculation Meter Factor Updates* ▪ You must **enable** the **Retroactive Accum Adjustment** field (**Liquid Meters** > **Meter** > **General** tab) to use this option. Retroactive recalculations can be set to apply to a change of either the meter factor or the K-factor (but not both). You can also use this option to select if every change to a factor should result in a recalculation of the totals, or only the first time. Because the meter factor or K-factor apply to an individual meter and not a station, a retroactive adjustment is applied at the meter level. Here you select the option for all meters assigned to this station. You can set adjustment amounts to apply to the liquid meter in the Liquid Calculations User Program. ▪ Using this option can cause temporary negative values.	
Contract Hour	Sets the hour of the day at which a batch ends. Click ▼ to display a list of hourly values.	
Hours Per Batch	Sets (for hourly-based batches) the number of hours between batches. Multiple hour batches are always with respect to midnight, meaning a batch will always end at midnight (00:00:00 or 12:00 am). Click ▼ to display a list of values. **Multiple Hours, with respect to Midnight:**	
	2 Hours	12:00am, 2:00am, 4:00am, 6:00am, 8:00am, 10:00am, 12:00pm, 2:00pm, 4:00pm, 6:00pm, 8:00pm, 10:00pm
	3 Hours	12:00am, 3:00am, 6:00am, 9:00am, 12:00pm, 3:00pm, 6:00pm, 9:00pm
	4 Hours	12:00am, 4:00am, 8:00am, 12:00pm, 4:00pm, 8:00pm
	6 Hours	12:00am, 6:00am, 12:00pm, 6:00pm
	8 Hours	12:00am, 8:00am, 4:00pm
	12 Hours	12:00am, 12:00pm

Field	Description	
Contract Week Day	Sets (for weekly-based batches) the day of the week on which batches contractually start. Click ▼ to display a list of values.	
Contract Month Day	Sets (for monthly-based batches) the day of the month (between 1 and 28) on which batches contractually end. The Last Day selection means the batch will end on the last day of the month (January 31st, February 28th [non-leap-year], March 31st, April 30th, and so on). Click ▼ to display a list of values.	
Time/Date	This **read-only** field displays the last day and time the batch ran.	
External Batch Control	Sets a manual batch control based on TLP assignments you define. These are typically assigned to a soft point parameter or discrete input status.	
	Batch Start	Click ... to display the Select TLP dialog and define the TLP (an external stimulus) to start batches. The target TLP is normally a zero value, so when it transitions from zero to one, a batch starts.
	Batch End	Click ... to display the Select TLP dialog and define the TLP (an external stimulus) to end batches. The target TLP is normally a zero value, so when it transitions from zero to one, a batch ends.
	External Write Back Option	If enabled, the program clears the target TLP (writes a value of zero) after starting or ending a batch. This option is use for latched DI points or host modified soft point parameters.

Retroactive Recalculation Meter Factor Updates

A batch recalculation has the following characteristics and limitations:

- The recalculation applies **only** to completed batches.
- A completed batch may not be as accurate as possible.
- Allows multiple recalculations of a batch.
- As many times as needed until it is correct.
- Only the last recalculation is saved.
- Lab analysis may provide more accurate data.
- Never overwrites the original data.
- Recalculated values are a second set of the totals.
- Not everything can be changed.

- Only certain items.
- Can recalculate individual meter totals or entire station.

Retroactive Recalculation Philosophies

Three different philosophies apply to retroactive recalculation:

No Retroactive adjustment

- Apply new meter factor(s) going forward only

5. One time adjustment

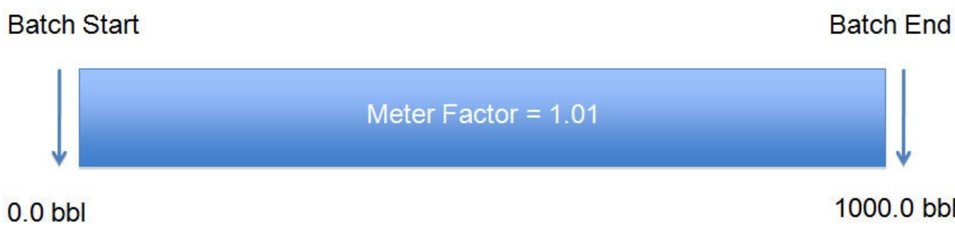
- Apply new meter factor to previous totals only one time, additional new meter factor(s) not retroactively applied

6. Multiple adjustment

- Apply all new meter factors to previous totals

Batch with Single Meter Factor

If you request a retroactive recalculation for to a batch with a single meter factor, the following occurs:



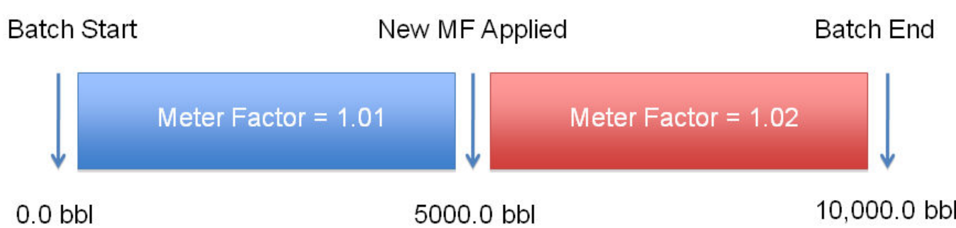
Batch Totals:

Indicated Volume: 1000.0 – 0.0 = 1000.0 bbl

Gross Volume: 1000.0 x 1.01 = 1010.0 bbl

Batch with Dual Meter Factors

If a retroactive recalculation occurs to a batch with a dual meter factors, the following occurs:



Batch Totals:

Gross Volume (Part 1): 5000.0 X 1.01 = 5050.0 bbl

Gross Volume (Part 2): 5000.0 X 1.02 = 5100.0 bbl

Total Volume: 1015.0 bbl

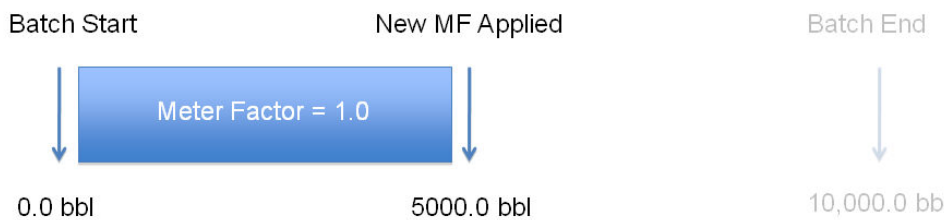
Batch with a Retroactive Dual Meter Factor

If a retroactive recalculation occurs to a batch with a retroactive dual meter factor, the following occurs:

Batch Starts with meter factor of 1.0

Batch Starts with meter factor of 1.0

1. New meter factor (1.01) is applied going forward

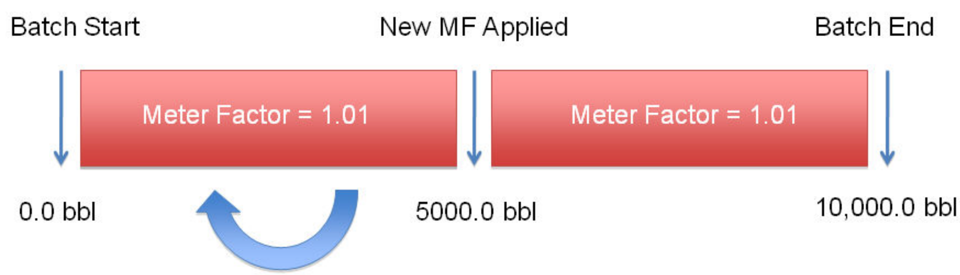


2. Batch Starts with meter factor of 1.0
3. New meter factor (1.01) is applied going forward

4. Batch Starts with meter factor of 1.0
5. New meter factor (1.01) is applied going forward
6. New MF is retroactively applied to 1st part of batch

7. Batch Starts with meter factor of 1.0
8. New meter factor (1.01) is applied going forward
9. New MF is retroactively applied to 1st part of batch

10. Batch Starts with meter factor of 1.0
11. New meter factor (1.01) is applied going forward
12. New MF is retroactively applied to 1st part of batch
13. Batch ends without further meter factor change



Recalculation Use Cases

Following are several use cases for recalculation and retroactive recalculation.

This section includes a few examples in which case you may desire to use the recalculation and retroactive recalculation options.

Lab Provides Density

- You perform no live density measurement.
- Sample can be taken to lab following batch.
- Lab provides correct base density that you enter.

Bad Transmitter

- Temperature transmitter fails during batch.
- Live values used during batch were wrong.
- Enter a “more correct” average value from the previous batch.

Old Meter Factor

- No prove occurred during batch, inaccurate MF.
- Prove during next batch.
- Apply the new meter factor to previous batch.

Lab Provides Sediment & Water (S&W)

- Sediment & Water used during batch.

- Close, but not as good as lab analysis.
- Enter new Sediment & Water percent for the completed batch.

Station Batch Configuration: Batch Queue

Use this tab to specify options for printing and saving batch information.

Note: The fields on this tab require you to use the Reporting user program.

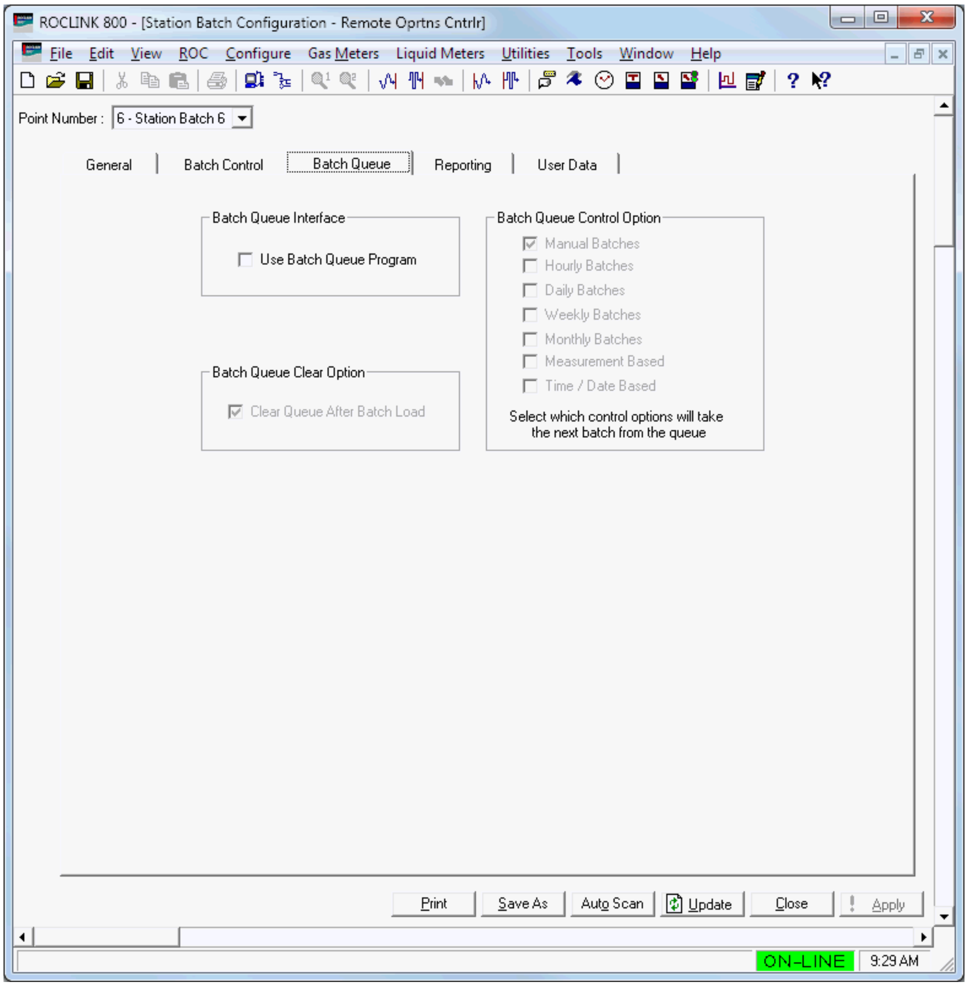


Figure 9-31. Station Batch Configuration – Batch Queue tab

Field	Description
Batch Queue Interface	Activates the Batch Queue program. When you select this option, the system assumes that the configuration for the next batch has been set in the Batch Queue program, copies that configuration, and places it into use for the next batch.

Field	Description
Batch Queue Clear Option	Clears the batch configuration stored in the Batch Queue program after that configuration has been loaded into the Batching program. When you enable the option, the system assumes that each batch configuration is unique, and is not reused.
Batch Queue Control Option	Selects the batch control options for the batch queue. For example, a batch may end either monthly or manually. If you select **Manual Batches**, the system takes the next batch from the queue when the batch ends due to a manual termination. If the batch ends due to the end of the month, the program **does not** use the queue for the next batch.

Station Batch Configuration: Reporting Tab

Use this tab to specify options for printing and saving batch information.

Note: The fields on this tab require you to use the Reporting user program.

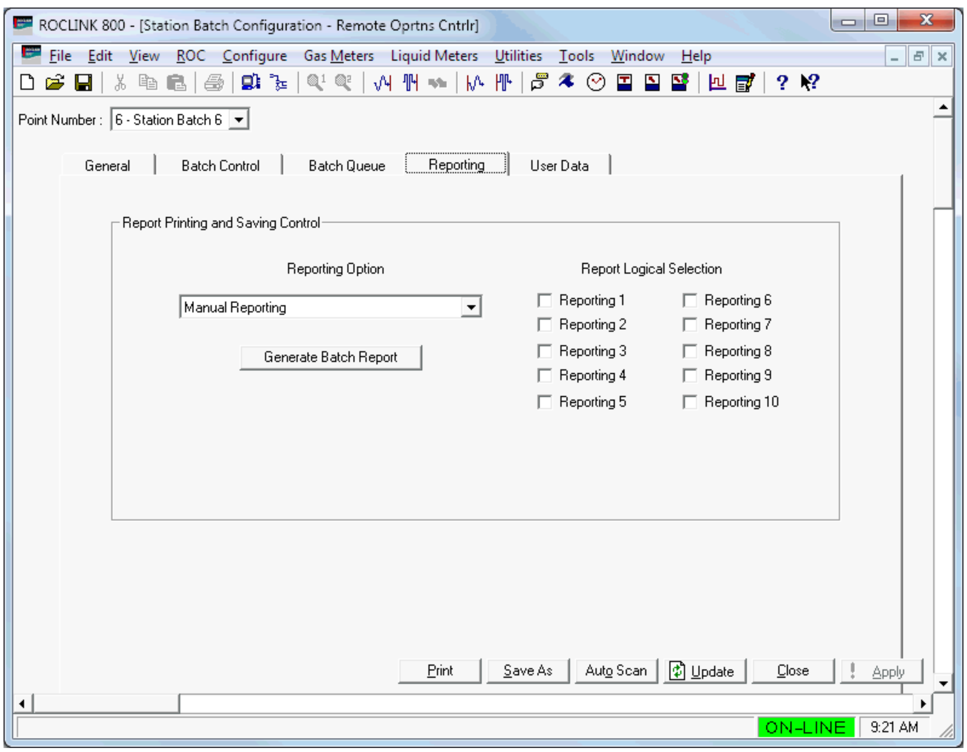


Figure 9-32. Station Batch Configuration – Reporting tab

Field	Description	
Reporting Option	Selects how the system prints and saves data at the end of a batch. Valid values are :	
	Manual Reporting	No report occurs at the conclusion of a batch. You must manually generate the report.

Field	Description	
	Automatic at Batch End	A report(s) automatically generates at the end of the batch.
	Automatic on Station Recalculation	A report(s) automatically generates when a recalculation occurs at the station level. Report(s) generate for every recalculation performed.
	Automatic on Batch End and Recalculation	A report(s) automatically generate at the end of the batch, or when a recalculation occurs at the station level.
Report Logical Selection	Selectst the reports to automatically print or save at the end of a batch for the Station Batch Report. No configuration of the details of the report that generate are done in the Batching User Program, instead you use the Reporting_800L User Program to configure the reports. Here you only select which logical instances of the Reporting User Program to trigger when reports generate. You can select none, one or multiple reporting logicals. If you only require a single batch report, then select one report logical, and configure it appropriately (in the Reporting User Program). If you require multiple reports, then select multiple logicals, and configure each according to the necessary report. For example, if you configure the Reporting user program as shown below and select **only** Reporting 3, the system generates **only** the Batch Ticket at the end of the batch. ▪ Reporting 1 – Prove Report ▪ Reporting 2 – Maintenance Report ▪ Reporting 3 – Batch Ticket ▪ Reporting 4 – Daily Totals Report ▪ Reporting 5 – Calculation Check Report Alternatively, if you configure the Reporting program as shown below and select Reporting 1, 2, 3, and 4 (for a three meter station), the system generates all four reports at the end of the batch. ▪ Reporting 1 – Station Batch Totals Report ▪ Reporting 2 – Meter 1 Batch Totals Report ▪ Reporting 3 – Meter 2 Batch Totals Report ▪ Reporting 4 – Meter 3 Batch Totals Report	
Generate Batch Report	Click to generate the batch report(s) you selected using the Report Logical Selection fields. The batch report(s) generate according to the options you select (**Send to Printer**, **Save to Flash**, or **Print and Save**) in the Action to Take field on the Reporting program's General tab.	

Station Batch Configuration: User Data Tab

Use this screen to define user-entered data fields included in the station batch report. These fields are a type of ROC point with generic parameters:

- Multiuse, “softpoint” like parameters.
- Five Double Precision Floats.
- Five Integers.
- Five Strings (40 characters).
- Follow a batch through its lifecycle.
- Configuration > Current > Completed.
- Possible uses: Operator notes, ambient temperature, sample can information, or a vessel name.

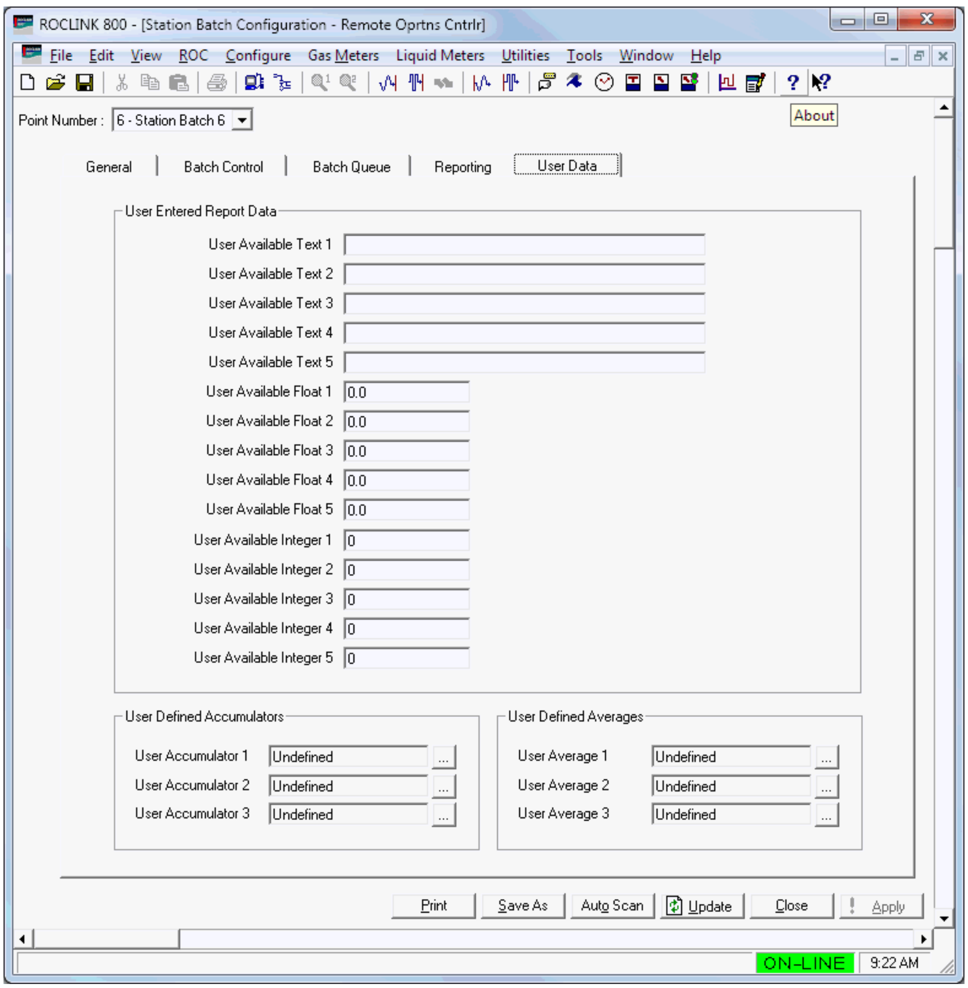


Figure 9-33. Station Batch Configuration – User Data tab

Field	Description
User Available Text	Specifies user-defined text that will transfer to the corresponding field in the current station batch. This field has no specific use, and you can use it to hold any text information associated with the batch. For example, enter your company name (Petro Pipeline Company), vessel name (Kinja Maru), or notes from the operator (Flow Control Valve 4 Offline). This data appears on the batch report at the conclusion of the batch.
User Available Float	Specifies user defined floating-point numbers (double precision) which transfer to the corresponding field in the current station batch. This field has no specific use, and you can use it store any value associated with the batch. For example, enter the ambient temperature during the batch (86.54 deg F) or the average product viscosity (22.751 cP). This data appears on the batch report at the conclusion of the batch.
User Available Integer	Specifies user defined integer numbers (long integers) which transfer to the corresponding field in the current station batch. This field has no specific use, and you can use it store any value associated with the batch. For example, enter the ID number of a sample can (542) or the meter ID number (7894). This data appears on the batch report at the conclusion of the batch.
User Defined Accumulators	Click ... to display the Select TLP dialog and define the TLP used for the user-defined batch accumulators. You can use the user-defined accumulators to total the amount of any TLP you choose, over the period of the batch. Assign to appropriate parameters which increment over the period of the batch, such as a gas orifice meter run accumulator for a vapor return or a discrete output accumulator parameter.
User Defined Average	Click ... to display the Select TLP dialog and define the TLP to create an average of over the period of the batch (for example, the MPU loading or cabinet temperature from an analog input). The averaging technique uses a simple linear average.

9.3.2 Station Current Batch

Use this screens to obtain a point-in-time view for the current station batch.

To access this screen from the Directory Tree:

1. Double-click **User Program**
2. Double-click **Batching_800L**.
3. Double-click **Display #211, Station Current Batch**.

4. Double-click **#1**. The Station Current Batch screen displays, showing the General tab.

Station Current Batch: General Tab

Use this screen to view the current batch data for the station.

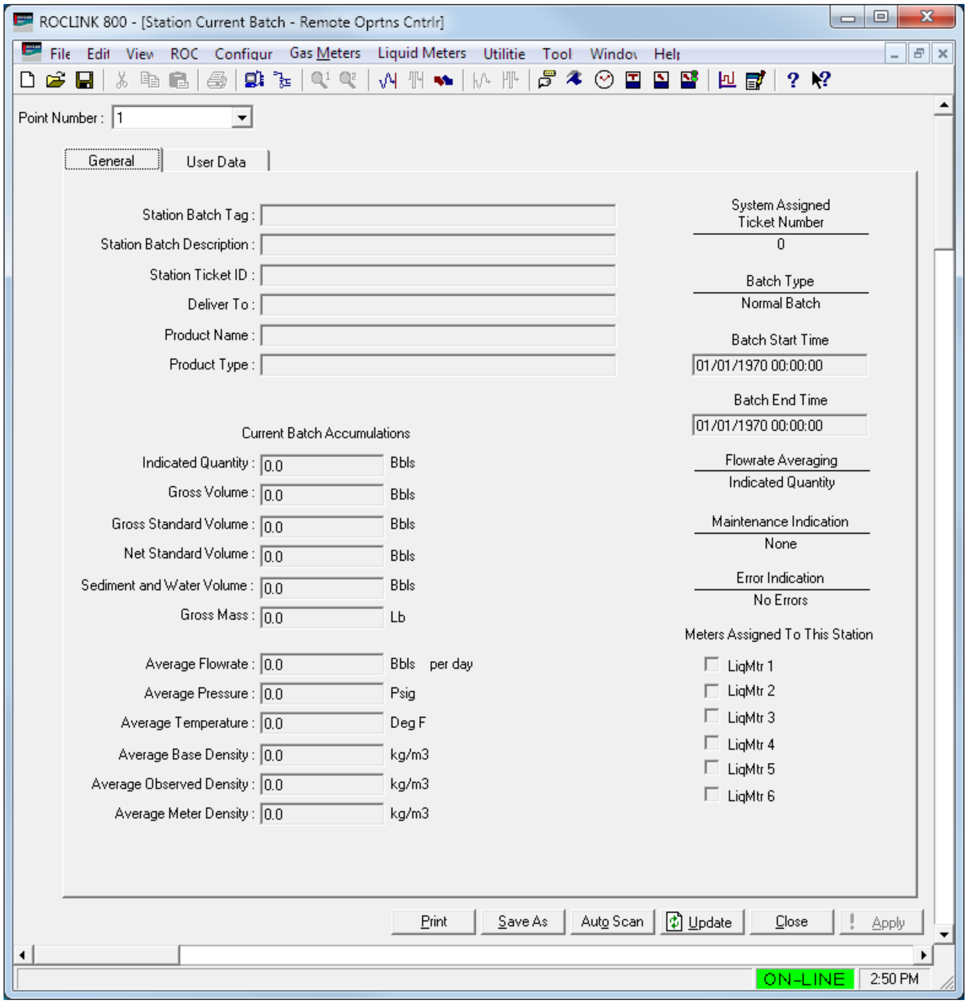


Figure 9-34. Station Current Batch – General tab

Field	Description
Point Number	Selects the station batch to configure or view. Click ▼ to display all defined station batches. **Note**: The selection in this field applies to **each** tab on this screen.
Station Batch Tag	Sets a short (up to 20 alphanumeric characters) identifier to define the name of the station batch.
Station Batch Description	This **read-only** field displays description of the station batch.
Station Ticket ID	This **read-only** field shows the ticket identification set for the Station Batch.
Deliver To	This **read-only** field shows where you deliver the liquid for the batch.

Field	Description
Product Name	This **read-only** field shows the name of the product in the batch, populated from the Liquid Product Tag.
Product Type	This **read-only** field shows the product type:
Indicated Quantity	This **read-only** field shows the station total indicated quantity for the batch. This value is the sum for all meters assigned to the station.
Gross Volume	This **read-only** field shows the station total gross volume for the batch. This value is the sum for all meters you assign to the station.
Gross Standard Volume	This **read-only** field shows the station total gross standard volume for the batch. This value is the sum for all meters assigned to the station.
Net Standard Volume	This **read-only** field shows the station total net standard volume for the batch. This value is the sum for all meters assigned to the station.
Sediment and Water Volume	This **read-only** field shows the station total sediment and water volume for the batch. This value is the sum for all meters assigned to the station.
Gross Mass	This **read-only** field shows the station total gross mass for the batch. This value is the sum for all meters assigned to the station.
Average Flowrate	This **read-only** field shows the station average flowrate for the batch. This value is the sum of the average flowrate for all meters assigned to the station.
Average Pressure	This **read-only** field shows the station average pressure for the batch. This value is the simple average for all meters assigned to the station.
Average Temperature	This **read-only** field shows the station average temperature for the batch. This value is the simple average for all meters assigned to the station.
verage Base Density	This **read-only** field shows the station average base density for the batch. This value is the simple average for all meters assigned to the station. A
Average Observed Density	This **read-only** field shows the station average observed density for the batch. This value is the simple average for all meters assigned to the station.
Average Meter Density	This **read-only** field shows the station average meter density. This value is the simple average for all meters assigned to the station.
System Assigned Ticket Number	This **read-only** field shows the system-assigned unique identification number for this batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Batch Type	This **read-only** field shows the category of the batch. Valid values are:

Field	Description	
	Normal Batch	Anything other than Normal is an invalid batch.
	Maintenance	Treated as normal.
	Unauthorized	Detected flow started this batch.
	Note: This option is for reporting purposes only. It does not effect the operation of the batch.	
Batch Start Time	This **read-only** field shows the time and date at which the current batch started. **Note:** This value displays until a new batch starts.	
Batch End Time	This **read-only** field shows the time and date at which the current batch is expected to end. **Note**: If a batch is not time-based, then this field is not used.	
Flowrate Averaging	This read-only field shows the current method for calculating flowrate averaging for the batch.	
Maintenance Indication	This **read-only** field shows if the station has been placed into Maintenance Mode during the batch. This field is reset at the end of the batch. Options are **Normal** or **Maintenance Mode**.	
Error Indication	This **read-only** field shows any errors associated with the selected batch. Possible errors are:	
	No Error	No errors were detected.
	Power Cycle	During the batch, a power cycled occurred. A power cycle can refer to a loss of power to the device, a warm start, or a restart.
	Time Skew	During the batch, the ROC clock has been changed. A change of less than 1 minute is expected operation, and does not trigger this error.
	Unit Change	Starting and ending unit selections (Liquid Preferences) do not match.
Meters Assigned To This Station	This **read-only** field shows the meters assigned to this station batch. Configure the meter-to-station assignment in the LiquidCalcs User Program.	

Station Current Batch: User Data Tab

Use this screen to define user-entered data fields to include in the station batch report. These fields are a type of ROC point with generic parameters that you can configure to hold data you desire to maintain.

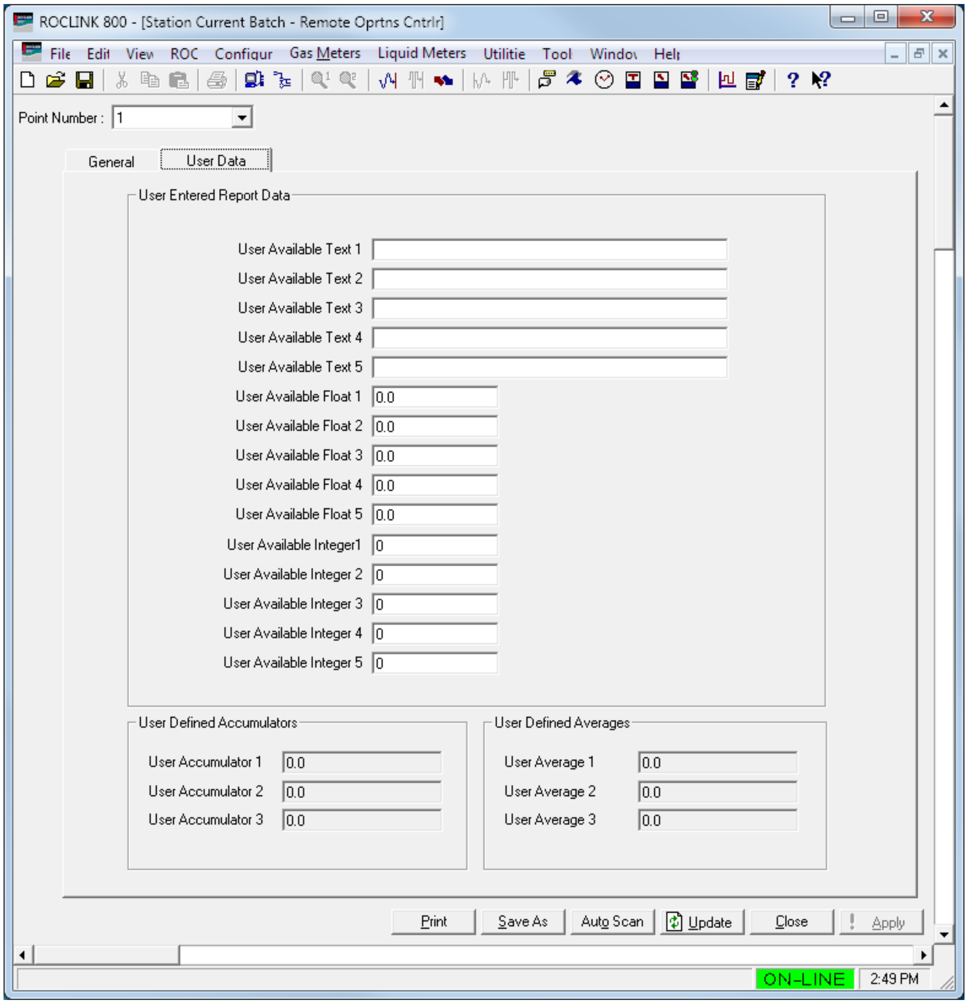


Figure 9-35. Station Current Batch – User Data tab

Field	Description
User Available Text 1 through 5	This field shows the text entered in the corresponding field in the Station Batch Configuration’s User Data screen. You can modify this text during the batch. When the batch completes, the program copies this text to the corresponding field in the Station Batch History’s User Data screen.
User Available Float 1 through 5	This field contains a floating-point value copied from the corresponding field in the Station Batch Configuration’s User Data screen. You can modify this value during the batch. When the batch completes, the program copies this value to the corresponding field in the Station Batch History’s User Data screen.
User Available Integer 1 through 5	This field contains an integer value copied from the corresponding field in the Station Batch Configuration’s User Data screen. You can modify this value during the batch. When the batch completes, the program copies this value to the corresponding field in the Station Batch History’s User Data screen.

Field	Description
User Defined Accumulators	These **read-only** field show user defined batch accumulators.
User Defined Average	These **read-only** field show user defined batch average parameters.

9.3.3 Station Batch History

Use these screens to view the history of your station batches.

To access these screens from the Directory Tree :

1. Double-click **User Program.**
2. Double-click **Batching_800L.**
3. Double-click **Display #212, Station Batch History**.
4. Double-click **#1**. The Station Batch Hisotry screen displays, showing the General tab.

Station Batch History: General Tab

Use the Station Batch History screen to view information on the last completed station batch.

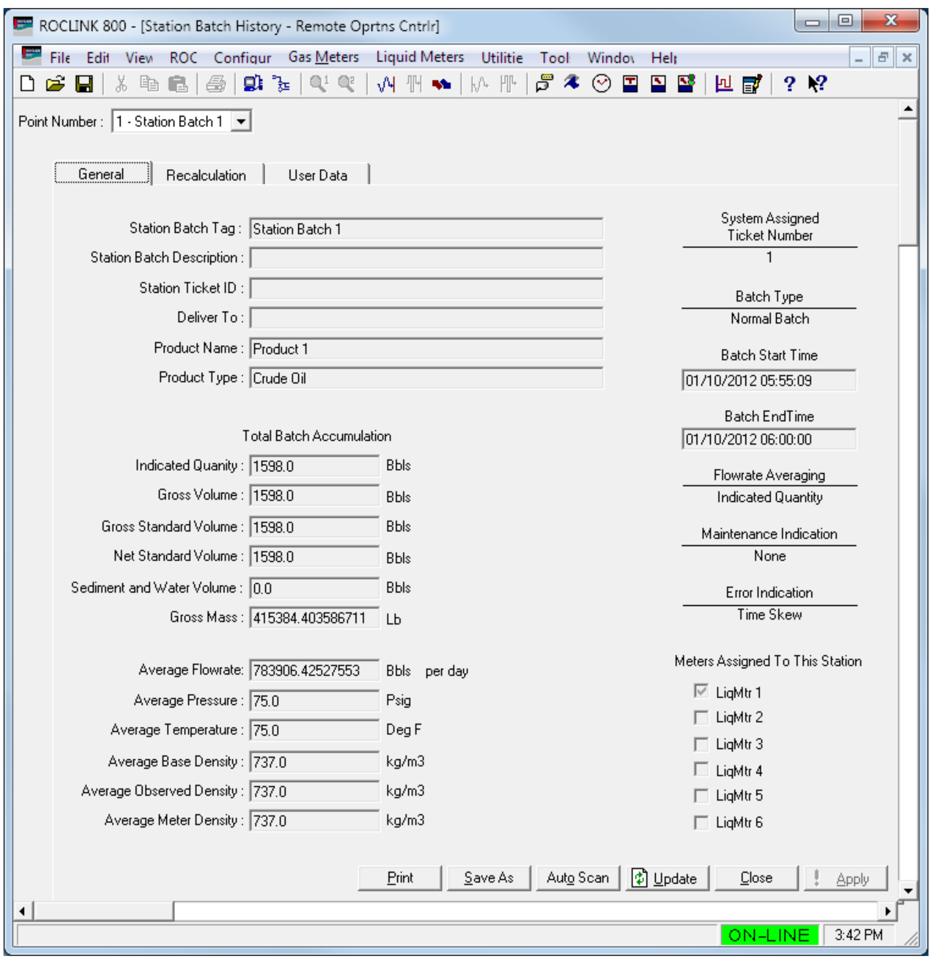


Figure 9-36. Station Batch History – General tab

Field	Description
Point Number	Select the station batch to configure or view. Click ▼ to display all define station batches. **Note**: This selection in this field applies to **each** tab on this screen.
Station Batch Tag	Sets a short (up to 20 alphanumeric characters) identifier to define the name of the station batch.
Station Batch Description	This **read-only** field shows a description of the Station Batch.
Station Ticket ID	This **read-only** field shows ticket identification set for the Station Batch.
Deliver To	This **read-only** field shows where you deliver the liquid for the batch.
Product Name	This **read-only** field displays the name of the product in the batch and populates from the Liquid Product Tag.
Product Type	This **read-only** field shows the product type.
Indicated Quantity	This **read-only** field shows the station total indicated quantity for the batch. This value is the sum for all meters assigned to the station.
Gross Volume	This **read-only** field shows the station total gross volume for the batch. This value is the sum for all meters you assign to the station.
Gross Standard Volume	This **read-only** field shows the station total gross standard volume for the batch. This value is the sum for all meters assigned to the station.
Net Standard Volume	This **read-only** field shows the station total net standard volume for the batch. This value is the sum for all meters assigned to the station.
Sediment and Water Volume	This **read-only** field shows the station total sediment and water volume for the batch. This value is the sum for all meters assigned to the station.
Gross Mass	This **read-only** field shows the station total gross mass for the batch. This value is the sum for all meters assigned to the station.
Average Flowrate	This **read-only** field shows the station average flowrate for the batch. This value is the sum of the average flowrate for all meters assigned to the station.
Average Pressure	This **read-only** field shows the station average pressure for the batch. This value is the simple average for all meters assigned to the station.
Average Temperature	This **read-only** field shows the station average temperature for the batch. This value is the simple average for all meters assigned to the station.
Average Base Density	This **read-only** field shows the station average base density for the batch. This value is the simple average for all meters assigned to the station.
Average Observed Density	This **read-only** field shows the station average observed density for the batch. This value is the simple average for all meters assigned to the station.

Field	Description	
Average Meter Density	This **read-only** field shows the station average meter density. This value is the simple average for all meters assigned to the station.	
System Assigned Ticket Number	This **read-only** field shows the system-assigned unique identification number for this batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.	
Batch Type	This **read-only** field shows the category of the batch.	
	Normal Batch	Anything other than Normal is an invalid batch.
	Maintenance	Treated as normal.
	Unauthorized	Detected flow started this batch.
	Note: This option is for reporting purposes only. It does not effect the operation of the batch.	
Batch Start Time	This **read-only** field shows the time and date at which the current batch started. **Note:** This value displays until a new batch starts.	
Batch End Time	This **read-only** field shows the time and date at which the current batch is expected to end. **Note**: If a batch is not time-based, then this field is not used.	
Flowrate Option	This **read-only** field shows the quantity flow rate the ROC800L used for flow weighted averaging (FWA) of inputs and to calculate the average flowrate.	
Maintenance Indication	This **read-only** field indicates if the station has been placed into Maintenance Mode during the batch. This field is reset at the end of the batch. Options are **Normal** or **Maintenance Mode**.	
Error Indication	This **read-only** field shows any errors associated with the selected batch. Possible errors are:	
	No Error	No errors were detected.
	Power Cycle	During the batch, a power cycled occurred. A power cycle can refer to a loss of power to the device, a warm start, or a restart.
	Time Skew	During the batch, the ROC clock has been changed. A change of less then 1 minute is expected operation, and does not trigger this error.
	Unit Change	Starting and ending unit selections (Liquid Preferences) do not match.
Meters Assigned To This Station	This **read-only** field shows the meters assigned to this station batch. You configure the meter-to-station assignment in the LiquidCalcs User Program.	

Station Batch History: Recalculation Tab

Use this tab to perform a recalculation on a completed batch when more accurate values for sediment and water, base density, pressure, and temperature have been obtained. For example, this may be necessary when you obtain a new sediment and water percentage from a sampler analysis, or a new meter factor from a prove. The recalculation does not affect the original batch data.

Note: Because the recalculation uses flow-weighted average correction factors, a recalculation using the original values may result in variances in volume/mass totals.

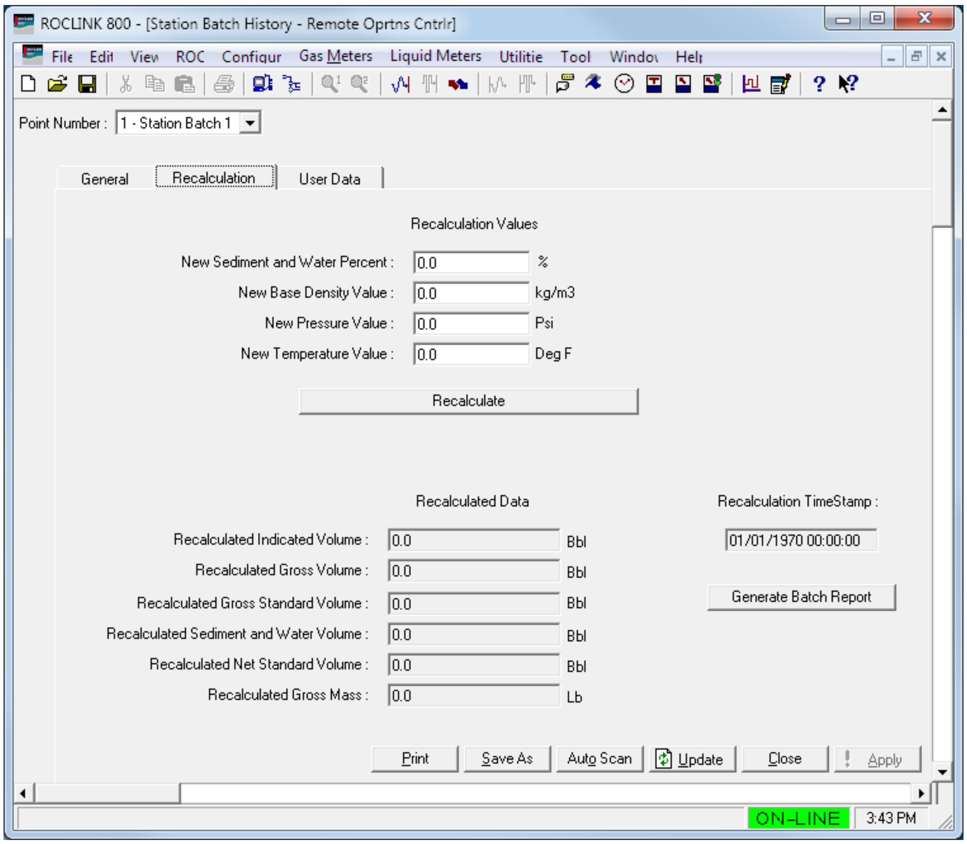


Figure 9-37. Station Batch History – Recalculation tab

Field	Description
New Sediment and Water Percent	Sets a new sediment and water percentage to use in recalculations for all meters assigned to the station. This affects the Net Standard Volume and Sediment and Water Volume. This value should be from 0% to 100%. **Note**: If you leave this field at the default value (0.0), when the program performs a station level recalculation. It uses the value entered at this meter. When you enter a value, **all** meters assigned to the station use that value when a station level recalculation occurs.

Field	Description
New Base Density Value	Sets a new base density value to use in recalculations for all meters assigned to the station. Calculation of the CTL and CPL volume correction factors use the base density. This affects the Gross Standard Volume. This value should be greater than 0.0; you define the Density Units on the Liquid Preferences screen. **Note**: If you leave this field at the default value (0.0), when the program performs a station level recalculation. It uses the value entered at this meter. When you enter a value, **all** meters assigned to the station use that value when a station level recalculation occurs.
New Pressure Value	Sets a new average pressure value to use in recalculations for all meters assigned to the station. Calculation of the CPL volume correction factor use the pressure. This affects the Gross Standard Volume. You define the Pressure Units on the Liquid Perefences screen. **Note**: If you leave this field at the default value (0.0), when the program performs a station level recalculation. It uses the value entered at this meter. When you enter a value, **all** meters assigned to the station use that value when a station level recalculation occurs.
New Temperature Value	Sets a new average temperature to use in recalculations for all meters assigned to the station. The calculation of the CTL volume correction factor uses the temperature. This affects the Gross Standard Volume. You define the Temperature Units on the Liquid Preferences screen. **Note**: If you leave this field at the default value (0.0), when the program performs a station level recalculation. It uses the value entered at this meter. When you enter a value, **all** meters assigned to the station use that value when a station level recalculation occurs.
Recalculate	Click to perform recalculations based on the data in the Recalculation Values fields. You may enter multiple recalculations.
Recalculated Indicated Volume	This **read-only** field shows the batch's total indicated volume after recalculation. The Indicated Volume is the pulses divided by the K-factor.

Field	Description
Recalculated Gross Volume	This **read-only** field shows the batch's total gross volume after recalculation. The Gross Volume is the indicated volume multiplied by the meter factor.
Recalculated Gross Standard Volume	This **read-only** field shows the batch's total gross standard volume after recalculation. The Goss Standard Volume is the gross volume multiplied by the volume correction factors.
Recalculated Sediment and Water Volume	This **read-only** field shows the batch's total sediment and water volume after recalculation. The Sediment and Water Volume is gross volume multiplied by the sediment and water percent.
Recalculated Net Standard Volume	This **read-only** field shows the batch's total net standard volume after recalculation. The Net Standard Volume is the result of the subtraction of the sediment and water volume from the gross standard volume. If you do not use the sediment and water feature, then this value is the same as the Gross Standard Volume.
Recalculated Gross Mass	This read-only field shows the batch's total mass after recalculation. The Gross Mass is the gross volume, multiplied by the meter (flowing) density.
Recalculated Time Stamp	This **read-only** field shows the time and date when the last recalculation was performed. **Note:** This value displays until a new recalculation occurs.
Generate Batch Report	Click to generate the batch report(s) you selected using the Report Logical Selection fields. The batch report(s) generate according to the options you select (**Send to Printer**, **Save to Flash**, or **Print and Save**) in the Action to Take field on the Reporting program's General tab.

Station Batch History: User Data Tab

Use this tab to review user-entered data fields to include in the station batch report.

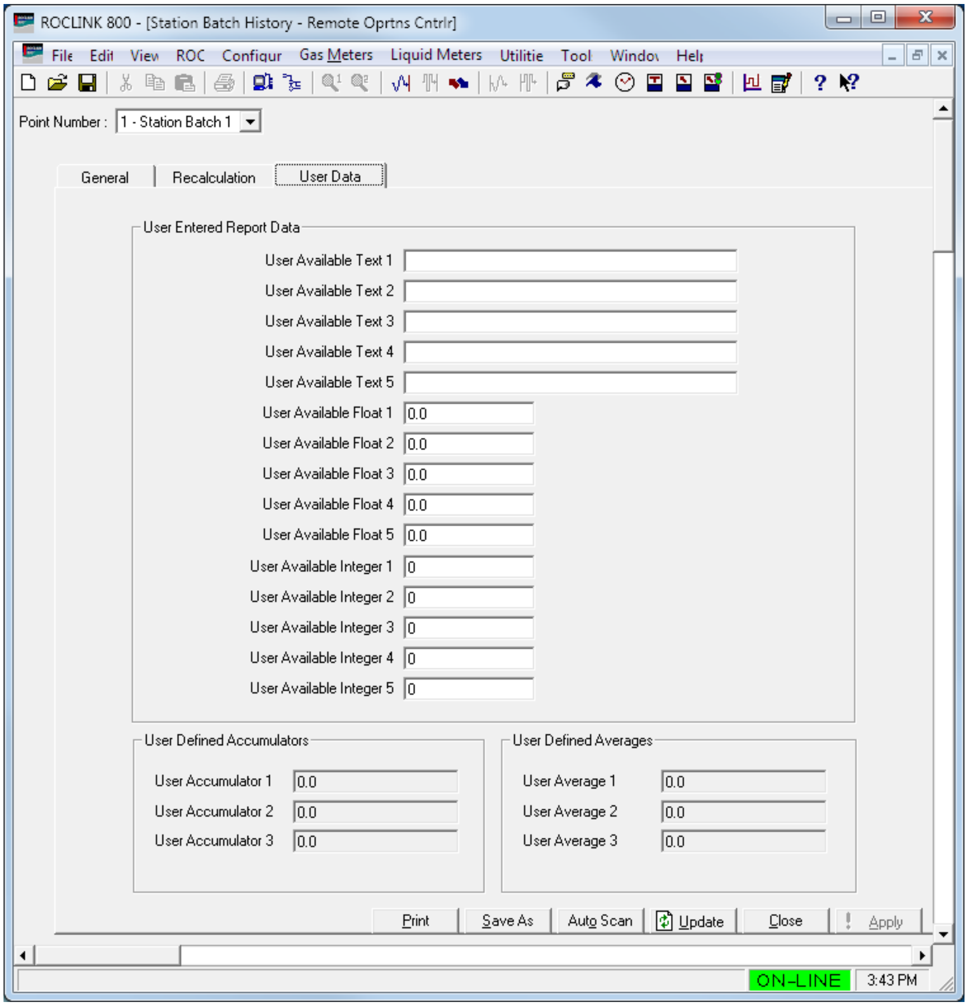


Figure 9-38. Station Batch History – User Data tab

Field	Description
User Available Text	Displays text copied from the corresponding field in the Station Current Batch Configuration. You can modify this text at the conclusion of the batch.
User Available Float	Displays floating point value copied from the corresponding field in the Station Current Batch Configuration. You can modify this value at the conclusion of the batch.
User Available Integer	Displays the integer value copied from the corresponding field in the Station Current Batch Configuration. You can modify this value at the conclusion of the batch.
User Defined Accumulators	This **read-only** field shows the accumulated value for the parameter defined in the Station Batch Configuration, over the period of the batch.
User Defined Averages	This **read-only** field shows the average value for the parameter defined in the Station Batch Configuration, over the period of the batch.

9.3.4 Meter Current Batch

Use this screens to obtain a point-in-time view for the current batch.

To access these screens from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #3, Batching_800L**.
3. Double-click **Display #213, Meter Current Batch**.
4. Double-click **#1**. The Meter Current Batch screen displays, showing the General tab.

Meter Current Batch: General Tab

This screen displays data detailing the current batch for the meter you select. The system clears all fields (sets them to default values) when no batch is in progress.

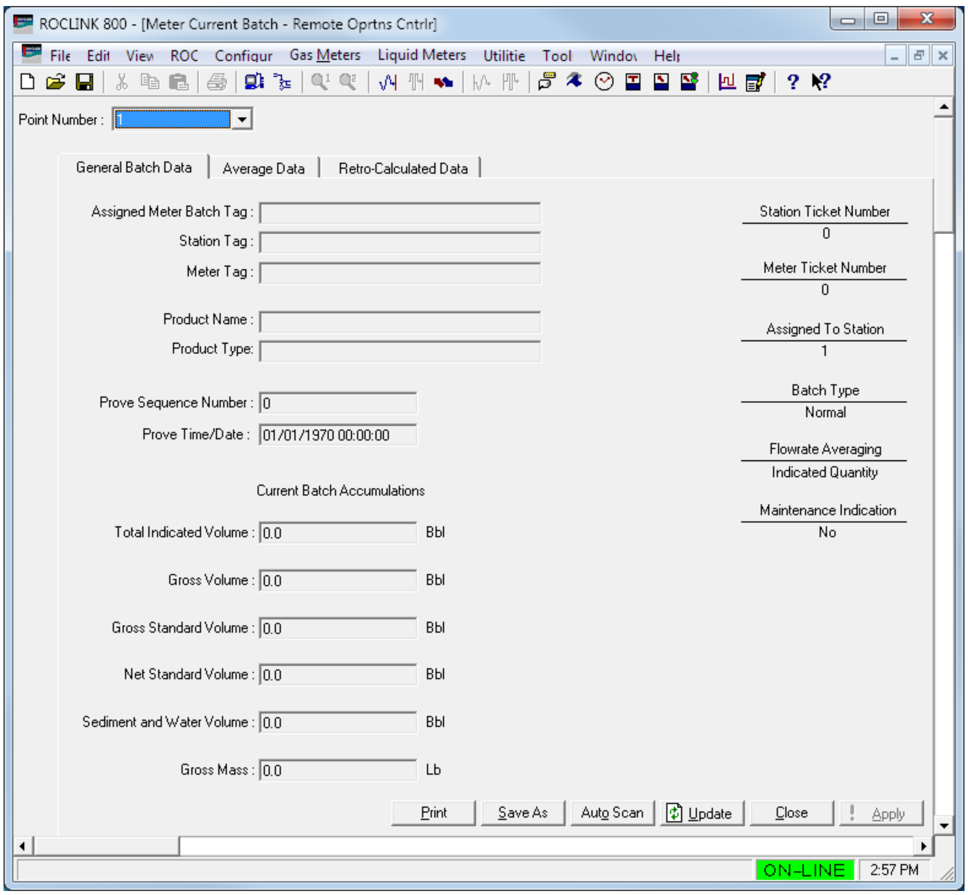


Figure 9-39. Meter Current Batch – General tab

Field	Description
Point Number	Selects the meter batch to configure or view. Click ▼ to display all defined meter batches. **Note**: The selection in this field applies to **each** tab on this screen.

Field	Description
Assigned Meter Batch Tag	This **read-only** field displays the unique identifier for the meter batch. This text is from the value you enter in the Station Batch Configuration.
Station Tag	Sets a 20-character name to identify the station.
Meter Tag	This **read-only** field displays the name of the meter associated with the meter batch. This text is from the value you enter in the Station Batch Configuration.
Product Name	This **read-only** field displays the name of the product in the batch and populates from the Liquid Product Tag.
Product Type	This **read-only** field identifies the product.
Prove Sequence Number	This **read-only** field shows the last prove sequence number. The unique number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296. This unique number is meant to identify the meter prove which applies to this batch.
Prove Time/Date	This **read-only** field shows the time and date at which the meter was last proved. **Note:** This value displays until a new batch starts.
Total Indicated Volume	This **read-only** field shows the batch's total indicated volume. The system calculates this value by subtracting the volume at the start of the batch from the volume at the end of the batch (Total = End – Start).
Gross Volume	This **read-only** field shows the meter total gross volume for the batch. The gross volume is the indicated volume multiplied by the meter factor. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Gross Standard Volume	This **read-only** field shows the meter total gross standard volume for the batch. The gross standard volume is the gross volume multiplied by the volume correction factors. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Net Standard Volume	This **read-only** field shows the meter total sediment and water volume for the batch. The net standard volume is the result of the subtraction of the sediment and water volume from the gross standard volume. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).

Field	Description
Sediment and Water Volume	This **read-only** field shows the meter total net standard volume for the batch. The gross mass is the gross volume, multiplied by the meter (flowing) density. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Gross Mass	This **read-only** field shows the meter total gross mass for the batch. The sediment and water volume is gross volume multiplied by the sediment and water percent. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Station Ticket Number	This **read-only** field shows the system-assigned ticket identification number for this batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Meter Ticket Number	This **read-only** field shows the system-assigned unique identification number for this meter batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Assigned To Station	This **read-only** field shows the station to which this meter is assigned.
Batch Type	This **read-only** field shows the category of the batch. **Normal Batch** – Anything other than Normal is an invalid batch. **Maintenance** – Treated as normal. **Unauthorized** – Detected flow started this batch. **Note**: This option is for reporting purposes only. It does not effect the operation of the batch.
Flowrate Averaging	This **read-only** field show which flowrate you are using to calculate flow weighted averages. Valid selections are: ▪ Indicated Quantity. ▪ Gross. ▪ Gross Standard. ▪ Net Standard. ▪ Sediment & Water. ▪ Mass.
Maintenance Indication	This **read-only** field indicates if the station has been placed into Maintenance Mode during the batch. This field is reset at the end of the batch.

Meter Current Batch: Average Data Tab

Use this screen to view average accumulations for a batch. The system clears all fields (reset to default values) when no batch is in progress.

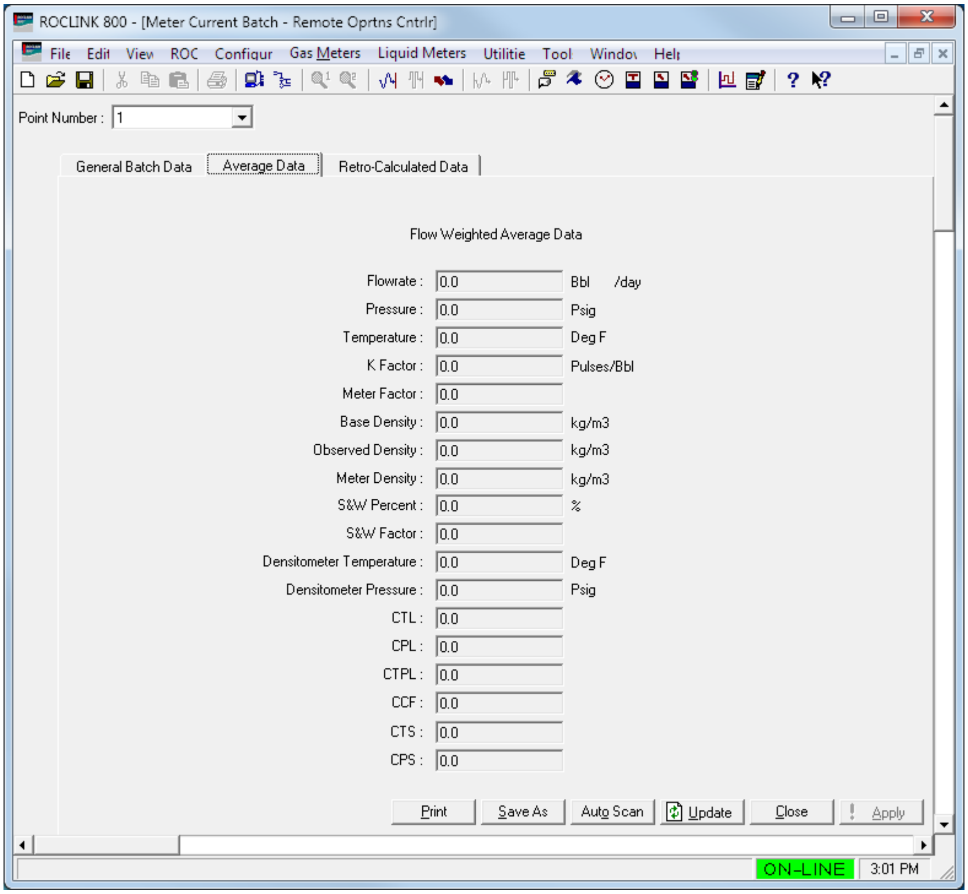


Figure 9-40. Meter Current Batch – Average Data tab

Field	Description
Flowrate	This **read-only** field displays the average flowrate, which is a value taken periodically from the meter and averaged over the course of the batch with the average based on the flowrate you select.
Pressure	This **read-only** field displays the average pressure, which is a value taken periodically from the meter and averaged over the course of the batch.
Temperature	This **read-only** field displays the average temperature, which is a value taken periodically from the meter and averaged over the course of the batch.
K Factor	This **read-only** field displays the average linear meter constant (K-factor) value.
Meter Density	This **read-only** field shows the average meter density. This is the density at the temperature and pressure of the meter.
Base Density	This **read-only** field displays the average base density, which is a value taken periodically from the meter and averaged over the course of the batch.

Field	Description
Observed Density	This **read-only** field shows the density reading obtained from the densitometer at flowing conditions. **Note:** This field is only applicable if you obtain the density reading from a densitometer.
Meter Density	This **read-only** field shows the average meter density. This is the density at the temperature and pressure of the meter.
S&W Percent	This **read-only** field shows the average percent of sediment and water.
S&W Factor	This **read-only** field shows the average correction factor for sediment and water.
Densitometer Temperature	This **read-only** field shows the average density temperature reading obtained from the densitometer at flowing conditions. **Note:** This field is only applicable if you obtain the density reading from a densitometer.
Densitometer Pressure	This **read-only** field shows the average density pressure reading obtained from the densitometer at flowing conditions. **Note:** This field is only applicable if you obtain the density reading from a densitometer.
CTL	This **read-only** field shows the average Correction for the Temperature of the Liquid (CTL) factor for the meter. **Note:** This field is only applicable for API/ASTM/IP 1980 tables and GPA TP27.
CPL	This **read-only** field shows the average Correction for the Pressure of the Liquid (CPL) factor for the meter. **Note:** This field is only applicable for API/ASTM/IP 1980 tables and GPA TP27.
CTPL	This **read-only** field shows the average Correction for the Temperature and Pressure of the Liquid (CTPL) factor for the meter. **Note:** This field is only applicable for API/ASTM/IP 2004 tables and GPA TP27.
CCF	This **read-only** field shows the average Combined Correction Factor (CCF) for the meter.
CTS	This **read-only** field shows the average correction for the effects of temperature on steel (CTS) meter housing. **Note**: This field is only applicable if using meter spool correction.
CPS	This **read-only** field shows the average correction for the pressure effect on steel (CPS) meter housing. **Note**: This field is only applicable if using meter spool correction.

Meter Current Batch: Retro-Calculated Data Tab

Use this screen to view meter batch totals for the original and new sets of completed batches. The system clears all fields (sets then to default values) when no batch is in progress or when no retroactive calculation has occurred.

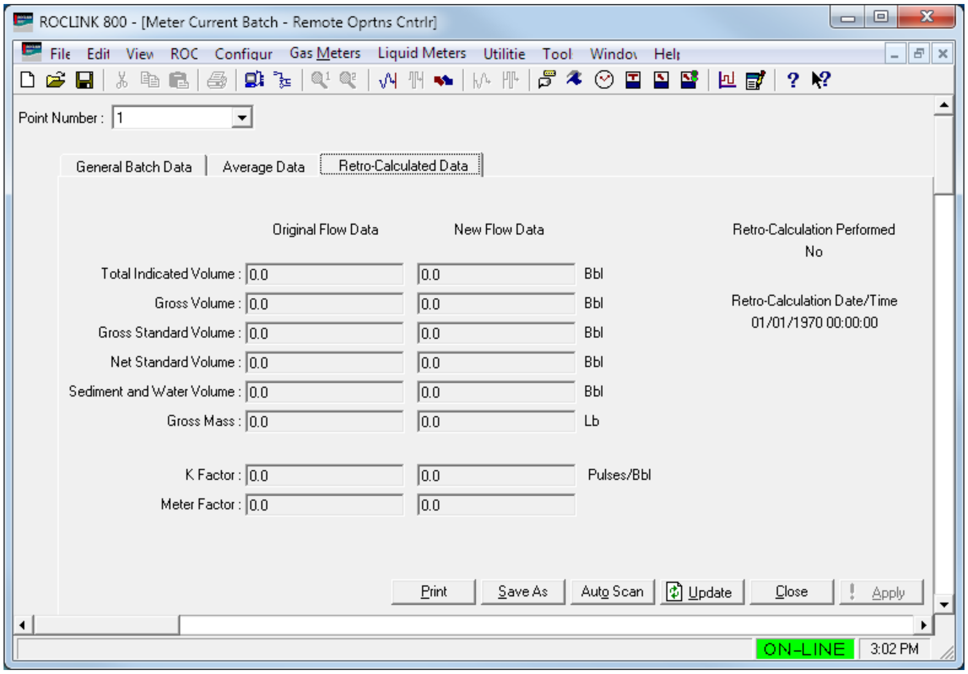


Figure 9-41. Meter Current Batch – Retro-Calculated Data tab

Field	Description
Total Indicated Volume	This **read-only** field shows the batch’s total indicated volume. The system calculates this value by subtracting the volume at the start of the batch from the volume at the end of the batch (Total = End – Start).
Gross Volume	This **read-only** field shows the batch's total gross volume for the batch.
Gross Standard Volume	This **read-only** field shows the batch's total gross standard volume for the batch.
Net Standard Volume	This **read-only** field shows the batch's total net standard volume for the batch.
Sediment and Water Volume	This **read-only** field shows the batch's total sediment and water volume for the batch.
Gross Mass	This **read-only** field shows the batch's total gross mass for the batch.
K Factor (Original Flow Data)	This **read-only** field displays the K-factor value **before** the retroactive calculation event occurs.

Field	Description
K Factor (New Flow Data)	This **read-only** field displays the linear meter constant (K-factor) value after the retroactive calculation event occurs. If performing retroactive recalculations based on a change to the meter K-factor, this value together with the original K-factor create a ratio. This ratio (ratio = original K-factor / new K-factor) is the value that modifies the original flow data.
K Factor (Original Flow Data)	This **read-only** field displays the K-factor value **before** the retroactive calculation event occurs.
Meter Factor (Original Flow Data)	This **read-only** field displays the Meter Factor value **before** the retroactive calculation event occurs.
Retro-Calculation Preformed	This **read-only** field indicates that a retroactive calculation has been performed for this meter. This means that the meter's K-factor or Meter Factor has changed during the batch, and this new factor value has been retroactively applied to the batch totals.
Retro-Calculation Date/Time	This **read-only** field shows the time and date when the Retro-Calculation was performed. **Note:** This value displays until a new Retro-Calculation occurs.

9.3.5 Meter Batch History

Use these screens to view the history of your meter batches.

To access these screens from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #3, Batching_800L**.
3. Double-click **Display #214, Meter Batch History**.
4. Double-click **#1**. The Meter Batch History screen displays, showing the General tab.

Meter Batch History: General Batch Data Tab

Use to view information on the last completed meter batch that you have selected.

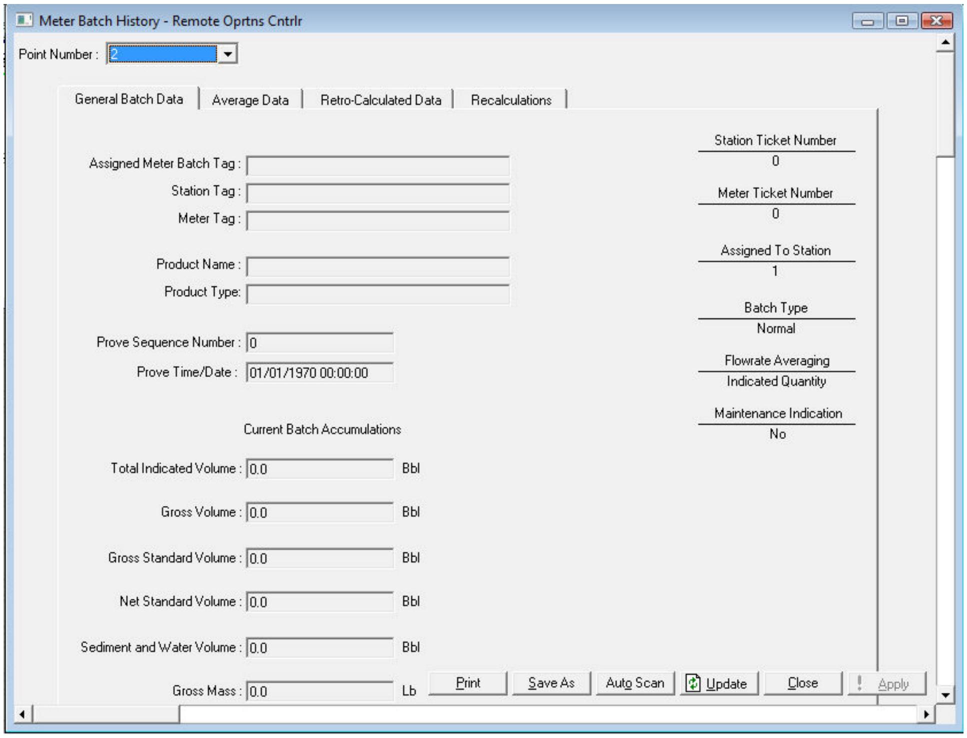


Figure 9-42. Meter Batch History – General Batch Data tab

Field	Description
Point Number	Select the meter batch to configure or view. Click ▼ to display all defined meter batches. **Note**: This selection in this field applies to **each** tab on this screen.
Assigned Meter Batch Tag	This **read-only** field displays the unique identifier for the meter batch. This text is from the value you enter in the Station Batch Configuration.
Station Tag	Sets a 20-character name for identification of the point.
Product Name	This **read-only** field displays the name of the product in the batch and populates from the Liquid Product Tag.
Product Type	This **read-only** field identifies the product.
Prove Sequence Number	This **read-only** field shows the prove sequence identifier for this Meter Factor and/or K-factor for this product on the indicated meter. This field populates when the Proving user program accepts a prove.
Prove Time/Date	This **read-only** field shows the time and date at which the meter was last proved. **Note:** This value displays until a new batch starts.
Total Indicated Volume	This **read-only** field shows the batch's total indicated volume. The system calculates this value by subtracting the volume at the start of the batch from the volume at the end of the batch (Total = End – Start).

