Instruction Manual
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ControlWave®
MRMS-IC Configuration Manual

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Contents

Chapter 1 – Getting Started

This chapter discusses how to install the MRMS-IC application and provides some general information about how to use it.

In This Chapter

1.1 What is MRMS-IC?

Multi-Run Multi-Station (MRMS) software with Industry Canada (IC) / Measurement Canada approvals is a software application that allows the ControlWave Micro controller to manage up to six (6) natural gas measurement stations.

The MRMS-IC application consists of:

- A ControlWave project file (*.PRO) pre-programmed for multi-run multi-station natural gas measurement.
- A customized flash configuration profile (*.FCP) file that configures the ports, audit, and archive parameters of the ControlWave Micro for the MRMS_IC.
- A TechView session. This includes the TechView session file (*.TVS), associated *.INI files, and a set of HTM menus customized for the MRMS-IC application. You use these menus to configure the application.

1.2 Before You Begin

- You must install the ControlWave Micro controller on site and connect field devices to its I/O modules. For information on ControlWave Micro hardware, see document *CI-ControlWave Micro*.
- You must install OpenBSI 5.7 software including TechView on your PC workstation. You must also install the latest service pack and patches (Service Pack 2, Patch D). See the *OpenBSI Utilities Manual (D5081),* the *BSI_Config User's Manual* (D5128), and the *TechView User Manual* (D5131) for details on installation requirements.

- You must connect the PC workstation to the ControlWave Micro controller. You can communicate using a serial cable or an Ethernet cable. Cable diagrams are included in *CI-ControlWave Micro*.
- The ControlWave Micro must be running a flash configuration profile file (*.FCP) compatible with MRMS-IC software. For information on updating FCP files, see *Chapter 5* of the *OpenBSI Utilities Manual* (D5081).
- The ControlWave Micro must be running the ControlWave project (*.PRO) file configured for the MRMS-IC. See *Chapter 7* of the *OpenBSI Utilities Manual* (D5081) for information on downloading a ControlWave project (*.PRO) file.

Note: If you ordered your ControlWave Micro with MRMS-IC software pre-installed, the FCP and PRO files are already loaded when the unit ships from the factory.

1.3 Installing MRMS-IC Software

Note: MRMS_IC runs on the following Windows operating systems: Windows XP

1. Double-click on the MRMS-IC application icon.

2. Click **Next** on the welcome screen of the installer.

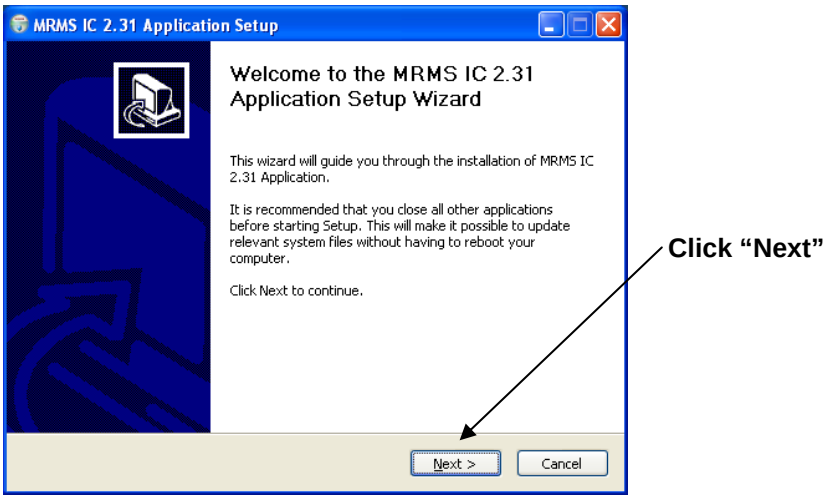


Figure 1-1. MRMS_IC Installer – Welcome Screen

3. The next screen includes a "Read Me" file which describes the changes since the last release of MRMS IC. Click **Next** after you review the changes.

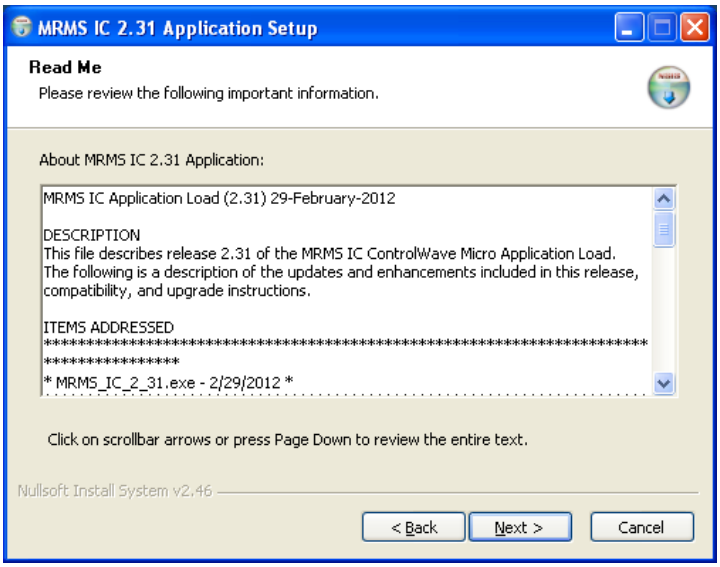
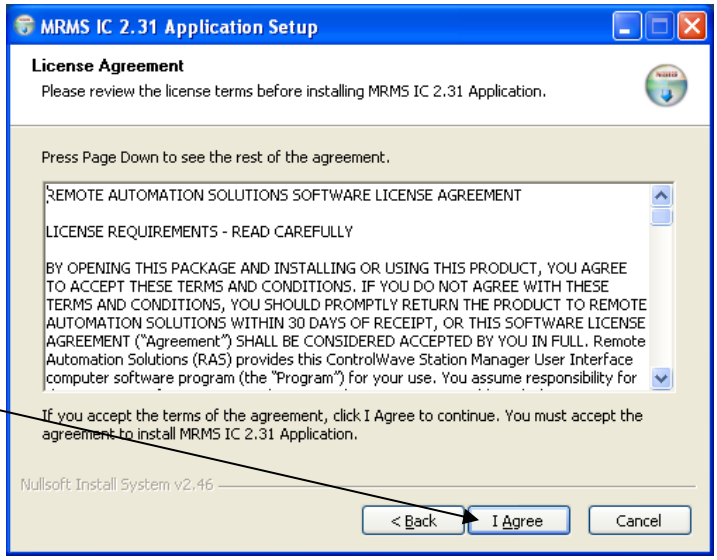


Figure 1-2. Read Me Page

4. Review the license agreement and click the **I Agree** button to proceed with the installation or **Cancel** to abort the installation process.



Click **I Agree**

Figure 1-3. License Agreement page

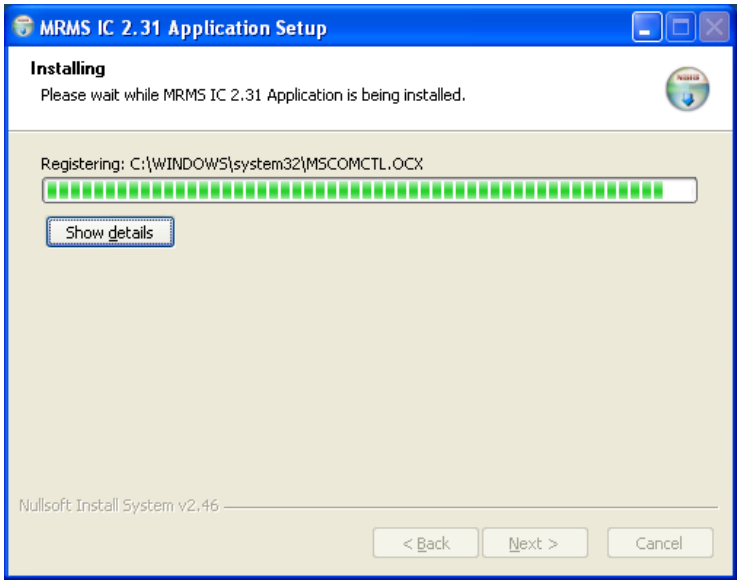


Figure 1-4. Installation in Progress

5. The installation begins. If you see the following message box, click **OK** to confirm that you have the proper OpenBSI version installed.