Field	Description
Gross Volume	These **read-only** fields display the accumulation of volume at flowing conditions, corrected for Meter Factor. You define the volume units in the Liquid Preferences General tab.
Gross Standard Volume	This **read-only** field shows the meter total gross standard volume for the batch. The gross standard volume is the gross volume multiplied by the volume correction factors. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Net Standard Volume	This **read-only** field shows the meter total sediment and water volume for the batch. The net standard volume is the result of the subtraction of the sediment and water volume from the gross standard volume. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Sediment and Water Volume	This **read-only** field shows the meter total net standard volume for the batch. The gross mass is the gross volume, multiplied by the meter (flowing) density. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Gross Mass	This **read-only** field shows the meter total gross mass for the batch. The sediment and water volume is gross volume multiplied by the sediment and water percent. This value is the difference of the ending value of the meter's total accumulator and the same accumulator at the start of the batch (Total = End – Start).
Station Ticket Number	This **read-only** field shows the system-assigned ticket identification number for this batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Meter Ticket Number	This **read-only** field shows the system-assigned unique identification number for this meter batch. The ticket number starts at 1 and increments by 1 for each new batch until it rolls-over at 4,294,967,296.
Assigned To Station	This **read-only** field shows the station to which this meter is assigned.
Batch Type	This **read-only** field shows the category of the batch. **Normal Batch**: Anything other than Normal is an invalid batch. **Maintenance**: Treated as normal. **Unauthorized**: Detected flow started this batch. **Note**: This option is for reporting purposes only. It does not effect the operation of the batch.

Field	Description
Maintenance Indication	This **read-only** field indicates if the station has been placed into Maintenance Mode during the batch. This field is reset at the end of the batch. Options are **Normal** or **Maintenance Mode**.

Meter Batch History: Average Data Tab

Use this screen to view the history of the average data for the selected batch.

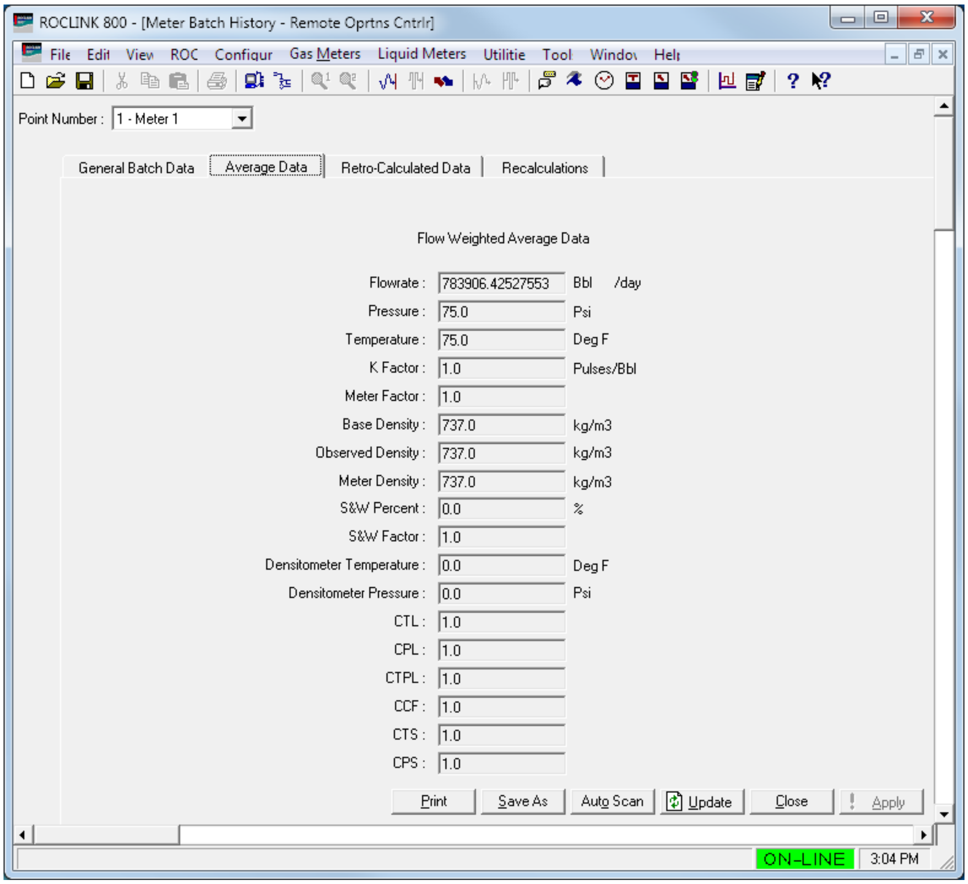


Figure 9-43. Meter Batch History – Average Data tab

Field	Description
Flowrate	This **read-only** field displays the average flowrate, which is a value taken periodically from the meter and averaged over the course of the batch with the average based on the flowrate you select.
Pressure	This **read-only** field displays the average pressure, which is a value taken periodically from the meter and averaged over the course of the batch.
Temperature	This **read-only** field displays the average temperature, which is a value taken periodically from the meter and averaged over the course of the batch.

Field	Description
K Factor	This **read-only** field displays the average linear meter constant (K-factor) value.
Meter Factor	These **read-only** fields show the average meter factor for the hour, previous hour, contract day and previous day.
Base Density	This **read-only** field displays the average base density, which is a value taken periodically from the meter and averaged over the course of the batch.
Observed Density	These **read-only** fields show the average observed density for the hour, previous hour, contract day and previous day.
Meter Density	This **read-only** field shows the current meter density. This is the density at the meter conditions (meter temperature and meter pressure).
S&W Percent	This **read-only** field shows the average percent of sediment and water.
S&W Factor	This **read-only** field shows the average correction factor for sediment and water.
Densitometer Temperature	This **read-only** field shows the average density temperature reading obtained from the densitometer at flowing conditions. **Note:** This field is **only** applicable if you obtain the density reading from a densitometer.
Densitometer Pressure	This **read-only** field shows the average density pressure reading obtained from the densitometer at flowing conditions. **Note:** This field is **only** applicable if you obtain the density reading from a densitometer.
CTL	This **read-only** field shows the average Correction for the Temperature of the Liquid (CTL) factor for the meter. **Note:** This field is **only** applicable for API/ASTM/IP 1980 tables and GPA TP27.
CPL	This **read-only** field shows the average Correction for the Pressure of the Liquid (CPL) factor for the meter. **Note:** This field is **only** applicable for API/ASTM/IP 1980 tables and GPA TP27.
CTPL	This **read-only** field shows the average Correction for the Temperature and Pressure of the Liquid (CTPL) factor for the meter. **Note:** This field is **only** applicable for API/ASTM/IP 2004 tables and GPA TP27.
CCF	This **read-only** field shows the average Combined Correction Factor (CCF) for the meter.

Field	Description
CPS	This **read-only** field shows the average correction for the pressure effect on steel (CPS) meter housing. **Note**: This field is **only** applicable if using meter spool correction.

Meter Batch History: Retro-Calculated Data Tab

This screen displays the original flow data and the new flow data after your perform a retroactive calculation for the meter during the batch. Retroactive calculations occur when you configure the appropriate option, and you change the meter factor or K-factor (user selectable).

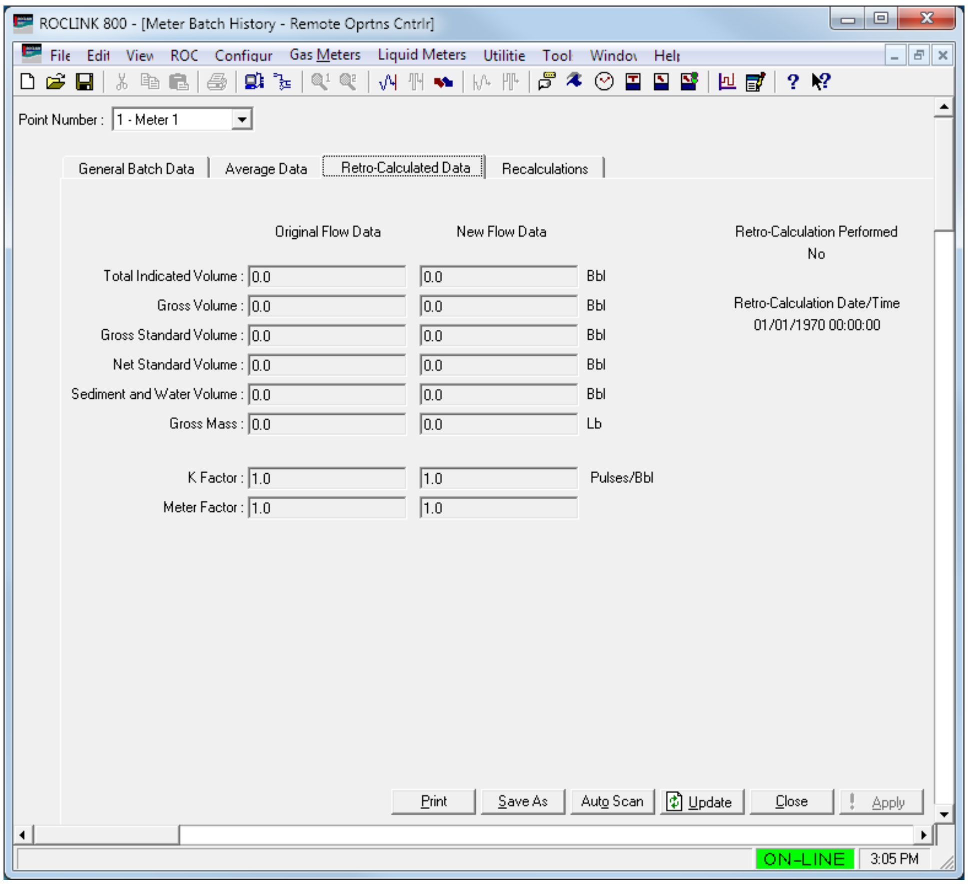


Figure 9-44. Meter Batch History – Retro-Calculated Data Tab

Field	Description
Total Indicated Volume (Original Flow Data)	This **read-only** field shows the batch's total indicated volume **before** the retroactive adjustment.
Total Indicated Volume (New Flow Data)	This **read-only** field shows the batch's total indicated volume **after** the retroactive adjustment.
Gross Volume (Original Flow Data)	This **read-only** field shows the meter total gross volume for the batch **before** the retroactive adjustment.

Field	Description
Gross Standard Volume (New Flow Data)	This **read-only** field shows the meter total gross standard volume for the batch **after** the retroactive adjustment.
Gross Standard Volume (Original Flow Data)	This **read-only** field shows the meter total gross standard volume for the batch **before** the retroactive adjustment.
Gross Standard Volume (New Flow Data)	This **read-only** field shows the meter total gross standard volume for the batch **after** the retroactive adjustment.
Net Standard Volume (Original Flow Data)	This **read-only** field shows the meter total sediment and water volume for the batch **before** the retroactive adjustment.
Net Standard Volume (New Flow Data)	This **read-only** field shows the meter total sediment and water volume for the batch **after** the retroactive adjustment.
Sediment and Water Volume (Original Flow Data)	This **read-only** field shows the meter total net standard volume for the batch **before** the retroactive adjustment.
Sediment and Water Volume (New Flow Data)	This **read-only** field shows the meter total net standard volume for the batch **after** the retroactive adjustment.
Gross Volume (Original Flow Data)	This **read-only** field shows the meter total gross volume for the batch **before** the retroactive adjustment.
Gross Mass (New Flow Data)	This **read-only** field shows the meter total gross mass for the batch **after** the retroactive adjustment.
K Factor (Original Flow Data)	This **read-only** field displays the K-factor value **before** the retroactive adjustment.
K Factor (New Flow Data)	This **read-only** field displays the K-factor value **after** the retroactive adjustment.
Meter Factor (Original Flow Data)	This **read-only** field displays the Meter Factor value **before** the retroactive adjustment.
Meter Factor (New Flow Data)	This **read-only** field displays the Meter Factor value **after** the retroactive calculation event occurs.
Retro-Calculation Preformed	This **read-only** field indicates that a retroactive calculation has been performed for this meter. This means that the meter’s K-factor or Meter Factor has changed during the batch, and this new factor value has been retroactively applied to the batch totals.
Retro-Calculation Date/Time	This **read-only** field shows the time and date when the Retro-Calculation was performed. **Note:** This value displays until a new Retro-Calculation occurs.

Meter Batch History: Recalculations Tab

Use this screen to perform a recalculation on a completed batch when more accurate values for Sediment and Water, K-factor, Meter Factor, Base Density, Pressure, or Temperature have been obtained. For example, this may be necessary when you obtain a new sediment and water percentage from a sampler analysis, or a new Meter Factor from a prove. The recalculation does not affect the original batch data.

Note: Because the recalculation uses flow-weighted average correction factors, a recalculation using the original values may result in variances in volume/mass totals.

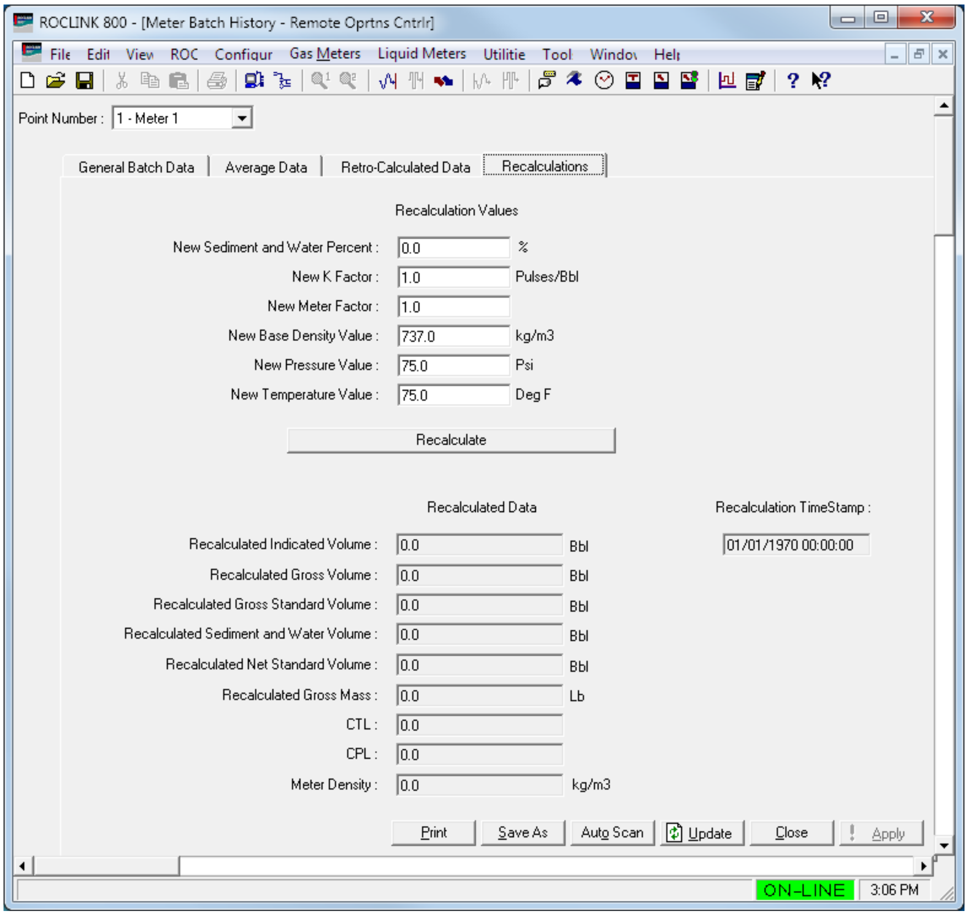


Figure 9-45. Meter Batch History – Recalculations tab

Field	Description
New Sediment and Water Percent	Sets a new sediment and water percentage to use in recalculations for all meters assigned to the station. This affects the Net Standard Volume and Sediment and Water Volume. This value should be from 0% to 100%. **Note**: If you leave this field at the default value (0.0), when the program performs a station level recalculation it uses the value entered at the meter. When you enter a value, all meters assigned to the station use that value when a station level recalculation occurs.

Field	Description
New K Factor	Sets a new K factor to use after the recalculation.
New Meter Factor	Sets a new meter factor to use after the recalculation.
New Base Density Value	Sets a new base density value to use in recalculations for all meters assigned to the station. Calculation of the CTL and CPL volume correction factors use the base density. This affects the Gross Standard Volume. This value should be greater then 0.0, and enter the value in the Density Units you configure in the Liquid Preferences screen. **Note**: If you leave the default value (0.0) then when a station level recalculation occurs, the system uses the value entered at the meter. When you enter a value, all meters assigned to the station use that value when a station level recalculation occurs.
New Pressure Value	Sets a new average pressure value to use in recalculations for all meters assigned to the station. Calculation of the CPL volume correction factor use the pressure. This affects the Gross Standard Volume. This value is entered in the Pressure Units you configure in the Liquid Preferences screen. **Note**: If you leave this field at he default value (0.0) then when a station level recalculation occurs, the meters use the value entered at the meter. When you enter a value, all meters assigned to the station use that value when a station level recalculation occurs.
New Temperature Value	Sets a new average temperature to use in recalculations for all meters assigned to the station. Calculation of the CTL volume correction factor uses the temperature. This affects the Gross Standard Volume. Enter the value in the Temperature Units you configure in the Liquid Preferences screen. **Note**: If you leave this field at he default value (0.0) then when a station level recalculation occurs, the meters use the value entered at the meter. When you enter a value, all meters assigned to the station use that value when a station level recalculation occurs.
Recalculate	Click to perform recalculations based on the data in the Recalculation Values fields. You may enter multiple recalculations.

Field	Description
Recalculated Indicated Volume	This **read-only** field shows the batch's total indicated volume after recalculation. The Indicated Volume is the pulses divided by the K-factor.
Recalculated Gross Volume	This **read-only** field shows the batch's total gross volume after recalculation. The Gross Volume is the indicated volume multiplied by the meter factor.
Recalculated Gross Standard Volume	This **read-only** field shows the batch's total gross standard volume after recalculation. The Goss Standard Volume is the gross volume multiplied by the volume correction factors.
Recalculated Sediment and Water Volume	This **read-only** field shows the batch's total sediment and water volume after recalculation. The Sediment and Water Volume is gross volume multiplied by the sediment and water percent.
Recalculated Net Standard Volume	This **read-only** field shows the batch's total net standard volume after recalculation. The Net Standard Volume is the result of the subtraction of the sediment and water volume from the gross standard volume. If you do not use the sediment and water feature, then this value is the same as the Gross Standard Volume.
Recalculated Gross Mass	This read-only field shows the batch's total mass after recalculation. The Gross Mass is the gross volume, multiplied by the meter (flowing) density.
CTL	This **read-only** field shows the average Correction for the Temperature of the Liquid (CTL) factor for the meter. **Note:** This field is **only** applicable for API/ASTM/IP 1980 tables and GPA TP27.
CPL	This **read-only** field shows the average Correction for the Pressure of the Liquid (CPL) factor for the meter. **Note:** This field is **only** applicable for API/ASTM/IP 1980 tables and GPA TP27.
Meter Density	This **read-only** field shows the average meter density. This is the density at the temperature and pressure of the meter.
Recalculated Time Stamp	This **read-only** field shows the time and date when the last recalculation was performed. **Note:** This value displays until a new recalculation occurs.

9.4 Batch Queuing (BatchQueue_800L)

Use the Batch Queue screens to configure Station Batches to run at the time you specify. You can determine the order of the batches and when each batch runs. Batches can be set to automatically run or you can manually start a batch. Batches also have reporting capabilities and can include user-defined data fields.

Note: Use of the Batch Queuing program is optional.

Batch queuing consists of:

- Six station queues.
- One queue for each possible station.
- Each queue contains ten positions to allow for scheduling the next ten batches.
- One list of possible future batches.
- All queues share this single list of possible batch configurations.
- List consists of ten batch configurations.

Batch Queue Positioning

This example shows batch queue positioning. .

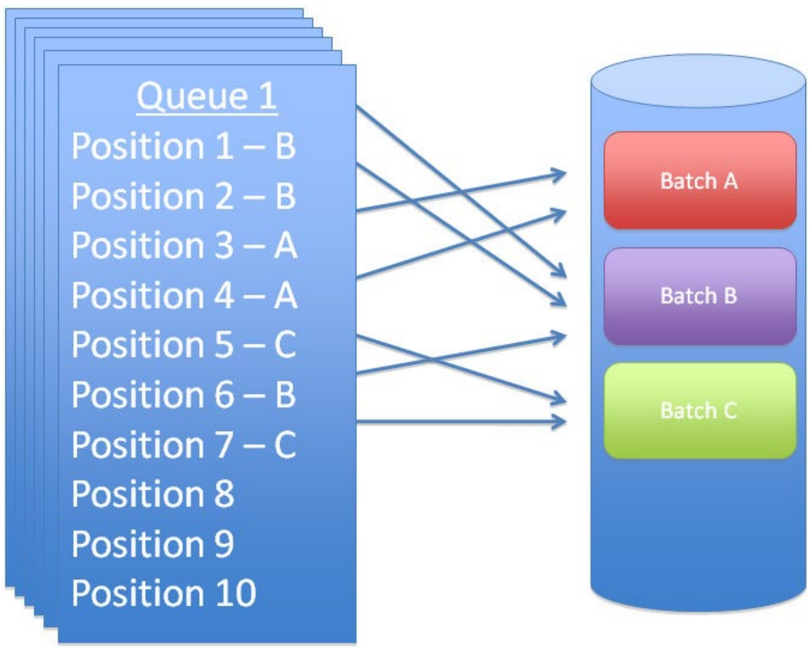


Figure 9-46. Batch Queue Positioning

Batch Queue using Alternating Products

This example shows a batch queue that uses alternating products.

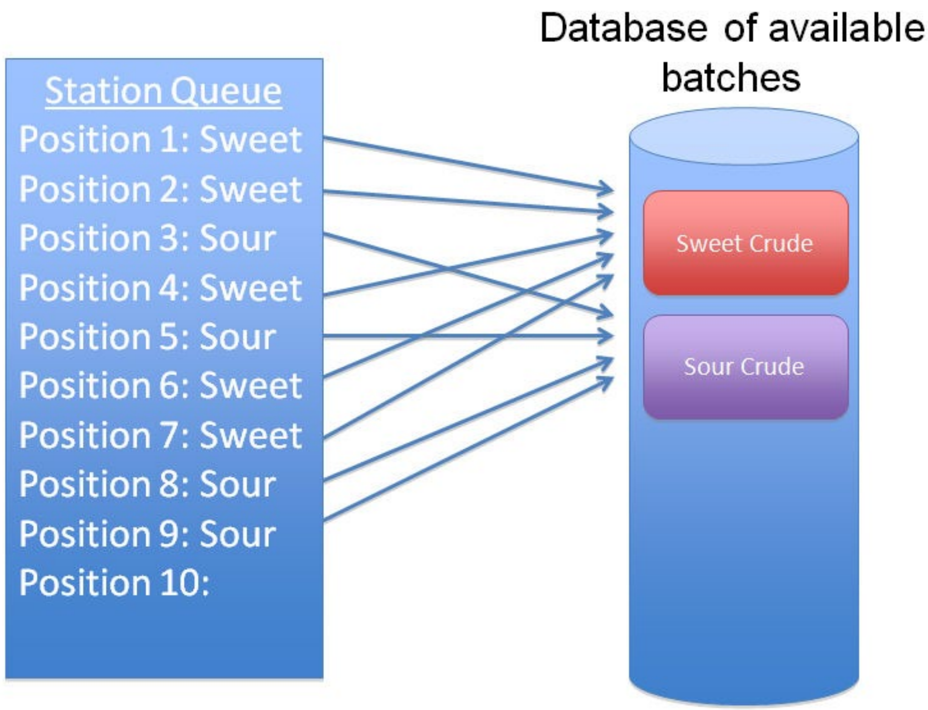


Figure 9-47. Batch Queue using Alternating Products

9.4.1 Default Batch Queue Configuration

- You can configure up ten future batches.
- User Program has 11 logical points for use.
- First point (logical number 0) is always the default.
- When the system uses and clears a batch, the system then sets it as the default (first point) batch.

Queue Order Commands

You have control over the items in the batching queue. .

- Each item in the queue can:
  - Move up.
  - Move down.
  - Move to top.
  - Move to bottom.
  - Delete from queue.
- You can manually advance the queue.
- You can sync all 6 station queues.

Pending Batch Configurations

Each batch can change:

- Product (fluid type).
- Batch Type (Timed, Measurement, User Signaled).
- Batch Options.
- User Data, Tags, Descriptions.

Typically you change only one component, such as the product.

9.4.2 Batch Queue Configuration

Use the Batch Queue Configuration screens to define basic batch information for up to 11 station batches.

To access these screens from the Directory Tree:

1. Double-click User Program.
2. Double-click **Program #2, BatchQueue_800L**.
3. Double-click **Display #215, Batch Queue Configuration**.
4. Double-click **#1**. The Batch Queue Configuration screen displays, showing the General tab.

Batch Queue Configuration: General Tab

Use this screen to configure each of the 11 station batches.

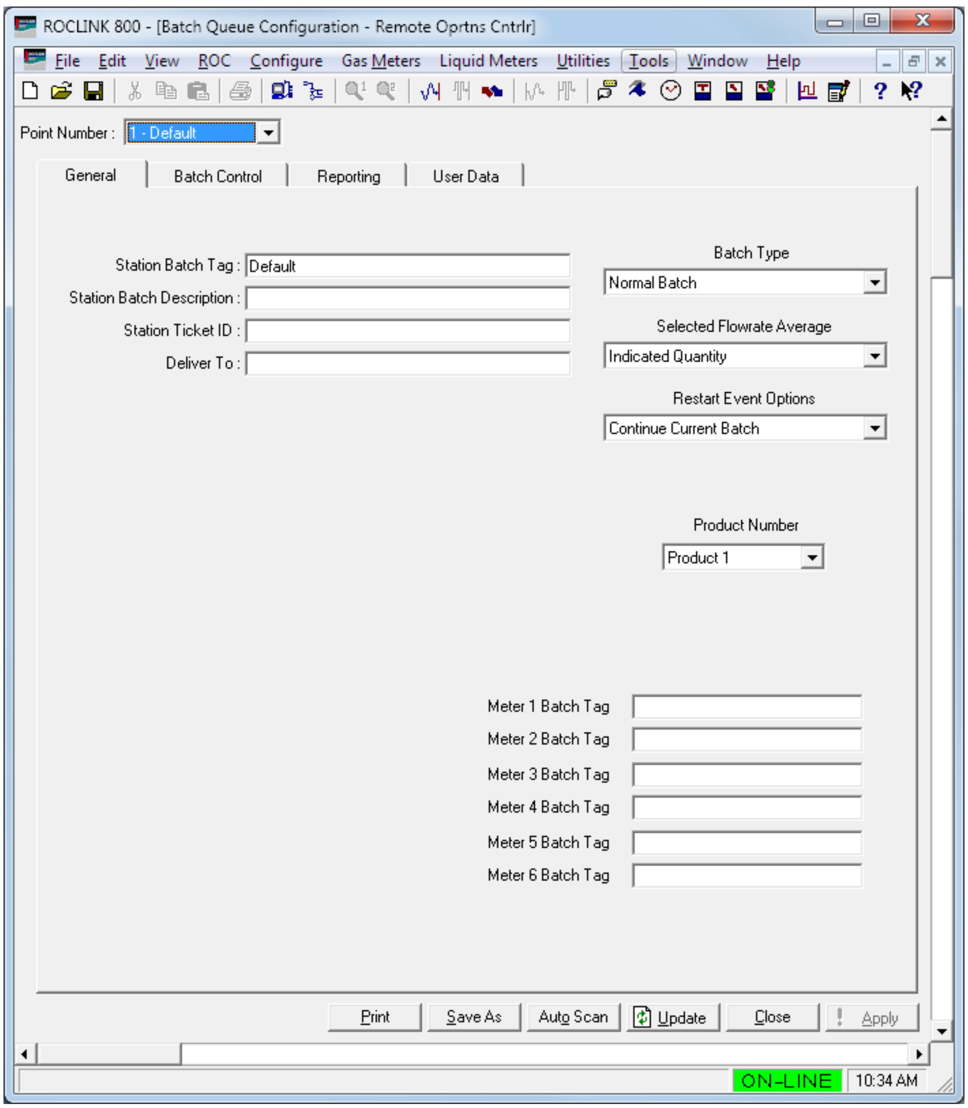


Figure 9-48. Batch Queue Configuration – General tab

Field	Description
Point Number	Select the Station Batch that you desire to configure or view. Click ▼ to display all defined station batches. **Note**: This selection in this field applies to each tab on this screen.
Station Batch Tag	Sets a short (up to 20 alphanumeric characters) identifier to define the name of the station batch.
Station Batch Description	Sets a detailed description (up to 40 alphanumeric characters) to identify the station batch. This field is for informational purposes, and you do not have to use it.
Station Ticket ID	Sets a name or numeric value (up to 20 alphanumeric characters) to identify the station batch. Enter a value meaningful to your organization. This field is for informational purposes, and you do not have to use it.
Deliver To	Sets a delivery description (up to 40 alphanumeric characters) to where you deliver the liquid for the station batch. This field is for informational purposes, and you do not have to use it.
Batch Type	Indicates the category of the batch. **Normal Batch** – Standard batch type, indicating nothing unusual. **Maintenance** – Treated as normal. Can indicate an abnormal batch. **Unauthorized** – Detected flow started this batch. **Note:** This option is for reporting purposes only. It does not affect the operation of the batch.
Product Number	Select the Product Number (1 to 24) you desire for the batch to record. You configure the Product Number in the Liquid Product screen.
Meter 1 to 6 Batch Tag	Sets a name (up to 20 alphanumeric characters) to identify the meter associated with the station batch. This tag copies to the meter level information for use by the batch.

Batch Queue Configuration: Batch Control Tab

Use this screen to set times, measurement types, and recalculation options for the station batch.

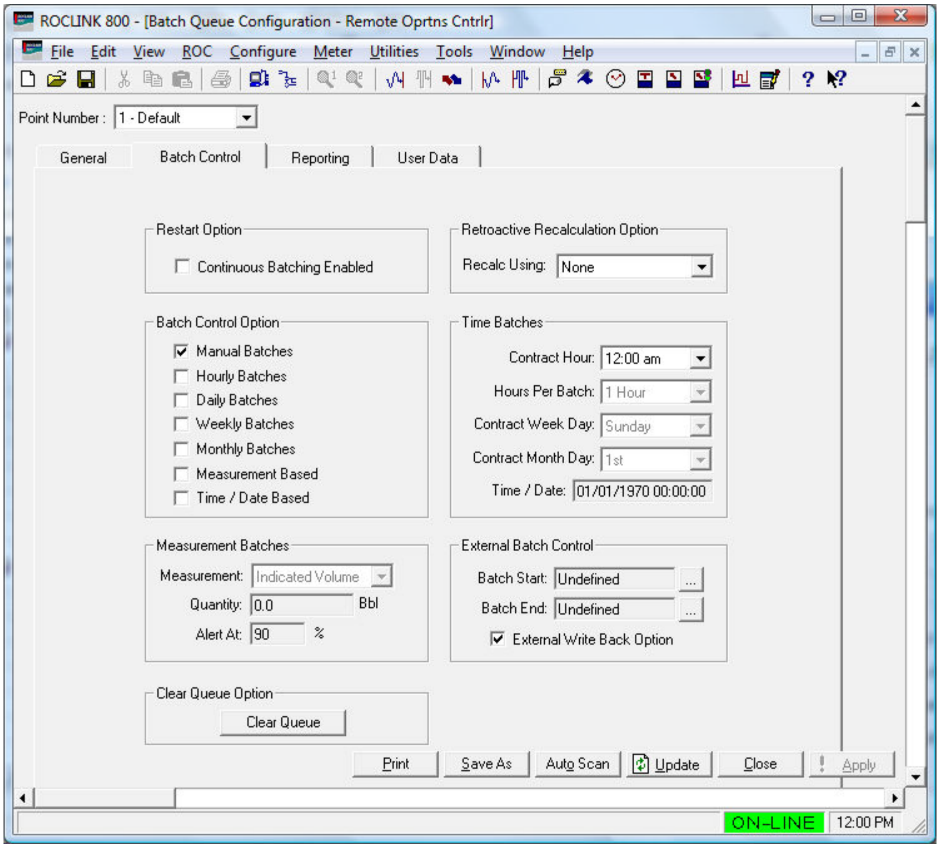


Figure 9-49. Batch Queue Configuration – Batch Control tab

Field	Description
Restart Option	Select the **Continuous Batching Enabled** option if you intend for a batch to be in progress at all times. When you enable this option, at the conclusion of a batch, the next batch starts immediately. There will be no idle period between batches. For example, if you intend to have reoccurring daily batches (one for each day), you must enable this option. Do not select this option if you desire to have idle periods of time in-between batches, for example when loading a truck or vessel.

Field	Description
Batch Control Option	Sets the algorithm the system uses to determine the conclusion of the batch. Time-based batches end when the user-specified time passes and generally are used in conjunction with the continuous batching enabled option, providing a series of on-going timed batches. The period of a batch can be defined as hours, days, weeks, months, or be measurement based. You may also use an exact time occurring in the future to use to determine the period of the batch (Time / Date Based Batches). All methods require a manual start. Once started, the batch continues until it meets the configuration criteria you set. You may select multiple options. If you select more them one option, then the batch stops at whichever criteria is met first. For example, if you select both monthly batches and measurement based batches, and the month ends before the batch reaches the specified measurement quantity, then the batch concludes at the end of the month. You may stop batches manually, even if you do not select the manual batches option. Valid values are:

Manual Batches	Batches stop only at manual commands.
Hourly Batches	Batches stop based on the value in the Contract Hour field and the value in the Hours Per Batch field.
Daily Batches	Batches stop based on the value in the Contract Hour field.
Weekly Batches	Batches stop based on the value in the Contract Hour and Contract Week Day fields.
Monthly Batches	Batches stop based on the value in the Contract Hour and Contract Month Day fields.
Measurement Based	Measurement batches stop once the batch flow total reaches the values you specify using the Measurement Batches fields.
Time/Date Based	Batch stops at the time and date you enter.

Field	Description	
Measurement	Sets which flowrate you desire to monitor when you use measurement based batches. Valid selections are: ▪ Indicated Volume. ▪ Gross Volume. ▪ Gross Standard Volume. ▪ Net Standard Volume. ▪ Sediment and Water Volume. ▪ Gross Mass.	
Quantity	Set the measurement amount that triggers the batch to stop. The batch continues until it reaches this amount (volume or mass). Use for measurement based batches.	
Alert At	Enter a percentage (from 0 to 100) for measurement based batches. Once a batch exceeds this percentage, an alert occurs. You can use an HMI (Human Machine Interface) or an external host application to view the alert status.	
Retroactive Recalculation Option	Select to recalculate the volume of a batch if a factor change occurs during the batch. When a retroactive recalculation occurs, a newly proved factor applies retroactively to the entire batch, and the totals adjust accordingly. The adjustments only apply to the batches in progress. Valid values are:	
	None	No retroactive calculation occur; a new factor is put into use only going forward from the time of the factor change.
	Meter Factor Once	Only the first change to the meter factor during the batch results in a retroactive adjustment of the totals for that meter.
	K Factor Once	Only the first change to the K-factor during the batch results in a retroactive adjustment of the totals for that meter.
	Meter Factor Multiple	Any change to the meter factor during the batch results in a retroactive adjustment. Only the last adjustment will apply to the batch totals.
	K Factor Multiple	Any change to the K-factor during the batch will result in a retroactive adjustment. Only the last adjustment will apply to the batch totals.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">Notes:
Refer to Retroactive Recalculation Meter Factor Updates
The Retroactive Accum Adjustment field must be Enabled in the Liquid Calcs > Liquid Meter > General tab to use this option.
Retroactive recalculations can be set to apply to a change of either the meter factor or the K-factor (but not both). You can also use this option to select if every change to a factor should result in a recalculation of the totals, or only the first time.
Because the meter factor or K-factor apply to an individual meter and not a station, a retroactive adjustment is applied at the meter level. Here you select the option for all meters assigned to this station.
You can set adjustment amounts to apply to the liquid meter in the Liquid Calculations User Program.
Using this option can cause temporary negative values.</td></tr>
<tr><td>Contract Hour</td><td colspan="2">Sets the hour of the day at which a batch ends. Click ▼ to display a list of hourly values.</td></tr>
<tr><td rowspan="7">Hours Per Batch</td><td colspan="2">Sets (for hourly-based batches) the number of hours between batches. Multiple hour batches are always with respect to midnight, meaning a batch will always end at midnight (00:00:00 or 12:00 am). Click ▼ to display a list of values.
Multiple Hours, with respect to Midnight:</td></tr>
<tr><td>2 Hours</td><td>12:00am, 2:00am, 4:00am, 6:00am, 8:00am, 10:00am, 12:00pm, 2:00pm, 4:00pm, 6:00pm, 8:00pm, 10:00pm</td></tr>
<tr><td>3 Hours</td><td>12:00am, 3:00am, 6:00am, 9:00am, 12:00pm, 3:00pm, 6:00pm, 9:00pm</td></tr>
<tr><td>4 Hours</td><td>12:00am, 4:00am, 8:00am, 12:00pm, 4:00pm, 8:00pm</td></tr>
<tr><td>6 Hours</td><td>12:00am, 6:00am, 12:00pm, 6:00pm</td></tr>
<tr><td>8 Hours</td><td>12:00am, 8:00am, 4:00pm</td></tr>
<tr><td>12 Hours</td><td>12:00am, 12:00pm</td></tr>
<tr><td>Contract Week Day</td><td colspan="2">Sets (for weekly-based batches) the day of the week on which batches contractually start. Click ▼ to display a list of values.</td></tr>
<tr><td>Contract Month Day</td><td colspan="2">Sets (for monthly-based batches) the day of the month (between 1 and 28) on which batches contractually end. The Last Day selection means the batch will end on the last day of the month (January 31st, February 28th [non-leap-year], March 31st, April 30th, and such). Click ▼ to display a list of values.</td></tr>
</table>

Field		Description
Time/Date		This **read-only** field displays the last day and time the batch ran.
External Batch Control		Sets a manual batch control based on TLP assignments you define. These are typically assigned to a soft point parameter or discrete input status.
	Batch Start	Click ... to select the TLP to use external stimulus to start batches. The target TLP is a normally zero value, and when it transitions from zero to one, a batch will start.
	Batch End	Click ... to select the TLP to use external stimulus to end batches. The target TLP is a normally zero value, and when it transitions from zero to one, a batch will end.
	External Write Back Option	If enabled, the program clears the target TLP (writes a value of zero) after starting or ending a batch. This option is use for latched DI points or host modified soft point parameters.
Clear Queue Option		Click to clear batch configuration information for the currently selected batch.

Batch Queue Configuration: Reporting Tab

Use this screen to specify options for printing batch information.

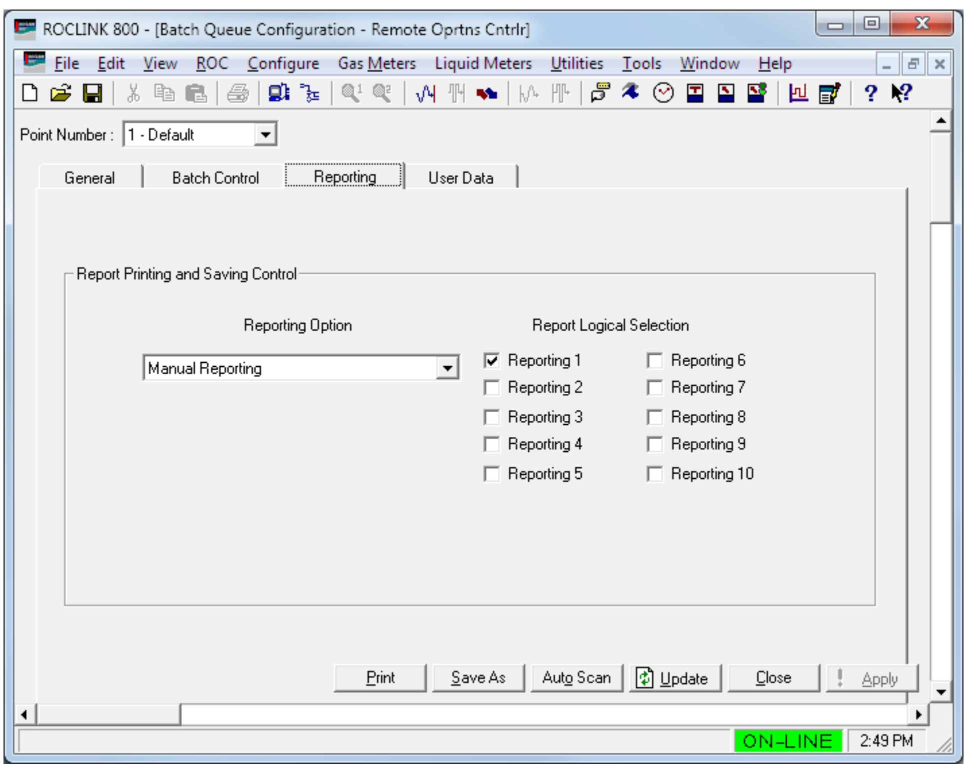


Figure 9-50. Batch Queue Configuration – Reporting tab

Field	Description	
Reporting Option	Controls what the system prints and it saves data at the end of a batch:	
	Manual Reporting	No report occurs at the conclusion of a batch. You must manually generate the report.
	Automatic at Batch End	A report(s) automatically generates at the end of the batch.
	Automatic on Station Recalculation	A report(s) automatically generates when a recalculation occurs at the station level. Report(s) generate for every recalculation performed.
	Automatic on Batch End and Recalculation	A report(s) automatically generate at the end of the batch, or when a recalculation occurs at the station level.
Report Logical Selection	Select the reports to automatically print or save at the end of a batch for the Station Batch Report. No configuration of the details of the report that generate are done in the Batching User Program, instead you use the Reporting_800L User Program to configure the reports. Here you only select which logical instances of the Reporting User Program to trigger when reports generate. You can select none, one or multiple reporting logicals. If you only require a single batch report, then select one report logical, and configure it appropriately (in the Reporting User Program). If you require multiple reports, then select multiple logicals, and configure each according to the necessary report. For example, if you configure the program as shown below and then select only Reporting 3, only the Batch Ticket generates at the end of the batch. ▪ Reporting 1 – Prove Report ▪ Reporting 2 – Maintenance Report ▪ Reporting 3 – Batch Ticket ▪ Reporting 4 – Daily Totals Report ▪ Reporting 5 – Calculation Check Report Alternately, if you configure the program as shown below and select Reporting 1, 2, 3, and 4 (for a three meter station) all four reports generate at the end of the batch. ▪ Reporting 1 – Station Batch Totals Report ▪ Reporting 2 – Meter 1 Batch Totals Report ▪ Reporting 3 – Meter 2 Batch Totals Report ▪ Reporting 4 – Meter 3 Batch Totals Report	

Batch Queue Configuration:User Data Tab

Use this screen to review and define the user-entered data fields that display in the station batch report. These fields are a type of ROC point with generic parameters that you can configure to hold data you desire to maintain. You define the User Entered Report Data fields in Station Batch Configuration > User Data tab.

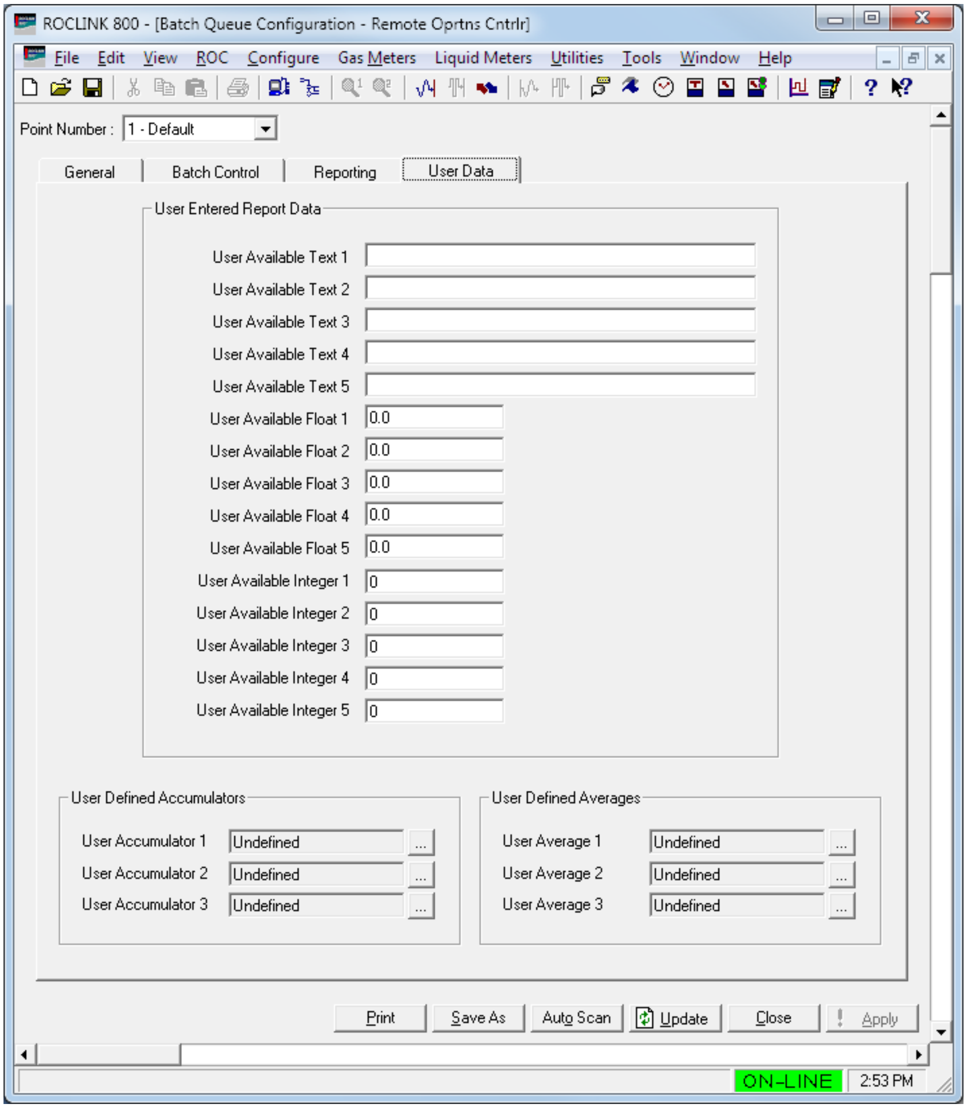


Figure 9-51. Batch Queue Configuration – User Data tab

Field	Description
User Available Text 1 through 5	Displays the text that defines the data to transfer to the current station batch. For example, the company name (Petro Pipeline Company), vessel name (Kinja Maru), or notes from the operator (Flow Control Valve 4 Offline). You define the User Entered Report Data fields in the **Station Batch Configuration** > **User Data** tab.
User Available Float 1 through 5	Displays the floating point number to transfer to the current station batch. For example, the ambient temperature that day (86.54 deg F) or the average product viscosity (22.751 cP). You define the User Entered Report Data fields in the **Station Batch Configuration** > **User Data** tab.

Field	Description
User Available Integer 1 through 5	Displays the integer number to transfer to the current station batch. For example, the ID number of a sample can (542) or the meter ID number (7894). You define the User Entered Report Data fields in the **Station Batch Configuration** > **User Data** tab.

9.4.3 Batch Queue - Queue Control Tab

Use this screen to configure the order of up to ten pending batches (Queue Pos #1 – Queue Pos #10). Batches in Queue Pos #1 are first, Queue Pos #2 are second, Queue Pos #3 are third, and so on. You can rearrange pending batches in any order. Ten queues exist, one for each meter (batch).

To access this screen from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #2, BatchQueue_800L**.
3. Double-click **Display #216, Batch Queue**.
4. Double-click **#1, Station 1 Queue**. The Batch Queue screen displays.

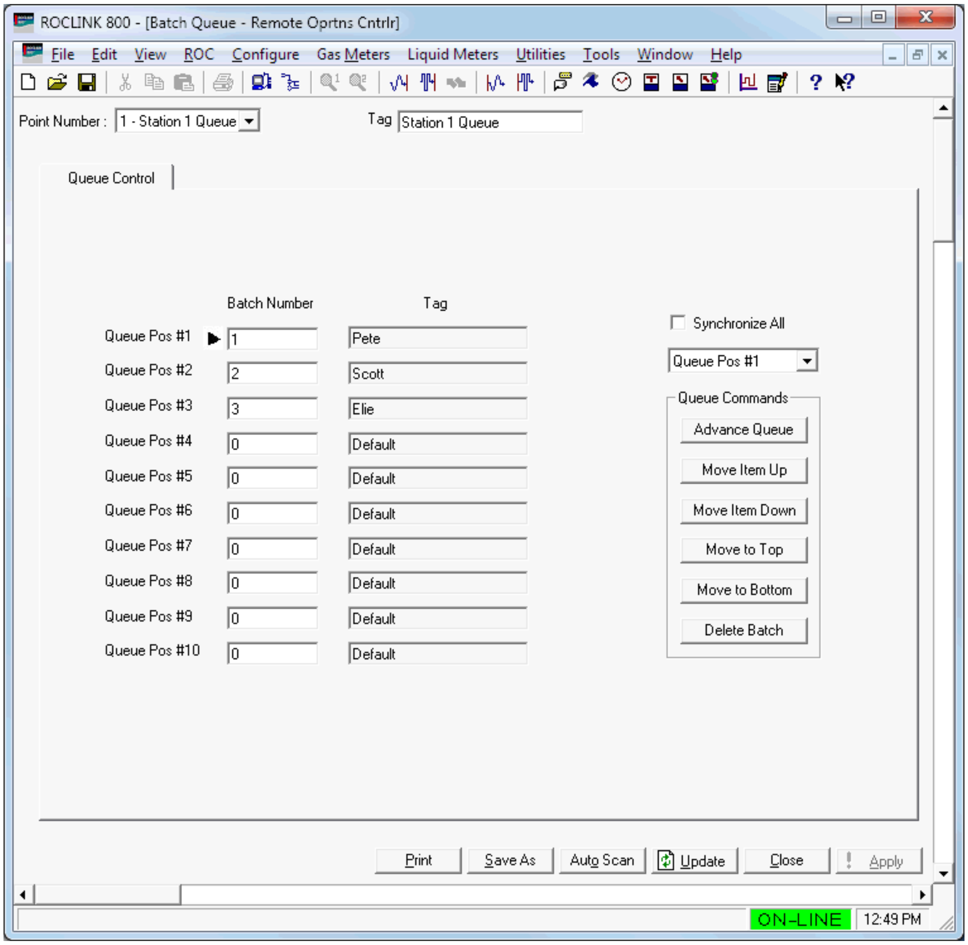


Figure 9-52. Batch Queue

Field	Description
Queue Pos #1 to #10	Sets the position of the batch in the sequence of batches. **0** is the default value and does not display in the batch.
Tag	This **read-only** field shows a short description for the batch. You set the tag in the Station Batch Tag field on General tab of the Batch Queue Configuration screen.
Synchronize All	Select to copy and synchronize the batch queue configuration in all other meters to the other batch queues. Ideally, only one meter should enable this feature and any changes in that meter reflect in the other meters. If any batch queue changes in this point type, select Synchronize All ensures all meters change.
Synchronize All Queue Position	Click ▼ to select a specific position from the drop-down list box. An arrow displays next to the selected position. The Queue Commands control the queues.

Field	Description	
Queue Commands	Specifies the action to perform on the queue.	
	Advance Queue	Remove first item in the queue and move all other items in the queue up one position in the batch queue.
	Move Item Up	Move the batch item up one position in the batch queue.
	Move Item Down	Move the batch item down one position in the batch queue.
	Move to Top	Move the batch item to the first position in the batch queue.
	Move to Bottom	Move the batch item to the bottom position in the batch queue.
	Delete Batch	Remove the batch item from the batch queue.

9.5 Proving (Proving_800L)

During a meter proving operation, detector inputs start and stop the accumulated pulse counts. A positive-to-negative transition on either detector input generates a time-stamped interrupt with the APM module's 30Mhz on-board processor. The system uses this interrupt for pulse accumulation between the detectors as well as for the pulse interpolation calculations.

You can configure the proving operations to include a selected number of successful runs in a sequence (maximum of 10 runs), set various timing parameters, and maintain accord with desired repeatability standards. The Prover Application records and displays all data for a trial run in an easy-to-understand tabular format with color coding to distinguish which results are acceptable in a sequence.

The resulting Meter Factor for a sequence can be compared using both the average data and average Meter Factor method. You can also view the repeatability of a trial run based on these methods. Text alarms are provided to indicate the status of the proving sequence which allows you to monitor performance at all times.

The proving feature uses the Advance Pulse Module (APM) which supports dual pulse integrity measurements in accordance with API standards, and provides detector switches to measure the beginning and end of a prover run.

The detector inputs can be used with relays, open collector/open drain type solid-state switches, and other two-state devices. The APM has a dedicated on-board digital signal processor for extremely precise counting of pulses, time interval calculations, and API pulse interpolation calculations.

Uni-directional, bi-directional, small volume, and master meter proving is supported. You can designate channel 4 on the APM as a pulse input or a solid state pulse output for remote totalizing.

The module's detector input channels can be used with individually wired detector switches or detector switches that are wired in series from the prover on the same cable. The detector inputs can be used with relays, open collector/open drain type solid-state switches, and other two-state devices. For more information on the APM refer to *Technical Specifications ROC800:APM*.

9.5.1 Prover Configuration

Use these screen to define prover parameters and configure the prover according to its type. The Proving User Program supports uni-directional large volume provers, bi-directional large volume provers, small volume provers and master meters. The prover type configuration varies for each type of prover. Each prove is unique to a meter and a product.

You must add an Advanced Pulse Module to utilize meter proving, pulse fidelity, frequency densitometer, or high speed pulse output.

To access these screens from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #4, Proving_800L**.
3. Double-click **Display #206, Prover Configuration**. The Prover Configuration screen displays, showing the General tab.

Prover Configuration: General Tab

Use the Prover Configuration screen to define prover identification information, including the type of meter to prove, method, and units.

To access these screens:

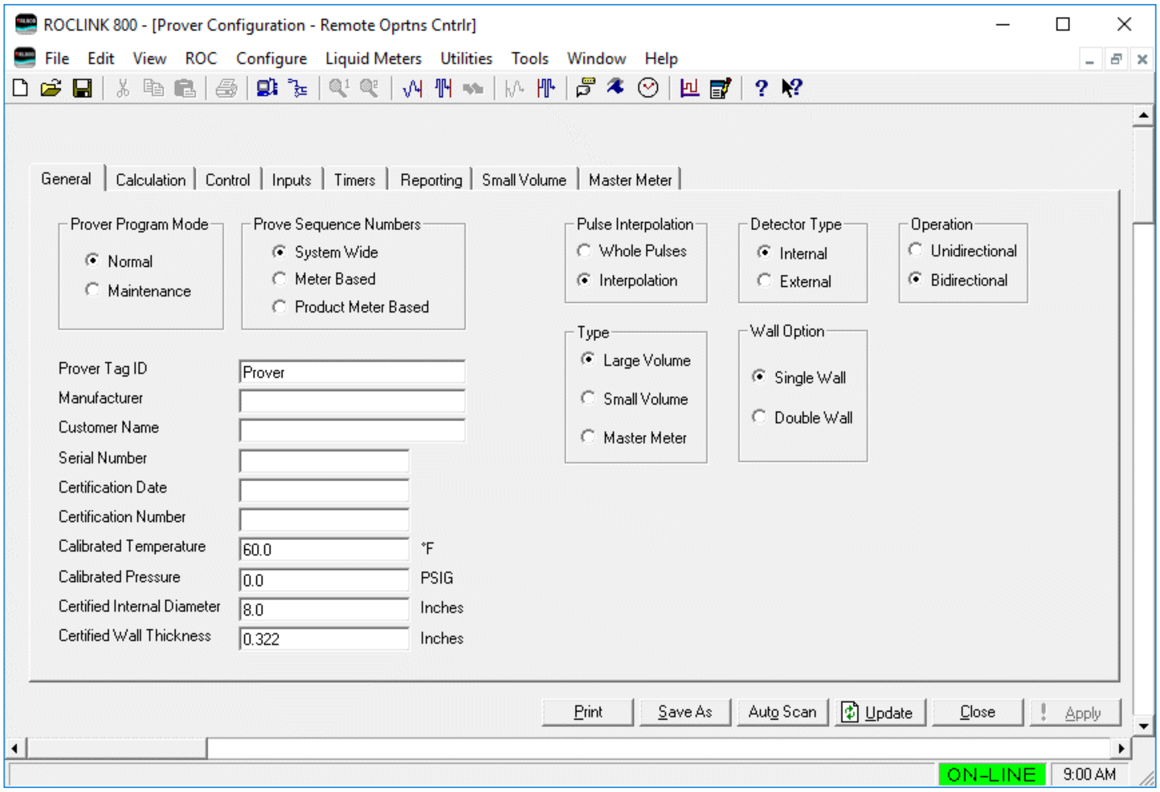


Figure 9-53. Prover Configuration – General tab

Field	Description	
Prover Program Mode	Specifies the prover mode. Valid values are **Normal** (regular operations) and **Maintenance** (if the physical prover is under maintenance). If you set the mode to Maintenance, the ROC800L does not allow proving. The default is **Normal**.	
Prover Sequence Numbers	Identifies the value associated with each prove you perform. This option selects how the system increments these sequence numbers.	
	System Wide	Prove sequence number increments globally; regardless of which meter is being proved. The default is **System Wide**.
	Meter Based	Prove sequence numbers increments on a per meter basis. Each meter has its own set of prove sequence numbers.

Field	Description	
	Product Meter Based	Prove sequence numbers increment on a per product, per meter basis. A given meter using a certain product has a set of prove sequence numbers. The same meter using another product, will have a different set of prove sequence numbers, and so on.
Prover Tag ID	Sets a name (up to 20 alphanumeric characters) to identify the prover. Enter a value meaningful to your organization.	
Manufacturer	Enter up to 20 characters of text to describe the name of the manufacturer of the prover. This information can display on the prover report.	
Serial Number	Enter up to 20 characters of text to indicate the serial number of the prover. This information can display on the prover report.	
Certification Date	Enter the date the prover was certified. This information can display on the final prove report.	
Certification Number	Enter the certification number for the last prove certification. This information can display on the final prove report.	
Calibrated Temperature	Enter the temperature of the prover at the time of calibration. Define temperature units on the Liquid Preferences screen; typical values are 60 Deg F, 15 Deg C, or 20 Deg C. The default value is **60 Deg F**.	
Calibrated Pressure	Enter the pressure of the prover at the time of calibration. Pressure units are the same as in the Liquid Preferences screen and typical values are 0 PSIG or 101.325 kPa. The default value is 0 PSIG.	
Certified Internal Diameter	Enter the internal diameter of the prover as documented by the certification and is in the same units as in the Liquid Preferences screen.	
Certified Wall Thickness	Enter the wall thickness of the prover as documented by the certification. This unit must be the same as defined on the Liquid Preferences screen.	
Pulse Interpolation	Sets the method of how to count pulses. Valid selections are **Whole Pulses** and **Interpolation**. Interpolation is recommended for use with small volume provers. The default value is **Whole Pulses**.	
Type	Select the category/class of the prover. Valid selections are **Large Volume**, **Small Volume**, and **Master Meter**. The default is **Large Volume**.	

Field	Description
Detector Type	Sets the location of the prover detection switches. Valid selections are Internal detectors or External detectors. The default is **Internal**. **Note:** Typically, Small Volume Provers use external detectors.
Wall Option	Enter the prover wall construction type. Valid selections are **Single Wall** or **Double Wall**. The default is **Single Wall**. **Note**: If you select Double Wall, the Proving User Program assumes the walls of the prover do not stretch elastically, and the correction for the pressure effect on steel (CPS) is 1.0.
Operation	Specify whether you are using a Uni-directional or Bi-directional prover. The default is **Bi-directional**. **Note**: This selection **only** applies when you select Large Volume in the Type field.

Prover Configuration: Calculation Tab

Use this screen to define parameters which affect the prove calculation.

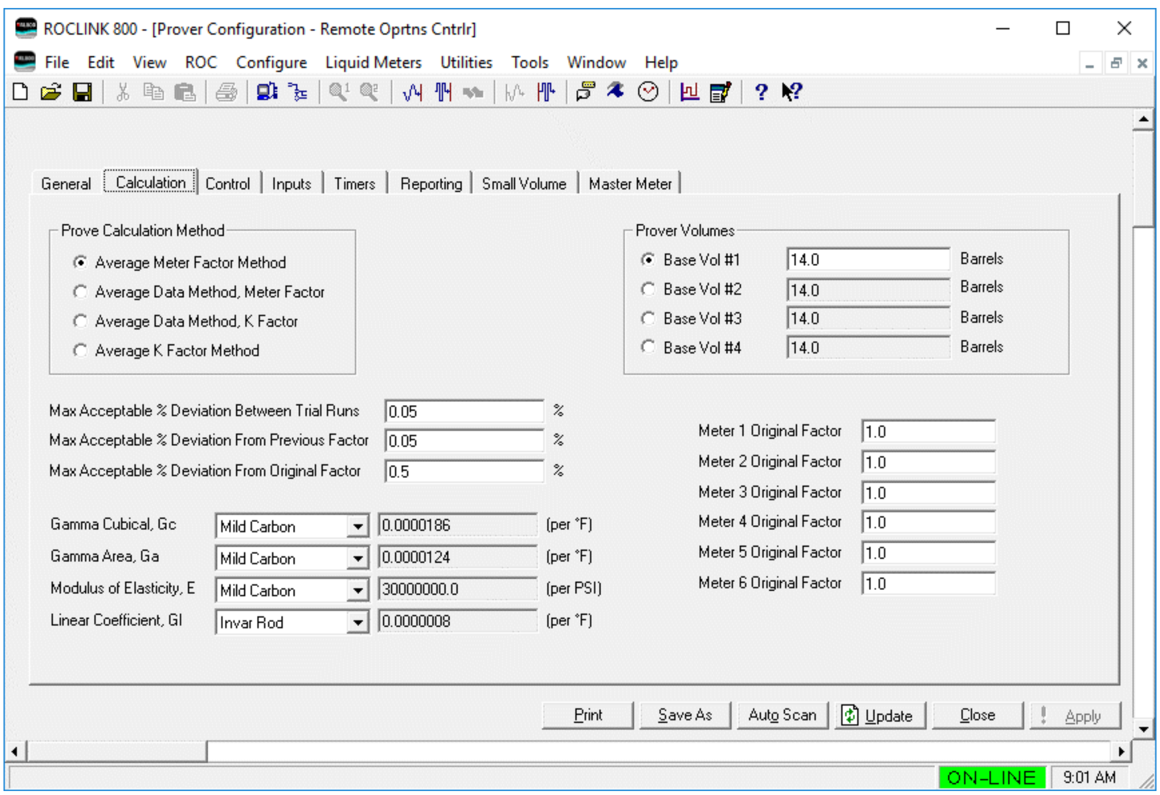


Figure 9-54. Prover Configuration – Calculation Tab

Field	Description	
Prove Calculation Method	Defines how the repeatability applies to trial runs for the purposes of determining which trial runs the final Meter Factor calculation includes in the prove sequence. This parameter also determines which Meter Factor or K-factor is shown on the prove report as the final factor for the prove sequence. Valid values are:	
	Average Meter Factor Method	Calculates an intermediate Meter Factor for each trial run based on pulse counts, and individual temperature / pressure averages. The average (mean) of these intermediate Meter Factors is the final Meter Factor. The difference in these intermediate Meter Factors determines repeatability between trial runs. **Note:** This is the default.
	Average Data Method, Meter Factor	Calculates only one Meter Factor. Pulse counts, pressures and temperatures are collected for each trial run. When the required amount of good trial run occurs, these values are averaged. The Prover User Program calculates the average values for the final Meter Factor. The difference in pulse counts determines repeatability between trial runs.
	Average Data Method, K Factor	Calculates only one K-factor. Each trial run collects the pulse counts, pressures and temperatures. When the required amount of good trial runs occur, the Prover User Program uses the average of the values to calculate the final K-factor. The difference in pulse counts determines repeatability between trial runs.

Field	Description	
	Average K Factor Method	Calculates an intermediate K-factor for each trial run based on based on pulse counts, pressures and temperatures. The average (mean) of these intermediate K-factors is the final K-factor. The intermediate K-factors are compared to determine the repeatability between trial runs.
Prover Volumes	Sets the certified prover volume in the Volume Units you select. Enter up to four base volumes (Base Vol #1 to #4), and select the appropriate base volume for this prove. If entering a base volume for a bi-directional prover, enter a value that represents **both** the forward and reverse passes.	
Max Acceptable % Deviation Between Trial Runs	Sets the maximum amount of variation/deviation from one trial run to another. If the deviation is under this value, then the trial run can be considered as valid for the prove sequence. If the variation between trial runs exceeds this amount, the trial run is considered bad. The default value is **0.05%**. Depending on the Meter Factor method, this is the repeatability between the number of pulses per trial run or the variation of the Meter Factor for that trial run.	
Max Acceptable % Deviation From Previous Factor	Sets the maximum amount of variation allowed in a prove. If the variation of the Meter Factor or K-factor from the originally entered value exceeds this amount, the prove is considered bad and is not accepted. The default value is **0.5%**.	
Max Acceptable % Deviation From Original Factor	Sets the maximum amount of variation allowed in a prove. If the variation of the Meter Factor or K-factor from the original prove exceeds this amount, the prove is considered bad and is not accepted. The default value is **0.5%**.	
Gamma Cubical, Gc	Specifies the option for the Cubical Coefficient. Select the type of steel the prover's construction uses. This sets the cubical coefficient of thermal expansion for the prover. Click ▼ to display all valid selections. The default is **Mild Carbon Steel**. **Note:** If the prover was constructed with a material that is not a valid selection, select **User Entered** and enter the coefficient.	

Field	Description
Gamma Area, Ga	Specifies the option for the Gamma Area Coefficient. Select the type of steel the prover's construction uses. This sets the area coefficient of thermal expansion for the prover. Click ▼ to display all valid selections. The default is **Mild Carbon Steel**. **Note:** If the prover was constructed with a material that is not a valid selection, select **User Entered** and enter the coefficient.
Modulus of Elasticity, E	Specifies the option for the Modulus of Elasticity. Select the type of steel the prover's construction uses. This sets the mathematical description of the steel's tendency to be deformed elastically when force is applied to it. Click ▼ to display all valid selections. The default is **Mild Carbon Steel**. **Note:** If the prover was constructed with a material that is not a valid selection, select User Entered and enter the modulus.
Linear Coefficient, Gl	Specifies the linear coefficient for the material the displacer shaft or detector mounting uses. This sets the Linear Coefficient of thermal expansion for the displacer shaft or detector mounting. Click ▼ to display all valid selections. The default is **Invar Rod**. **Notes**: ▪ If the shaft or mounting was constructed with a material that is not a valid selection, select **User Entered** and enter the coefficient. ▪ This is for small volume provers **only**.
Meter 1 to 6 Original Factor	Enter the Meter Factor or K-factor value of the factor at commissioning or startup. When a prove for a given meter completes successfully, the system compares the original factor value to the newly proved factor using the formula: *Deviation From Original = (Newly Proved Factor – Original Factor) / Original Factor * 100.0* As proves are performed, it is expected that the factor value will drift in one direction or another. The original factor provides a check against the factor drifting completely away from an accurate range.