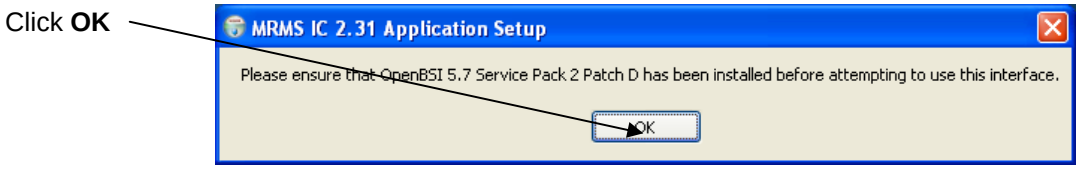


Figure 1-5. Confirm OpenBSI Version

6. At the completion of the installation, click **Next**.

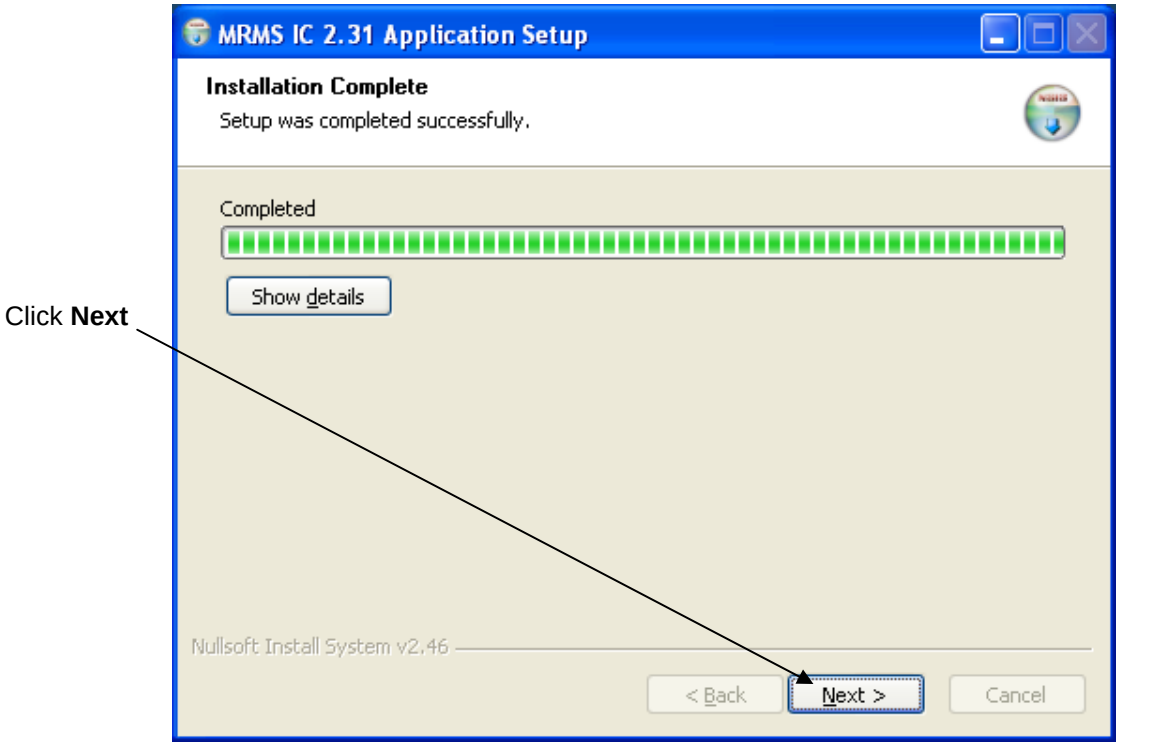


Figure 1-6. Installation Completion

7. Now click **Finish** to exit the installer.

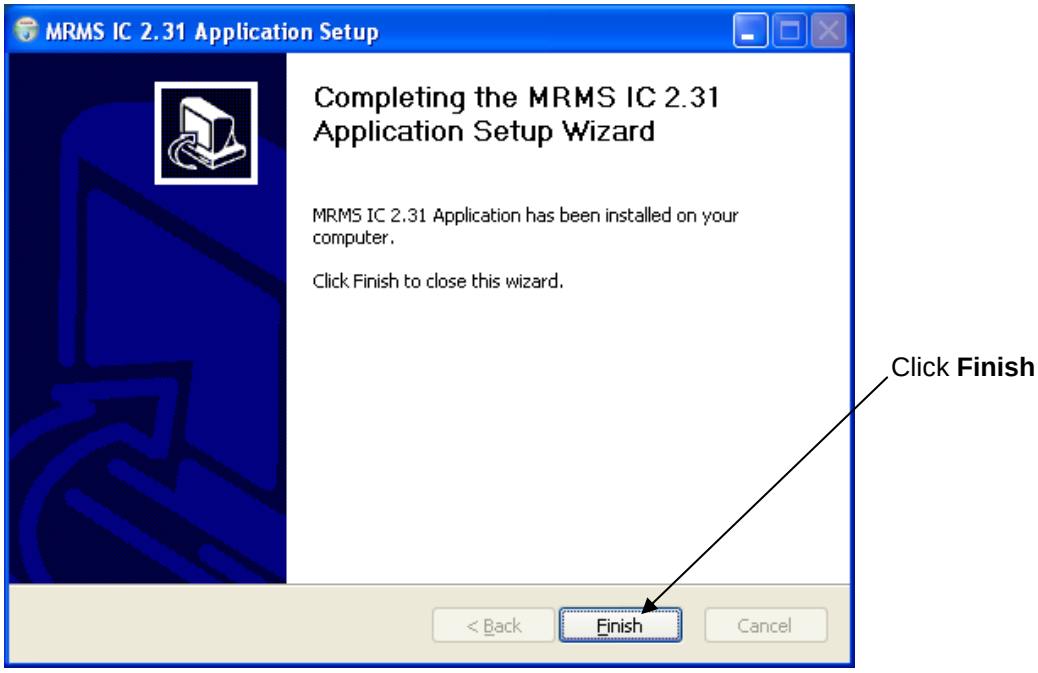


Figure 1-7. Exit the Installer

1.4 Starting MRMS-IC Software

You start the MRMS_IC software by invoking the proper TechView file. There are two ways to do this:

Starting MRMS_IC from the Start Programs Menu

For an IP connection, click: **Start > Programs > MRMS_IC > MRMS_IC_IP_tvs**

For a serial connection, click: **Start > Programs > MRMS_IC > MRMS_IC_Serial_tvs**

Starting MRMS_IC from an icon

From a desktop icon, similar to those below, or from the \MRMS_IC\SUPPORT folder, double-click the IP or serial TVS file, depending upon your type of connection.

Figure 1-8. MRMS_IC TVS file icons

For IP communication, see *Section 1.4.1 MRMS_IC IP Startup.*

For serial communication see *Section1.4.2 MRMS_IC Serial Startup.*

1.4.1 MRMS_IC IP Startup

Note: Although you can view data through an IP connection, the MRMS-IC application only allows configuration changes when you establish a physical serial connection to serial communication port 1 on the ControlWave Micro.

Once you start the TVS file for IP operation, TechView opens the Runtime Configuration Parameters dialog box:

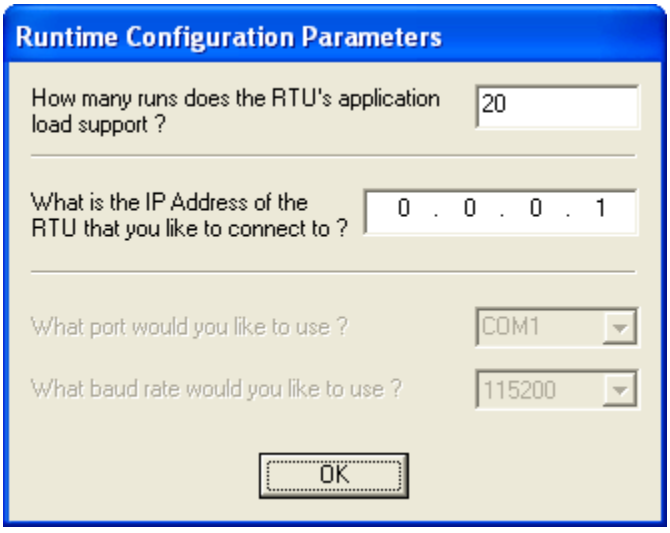


Figure 1-9. IP Runtime Parameters

1. Ignore the number of runs; this parameter does not apply for

MRMS-IC.

2. Enter the IP address of the ControlWave Micro IP port to which you are connected.
3. Click **OK**.
4. Log onto the ControlWave Micro as described in *Section 1.4.3.*

1.4.2 MRMS_IC Serial Startup

Once you start the TVS file for serial operation, TechView opens the Runtime Configuration Parameters dialog box:

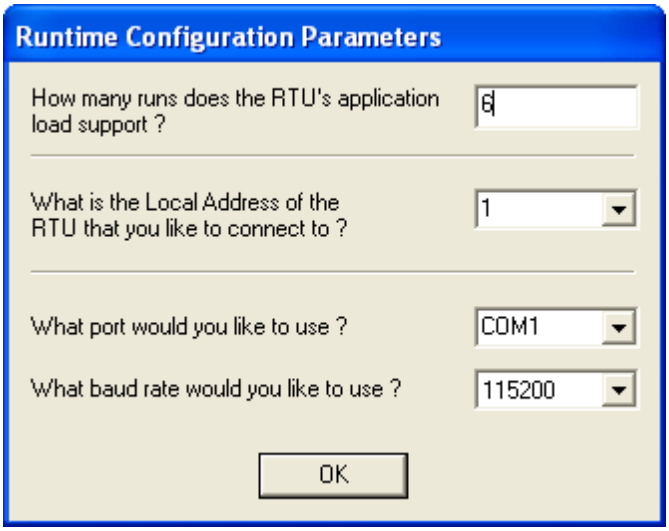


Figure 1-10. Serial Runtime Parameters

1. Ignore the number of runs; this parameter does not apply to MRMS-IC.
2. Enter the BSAP local address of the ControlWave Micro to which you are connected.
3. Select the serial communication port on the PC which you are using to communicate with the ControlWave Micro.
4. Select the baud rate on the serial communication line.
5. Click **OK**.
6. Log onto the ControlWave Micro as described in *Section 1.4.3.*

1.4.3 Logging Onto the ControlWave Micro

In the SignOn to RTU dialog box, enter a **Username / Password** combination that allows full access to the ControlWave Micro, then click the **SignOn** button.

Figure 1-11. Logging onto the ControlWave Micro

1.5 Accessing Pages of the MRMS_IC Application

To access various pages of the MRMS_IC application, click on the tab for the function you want to configure, then click on the buttons which appear on that tab. By default, the I/O tab appears first.

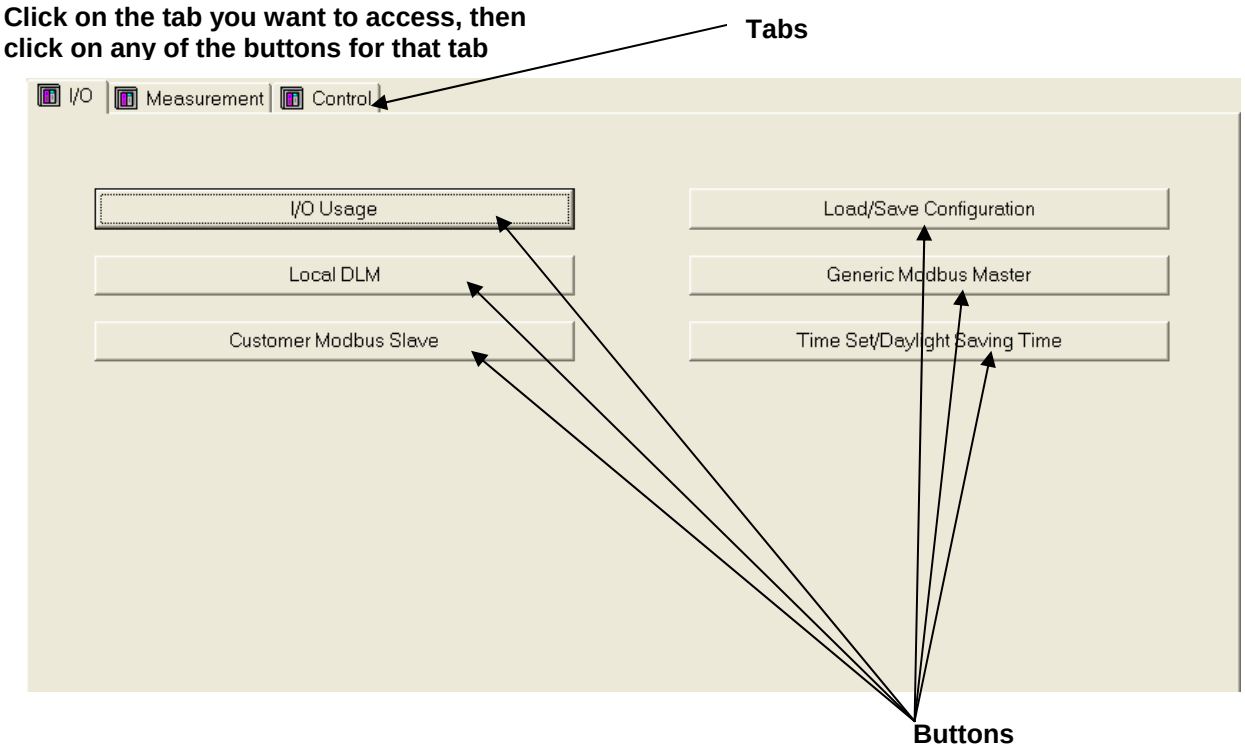


Figure 1-12. Tabs and Buttons in MRMS_IC

The next several chapters describe the functions available on each tab of the application.