Prover Configuration: Control Tab

Use this screen to define the parameters of a prove including maximum temperature, pressure, and flow rate deviation.

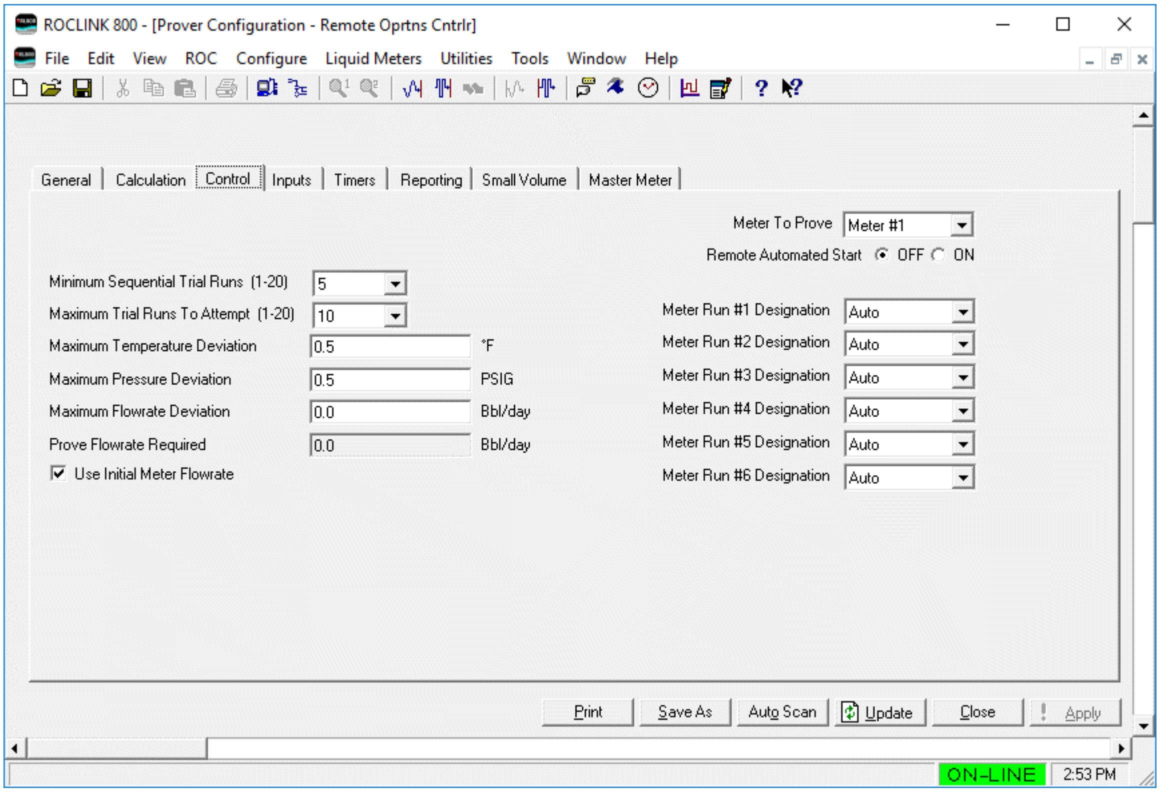


Figure 9-55. Prover Configuration – Control Tab

Field	Description	
Meter To Prove	Selects the meter to prove. This selection refers to the 6 Liquid Meters you configure in the Liquid Calcs User Program. You must select one of the 6 meters before a prove can begin. Valid selections are No Meter, Meter #1 to Meter #6. The default is **No Meter**. Click ▼ to display the options.	
Remote Automated Start	Sets if if the start of a prove can be automated. Valid values are:	
	ON	You can start a prove by writing to the Start Prove parameter [TLP:206,0,85] via a SCADA or by manually pressing the Start Prove button. The system will then sync what is in the Meter Currently Aligned parameter to the Meter to Prove parameter, reset the prover, and begin the prove. **Note:** The system still makes all the normal checks, and aborts the prove if all checks do not pass.
	OFF	A prove can only be started by manually setting the Meter to Prove parameter to match the Meter Currently Aligned parameter, resetting the prover, and pressing the Start Prove button.

Field	Description
Minimum Sequential Trial Runs	Indicates the minimum number of trial runs (that must occur in order) that fall within the allowable range of repeatability. Valid selections are 1 to 20. The default is **5**. Click ▼ to display the valid options.
Maximum Trial Runs To Attempt	Indicates the greatest number of trial runs the system attempts before aborting the prove sequence. Valid selections are 1 to 20. The default is **10**. Click ▼ to display the valid options.
Maximum Temperature Deviation	Sets the greatest amount of temperature variation allowed between the prover temperature and the meter temperature from one trial run to another. Temperature deviation is checked at the beginning of the prove sequence and must fall within the range within a user-defined time period for the sequence to continue. ROCLINK continually checks the temperature deviation throughout the prove. If the deviation is under this value then the run can be considered as a potentially valid run for the prove sequence. If the temperature difference exceeds the maximum deviation, the prove aborts. Depending on the Meter Factor method, this is the repeatability between the number of pulses per trial run or the variation of the Meter Factor for that trial run. The default is **0.5**. **Note:** Set the units for temperature deviation using the Liquid Preferences screen.
Maximum Pressure Deviation	Sets the greatest amount of pressure variation allowed between the prover pressure and the meter pressure. The meter pressure and the prover pressure may be from a single value or from an average of the prover inlet and prover outlet values. ROCLINK continually checks pressure deviation at the beginning and throughout the prove sequence. The pressure must fall within the range within a user-defined time period for the sequence to continue. If the pressure difference exceeds the maximum deviation, the prove is aborted. The default is **0.5**. **Note**: Set the units for pressure deviation using the Liquid Preferences screen.
Maximum Flowrate Deviation	Sets the amount of flow rate variation allowed during a prove when comparing the meter flow rate to the prove flow rate. Accurate proving requires a steady flowrate. The meter flow rate is recorded at the start of the prove and should the flow rate deviate greater than this amount, the prove aborts. If you enter a value of 0.0, flowrate checks will be disabled. The default is **0.0**. **Note:** Enter the Maximum Flow Rate Deviation as absolute value.

Field	Description
Prove Flowrate Required	Sets the flow rate value which the current meter flow rate must match during a prove within an acceptable percentage of deviation when in-between detectors. If the flowrate deviates more then the allowed amount, the prove aborts. The default is **0.0**.
Use Initial Meter Flowrate	Sets a sampled initial meter flowrate the system uses from the start of the prove as the standard to compare against for the duration of the prove. The current Meter Flow Rate at the start of the prove to the Prove Flowrate Required field. During the prove, the flowrate must not vary from this value more then the Maximum Flowrate Deviation. Should that occur, the prove aborts.
Meter Run #1 to #6 Designation	Sets the run control designation for alignment. This designation is for use by an external valve alignment application and has no effect on the Proving User Program. Click ▼ to display the options. Valid selections are: **Auto** – Automatically controls the valve position and monitors valve position. **Note:** This is the default. **Manual** – Does not control the valve, but monitors valve position. **Not Available** – Does not control the valve or monitor valve position.

Prover Configuration: Inputs Tab

Use this screen to configure temperature inputs, pressure inputs, and valve seal input if applicable for the prover.

To access this screen, select the Inputs tab. The Inputs screen displays.

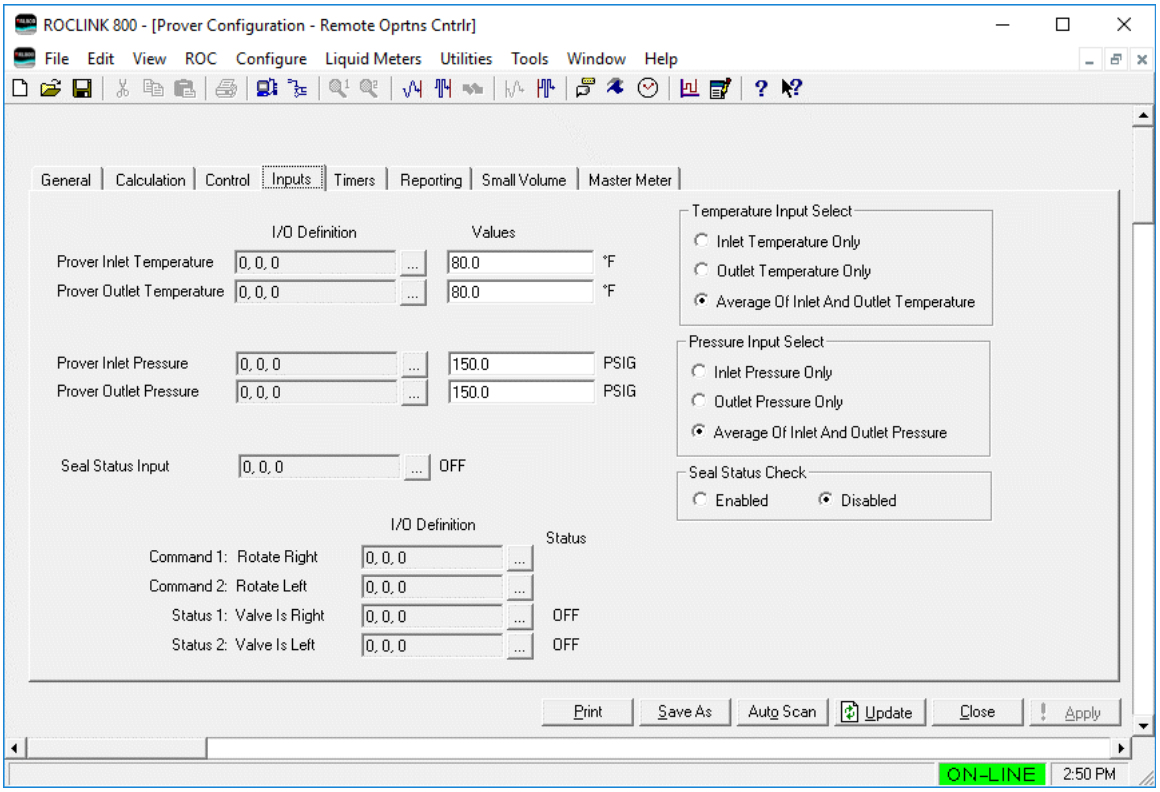


Figure 9-56. Prover Configuration – Inputs Tab

Field	Description
Prover Inlet Temperature	Defines the input for the prover inlet temperature. Click ... to display the Select TLP screen and define the TLP to provide this value. Valid values include: ▪ Analog Input, EU Value. ▪ HART Input, Primary Variable, Secondary Variable, and such. ▪ RTD, EU Value. ▪ Thermocouple, EU Value. ▪ MVS, Temperature Reading. ▪ FST Registers. ▪ Soft Point Float. **Note**: If you select **Undefined** for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input.

Field	Description
Prover Outlet Temperature	Defines the output for the prover output temperature. Click [...] to display the Select TLP screen and define the TLP to provide this value. Valid values include: ▪ Analog Input, EU Value. ▪ HART Input, Primary Variable, Secondary Variable, and such. ▪ RTD, EU Value. ▪ Thermocouple, EU Value. ▪ MVS, Temperature Reading. ▪ FST Registers. ▪ Soft Point Float. **Note:** If you select **Undefined** for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input.
Prover Inlet Pressure	Defines the input for the prover input pressure. Click [...] to display the Select TLP screen and define the TLP to provide this value.Valid values include: ▪ Analog Input, EU Value. ▪ HART Input, Primary Variable, Secondary Variable, and such. ▪ MVS, Temperature Reading. ▪ FST Registers. ▪ Soft Point Float. **Note:** If you select **Undefined** for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input.
Prover Outlet Pressure	Defines the output for the prover output pressure. Click [...] to display the Select TLP screen and define the TLP to provide this value. Valid values include: ▪ Analog Input, EU Value. ▪ HART Input, Primary Variable, Secondary Variable, and such. ▪ MVS, Temperature Reading. ▪ FST Registers. ▪ Soft Point Float. **Note:** If you select **Undefined** for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Seal Status Input</td><td colspan="2">Defines the input status where the proving valve seal signal is wired. Click … to display the Select TLP screen and define the TLP to This is typically a discrete input status parameter.</td></tr>
<tr><td>Command 1</td><td colspan="2">Sets the rotate right output to conduct a trial run or prove sequence. This will typically be a discrete output status parameter.
▪ If the prover operation is uni-directional, click … to display the Select TLP screen and define a TLP responsible for launching the displacer by energizing the ram. This command turns off at the first detector trip.
▪ If the prover operation is bi-directional, click … to display the Select TLP screen to define a TLP to issue the rotate right command to the 4 way valve. This is the Run command for Compact Provers.
Note: Master meter provers do not use this feature.</td></tr>
<tr><td>Command 2</td><td colspan="2">Set the rotate left output to conduct a trial run or prove sequence.
▪ If the prover operation is uni-directional and compact, click … to display the Select TLP screen and define the TLP responsible to turn on the hydraulics commonly associated with a uni-directional prover. This command turns on at the start of a new prove sequence and stays on until the sequence finishes or is aborted.
▪ If the prover operation is bi-directional, click … to display the Select TLP screen and define a TLP to issue the reverse launch (rotate left) command to the 4 way valve.
Note: Master meter provers do not use this feature.</td></tr>
<tr><td rowspan="5">Status 1</td><td colspan="2">Set the status input for the right prover signal. Valid values are:</td></tr>
<tr><td>Uni-directional</td><td>Not used.</td></tr>
<tr><td>Bi-directional with a 4-Way Valve</td><td>Indicates the valve is in the forward position or “valve is rotated right.” Click … to display the Select TLP screen and define a TLP that indicates when the 4 way valve has rotated to the right. This is typically a discrete input status parameter.</td></tr>
<tr><td>Compact Prover</td><td>Indicates the hydraulic valve is open.</td></tr>
<tr><td colspan="2">Note: Only bi-directional provers use this feature.</td></tr>
</table>

Field	Description
Status 2	Set the status input for the left prover signal. Valid values are: **Uni-directional or Compact**: Prover is on and ready to initiate a trial run. Click to display the Select TLP screen and define a TLP that indicates that the prover is ready. **Bi-directional with a 4-Way Valve**: Valve is in the reverse position or “valve is rotated left.” Click to display the Select TLP screen and define a TLP that indicates when the 4-way valve has rotated to the left. **Note:** Only bi-directional provers use this feature
Temperature Input Select	Sets which input to use for the prover flowing temperature. This is the value averaged between detector switch trips. The default is **Average Of Inlet And Outlet Temperature**.
Pressure Input Select	Sets which input to use for the prover flowing pressure. This is the value averaged between detector switch trips. The default is **Average Of Inlet And Outlet Pressure**.
Seal Status Check	Defines whether the program checks the 4-way seal status between detector switches. If the seal is lost between detector during a trial run, the prove aborts. Valid values are **Enabled** (checking occurs) and **Disabled** (no checking occurs). The default is **Enabled**. **Note**: This selection is **only** used for bi-directional provers. If you are not using a bi-directional prover, select **Disabled**.
Prover Density	Click ▼ to select which densitometer to use for the prover density. **Note:** If you select Manual Value, you must enter a value to use for the prover density.

Prover Configuration: Timers Tab

Use this screen to define the various timers associated with the prove sequence.

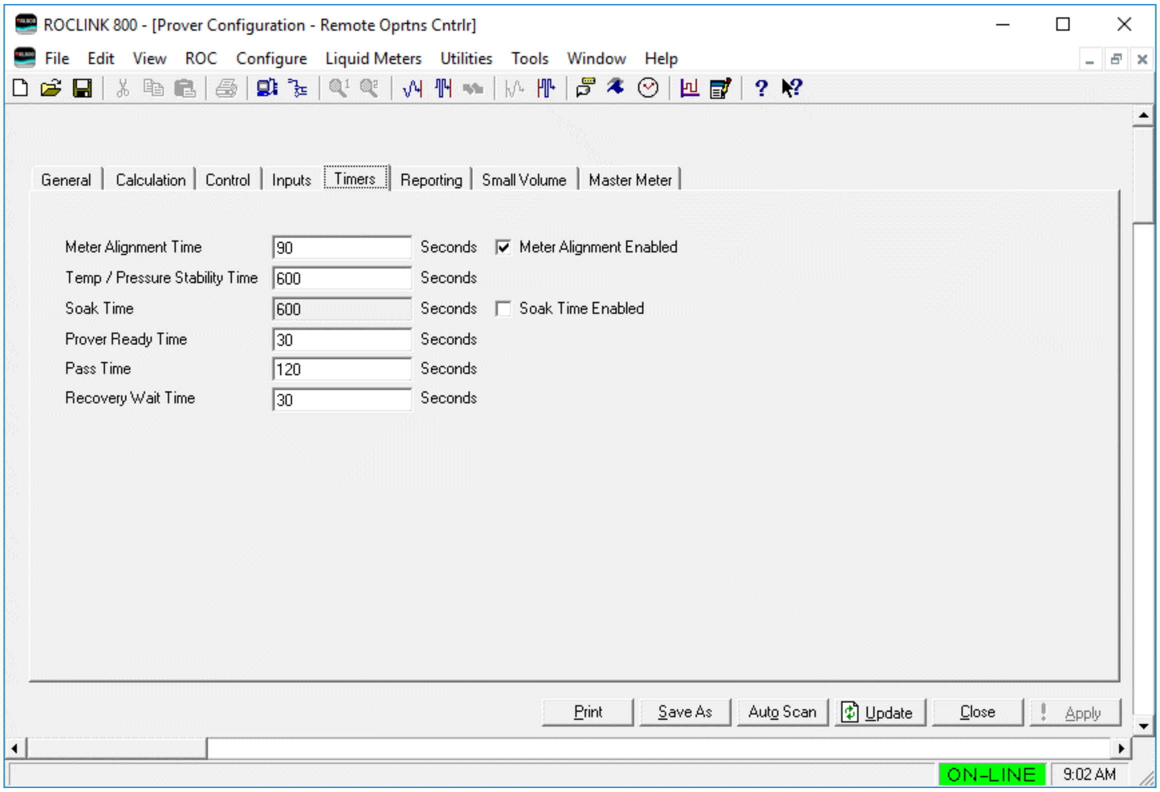


Figure 9-57. Prover Configuration – Timers Tab

Field	Description
Meter Alignment Time	Sets the maximum time (in seconds) for the alignment of a meter to the prover before aborting the prove. Meter alignment is the first step in performing a prove. The default is **90** seconds.
Meter Alignment Enabled	Turns the meter alignment timer on or off. If enabled (checked), the Meter To Prove and Aligned Meter must match prior to starting a prove. Some external application, such as DS800, Modbus, a button on a HMI screen, require the parameters match or they may set this parameter to –1 for many different reasons, such as the application could not align the correct meter or the valves are in transition.
Temp / Pressure Stability Time	Sets the maximum time (in seconds) to achieve pressure and temperature stability before aborting the prove. Stability is defined as the prover inlet/outlet temperature and pressure values being equal to the meter temperature value within the maximum deviations. The default is **600** seconds.
Soak Time	Sets the amount of time (in seconds) to wait for the temperature of the steel to measure closer to the temperature of the fluid. This additional time is used for the temperature of the prover to change because of the temperature of the fluid. The default is **600** seconds.

Field	Description
Soak Time Enabled	Sets the soak timer on or off to add time following the temperature stabilization timer. If disabled, this step is skipped.
Prover Ready Time	Sets the maximum time (in seconds) to achieve a Prover Ready indication signal from the prover before aborting the prove. This is the allowed time between starting the prove sequence and receiving the Prover Ready indication signal. The default is **30** seconds. **Note:** This field **does not** apply to master meters.
Pass Time	Sets the maximum time (in seconds) to achieve a successful pass before aborting the prove. This is the allowed time between issuing the launch command and receiving the second detector trip for each pass. The default is **120** seconds. **Note:** This field **does not** apply to master meters.
Recovery Wait Time	Sets the amount of time (in seconds) the program waits between receiving the second detector switch trip and starting the next pass. This time allows the prover equipment to return to a ready state. The default is **30** seconds.

Prover Configuration: Reporting Tab

Use this screen to define options for generating prove reports. You can specify the specific report to print or save to internal memory, change the orientation of the report, and specify characters per inch displayed on the printed report. You can generate two types of reports at the completion of a prove: a final prove report and a trial report:

- A **final prove report** provides general prover information. Use this information to verify the calculation of the final Meter Factor. Examples are outlined in API Chapter 12, Section 2, Part 3 - Proving Reports. This report may contain data such as the prove date/time, prove number, prove certification date, prover volume, meter data, pulse counts, and the final proved Meter Factor / K-factor.
- A **trial report** provides detailed data from each trial run. Use this information to troubleshoot and verify calculations for the average Meter Factor method. Values shown for each trial run include date/time, prover pressure, prover temperature, meter pressure, meter temperature, CTSp, CPSp, CTLp, CPLp, CTLm, CPLm, pulse count, flow rate, and intermediate Meter Factor.

To access this screen, click the Reporting tab.

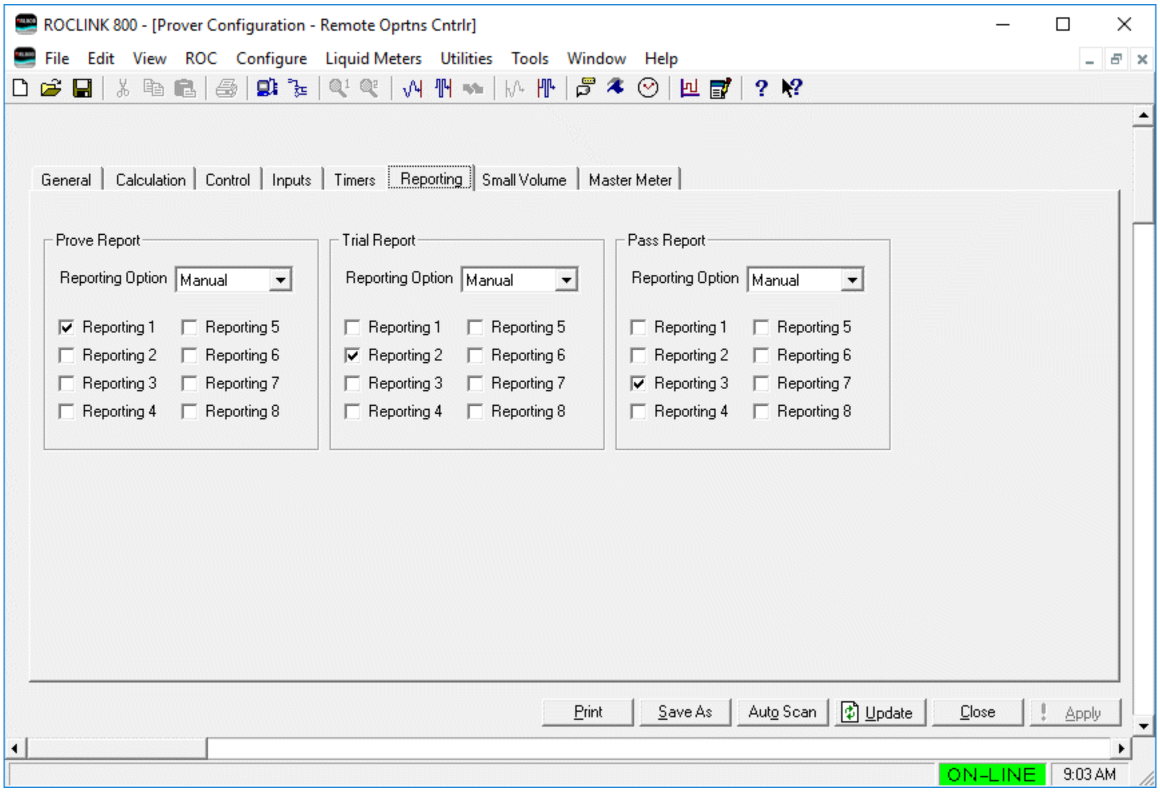


Figure 9-58. Prover Configuration – Reporting tab

Field	Description	
Prove Report	Selects how the program generates the prove report at the conclusion of a prove. You typically use a prove report to provide the proved Meter Factor or K-factor, and supporting information for the values used during calculation. The selection is applicable to every completed or aborted prove.The selection is applicable to every completed or aborted prove.	
	Manual	Manually generate the report.
	Auto	Automatically print and save reports.
	Note: The Reporting checkboxes correspond to the Reports in the Reports User Program.	
Trial Report	Selects how the program generates the trial report at the conclusion of a prove. You typically use a trial report to provide detailed information about the trial runs for the prove. The selection is applicable to every completed or aborted prove.	
	Manual	Manually generate the report.
	Auto	Automatically print and save reports.
	Note: The Reporting checkboxes correspond to the Reports in the Reports User Program.	

Field	Description
Pass Report	Selects how the program generates the pass report at the conclusion of a prove. You typically use a pass reports to provide detailed information for the multiple passes of a trial run, when using small volume proving. The selection is applicable to every completed or aborted prove. Valid values include:
	Manual Manually generate the report.
	Auto Automatically print and save reports.
	Note: The Reporting checkboxes correspond to the Reports in the Reports User Program.
Reporting 1 to 10	Selects the reporting instance the Prover User Program uses when generating prove, trial, and pass reports. You may select multiple checkboxes. The Reporting checkboxes correspond to the Reports in the Reporting program.

Prover Configuration: Small Volume Tab

Use this screen to define the parameters when using a small volume prover. If not configuring for use with a small volume prover, ignore this screen.

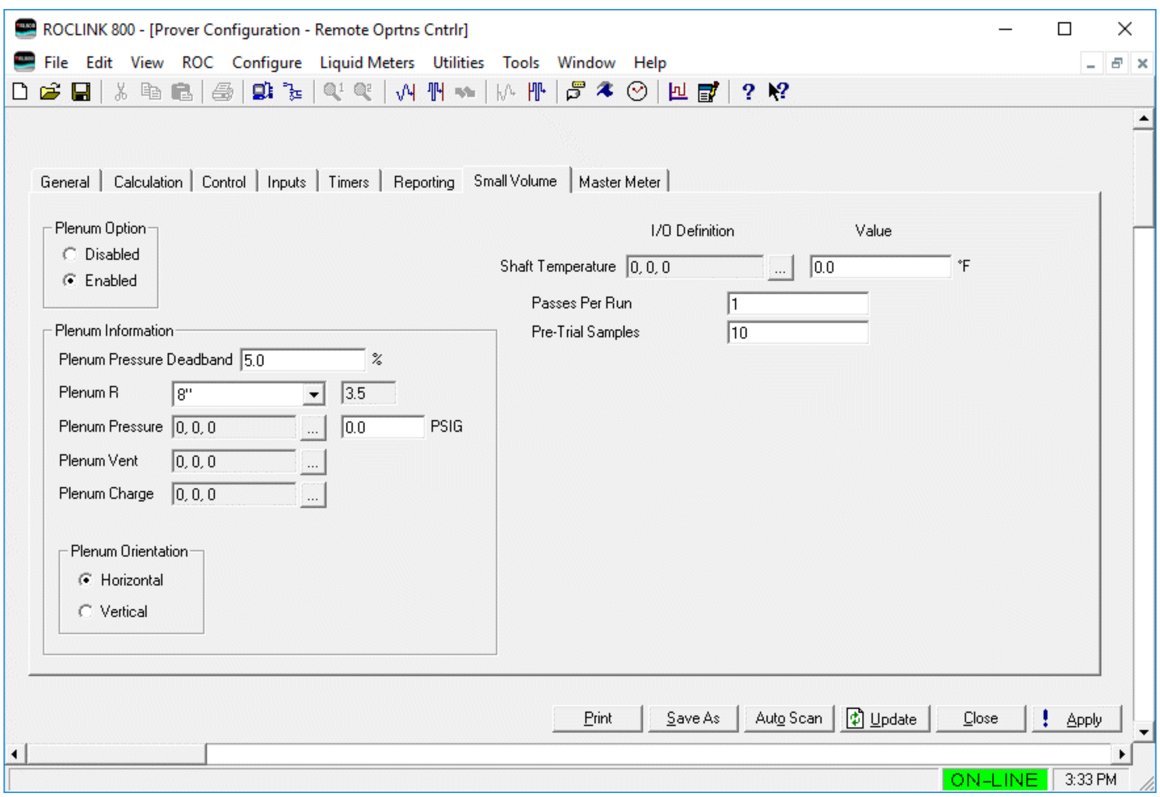


Figure 9-59. Prover Configuration – Small Volume Tab

Field	Description
Plenum Option	Select Enabled if your prover has a plenum, and enter parameters specific to your installation.

Field	Description
Plenum Pressure Deadband	Sets a value that determines the acceptable range for plenum pressure. This is the percentage (positive only) above the calculated required pressure to allow the prove sequence to proceed. If the plenum pressure reaches a value outside the range of the target or the target plus the deadband, additional nitrogen is added or vented to bring the pressure back in range. The default is **5.0%**. **Note**: This field appears **only** if you select **Enabled** in the Plenum Option field.
Plenum R	Select the size of the prover to set the Plenum "R" constant for the prove, which the program uses to calculate the required plenum pressure. Click ▼ to display all defined values. Once you select the prover size, the program displays the appropriate R constant value in the field to the right of the size. The default is **8"**. **Note**: ▪ If the prover size is not a valid selection, select **User Entered** and enter the constant in the supplied field. ▪ This field appears **only** if you select **Enabled** in the Plenum Option field.
Plenum Pressure	Defines the input for the Plenum Pressure to proceed with a prove. Click to display the Select TLP screen and define the TLP to provide this value. If the small volume prover has a manually controlled plenum, or none at all, this field should be left Undefined. When a prove is in progress, this plenum pressure must meet the value of a calculated required pressure, which varies depending on the meter pressure of the meter under test, and is calculated as: $required = \frac{PipelineGauge}{R}\ x N2K$ where ▪ *PipelineGauge* = The current pressure at the meter. ▪ *R* = The constant value for the size of the prover (see below). ▪ *N2K* = The constant value for the orientation and pressure units in use (see below). **Note**: ▪ If you select Undefined for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input. ▪ This field appears **only** if you select **Enabled** in the Plenum Option field.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Plenum Vent</td><td>Defines the output to the plenum vent solenoid. Click to display the Select TLP screen and define the TLP to provide this value. This output releases the pressure from the plenum on a compact prover. If you do not require computer controlled plenum pressure, leave this value as Undefined.
Note: This field appears only if you select Enabled in the Plenum Option field.</td></tr>
<tr><td>Plenum Charge</td><td>Click to select the TLP to define the output to the plenum charge solenoid on a compact prover. This output increases the pressure from the plenum on the compact prover. If you do not require computer controlled plenum pressure, leave this value as Undefined.
Note: This field appears only if you select Enabled in the Plenum Option field.</td></tr>
<tr><td>Plenum Orientation</td><td>Sets the direction of the prover mounting. This determines the value of the plenum N2K number which in combination with the pressure units, is used in calculating the required plenum pressure.
<table>
<tr><th>Units</th><th>Horizontal</th><th>Vertical</th></tr>
<tr><td>PSI</td><td>60.0</td><td>40.0</td></tr>
<tr><td>kPa</td><td>413.6854</td><td>275.7903</td></tr>
<tr><td>bar</td><td>4.13685</td><td>2.7579</td></tr>
<tr><td>kg/cm²</td><td>4.218417</td><td>2.812278</td></tr>
</table>
The default is Horizontal.
Note: This field appears only if you select Enabled in the Plenum Option field.</td></tr>
<tr><td>Shaft Temperature</td><td>Defines the input for the temperature of the shaft containing the external detector switches. Click to display the Select TLP screen and define the TLP to provide this value. CTSp uses this temperature value in its calculation (see API MPMS Chapter 12.2.3, section 10.2).
Note: If you select Undefined for the I/O definition, you can manually enter a value in the Value field. Otherwise, the program displays the value for the currently selected input.</td></tr>
<tr><td>Passes Per Run</td><td>Sets the number of passes of the displacer which count as a single trial run. When performing small volume proving, it is typical to have multiple passes combined to form a single trial run. The default is 1.</td></tr>
<tr><td>Pre-Trial Samples</td><td>Sets the number of process variable samples taken to create an average of all prover variables which serve as inputs into calculations for each trial run. These samples are taken at the beginning of each trial run. This is only used for small volume provers. The default is 10.</td></tr>
</table>

Prover Configuration: Master Meter Tab

Use this screen to define the parameters when using a master meter. If not configuring for use with a master meter, then the settings on this tab will have no affect, and you can ignore this tab.

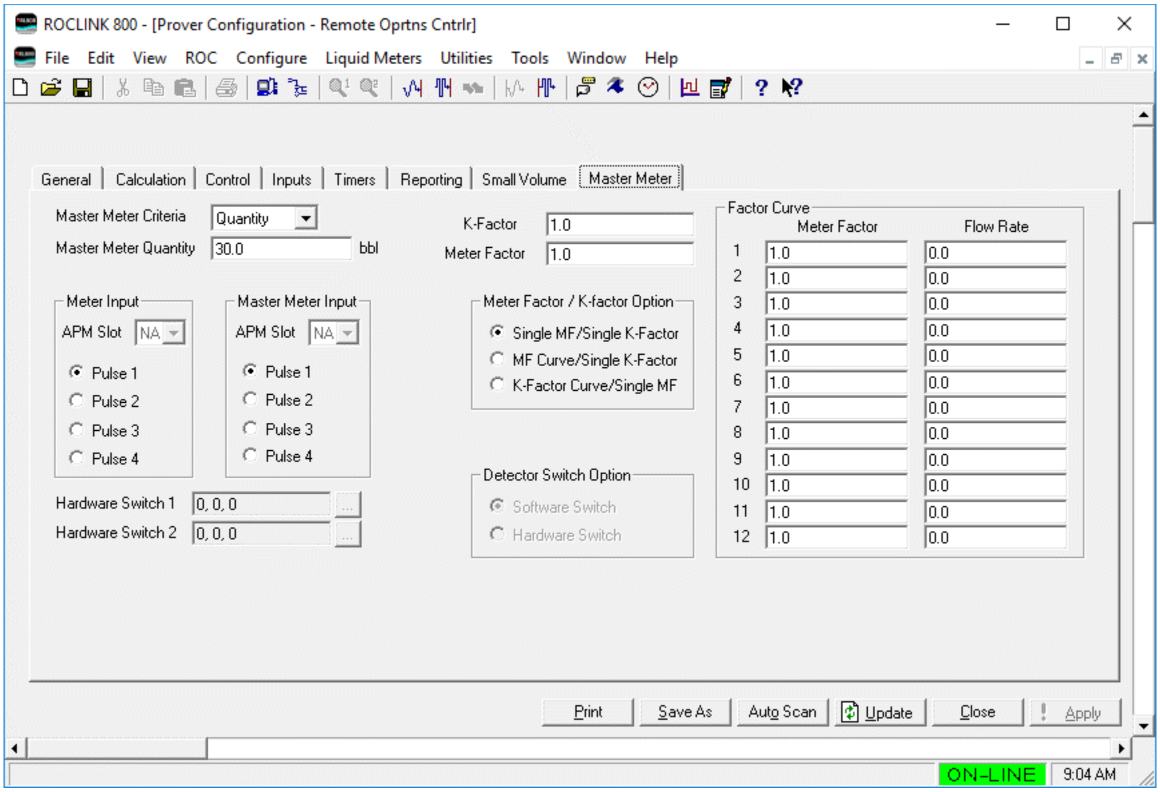


Figure 9-60. Prover Configuration – Master Meter Tab

Field	Description	
Master Meter Criteria	Selects the criteria used to determine a trial run. Because there are no physical detector switches in use in master meter proving, the program uses one of the following values to determine the start/stop of pulse counting. Valid selections are:	
	Quantity	A user-defined quantity is used to determine the completion of a trial run. Set the units of the quantity in the **Liquid Preferences** > **General** tab. This is the **default**.
	Pulses	A user-defined number of pulses is used to determine the completion of a trial run.
	Time	A user-defined time (in seconds) is used to determine the completion of a trial run.

Field	Description
Master Meter Quantity	Sets the quantity to compare the accumulation to when conducting a Master Meter proof to end the trial run. This number is based on your selection in the Master Meter Criteria field. If the Master Meter Criteria field is set to Volume, the volume units are the same as selected in Liquid Preferences screen. If the Master Meter Criteria field is set to Pulses, set this number greater then 10,000. If the Master Meter Criteria field is set to Time, this is a number in seconds. **Note**: A trial run will not end precisely at this quantity value, rather at some value slightly past it. For example, if a time of 25 seconds is entered, a trial run might end at 26 seconds.
K-Factor	Sets the K-factor of the product you select for the respective master meter. The default is **1.0**.
Meter Factor	Sets the Meter Factor of the selected product for the respective master meter. The default is **1.0**.
Meter Input	Identifies the slot location of the APM module attached to the meter under test. If value is N/A, then there is no APM associated with the meter. Associate APMs with a Liquid Calcs meter using the Meter's Flow Input parameter. **Note**: This field is read-only if the Detector Switch Option is set to Software Switch.
Master Meter Input	Identifies the slot location of the APM module attached to the meter under test. When proving with a master meter, both the pulse in for the meter and the master meter must be on the same APM card. If value is N/A, then there is no APM associated with the meter. Associate APMs with a Liquid Calcs meter using the Meter's Flow Input parameter. **Note**: This field is read-only if the Detector Switch Option is set to Software Switch.
Hardware Switch 1 and 2	Assigns the point type, logical, and parameter (TLP) of the output to trigger detector switches. These two hardware switch outputs correspond to the pair of detector switches on two or more APMs. The outputs you defined, physically wire to the detector switches on the multiple APMs. What you define for hardware switch 1 (typically a discrete output status parameter), should be physically wired to detector switch 1 of **both** the APM for the master meter and the APM for the meter. What you define for the hardware switch 2 (typically a discrete output status parameter) physically wires to the detector switch 2 of **both** the APM for the master meter and the APM for the meter under test. This allows both APMs to start counting pulses and stop counting pulses at the same time. Click ... to display the Select TLP screen and define your selection for each switch. **Note**: This field is read-only if the Detector Switch Option is set to Software Switch.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Meter Factor / K-factor Option</td><td colspan="2">Sets the option the system uses when calculating K-factors or Meter Factors. Valid selections are:</td></tr>
<tr><td>Single MF/Single K-factor</td><td>Uses a single Meter Factor and a single K-factor for the master meter. Set values for each in the K-factor and Meter Factor fields. This is the default value.</td></tr>
<tr><td>MF Curve/Single K-factor</td><td>Uses a series of Meter Factor curve values and a single K-factor. Complete the K-factor field and provide up to 12 Meter Factor and Flow Rate values in the Factor Curve frame.</td></tr>
<tr><td>K-factor Curve/Single MF</td><td>Uses a single Meter Factor curve value and a series of K-factors. Complete the Meter Factor field and provide up to 12 K-factor and frequency values in the Factor Curve frame.</td></tr>
<tr><td>Detector Switch Option</td><td colspan="2">When proving with a master meter, if both the meter and the master meter are attached to the same APM card, then use that APM's Software detector switch. If the meters are attached to different APM cards, use the Hardware detector switch option.</td></tr>
<tr><td>Factor Curve</td><td colspan="2">Enter specific Meter Factor Curve or K-factor Curve information. The Factor Curve uses straight line interpolation to calculate a Meter Factor or K-factor for the master meter, for use in calculations. This field is only applicable if you select MF Curve/Single K-factor or K-factor Curve/Single MF as the calculation method.</td></tr>
</table>

9.5.2 Prover Overview

Use the Prover Overview screens to select the meter to prove, and view current and historical information gathered during the prove sequence. These screens also provides current prove status and the ability to save and print detailed information about each prove sequence.

To access this screen from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #4, Proving_800L**.
3. Double-click **Display #207, Prover Overview**. The Prover Overview screen displays, showing the Current Prove Information tab.

Prover Overview: Current Prove Information Tab

Use this screen to reset the stored prove data, start a prove, and view current prove information.

Note: You must first click Reset Prove Controller before starting a new prove.

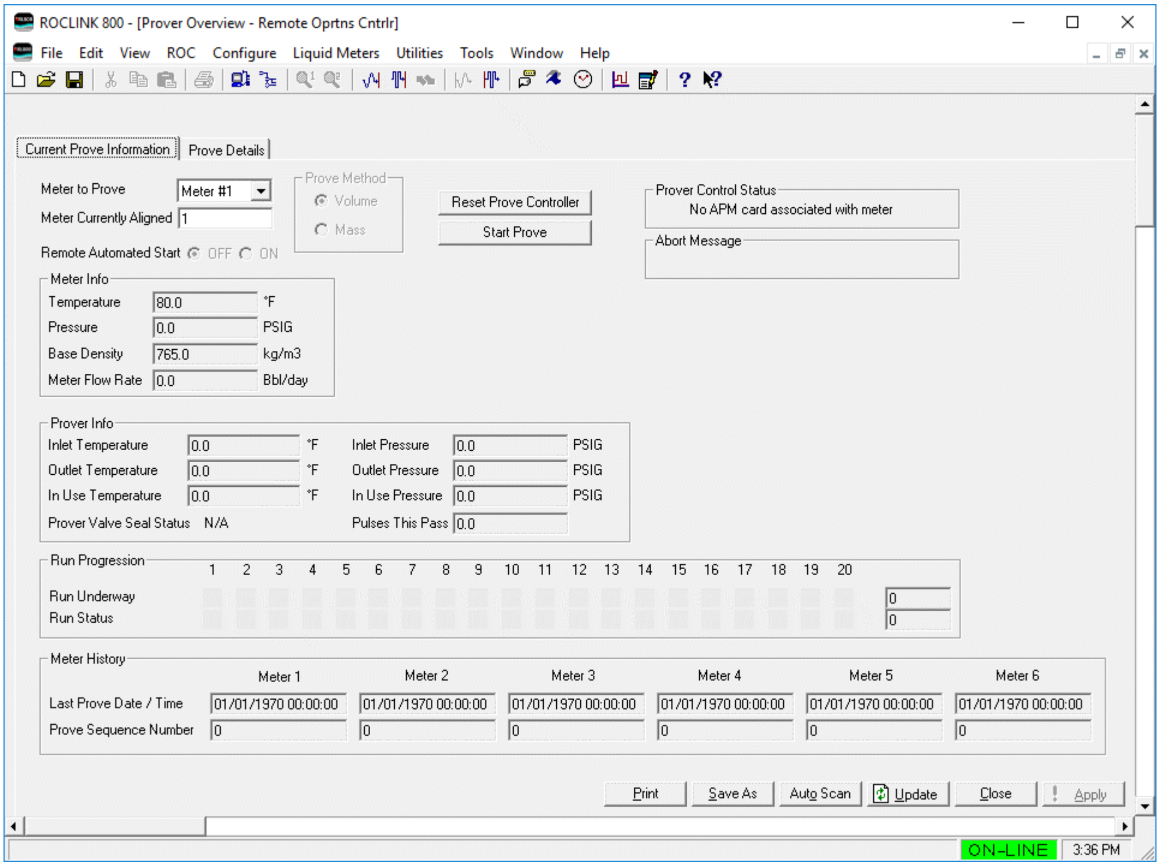


Figure 9-61. Prover Overview – Current Prove Information tab

Field	Description
Meter To Prove	Selects the meter to prove. This selection refers to the six liquid meters you configure in the Liquid Calcs Program. You must select one of the six meters before a prove can begin. Valid values are **No Meter** and **Meter #1** to **Meter #6**. The default is **No Meter**. Click ▼ to display the options.
Meter Currently Aligned	Displays the current alignment of the meters with the prover. In many applications, you use a single prover to test multiple meters for a site. You can only align one meter to the prover at a given time. This value must match the Meter To Prove before the Proving User Program can proceed with a prove. If these values do not match, the prove sequence does not proceed until you correctly align the meter and waits only for the specified time entered in **Prover Configuration** > **Timers** tab > **Meter Alignment Time** field. Some external applications (such as DS800, Modbus, or a button on a HMI screen) require that the parameters match.

Field	Description
Remote Automated Start	This **read-only** field shows the status of the Remote Automated Start option found on the Control tab of the Prover Configuration screen.
Prove Method	This **read-only** field shows the accumulation type used when calculating the Meter Factor. **Note:** The system automatically selects a Prove Method based on the type of meter currently aligned.
Reset Prove Controller	Click to reset the proving software. Clicking this button clears all data from the last prove sequence, and readies the program for the next prove. After issuing this command, click **Start Prove** to start a new sequence.
Start Prove	Click to initiate the prove sequence. You must click **Reset Prove Controller** before starting the prove sequence.
Abort Prove	Click to stop the prove sequence. **Note:** This button appears **only** after you initiate a prove sequence.
Prover Control Status	This **read-only** field shows the current status of the prover. The type of Prove device determines the type Status values that occur.
Abort Message	This **read-only** field shows the reason for an aborted prove sequence. This field is typically blank, and the program clears this field on reset. The type of prove device determines the type Abort Message values that display. The following are the possible abort messages: ▪ "Abort: Meter Alignment Failed" ▪ "Abort: Meter Alignment Lost During Seq" ▪ "Abort: No Pressure/Temperature Stabilization" ▪ "Abort: No Prover Ready Indication" ▪ "Abort: Prover Valve Did Not Seal" ▪ "Abort: 4-way Valve Not In Expected State" ▪ "Abort: Pass Timer Timed Out" ▪ "Abort: Flowrate Stability Lost" ▪ "Abort: Could Not Get X Out Of Y Runs" ▪ "Abort: APM Counted No Pulses" ▪ “Abort: Manual Prover Density is 0” ▪ “Abort: Density Interface input not set”
Meter Info	These **read-only** fields show critical information for the meter under test. Values include: **Temperature** — The current temperature of the meter under test. **Pressure** — The current pressure of the meter under test. **Base Density** — The current base density of the meter under test. **Meter Flow Rate** — The current flow rate of the meter under test.

Field	Description	
Prover Info	These **read-only** fields show critical information for the prover under test. Values include:	
	Inlet Temperature	The current inlet temperature of the prover.
	Outlet Temperature	The current outlet temperature of the prover.
	In Use Temperature	The current in-use temperature of the prover. This could be the inlet temperature, outlet temperature, or an average of the two.
	Prover Valve Seal Status	The current valve seal condition of the prover. **Note:** Not applicable if the Seal Status is disabled.
	Inlet Pressure	The current inlet pressure of the prover.
	Outlet Pressure	The current outlet pressure of the prover.
	In Use Pressure	The current in-use pressure of the prover. This could be the inlet pressure, outlet pressure, or an average of the two.
	Pulses This Pass	The number of pulses received in the current pass. This provides an indication of the progress of a pass while a prove is in progress.
Master Meter Info	These **read-only** fields show critical information for the master meter prover under test. Values include:	
	Current Quantity	The current quantity (in volume, pulses or time) that has passed for a given trial run.
	Quantity Required	The quantity required for a trial run to complete. A trial run will continue until the current quantity exceeds the quantity required.
	Note: These fields display **only** if the prover type is **Master Meter**.	
Small Volume Prover Info	These **read-only** fields show critical information for the small volume meter prover under test. Values include:	
	Plenum Pressure	The current value of the pressure for the small volume prover plenum.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Required Pressure</td><td>The current calculated value that is required for the plenum pressure. If the plenum pressure does not equal this value within a user defined deadband, then the plenum pressure will be adjusted for the next trial run.</td></tr>
<tr><td></td><td>Plenum R</td><td>The constant value for this prover size, which is used in the calculation of the required plenum pressure.</td></tr>
<tr><td></td><td colspan="2">Note: These fields display only if the Prover Type is Small Volume.</td></tr>
<tr><td>Run Progression</td><td colspan="2">These read-only fields show the progress of the prove. Values include:</td></tr>
<tr><td></td><td>Run Underway</td><td>The progress of the prove. A green box displays under each trial run to indicate its completion.</td></tr>
<tr><td></td><td>Run Status</td><td>The status of the completed trial runs. Runs marked as bad display as a red box.</td></tr>
<tr><td>Meter History</td><td colspan="2">These read-only fields show historical meter values for the prove. Values include:</td></tr>
<tr><td></td><td>Last Prove Date/Time</td><td>For Meter 1 to 6, the date and time of the last accepted prove. This is the time of the acceptance of the prove, not of the prove itself. The program updates this field when you accept a Meter Factor or K-factor for the meter under test.</td></tr>
<tr><td></td><td>Prove Sequence Number</td><td>For Meter 1 to 6, the unique prove sequence number from the last accepted prove. The program updates this field when you accept a Meter Factor or K-factor for the meter under test is accepted.</td></tr>
</table>

Prover Overview: Prove Details Tab

Use this screen to view specific information about the last prove. Configuration parameters begin at the start of a prove and display as read-only data. Examples of the parameters captured are the Base Prover Volume, Prove Number, Product, Prove Calc Method, Max Allowed Percentage of Deviation, CTL Table, CPL Table, and Max Percent Factor Variation.

Note: The Good/Bad Status area displays a green square for "good" (successful) trial runs and a red square for "bad" (unsuccessful) trial runs. Trial runs considered "good" are strictly based on **Prover Configuration > Calculation tab > Prove Calculation Method** selection.

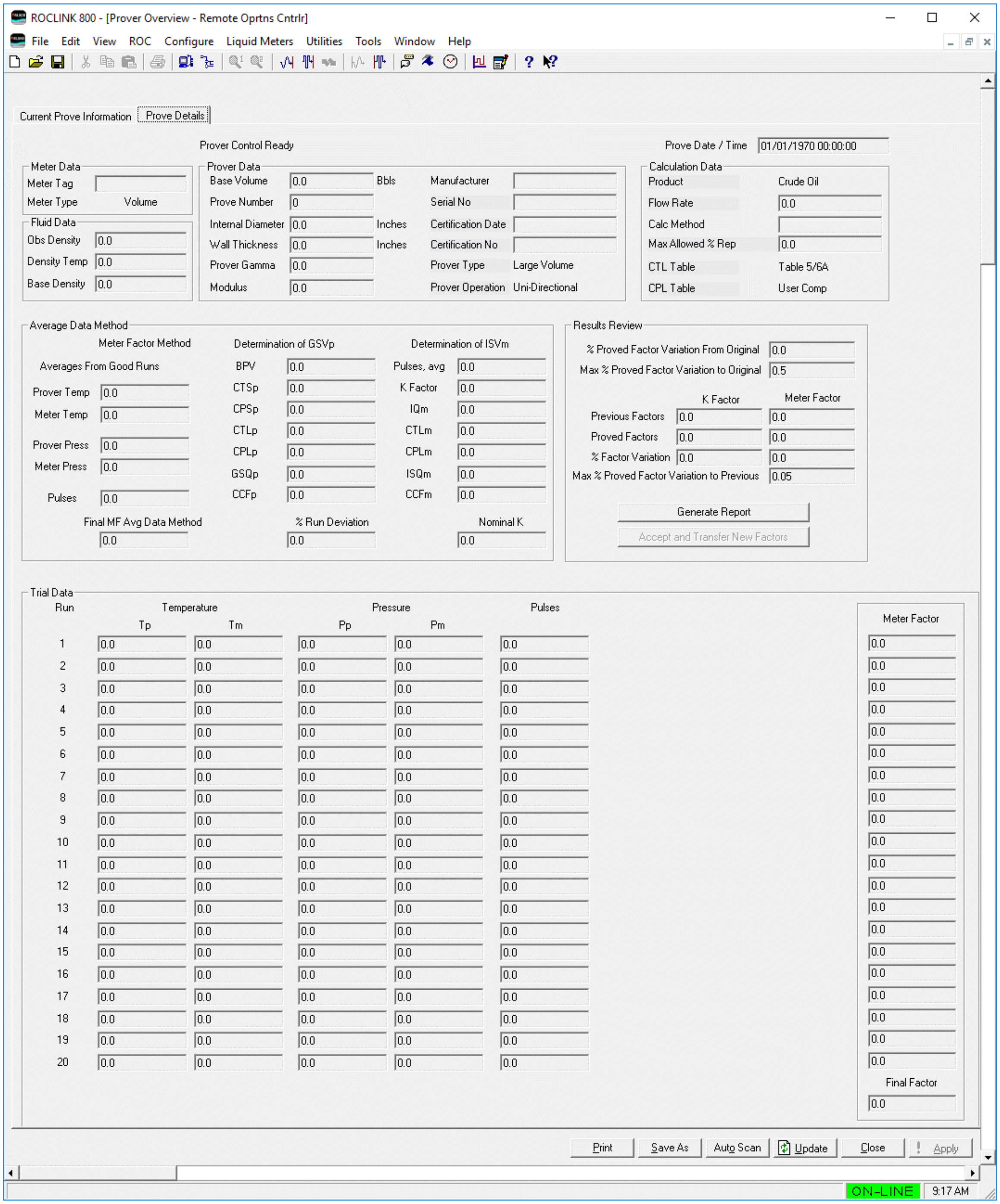


Figure 9-62. Prover Overview – Prove Details tab

Field	Description
Prove Date / Time	This **read-only** field shows the date and timestamp of this trial run.

Field	Description	
Meter Data	This **read-only** field shows the name identifying the meter.	
Fluid Data	These **read-only** fields displays fluid data:	
	Obs Density	Average observed density of the last prove. This is the value averaged between detector switch trips.
	Density Temp	Average temperature of the last prove.
	Base Density	Average base density of the last prove.
Prover Data	These **read-only** fields display prover data:	
	Base Volume	Selected base volume of the prove at the time of this prove.
	Prove Number	Internally generated number that identifies the number of the prove.
	Internal Diameter	Internal Diameter of the prove device at the time of this prove.
	Wall Thickness	Wall Thickness of the prove device at the time of this prove from the Prover Configuration > General tab.
	Prover Gamma	Prover Gamma of the prove device from the Prover Configuration > Calculation tab.
	Modulus	Modulus of Elasticity of the prove device from the Prover Configuration > Calculation tab.
	Manufacturer	Manufacturer name of the prove device from the Prover Configuration > General tab.
	Serial No	Serial Number of the prove device from the Prover Configuration > General tab.
	Certification Date	Certification Date of the prove device from the Prover Configuration > General tab.
	Certification No	Certification Number of the prove device from the Prover Configuration > General tab.

Field	Description	
	Prover Type	Prover Type of the prove device from the Prover Configuration > General tab: Large Volume, Small Volume, or Mater Meter.
	Prover Operation	Prover Operation of the prove device from the Prover Configuration > General tab: Unidirectional or Bidirectional.
Calculation Data	These **read-only** fields display data associated with this prove including the Product, Flow Rate, Calc Method, Maximum allowed percentage of repetitions, the CTL and CPL tables at the time of the prove.	
Average Data Method	These **read-only** fields display data associated with this prove including the Meter Factor Methods, Determination of GSVp, and Determination of ISVm at the time of the prove. **Note:** These fields **do not** appear for Master Meters.	
Results Review	These **read-only** fields show the final results from the prove Values include: ▪ **% Proved Factor Variation From Original:** The calculated variation between a proved meter factor (or K-factor) value and the original user entered value from factory acceptance. If this value is greater than the maximum allowed % directly below, then the newly proved factor cannot be automatically accepted. ▪ **Max % Proved Factor Variation to Original:** The user entered maximum allowed variation from the originally entered factor value. ▪ **Previous Factors:** The meter factor and K-factor values in use at the start of the prove. ▪ **Proved Factors:** The final calculated meter factor and K-factor values from the prove. ▪ **% Factor Variation:** The calculated variation between the previous and the proved factor. The system calculates this value as: $variation\% = \left(\frac{Proved - previous}{previous} \right) \times 100$ Where ▪ **proved** = the calculated factor value from the prove ▪ **previous** = the factor value in use at the start of the prove	

Field	Description
	If this value is greater than the user entered maximum acceptable percent deviation from previous factor, then the newly proved factor **cannot** be automatically accepted.
Generate Report	Click to generate a report detailing this prove. This triggers the prove report you configured via the **Prover Configuration > Reporting tab**.
Accept and Transfer New Factors	Click to accept the final proved factor, and put it into use for the meter that was proved. When you click this button, an event generates and the proved factor copies to the appropriate parameter in the Liquid Calcs User Program, Liquid Meter. The new factor affects measurement immediately after acceptance. **Note**: This button is not accessible when the proved factor value is outside the acceptable range.
Trial Data	These **read-only** fields display data associated with this prove: **Tp** – Average temperature at the prover used in calculations for the trial run. **Tm** – Average temperature at the meter used in calculations for the trial run. **Pp** – Average pressure at the prover used in calculations for the trial run. **Pm** – Average pressure at the meter used in calculations for the trial run. **Pulses** – The total pulses counted for the trial run. **Meter Factor** – The meter factor calculated for the trial run using the Average Meter Factor method. Note: This field is only visible when proving using the Average Meter Factor Method, or the Average Data Method, Meter factor. **K Factor** – The K-factor calculated for the trial run using the Average K-factor method. Note: This field is only visible when proving using the Average K-factor Method, or the Average Data Method, K-factor. **Final Factor** – The average value for the Meter Factor or K-factor calculated by averaging the factor value for each “good” trial run.
Meter Factor	These **read-only** fields show the meter factor for each trail run, as well as a final factor.

9.5.3 Trial Details

Use the Trial Details screen to view specific information about the last twenty trial runs. The **Prover Configuration > Calculation tab > Prove Calculation Method** determines the successful trial runs.

If you select the Average Meter Factor Method, the Meter Factor Repeatability (MF %R) determines successful proves. If you select Average Data Method, Meter Factor or Average Data Method, K-factor, the Pulses Repeatability (Pulses %R) determines successful proves.

To access this screen from the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #4, Proving_800L**.
3. Double-click **Display #208, Trial Details**. The Trial Details screen displays.

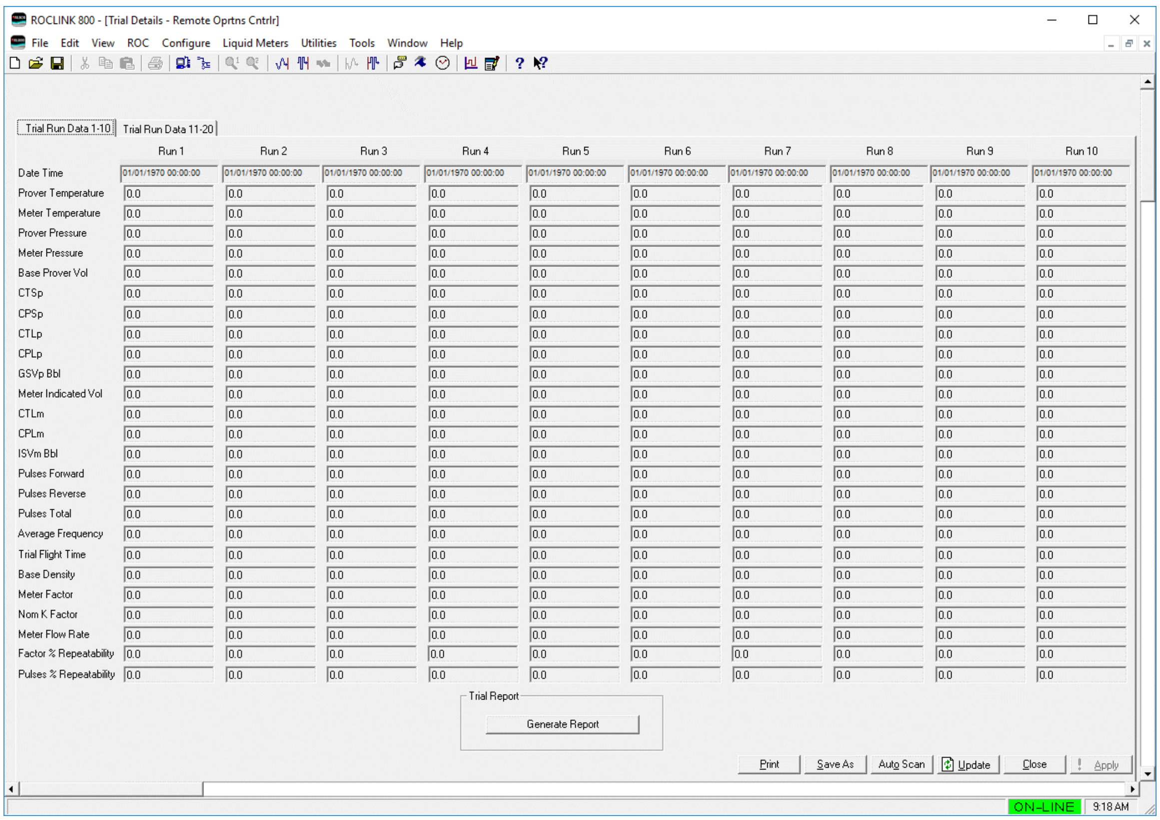


Figure 9-63. Trial Details

Field	Description
Date Time	This **read-only** field displays the date and timestamp of this trial run.
Prover Temperature	This **read-only** field displays the average calculated prover temperature while accumulating pulses for this trial run.

Field	Description
Meter Temperature	This **read-only** field displays the average calculated meter temperature while accumulating pulses for this trial run.
Prover Pressure	This **read-only** field displays the average calculated prover pressure while accumulating pulses for this trial run.
Meter Pressure	This **read-only** field displays the average calculated meter pressure while accumulating pulses for this trial run.
Base Prover Vol	This **read-only** field displays the base prover volume used in calculations for this trial run.
CTSp	This **read-only** field displays the CTSp (correction for the effect of temperature on the prover steel) calculated for this trial run. This calculated value varies with the average prover temperature.
CPSp	This **read-only** field displays the CPSp (correction for the effect of pressure on the liquid in the prover) calculated for this trial run. This calculated value varies with the average prover pressure.
CTLp	This **read-only** field displays the CPLp (correction for the effect of pressure on the liquid in the prover) calculated for this trial run. This calculated value varies with the average prover pressure.
CPLp	This **read-only** field displays the CPLp (correction for the effect of pressure on the liquid in the prover) calculated for this trial run. This calculated value varies with the average prover pressure.
GSVp	This **read-only** field displays the GSVp (Gross Standard Volume for the prover) calculated as: *GVSp = Base x CTLp x CPLp x CTSp x CPSp* Where: **Base** The prover base volume. **CTLp** Correction for the effect of temperature on the liquid in the prover. **CPLp** Correction for the effect of pressure on the liquid in the prover. **CTSp** Correction for the effect of temperature on the prover steel. **CTSp** Correction for the effect of pressure on the prover steel. **Note:** This field displays **only** if the Flow Meter Type is set to **Volume**.

Field	Description
Meter Indicated Vol	This **read-only** field shows the uncorrected IVm (Indicated Volume for the meter) calculated as follows: $IVm = \frac{Pulses}{K - factor}$ Where: **Pulses** Total pulses counted for the trial run. **K-factor** The K-factor for the meter under test.
CTLm	This **read-only** field displays the CTLm (correction for the effect of temperature on the liquid in the meter) for this trial run. This calculated value varies with the average meter temperature.
CPLm	This **read-only** field displays the CPLm (correction for the effect of pressure on the liquid in the meter) for this trial run. This calculated value varies with the average meter pressure.
ISVm	This **read-only** field shows the corrected ISVm (Indicated Standard Volume for the meter) calculated as follows: $IVSm = \frac{Pulses}{K - factor} \text{ x } CTLm \text{ x } CPLm$ Where: **Pulses** Total pulses counted for the trial run. **K-factor** K-factor for the meter under test. **CTLm** Correction for the effect of temperature on the liquid in the prover. **CPLm** Correction for the effect of pressure on the liquid in the prover. **Note:** This field displays **only** if the Flow Meter Type is set to **Volume**.
Prv Mass	This **read-only** field shows the Gross Standard Quantity of the prover calculated as follows: *Prv Mass = GSVp * Avg Observed Density Corrected* Where: **GSVp** *Base Prover Volume * CTSp * CPSp* **Avg Observed Density Corrected** *Avg Observed Density * Density Correction Factor* **Note:** This field displays **only** if the Flow Meter Type is set to **Mass**.

Field	Description
Meter Mass	This **read-only** field shows the Indicated Standard Quantity of the meter calculated as follows: *Meter Mass = Pulses / K Factor* **Note:** This field displays **only** if the Flow Meter Type is set to **Mass**.
Pulses Forward	This **read-only** field displays the total forward pulses counted for this trial run.
Pulses Reverse	This **read-only** field displays the total reverse pulses counted for this trial run. **Note**: This field is used **only** for bi-directional proving only.
Prove Pulses	This **read-only** field displays the total number of pulses counted for this trial run.
Master Meter Pulses	This **read-only** field displays the total number of pulses read by the master meter. **Note**: This field appears **only** for Master Meter provers.
Pulses Total	This **read-only** field displays the total of all pulse counts for this trial run.
Average Frequency	This **read-only** field shows the average meter frequency calculated for this trial run. The system calculates this value as: $Frequency = \frac{PulseCount}{Time}$ Where **PulseCount**: Total pulses counted for this trial run. **Time**: Flight time (detector to detector) for this trial run.
Trial Flight Time	This **read-only** field displays the average detector to detector flight time provided by the APM for this trial run.
Base Density	This **read-only** field displays the average base density of the meter for this trial run.
Meter Factor	This read-only field displays the Meter Factor of the selected product for the respective master meter.
Nom K Factor	This **read-only** field displays the associated meter's nominal K-factor used for calculations for this trial run if proving for a meter factor. The field displays the proved K-factor value for the trial run is proving for a K-factor.
Meter Flow Rate	This **read-only** field displays the average flow rate of the meter during the course of the prove. Which flowrate it represents (Indicated, Gross, Gross Standards, and such) is selected by the Average Flowrate Option (Liquid Station > General tab) for the station associated with the meter under test.

Field	Description
Factor % Repeatability	This **read-only** field shows the calculated factor repeatability for this run as specified in API MPMS 12.2.3 when using the average meter factor method. This is a function of the calculated meter factor (or K-factor) for each run deemed acceptable in a sequence. The system calculates this value as: $repeatability\% = \left(\frac{HighIMF - LowIMF}{LowiMF} \right) \times 100$ Where **HighIMF**: Largest intermediate meter factor (or K-factor) for the set of "good" trial runs. **LowIMF**: Smallest intermediate meter factor (or K-factor) for the set of "good" trial runs.
Pulses % Repeatability	This **read-only** field shows the calculated pulses repeatability for this run as specified in API MPMS 12.2.3 when using the average data method. This is a function of the recorded pulses for each run deemed acceptable in a sequence. The system calculates this value as: $repeatability\% = \left(\frac{HighPulse - LowPulse}{LowPulse} \right) \times 100$ Where **HighPulse**: Largest pulse count for the set of "good" trial runs. **LowPulse**: Smallest pulse count for the set of "good" trial runs.
Generate Report	Click to generate a report detailing the trial run data. This triggers the trial report you configured via the Prover Configuration > Reporting tab.

9.6 Reporting and Printing (Reporting_800L)

The Reporting program stores data for several transactions. Use these screens to define settings for printing and saving reports to generate fiscal and non-fiscal reports from the ROC800L. Predefined reports for Quantitative Transaction Reports (QTRs) and Bills of Lading (BOL) are available. You can also create personalized report formats using ROCLINK 800 displays. For example, you may create an Approve Report that includes an archive of daily system statuses, such as for temperature, which you generate daily for approval. ROCLINK generates reports that you load in the Display Administrator.

You can configure the ROC800L either to provide individual reports for each meter or to generate station reports that consolidate multiple meters. Station reports eliminate redundant meter run data, reduce the need to download and upload, and result in a more efficient reporting process.

Typically you use the Reporting program in conjunction with Batching and Proving to create batch/prove reports. You can configure reports to run manually when your request a report, at the end of a batch, at the end of a prove, or at a scheduled time.

Example reports include, but are not limited to:

- Batch Ticket
- Daily Station Report
- Prove Report
- Prove Trial Data
- System Status
- Calculation Check
- Maintenance Information

You can define multiple report configurations. You can send reports to a local printer connected to a serial or Ethernet port on the device or saved to internal memory. You configure each report independently including automated report generation settings.

Use the Reporting screens to define printer settings for printing information gathered during a prove or batch sequence.

Note: The optional Reporting program requires you to install the Liquid Calculations program.

Standards Reporting uses the following industry standards:

Prove Reports

According to API MPMS 12.2.3:

- *Manual of Petroleum Measurement Standards Chapter 12 – Calculation of Petroleum Quantities*
- Section 2 – Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors
- Part 3 – Proving Reports

Batch Tickets

According to API MPMS 12.2.2 – Quantitative Transaction Reports (QTRs) and Bills of Lading (BOL):

- *Manual of Petroleum Measurement Standards Chapter 12 – Calculation of Petroleum Quantities*
- Section 2 – Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors
- Part 2– Measurement Tickets

To access create and print reports for the Directory Tree:

1. Double-click **User Program**.
2. Double-click **Program #5, Reporting_ROC800L**.
3. Double-click **Display #219, Report Configuration**.
4. Double-click **#1**. The Report Configuration screen displays, showing the General tab.
5. **Configure** the **reporting** options.
6. Create a **User Display** for the report. Do not forget to align the fields that you create.
7. **Save** the User Display.
8. **Load** the **User Display Editor** into the **Display Administrator**.

Note: Remember the location of the slot number where you load the User Display.

9. **Load** the **report** into the **Report Configuration Display # to Print** field. *This is the same number as the slot number in the Display Administrator where you loaded the User Display (report).*
10. Generate the report to the location you select in the **Action to Take** field. You print to Ethernet or Serial Printers or send the file to flash memory in the device. Refer to Read File from Device.

Note: If you alter a report in the User Display Editor, you must re-load the User Display (report) into the User Display Administrator slot.

9.6.1 Generating Reports

This section discusses the various ways in which you can generate reports including:

- Manual Reports.
- Batch and Prove Reports.
- Scheduled Reports.

Generating Manual Reports

This section discusses generating manual reports:

- Click the **Generate Reports** button.
- Use for occasional reports.
- Possible uses include:
  - Maintenance Report.
  - Calculation Check Report.
  - Batch Recalculation.
  - Need Extra Copies.
  - Host System Reports.

Generating Batch and Prove Reports

This section discuses generating Batch and Prove reports:

- Batching or Proving User Programs trigger the report(s).
- End of Batch or Prove auto generates the report(s).
- You configure report options in a logical within the Reporting User Program.
- You point the report to that logical from Batching or Proving.
- You can select more than one logical report (1 through 10).

Batching and Proving can use one or more logicals of the Reporting User Program to generate reports at the conclusion of a Batch or Prove:

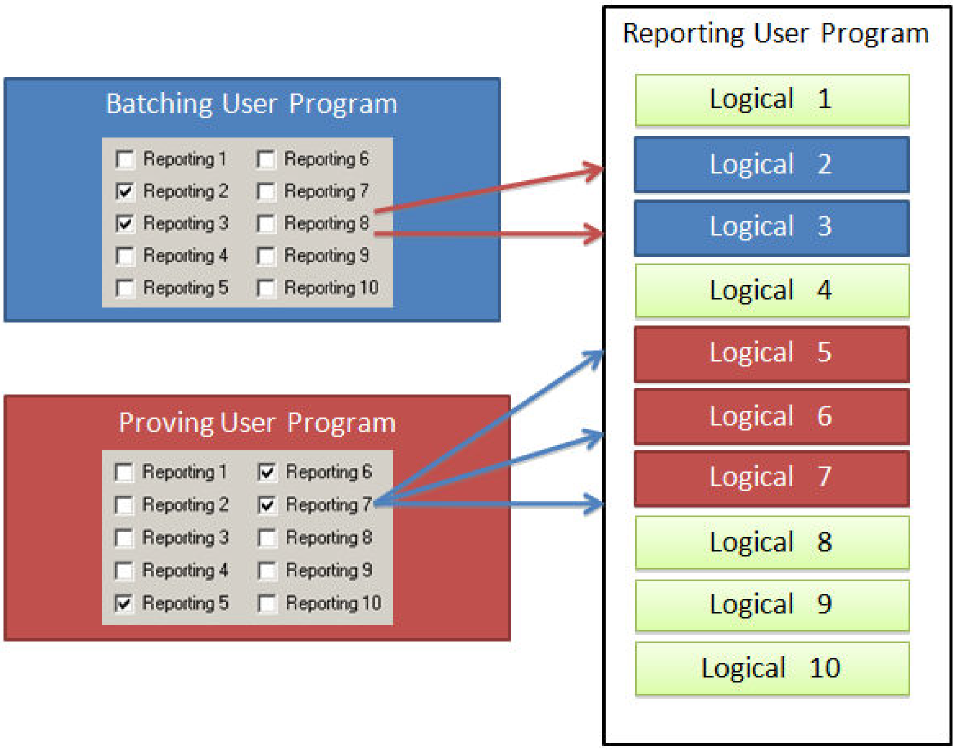


Figure 9-64. Reporting Program Logicals

Generating Scheduled Reports

This section discuses generating scheduled reports:

- You require a report on a reoccurring basis.
- Possible uses include:
- Daily System Report.
- Month Production Total Report.

Multiple Printers and Multiple Protocols

You can configure the Reporting User Program to print to multiple computers using multiple protocols.

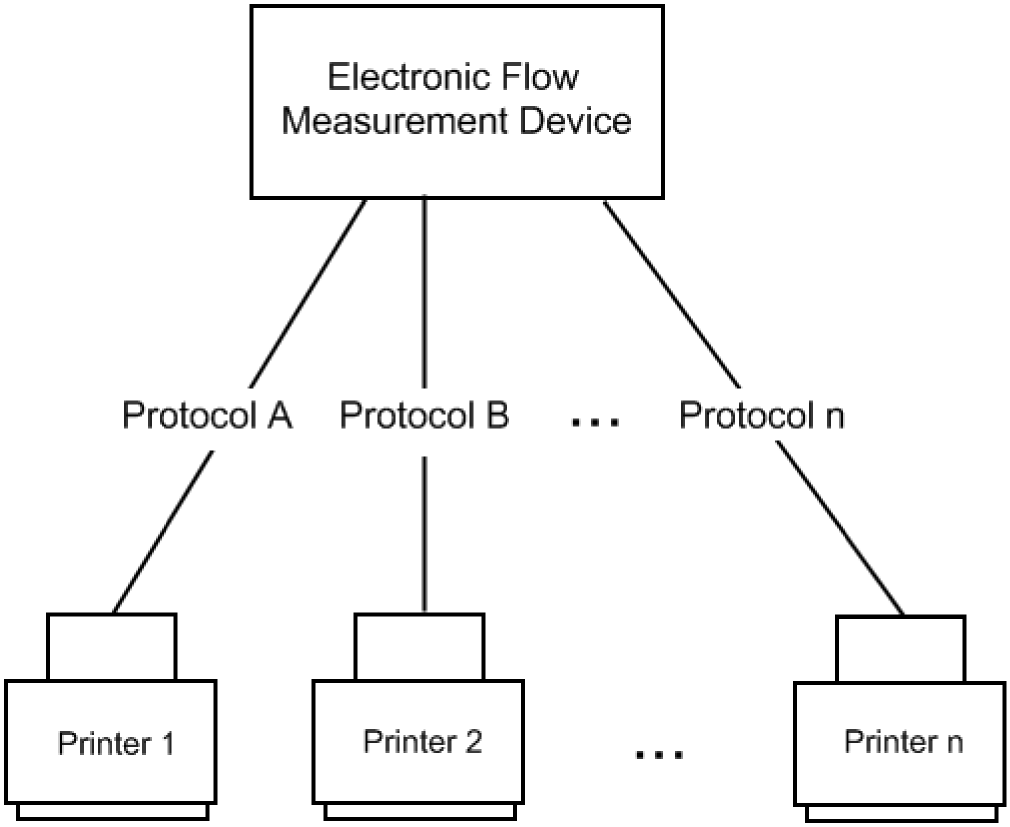


Figure 9-65. Multiple Printers and Multiple Protocols

Uses include:

- Manual Reports.
- Batch and Prove Reports.
- Scheduled Reports.

Ten Report Logicals

The ten reporting logicals provide flexibility when configuring your reports. Including:

- You can set a unique report for each logical.
- You can set a printer for each logical (for example, 10 different reports going to one printer or one report going to 10 different printers) .
- Anything in between.

Note: You configure the name of the report in the **Reporting** > **Tag** field.

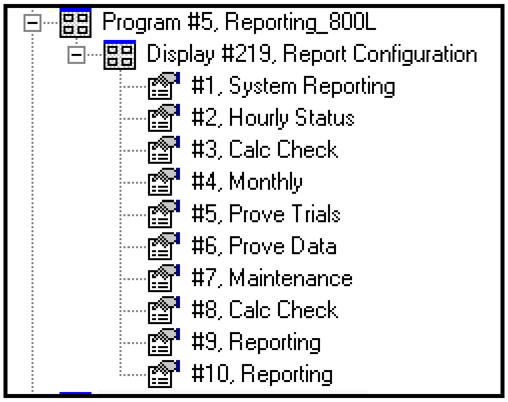


Figure 9-66. 10 Report Logicals

Example Reporting Application

This graphic displays an example how you may setup your Reporting User Program.

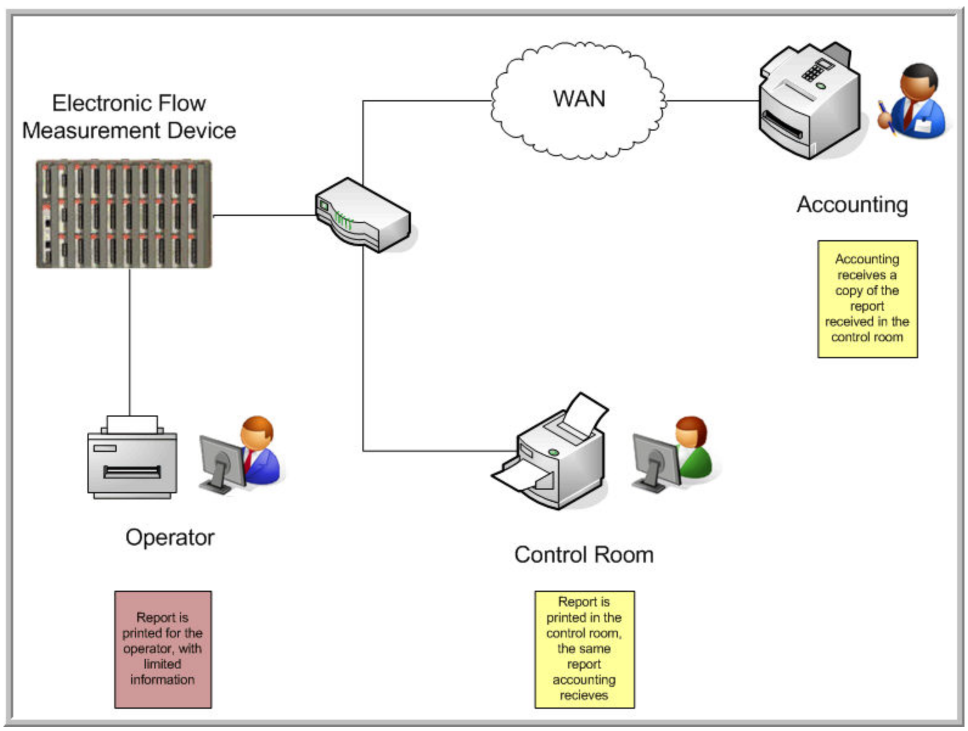


Figure 9-67. Example Reporting Application

Report Configuration: General Tab

Use this screen (which displays when you initially access the Report Configuration scrren) to configure report selections, saved report information, manually generate reports, and time-related data for automated reports.

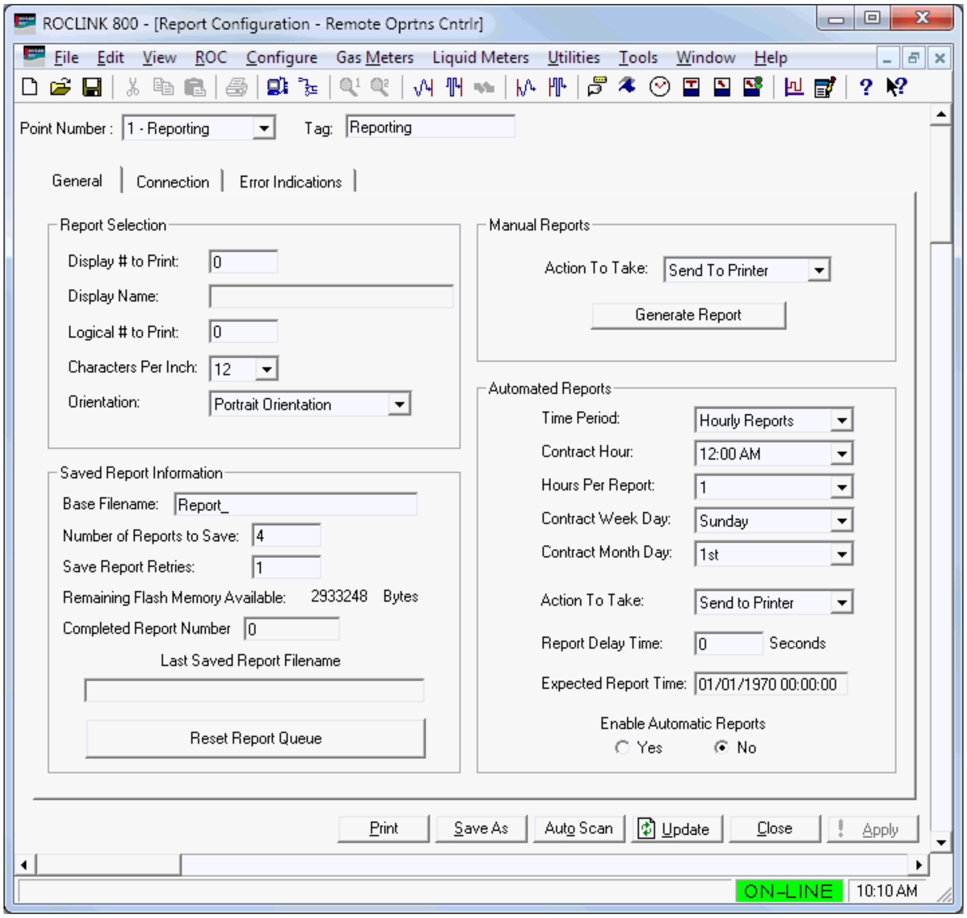


Figure 9-68. Report Configuration – General tab

Field	Description
Point Number	Select the report to configure or view (1 through 10). Click ▼ to display all defined reports. **Note**: This selection in this field applies to **each** tab on this screen.
Tag	Sets a 20-character name for identification of the report. Use a meaningful name, such as Monthly Report, to indicate this report contains report data for the month. This field displays in the Configuration Tree indicating the name of the User Program's Report Display that you currently have loaded. **Note**: This selection in this field applies to **each** tab on this screen.

Field	Description
Display # to Print	Sets the display (report template) to print. You must first load displays into the device via the Display Administrator screen (**View** > **Display** > **From Device** > **Administrator**). There are 246 available slots. Once you load a display, note of the number associated with it, and enter that number in this field. **Note**: There are ten logical points for reports so if you use a Display slot number from 1 to 10, you can use the same number in this field making it easier to remember.
Display Name	This **read-only** field populates when you enter a valid display number in the Display # to Print field. You enter the Display Name in the Utilities menu > Custom Display Editor screen.
Logical # to Print	Sets, for displays with an associated point type(s), the logical number to print for fields that reference those point types. For displays without an associated point type, the value should be zero. If a display uses a point type, then all objects with an associated TLP ignore the logical number and use this value instead.
Character Per Inch	Sets the size of the characters that print on the report. When CPI increases, the size of printed characters decrease. Click ▼ to display the valid options. **Note**: This field applies **only** to Ethernet printers.
Orientation	Sets the report to print in landscape or portrait orientation. Click ▼ to display the valid options. **Note**: This field applies only to Ethernet printers.
Base Filename	Sets the file name prefix for reports you save to the ROC's internal flash file system (up to 11 characters). Valid characters are a-z, A-Z, 0-9. It is critical to use a Base Filename that reflects what data the report contains, such as Prove_Report or Batch_Report. After you generate the report, the program also appends the date and time to the name in the **Last Saved Report File Name** field (for example, Batch_Report_100621_175429).
Number of Reports to Save	Sets the maximum number of reports to keep in the device's flash file memory before automatically deleting the oldest. Each logical instance of the reporting program (there are 10 logical report instances total) maintains a first-in, first-out (FIFO) queue of the 10 report files. This number effectively defines the size of that queue. For example, if you are generating a year's worth of reports, enter **12** in this field. When the 13th report generates, the program overwrites the first report. **Note**: You could also enter the Tag as Monthly Report indicating what data resides in the reports.

Field	Description
Save Report Retries	Sets the number of additional attempts to save a file to the flash file system, if something should go wrong on the initial attempt. Enter a number between 0 and 10.
Remaining Flash Memory Available	This **read-only** field shows the amount of internal memory remaining on the ROC. You should monitor this value and delete stores reports as this number approaches zero. If this value reaches zero, the program **stops** generating reports and **does not** overwrite current reports.
Completed Report Number	This **read-only** field increments one count for each new report file that you save to the device's flash file system. You can use this to verify a report has been saved, or to notify a host computer there is a new file extract.
Last Saved Report Filename	This **read-only** field displays the file name for the latest report file saved to flash. You can use this to help a user or host computer retrieve the file. The Base Filename appears before the Last Saved Report Filename that displays as a date and time stamp.
Reset Report Queue	Click to remove the application’s internal list of reports in the flash file system (for this logical instance, not for the entire Reporting program). **Note**: This action **does not** delete any report files. When you clear the report queue, it is necessary to delete report files previously saved by this logical instance manually, as they will not automatically delete.
Action To Take	Select the action to take when you click the Generate Report button. ROCLINK supports Printer Command Language (PCL), Ethernet printers using TCP/IP port number 9100 in direct mode, and serial printers using RS-232 and RS-485. Click ▼ to display the valid options. **Send to Printer**: Send the report to the printer (Ethernet or serial) you select to create a physical paper copy. Many custody transfer locations require paper reports. **Save to Device**: Save the report as an ASCII text file to the flash file system where you can view or save the report to a location you select. You can retrieve the report via ROCLINK800 or another host device. Refer to **Both Send and Save**: Send the report to the printer you select and save the report to the device creating both a hard copy report and an ASCII report.

Field	Description
	Note: ROCLINK does not print to USB devices. However, you can use the User Display to print the report to a USB device.
Generate Report	Click to perform the action you select in the **Action To Take** field. You can generate reports in three basic ways: **Manually** — You initiate a request for report. **On end of Batch or Prove** — Other user program requests report. Supported by batching and proving user programs. **Scheduled (hourly, daily, monthly, or such)** — You configure a periodic timer. **Note**: If you are having issues generating a report, click the **Error Indications** tab and click the **Clear Error** button and attempt to generate the report again. Remember if you alter a report in the User Display Editor, you MUST re-load the User Display (report) into the User Display Administrator slot.
Time Period	Sets the time period to automatically generate the reports. Valid options include: **Hourly Reports**, **Daily Reports**, **Weekly Reports**, or **Monthly Reports**. Click ▼ to display the valid options.
Contract Hour	Sets (for hourly-based, daily-based, weekly-based, or monthly-based reports) the hour at which a new report generates. Click ▼ to display the valid options.
Hours Per Report	Sets, for hourly-based reports, the number of hours between reports. You can generate Hourly reports at a rate of 1 per hour, or multiple hours per report. When selecting multiple hours per report, this will always be with respect to midnight. Click ▼ to display the valid options.
Contract Week Day	Sets, for weekly-based reports, the day of the week on which a report generates. Click ▼ to display the valid options.
Contract Month Day	Sets, for monthly-based reports, the day of the month (between 1 and 28) on which reports generates. Click ▼ to display the valid options.

Field	Description	
Action To Take	Defines the action the program takes when the period of time you configure expires. ROCLINK supports Printer Command Language (PCL), Ethernet printers using TCP/IP port number 9100 in direct mode, and serial printers using RS-232 and RS-485. Click ▼ to display the valid options.	
	Send to Printer	Send the report to the printer (Ethernet or serial) you select to create a physical paper copy. Many custody transfer locations require paper reports.
	Save to Device	Save the report as an ASCII text file to the flash file system where you can view or save the report to a location you select. You can retrieve the report via ROCLINK800 or another host device. Refer to
	Both Send and Save	Send the report to the printer you select and save the report to the device creating both a hard copy report and an ASCII report.
	Note: ROCLINK does not print to USB devices. However, you can use the User Display to print the report to a USB device.	
Report Delay Time	Sets the number of seconds to delay when printing and / or saving a report. If you expect a report at 7:00 am (7:00:00), and you enter a report delay time of 5 seconds, then the report generates 5 seconds after the hour (7:00:05). Use this when your system already processes a lot of information at a certain time so you do not overload it. This is typically a 2 to 10 second delay. This only applies when you select **Enable Automatic Reports**.	
Expected Report Time	This **read-only** field displays the time and date stamp of the next scheduled report for automatic reporting. An internal timer is set when you enable automated reports. This shows when that timer is set to expire.	
Enable Automatic Report	Enables automated reporting. **Note**: You must configure the above fields in the Automated Reporting frame for the Enable Automated Reporting function to work correctly. **If you modify one of the time period configuration parameters after you enable this function, you need to disable, and re-enable the automatic report function.**	

Report Configuration: Connection Tab

Use this screen to configure the printer options for your reports.

To access this screen, select the Connection tab.

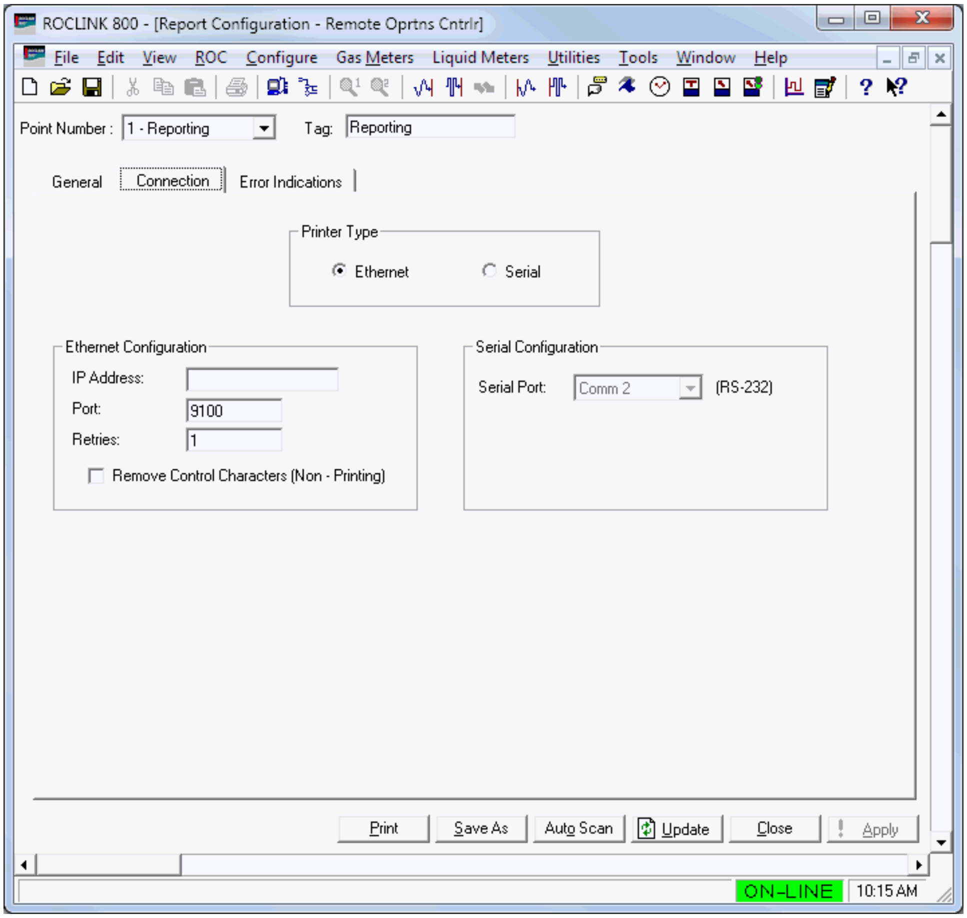


Figure 9-69. Report Configuration – Connection Tab

Note: If you are having issues generating a report, select the Error Indications tab, click the Clear Error button, and attempt to generate the report again.

Field	Description
Printer Type	Sets the connection type of the printer. Valid selections are **Ethernet** and **Serial**. ▪ Ethernet printers must implement Printer Control Language (PCL) using TCP/IP port 9100 in Direct Mode. The Ethernet device does not have to be a printer, such as: ○ Send ASCII to a report recording server. ○ Send CSV data to an application. ○ Send XML data to an application. ▪ Serial printers must accept and print ASCI over RS-232 or greater including laser serial printers, dot matrix serial printers, and thermal serial printers. ▪ Parallel and USB printers are not supported. However, you can use ROCLINK800 and a PC to send a report via USB.

Field	Description
IP Address	Sets the printer's IP address in the standard IPv4 format (for example, 192.168.0.1) to configure a printer connected via an Ethernet cable. If you enter an invalid IPv4 address, the program sets the error Bad IP Address and disables printing. ROCLINK ignores additional characters after the address.
Port	Defines the TCP port the printer monitors for incoming print jobs. Typically, the default port for Ethernet printers is 9100. Consult your printer manual or network administrator.
Retries	Sets the number of additional attempts to connect to an Ethernet printer if the initial connection attempt fails. Enter a number between 0 and 10.
Remove Control Characters	Removes control character from the report. Outgoing packets embed these characters for use in formatting and control of an Ethernet printer. If you are sending a report to a non-printer TCP/IP device, such as a data logger, select this option. **Note**: You require a third-party application to push the report to a non-printer device.
Serial Port	Selects the serial port on which reports print. Click ▼ to display all valid options. You configure the additional attributes of the serial port, such as the baud rate, parity, and data bits, in the **ROC** > **Comm Port** screen.

Report Configuration: Error Indications Tab

Use this screen to view errors associated with the reports.

To access this screen, select the Error Indications tab.

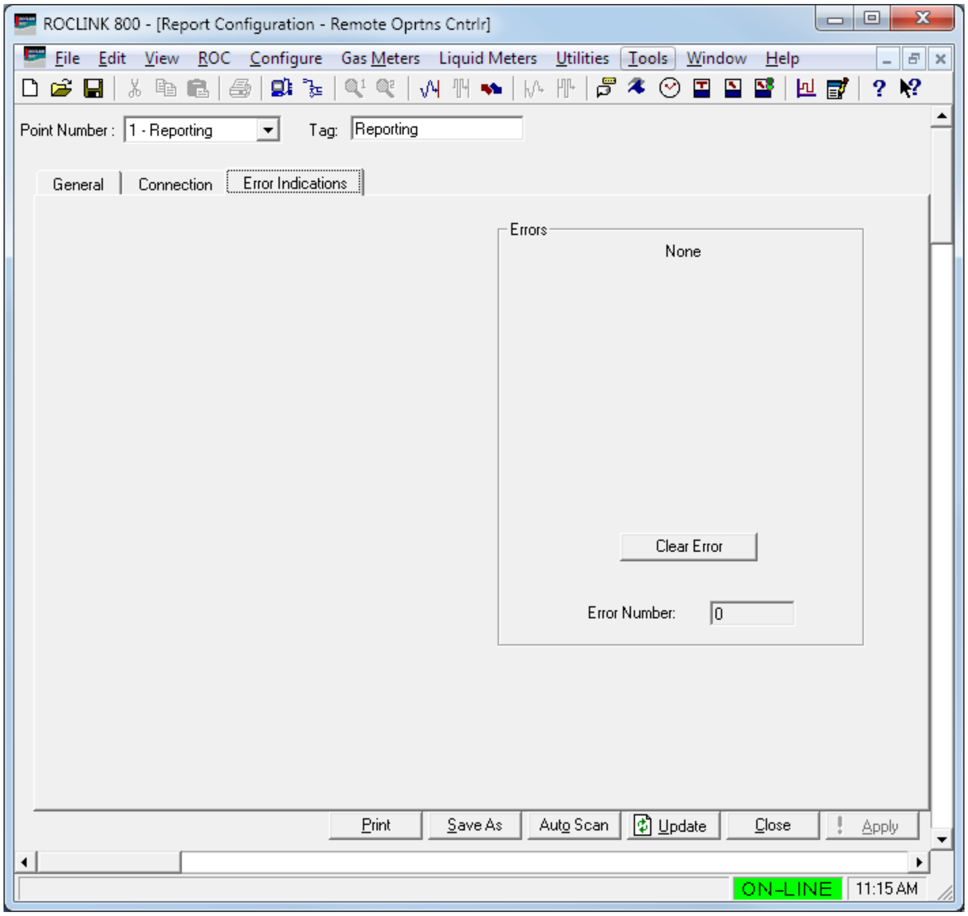


Figure 9-70. Report Configuration – Error Indications Tab

Field	Description
Clear Error	Click to clear all report errors. Use if you are having issues generating a report. Attempt to generate the report again.
Error Number	This **read-only** field displays a collection of errors that the user program may encounter. Click the **Clear Error** button to clear the errors. Possible errors are:
	Connection Refused – The TCP/IP device at the configured IP address has refused connection on the configured port. Verify that the device at the IP address is a printer, and is listening on the correct port.
	Bad IP Address Input – The IP address is not formatted correctly. Re-enter the IP Address for the printer.

Field	Description	
	Cannot Acquire Socket	The user program is unable to acquire a TCP/IP socket from the operating system. Try a Warm Start of the device.
	Cannot Connect, Timeout	No response was received from the TCP/IP printer. Try to ping the IP address.
	Cannot Allocate Memory	The user program was unable to allocate the memory required to save a report file. Try restarting the user program.
	Cannot Find/Open Display File	The selected display number to print does not exist. Verify that a valid number is entered, and that the report display has been loaded into the device at that slot number.
	Inet Error	An internal error occurred. Try a Warm Start of the device.
	Send Error	An internal error occurred. Try a Warm Start of the device.
	Flash Drive Full	There is no more space of the device’s flash file system to save additional report files. Try freeing up flash space.
	Cannot Edit Report Queue	The application is having trouble modifying it’s internal list of saved reports. Consider clearing and reloading the user program.
	Bad Base Filename, Use 9-0 a-z _	The base filename contains illegal characters that cannot be used in the name of a file saved to the devices flash file system. Change the base file name.

9.7 Creating a Report (Tutorial)

The purpose of this tutorial is to create a sample report template. Reports such as batching or prove reports are not set-in-stone, unchangeable layouts. You can change a report template at any time.

Note: If you alter a report in the User Display Editor, you must re-load the User Display (report) into the User Display Administrator slot.

This example creates a simple batch report for a station with two meters. When completed and populated with data, the report should resemble *Figure 9-71*:

```
BATCH REPORT


Ticket No: 88

Start Time: 07/09/2010 13:24:19
Finish Time: 07/09/2010 14:05:50

Product Name: Blend Heavy
Product Base Density: 806.100000

----------------------------------------------------------------
Meter Tag Gross Vol Mass Ave Temp Ave Press
----------------------------------------------------------------
Crude Mtr 1 42.31 32984.14 30.00 10.00
Crude Mtr 2 12.21 9809.80 29.50 11.00
----------------------------------------------------------------
```

Figure 9-71. Example Custom User Program Report

You use the ROCLINK 800 User Display Editor Report to design report templates.

Note: You must install the Reporting User Program in order for this to be functional.

9.7.1 Step 1: Create New Display

To create a new custom display for a report:

Connect to the **ROC800L**.

1. Select one of the following:
   - **View > Display > New**.
   - **Utilities > Custom Display Editor**.

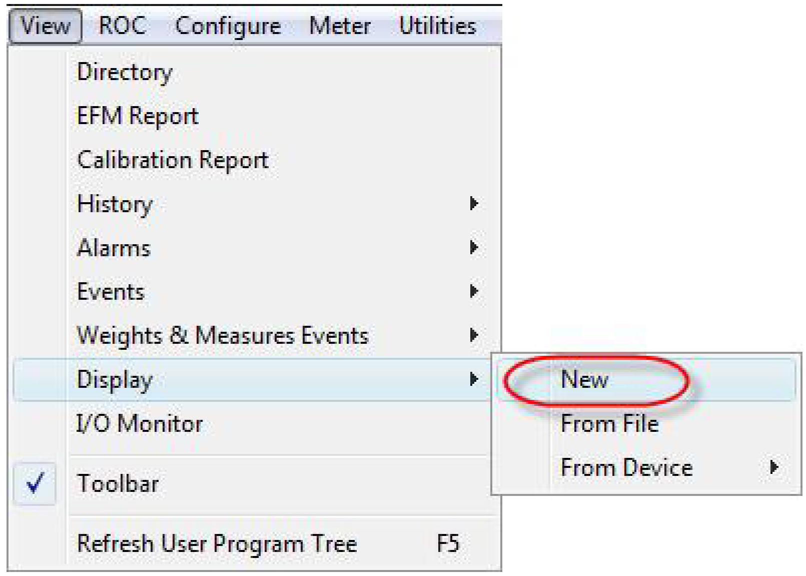
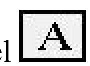


Figure 9-72. View > Display > New

9.7.2 Step 2: Labels and Captions

For designing this report template, you use only the **Label** and **Text** objects of the Display Editor on a printable report template. Objects such as check boxes and buttons are not appropriate for a report template.

The Label object is available in the tool bar.

1. Click and drag and drop the Label  button to the location where you desire the label to appear in the report.

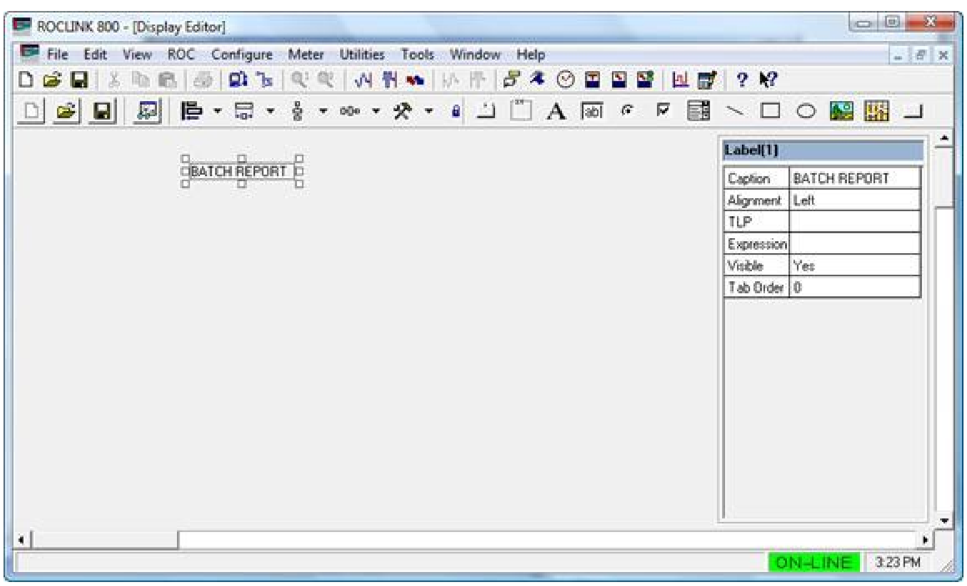


Figure 9-73. Label Example

2. Type **BATCH REPORT** in the **Caption** field of the Label(1) Properties frame.

3. Widen the **Label** using the **square sizing handles** so that all the text displays. This object is static text; it will always look the same on every report generated from this template.

4. Drag and drop a second **Label** below and to the left of the first Label.

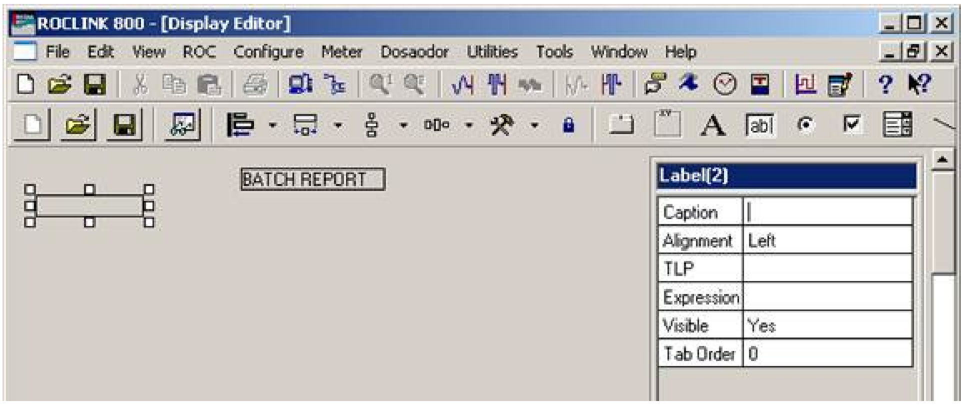


Figure 9-74. Label Example 2

5. **Delete** the **Caption** in the Properties frame, so that it is empty. This creates an empty line on any report generated from this template.

6. Drag and drop another **Label** and name the Caption **Ticket No**, indicating the Batch Ticket Number. This static object always displays the same text.

7. Drag and drop another **Label** to the right of the "Ticket No:" Label and delete the Caption **text.**

8. Assign the new **TLP** property, assign to **212,0,4 (Station Ticket Number)** as shown in the Select TLP dialog box next.

Note: This second Label object is dynamic and changes on each report. What displays for this object depends on the value of a parameter at the time the report generates.

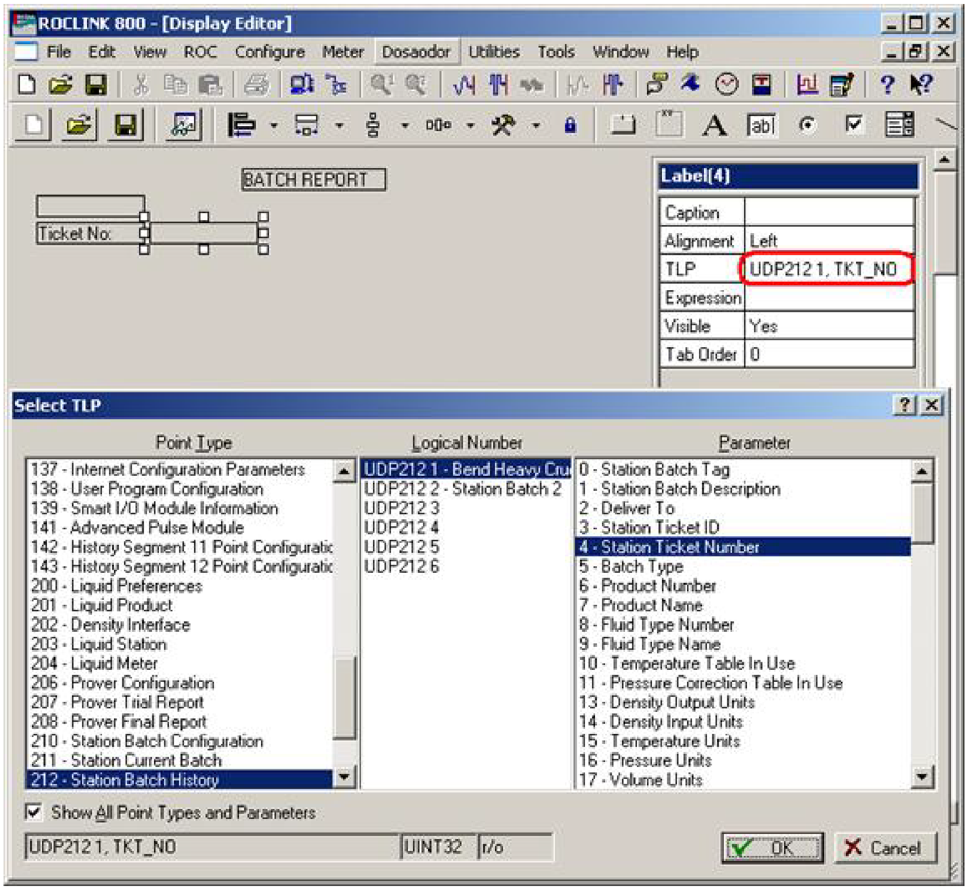


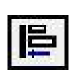
Figure 9-75. TLP Example

9.7.3 Step 3: Aligning Labels

It is important to ensure that the two Ticket Number labels properly align. Both of these objects appear on the same line of the final report generates. **Two objects appear on the same line only if you align their tops exactly.**

Note: If you do not align the two objects, then they appear on separate lines of the report.

To be certain that you correctly align the two labels:

1. Use **Shift + click** to select the multiple objects you wish to align.
2. Select the  Align button.
3. Selects **Align Tops**.

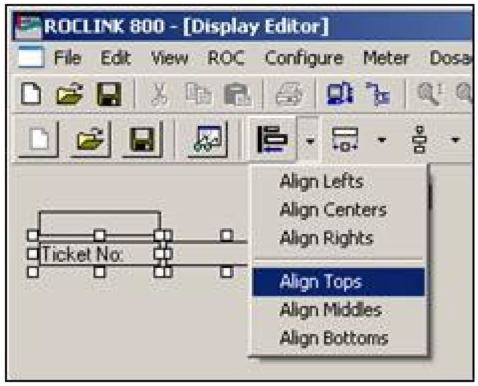


Figure 9-76. Align Tops – Labels

4. Place a Label below and to the left of the previous, In the Properties frame, **delete** the **Caption**, so that it is blank. This creates another empty line on any report generated from this template.

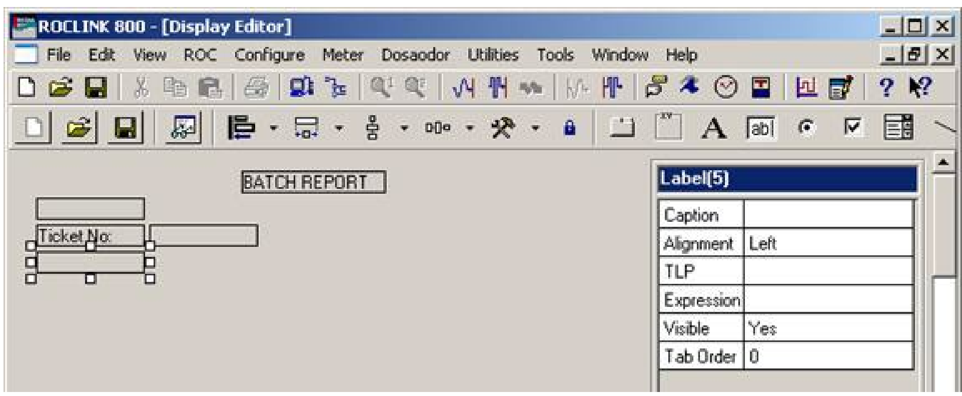
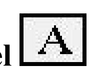
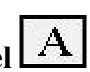
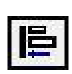


Figure 9-77. Adding Additional Labels

9.7.4 Step 4: Adding the Start and End Time for a Batch

The next element on the report is the start time and end times of the batch, type of product, and what you desire to report.

1. Drag and drop a **Label**  directly below the previous label.
2. Enter the Caption name **Start Time**.
3. Drag and drop a **Label**  to the right of the Start Time Label.
4. Select the **TLP** Label to **212,0,28** (**Batch Start Time / Date**) in the Properties frame.
5. Align  the frames.

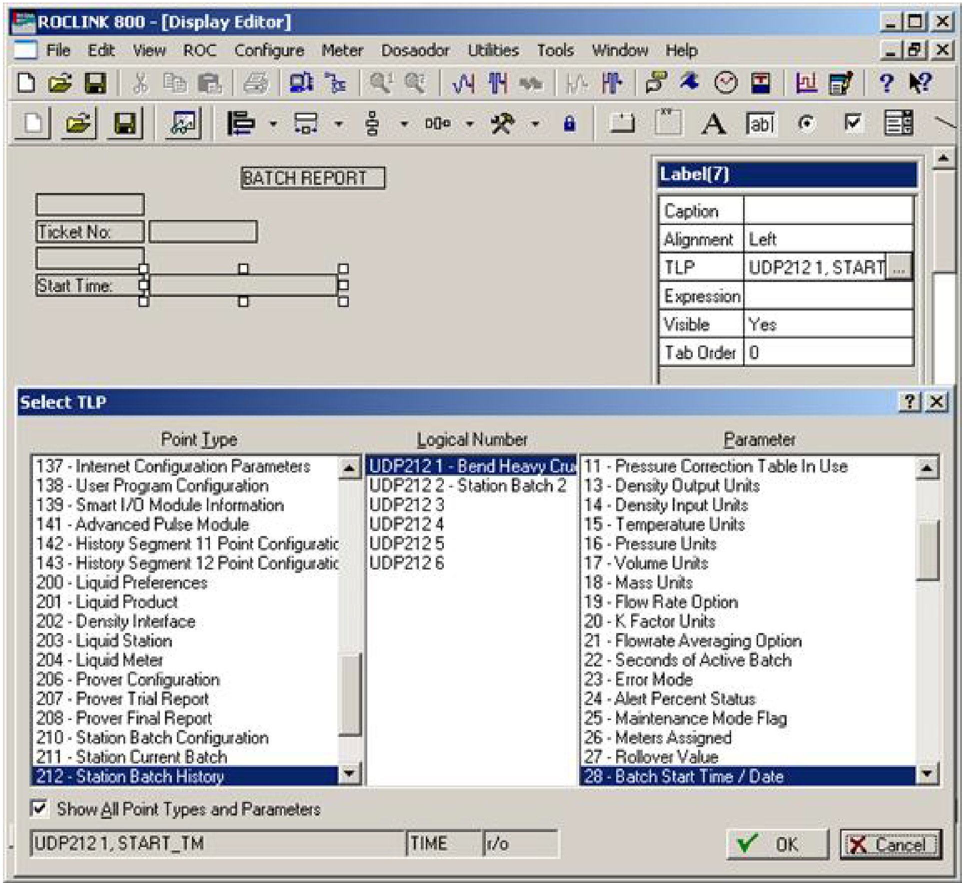
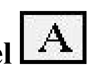
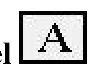


Figure 9-78. Start Time and TLP Assignment

6. Drag and drop a **Label**  under the Start Time field.
7. Enter **End Time** as the Caption in the Properties field.
8. Drag and drop **Label**  to the right of the End Time Field.
9. Delete the **Caption** from the Label in the Properties frame.
10. Select the **TLP** Label to **212,0,28** (Batch Start Time / Date) in the Properties frame.

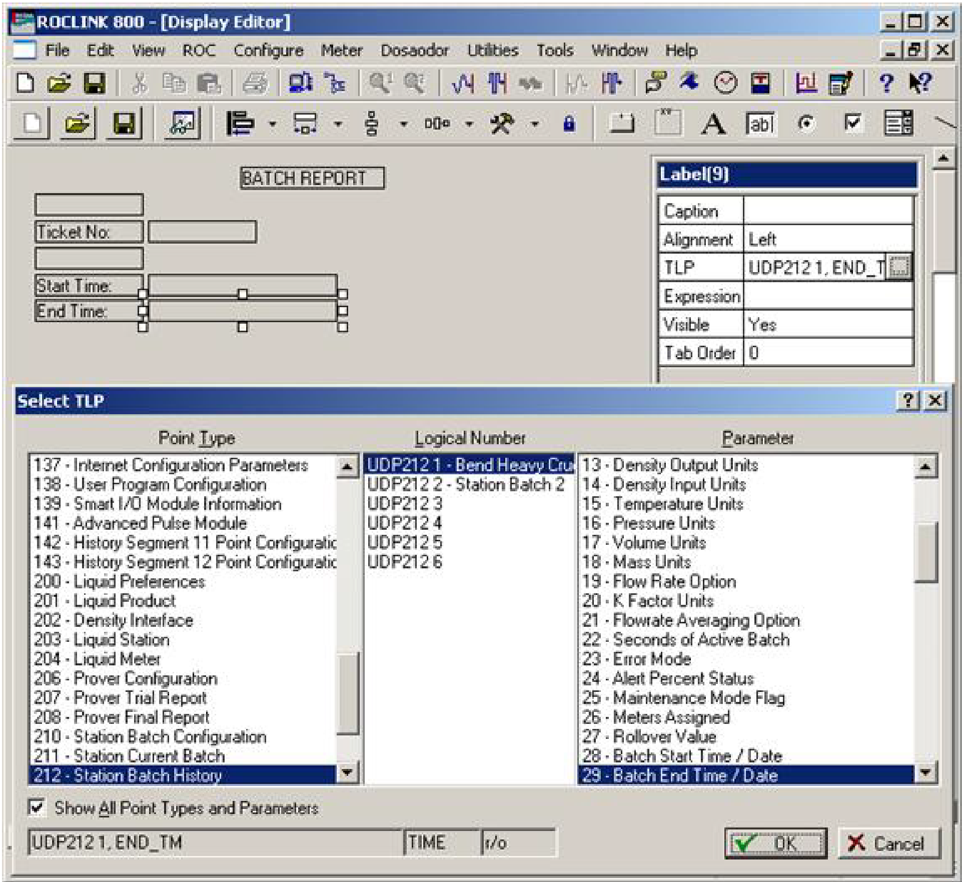
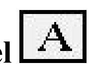


Figure 9-79. End Time and TLP Assignment

11. Drag and drop a **Label**  below the **End Time** field to create an empty line.

12. Delete the **Caption** field in the Properties frame.

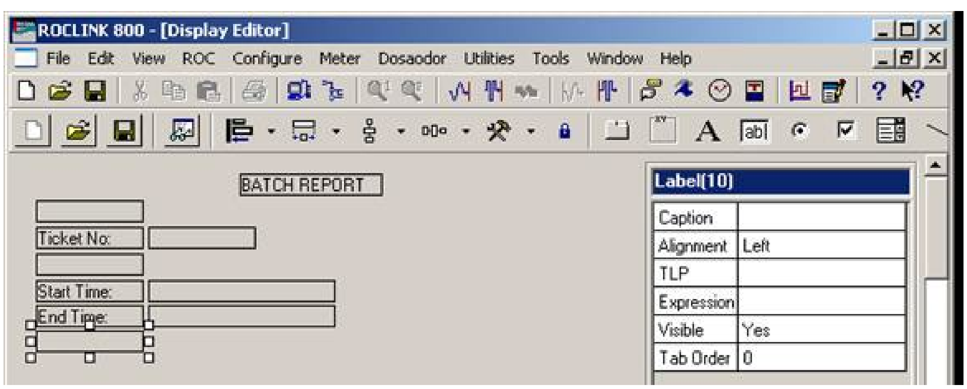
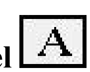


Figure 9-80. Creating a Blank Line

13. Drag and drop a **Label**  another field under the blank field and enter the **Caption Product Name**.

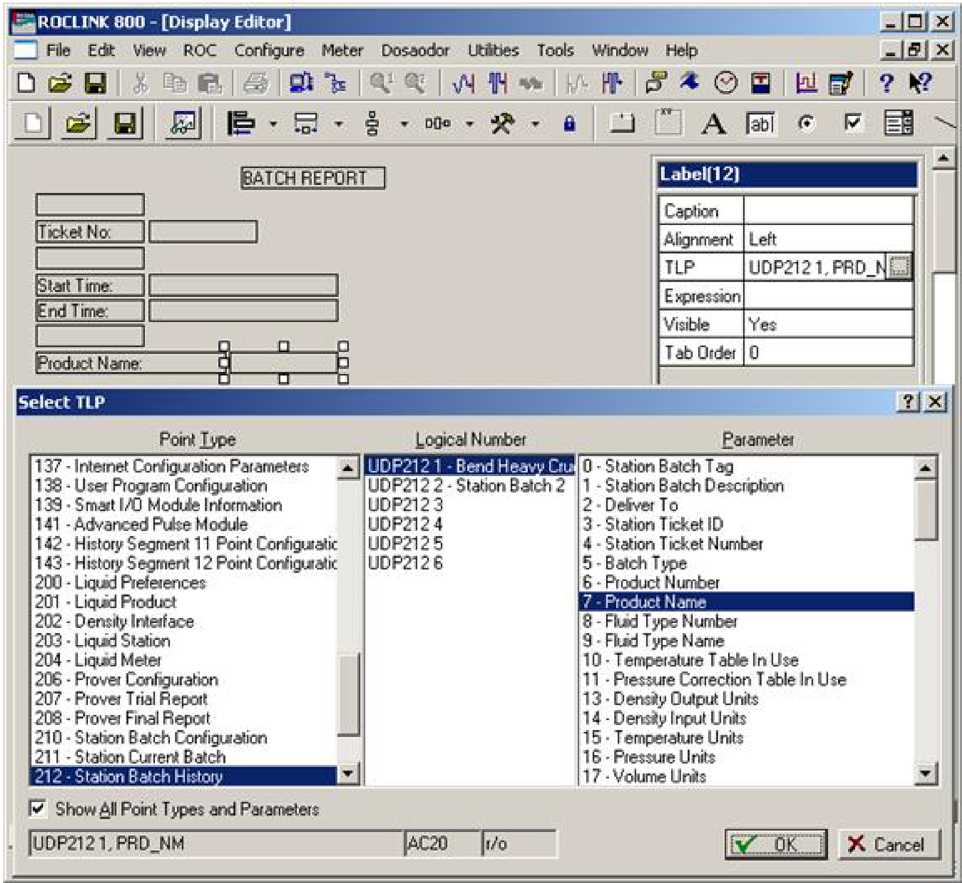
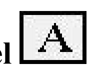
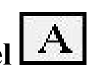


Figure 9-81. Product Name Fields

14. Drag and drop a **Label**  next to the **Product Name** and delete Caption in the Properties frame.

15. Select the **TLP** Label to **212,0,7** (Product Name) in the Properties frame.

16. Drag and drop a **Label**  below the Product Name and enter the **Caption Product Base Density** in the Properties frame.

17. Select the **TLP** Label to **212,0,39** (Product Base Density) in the Properties frame.

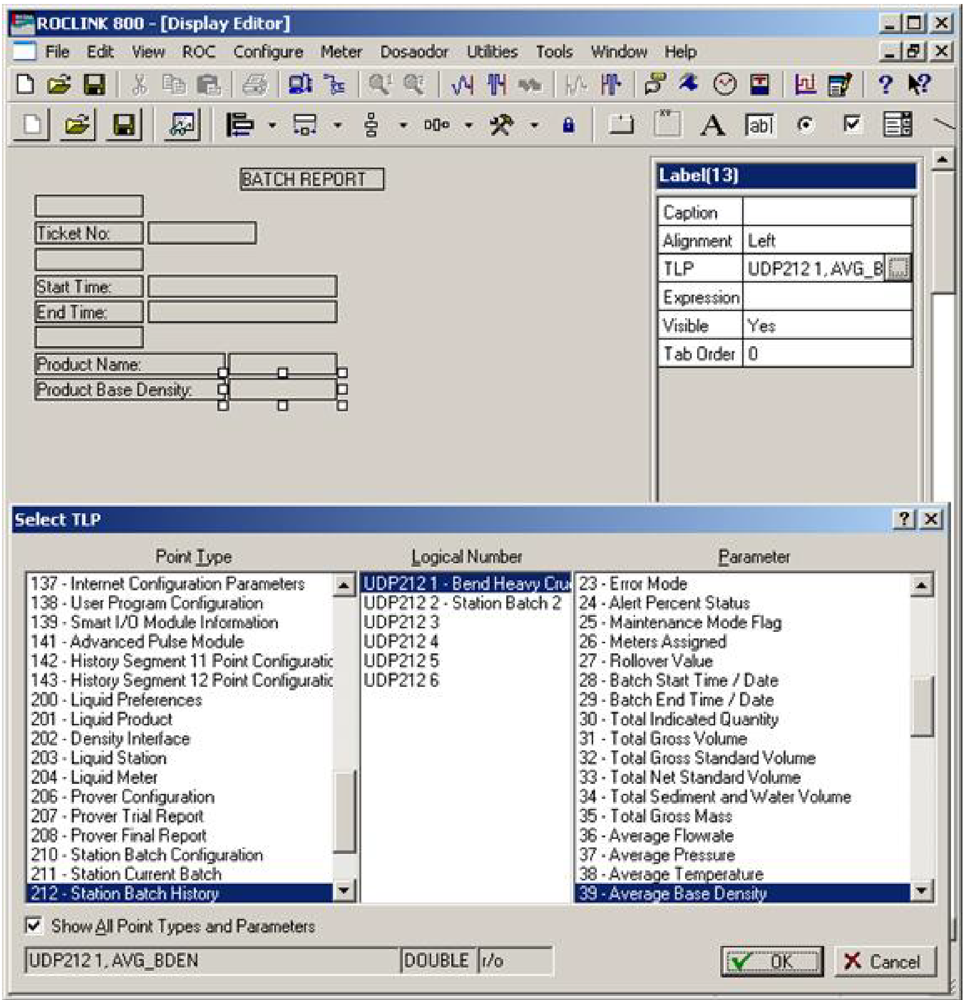


Figure 9-82. Product Base Density (Average Base Density)

18. Drag and drop a **Label** another field under the blank field and enter the Caption **Product Base Density** fields.

19. Drag and drop a **Label** next to the **Product Base Density** and delete Caption in the Properties frame.

20. Select the **TLP** Label to **212,0,39** (**Average Base Density**) in the Properties frame.

21. **Align** the fields as necessary.

9.7.5 Step 5: Adding Meter Data to the Report

In this section, you will learn how to add meter data to your reports. To assist in reading a report, it is a best practice to introduce blank spaces and lines with which to separate data.

Drag and drop a **Label** another field under the **Product Base Density** field and **delete** the data in the **Caption** field.

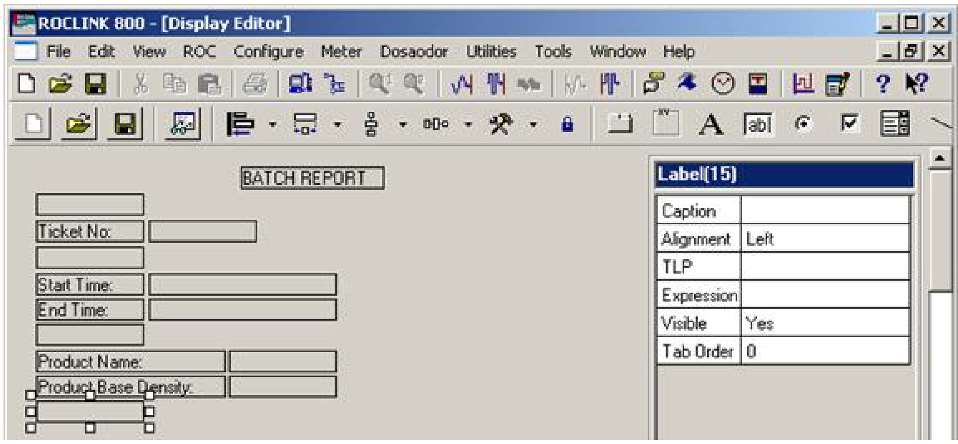
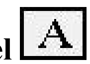


Figure 9-83. Blank Line Example

1. Drag and drop a **Label**  another field under the blank field and delete the data in the Caption field.
2. Widen the **Label** using the square sizing handles so that all the text displays. This object is static text and displays the same on every report you generate from this template.
3. Enter approximately 60 dash characters "–" in the **Caption** field.

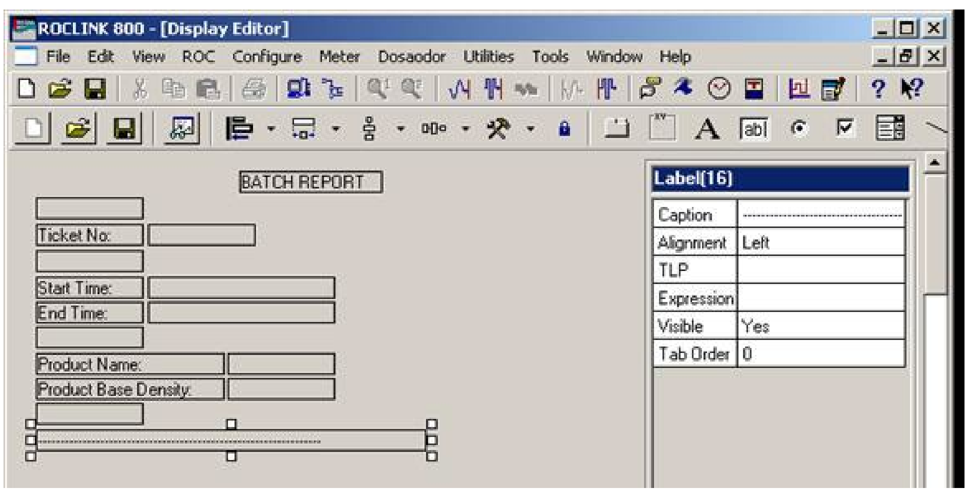


Figure 9-84. Dashed Lines and Space in Reports

Note: When designing reports in ROCLINK 800, labels display in proportional fonts, such that letter and characters do not occupy the same horizontal space. When the report generates, characters display in a monospaced font, meaning all letters and characters equal the same amount of horizontal space. Because of this difference, the row of dashes appear much longer on a report than do they display in the Display Editor.

---

4. Add **five Labels** on the report for each of the meter data items you desire to display. Remember to align the Labels. Enter the Label's Captions as follows:

- Meter Tag
- Gross Vol
- Gross Mass
- Ave Temp
- Ave Press

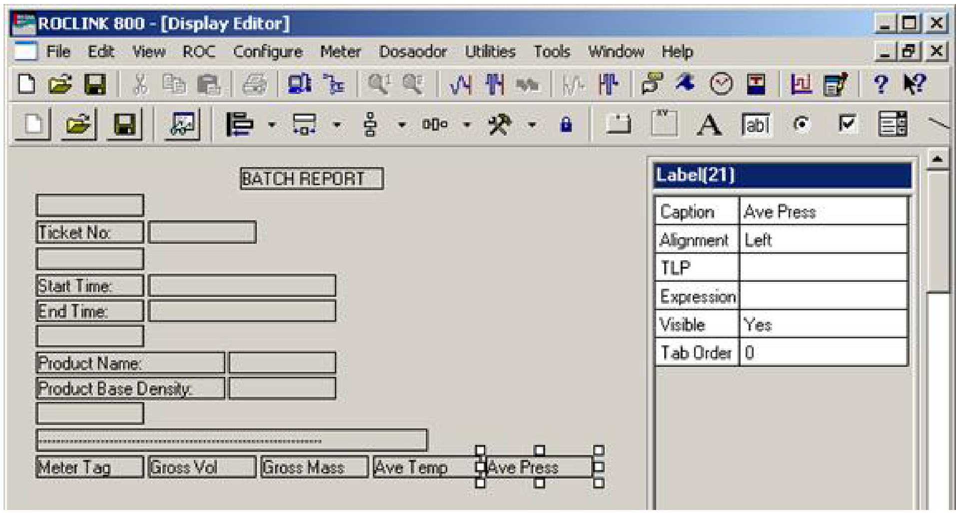
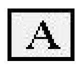


Figure 9-85. Meter Data Label Examples

5. Drag and drop a **Label**  another field under the blank field and delete the data in the Caption field.
6. Widen the **Label** using the square sizing handles so that all the text displays.
7. Enter approximately 60 dash characters "–" in the **Caption** field.

Note: You can also cut and paste the previous line. Move the line to the appropriate locations

8. Add **five Labels** on the report for each of the meter data items you desire to display and delete the Captions. Remember to align the Labels.
9. Assign the parameters to the TLPs. Configure these for the first of the two meters (select the first logical Meter 1) as follows:

▪ Meter Tag	214,0,4 (Meter Tag)
▪ Gross Volume	214,0,17 (Total Gross Volume)
▪ Gross Mass	214,0,21 (Total Gross Mass)
▪ Ave Temp	214,0,25 (FWA Temperature)
▪ Ave Press	214,0,24 (FWA Pressure)

10. **Align** the fields as necessary.

9.7.6 Step 6: Adding the Actual Meter Data on the Report

Next, include the actual meter data on the report.

Add **five Labels** under the line for each of the meter data items you desire to display and delete the Captions. Remember to align the Labels.

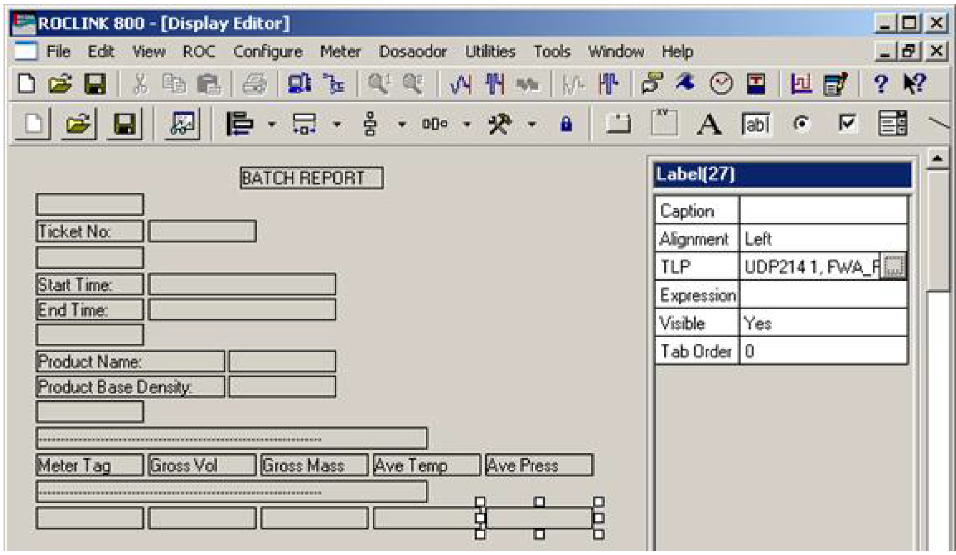


Figure 9-86. Parameter Assignments

For each of the numerical value Labels (Gross Vol, Gross Mass, Ave Temp, and Ave Press), restrict the decimal places such that 123.45000000 displays as 123.45.

1. Select the **Gross Vol** Label and click the Expression field in the Properties frame.
2. Click ... to open the Expression Builder.
3. Enter the expression **FormatNumber(This,2)**.