You need not configure all the features of the application; only those that you need for your particular purpose and measurement needs.

1.6 Entering Data in Fields of the MRMS_IC Application

Whenever you select a field and enter data, or select from a drop-down menu, you must press the **[Enter]** key to confirm and save your choice.

To exit a field without entering data, press the **[Esc]** key.

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Chapter 2 – Configuring Inputs and Outputs (I/O Tab)

This chapter discusses configuring the MRMS-IC application to accept field inputs and outputs (I/O). This is accomplished from the MRMS-IC's I/O tab.

Note: Although you can view data through an IP connection, the MRMS-IC application only allows configuration changes when you establish a physical serial connection to serial communication port 1 on the ControlWave Micro.

In This Chapter

2.1 I/O Tab

Click the I/O tab to display the various I/O options you can configure. We'll discuss each of these in the sections that follow.

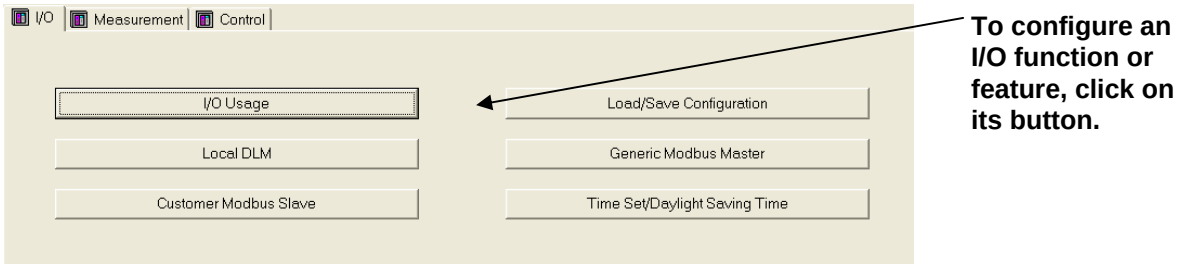


Figure 2-1. I/O Tab in MRMS-IC

2.2 I/O Usage

When you click the I/O Usage button on the I/O tab, the I/O Usage page displays a graphical representation of the ControlWave Micro, showing each of the I/O modules detected by the MRMS-IC. If MRMS-IC cannot detect a particular module or an I/O slot is empty, its graphic shows "Not Present." MRMS-IC only uses Mixed I/O modules.