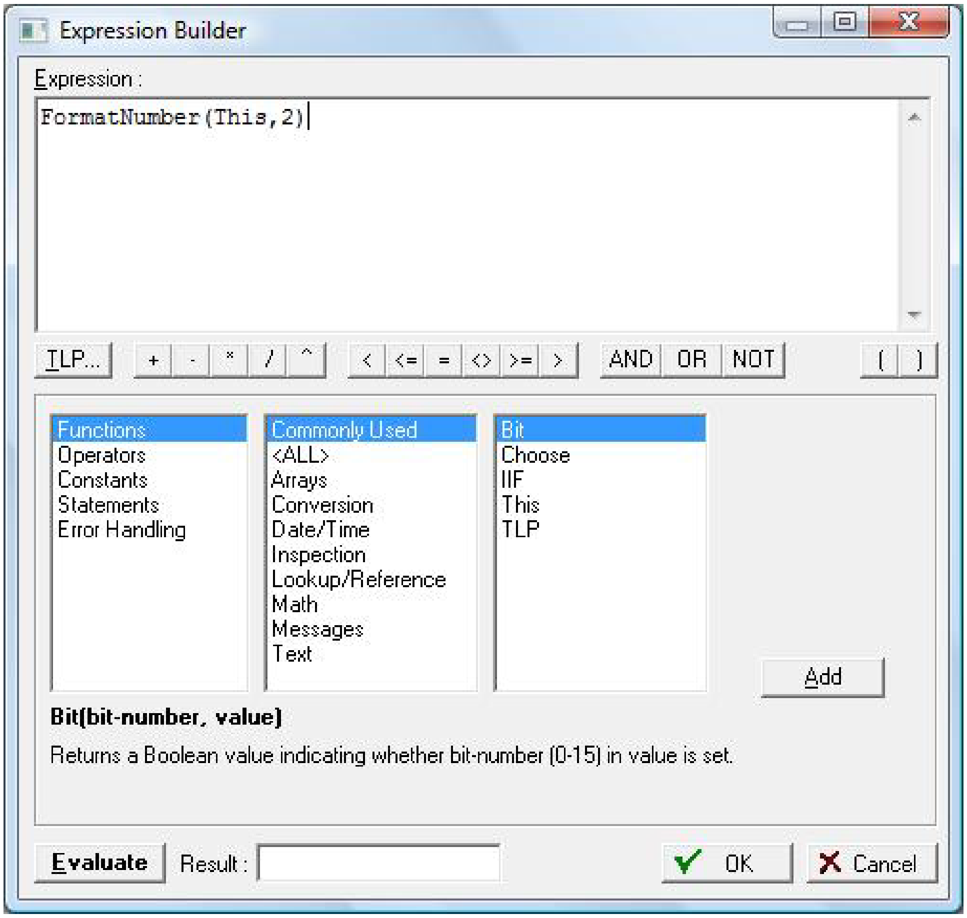


Figure 9-87. Expression Builder

4. Repeat for the **Gross Mass** value Label, the **Ave Temp** value Label and the **Ave Press** value Label.
5. Click in a neutral area in the Display Editor and ensure there is nothing active.
6. Drag the cursor around the **Meter Tag**, **Gross Vol**, **Gross Mass**, **Ave Temp**, and **Ave Press Label** fields from below the dashed line to copy the data fields.

Figure 9-88. Copy Label Fields

7. Move the data fields and drag and drop them **below the other data values**.

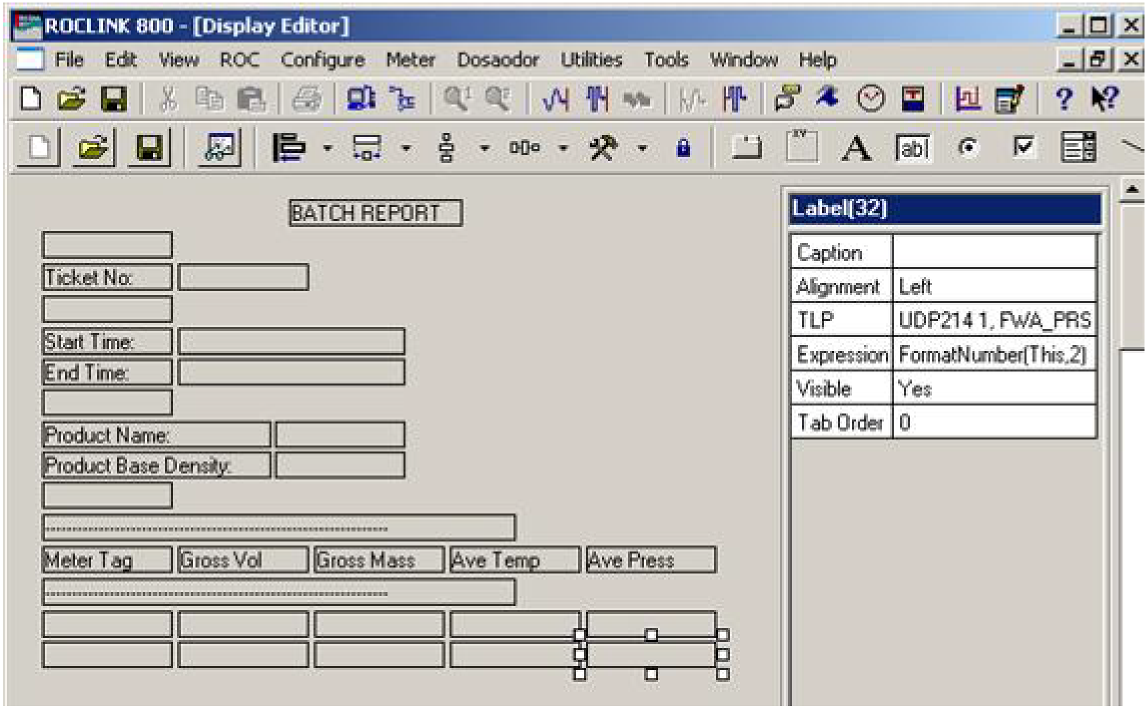


Figure 9-89. Second Meter Data Fields

8. Modify the **TLP** property of each of the objects, so that they point to the second logical in the TLP selector. Do this for each of the five objects.

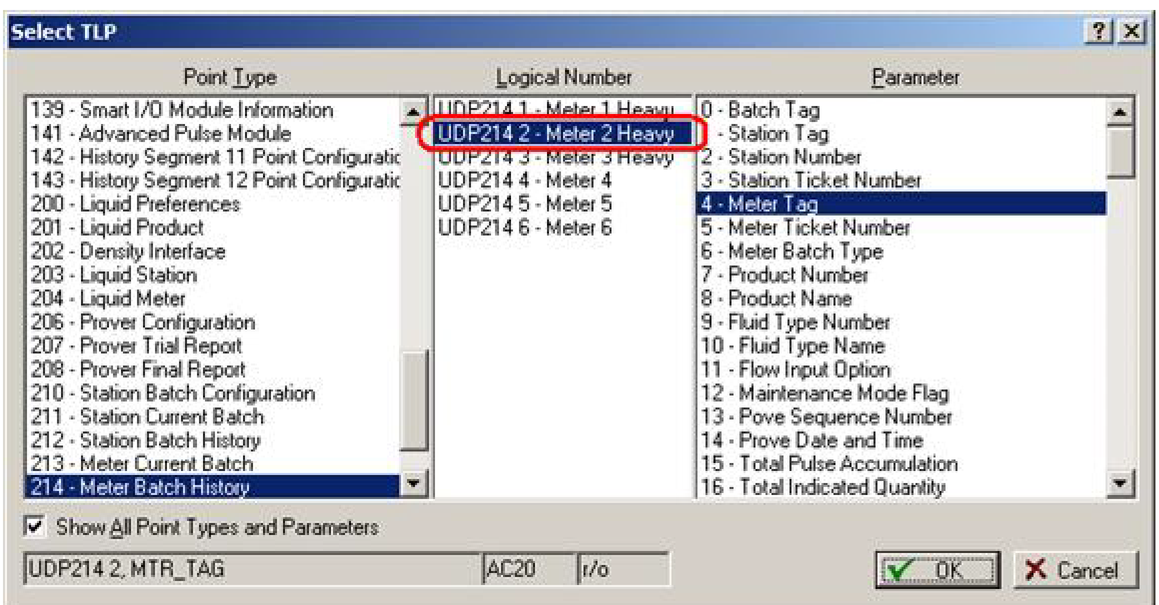


Figure 9-90. Select TLP for Second Meter Data

9. Copy and paste one of the **dashed lines** you previously created to create a batch ticket line.
10. Paste the line after the second meter data fields.
11. **Align** the fields as necessary.

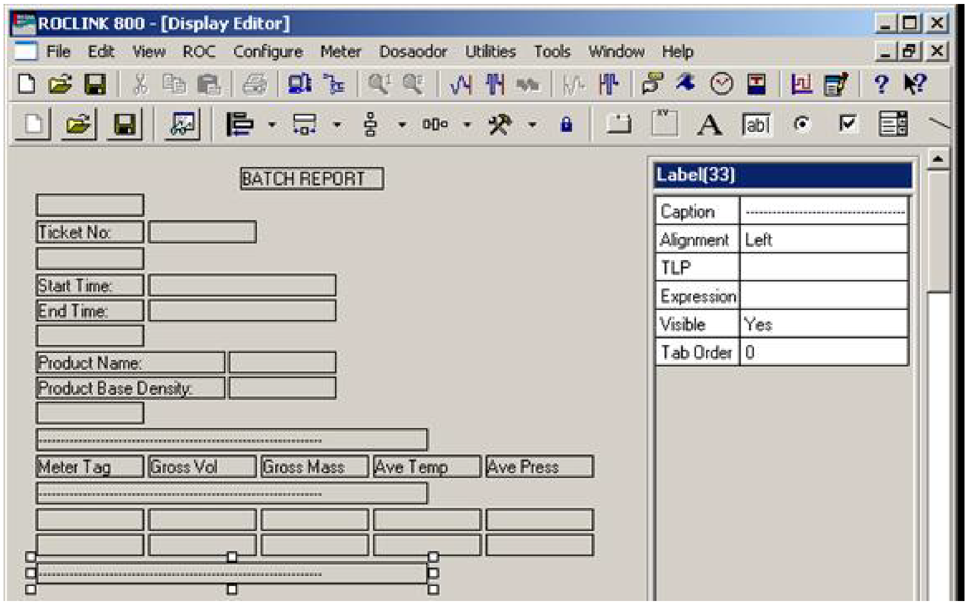


Figure 9-91. Copy Dashed Line

9.7.7 Step 7: Saving the Report

To name the report:

Click in a neutral area in the Display Editor and ensure there is nothing active.

1. Enter the Display Name Batch Report in the Properties frame.
2. Click the **Test** button to test the report template with live data..

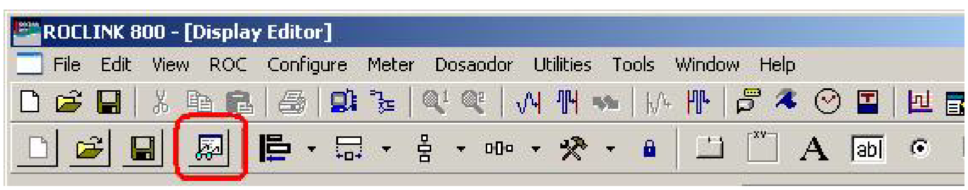


Figure 9-92. Test Button

3. Click the **Edit** button at the bottom of the ROCLINK window.
4. Click the **Save** button to save the report template file to your PC.

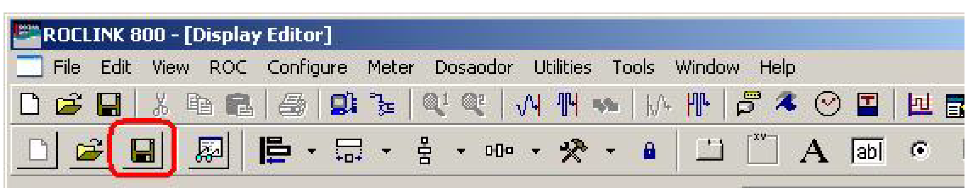


Figure 9-93. Save Button

5. Enter the report name in the **File name** field. The file has an extension of **.dsp**.

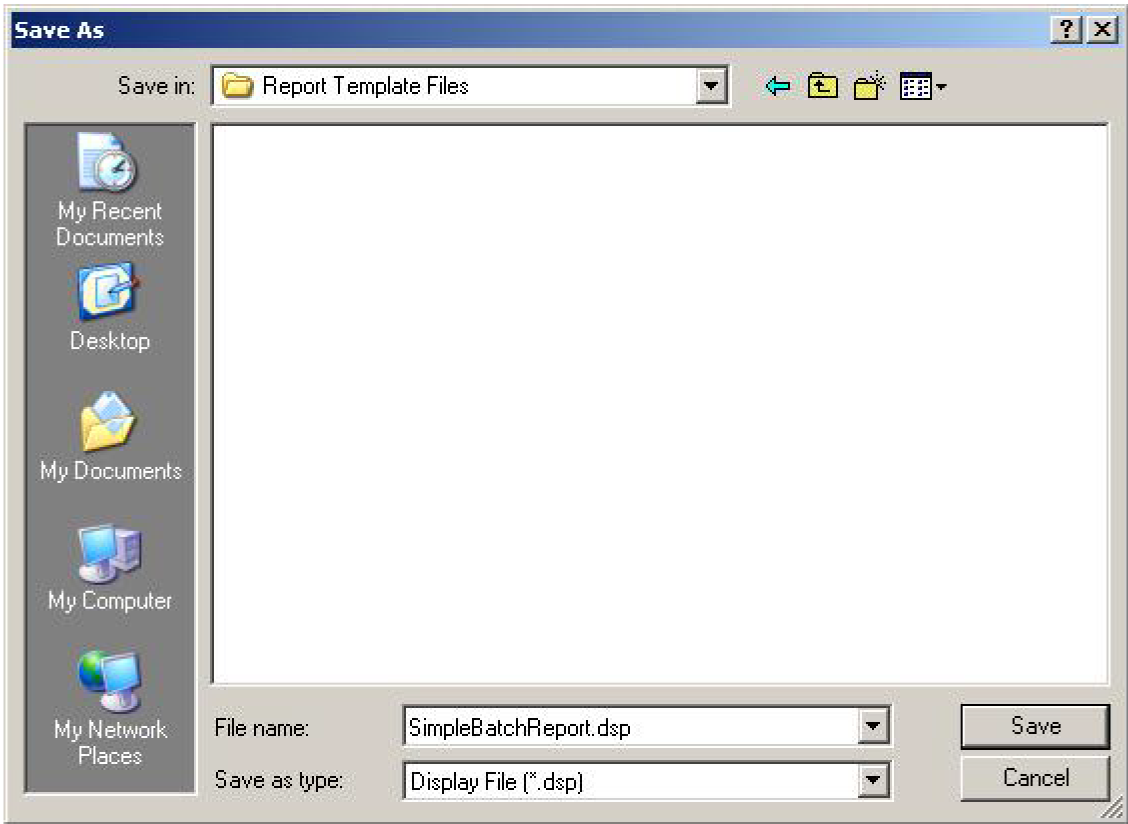


Figure 9-94. Save Display

Note: If you alter a report in the User Display Editor, you must re-load the User Display (report) into the User Display Administrator slot.

9.8 Using the Reports User Program

The purpose of this tutorial is to familiarize you with the functions of the Reporting program in the ROC800. In this tutorial, you:

- Load a report template file into the ROC800 device (User Display).
- Generate a report ASCII text file to the devices flash file system.
- Extract the report text file from the device and save it to your PC.

Note: This tutorial is generic for the ROC800 environment.

9.8.1 Loading the Report into the Display Administrator

To access the report, you must load the report into the Display Administrator.

1. Connect to the ROC800.
2. Double-click **User Display** in the Configuration Tree.
3. Double-click **Administrator**.

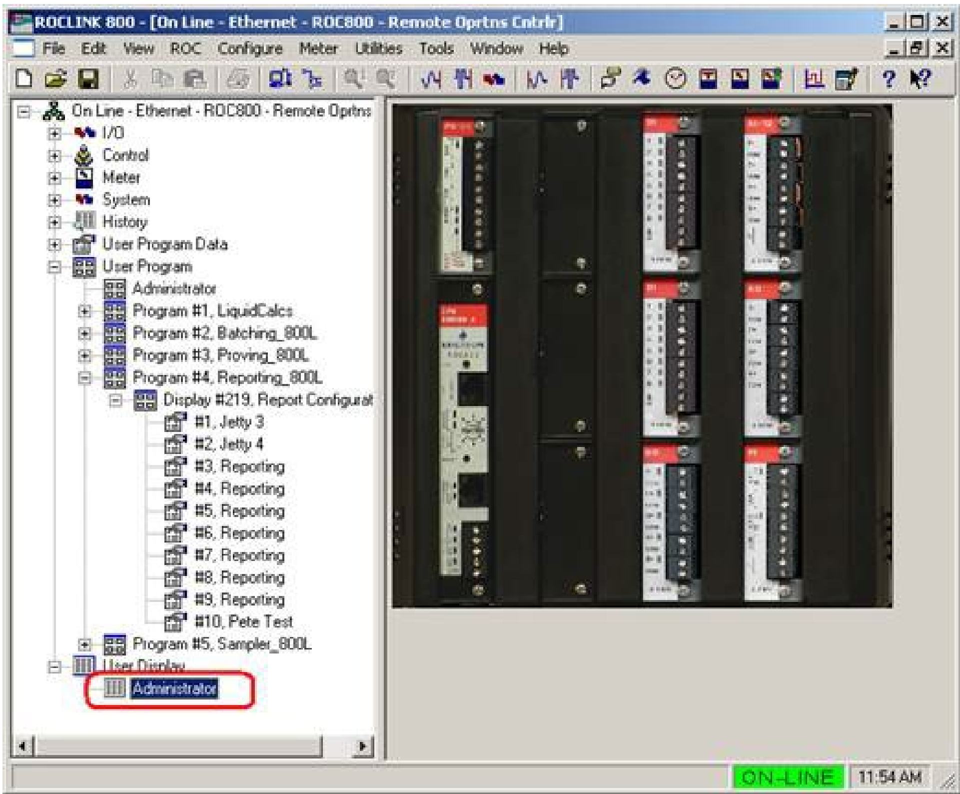


Figure 9-95. Configuration Tree

4. **Select** one of the available **slots**.

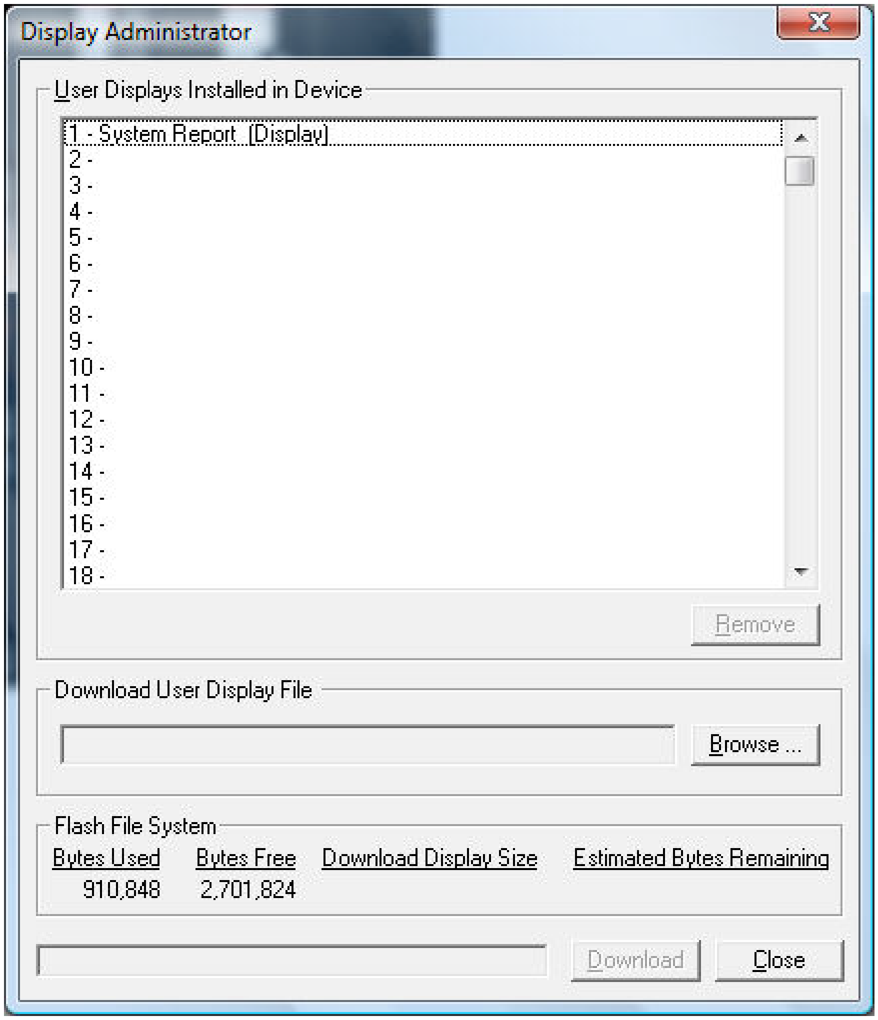


Figure 9-96. Display Administrator

5. Click the **Browse** button and location of the Report/Display (*.dsp) on your computer.

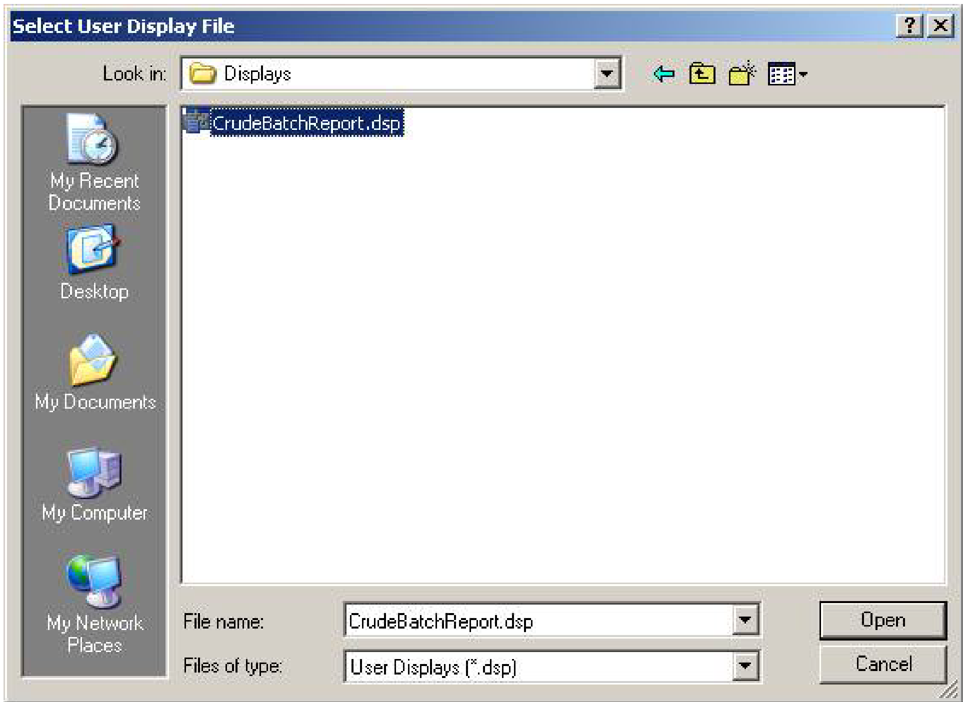


Figure 9-97. Select User Display File

6. Select the **report** and click **Open**.
7. Click the **Download** button.
8. Click the **Yes** button when prompted.

Figure 9-98. Download Prompt

9. Click the **OK** button.

Figure 9-99. Download Complete

10. Close the **Display Administrator**. Note the new display in the ROCLINK tree.

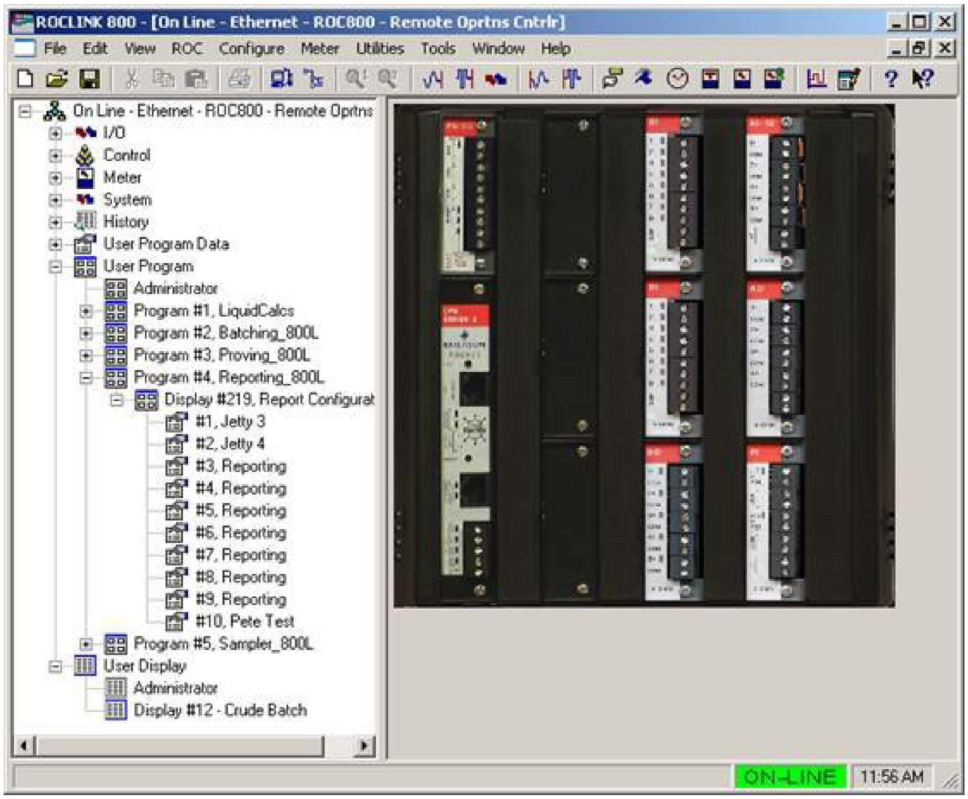


Figure 9-100. User Display Loaded

Note: If you alter a report in the User Display Editor, you must re-load the User Display (report) into the User Display Administrator slot.

9.8.2 Configuring the Report

This section details how to configure the report to use with the User Programs.

Double-click **User Program** in the Configuration Tree.

1. Double-click the **Reporting**.

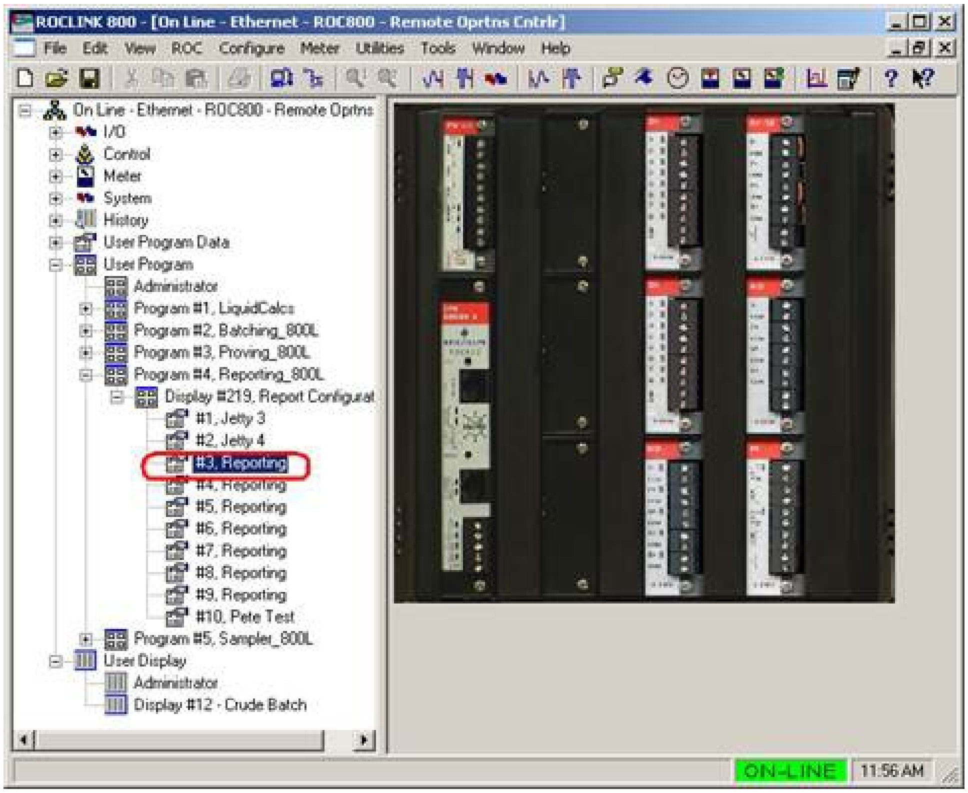


Figure 9-101. User Program Report Configuration

2. Double-click one of the ten reporting options.
3. Enter the **Tag**. This displays in the Configuration Tree to indicate the name of the report.
4. Enter the display number to print in the **Display # to Print** field.

Note: There are ten logical points for reports so if you use a Display slot number from 1 to 10, you can use the same number in the Display # to Print field making it easier to remember.

5. Select 12 in the **Characters Per Inch** drop-down list box.

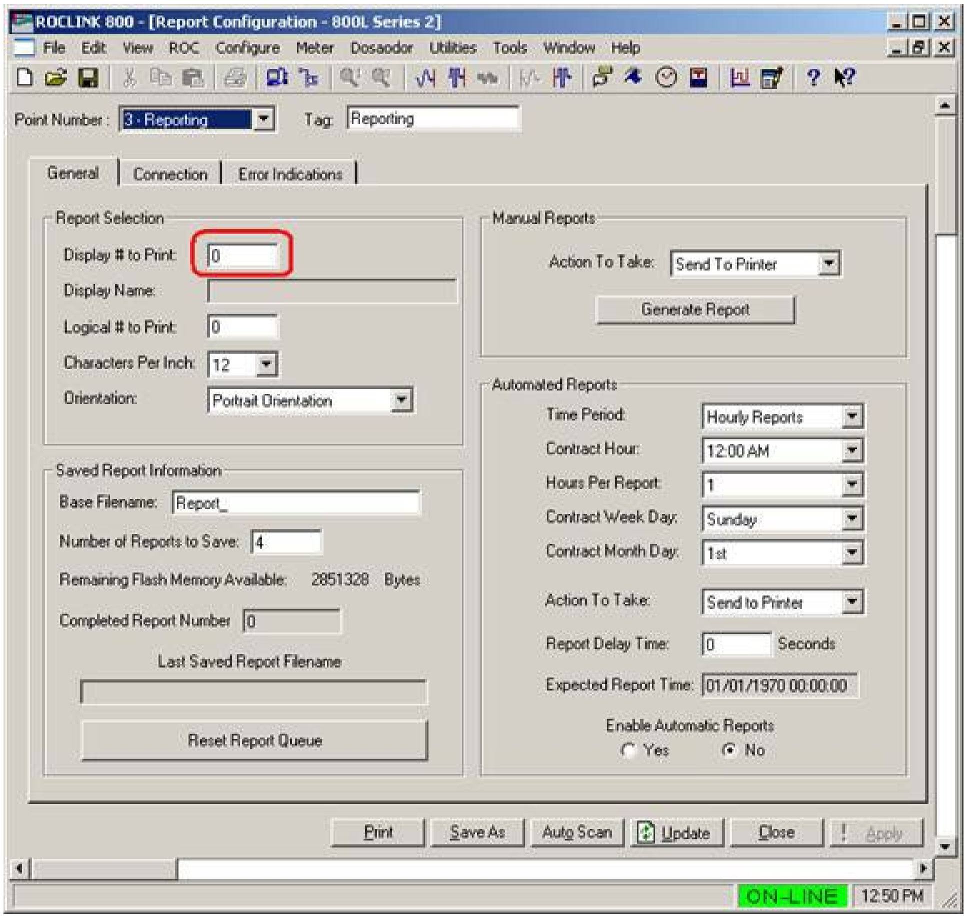


Figure 9-102. Report Configuration – General tab

6. Click **Apply**.

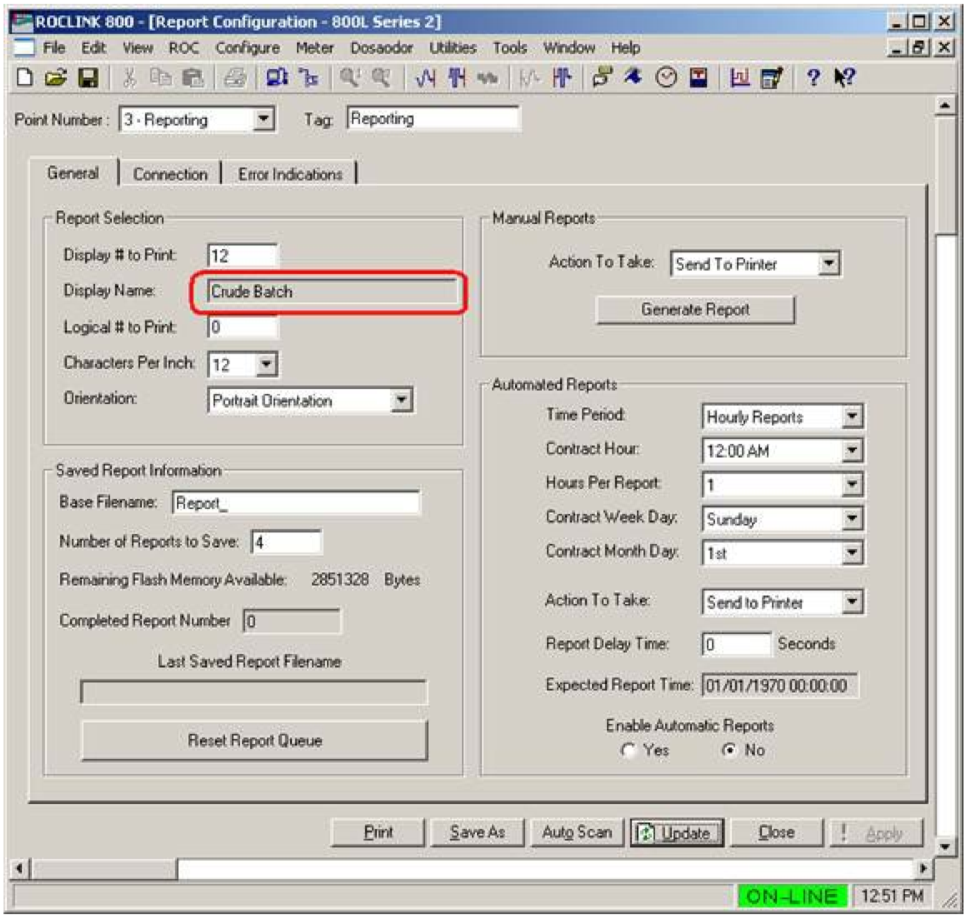


Figure 9-103. Display Name

7. The **Display Name** field should have updated. If it has not, click **Update**.
8. Enter the name in the **Base Filename** field.

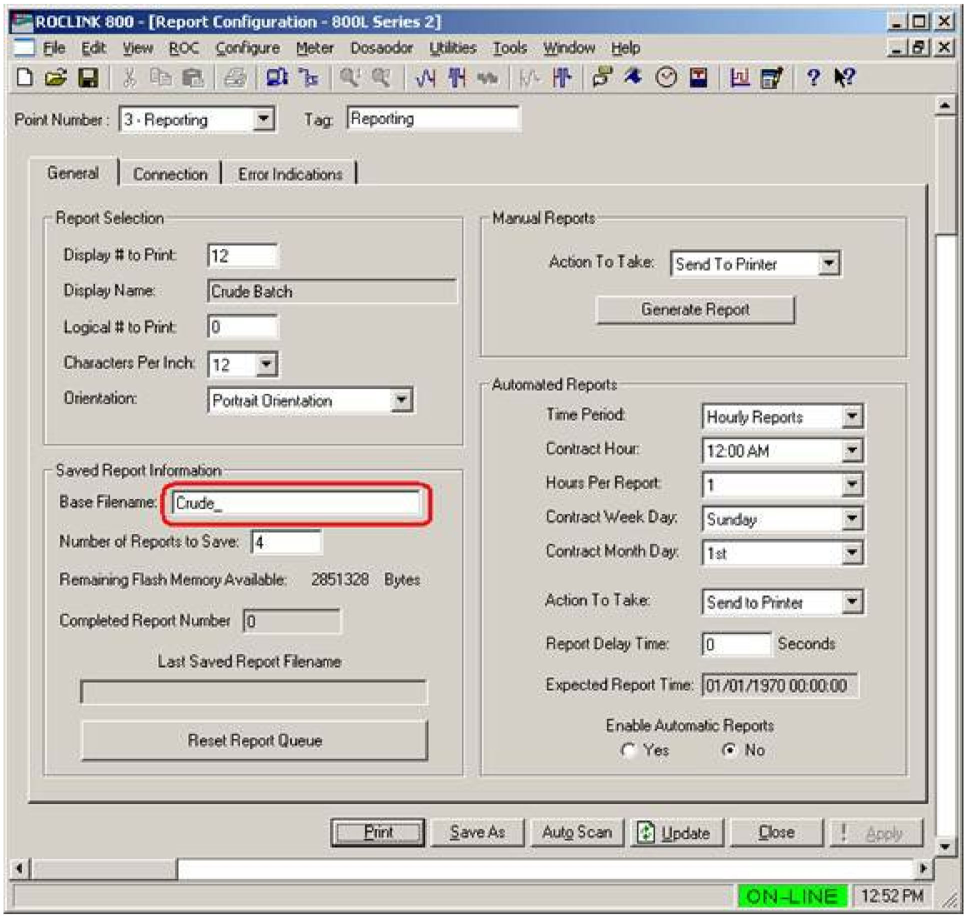


Figure 9-104. Base Filename

9. Select **Save To Drive** in the Action to Take field. This selection indicates that you only want to create a report file inside the device.

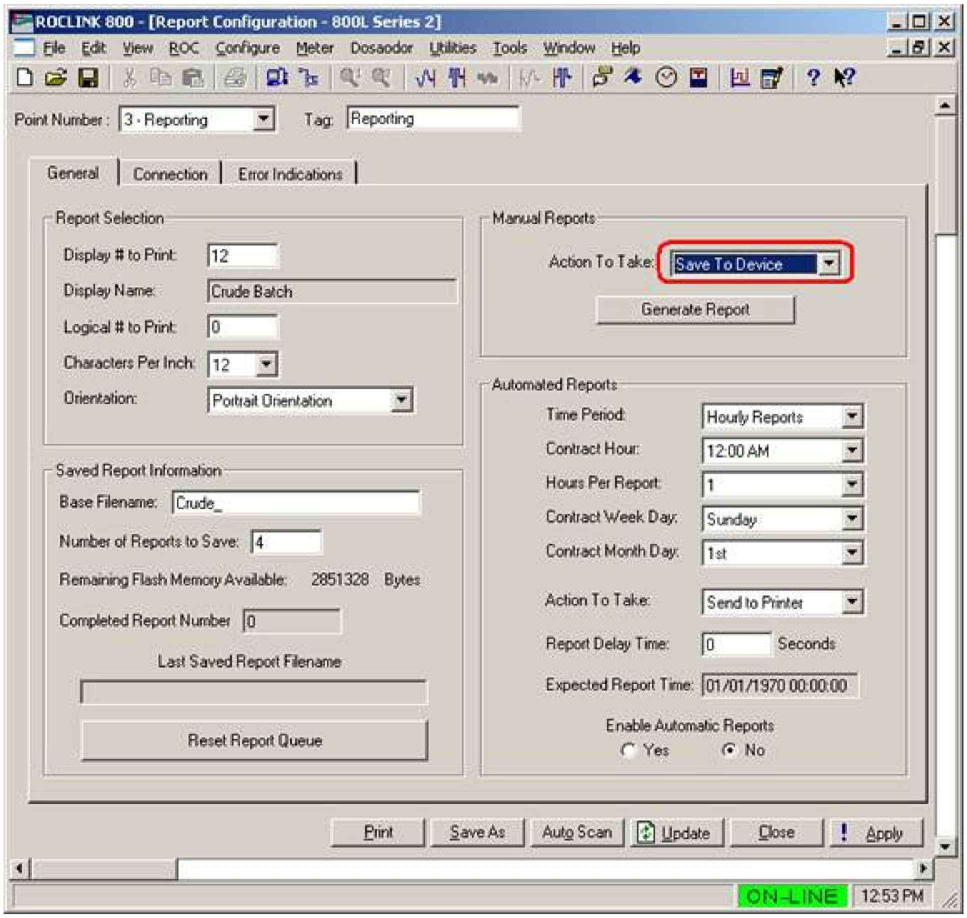


Figure 9-105. Action to Take

10. Click **Generate Report** to create the report file.

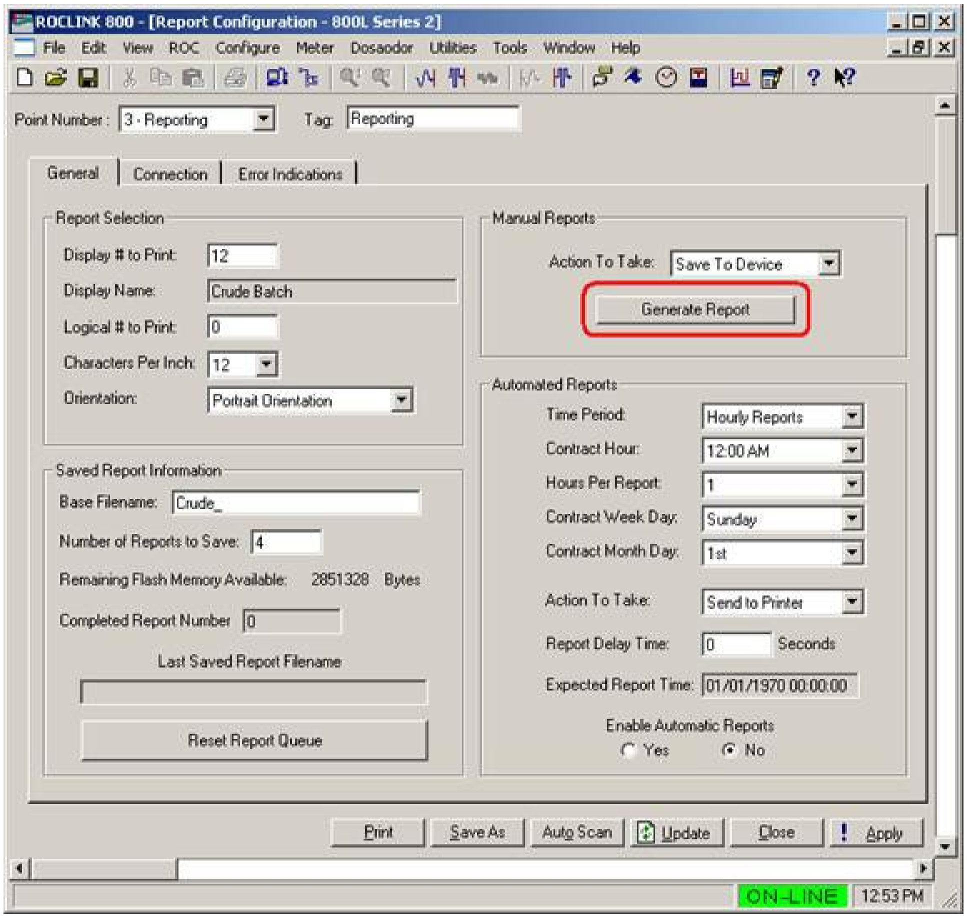


Figure 9-106. Generate Report

Notice that the last report information updates with the filename of the report and the value in **Completed Report Number** increments. These fields provide feedback that the report did generate.

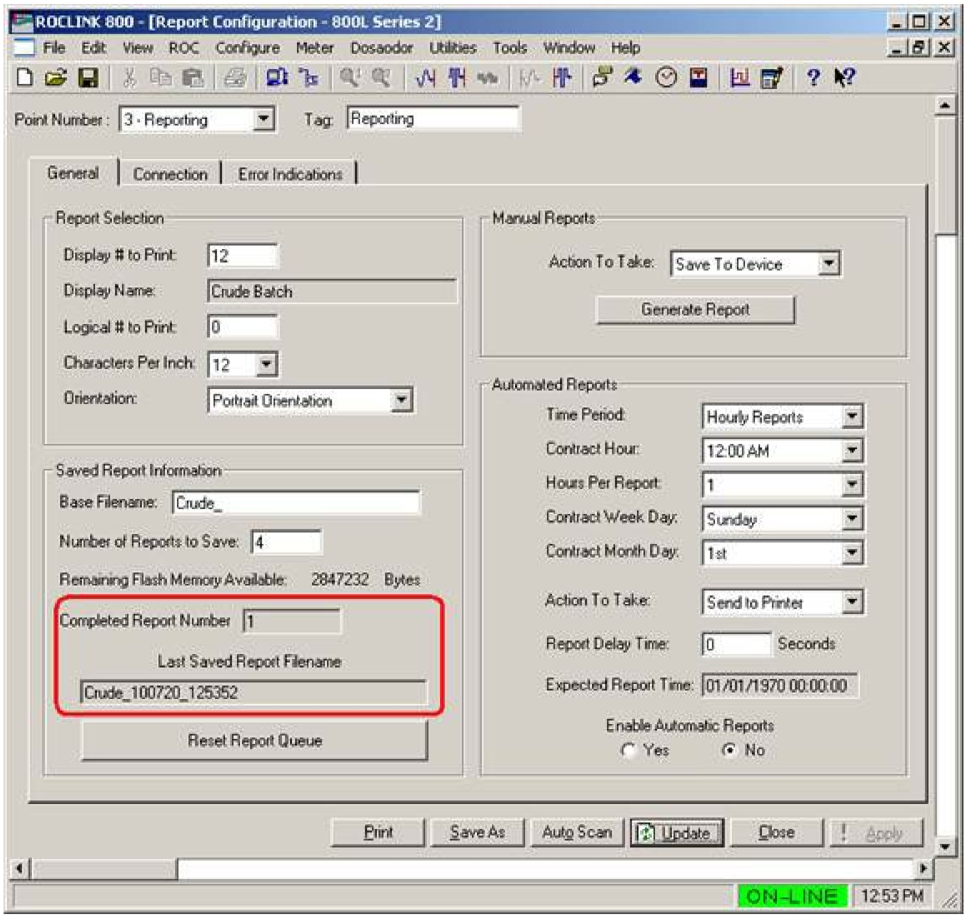


Figure 9-107. Indication that Report Generated

The file is now available in the device flash file system, and available for you to retrieve via ROCLINK.

Note: If you are having issues generating a report, click the Error Indications tab and click Clear Error, and attempt to generate the report again.

9.8.3 Reading the Report File From Device

To read the report:

1. Select **Utilities** > **Read File From Device**.

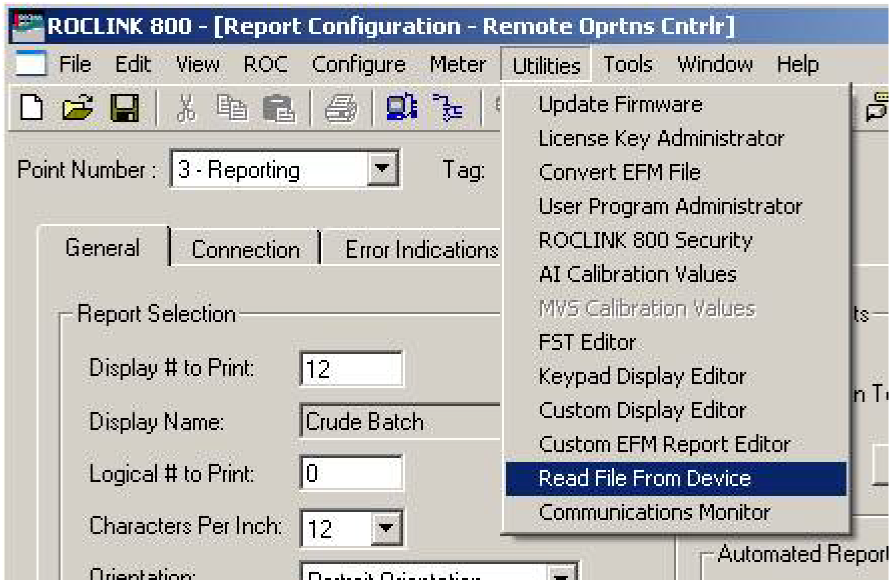


Figure 9-108. Read File From Device Menu

2. Select the **file** and click **Read File**.

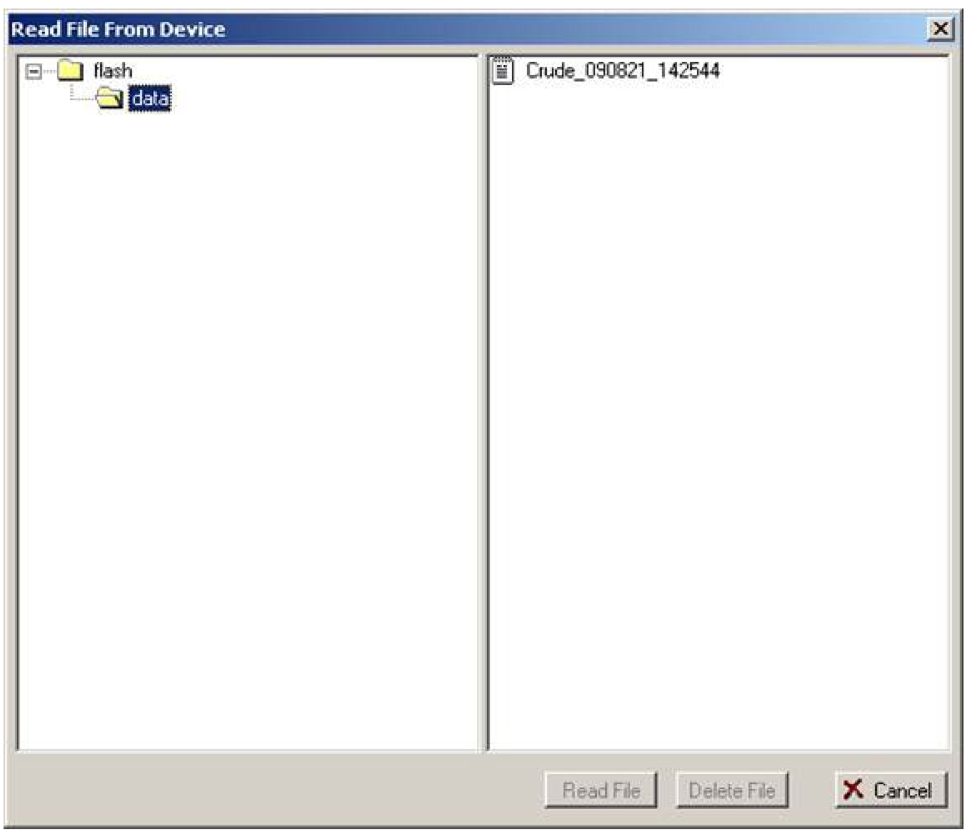


Figure 9-109. Read File From Device Screen

3. Browse to an appropriate directory on your local disk to save the file.
4. Click the **Save** button.

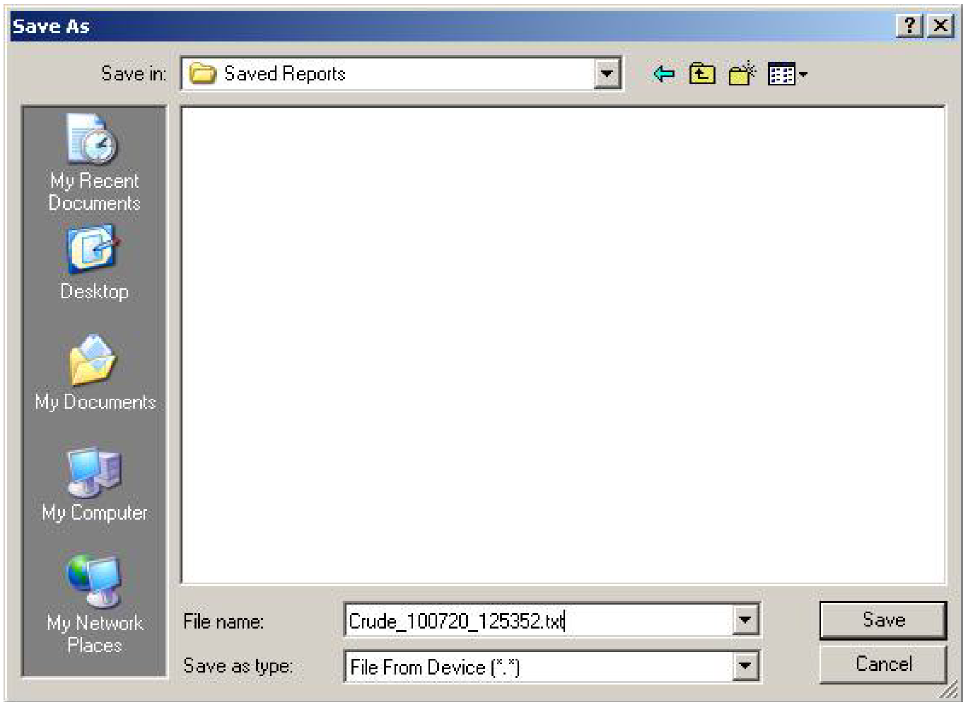


Figure 9-110. Save As

Note: Because the report is an ASCII text file, append the *.txt extension to the File name.

5. Click **OK**.

Figure 9-111. Read Device File Completed

Chapter 10 – The Utilities Menu

In This Chapter

Use the options on the Utilities menu to update firmware, manage software licenses, convert EFM files, manage user programs, set ROCLINK 800 security, view AI, RTD, and MVS calibration values, access the FST Editor, and monitor communications.

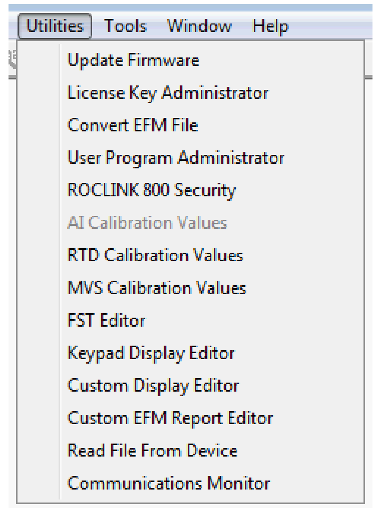


Figure 10-1. Utilities Menu

Note: For information on the FST Editor and writing FSTs, refer to the *Function Sequence Table (FST) User Manual* (part D301058X012).

10.1 Update Firmware

Select **Utilities** > **Update Firmware** to display the Update Firmware screen:

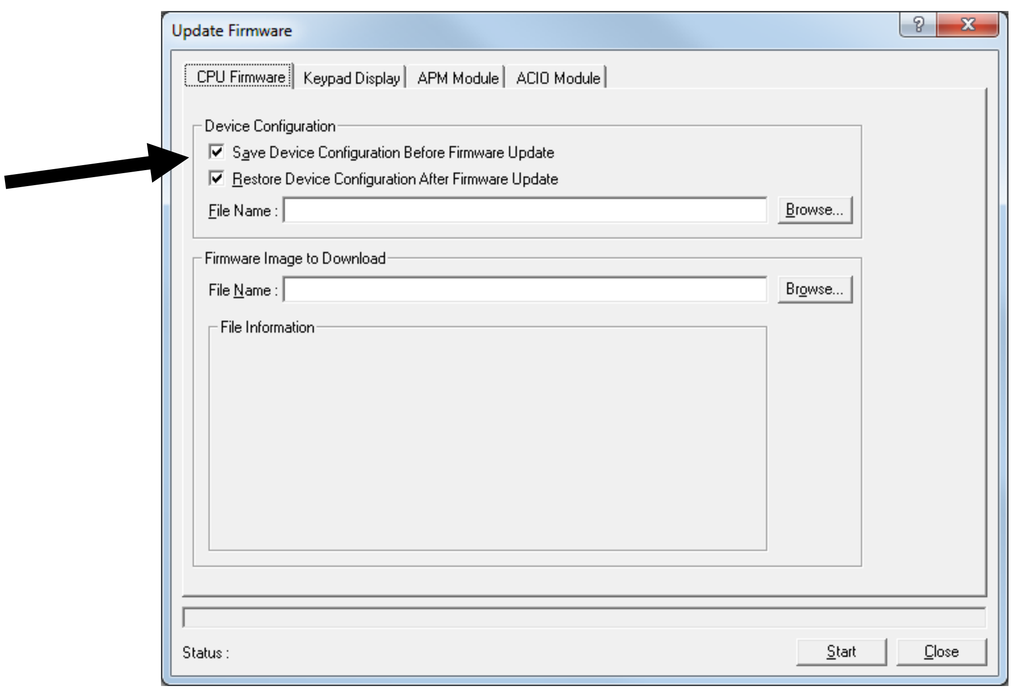


Figure 10-2. Update Firmware

10.1.1 CPU Firmware Tab

Use the Update Firmware tab to update the ROC's internal software ("firmware") that is stored in the CPU module's flash ROM.

Notes:

- This option does not update the ROCLINK 800 software.
- Firmware cannot be updated over an Ethernet connection.

Caution **During the update, this option disables measurement and control. It is a good practice to preserve the contents of the event and alarm logs (saved to a file) BEFORE you update any firmware. You CANNOT reload event logs or alarm logs.**

1. Create a backup copy of the firmware update disk or download the firmware file from the Remote Automation Solutions website (*http:// www.EmersonProcess.com/Remote*).
2. Read the README text file included with the firmware update.
3. Select **Utilities > Update Firmware**. The Update Firmware screen displays.

   Note: By default, the system selects the Device Configuration options **Save Device Configuration Before Firmware Update** and **Restore Device Configuration After Firmware Update.** This saves your current configuration, calibration, communication settings, user displays and FSTs to the file name you specify.

4. Click **Browse** to select or specify a file name the system uses to save and restore the system configuration file. The default file location is C:\Program Files\ROCLINK800. The default file extension is **.800**.

   Note: You can also save the configuration to flash memory using the **Save Configuration** button on the Flags screen **(ROC > Flags > Save Configuration)**.

5. In the Firmware Image to Download frame, click **Browse** to specify the location of the update firmware code.

   Note: The ROC800-Series uses the file extension ***.dli**. You can obtain firmware updates either from your factory representative or from the Remote Automation Solution SupportNet website (*http://www.emersonprocess.com/remote/support/support_login.html*). Regardless of source, you must store the firmware update files on your PC **before** you can apply them.

6. Once you select a firmware upgrade, ROCLINK 800 completes the lower portion of the Firmware Image to Download frame with information related to that upgrade. Review the information to make sure you want to apply that upgrade.

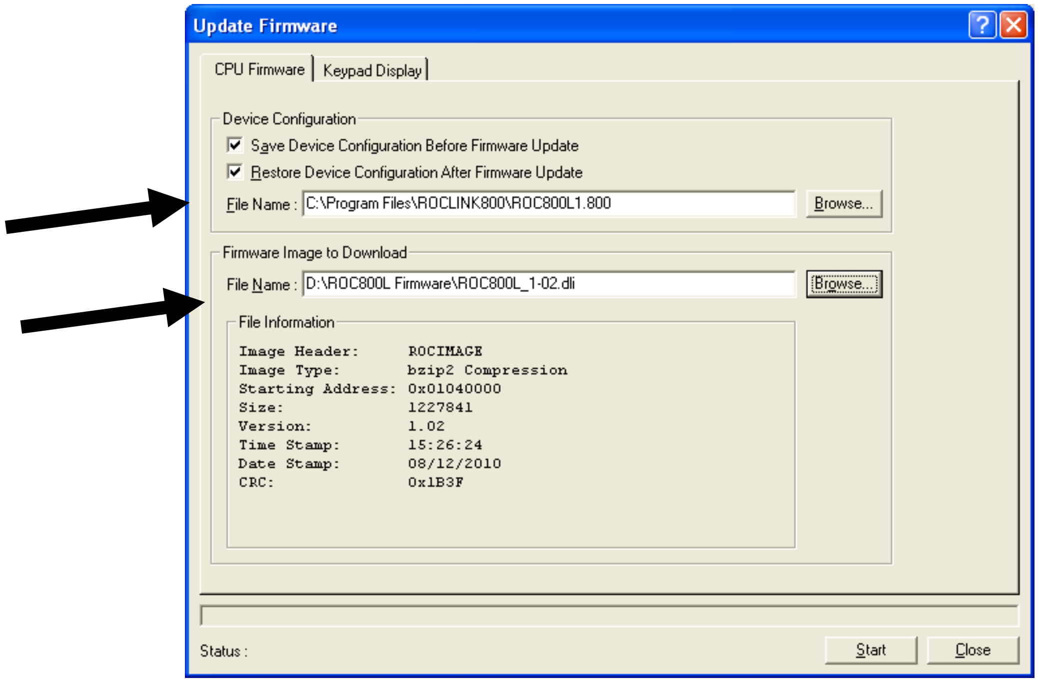


Figure 10-3. Update Firmware – CPU Firmware tab

7. Click **Start**. The system displays a confirmation dialog box.
8. Click **Yes** to confirm the update.

Note: The loading process typically takes several minutes. Do **not** disturb the ROC during this time.

When firmware load completes, a dialog box displays.

Figure 10-4. Firmware update complete .

9. Click **OK** to accept the dialog box.

ROCLINK 800 automatically loads the configuration files into the ROC (if you selected the Restore Device Configuration option) and records the actions in the event log.

When the backup reload completes, a "Reconnect to Device Completed" message displays in the Status field at the bottom of the Update Firmware screen. ROCLINK 800 also adds an "Updated" flag to the information displayed in the Firmware Image to Download frame. You can also verify the upgrade on the Device Information screen (**ROC** > **Information** > **Revision Info**).

10. If you saved the configuration to flash memory, ROCLINK 800 performs a cold start to reload the configuration.

Note: If you selected the **Restore Device Configuration After Firmware Update** option on the Update Firmware screen, this step is not required.

11. Check the configuration and FSTs. If they are not correct, reload them (using **File > Download**) from the files you created in Step 4.

12. Save the configuration (using **ROC > Flags > Save Configuration**) to permanent memory.

The **Utilities > Update Firmware > CPU Firmware** tab initially displays the CPU tab. Use this tab to view the currently installed firmware version, save a current configuration before downloading a new configuration, download a new firmware image, and restore a configuration after updating the firmware.

10.1.2 Additional Update Firmware Tabs

Depending on the configuration of your ROC800L, one or more additional tabs may display on the Update Firmware screen. These additional tabs enable you to update the firmware for the selected hardware. The additional tabs may include:

- **ACIO Module** – Updates the firmware for the Alternating Current I/O (ACIO) module.
- **APM Module** – Updates the firmware for the Advanced Pulse Module (APM).
- **CPU Backplane** – Updates the firmware for the ROC827 CPU backplane.
- **Expanded Backplane** – Updates the firmware for the ROC827 expanded backplane.
- **Keypad Display** – Updates the firmware for the optional Keypad Display.
- **MVS Module** – Updates the firmware for the optional Multi-Variable Sensor module.

The process for updating firmware for these additional ROC800 components is the same as the process for updating the CPU firmware. However, the additional Update Firmware screens identify the firmware level currently installed and monitor the available flash space remaining:

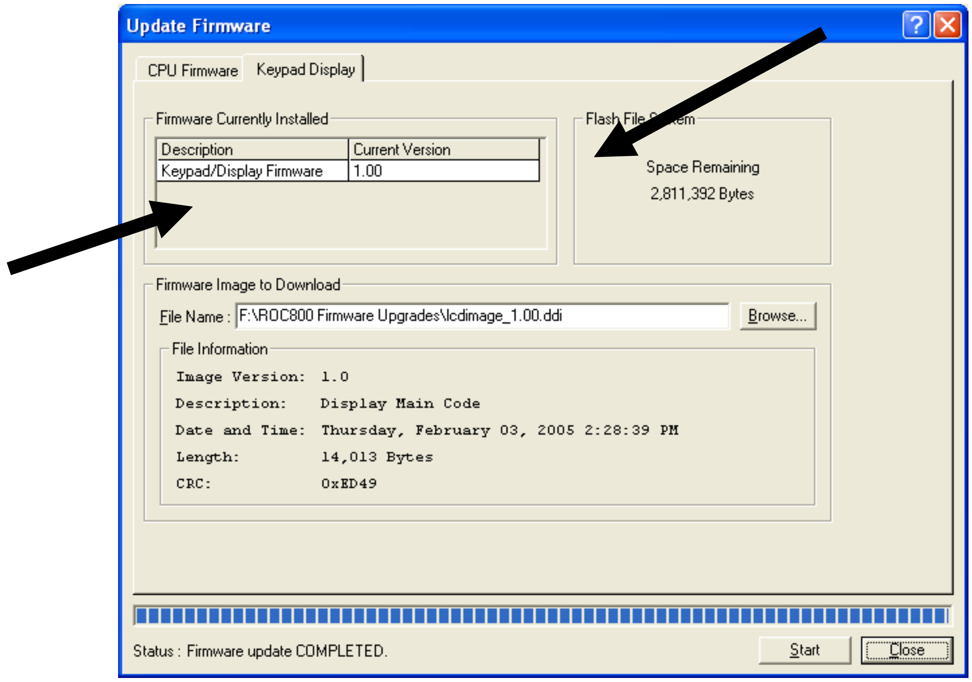


Figure 10-5. Update Firmware Example

Note: The upgrade file may have either a **.dli** or a **.ddi** file type. This is normal.

10.2 License Key Administrator

Use the License Key Administrator screen to view and manage information on any software licenses currently installed on the ROC 800-Series. Some applications require that you install a license in the CPU to run the application. These licenses are typically housed on a license key, which you insert in a specific location on the CPU (see *License Keys* in *Chapter 2* of the *ROC800-Series Remote Operations Controller Instruction Manual* (Form A6175).

Select **Utilities** > **License Key Administrator**. The License Key Administrator screen displays.

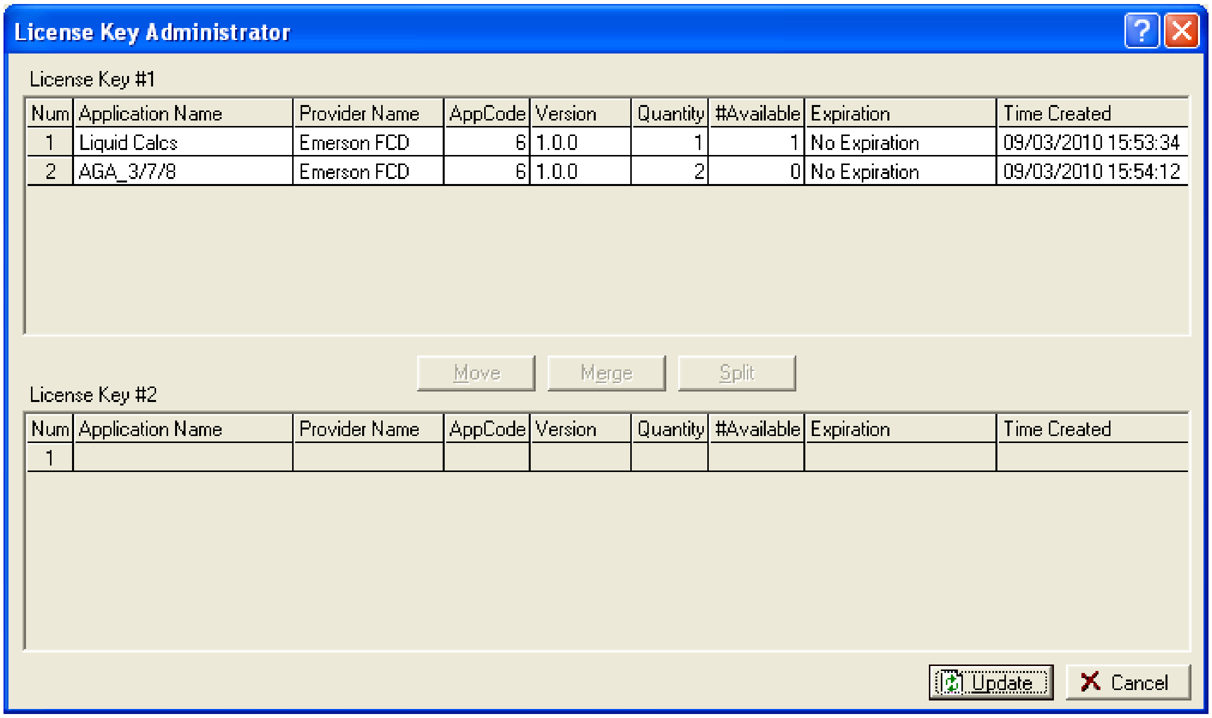


Figure 10-6. License Key Administrator

A ROC8000-Series CPU can contain up to two license keys. The upper and lower portions of this screen indicate whether keys are installed and what licenses are present. *Figure 10-6* shows that the key installed in slot 1 contains a Liquid Calcs license and an AGA license.

10.2.1 Managing Licenses

You can also use this screen to manage licenses. For example, your organization may have obtained AGA licenses for your ROC800L. Place the license key with the AGA licenses in an empty slot in the CPU and use this utility to transfer a license to the ROC800L.

1. Select **Utilities** > **License Key Administrator**. The License Key Administrator screen displays.

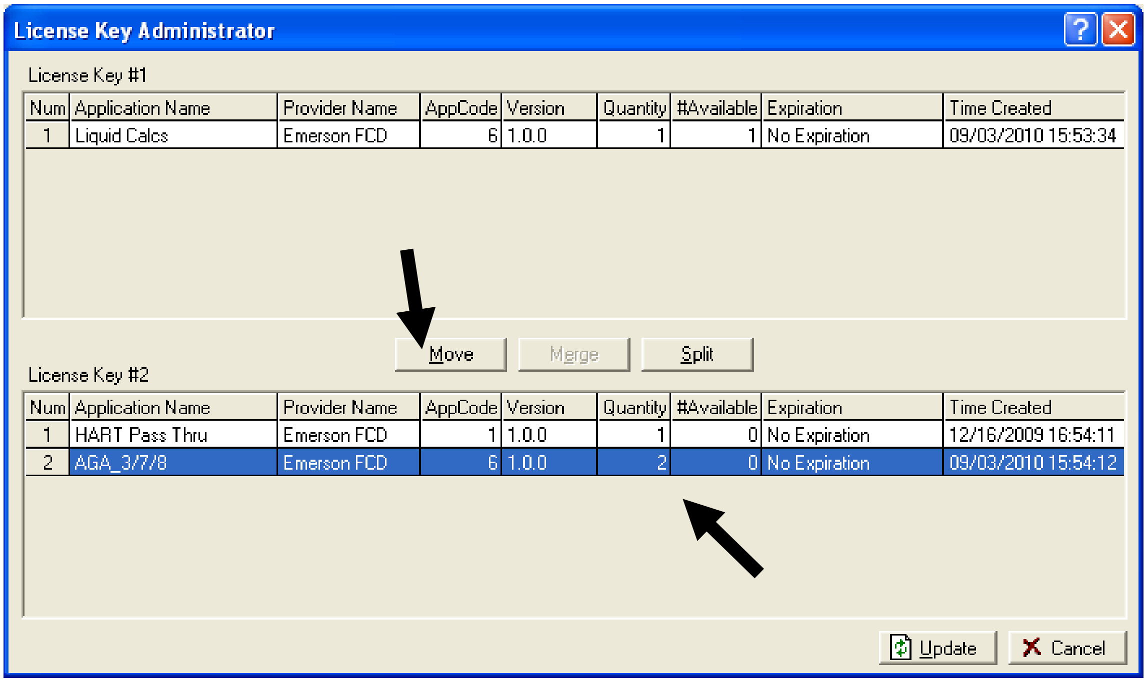


Figure 10-7. License Key Administrator

The AGA licenses are on the second license key. To move an AGA license to key #1:

2. Select the license to move. The **Move** and **Split** buttons activate. Note that the Quantity field indicates there are two AGA licenses.
3. Click **Split.** The AGA license splits into two individual licenses.

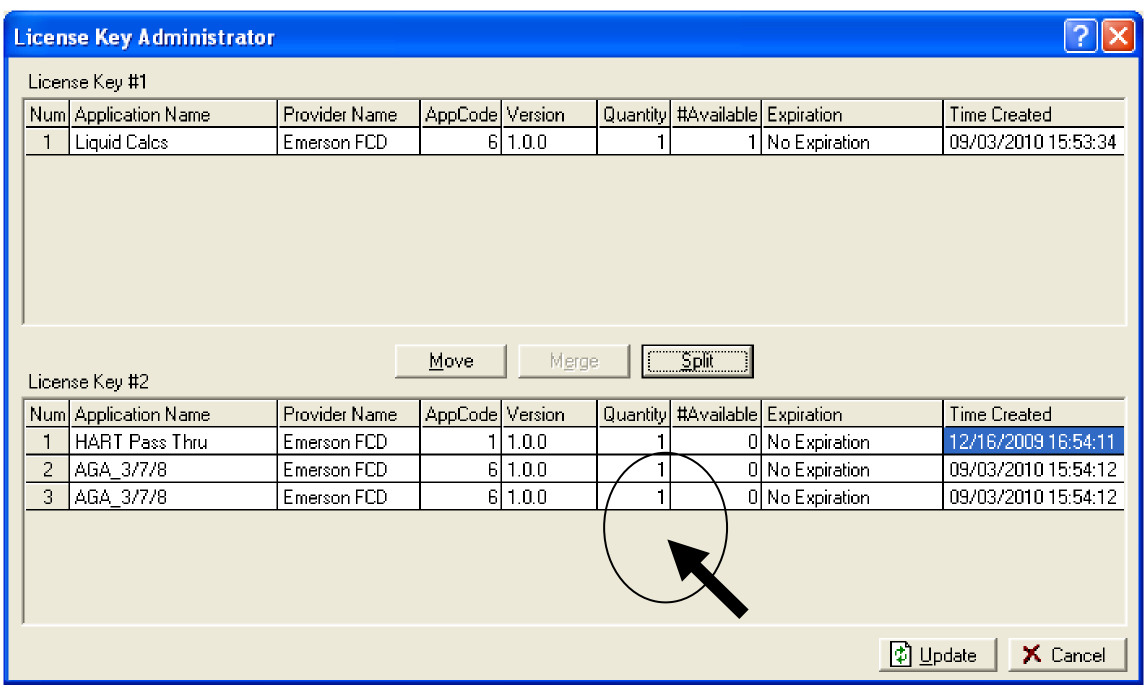


Figure 10-8. Split Licenses

4. Select one of the AGA licenses. The **Move** and **Merge** buttons activate, indicating available actions.
5. Click **Move**. The selected AGA license moves to key #1.

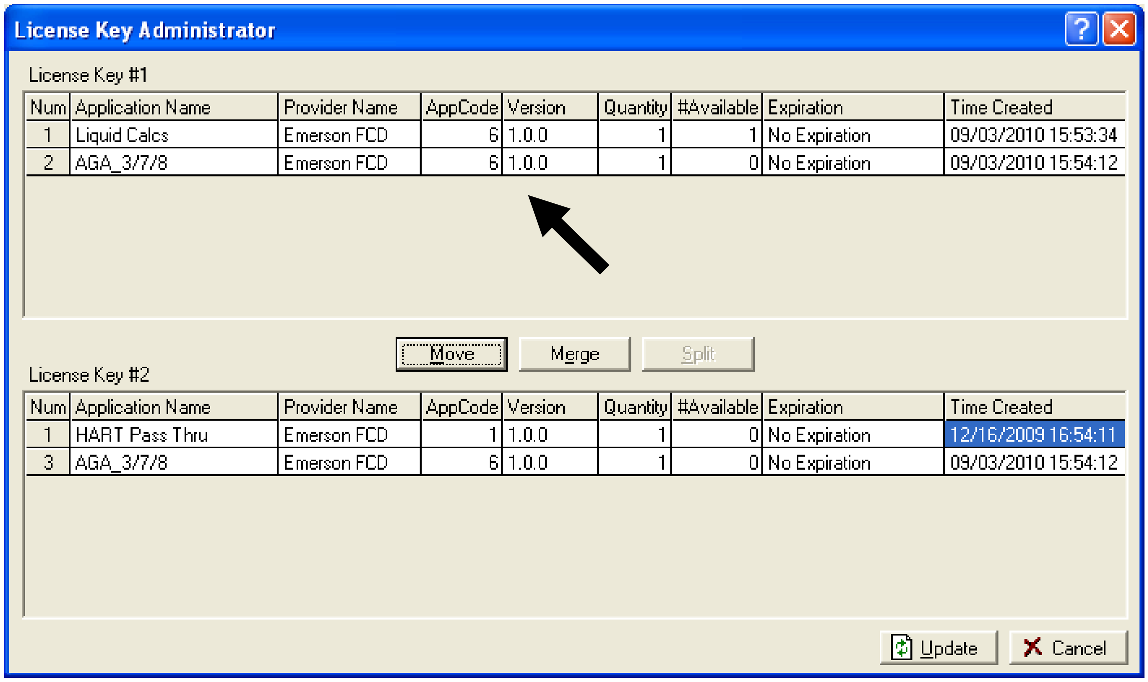


Figure 10-9. Moved License

6. You can now remove the second license key or leave it in place, as your organization requires.

10.3 Converting EFM Report Files

Note: This section applies **only** to gas applications for the ROC800L.

The **Convert EFM File** option enables you to convert an EFM report file (.**EFM** database file) to the report file format you select. ROCLINK 800 version 1.60 or greater supports batch conversion of EFM files to PGAS and Flow-Cal formats.

To convert an EFM file:

1. Select **Utilities > Convert EFM File**. The Convert EFM File screen displays.

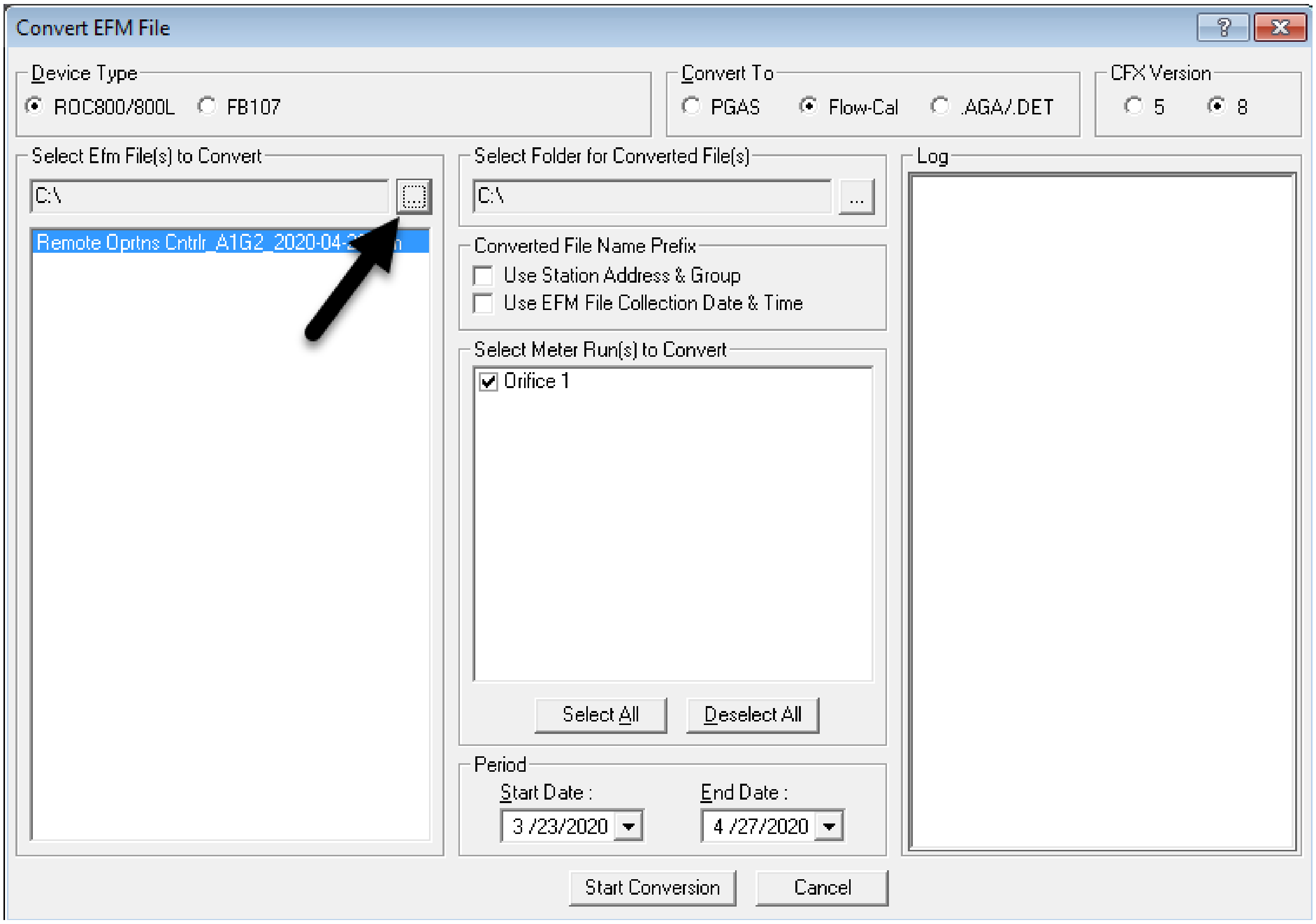


Figure 10-10. Convert EFM File

2. Select **ROC800** as the Device Type.

3. Select a conversion format:

- **PGAS** provides .EVT, .ANA, .ARM, and .VOL file formats (for EMS Pipeline Services)
- **Flow-Cal** provides the .CFX file format (for Coastal Flow Measurement, Inc.)

Note:

- If you select Flow-Cal, select the CFX version the system uses for the conversion in the **CFX Version** field.
- You **must** configure device history in order to generate a CFX file that will successfully import into the Flow-Cal software.

- **.AGA/.DET** provides standard history points for the meter run.

Note: The **Converted File Name Prefix**, **Select Meter Run(s) to Convert**, and **Period** frames are not valid for this selection.

4. Click the **Browse** button to select a file to convert. The Select EFM Files to Convert screen displays.

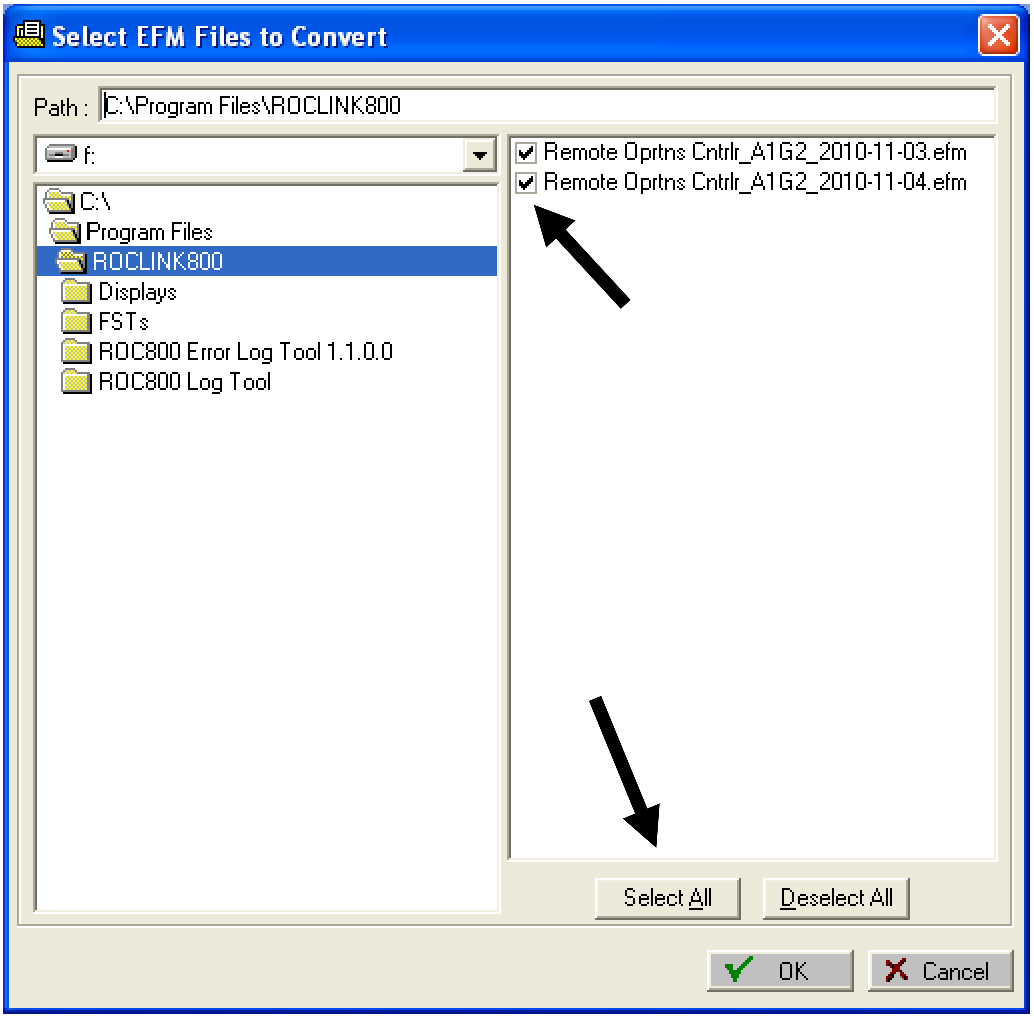


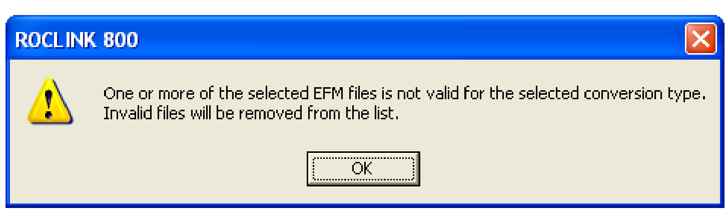
Figure 10-11. Select EFM File

By default, the screen displays the ROCLINK800 folder and selects any .EFM files in that folder. If the .EFM files you want to convert are located in another folder, navigate to that folder and select the appropriate files.

5. Select the files to convert. You can individually select files using the checkboxes or click **Select All** to select all of the EFM files in the folder. (Click **Deselect All** to unselect all files in the folder.)

6. Click **OK**.

ROCLINK 800 verifies that each file is a valid file type. If any file is invalid, a notification dialog displays.



If this dialog displays, click **OK** to continue. ROCLINK 800 removes the invalid file(s) and notes the action in the Log frame on the Convert EFM File screen.

7. Select the **Converted File Name(s) Prefix** options to determine the converted file name format.
   - **Use Station Address & Group** – Includes the Station Address and Group in the file name.
   - **Use Current Data & Time** – Includes the current data and time in the file name.
8. Select meter runs in the **Select Meter Run(s) to Convert** frame.
9. Select the **Period Start Date** and **End Date** to define the time frame for which the conversion of data is performed. The Start Date is automatically post dated 35 days prior to the end date. The End Date defaults to the current date. You can manually enter a date or click the ▼ option to display a calendar and make your date selections.
10. Click **Start Conversion**.
11. Click **OK** when the conversion completes.

Note: If you click **Cancel** any time during the conversion, you must click **OK** when prompted to acknowledge that you've canceled the conversion process.

10.3.1 Flow-Cal (.CFX) Conversions

Selecting Flow-Cal performs conversion of EFM files to the Flow-Cal (Coastal Flow) .CFX format. For additional information on the Flow-Cal and the .CFX file format, refer to the documentation provided with your Flow-Cal product and the web site *www.flowcal.com*.

Note: You **must** configure device history in order to generate a CFX file that will successfully import into the Flow-Cal software.

10.3.2 PGAS Conversions

The PGAS exports the EFM file data to four files. The PGAS event file (.**EVT**) lists all of the events in the Event Log that are related in any way to a Meter Run. The exception is Gas Quality events that are included in the PGAS quality file (.**ANA**).

PGAS Gas Quality Files

All Gas Quality data converts to an .ANA file. The Gas Quality data is retrieved from the ROC in the form of Parameter change events to the Gas Quality Parameters if the Gas Quality type (Point Type 112, Parameter 24) is configured for entered values (0). The Event Log scans for Gas Quality events and any group of unique Gas Quality events that occur within a five minute period appear as one record. Use the date and time stamp for the latest event for the SAMPLE_DATE.

The Gas Quality data is retrieved from the ROC in the form of hourly historical averages of the Gas Quality Parameters if the Gas Quality (Point Type 112, Parameter 24) is configured for live values (1).

#	Column Name	Data Type	Description
1	METER_ID	char(16)	Identification number for the measurement point in the field. Tag of the orifice or turbine point associated with the alarm.
2	SAMPLE_DATE	datetime	Actual date and time of the sample in mm/dd/yyyy hh:mm format and is the date and time of the event excluding the seconds.
3	EFFECTIVE_DATE	datetime	Optional date and time for which the sample should be considered "effective" in mm/dd/yyyy hh:mm format. Not used for the Gas Quality events.
4	GAS_SAMPLE_TYPE	char(2)	Sample Type: CO = Continuous if the Gas Quality type in the ROC (Point Type 112, Parameter 24) is equal to 1 for live Gas Quality values. SP = Spot if the Gas Quality type is equal to 0 for entered Gas Quality values.
5	SAMPLE_ID	char(2)	Not used by PGAS or ROC (informational only).
6	METHANE_MOL	float	ROC Point Type 112 (Station), Parameter 28
7	ETHANE_MOL	float	ROC Point Type 112 (Station), Parameter 29
8	PROPANE_MOL	float	ROC Point Type 112 (Station), Parameter 30
9	IBUTANE_MOL	float	ROC Point Type 112 (Station), Parameter 32
10	NBUTANE_MOL	float	ROC Point Type 112 (Station), Parameter 31
11	IPENTANE_MOL	float	ROC Point Type 112 (Station), Parameter 34
12	NPENTANE_MOL	float	ROC Point Type 112 (Station), Parameter 33
13	NHEXANE_MOL	float	ROC Point Type 112 (Station), Parameter 35
14	NHEPTANE_MOL	float	ROC Point Type 112 (Station), Parameter 36
15	NOCTANE_MOL	float	ROC Point Type 112 (Station), Parameter 37
16	NNONANE_MOL	float	ROC Point Type 112 (Station), Parameter 38
17	NDECANE_MOL	float	ROC Point Type 112 (Station), Parameter 39
18	N2_MOL	float	ROC Point Type 112 (Station), Parameter 26
19	CO2_MOL	float	ROC Point Type 112 (Station), Parameter 27
20	H2O_MOL	float	ROC Point Type 112 (Station), Parameter 41
21	H2S_MOL	float	ROC Point Type 112 (Station), Parameter 40
22	H2_MOL	float	ROC Point Type 112 (Station), Parameter 45
23	CO_MOL	float	ROC Point Type 112 (Station), Parameter 44
24	O2_MOL	float	ROC Point Type 112 (Station), Parameter 43
25	HE_MOL	float	ROC Point Type 112 (Station), Parameter 42
26	AR_MOL	float	ROC Point Type 112 (Station), Parameter 62
27	GRAVITY	float	ROC Point Type 112 (Station), Parameter 23
28	AMPLE_PRESSURE_BASE	float	Pressure base at which the BTU value was measured; however, this is left blank as the ROC does not include a Parameter.
29	DRY_ENERGY_FACTOR	float	This field is for heating value (ROC Point Type 112, Parameter 22) if "Dry" (0) is selected for the Heating Value Basis (ROC Point Type 112, Parameter 21).

#	Column Name	Data Type	Description
30	SAT_ENERGY_FACTOR	float	This field is for heating value (ROC Point Type 112, Parameter 22) if "Wet" (1) is selected for the Heating Value Basis (ROC Point Type 112, Parameter 21).
31	AS_DELIVERED_ENERGY_FACTOR	float	This field is for heating value (ROC Point Type 112, Parameter 22) if "As Delivered" (2) is selected for the Heating Value Basis ROC Point Type 112, Parameter 21).
32 to 53	N/A	N/A	These fields are not used by the ROC and will be left blank.

The PGAS system does not support Stations. All Gas Quality data is part of the Station point in the ROC, all .ANA files duplicate for each Meter Run in the Station, the only difference being the METER_IDs.

PGAS Alarm Files

All alarms in the Alarm Log (.**ARM**) that are related in anyway to a Meter Run are included in the PGAS .ARM file. These alarms include High, Low, and No Flow alarms for Meter Run and Station Flows, Low, Low Low, High, High High, Rate, Manual Mode, and Point Fail alarms for points configured as inputs to meter points, including communication alarms for an MVS points configured as inputs to a meter point. Station alarms duplicate for each Meter included in the Station.

#	Column Name	Data Type	Description
1	METER_ID	char(16)	Identification number for the measurement point in the field. Tag of the orifice or turbine point associated with the alarm.
2	ALARM_DATE	datetime	Date and time the alarm occurred in mm/dd/yyyy hh:mm:ss format.
3	PRIORITY_LEVEL	U8	This represents the importance of the event: 0 = Alarm will not affect volume calculations. 1 = Alarm will affect volume calculations.
4	ALARM_TEXT	varchar(64)	Text description of the alarm.
5	TRIGGER_VALUE	char(16)	Value that triggered the alarm.
6	ALARM_VALUE	char(16)	Alarm Value.

PGAS Event Files

PGAS Event Files (.**EVT**) detail meter information.

#	Column Name	Data Type	Description
1	METER_ID	char(16)	Identification number for the measurement point in the field. This must be the tag id of the orifice or turbine point associated with the event.
2	EVENT_DATE	Datetime	Date and time the event occurred in mm/dd/yyyy hh:mm:ss format.

#	Column Name	Data Type	Description
3	METER_CALC_COLUMN_NAME	char(32)	Actual column name within the METER_CALC table. This information is only required for events that are to trigger record insertion into the METER_CALC table.
4	NEW_VALUE	char(16)	New value to be used in the METER_CALC record. This is the ASCII representation of the number.
5	OLD_VALUE	char(16)	Old value to be used in the METER_CALC record. This is the ASCII representation of the number. The event name, new value, and old value appear in the Comment for the new METER_CALC record.
6	PRIORITY_LEVEL	U8	This represents the importance of the event: 0 = Alarm will not affect volume calculations. 1 = Alarm will affect volume calculations. This is redundant. If METER_CALC_COLUMN_NAME exists for the event, the PRIORITY_LEVEL will be a 1, if not, it will be a 0.
7	DESCRIPTION	varchar(64)	Text description of the event.
8	COMMENT	varchar(100)	Comment (optional)

PGAS Meter Event-related Files

Meter related events include changes to Meter and Station Points, Parameters, and Calibration Verification events for points configured as inputs to meter points, changes to the number of active Stations, orifice, or turbine points, changes to the clock, system events, and Parameter change events for history points when the old or new point being archived is a Meter or Station point.

Events such as warm starts, cold starts, system initializations, and clock changes duplicate for every meter run in the unit. Station Parameter change events duplicate for every meter run in that Station. Events used by the PGAS system to recalculate meter values are indicated by including a METER_CALC_COLUMN_NAME in the PGAS event record. The Point Types and Parameters map to PGAS METER_CALC events.

Description	METER_CALC_COLUMN_NAME	Data Type	Point Types	Parameters
Orifice Diameter	ORIFICE_SIZE	Float	Orifice Config (113)	15
Pipe Diameter	TUBE_DIAMETER	Float	Orifice Config (113)	12

Description	METER_CALC_COLUMN_NAME	Data Type	Point Types	Parameters
Base Temperature	TEMP_BASE	Float	Station (112)	14
Base Pressure	CONTRACT_PRES_BASE	Float	Station (112)	13
Atm Pressure	SITE_ATMOS_PRES	Float	Station (112)	16
Orifice Material	PLATE_MATERIAL	U8	Orifice Config (113)	17
Pipe Material	TUBE_MATERIAL	U8	Orifice Config (113)	14
Tap Location	STAT_TAP_LOCA	U8	Orifice Config (113)	3
Diff Press Span[1]	DIFF_HI_RANGE	Float	Orifice Config (113)	25
Static Press Span[2]	STATIC_HI_RANGE	Float	Orifice Config (113) or Turbine Config (115)	27 or 15
Temp 0% EU[3]	TEMP_LO_RANGE	Float	Orifice Config (113) or Turbine Config (115)	29 or 17
Temp Span[3]	TEMP_HI_RANGE	Float	Orifice Config (113) or Turbine Config (115)	29 or 17

[1] The ROC Point Type and Parameter listed for this entry contains a 3-byte value that is the Point Type, Point Number, and Parameter to use for the differential pressure value. If the Point Type of the differential pressure input is MVS (108) or analog input (103), the differential pressure span will be the same Point Type and Point Number as the differential pressure value and (coincidentally) the Parameter will be 17 for both of these Point Types. If the Point Type is any other type, a span will not be available.

[2] The ROC Point Type and Parameter listed for this entry contains a 3-byte value that is the Point Type, Point Number, and Parameter to use for the static pressure value. If the Point Type of the static pressure input is MVS (108), the static pressure span will be the same Point Type and Point Number as the static pressure value and the Parameter will be 33. If the Point Type of the static pressure input is analog input (103), the static pressure span will be the same Point Type and Point Number as the static pressure value and the Parameter will be 17. If the Point Type is any other type, a span will not be available.

[3] The ROC Point Type and Parameter listed for this entry contains a 3-byte value that is the Point Type, Point Number, and Parameter to use for the temperature value. If the Point Type of the temperature input is MVS (108), analog input (103), or RTD (106), the temperature zero and span will be the same Point Type and Point Number as the temperature value and the Parameters will be as follows:

Point Type	Zero Parameter	Span Parameter
MVS (108)	44	48
AIN (103)	13	17
RTD (106)	9	13

PGAS Volume Files

The PGAS .**VOL** file contains the hourly volume data related to a Meter Run including the Meter Run ID, report information, general Meter Flow Parameters, and Calculated Factors. The Archive Type and TLP of the History Points expected for the hourly volume report display.

The PGAS .**VOL** file contains the hourly volume data related to a Meter Run including the Meter Run ID, report information, general Meter Flow Parameters, and Calculated Factors. The Archive Type and TLP of the History Points expected for the hourly volume report display.

PGAS Volume Files Format

The PGAS .**VOL** file contains the hourly volume data related to a Meter Run including the Meter Run ID, report information, general Meter Flow Parameters, and Calculated Factors.

The Archive Type and TLP of the History Points expected for the hourly volume report display.

#	Column Name	Data Type	Description
1	METER_ID	char(16)	Identification number for the measurement point in the field. Tag of the orifice or turbine point associated with the alarm.
2	PRODUCATION_DATE_START	datetime	Start date and time of the record in mm/dd/yyyy hh:mm format. Since date and time stamps of ROC history are for the end of the record, this will be the date and time stamp of the previous record.
3	PRODUCTION_DATE_END	datetime	Ending date and time of the record in mm/dd/yyyy hh:mm format. This will be the history date and time stamp from the ROC.
4	FLOW_TIME_MINUTES	float	Hourly value for the meter run flow minutes.
5	EFM_VOLUME	float	Hourly accumulation of volume for the meter run in MCF.
6	EFM_ENERGY	float	Hourly accumulation of energy for the meter run in MMBTU.
7	FLOW_EXTN	float	Hourly value for hwPf (Orifice only).
8	DIFF_PRESS	float	Hourly average of differential pressure in Inches ^{H2O} (Orifice only).
9	STAT_PRESS	float	Hourly average of static pressure in PSI.
10	FLOW_TEMP	float	Hourly average of the flowing temperature in Deg F.
11	ROTARY_CURR_UNCO_VOL	float	Hourly accumulation of uncorrected volume at flowing conditions in MCF (Turbine only).
12	ROTARY_PREV_UNCO_VOL	float	N/A
13	ROTARY_AVG_FREQ	float	Hourly accumulation of raw pulses (Turbine only).
14	C_PRIME	float	Hourly average of the multiplier value (Orifice or Turbine).
15	FA	float	N/A
16	FB	float	N/A
17	FG	float	N/A
18	FPB	float	N/A
19	FPM	float	N/A
20	FPV	float	N/A
21	FR	float	N/A
22	FTB	float	N/A
23	FTF	float	N/A
24	Y	float	N/A
25	F_MASS	float	N/A
26	C_D_FT	float	N/A
27	RHO_T_P	float	N/A
28	RHO_B_GAS	float	N/A
29	EFM_N2_MOL	float	N/A
30	EFM_CO2_MOL	float	N/A
31	EFM_GRAVITY	float	N/A
32	EFM_ENERGY_FACTOR	float	N/A
33	DP_MAN_OVR	U8	N/A

#	Column Name	Data Type	Description
34	DP_LO_ALM	U8	N/A
35	DP_HI_ALM	U8	N/A
36	DP_TX_FAIL	U8	N/A
37	SP_MAN_OVR	U8	N/A
38	SP_LO_ALM	U8	N/A
39	SP_HI_ALM	U8	N/A
40	SP_TX_FAIL	U8	N/A
41	TEMP_MAN_OVR	U8	N/A
42	TEMP_LO_ALM	U8	N/A
43	TEMP_HI_ALM	U8	N/A
44	TEMP_TX_FAIL	U8	N/A
45	VOL_MAN_OVR	U8	N/A
46	VOL_LO_ALM	U8	N/A
47	VOL_HI_ALM	U8	N/A
48	VOL_TX_FAIL	U8	N/A
49	N/A	float	N/A
50	N/A	float	N/A
51	COMMENT	char(100)	N/A
52	EFM_PRESSURE_BASE	float	N/A
53	BACK_FLOW	float	N/A
54	LITHIUM_ALARM_FLAG	U8	N/A
55	BATTERY_VOLTAGE	U8	N/A
56	AVG_METHANE	float	N/A
57	AVG_ETHANE	float	N/A
58	AVG_PROPANE	float	N/A
59	AVG_H2O	float	N/A
60	AVG_H2S	float	N/A
61	AVG_H2	float	N/A
62	AVG_CO	float	N/A
63	AVG_O2	float	N/A
64	AVG_IBUTANE	float	N/A
65	AVG_NBUTANE	float	N/A
66	AVG_IPENTANE	float	N/A
67	AVG_NPENTANE	float	N/A
68	AVG_NHEXANE	float	N/A
69	AVG_NHEPTANE	float	N/A
70	AVG_NOCTANE	float	N/A
71	AVG_NNONANE	float	N/A
72	AVG_NDECANE	float	N/A
73	AVG_HELIUM	float	N/A
74	AVG_ARGON	float	N/A

Note: For additional information on the PGAS and the .EVT, .ANA, .ARM, and .VOL file formats, refer to the documentation provided with your PGAS or the web site *www.pgas.com*.

PGAS Volume Files For Orifice Meter

The PGAS **.VOL** file contains the hourly volume data related to a Meter Run including the Meter Run ID, report information, general Meter Flow Parameters, and Calculated Factors.

The Archive Type and TLP of the History Points expected for the hourly volume report display.

Description	Archive Type	Averaging / Rate Type	Point Type	Parameter
Flowing Minutes	Totalize (134)	None (0)	Orifice Values (114)	Minutes Accumulated (28)
Differential Pressure	Average (128)	Flow Dependent Linear (1)	Orifice Configuration (113)	DP (26)
	Average (128)	Flow Dependent Formulaic (2)	Orifice Configuration (113)	DP (26)
	Average (128)	Flow Weighted Linear (3)	Orifice Configuration (113)	DP (26)
	Average (128)	Flow Weighted Formulaic (4)	Orifice Configuration (113)	DP (26)
Static Pressure	Average (128)	Flow Dependent Linear (1)	Orifice Configuration (113)	SP (28)
	Average (128)	Flow Dependent Formulaic (2)	Orifice Configuration (113)	SP (28)
	Average (128)	Flow Weighted Linear (3)	Orifice Configuration (113)	SP (28)
	Average (128)	Flow Weighted Formulaic (4)	Orifice Configuration (113)	SP (28)
Temperature	Average (128)	Flow Dependent Linear (1)	Orifice Configuration (113)	TMP (30)
	Average (128)	Flow Dependent Formulaic (2)	Orifice Configuration (113)	TMP (30)
	Average (128)	Flow Weighted Linear (3)	Orifice Configuration (113)	TMP (30)
	Average (128)	Flow Weighted Formulaic (4)	Orifice Configuration (113)	TMP (30)
Pressure Extension	Average (128)	Flow Dependent Linear (1)	Orifice Values (114)	Pressure Extension (4)
	Average (128)	Flow Dependent Formulaic (2)	Orifice Values (114)	Pressure Extension (4)
	Average (128)	Flow Weighted Linear (3)	Orifice Values (114)	Pressure Extension (4)
	Average (128)	Flow Weighted Formulaic (4)	Orifice Values (114)	Pressure Extension (4)
C Prime	Average (128)	Flow Dependent Linear (1)	Orifice Values (114)	Multiplier Value (12)
	Average (128)	Flow Dependent Formulaic (2)	Orifice Values (114)	Multiplier Value (12)

Description	Archive Type	Averaging / Rate Type	Point Type	Parameter
	Average (128)	Flow Weighted Linear (3)	Orifice Values (114)	Multiplier Value (12)
	Average (128)	Flow Weighted Formulaic (4)	Orifice Values (114)	Multiplier Value (12)
Volume	Totalize (134)	None (0)	Orifice Values (114)	Flow Accumulated (23)
	Accumulate (129)	Per Day (13)	Orifice Values (114)	Flow Rate Per Day (0)
	Accumulate (129)	Per Hour (12)	Orifice Values (114)	Flow Rate Per Hour (2)
Energy	Totalize (134)	None (0)	Orifice Values (114)	Energy Accumulated (33)
	Accumulate (129)	Per Day (13)	Orifice Values (114)	Energy Rate Per Day (1)
	Accumulate (129)	Per Hour (12)	Orifice Values (114)	Energy Rate Per Hour (3)

PGAS Volume Files For Turbine Meter

The PGAS .**VOL** file contains the hourly volume data related to a Meter Run including the Meter Run ID, report information, general Meter Flow Parameters, and Calculated Factors.

The Archive Type and TLP of the History Points expected for the hourly volume report display.

Description	Archive Type	Averaging / Rate Type	Point Type	Parameter
Flowing Minutes	Totalize (134)	None (0)	Turbine Values (116)	Minutes Accumulated (21)
Raw Pulses	Totalize (134)	None (0)	Turbine Values (116)	Pulses Accumulated (9)
Static Pressure	Average (128)	Flow Dependent Linear (1)	Turbine Configuration (113)	SP (16)
	Average (128)	Flow Dependent Formulaic (2)	Turbine Configuration (113)	SP (16)
	Average (128)	Flow Weighted Linear (3)	Turbine Configuration (113)	SP (16)
	Average (128)	Flow Weighted Formulaic (4)	Turbine Configuration (113)	SP (16)
Temperature	Average (128)	Flow Dependent Linear (1)	Turbine Configuration (113)	TMP (18)
	Average (128)	Flow Dependent Formulaic (2)	Turbine Configuration (113)	TMP (18)
	Average (128)	Flow Weighted Linear (3)	Turbine Configuration (113)	TMP (18)
	Average (128)	Flow Weighted Formulaic (4)	Turbine Configuration (113)	TMP (18)

Description	Archive Type	Averaging / Rate Type	Point Type	Parameter
C Prime	Average (128)	Flow Dependent Linear (1)	Turbine Values (114)	Multiplier Value (12)
	Average (128)	Flow Dependent Formulaic (2)	Turbine Values (114)	Multiplier Value (12)
	Average (128)	Flow Weighted Linear (3)	Turbine Values (114)	Multiplier Value (12)
	Average (128)	Flow Weighted Formulaic (4)	Turbine Values (114)	Multiplier Value (12)
Uncorrected Volume	Totalize (134)	None (0)	Turbine Values (114)	Uncorrected Accumulated (31)
	Accumulate (129)	Per Hour (12)	Turbine Configuration (113)	Uncorrected Flow Rate (14)
Volume	Totalize (134)	None (0)	Turbine Values (114)	Flow Accumulated (16)
	Accumulate (129)	Per Day (13)	Turbine Values (114)	Flow Rate Per Day (0)
	Accumulate (129)	Per Hour (12)	Turbine Values (114)	Flow Rate Per Hour (2)
Energy	Totalize (134)	None (0)	Turbine Values (114)	Energy Accumulated (26)
	Accumulate (129)	Per Day (13)	Turbine Values (114)	Energy Rate Per Day (1)
	Accumulate (129)	Per Hour (12)	Turbine Values (114)	Energy Rate Per Hour (3)

10.4 User Program Administrator

User programs provide the ROC with extended functions and applications (such as gas chromatograph support or GOST calculations). Use this option to download, start, stop, and remove user programs.

Note: Extensive documentation covering configuration and usage information accompanies each user program.

Select **Utilities** > **User Program Administrator**. The User Program Administrator screen displays.

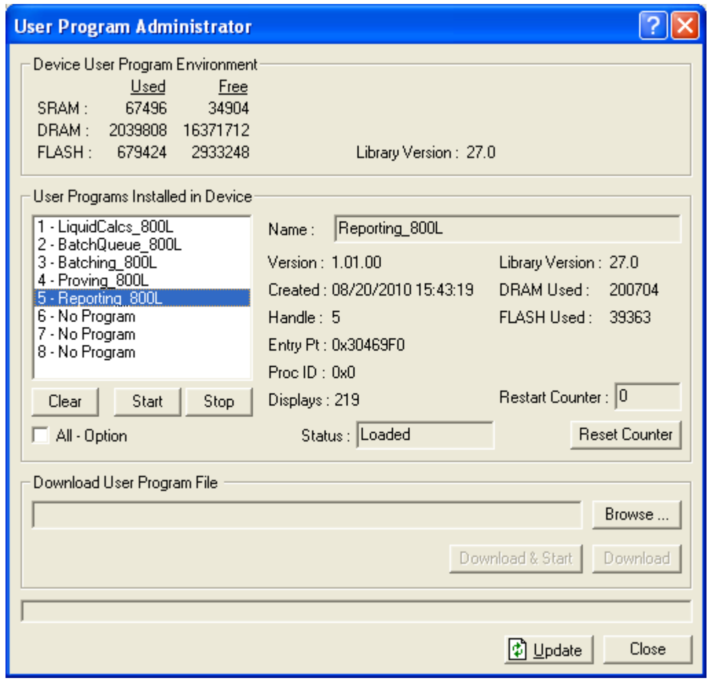


Figure 10-12. User Program Administrator

Field	Description	
Device User Program Environment	These **read-only** fields show the amount of used and available memory. The user program that you intend to load must be able to access the memory location.	
User Programs Installed in Device	Displays any currently installed user programs. If you select a currently installed program, the system completes the User Programs Installed in Device frame with information detailing specific information about that user program.	
Clear	Click to delete the selected user program from memory.	
Start	Click to start the selected user program.	
Stop	Click to stop the selected user program from running.	
All - Option	Select to perform the same action (Clear, Start, or Stop) on every user program.	
Status	This **read-only** field indicates the status of the selected program. Valid values are:	
	Empty	No program installed.
	Loaded	Program loaded but not running.
	Running	Program loaded and active.
	License Not Found	Program requires a license to operate.
Reset Counter	Click to clear the value that indicates how many times the user program has been restarted.	

Field	Description
Download User Program File	Identifies the program file to be downloaded to the ROC. Click **Browse** to locate the file you desire to download. When you select a user program file, the system completes the lower portion of the screen with configuration information detailing for the user program.
Download & Start	Click to download **and** start the user program running.
Download	Click **Download** to download but **not** start the user program. **Note:** If you download several programs, they may need to be started in a particular order. Use this button to download without starting the programs.
Update	Click to update values on the screen.
Close	Click to close the screen.

10.4.1 Downloading a User Program

The User Program Administrator screen enables you to download a user program to the ROC:

1. Select **Utilities > User Program Administrator**. The User Program Administrator screen displays.
2. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays.

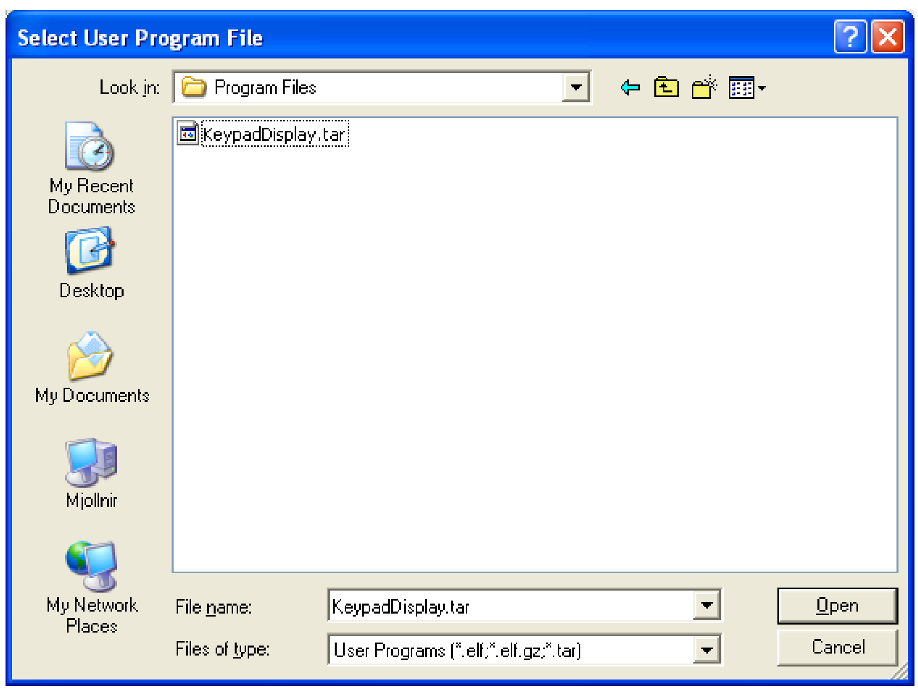


Figure 10-13. Select User Program File

Note: User program files are typically located in the Program Files folder on the distribution CD.

3. Select a file name to load and click **Open**. The User Program Administrator screen displays:

Select an **empty** program slot

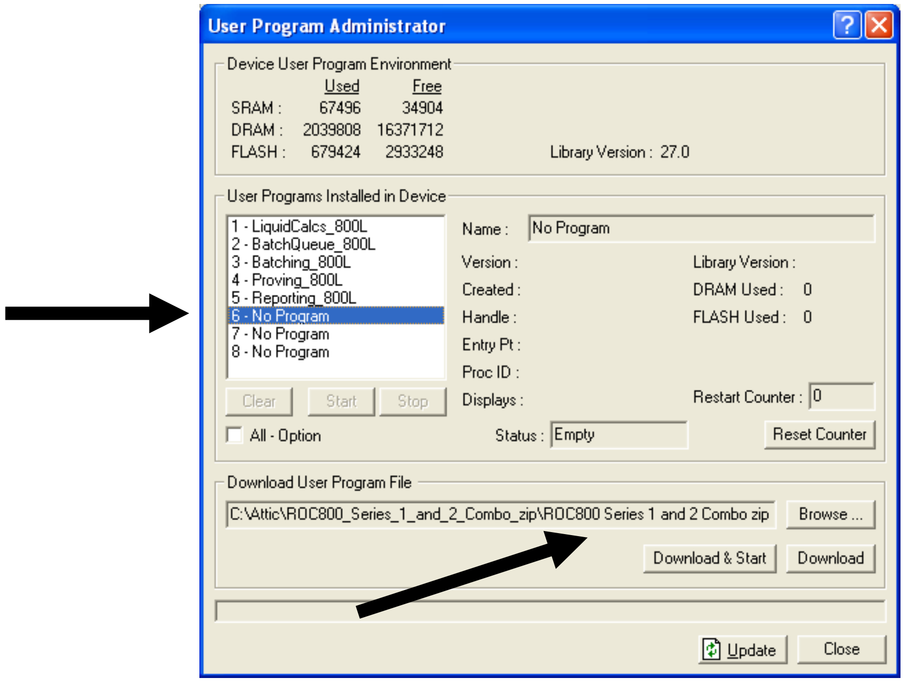


Figure 10-14. User Program Administrator

Note: The system adds the program file name to the Download User Program File field and activates the **Download & Start** and **Download** buttons.

⚠ **Caution** **As shown in *Figure 10-14*, select an empty program slot to install the user program BEFORE you click Download & Start or Download.**

4. Click **Download & Start** to download and automatically start the selected user program (or click **Download** to download the user program without starting it). A message dialog displays.

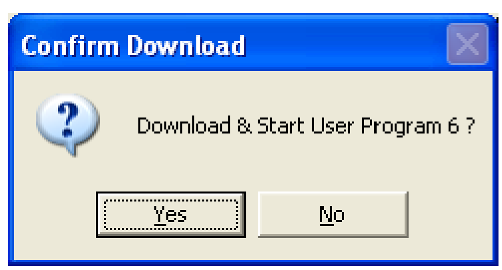


Figure 10-15. Confirm Download

5. Click **Yes** to begin the download. During the download, the program performs a warm start, creates an event in the Event Log, and—when the download completes—displays a completion dialog:

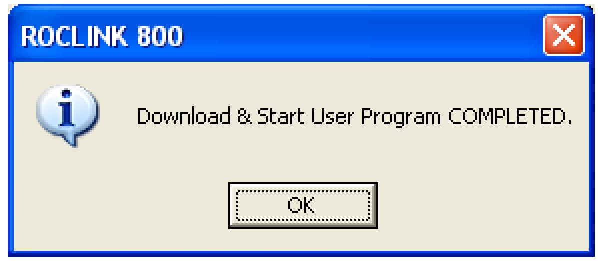


Figure 10-16. Successful Download Confirmation

6. Click **OK**. The User Program Administrator screen displays. Note that:

- The User Programs Installed in Device frame now identifies the loaded program.
- The Status field indicates that the program is running.

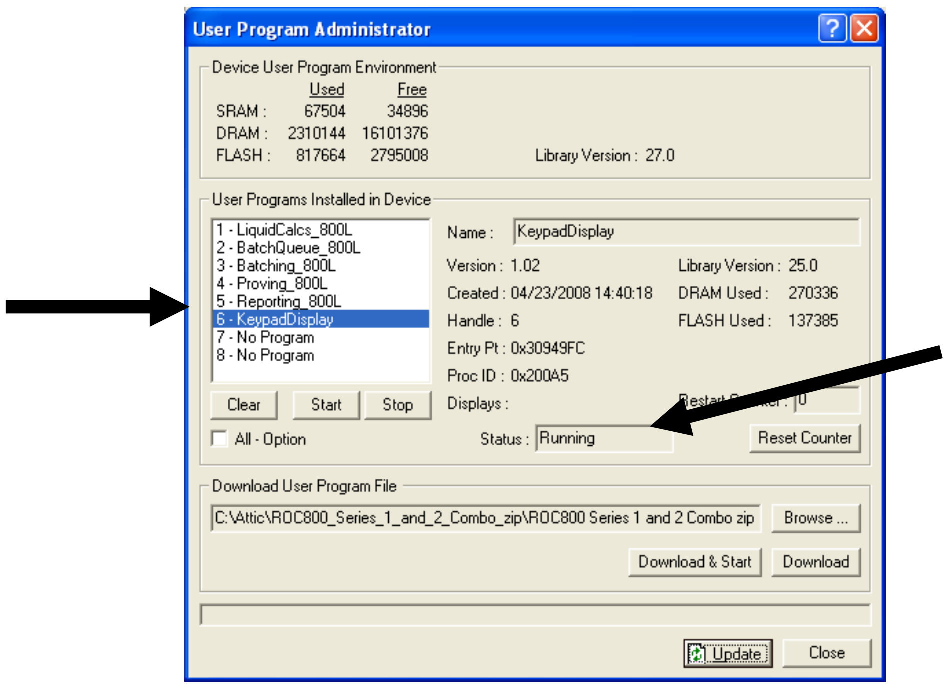


Figure 10-17. User Program Running

7. Select **ROC** > **Flags**, click **Save Configuration**, and click **Yes**. This ensures that the program automatically restarts after a cold start.

Note: Refer to the user documentation accompanying the user program for additional information on configuration and use.

10.4.2 MPU Loading Threshold

To maximize the performance of your ROC800 device, always verify the performance of specific application combinations before using them in the field to ensure the MPU load typically remains **below** 85% with peak MPU loading levels **below** 95%.

To check the current MPU load at any time, select **ROC** > **Information** > **Other Information** and review the value in the MPU loading field.

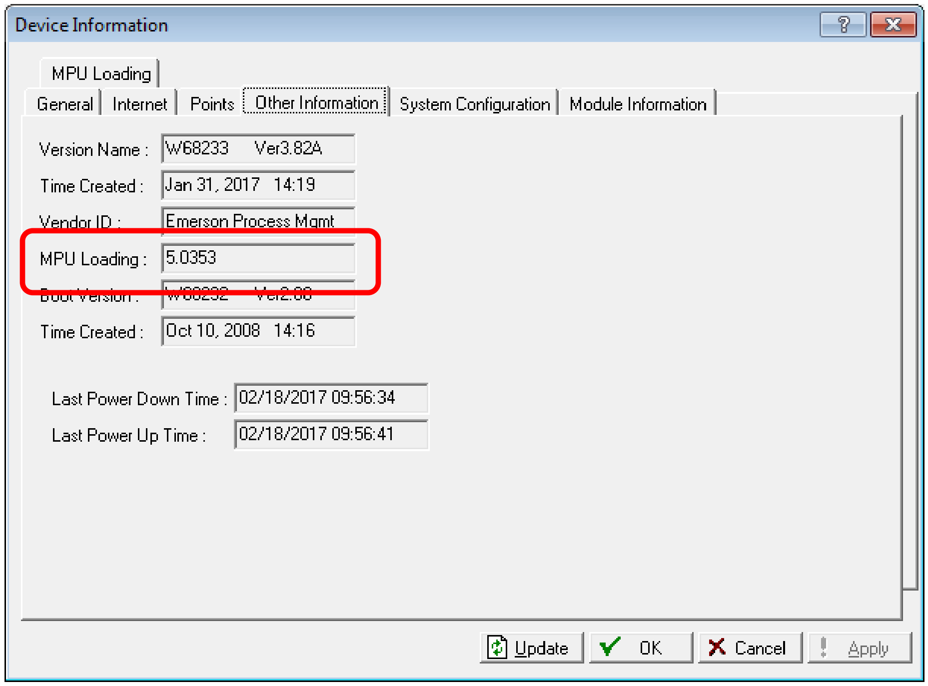


Figure 10-18. MPU Loading

10.5 ROCLINK 800 Security

Use the ROCLINK 800 Security screen to set access to ROCLINK 800.

Note:

- This section focuses on security related to software. For device-related security, refer to *Security* in *Chapter 3*.
- The requirements for the Operator ID and Password fields are dependent on your selection in the **Enable Enhanced Security Features** field on the Device Security screen (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*.
- The ROCLINK 800 Security table can be a mix of the older username/password format and the new complex username/password formats.

To access this screen, select **Utilities > ROCLINK 800 Security**. The ROCLINK 800 Security screen displays.

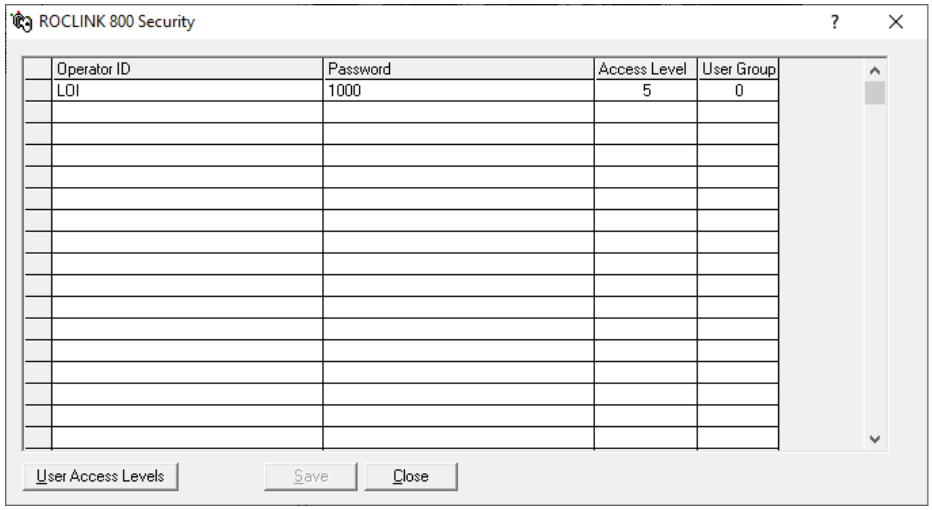


Figure 10-19. ROCLINK 800 Security

Its table format enables you to define, by operator ID, password, and security level, who can log on to ROCLINK 800 and the screens that those IDs can access. You may define up to 64 different users.

Note: The default Operator ID is **LOI**. The default password is **1000**.

Caution **The settings you define in Utilities > ROCLINK 800 Security must match the settings you define in ROC > Security (Device Security) in order for users to log onto ROCLINK 800.**

10.5.1 Defining Access

1. Select **Utilities** > **ROCLINK 800 Security**. The ROCLINK 800 Security screen displays:

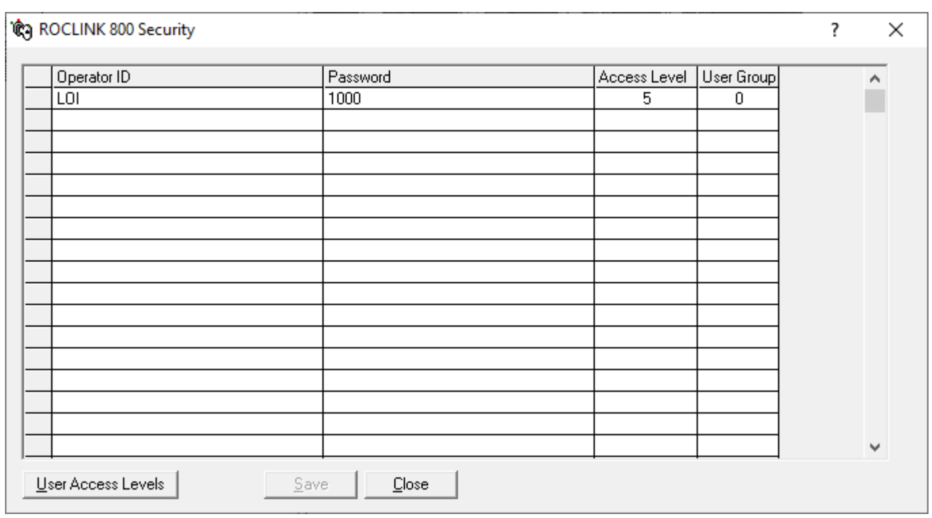


Figure 10-20. ROCLINK 800 Security

2. Enter an **Operator ID** used to log into ROCLINK 800. The requirements for the Operator ID field differ based on if you have

selected **Enable Enhanced Security Features** (**ROC > Security**). For more information, refer to *Section 3.7.3 Enhanced Security*:

- If you **have not** selected **Enable Enhanced Security Features**, enter three alphanumeric characters for the **Operator ID**. Typically these are the initials of the person who operates the device.

  Note: Each Operator ID **must** be unique and is case-sensitive (that is, **ABC** is different from **Abc**).

- If you **have** selected **Enable Enhanced Security Features**, enter between three and 30 alphanumeric/special characters for the **Operator ID**.

  Note: The Operator ID is **not** case-sensitive.

3. Enter a **Password** for the Operator ID. The requirements for the Password field differ based on if you have selected **Enable Enhanced Security Features** (**ROC > Security**):

   - If you **have not** selected **Enable Enhanced Security Features**, enter four numeric characters (between **0000** and **9999**) to define the operator **Password**. More than one user can have the same password.

     Note: If you precede a password value with zeroes (such as **0006**), ROCLINK 800 saves that password as **6**.

   - If you **have** selected **Enable Enhanced Security Features**, enter between eight and 32 alphanumeric/special characters to define the operator **Password**. More than one user can have the same password.

4. Enter the desired **Access Level** for the user. **0** is the lowest (least inclusive) access level and allows access to the fewest number of screens. **5** is the highest (most inclusive) access level and allows access to all screens. Each access level permits access to screens at that level and any inherited from lower access levels. For example, an operator ID with Access Level 3 can access screens with levels 0, 1, 2, and 3. Refer to *Table 10-1, Security Access Levels*.

   Note: Click **User Access Levels** to display a User Access Levels dialog that shows all menu options and their access levels.

5. Click **Save**.

Security Access Levels

The Security Access Levels table lists the system screens and their system-assigned security access levels. The Menu Options focus on the activity while you use the Access Levels to increase or decrease responsibility levels within the Menu Options.

To access this screen, select **Utilities** > **ROCLINK 800 Security** > **User Access Levels**.

Note: ROCLINK 800 rejects login requests if access levels are greater than device security. Additionally, if you enable security on any port, at least one operator ID must have the highest level (level 5) of security.

Table 10-1. Security Access Levels

	Menu	Menu Option	Access Level
1	Configure	Transaction History	5
15	View Display	New	5
24	ROC	Security	5
71	Utilities	License Key Admin 107	5
72	Utilities	License Key Administrator 800	5
80	Utilities	Custom Display Editor	5
81	Utilities	Custom EFM Report Editor	4
20	ROC Display	Administrator	4
69	Utilities	Update Firmware	4
70	Utilities	Upgrade Hardware	4
74	Utilities	User Program Administrator	3
2	File	New	3
4	File	Download	3
5	File	Save Configuration	3
18	View Display	From File	3
19	View Display	From Device	3
23	ROC	Clock	3
25	ROC	Comm Ports	3
27	ROC	Information	3
28	ROC	Flags	3
29	Configure IO	AI Points	3
30	Configure IO	AO Points	3
31	Configure IO	DI Points	3
32	Configure IO	DO Points	3
33	Configure IO	PI Points	3
34	Configure IO	TC Points	3
35	Configure IO	RTD Points	3
36	Configure IO	System AI Points	3
37	Configure IO	Soft Points	3
38	Configure IO	Extended Soft Point	3
39	Configure IO	MVS Sensor	3
40	Configure IO	HART Points	3
41	Configure IO	Setup	3
42	Configure IO	Advanced Pulse Module	3
43	Configure IO	ACIO Module	3
44	Configure IO	Virtual Discrete Output	3

	Menu	Menu Option	Access Level
45	Configure Control	FST Registers	3
46	Configure Control	PID Loop	3
47	Configure Control	Radio Power Control	3
48	Configure Control	Sampler/Odorizer	3
49	Configure Control	DS800	3
50	Configure	History Segments	3
51	Configure	HistoryPoints	3
52	Configure	Opcode Table	3
53	Configure	Modbus	3
54	Configure	Rtu Network	3
55	Configure	LCD User List	3
56	Configure User Data	UD1	3
73	Utilities	Convert EFM File	3
75	Utilities	AI Calibration Values	3
76	Utilities	MVS Calibration Values	3
77	Utilities	FST Editor	3
78	Utilities	Keypad Display Editor	3
79	Utilities	Read File From Device	3
82	Utilities	Options	3
84	Tools	Data Logger	3
7	View	EFM Report	2
8	View	Calibration Report	2
22	ROC	Collect Data	2
57	Meter	Setup	2
58	Meter Setup 800	Station	2
59	Meter Setup 800	Orifice meter	2
60	Meter Setup 800	Linear meter	2
61	Meter	Calibration	2
62	Meter Calibration 800	Orifice meter	2
63	Meter Calibration 800	Linear Meter	2
64	Meter	Values	2
65	Meter Values 800	Orifice meter	2
66	Meter Values 800	Linear Meter	2
67	Meter	Plate Change	2
68	Meter	History	2
3	File	open	1
6	File	Print Configuration	1
9	View History	From Device	1
10	View History	From File	1
11	View Alarms	From Device	1
12	View Alarms	From File	1
13	View Events	From Device	1

	Menu	Menu Option	Access Level
14	View Events	From File	1
21	View	I/O Monitor	1
26	ROC	Memory	1
16	View Display	Display 1	0
17	View Display	Display 2	0
83	Utilities	Communications Monitor	0

10.6 Analog Input (AI) Calibration Values

Use this option to review all the calibration values for a specific analog input point.

1. Select **Utilities > AI Calibration Values**. The AI Calibration screen displays.

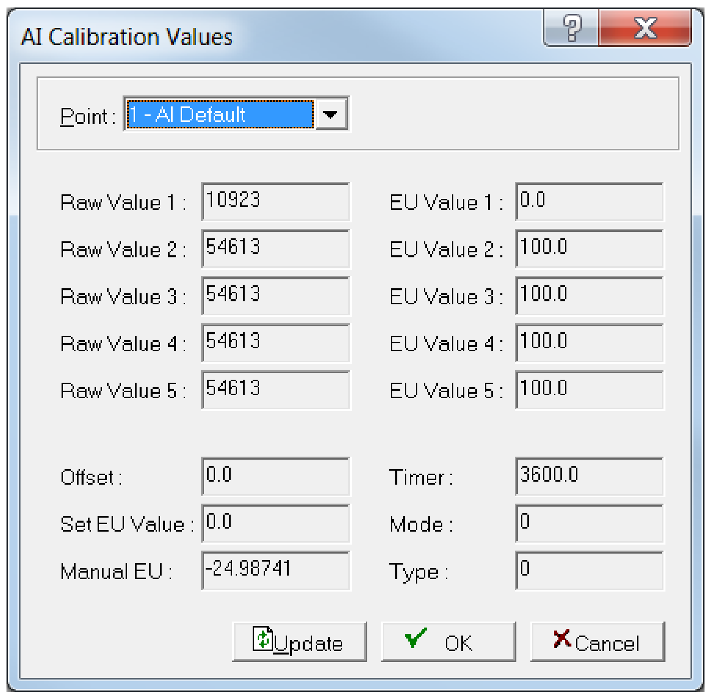


Figure 10-21. AI Calibration Values

Field	Description
Point	Click ▼ to select an AI point.
Raw Value (1 - 5)	These **read-only** fields show the calibrated raw A/D input, where **Value 1** is the lowest calibrated input and **Value 5** is the highest calibrated input.

Field	Description
Offset	This **read-only** field shows the **zero shift** adjustment value for a differential pressure input. This value is an offset to the calibrated EU Values, and compensates for the effect of working static pressure on a DP transmitter that was calibrated at atmospheric pressure.
Set EU Value	This **read-only** field shows the Tester Value specified for the last calibration.
Manual EU	This **read-only** field shows the Live Reading for the last calibration.
EU Value (1 - 5)	These **read-only** fields show the five calibration settings in Engineering Unit values, converted from the raw values, based on the low reading EU and the high reading EU defined for the point. Value #1 is the zero value, value #5 is the span value, and values 2, 3, and 4 are midpoint values.
Timer	This **read-only** field shows the last inactivity count-down in seconds (typically starting from 3600 seconds) that occurred during the last calibration session. Had the countdown reached 0, time-out would have taken place, automatically ending the calibration mode.
Mode	This **read-only** field shows the status of the calibration. Valid values are: **0** = Use Current Calibration **1** = Start Calibration **2** = Calibrate **3** = Restore Previous Calibration **4** = Stop Calibration
Type	This **read-only** field shows the currently set calibration value. Valid values are: **0** = Inactive (no value) **1** = Zero **2** = Span **3** = Midpoint 1 **4** = Midpoint 2 **5** = Midpoint 3 **6** = Zero Shift

10.7 RTD Input Calibration Values

Select **Utilities > RTD Calibration Values** to view all the calibration values for a specific RTD input point.

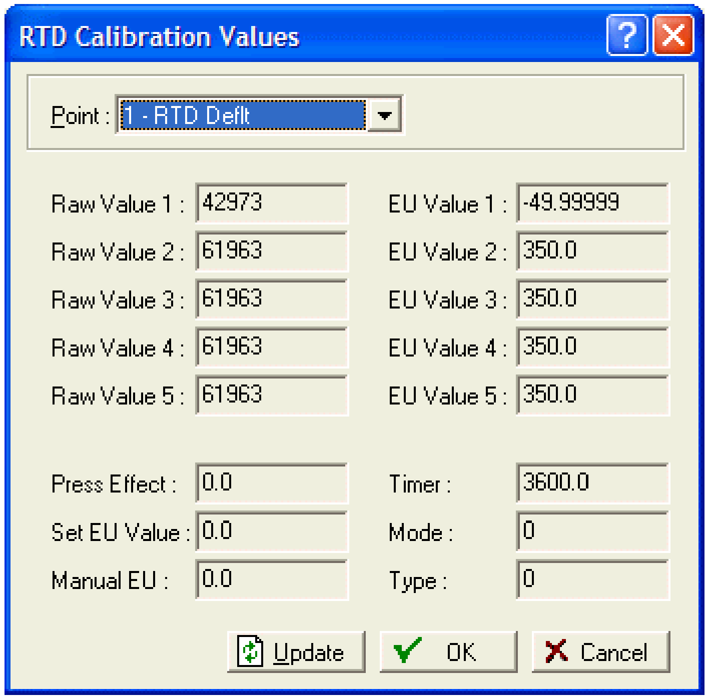


Figure 10-22. RTD Input Calibration Values

Field	Description
Point	Click ▼ to select an RTD point.
Raw Value (1 - 5)	These **read-only** fields show the calibrated raw values, where Raw Value 1 is the lowest calibrated raw A/D input and Raw Value 5 is the highest calibrated raw A/D input.
RTD Bias	This **read-only** field shows the Press Effect is the Zero Shift or RTD Bias adjustment value (applies only to points configured as the Differential Pressure input to a Meter Run) or temperature input.
Set EU Value	This **read-only** field shows the Tester Value specified for the last calibration value that was set.
Manual EU	This **read-only** field shows the Manual EU Live Reading for the last calibration value that was set.
EU Value (1 - 5)	These **read-only** fields show the five calibration settings in engineering unit values, converted from the raw values, based on the Low Reading EU and High Reading EU defined for the point. EU Value 1 is the Zero value and EU Value 5 is the Span value. The rest are midpoint values.
Timer	This **read-only** field shows, in seconds, the last inactivity count-down (typically starting from 3600 seconds) that occurred during the last calibration session. Had the countdown reached 0, time-out would have taken place, automatically ending the calibration mode.