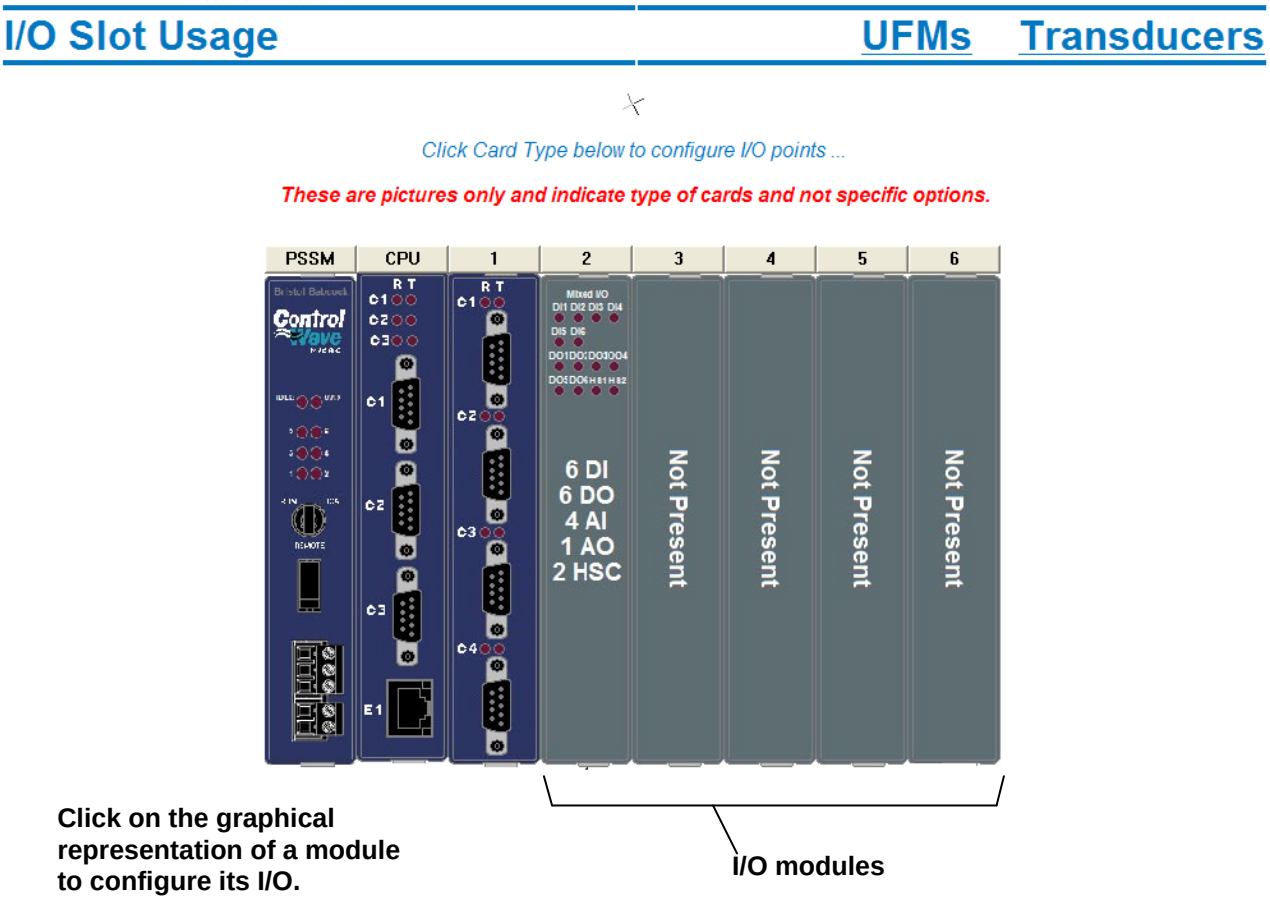


Figure 2-2. I/O Usage Screen Showing I/O Modules Detected

When you move the cursor over the CPU module, an Expansion Communication (ECOM) module, or any I/O module, you'll see a yellow box on the screen. To configure I/O, follow these steps:

1. From the I/O tab, click the **I/O Usage** button.
2. Position the cursor over the I/O module you want to configure; a yellow box indicates the cursor position on any configurable module.
3. Click on the module you want to configure. This opens a screen showing the possible choices for I/O. The Mixed I/O Module shows multiple types of I/O (see *Figure 2-3*).

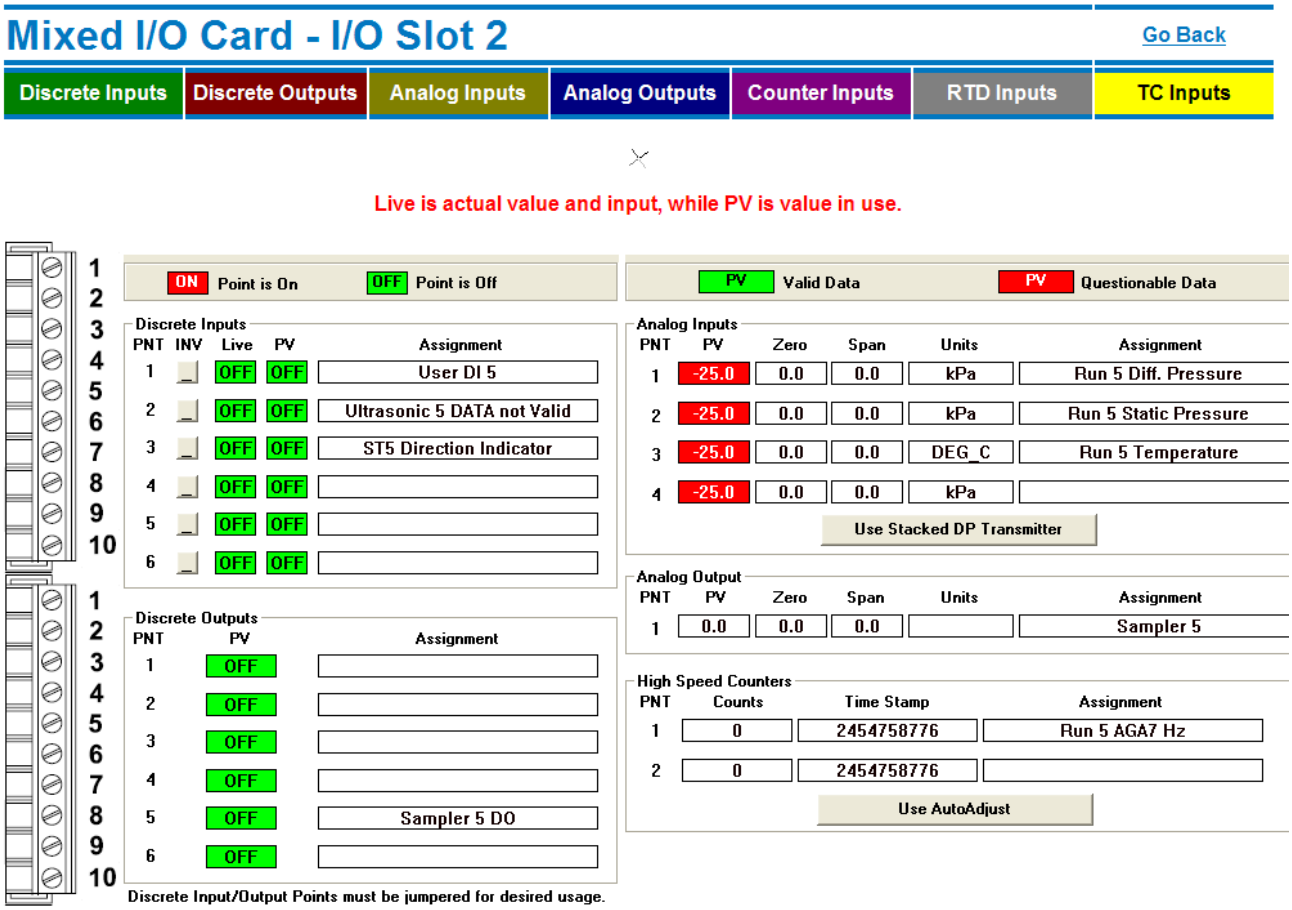


Figure 2-3. Mixed I/O Module

4. The I/O assignments in the MRMS-IC application are fixed based on the I/O slot. Because you can have an expanded communication module (ECOM) in either I/O slot 1 or 2, I/O designations begin with the right-most slot and go in **reverse order**. In other words, the mixed I/O module in I/O slot 6 holds user DI1, whereas the mixed I/O module in I/O slot 1 holds user DI6.