Field	Description
Mode	Indicates the calibration mode. Valid values are: **0** = Use Current Calibration **1** = Start Calibration **2** = Calibrate **3** = Restore Previous Calibration **4** = Stop Calibration
Type	Indicates the calibration value currently being set. Valid values are: **0** = Inactive (no value) **1** = Zero **2** = Span **3** = Midpoint 1 **4** = Midpoint 2 **5** = Midpoint 3 **6** = Unused

10.8 MVS Input Calibration Values

Use this option to display a screen that shows all the current calibration values for MVS sensor points.

Select **Utilities > MVS Calibration Values**. The MVS Calibration screen displays.

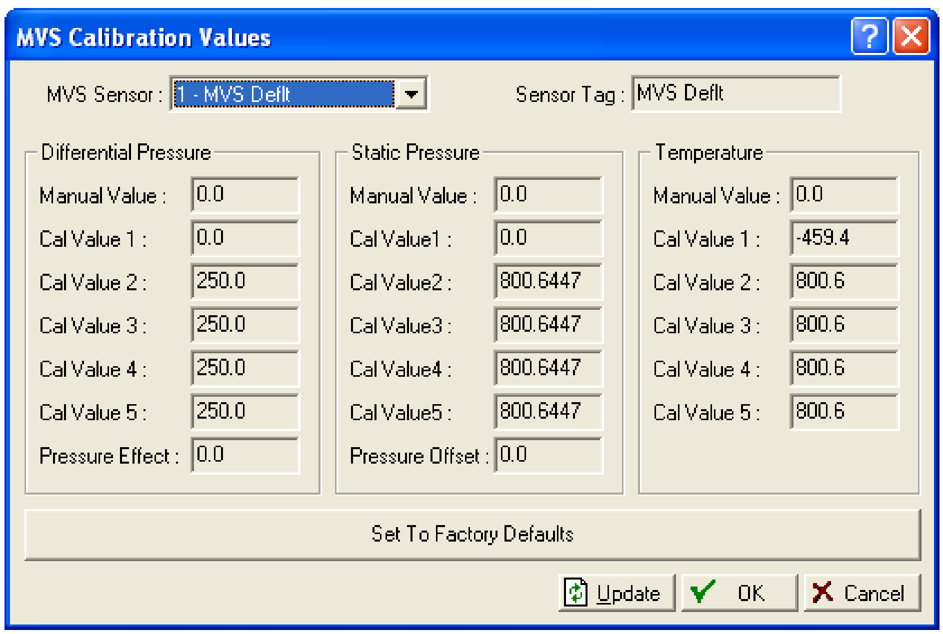


Figure 10-23. MVS Input Calibration Values

Field	Description
MVS Sensor	Click ▼ to select an MVS sensor.
Sensor Tag	This **read-only** field shows the label associated with the selected MVS sensor.

Field	Description
Differential Pressure	
Manual Value	This **read-only** field shows the value of the input at the last meter Freeze.
Cal Value (1 – 5)	These **read-only** fields show the differential pressure calibration values the selected MVS sensor currently uses.
Pressure Effect	This **read-only** field shows the adjustment factor for pressure.
Static Pressure	
Manual Value	This **read-only** field shows the value of the input at the last meter Freeze.
Cal Value (1 – 5)	These **read-only** fields show the static pressure calibration values the selected MVS sensor uses.
Pressure Offset	This **read-only** field shows the adjustment factor for pressure.
Temperature	
Manual Value	This **read-only** field shows the value of the input at the time of the last meter "Freeze."
Cal Value (1 – 5)	these **read-only** fields show the temperature calibration values the selected MVS sensor currently uses.
Set To Factory Defaults	Click to return the MVS calibration values to their original values and reset the MVS. **Note:** You must answer **Yes** to a verification dialog before the reset occurs. When the reset completes, a verification dialog box displays. This resets the MVS address to the default value of 1 and the Sensor Tag to **MV Sensor**.

10.9 FST Editor

ROCLINK 800's Function Sequence Table (FST) utility provides an instruction list programming language you can use to define and perform a set of specific actions when a set of conditions exists. For complete documentation on this option, refer to the *Function Sequence Table (FST) User Manual* (part D301058X012).

10.10 Keypad Display Editor

Select **Utilities > Keypad Display Editor** to create and edit keypad display files. You can store these files on a PC or download them to the ROC. While in use on the ROC Keypad Display, the display file resides in the configuration memory of the ROC.

Note: Keypad display files use the extension .DCFG.

The Keypad Display Editor is available while on-line with a ROC800-Series that has a keypad display connected.

The Keypad Display allows interaction with TLPs in the ROC database. An understanding of TLPs is crucial to configuring a keypad display file. TLP refers to Point Type, Logical number (Instance), and Parameter. For example, the TLP **DIN 4-2, ACC** is the Accumulated Value parameter of channel 2 of the discrete Input module in slot 4. This TLP can also be expressed numerically as 101, 4-2, 6.

10.10.1 Creating a Keypad Display File

You can create display files either by editing an existing file or by creating one in the Editor

To create a new display file:

1. Select **Utilities > Keypad Display Editor**. A blank Keypad Display Editor screen displays:

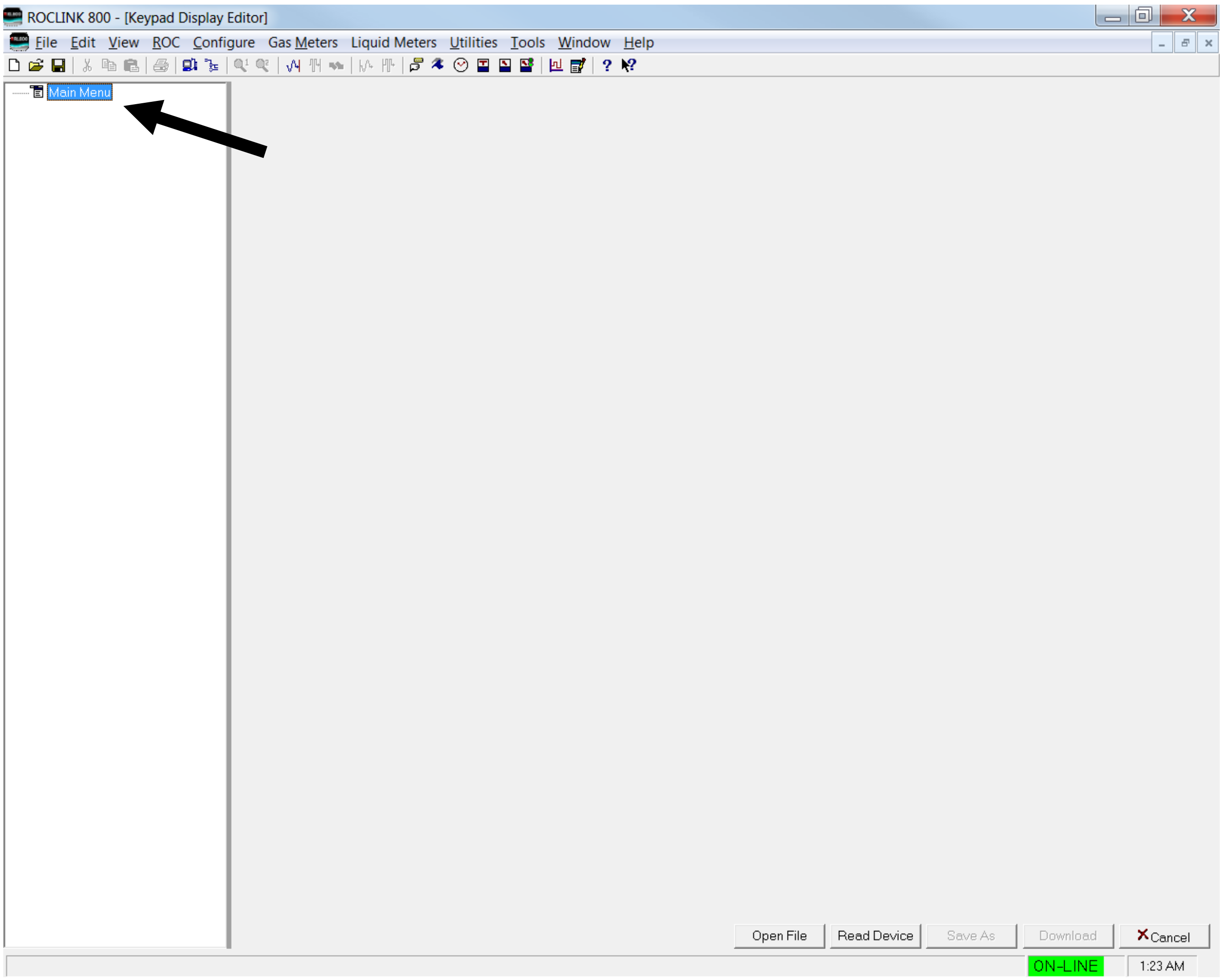
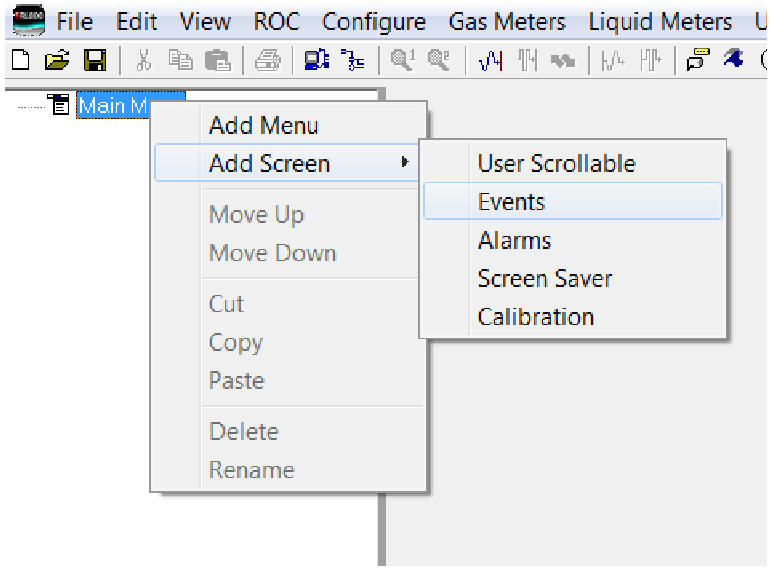


Figure 10-24. Keypad Display Editor (Blank)

2. **Right-click** on Main Menu in the Hierarchy Menu in the left pane of the editor. A menu displays.
3. Select **Add Menu** as many times as your display requires.

4. The Hierarchy Menu determines the navigation for the display. Each level in the Hierarchy Menu represents a screen with menu choices. Add menus and screens to each level in the Hierarchy Menu to suit your application.

5. **Right-click** on a menu in the Hierarchy Menu and select **Add Screen**.



6. Use this menu to select the type of screen:

Menu Type	Description
User Scrollable	Provides displays and interaction with TLP names and values.
Events	Displays the Events log. **Note**: You can insert only **one** instance of this screen type in a display file.
Alarms	Displays the Alarms log. **Note**: You can insert only **one** instance of this screen type in a display file.
Screen Saver	Provides a scrolling list of parameters that appears when no user is logged on. The function of the screen saver is the same no matter where you place it in the hierarchy menu. **Note**: You can insert only **one** instance of this screen type in a display file.
Calibration	Allows you to perform a deadweight calibration of the I/O channels for which calibration is appropriate. **Note**: You can insert only one instance of this screen type in a display file.

Once you add the required number of menus and screens, it is good practice to **save** the file to the PC. Use the **Save As** button in the right pane of the editor. ROCLINK 800 saves keypad display files using the extension DCFG. You can also save a display file in a configuration file (*.800) using either the **Download** button (when on-line) or the Save button (when off-line).

Creating the display file is only the first step. You must now edit the display file to select TLPs and assign security. Refer to the steps in the Editing a Keypad Display File. Once you complete the edit process, you must again save the file. Then you can download it to the ROC.

10.10.2 Editing a Keypad Display File

The Keypad Display Editor also enables you to edit an existing keypad display file.. ROCLINK 800 includes a sample display file (**display_config.dcfg**) you can use it in its current state or customized it to suit your application..

To edit a display file:

1. Select **Utilities > Keypad Display Editor**.
2. Click **Read Device** (if file is stored in the ROC) or **Open File** (if file is saved on the PC) to open the display.

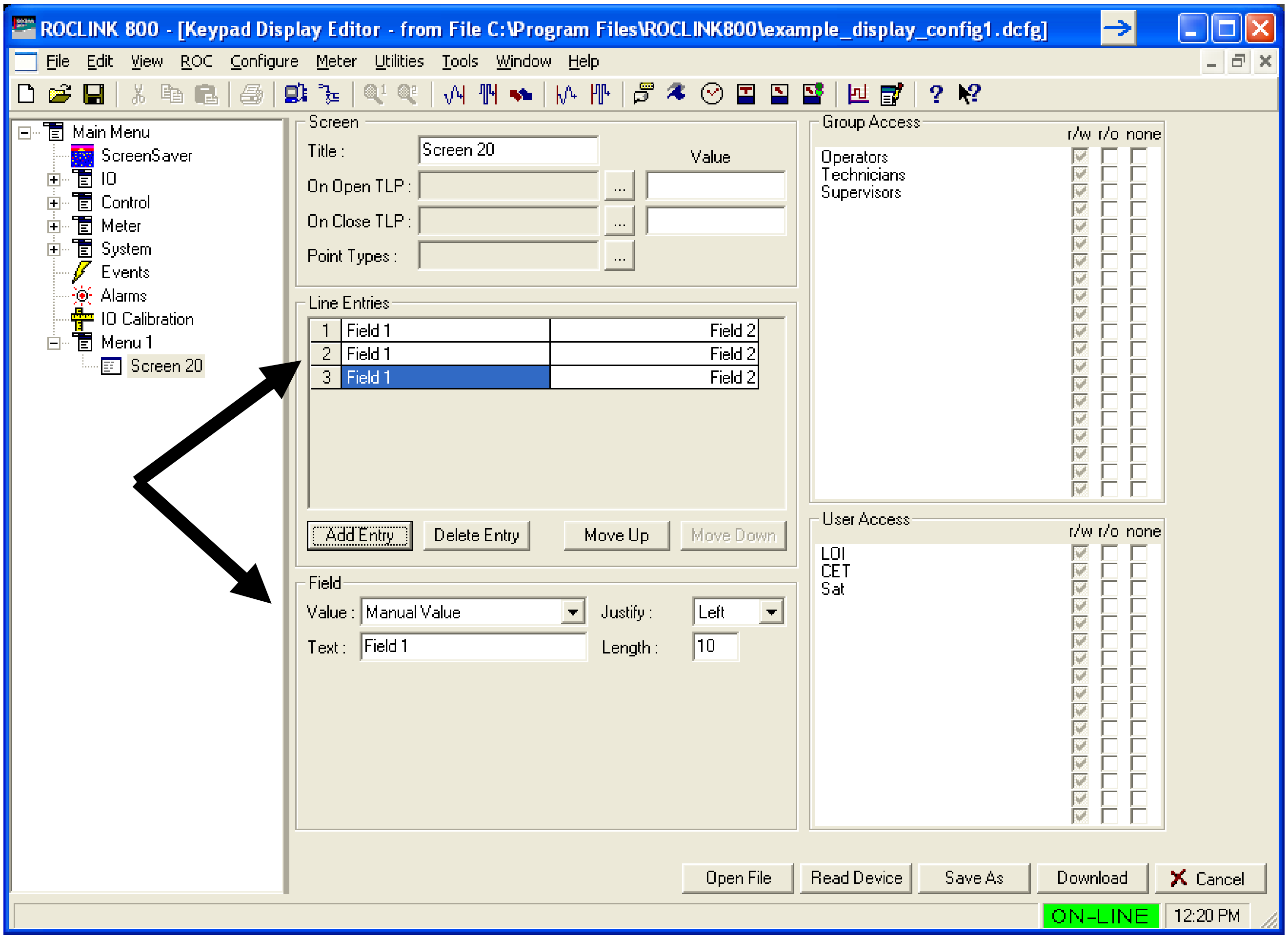


Figure 10-25. Example Keypad Display Editor

Field	Description
Hierarchy Menu	The **Hierarchy Menu** determines the navigation for the display. Each level in the **Hierarchy Menu** represents a screen with menu choices. Add menus and screens to each level in the **Hierarchy Menu** to suit your application.
Title	Sets the **Title** for this configuration file. Use of all capital letters is recommended.
On Open TLP and **On Close TLP**	When the ROC Keypad Display is in use (logged on), the system writes the value indicated in the Value field to the TLP specified in the **On Open TLP** field. When the ROC Keypad Display is no longer in use (logged off), the system writes the value indicated in the Value field to the TLP specified in the **On Close TLP** field.
Point Types	Enables you to scroll through the logical instances of the point types assigned in the **Point Types** field.

Field	Description
Line Entries	You can add, delete, and move **Line Entries**. Each line represents one line on the display. Each field of the entry is configured separately. However, a command to Add Entry, Move Up, Move Down, or Delete Entry causes the entry to add, move or delete the entire line. **Note**: Once you create a line entry, use the parameters in the Field frame to control the values for that line entry.
Add Entry	Click to add a line entry field.
Delete Entry	Click to delete the highlighted line entry field.
Move Up	Click to move the selected line entry field up one position.
Move Down	Click to move the selected line entry field down one position.
Value	If the field highlighted in the Line Entry frame is to have manually entered text or numbers, select a Value of **Manual Value**. If the field is to have a parameter name in full, select **Parameter Name**. If the field is to have an abbreviation of the Parameter name, select **Parameter Abbreviation**. If the field is to have the value of the parameter, select **Parameter Value**.
Text	If the Value selected was Manual Value, set the text or number in the **Text** field.
TLP	Indicates the TLP for the field's value. **Note**: This field displays **only** if you selected Parameter Name, Parameter Abbreviation, or Parameter Value in the Value field.
Justify and Length	Controls the positioning of the value in the selected field. Valid values are **Left** (the default) **Center**, or **Right**. **Length** determines the maximum length of the text or numbers in the entry field.
Length	Indicates the maximum number of characters (text or digits) in the selected line
Read Only	Select Read Only (**R/O**) if the TLP selected is to be a display only on the ROC Keypad Display. If not selected, the TLP will be Read Write (**R/W**) if the keypad user has Read-write privileges to TLPs in that access group. Note that only **one** field in an entry line can be R/W.
Leading Text and Trailing Text	In some circumstances, when you select **Parameter Value**, you can type text to go before or after the value. **Leading and Trailing Text** allows units of measurement or some other text to appear on the screen.

Field	Description
Data Format	In some circumstances, when you select the **Parameter Value** and the **Use Default Format** checkbox, set whether the **Data Format** will be the default that has a Precision of two characters or another manually entered precision.
Open File	Click to open a .DCFG file residing on your PC.
Read Device	Click to read a .DCFG file residing on your ROC.
Save As	Click to save the current .DCFG file wit the name you indicate.
Download	Click to download the current .DCFG file to the connected ROC. **Note**: Before you download a file, ensure that you have assigned the ROC comm port to LCD (Comm Port Owner field on **ROC > Comm Ports**).
Cancel	Click to close the Keypad Display Editor without saving any changes.

3. Click **Save As** to save your keypad display file.

Keypad Display Security

The ROC Keypad Display utility provides security to help you control user access to information. You can place users in "groups" that have a predefined access level. Within each group, individuals can be assigned an additional level of access that overrides the group access level. The panels on the right side of the Keypad Display Editor provide this functionality.

You can define customer display screens that allow users to view and edit parameters, view parameters only, or have no display access based on their group or individual access level. Typically, you assign group or individual access based on job function. Each user within a group assumes that group’s access level. However, you can grant or deny to an individual user’s access to a specific display based on that user’s individual access level.

For example, John, Joe, and Pat are members of a "Technicians" group that is allowed to view and edit the PID display. You can prevent Joe from changing the set point of a PID loop if you define individual access that restricts him to viewing (R/O) only. The rest of the group’s members are unaffected by Joe’s individual restriction.

If you assign a user to more than one group, each of which has different access levels, the user assumes the access level of the **highest** group for all of their assigned groups.

For example, John is in the Technicians group, which has access to edit and view. You also assign him to the Meter Setup group, which only has view access. John automatically has **edit** access in the Meter Setup group because of his membership in the Technicians group. However, you can individually restrict him to read only access in the Meter Setup group.

Note: The User Access and Group Access lists for a ROC800-Series unit are established on the **ROC > Security** screen. For more information on security in the ROC, refer to Device Security.

Field	Description
Group Access	Sets the **Group Access** to determine the type of access (Read/Write or Read/Only) allowed by the groups of users to a given display.
User Access	Sets the **User Access** to determine the type of access (Read/Write or Read/Only) allowed by the individual users to a given display.

Updating Keypad Display Firmware

You can update the firmware in the keypad display while connected by a serial or TCP/IP (Ethernet) communications connection.

1. The updated firmware files are typically supplied on in a .zip file. It is recommended that you create a backup copy of the firmware update file after you unzip the file.
2. Read the **README** text file included with the firmware update.
3. Select **Utilities > Update Firmware** and select the Keypad Display tab.
4. Click **Browse** and navigate to the new firmware file on the PC.
5. Once the file is found, click **Start**. The update may take a while; do not interrupt the update while it is in progress.
6. Click **OK** when the Firmware Update Completed dialog box appears.

10.11 Custom Display Editor

The custom display options in ROCLINK 800 allow you to create customized ROC display files (*.DSP) and load them to a ROC. The ROC can store up to 246 displays (including both custom user displays you create and user program displays that accompany user programs).

⚠ **Caution** — **You should be familiar with Visual Basic before attempting to create custom displays.**

Refer to *Appendix B, Display Editor*, for a complete discussion of creating customer displays.

10.12 Custom EFM Report Editor

Note: This section applies **only** to gas applications for the ROC800L.

The Custom EFM Report Editor allows you to create a custom .EFM report format. Custom EFM report formats enable you to present EFM data in a way most useful to your organization. The ROC can store up to 246 report formats (including both custom user reports and custom displays you create, as well as user program displays that may accompany user programs).

The process of creating a custom .EFM report is similar to the process for creating a custom displays, but creates a file with an *.RPT file extension that you subsequently store on your PC's hard drive.

Caution **You should be familiar with Visual Basic before attempting to create custom reports.**

Select **Utilities > Custom EFM Report Editor**. A blank Custom EFM Report Editor screen displays:

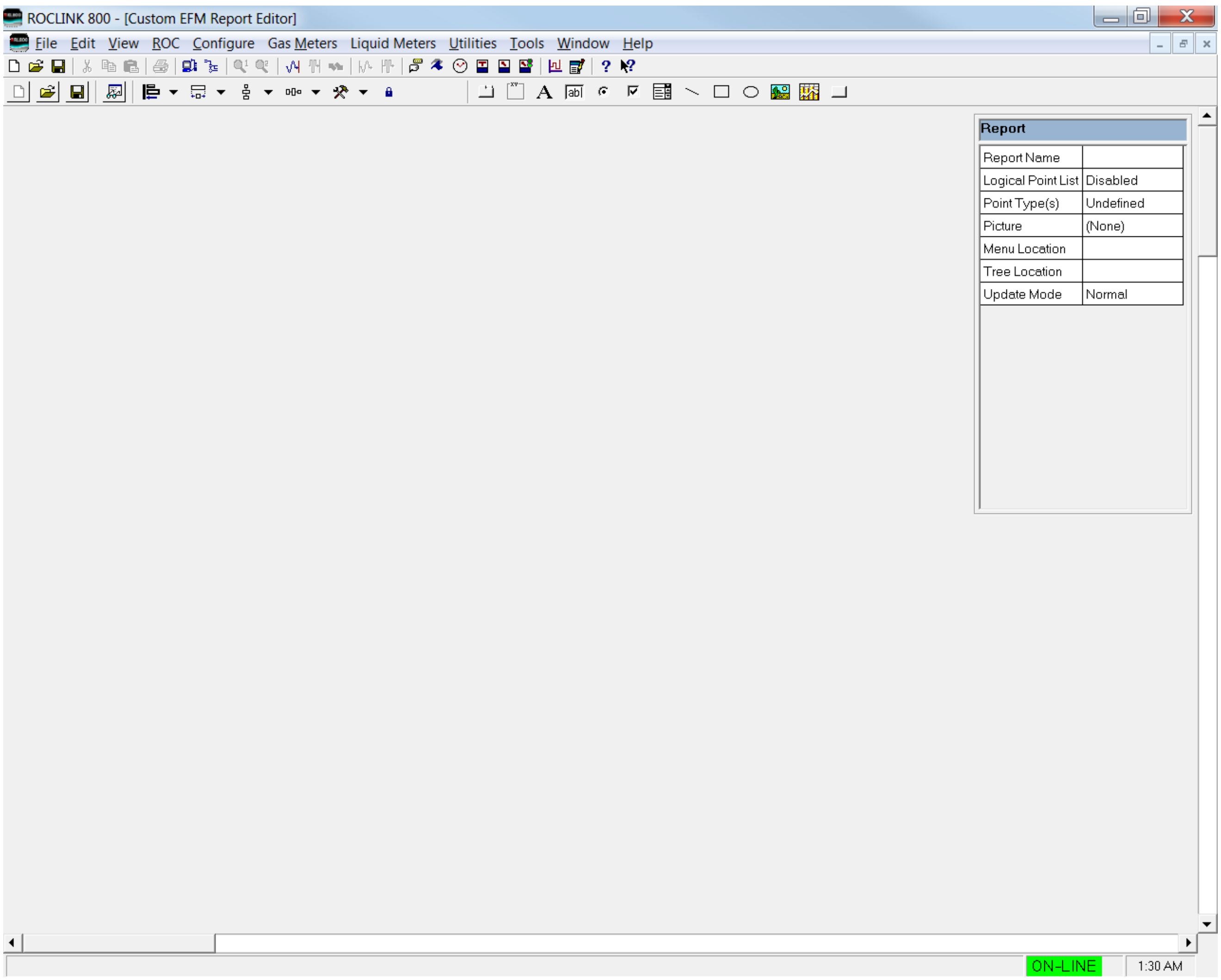


Figure 10-26. Custom EFM Report Editor (blank)

Use the techniques and tool described in *Appendix B* to create a custom EFM report (an example appears in *Figure 10-27*).

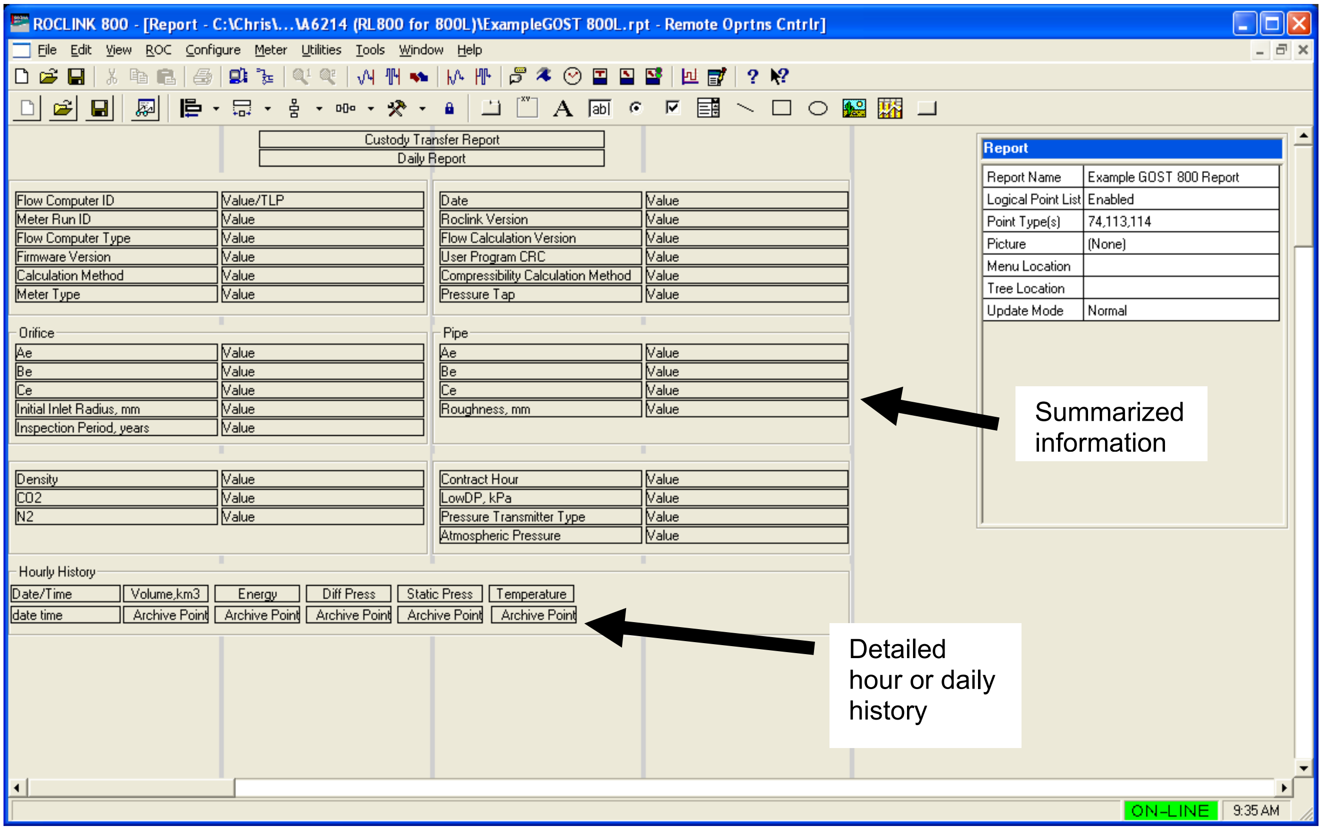


Figure 10-27. Custom EFM Report (Completed)

One major feature of a custom EFM report is the ability to include detailed history. This enables you to display summarized information as well as supporting detailed information.

10.12.1 Viewing Custom EFM Reports

Once you have created a custom .EFM report file, you use it to view a Custom EFM Report file:

1. Select **View > EFM Report**. An Open dialog displays.
2. Select an EFM report (which has an .efm file extension) and click **Open**. The View EFM Report screen displays.

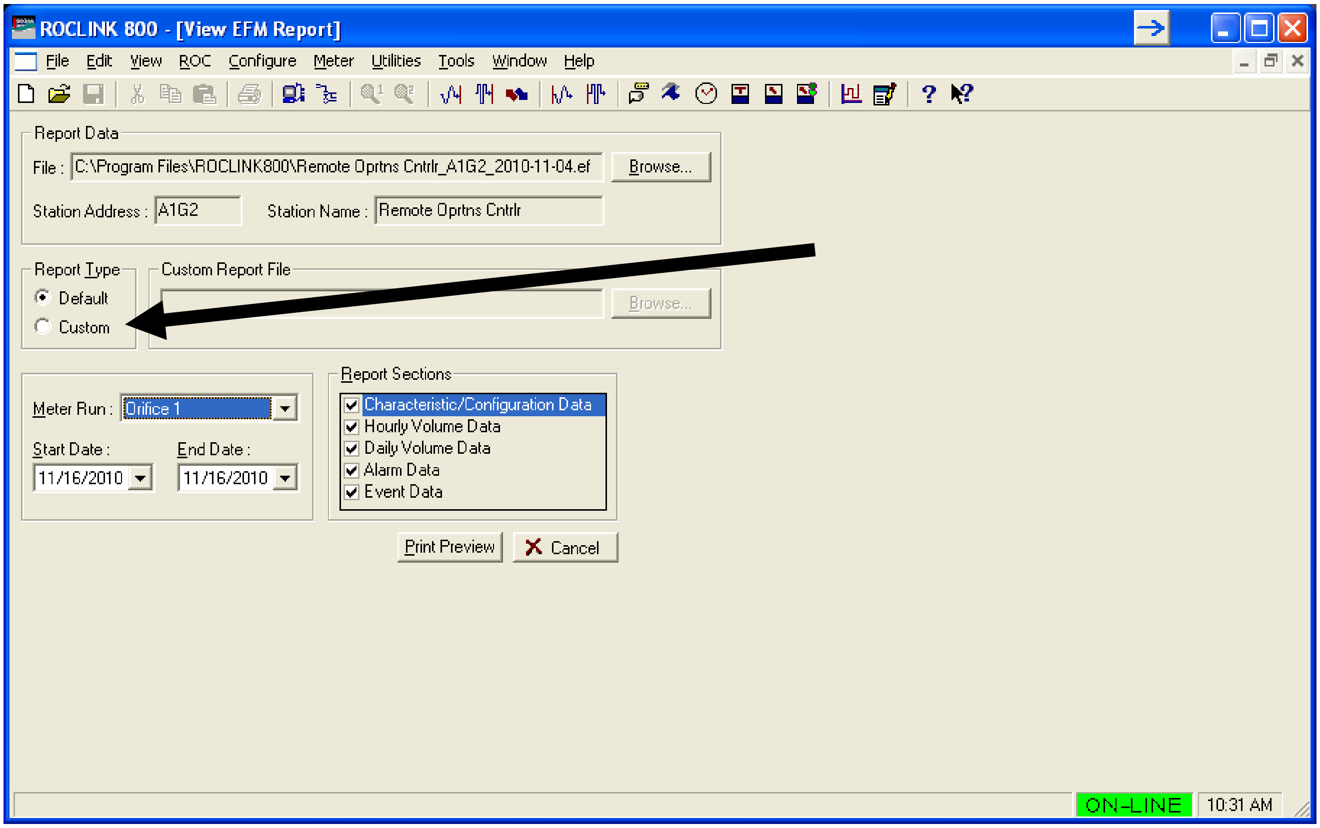


Figure 10-28. View EFM Report

3. Select **Custom** in the Report Type frame.
4. Click **Browse** in the Custom Report File frame. A Select Custom Report dialog displays.
5. Select the appropriate ***.RPT** report file and click **Open**. The View EFM Report screen displays showing the custom report file you have selected.

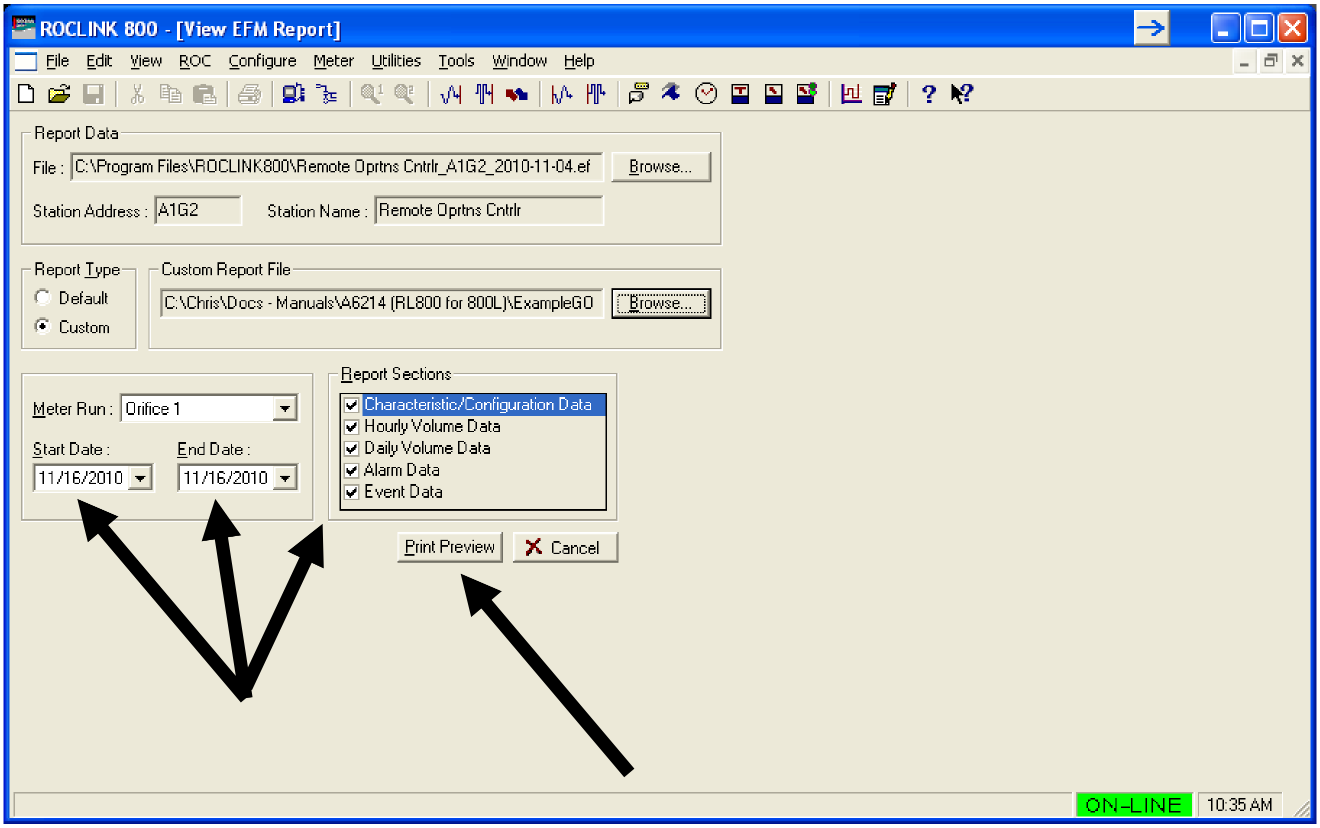


Figure 10-29. View EFM Report

6. Select the report options (Meter Run, Start Date, End Date, and Report Sections) and click **Print Preview**. An on-screen version of the report displays.

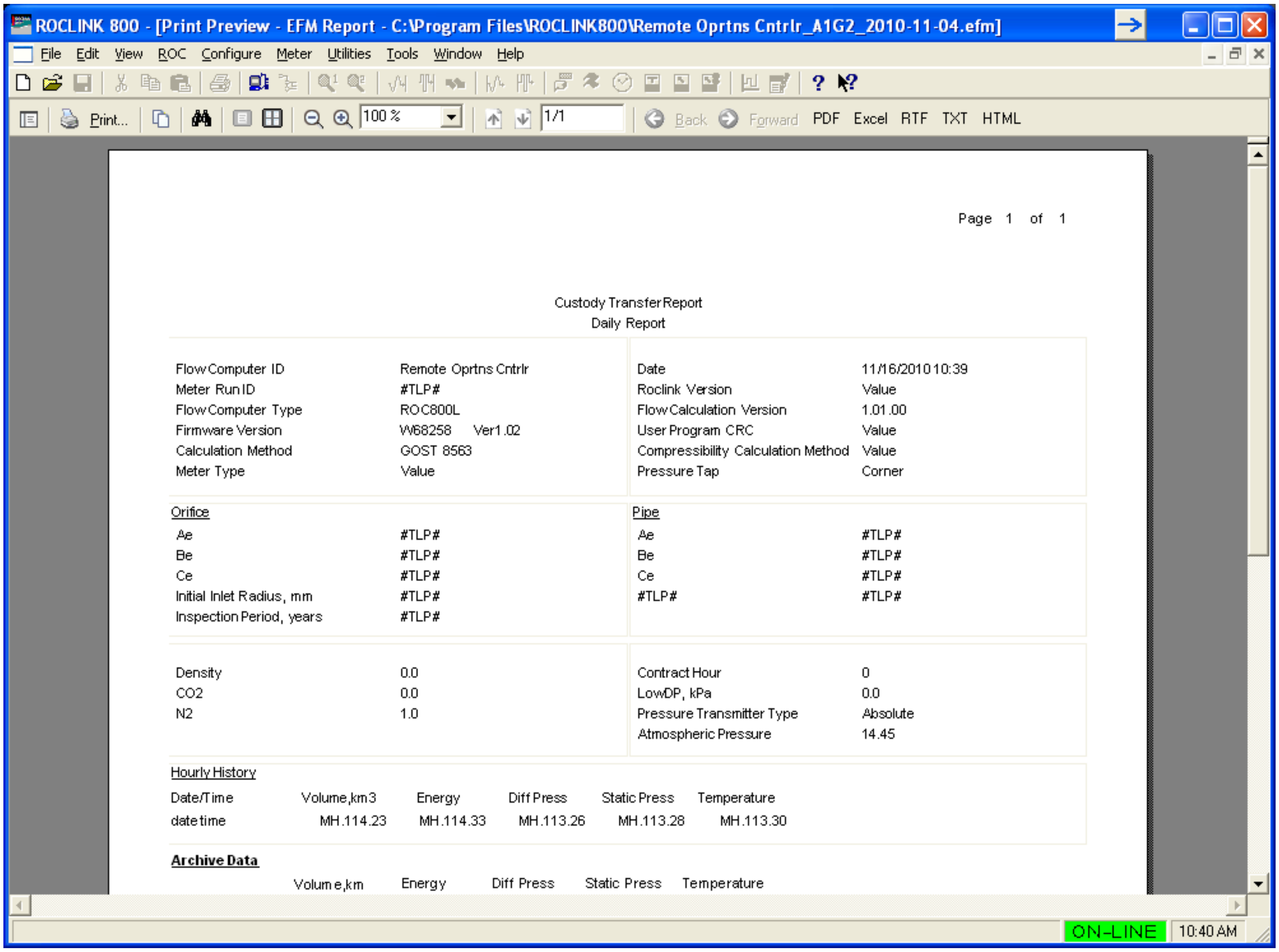


Figure 10-30. Custom EFM Report

7. Use the print (or export) options on this screen to produce the report.

10.13 Read File from Device

Use the **Read File From Device** screen to extract saved files from the device's flash file system. These files are generated through device features such as saving report files, or the creation of a constant log.

Select **Utilities** > **Read File from Device**. The Read File from Device screen displays:

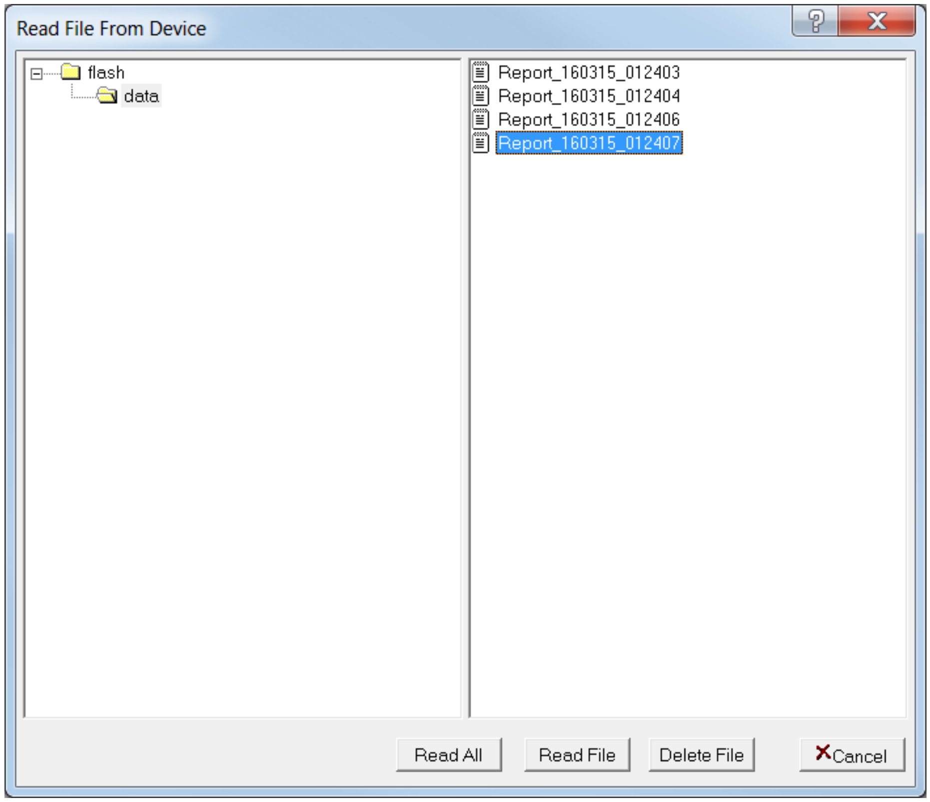


Figure 10-31. Read File from Device screen

Note: Files are generated during normal operation if the device is configured to do so. Initially there will be no files available.

Field	Description
Read All	Click to save all the files contained in the device to your computer
Read File	Click to save the selected file in the device to your computer. **Note:** This button is not useable until you select a file from the list.
Delete File	Click to remove the selected file from the device. **Note:** This button is not useable until you select a flie from the list.
Cancel	Exits the Read File From Device screen.

10.14 W&M Lock/Unlock

Note: This section applies **only** to liquid applications for the ROC800L.

Use this utility to lock a configuration for all read/write conditional parameters in the ROC800L and prevent changes. Use this feature to force read/write conditional parameters into the read-only state for regulatory purposes. You can lock or unlock a configuration, return to the previous locked configuration, or undo any changes made to read/write conditional parameters since the unit was unlocked by returning to the current configuration.

Select **Utilities** > **W&M Lock/Unlock**. The Lock/Unlock screen displays:

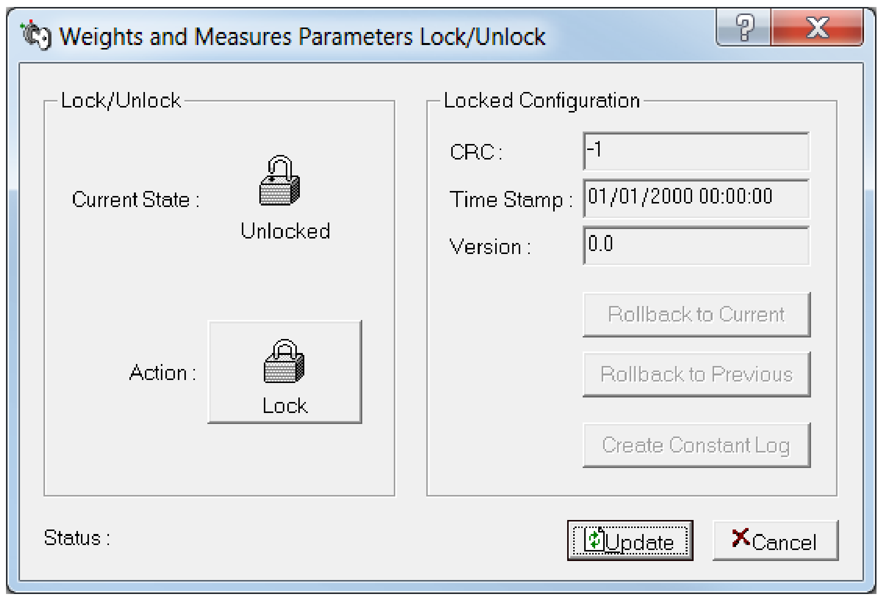


Figure 10-32. Lock/Unlock

Field	Description
Lock/Unlock	Indicates the current state of the configuration and the available action. Click **Lock** to lock all read/write parameters; click **Unlock** to unlock all read/write parameters.
CRC	Displays the CRC-16 value the system calculates each time you lock the configuration. A checksum does not occur on the factory default configuration, so this parameter displays the default value **–1** until you lock the ROC800L for the first time.
Time Stamp	Displays the date and time you locked the configuration. The date and time stamp displays the default value **01/01/2000 00:00:00** until you lock the ROC800L the first time.
Version	Displays the version of the current configuration in the format XXX.X. The default configuration from the factory is **0.0**, and is set to 1.0 the first time you lock the unit and increments by 0.1 each time you lock the configuration after that.

Field	Description
Rollback to Current	After you unlock a configuration, click **Rollback to Current** to restore the read/write conditional parameters to the state they were in when the unit was last locked. After completing the rollback, the unit automatically locks.
Rollback to Previous	After you unlock the ROC800L, click to retrieve a previous version of the configuration, if a previous configuration is available. ROCLINK 800 does not allow you to rollback the configuration if a previous configuration is not available. A previous version will not be available until you lock the unit twice with new values for read/write conditional parameters or if a rollback to previous has already been performed.
Create Constant Log	After locking the ROC800L, click to create a text file that contains the values of all read/write and read/write log parameters.
Status	This **read-only** field shows the status of the configuration indicating if the ROC is actively operating on the configurations, has successfully completed operations, or has encountered an error. A Normal status (the default) indicates the ROC is not accessing the configurations and is ready for you to unlock. After you lock the ROC, the Status indicates the ROC is currently calculating the CRC, then saving the previous and current configurations to flash. If you request a rollback, Status indicates the process of completing the rollback. If operations complete without error, the Status returns to Normal. If an error occurs in the Calculating CRC, Saving Configurations, or Rolling Back to Previous Configuration, the Status indicates the location of the error. Valid values include: ▪ Normal ▪ Calculating CRC ▪ Saving Configurations ▪ Rolling Back Previous Configuration ▪ Error Calculating CRC ▪ Error Saving Configurations ▪ Error Rolling Back Previous Configuration You cannot unlock the ROC when the configuration Status indicates Calculating CRC, Saving Configurations, or Rolling Back to Previous Configuration. If the configuration Status indicates an error, lock or unlock the ROC and attempt the operations again.

10.14.1 Creating a Constant Log

The constant log is a text file containing the TLP and value of all the read/write and read/write log parameters. Click **Create Constant Log** to create the log. The Status field displays *Creating constant* *log*…When the confirmation dialog displays, click **OK** to close the dialog.

Note: This button is active **only** when the configuration is locked.

10.14.2 Restoring a Current Configuration

You must lock the unit at least once prior to performing a rollback to the current configuration and you must unlock the unit. This restores all read/write conditional parameters to the state they were in when the unit was last locked:

1. Select **Utilities > Lock/Unlock**.
2. Click **Unlock**.
3. Click **Rollback to Current**.

This copies the previous configuration to the current configuration (including the version number and date and time stamp), clears the previous configuration, and locks the ROC800L.

10.14.3 Restoring a Previous Configuration

This restores all read/write conditional parameters to the state they were in the time before last configuration.

Note: You must lock the unit at least **twice** prior to performing a rollback to the previous configuration and you **must** unlock the unit. The rollback does not occur if a previous configuration is not available.

1. Select **Utilities > Lock/Unlock**.
2. Click **Unlock**.
3. Click **Rollback to Current**.

10.15 Communications Monitor

Select **Utilities > Communications Monitor** and perform an operation to display the data bytes (in hexadecimal format) sent and received from the ROCLINK 800 during that operation.

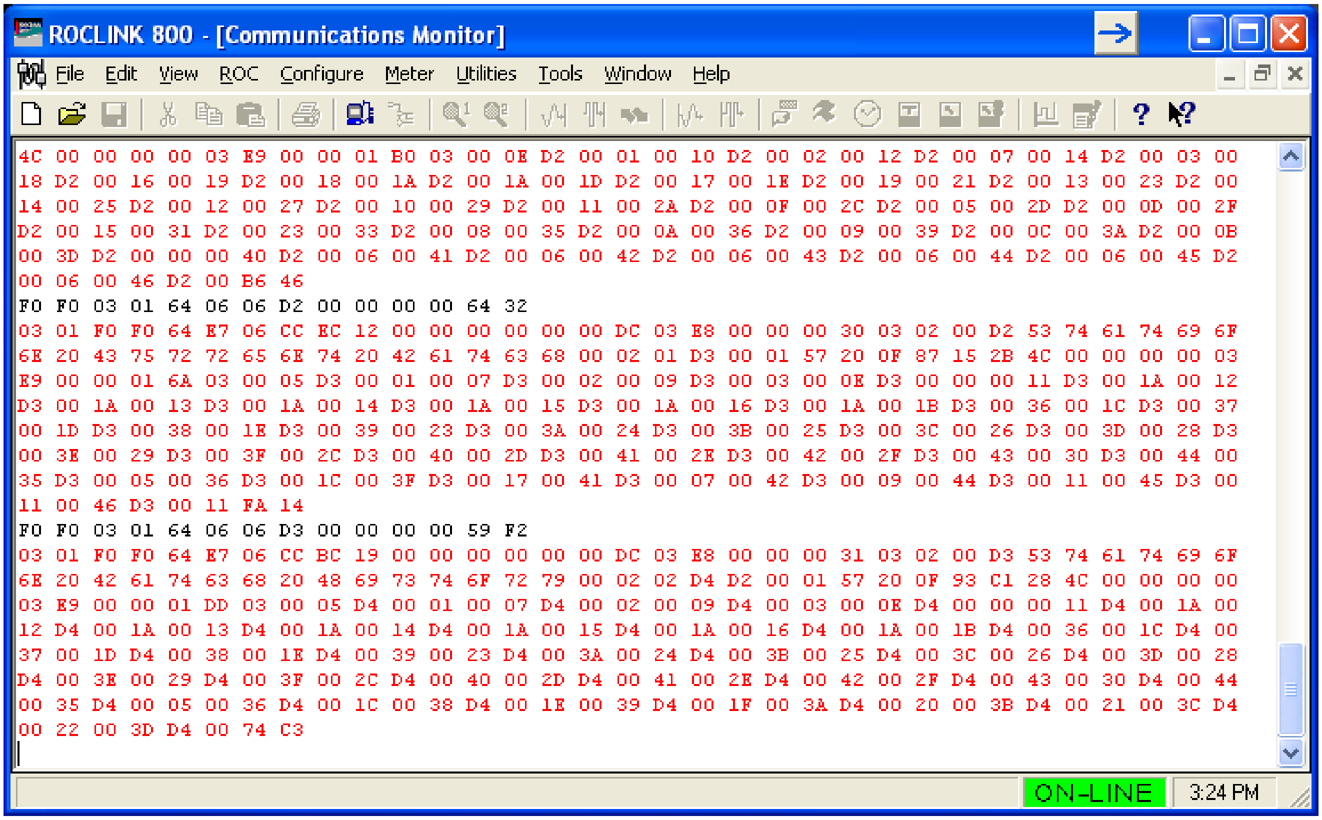
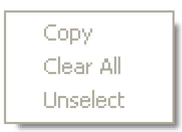


Figure 10-33. Communications Monitor

The system shows bytes sent in black and bytes received in red. Data received since the last good response (and before a request) are shown in aqua.

Right-click on the display to display a menu that enables you to **Copy** highlighted data, **Clear All** data, or **Unselect**.



You can paste copied data in a file for analysis.

Chapter 11 – The Tools Menu

Use the Tools menu to configure how your Point Type (T), Logical Number (L), and Parameter (P) options display and to customize your toolbars.

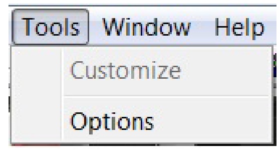
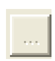


Figure 11-1. Tools Menu

Note: The Customize option is currently unavailable with the ROC800L.

11.1 Options

ROCLINK 800 enables you to display TLP selections either as text or numbers.



When the Browse button (shown on left) is associated with a TLP, click the Browse button to display the Select TLP dialog (see *Figure 11-2*).

Use the Select TLP dialog to assign specific inputs and outputs to parameters. ROCLINK 800 uses Point Type (T), Logical Number (L), and Parameter (P) to define point locations.

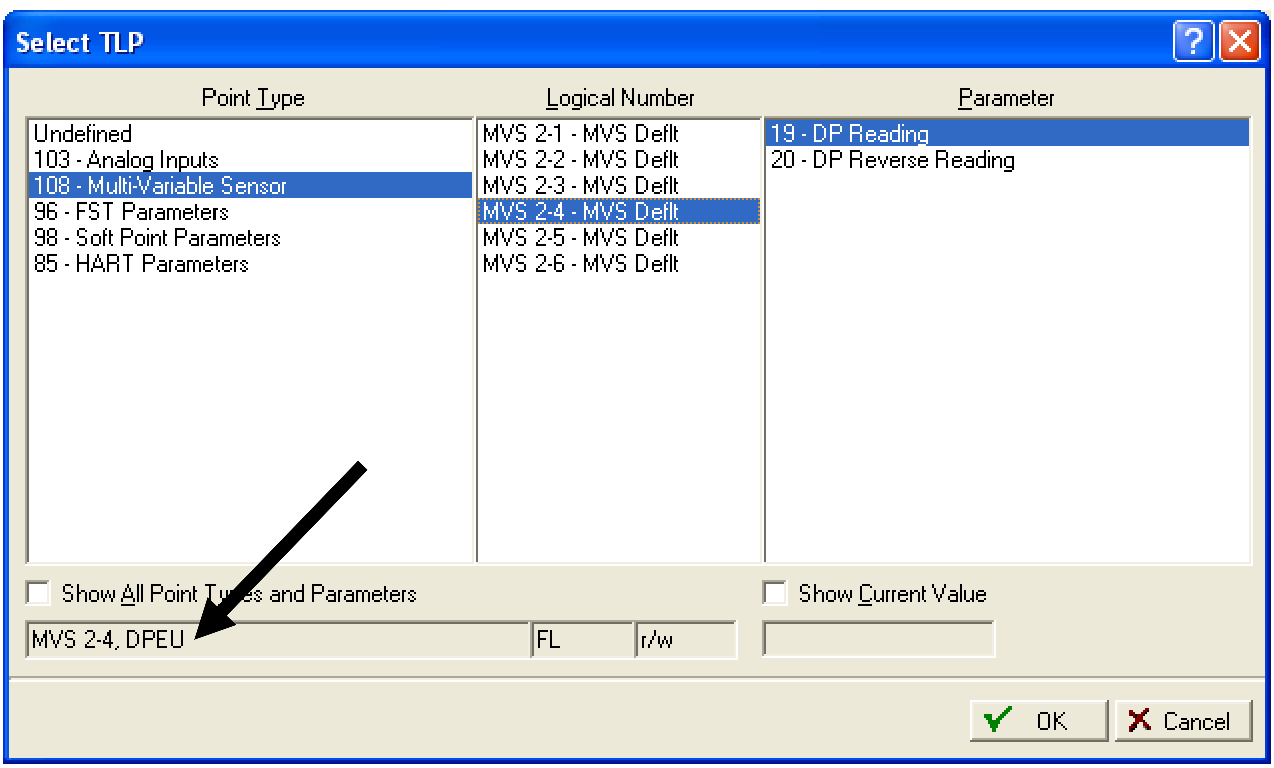


Figure 11-2. Textual TLP Display)

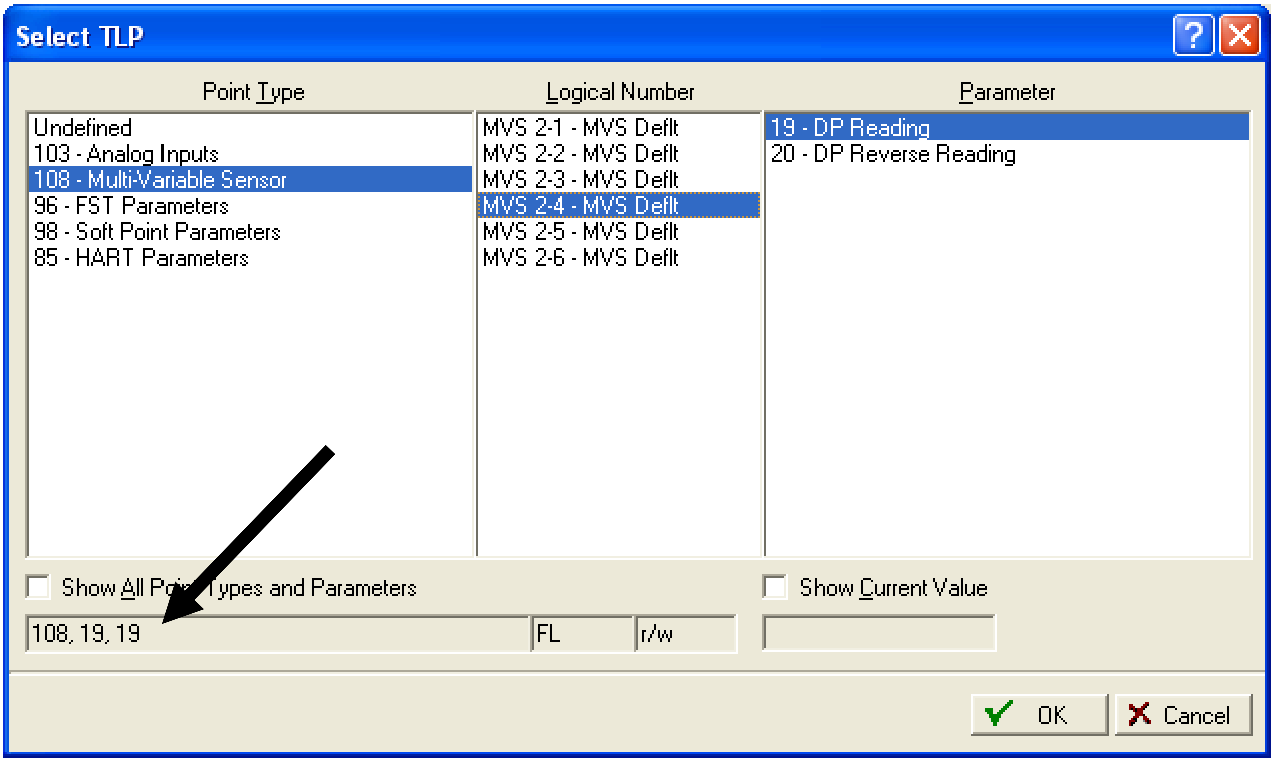


Figure 11-3. Numeric TLP Display

To select how TLP values display, select **Tools > Options.** The Options dialog displays.

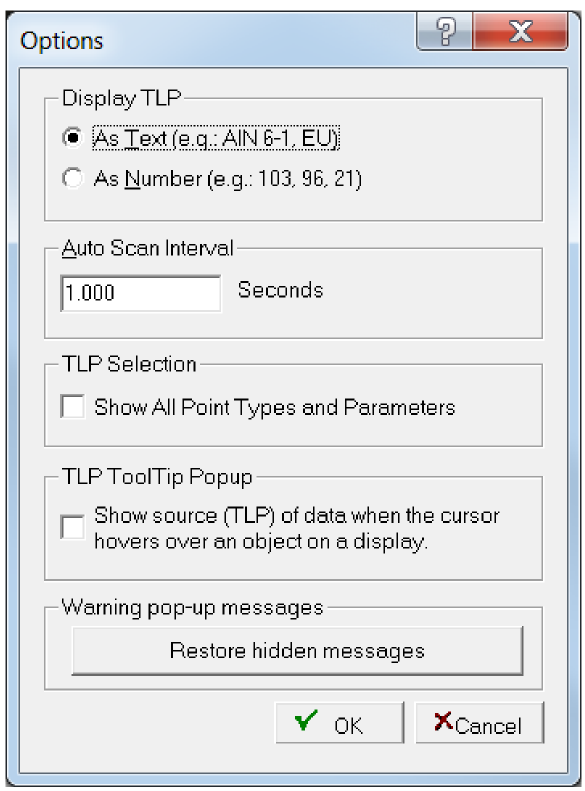


Figure 11-4. Options

Field	Description
Display TLP	Displays values on the Select TLP screen as either text or numbers. For example, the TLP for Register 2 of FST 1 could display as either **FST 1, R2** or **96, 0, 3**.
Auto Scan Interval	Sets, in seconds, the time interval at which the Auto Scan feature (present on numerous ROCLINK 800 screens) polls a ROC.
TLP Selection	Select to display **all** TLP options if the TLP does not pertain to the option you are configuring.
TLP ToolTip Popup	Select to display a context-sensitive TLP source data detailing the selection when you hover over it.

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Chapter 12 – The Windows Menu

In This Chapter

Use the Windows menu to configure how your screens display and to sets the ROCLINK screen you desire to view.

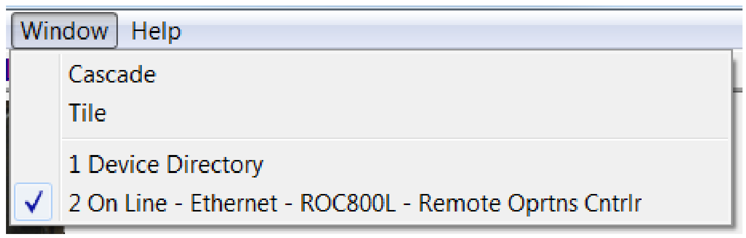


Figure 12-1. Windows Menu

12.1 Cascade

Select **Window** > **Cascade** to view all open ROCLINK 800 windows in a Cascade view.

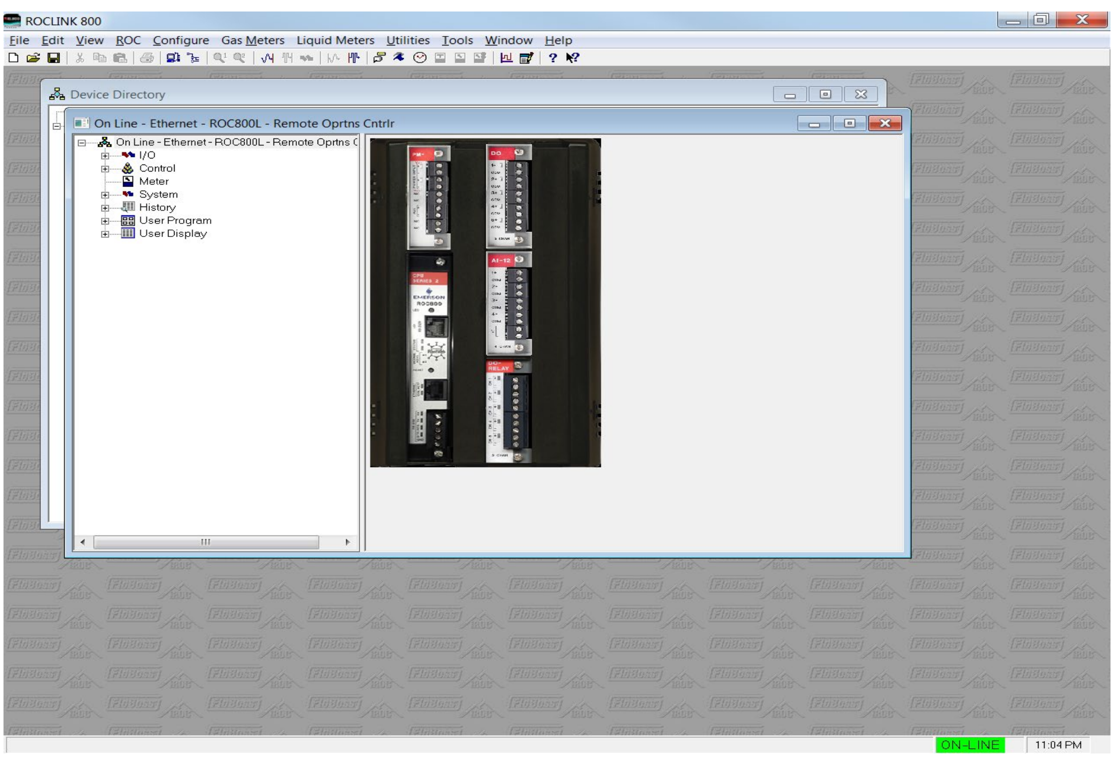
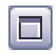


Figure 12-2. Cascade

Button	Description
	Minimizes the size of the window and places it at the bottom of the screen.
	Maximizes the size of the window to fill the screen area.
	Restores the original size of the window.
	Closes a window.

12.2 Tile

Select **Window** > **Tile** to view all open ROCLINK 800 windows in a Tile view.

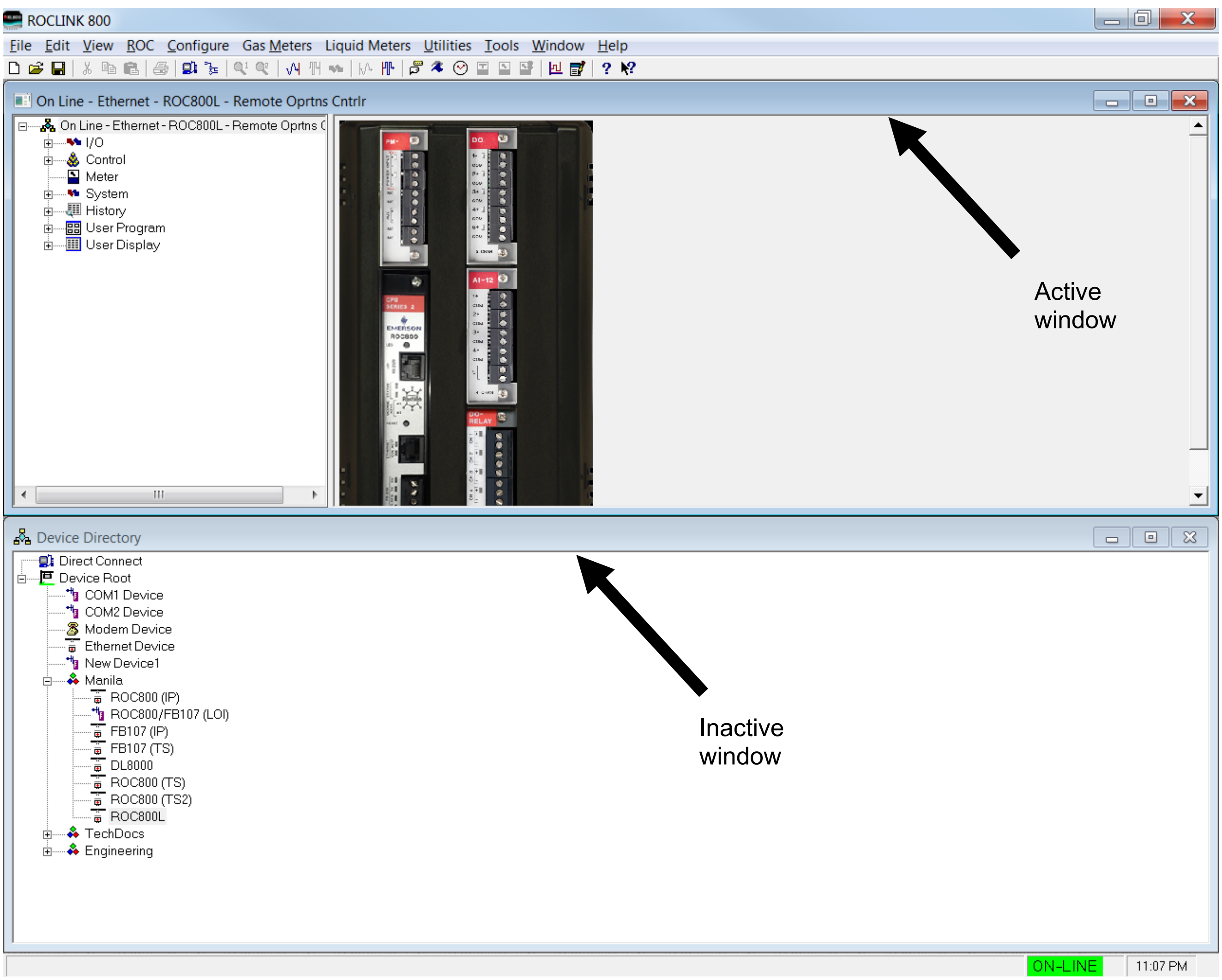


Figure 12-3. Tile

Note the difference in color intensity of the title bars: the currently active window's title bar is highlighted.

12.3 Active View

To switch between active views in ROCLINK 800, select **Window > View**. A check mark appears next to the active view. A view must be active before you can alter information on that screen.

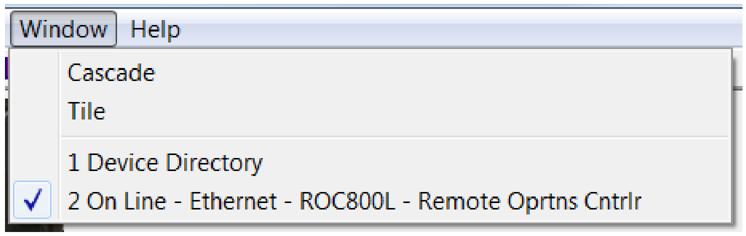


Figure 12-4. Active View

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Chapter 13 – The Help Menu

In This Chapter

Use the Help menu to access the on-line help system and view the About ROCLINK 800 screen.

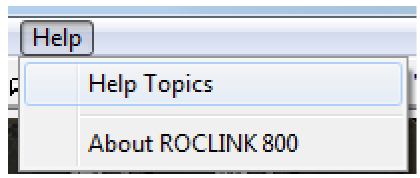


Figure 13-1. Help Menu

13.1 Help Topics

ROCLINK 800 has a comprehensive help system. To access help, click **Help Topics** on the Help menu. To display context-sensitive help on a specific issue, select the item, parameter, field, or button, and press **F1**.

When you select **Help** > **Help Topics**, you display the ROCLINK 800 main help screen:

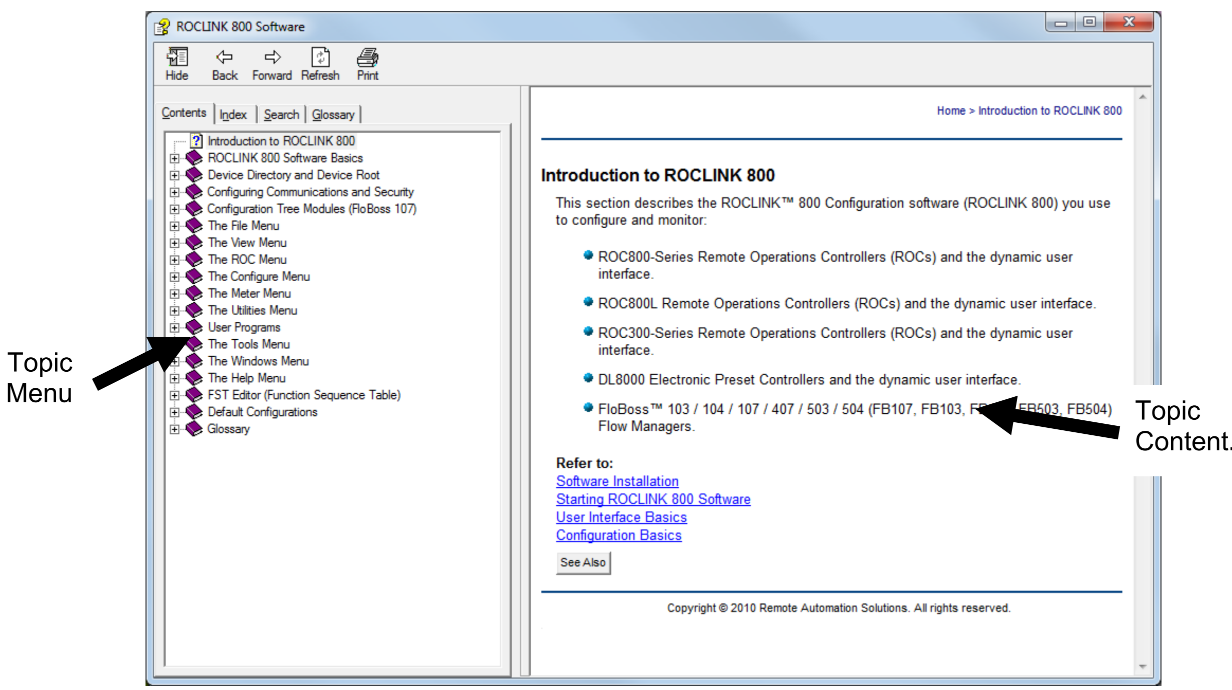


Figure 13-2. ROCLINK 800 Software Help

A table of contents for all help topics appears on the left of the help topic contents. The Help Topics consist of parameter names and menu options. Note that some topic names have been abbreviated. For example: analog input functions appear with "AI" in front of the name, such as in AI Alarms, AI Scanning, or AI-analog inputs.

13.2 About ROCLINK 800

Select **Help** > **About ROCLINK** to display the **About ROCLINK 800** dialog.

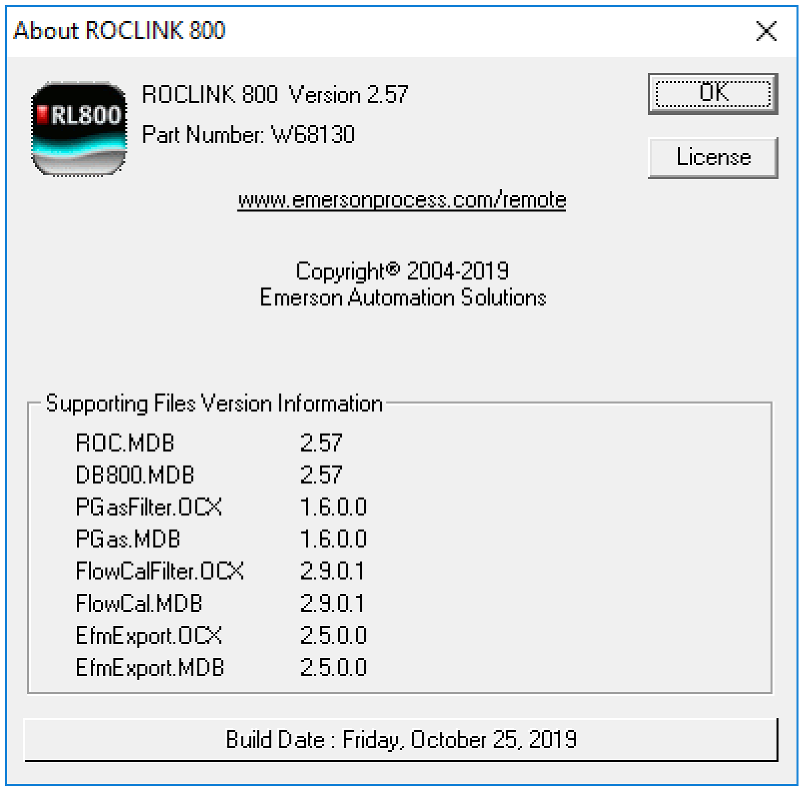


Figure 13-3. About ROCLINK

This dialog displays a variety of information, including the version number, license agreement, creation (software build) date, and version information for supporting files. Click **OK** to close the dialog.

Note: *Figure 12-3* represents the current version as of the publication date of this manual. Newer versions may be available. Consult with your LBP.

Appendix A – Glossary

Note: This is a generalized glossary of terms. Not all the terms may necessarily correspond to the particular device or software described in this manual. For that reason, the term "ROC" is used to identify all varieties of Remote Operations Controllers.

A

A/D	Analog to Digital signal conversion.
ABS	Acrylonitrile Butadiene Styrene.
ADC	Analog to Digital Converter. Used to convert analog inputs (AI) to a format the flow computer can use.
Additive	A liquid that is injected into a primary liquid component in relatively small quantities, usually less than four percent of the delivered volume total. Additives are injected into the primary liquid component by an injector mechanism which places a known, fixed volume of the additive into the primary liquid component stream for each injector pulse received from the DL8000 Preset.
AGA	American Gas Association. A professional organization that oversees the AGA3 (orifice), AGA5 (heating value), AGA7 (turbine), AGA8 (compressibility), AGA9 (Ultrasonic), and AGA11 (Coriolis) gas flow calculation standards. See http://www.aga.org.
AWG	American Wire Gauge.
AI	Analog Input.
AO	Analog Output.
Analog	Analog data is represented by a continuous variable, such as an electrical current signal.
Annubar	A device that uses Pitot tubes to measure the gas flow rate within a pipeline. The gas volume is calculated from the difference between the flowing pressure and the static pressure of the gas.
AP	Absolute Pressure.
API	American Petroleum Institute. See http://www.api.org.
Area	A user-defined grouping of database entities.
Arm	A movable pipe or hose assembly used at a tanker truck loading island (also: *swing arm, loading arm*). The arm can be designed for either top loading or bottom loading to the tanker compartments. A *swing arm* can be positioned to load at either side of the loading island or the parked state.
ASCII	American (National) Standard Code for Information Interchange.
Attribute	A parameter that provides information about an aspect of a database point. For example, the alarm attribute is an attribute that uniquely identifies the configured value of an alarm.

B

Batch	A preset, quantity-based product delivery or blended component delivery of a single recipe.
Blend Stream	A product stream blended of both gasoline and ethanol.

Blending	The process of mixing two or more liquid components to form a composite delivered stream. The DL8000 controls blending based on a predetermined recipe by either the sequential (automatic or manual) or the inline (proportional or non-proportional) method. The quantity of each component in a blend is typically greater than two to four percent of the blended product. Injection of very small quantities of liquids, less than four percent of the blended product, is usually controlled by the additive injection process.
BMV	Base Multiplier Value, used in AGA7 (turbine) calculations.
BPS	Bits Per Second, associated with baud rate.
BTU	British Thermal Unit, a measure of heat energy.
Built-in I/O	I/O channels that are fabricated into the ROC and do not require a separate option. Also called “on-board” I/O.

C

CID2	Class I, Division 2 hazardous area
CF	Compare Flag; stores the Signal Value Discrete (SVD).
CMOS	Complementary Metal Oxide Semiconductor, a type of microprocessor used in a ROC.
Coil	Digital output, a bit to be cleared or set.
COL	Ethernet Packet Collision.
COM	Communications port on a personal computer (PC).
COMM	Communications port on a ROC used for host communications.
Comm Module	Module that plugs into a ROC to provide a channel for communications via a specified communications protocol, such as EIA-422 (RS-422) or HART.
Component	Any liquid metered and controlled by the DL8000. Liquid hydrocarbons refined from crude oil and LPGs (such as propane) are usually referred to as *products*. Components are base products or tank products stored at a distribution terminal. The component is measured before being blended with other components. Additives may be injected before (upstream of) or after (downstream of) the component meter.
Configuration	Refers either to the process of setting up the software for a given system or the result of performing this process. The configuration activity includes editing the database, building schematic displays and reports, and defining user calculations. Typically, the software set up of a device that can often be defined and changed. Can also mean the hardware assembly scheme.
Configuration Tree	In ROCLINK 800, the graphical display that appears when a configuration file opens (also *Directory Tree*). It is a hierarchical branching (“tree-style”) method for navigating within the configuration screens.
CPU	Central Processing Unit.
CRC	Cyclical Redundancy Check error checking.
Crosstalk	The amount of signal that crosses over between the receive and transmit pairs, and signal attenuation, which is the amount of signal loss encountered on the Ethernet segment.
CSA	Canadian Standards Association. See http://www.csa.ca.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection.
CTS	Clear to Send modem communications signal.

D

D/A	Digital to Analog signal conversion.
DB	Database.

dB	Decibel. A unit for expressing the ratio of the magnitudes of two electric signals on a logarithmic scale.
DCD	**Data Carrier Detect** modem communications signal. In addition, **Discrete Control Device** – A discrete control device energizes a set of discrete outputs for a given setpoint and matches the desired result against a set of discrete inputs (DI).
DCE	Data Communication Equipment.
Deadband	A value that is an inactive zone above the low limits and below the high limits. The purpose of the deadband is to prevent a value (such as an alarm) from being set and cleared continuously when the input value is oscillating around the specified limit. This also prevents the logs or data storage location from being over-filled with data.
Device Directory	In ROCLINK 800, the graphical display that allows navigation through the PC Comm Ports and ROC Comm Ports set up screen.
DI	Discrete Input.
Discrete	Input or output that is non-continuous, typically representing two levels (such as on/off).
DMM	Digital multimeter.
DO	Discrete Output.
Download	The process of sending data, a file, or a program from a PC to a ROC.
DP	Differential Pressure.
DSR	Data Set Ready modem communications signal.
DTE	Data Terminal Equipment.
DTR	Data Terminal Ready modem communications signal.
Duty Cycle	Proportion of time during a cycle that a device is activated. A short duty cycle conserves power for I/O channels, radios, and so on.
DVM	Digital voltmeter.
DVS	Dual-Variable Sensor. A device that provides static and differential pressure inputs to a ROC.

E

EDS	Electronic Static Discharge.
EEPROM	Electrically Erasable Programmable Read-Only Memory, a form of permanent memory on a ROC.
EFM	Electronic Flow Metering or Measurement.
EIA-232 (RS-232)	Serial Communications Protocol using three or more signal lines, intended for short distances. Concerning RS232D and RS232C, the letters C or D refer to the physical connector type. D specifies the RJ-11 connector where a C specifies a DB25 type connector.
EIA-422 (RS-422)	Serial Communications Protocol using four signal lines.
EIA-485 (RS-485)	Serial Communications Protocol requiring only two signal lines. Can allow up to 32 devices to be connected together in a daisy-chained fashion.
EMF	Electro-Motive Force.
EMI	Electro-Magnetic Interference.
ESD	Electro-Static Discharge.
EU	Engineering Units. Units of measure, such as MCF/DAY.

F

FCC	Federal Communications Commission. See http://www.fcc.gov.

Firmware	Internal software that is factory-loaded into a form of ROM. In a ROC, the firmware supplies the software used for gathering input data, converting raw input data values, storing values, and providing control signals.
FlashPAC module	ROM and RAM module for a ROC300-Series unit that contains the operating system, applications firmware, and communications protocol.
Flash ROM	A type of read-only memory that can be electrically re-programmed. It is a form of permanent memory (requires no backup power). Also called Flash memory.
FloBoss	A microprocess-based device that provides flow calculations, remote monitoring, and remote control. A FloBoss is a type of ROC.
FM	Factory Mutual.
Force	Write an ON/OFF, True/False, or 1/0 value to a coil.
FPV	Compressibility Factor.
FSK	Frequency Shift Keypad.
FST	Function Sequence Table, a type of user-written program in a high-level language designed by Emerson Process Management's Remote Automation Solutions Division.
Ft	Foot or feet.

G

GFA	Ground Fault Analysis.
GND	Electrical ground, such as used by the ROC unit's power supply.
GP	Gauge Pressure.
Gross Quantity	The *indicated quantity times* the *meter factor* derived from a meter proving of the flow meter at a specific flow rate. *Calculation:* gross quantity = indicated quantity *times* meter factor.

H

HART®	Highway Addressable Remote Transducer.
Holding Register	Analog output number value to be read.
Hw	Differential pressure.
Hz	Hertz.

I, J

IC	Integrated Circuit. Also, Industry Canada (more recently known as Measurement Canada), an organization that grants custody transfer approvals on certain ROC units.
ID	Identification.
IEC	Industrial Electrical Code or International Electrotechnical Commission. See http://www.iec.ch.
IEEE	Institute of Electrical and Electronic Engineers. A professional organization that, in conjunction with the International Standards Organization (ISO), establishes and maintains the Open System Interconnection (OSI) reference model and an international standard for the organization of local area networks (LANs). Refer to http://www.ieee.org.
IMV	Integral Multiplier Value, used in AGA3 (orifice) calculations.
Indicated Quantity	The change in the flow meter reading that occurs during a product flow measurement operation. (Not displayed by the device calculation: indicated quantity = end reading *minus* start reading.)

Input	Digital input, a bit to be read.
Input Register	Input numeric value to be read.
I/O	Input/Output.
I/O Module	Module that plugs into an I/O slot on a ROC to provide an I/O channel.
IP-252	*Institute of Petroleum* standard 252. A British standard for pulse fidelity and security for pulse output type flow meters. Program codes 233 and 234 define the operation of this function. **Note**: Equivalent standard is API Manual of Petroleum Measurement Standards / Chapter 5 - Metering /
IRQ	Interrupt Request. Hardware address oriented.
ISO	International Standards Organization. See http://www.iso.ch.
IV	Integral Value.

K

KB	Kilobytes.
KHz	KiloHertz.
K-factor	The pulses per unit quantity generated by a pulse output type flow meter (also *system factor*). The nominal value is determined by flow meter design and factory water flow calibration. The “average” K-factors for the flow meters are usually indicated on the flow meter nameplates.

L

LCD	Liquid Crystal Display.
LDP	Local Display Panel, a display-only device that plugs into ROC300 (via a parallel interface cable) used to access information stored in the ROC.
LED	Light-Emitting Diode.
Load	**For sequential blending**: In multi-component blending, a load is the completed delivery of one component of a batch. The completion of loading all components in the batch completes the batch delivery. If the recipe only loads one component, a load corresponds to a batch delivery. **For inline blending:** Each component of the blend is loaded simultaneously. Depending on the blend ratio, the low-proportion components are loaded completely during the time that the high proportion component(s) are being loaded. After loading of the highest proportion component has been terminated, all component loads and the batch delivery are complete.
Loading Island	Also l*oading rack;* an installation of one or more loading arms or risers used to deliver liquid components to a tanker vehicle located on one or both sides of the island, depending on the design of the island.
Loading Riser	The related instruments and devices, located in a meter stream, that provide the liquid component loading capability to a mobile tanker vehicle. **Note**: The flow meter piping can also be installed horizontally, if desired.)
Load Spot	Also *bay or lane*; one side of a loading island, a position where a tanker vehicle parks for a loading operation. One load spot can have one or more loading arms.
Local Port	Also *LOI*; the serial EIA-232 (RS-232) port on the ROC through which local communications are established, typically for configuration software running on a PC.
Logical Number	The point number the ROC and ROC Plus protocols use for I/O point types are based on a physical input or output with a terminal location; the point numbers for all other point types are “logical” and are simply numbered in sequence.
LNK	Ethernet has linked.

LOI	Local Operator Interface (or Local Port). Refers to the serial EIA-232 (RS-232) port on the ROC through which local communications are established, typically for configuration software running on a PC.
LPM	Lightning Protection Module; a device that provides lightning and power surge protection for ROCs.
LRC	Longitudinal Redundancy Checking error checking.

M

m	Meter.
mA	Milliamp(s); one thousandth of an ampere.
MAC Address	Media Access Control Address; a hardware address that uniquely identifies each node of a network.
Manual mode	For a ROC, indicates that the I/O scanning has been disabled.
MAU	Medium Attachment Unit.
MCU	Master Controller Unit.
Meter Factor	A number obtained by dividing the actual volume of liquid passed through a flow meter during a meter proving operation by the volume registered by the flow meter. The meter factor is used in flow calculations to correct the *indicated volume* (end flow meter registration minus start flow meter registration) to the observed *gross volume* (actual flow meter throughput at operating conditions). Meter factor = (Meter prover volume corrected to standard conditions) ÷ (Flow meter indicated volume corrected to std conditions)
Meter Proving	A procedure used to determine the meter factor for a flow meter. The K-factor (exact number of pulses per a volume unit that a flow meter generates) is determined at the factory. The K-factor is used to derive a mathematical factor, known as meter factor, which is used to adjust results of the internal flow calculations the DL8000 performs. **Note**: The flow meter is not re-calibrated; determining the meter factor allows the operator to manually re-calibrate the DL8000 so that the flow meter's nonadjustable calibration characteristic [pulses per volume unit (K-factor)] are incorporated into the flow calculations.
Modbus	A popular device communications protocol developed by Gould-Modicon.
MPU	Micro-Processor Unit.
mm	Millimeter.
MMBTU	Million British Thermal Units.
msec	Millisecond, or 0.001 second.
MVS	Multi-Variable Sensor. A device that provides differential pressure, static pressure, and temperature inputs to a ROC for orifice flow calculations.
mV	Millivolts, or 0.001 volt.
mW	Milliwatts, or 0.001 watt.

N

NEC	National Electrical Code.
NEMA	National Electrical Manufacturer's Association. See http://www.nema.org.

O

OH	Off-Hook modem communications signal.
Off-line	Accomplished while the target device is not connected (by a communications link). For example, "off-line configuration" refers to configuring an electronic file that is later loaded into a ROC.

Ohms	Units of electrical resistance.
On-line	Accomplished while connected (by a communications link) to the target device. For example, “on-line configuration” refers to configuring a ROC800-Series unit while connected to it, so that you can view the current parameter values and immediately load new values.
Opcode	Type of message protocol the ROC uses to communicate with the configuration software, as well as host computers with ROC driver software.
Operator Interface	Also LOI or Local Port; the serial EIA-232 (RS-232) port on the ROC through which local communications are established, typically for configuration software running on a PC.
Orifice meter	A meter that records the flow rate of gas through a pipeline. The flow rate is calculated from the pressure differential created by the fluid passing through an orifice of a particular size and other parameters.

P, Q

Parameter	A property of a point that typically can be configured or set. For example, the Point Tag ID is a parameter of an Analog Input point. Parameters are normally edited by using configuration software running on a PC.
PC	Personal Computer.
Permissive	A discrete signal from a device that is input to a discrete input in the DL8000. The DL8000 uses this signal to allow a product delivery to be initiated or allow a product delivery to continue. Permissive contacts are *CLOSED* in the normal or safe state and *OPEN* in the abnormal or unsafe state.
Pf	Flowing pressure.
P/DP	Pressure/Differential Pressure.
PI	Pulse Input.
PID	Proportional, Integral, and Derivative control feedback action.
PIT	Periodic Timer Interrupt.
PLC	Programmable Logic Controller.
Point	Software-oriented term for an I/O channel or some other function, such as a flow calculation. Points are defined by a collection of parameters.
Point Number	The physical location of an I/O point (module slot and channel) as installed in the ROC.
Point Type	Defines the database point to be a specific type of point available to the system. The point type determines the basic functions of a point.
Preset	Number value previously determined for a register. Also: A generic term that describes the functional instrument group to which the DL8000 belongs. The term originated from mechanical and electrical preset counters. The DL8000 provides much more versatility and capability compared to a simple mechanical or electrical preset counter.
PRI	Primary PID control loop.
Primary Blend Stream Component	A blended product measured by a primary blend stream meter.
Primary Blend Stream Meter	A meter measuring the gasoline-ethanol blend.
Protocol	A set of standards that enables communication or file transfers between two computers. Protocol parameters include baud rate, parity, data bits, stop bit, and the type of duplex.

PSTN	Public Switched Telephone Network.
PT	Process Temperature.
PTT	Push-to-Talk signal.
Pulse	Transient variation of a signal whose value is normally constant.
Pulse Interface module	A module that provides line pressure, auxiliary pressure, and pulse counts to a ROC.
PV	Process Variable or Process Value.
Quantity	The resulting amount of product measured after compensation for operational temperature and pressure, indicated in one of the following corrected units: cubic meters, liters, barrels, gallons.

R

Rack	A row of slots on a ROC into which I/O modules can be plugged. Racks are given a letter to physically identify the location of an I/O channel (such as “A” for the first rack). Built-in I/O channels are assigned a rack identifier of “A” while diagnostic I/O channels are considered to be in “E” rack.
RAM	Random Access Memory. RAM is used to store history, data, most user programs, and additional configuration data.
RBX	Report-by-exception. RBX always refers to Spontaneous RBX in which the ROC contacts the host to report an alarm condition.
RR	Results Register; stores the Signal Value Analog (SVA).
Recipe	A pre-entered delivery/blending/control description that allows the DL8000 to automatically control the product quantity or total quantity based on percentages of multiple components during a batch delivery operation. The DL8000 supports up to thirty recipes.
RFI	Radio Frequency Interference.
RI	Ring Indicator modem communications signal.
ROC	Remote Operations Controller microprocessor-based unit that provides remote monitoring and control.
ROCLINK 800	Microsoft® Windows®-based software used to configure functionality in ROC units.
ROM	Read-only memory. Typically used to store firmware. Flash memory.
Rotary Meter	A positive displacement meter used to measure flow rate, also known as a Roots meter.
RTC	Real-Time Clock.
RTD	Resistance Temperature Device.
RTS	Ready to Send modem communications signal.
RTU	Remote Terminal Unit.
RTV	Room Temperature Vulcanizing, typically a sealant or caulk such as silicon rubber.
RS-232	Serial Communications Protocol using three or more signal lines, intended for short distances. Also referred to as the EIA-232 standard.
RS-422	Serial Communications Protocol using four signal lines. Also referred to as the EIA-422 standard.
RS-485	Serial Communications Protocol requiring only two signal lines. Can allow up to 32 devices to be connected together in a daisy-chained fashion. Also referred to as the EIA-485 standard.
RX or RXD	Received Data communications signal.

S

SAMA	Scientific Apparatus Maker's Association.
Script	An uncompiled text file (such as keystrokes for a macro) that a program interprets in order to perform certain functions. Typically, the end user can easily create or edit scripts to customize the software.
Side Stream	The controlled stream, often called the ethanol product. The side stream is metered and can be controlled and measured.
Side Stream Component	A mix component measured by both a side stream meter and a primary blend stream meter. Ethanol is often referred as a side stream component.
Side Stream Meter	A meter that measures the side component (ethanol).
Smart module	A module, typically for the ROC800-Series or FloBoss 107 devices, having an on-board processor which can execute a program.
Soft Points	A type of ROC point with generic parameters that can be configured to hold data as desired by the user.
SP	Setpoint, or Static Pressure.
SPI	Slow Pulse Input.
SPK	Speaker.
SRAM	Static Random Access Memory. Stores data as long as power is applied; typically backed up by a lithium battery or supercapacitor.
SRBX	Spontaneous Report-By-Exception. SRBX always refers to Spontaneous RBX in which the ROC contacts the host to report an alarm condition.
Standard Quantity	The *gross quantity* corrected to standard temperature and/or pressure. This is a quantity measurement. *Calculation:* standard quantity = gross quantity *times* CTLM (correction factor for the effect of temperature on the liquid in the meter) *times* CPLM (correction factor for the effect of pressure on the liquid in the meter)
SVA	Signal Value Analog. Stored in the Results Register, it is the analog value that is passed between functions in an FST.
SVD	Signal Value Discrete. Stored in the Compare Flag, it is the discrete value that is passed down the sequence of functions in an FST.
System Variables	Configured parameters that describe the ROC; set using ROCLINK software.

T

T/C	Thermocouple Input.
TCP/IP	Transmission Control Protocol/Internet Protocol.
TDI	Time Duration Input.
TDO	Time Duration Output.
Tf	Flowing temperature.
TLP	Type (of point), Logical (or point) number, and Parameter number.
Transaction	Group of one or more consecutive batch deliveries for accounting purposes. The batches that comprise a transaction always use one recipe, one additive selection, and one loading side. An example of a transaction is the delivery of multiple batches to different compartments in a single tanker vehicle.
Turbine meter	A device used to measure flow rate and other parameters.
TX or TXD	Transmitted Data communications signal.

U

Upload	Send data, a file, or a program from the ROC to a PC or other host.

V-Z

V	Volts.
Volume	The actual space occupied by the product measured, indicated in one of the following actual units: cubic meters, liters, barrels, gallons.
Wild Stream	Wild stream is the uncontrolled stream, often referring to the gasoline product. This is because the gasoline product cannot be exclusively metered, controlled, or measured.
Wild Stream Component	A product component measured as part of (Primary Blend Stream Component – Side Stream Component) a primary blend stream component by a primary blend stream meter is called a wild stream component. Gasoline is referred as wild stream component.

Appendix B – The Display Editor

In This Chapter

The custom display option in ROCLINK 800 software allows you to create customized displays or load a display from a file. The ROC can store up to 246 displays (including both custom user displays you create and user program displays that accompany user programs).

⚠ **Caution**	**You should be familiar with Visual Basic before attempting to create custom displays.**

You can add fields to monitor flow, I/O points, and other TLPs. Select **View** > **Display** > **New**. A blank Display Editor screen displays.

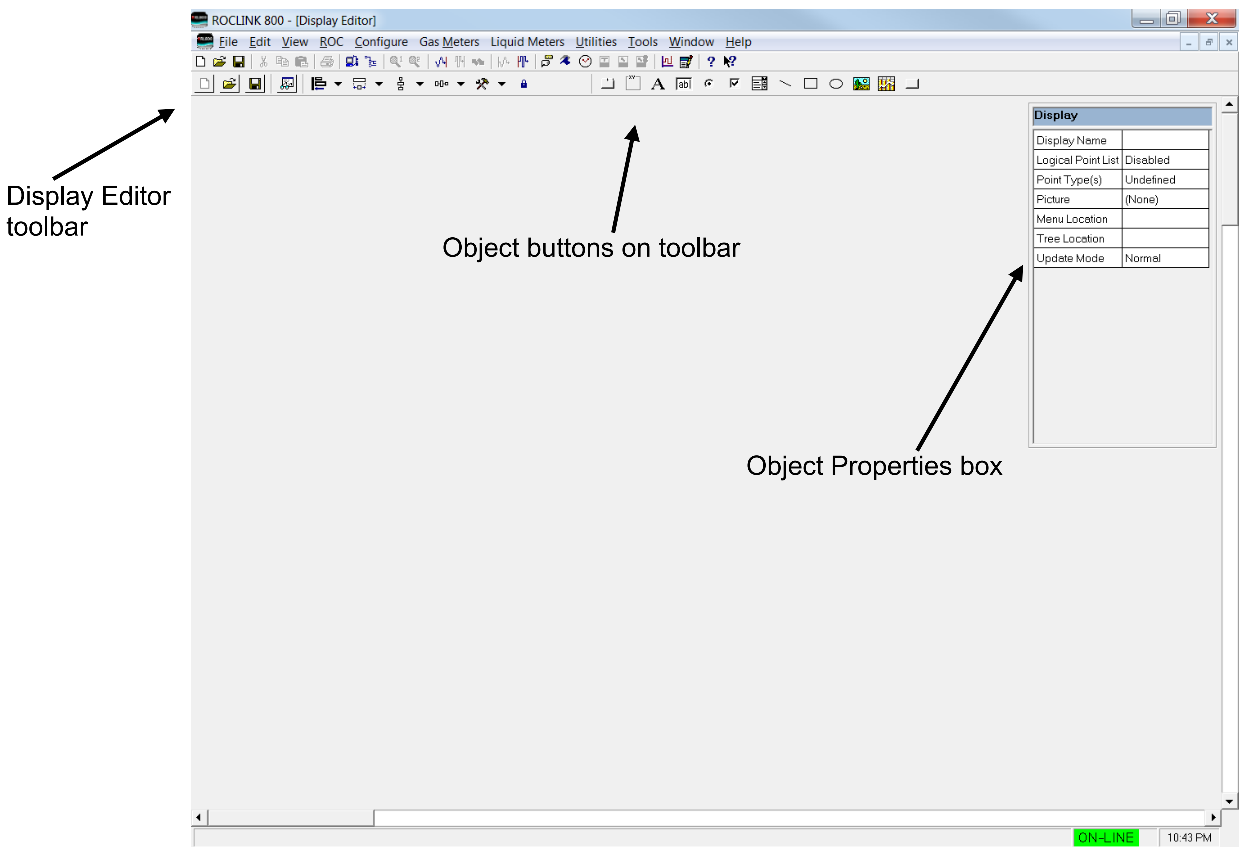


Figure B-1. Display Editor

By adding objects (tabs, fields, labels, text, etc.) to the display, you can incorporate "live" data as well as images and other information you wish to convey. One use of custom displays is to graphically represent the application that a ROC monitors and controls. Another use is to monitor the ROC, giving you to opportunity to change commonly used parameters from a single screen.

Each custom display has parameters specific to the entire display that you are creating. By default, the system places the Display object properties box at the upper right of the screen in a pop-up window. A similar object properties box displays for each object you add to the display.

Caution

When creating a custom display with multiple iterations that includes writable ROC800 HART-2 parameters, the system writes HART-2 values for all logicals to logical one. This means that the value for logical one is overwritten when the system writes each additional logical value. For example, if the value of logical one is 3, the current value of logical two is 5, and the new value of logical two is 7, the system overwrites the value in logical one (3) with the new value of logical two (7) and does not update the current value of logical two (5).

You can avoid this issue by creating a custom display with a single iteration that includes the fields for all logicals on a single screen. By manually assigning the TLP values for each field, the system writes all values to the correct logicals.

Drag and drop the object buttons from the toolbar to the Display Editor screen and set the associated parameters. Each option has parameters associated with it depending on the type of option you have selected and you can customize the parameters in the object properties box.

Note: Custom displays developed with ROCLINK for Windows are **not** compatible with ROCLINK 800 Configuration software.

Sections B.1 and *B.2* discuss the process of creating a new custom display and of adding and arranging objects on that display.

B.1 Creating a New Custom Display

To create a new display:

1. Select **View** > **Display** > **New**. A blank Display Editor screen displays.

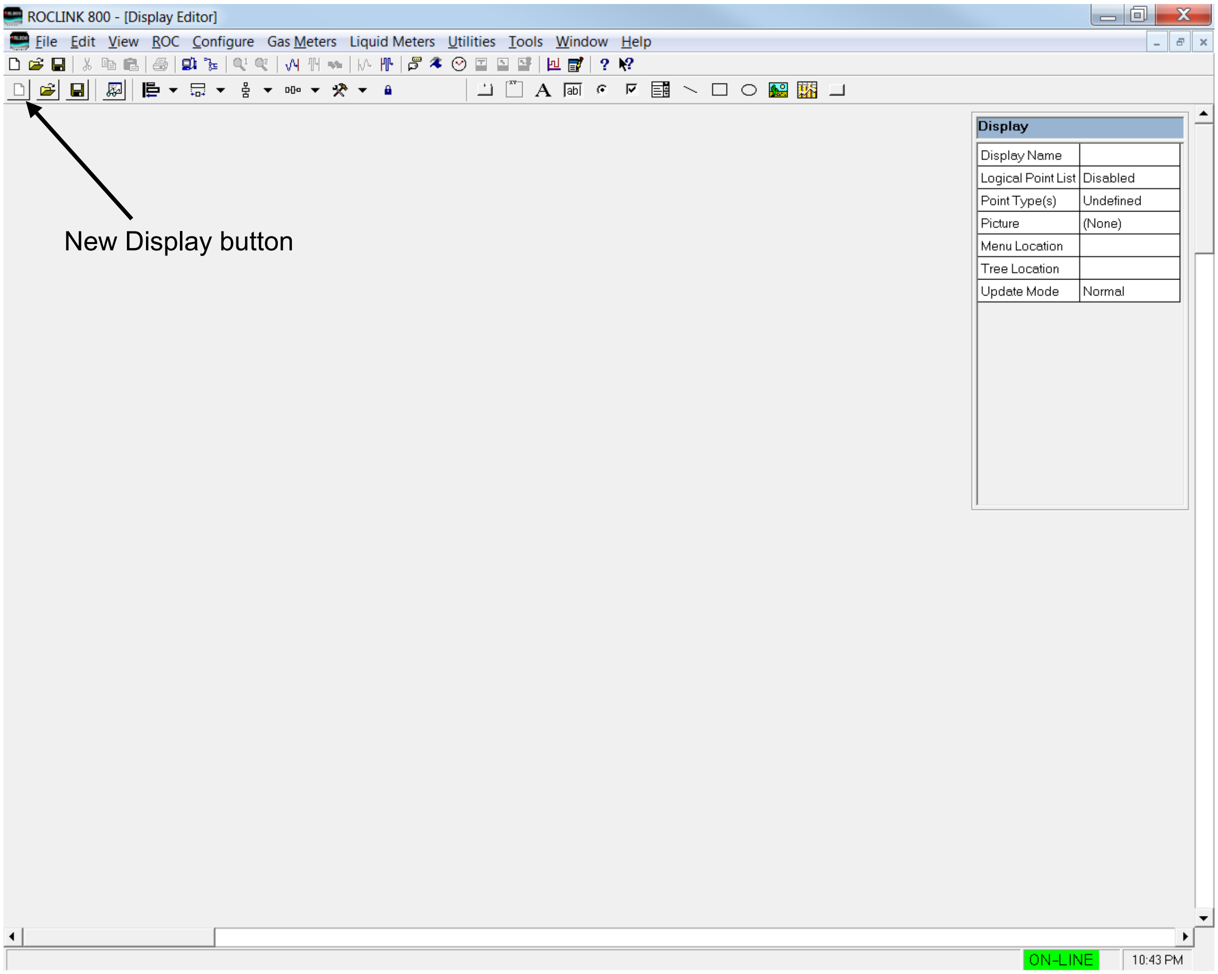


Figure B-2. Display Editor (blank)

Note: You can also click the **New Display** button (at the extreme left of the Display Editor toolbar) to create a new display.

2. Specify the properties for the new custom display:

Field	Description
Display Name	Names the display. Although you can enter up to 50 characters for a display name, a maximum of 10-20 characters should be sufficient to uniquely identify the display.
Logical Point List	Indicates whether the display is unique or one of several iterations. Click ▼ (which appears when you click the field) to display the values. Valid values are **Disabled** (screen is unique) or **Enabled** (number of screens equals the number of logicals). The default is **Disabled**. **Note**: The number of screens is based of the number of logicals for the first point type selected in the Point Type field.

Field	Description	
Point Type(s)	Sets, if you **enable** the Logical Point List option, the point type(s) whose logicals track the iteration of the display. Click **…** (which appears when you click the field) to display the Select Point Type(s) screen. Use that screen to associate one or more point types with this Logical Point List.	
Picture	Identifies a graphic used for the background of the display. Click **…** (which appears when you click the field) to display a Select Picture File screen. Use that screen to associate an image with the display.	
Menu Location	Allows you to hide, replace, or rename a menu selection in the ROCLINK 800 menu. This option applies **only** to displays physically residing in the ROC.	
	Hide	Hides a menu selection in the Meter, View, or ROC menu. Requires the syntax H:menuname.submenuname (as in **H:Meter.Plate Change**).
	Replace	Replaces a screen in the Meter menu with the current custom display. Requires the syntax R:menuname.submenuname (as in **R:Meter.Setup**).
	Rename	Replaces a menu in the Meter, View, or ROC menu with the current display using the indicated name. Requires the syntax N:menuname.submenuname: newsubmenuname (as in **N:Meter.Calibration:Coriolis Cal**).
	Note: Use a comma to hide, replace, or rename multiple features, as in **N:Meter.Calibration:Coriolis Cal,N:Meter,Calibration:Central Cal**.	
Tree Location	Currently unavailable.	
Update Mode	Sets when the system updates data on this screen. Valid values are **Normal** (system does not update the screen content) or **AutoScan** (system updates the screen content based on the interval you specify in the Auto Scan Update Interval field on the Options screen (**Tools** > **Options**). The default value is **Normal**. **Note**: If you include dynamic content on your custom display, you may want the system to refresh that content for the most current values.	

3. Add display content to the custom display. You can **either** drag an object from the toolbar and place it on the custom display **or** place the cursor on the display where you want the object, right-click, and select from the pop-up menu. Refer to *Section B.2, Adding Custom Display Objects,* for a description of each object and its properties.
   - Add as many objects to the screen as you need. You can place objects anywhere on the Display Editor screen. Use a frame with a label to logically group certain options (such as option buttons or check boxes) to ensure that others know the use context for the options.
   - For each object you enter, complete that object's Properties box. Each object's Properties box has different items, and you can edit those properties at any time.
   - Move and re-shape objects within the display as necessary. To modify an object's placement or shape:
     - Click and drag on the control squares to change the size of the object.
     - Press **Shift + arrow keys** to change an object's size. Press **Shift +Alt + arrow keys** for smaller changes.
     - Press **Ctrl + arrow keys** to move an object to the desired position. Press **Ctrl + Alt + arrow keys** for smaller moves.
     - Select the **Align Lefts** icon to align all selected objects to the furthest left point in the group.
     - Select the **Size to Widest** icon to change the width of all selected objects to the width of the widest element.
     - Select the **Make Vertical Spacing Equal** icon to evenly adjust the vertical spacing between all the selected objects.
     - Select the **Make Horizontal Spacing Equal** icon to evenly adjust the horizontal spacing between all the selected objects.
     - Remove objects by selecting the object and pressing **Delete**.
4. Click the **Test** icon to verify that the completed custom display works correctly.
5. Click the **Save Display to File** icon to save the completed and tested custom display. ROCLINK 800 displays use the suffix .DSP (as in *TestScreen.dsp*).

B.2 Adding Custom Display Objects

The right-hand side of the Display Editor toolbar (see *Figure B-3*) includes a number of buttons for custom objects.

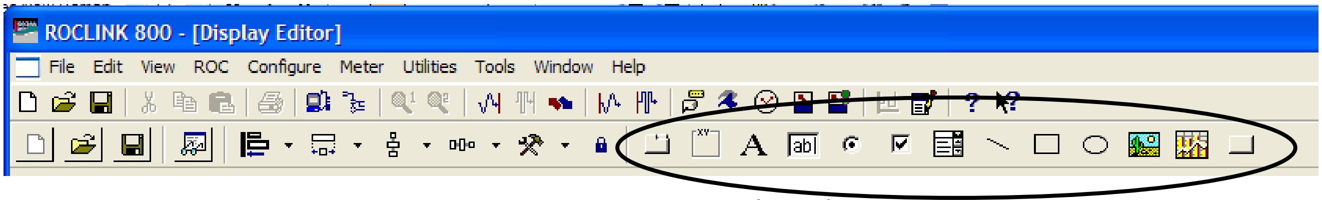


Figure B-3. Custom Display Objects

Tab Control

Adds an twelve-tab image, which you can size appropriately and edit to fewer tabs. You can then drag and drop objects onto each tab.

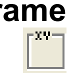
This object has the following properties:

TabControl(0)	
Tabs	12
Caption 1	Tab 1
Caption 2	Tab 2
Caption 3	Tab 3
Caption 4	Tab 4
Caption 5	Tab 5
Caption 6	Tab 6
Caption 7	Tab 7
Caption 8	Tab 8
Caption 9	Tab 9
Caption 10	Tab 10
Caption 11	Tab 11
Caption 12	Tab 12
Allow Data Entry	Yes
Visible	Yes
Tab Order	0

Property	Description
Tabs	Sets the number of tabs (up to 12) on the screen. Click ▼ (which displays when you click in the field) to specify the number of tabs.
Caption 1 through **12**	Sets a label or caption for each tab. The size of the tab increases to accommodate the text.
Allow Data Entry	Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values: **Yes** Allows editing. This is the **default**. **No** Does not allow editing.

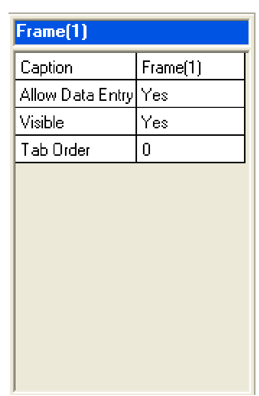
	Expression	Editing is permitted based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.	

Frame



Adds an organizing frame, which you use to group similar user selections. Once a frame is in place, drag and drop objects onto the frame.

This object has the following properties:

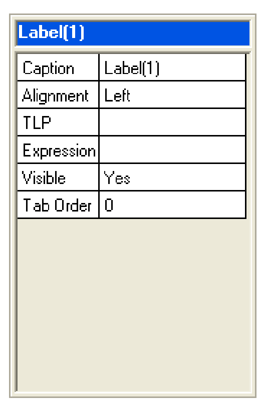


Property	Description
Caption	Sets a label or caption for the object. The default is **Frame(1)**; the system uniquely names each object until you rename it.

Property		Description
Allow Data Entry		Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values:
	Yes	Allows editing. This is the **default**.
	No	Does not allow editing.
	Expression	Editing is allowed based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*
Visible		Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order		Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.

Label

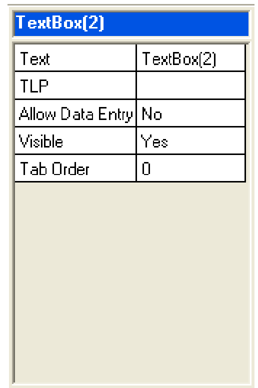
Adds labels to identify objects. This object has the following properties:



Property	Description
Caption	Sets a label or caption for the object. The default is **Label(1)**; the system uniquely names each object until you rename it.
Alignment	Indicates where the label text displays. Click ▼ (which displays when you click in the field) to display the valid values: **Left** (text is flush left), **Right** (text is flush right), or **Center** (text is centered).
Property	**Description**
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the associated TLP.
Expression	Associates the object with a Visual Basic expression. Click **…** (which displays when you click in the field) to display an Expression Builder window which you use to define the expression. Refer to *Section B.4, Adding an Expression to an Object.*
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values: **Yes** – Object is always visible. This is the **default**. **No** – Object is not visible. **Expression** – Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.

Text Box

Adds a data entry field. This object has the following properties:

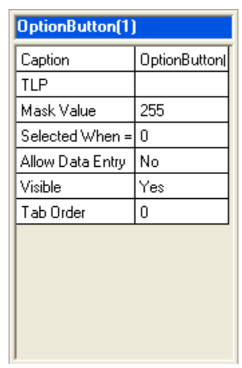


Property	Description	
Text	Sets text that appears in the object. You can enter as many characters as necessary. Use the control squares to change the size of the text box. The default is **TextBox(1)**; the system uniquely names each object until you rename it.	
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the associated TLP.	
Allow Data Entry	Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Allows editing. This is the **default**.
	No	Does not allow editing.
	Expression	Allows editing based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*

Property	Description	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.	

Option Button

Adds a radio button to limit input to a single selection. This object has the following properties:

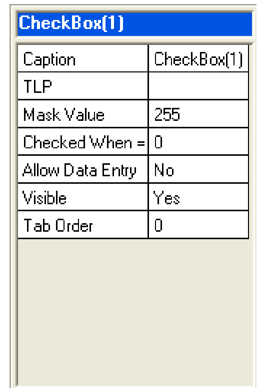


Property	Description
Caption	Sets a label or caption for each object. The default is **OptionButton(1)**; the system uniquely names each object until you rename it.
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the associated TLP.
Mask Value	Identifies individual bits of an 8-bit integer ROCLINK uses when calculating the value to be compared to the value specified in the **Selected When** or **Checked When** fields. ROCLINK performs a mathematical AND comparing this masked value and the value in the Selected When or Checked When field and activates the button or box if the values are equal. The default value is **255**.

Property	Description	
Selected When =	Specifies the value at which the option button activates. Works in conjunction with the value in the **Mask Value** field.	
Allow Data Entry	Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Allows editing. This is the **default**.
	No	Does not allow editing.
	Expression	Allows editing based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.	

Check Box

Adds a check box for multiple selections. This object has the following properties:



CheckBox(1)

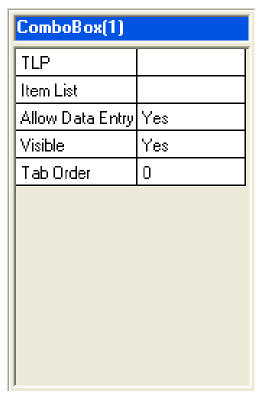
Caption	CheckBox(1)
TLP	
Mask Value	255
Checked When =	0
Allow Data Entry	No
Visible	Yes
Tab Order	0

Property	Description	
Caption	Sets a label or caption for the object. The default is **CheckBox(1)**; the system uniquely names each object until you rename it.	
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the associated TLP.	
Mask Value	Identifies individual bits of an 8-bit integer ROCLINK uses when calculating the value to be compared to the value specified in the **Selected When** or **Checked When** fields. ROCLINK performs a mathematical AND comparing this masked value and the value in the Selected When or Checked When field and activates the button or box if the values are equal. The default value is **255**.	
Checked When =	Specifies the value at which the checkbox activates. Works in conjunction with the value in the **Mask Value** field.	
Allow Data Entry	Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Allows editing. This is the **default**.
	No	Does not allow editing.
	Expression	Allows editing based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*

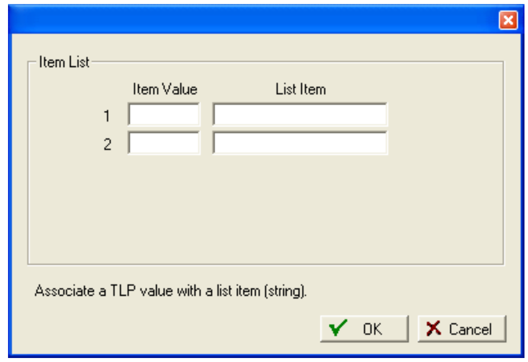
Property	Description	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.	

Combo Box

Adds a list of options that opens when you click ▼. This object has the following properties:



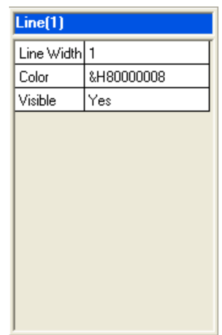
Property	Description
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to select the associated TLP.

Property	Description	
Item List	Enables you to build a drop-down list of up to 30 selectable items. Click **…** (which displays when you click in the field) to display an Item List screen:  Use this screen to add items to the drop-down menu. ROCLINK 800 expands the list as you add items.	
	Item Value	Associates the label in the drop-down menu with a value in the designated TLP.
	List Item	Sets the label that appears in the drop-down menu.
Allow Data Entry	Sets whether the user can edit the object. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Allows editing. This is the **default**.
	No	Does not allow editing
	Expression	Allows editing based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the data entry is allowed. Refer to *Section B.4, Adding an Expression to an Object.*
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*

Property	Description
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.

Line

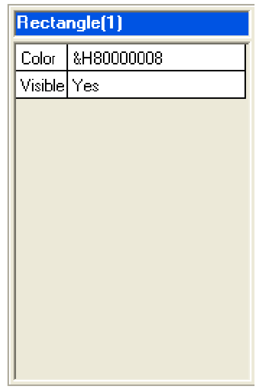
Adds a line to mark borders between objects. This object has the following properties:



Property	Description	
Line Width	Sets the thickness of the line. The default is **1**.	
Color	Sets the color of the object. Enter a hexadecimal color value or click in the field to display a Color screen, which you use to assign a color to the object.	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*

Rectangle

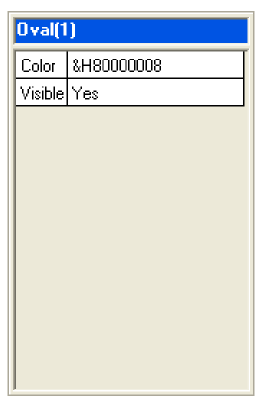
Adds a rectangle to mark borders between objects. This option has the following properties:



Property	Description	
Color	Sets the color of the object. Enter a hexadecimal color value or click in the field to display a Color screen, which you use to assign a color to the object.	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object*

Oval

Adds an oval to mark borders between objects. This object has the following properties:

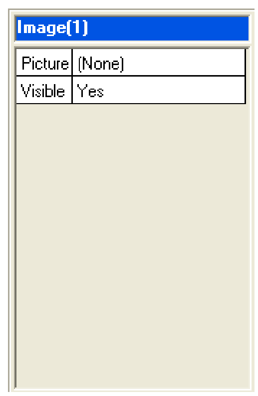


Property	Description
Color	Sets the color of the object. Enter a hexadecimal color value or click in the field to display a Color screen, which you use to assign a color to the object.

Property	Description	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*

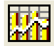
Image

Adds an image (.JPG, .BMP, .PNG, .GIF, or other graphic formats) from a file. This object has the following properties:



Property	Description	
Picture	Sets an image (.JPG, .BMP, .GIF, or other graphic formats) to display with the object. Click in the field to display a Select Picture File screen which you use to indicate the appropriate image. The default is **None**.	
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values:	
	Yes	Object is always visible. This is the **default**.
	No	Object is not visible.
	Expression	Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*

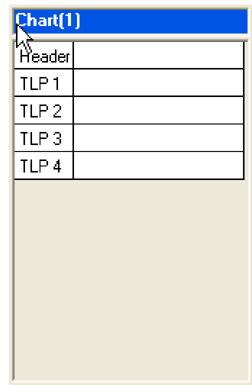
Chart



Adds a chart to represent data graphically.

Note: You can view real-time data by configuring what figures display on the chart. After you configure the chart, view the display and select **Auto-Scan**. The chart displays the collected data in real-time. You cannot save the chart data to system memory.

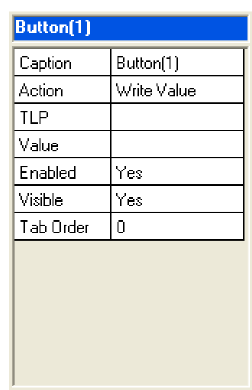
This option has the following properties:



Property	Description
Header	Sets a title for the object.
TLP 1 through **4**	Associates up to four TLPs with the chart. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the TLPs.

Button

Adds a button to the screen. This object has the following properties:



Property	Description
Caption	Sets a label or caption for the object. The default is **Button(1)**; the system uniquely names each object until you rename it.
Action	Associates an activity with the button. **Write Value** is the only action currently associated with this control. The system writes the value identified in the Value property
TLP	Associates the object with a TLP. Click **…** (which displays when you click in the field) to display a Select TLP screen you use to define the TLP.

Property	Description
Value	Opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section 5.6.4, Adding an Expression to an Object.*
Enabled	Indicates whether the button is active. Valid values are: **Yes** Object is always active. This is the **default**. **No** Object is not active. **Expression** Selection is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Visible	Indicates whether the object appears in the final version of the display. Click ▼ (which displays when you click in the field) to display the valid values: **Yes** Object is always visible. This is the **default**. **No** Object is not visible. **Expression** Visibility is based on a Visual Basic expression. This option opens an Expression Builder window which you use to determine the conditions under which the object is visible. Refer to *Section B.4, Adding an Expression to an Object.*
Tab Order	Sets the object-to-object order the cursor follows on the custom display when you press the Tab key. **Note**: For greatest efficiency, use the **Set Tab-Key Order** option (accessed through the Other Tools button on the toolbar) to set this sequence when you have finished defining **all** the objects on the custom display.

B.3 Managing Custom Display Objects

The left-hand side of the Custom Display toolbar (see *Figure B-4*) provides utilities you use to manage the objects placed on the custom display.

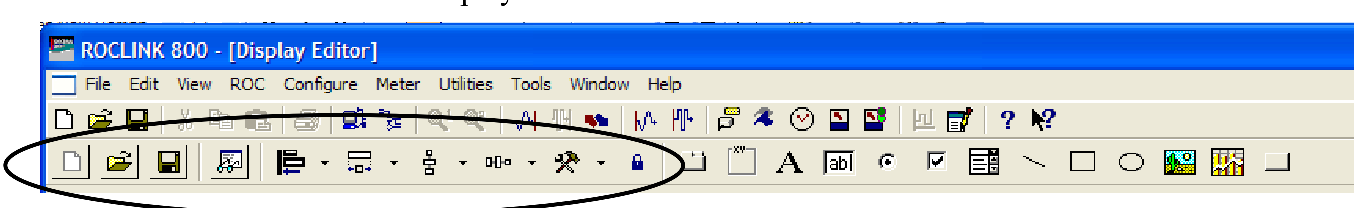


Figure B-4. Object Management Tools

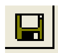
New Display

Creates a new custom display file.

Open Display File

Opens an existing custom display file. Click this button to display an Open screen that shows all available .DSP files in the default ROCLINK 800 directory. If you store .DSP files elsewhere, use this screen to navigate to that location and select a file.

Save Display to File



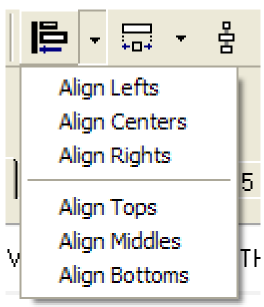
Saves the current display. Click this button to display a Save As screen that shows the .DSP files in the default ROCLINK 800 directory. If you store .DSP files elsewhere, use this screen to navigate to that location and save the display file.

Test

Closes edit mode for the custom display and shows the custom display as defined. If any errors exist, the system displays appropriate error messages.

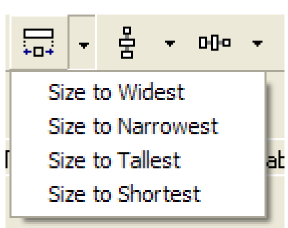
Align Lefts

Aligns selected objects to the left. Click ▼ to display a drop-down menu that provides more specific alignment options:



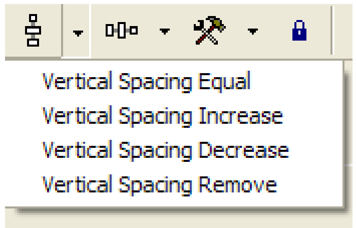
Size to Widest

Adjusts the size of the selected objects to the width of the widest object. Click ▼ to display a drop-down menu that provides more specific sizing options:



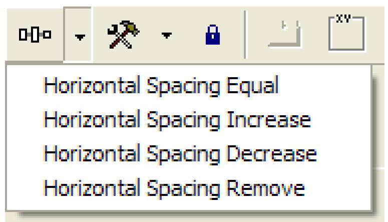
Make Vertical Spacing Equal

Equalizes the vertical spacing between the selected objects. Click ▼ to display a drop-down menu that provides more specific spacing options:



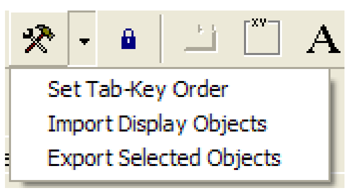
Make Horizontal Spacing Equal

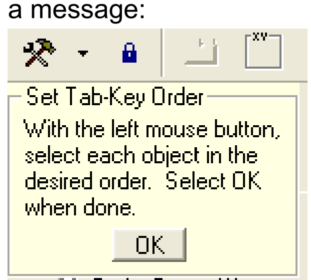
Equalizes the horizontal spacing between the selected objects. Click ▼ to display a drop-down menu that provides more specific spacing options:



Other Tools

Provides additional object-management tools. Click ▼ to display a drop-down menu that provides more specific spacing options:



Option	Description
Set Tab-Key Order	Allows you to specify the object-to-object sequence for the cursor on the custom display when you press Tab. When you click this option, the system displays a message: 

Option	Description
Import Display Objects	Allows you to import another custom display into the current custom display. Use this to quickly duplicate custom displays or build similar custom displays. When you click this option, the system displays an Import screen that you use to select the .DSP file to import.
Export Display Objects	Allows you to save the current custom display. When you click this option, the system displays a Save As screen. Use it to save the .DSP file to the default (or other) ROCLINK 800 directory.

Lock Controls Restricts the movement of objects on the custom display. This control is helpful when you want to make minor changes to the custom display without accidentally modifying the location of objects.

B.4 Adding an Expression to an Object

Some custom display objects—tab, label, button, text box, option, check box, combo box, line, circle, square, and image—allow you to add Visual Basic expressions that cause the display to change under specific conditions.

The Expression Builder screen enables you to quickly build and test a Visual Basic expression to provide customized functioning. For example, you could set a frame's Visible property to Expression and then specify the conditions (such as a particular TLP value) under which the frame displays. Until that value occurs, the frame does not appear on the custom display.

⚠ Caution **We strongly suggest prior experience in Visual Basic programming if you want to create display element expressions.**

To add an expression:

1. Click an object's property that includes **Expression** as an option.
2. Click ▼ and select **Expression**.
3. Click **…** (which displays as part of the Expression option). The Expression Builder screen displays:

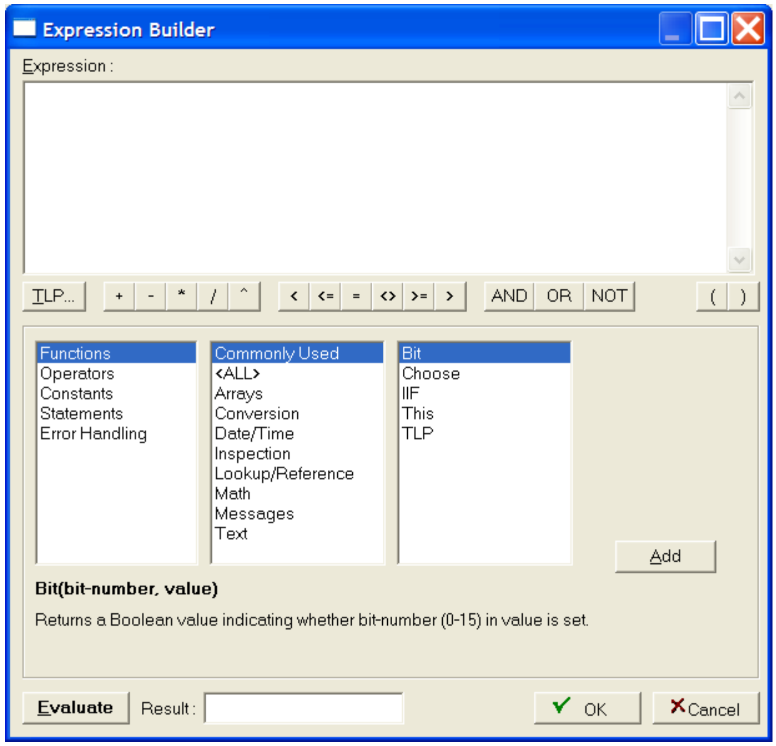


Figure B-5. Expression Builder

Note: If you are skilled in Visual Basic or already know the specific expression you want to add, you can enter the desired expression directly in the upper (Expression) box on this screen.

4. Build an expression using the buttons immediately under the Expression box and/or the three boxes in the center of the screen. Click **Add** to include each expression component to the screen.

Note: Based on your selected expression category, ROCLINK 800 changes the options displayed in the other two boxes to help you in the building process. Additionally, ROCLINK 800 displays definitions and explanations at the bottom of the screen.

5. When your expression is complete, click **Evaluate**. ROCLINK 800 checks your expression for errors. Correct any errors.

6. Click **OK** when your expression is complete. The Display Editor screen displays.

Note: At this point it is **strongly** recommended that you save the custom display to save the expression.

B.5 Editing a Custom Display from a File

Once you have created a custom display, you save the display as a **.DSP** file you can later edit. Click **Save Display to File** on the Display Editor toolbar and indicate the name and location for the saved display.

To edit a saved display, select **View** > **Display** > **From File**. An Open screen displays. Select the .DSP file and click **Open**. ROCLINK 800 opens that display.

If **Edit** is **not** included in the buttons displayed at the bottom of the ROCLINK 800 screen, you need to change the attributes of the .DSP file. Using Window's Explorer, access the directory that houses your .DSP files (typically C:\Program Files\ROCLINK800\Displays, if you accepted defaults during system installation). If you store your .DSP files in another location, access that directory. Locate the .DSP file and left-click the file to display a pop-up menu. Select **Properties**. A window similar to this one should appear:

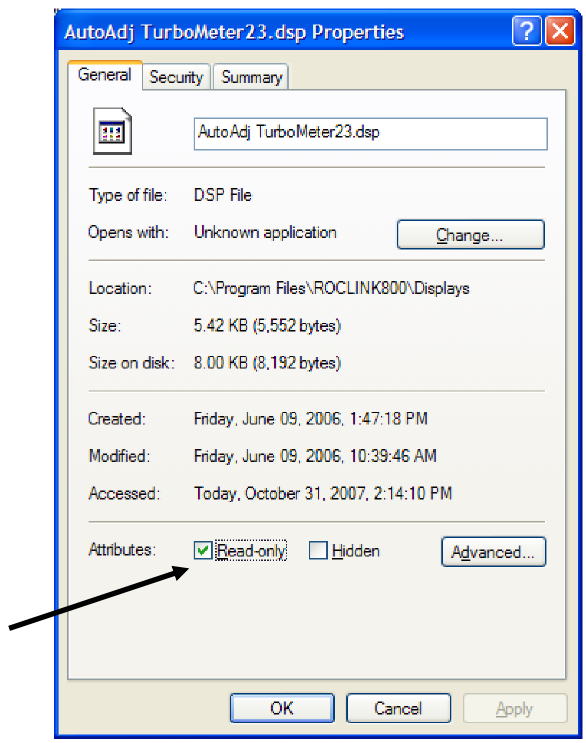


Figure B-6. Properties

Uncheck the **Read-only** Attributes box and click **Apply**. You can now edit the .DSP file.

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