5. Configuration is limited based on the I/O type. Refer to the sub-sections that follow.

Note: You may have noticed that when the cursor is left hovered over an IO point, the graphics to the left display the applicable connection points for direct and remote IO.

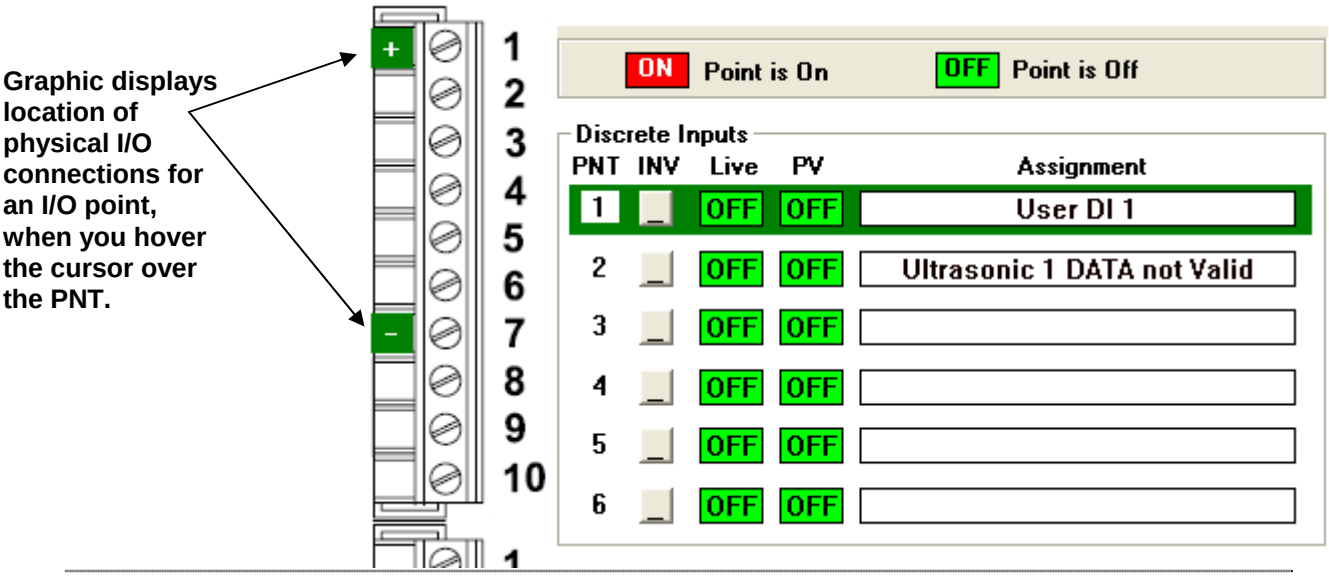


Figure 2-4. Connection Points for Physical I/O

Notes:

- The MRMS-IC application only uses Mixed I/O modules.
- Depending upon your particular configuration, you might not use all the inputs or outputs in a particular meter run or station.
- If you have I/O that comes from an ultrasonic flow meter or a multi-variable transmitter that communicates with the MRMS-IC through a communication port, instead of an I/O module, you configure it from the UFM or Transducer pages, discussed later in this chapter.
- To return to the I/O Usage page from any page underneath it, click the Go Back link.

2.2.1 Discrete Inputs (DI)

Discrete inputs (DIs) include the following fields:

Field	Description
PNT	This read-only field displays the I/O point number.
INV	If you click this box for a given I/O point so that "**Y"** is displayed, MRMS-IC inverts the real-live field value and uses the inverted value as the process value. For example, if the **Live** value of discrete I/O point 5 is **OFF**, and **INV** is selected for that point, **PV** is set **ON** and that's what MRMS-IC uses for control and processing.
Live	This read-only field shows the actual ON/OFF status of this discrete input point. Points that are **ON** show in red.  Points that are **OFF** show in green. 
PV	This read-only field shows the value of the process variable **(PV)** used in MRMS-IC. This matches the **Live** value unless you invert the input using **INV**. Points that are **ON** show in red.  Points that are **OFF** show in green. 
Assignment	This read-only field shows details of the fixed I/O assigned to this point.

2.2.2 Discrete Outputs (DO)

Discrete outputs (DOs) include the following fields:

Field	Description
PNT	This read-only field displays the I/O point number.
PV	This read-only field shows the value of the process variable **(PV)** MRMS-IC will output to the field device.
Assignment	This read-only field shows details of the fixed I/O assigned to this point.

2.2.3 Analog Inputs (AI)

Analog inputs (AIs) include the following fields:

Field	Description
PNT	This read-only field displays the I/O point number.
PV	This read-only field shows the calculated value of the analog input process variable **(PV)** based on the configured **Zero** and **Span**. If the value shows in red, the value is questionable  . This could indicate no connection, a communication problem with the field device, data timeout or some other problem that could cause the value to be invalid.
Zero	Enter the value that the process variable should read when the AI field input is 4mA. Press **[Enter]** to save your selection.
Span	Enter the value that, when added to the **Zero** value, represents what the process variable should display when the AI field input is 20mA. Press **[Enter]** to save your selection. For example, if **Zero** is 5 and **Span** is 20, then: If the AI field input is: 4mA → PV will be: 5 If the AI field input is: 20mA → PV will be: 25 If the AI field input is: 12mA → PV will be: 15
Units	The engineering units for this process variable. Click in the field and select the proper units from the drop-down menu. Press **[Enter]** to save your selection.
Assignment	This read-only field shows details of the fixed I/O assigned to this point.
Use Stacked DP Transmitter / Use Single DP Transmitter Only button	This button toggles I/O assignments based on whether you use a single DP transmitter, or stacked DP transmitters. To use stacked, click the **Use Stacked DP Transmitter** and assignments change to stacked; the label on the button then changes to **Use Single DP Transmitter Only**. To use a single DP transmitter, click the **Use Single DP Transmitter** and assignments change to single; the label on the button then changes to **Use Stacked DP Transmitter**.

2.2.4 Analog Outputs (AO)

Analog outputs (AOs) include the following fields:

Field	Description
PNT	This read-only field displays the I/O point number.
PV	This read-only field shows the calculated value of the analog output process variable **(PV)** based on the configured **Zero** and **Span**. This value will be sent to the field device.
Zero	Enter the value that the process variable should read when the AO field output is 4mA. Press **[Enter]** to save your selection.
Span	Enter the value that, when added to the **Zero** value, represents what the process variable should display when the AO field output is 20mA. Press **[Enter]** to save your selection. For example, if **Zero** is 5 and **Span** is 20, then: If PV is: 5 → The AO field output is: 4mA If PV is: 25 → The AO field output is: 20mA If PV is: 10 → The AO field output is: 8mA
Units	The engineering units for this process variable. Click in the field and select the proper units from the drop-down menu. Press **[Enter]** to save your selection.
Assignment	This read-only field shows details of the fixed I/O assigned to this point.

2.2.5 High Speed Counters (HSC)

High speed counters (HSC) include the following fields:

Field	Description
PNT	This read-only field displays the I/O point number. The number varies depending upon the type of I/O module.
Counts	This read-only field displays the number of counts since the last power cycle.
Time Stamp	This read-only field displays the timestamp of the last sample from the HSC module. The timestamp is the number of milliseconds since boot.
Assignment	This read-only field shows details of the fixed I/O assigned to this point.
Use AutoAdjust / Use Single HSC Input button	This button toggles I/O assignments based on whether you use a single HSC input, or you use Auto Adjust which requires two HSC inputs. To use auto adjust, click the **Use AutoAdjust** and assignments change to show two HSC inputs; the label on the button then changes to **Use Single HSC Input**. To use a single HSC input, click the **Use Single HSC Input** and assignments change to a single HSC; the label on the button then changes to **Use AutoAdjust**.

2.2.6 Ultrasonic Flow Meters (UFM)

If you have one or more ultrasonic flow meters, click the UFMs link on the top of the I/O Usage page to call up the UFM page.

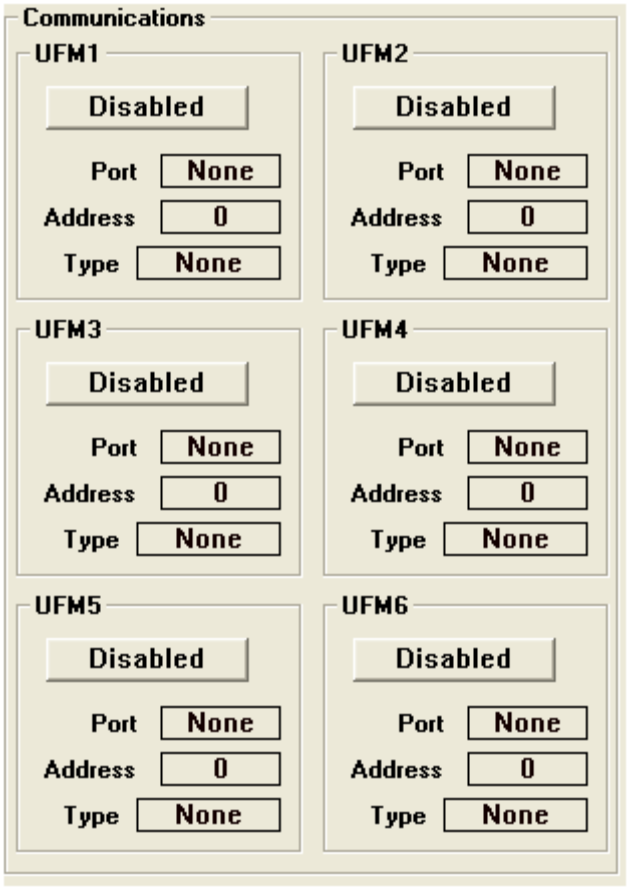


Figure 2-5. Ultrasonic Flow Meter (UFM) Configuration

Configure the following fields for your ultrasonic flow meter.

Field	Description
Enabled/Disabled	Click this button to enable communication from this UFM to the MRMS-IC.
Port	Use the dropdown menu to specify the ControlWave Micro serial communication port which connects to this UFM. Press **[Enter]** to save the selection.
Address	Enter the address of the UFM here. Press **[Enter]** to save the selection.
Type	Use the drop-down menu to select the type of UFM. Press **[Enter]** to save your selection.

2.2.7 Multi-variable Transmitters (Transducers)

If you have one or more multi-variable transmitters, click the Transducers link on the top of the I/O Usage page to call up the Transducers page.

The Transducers page shows the first three multi-variable transmitters (MVTs). If you want to view a different group of three MVTs, click the button corresponding to the range of MVTs (1-3 or 4-6) on the top of the screen.

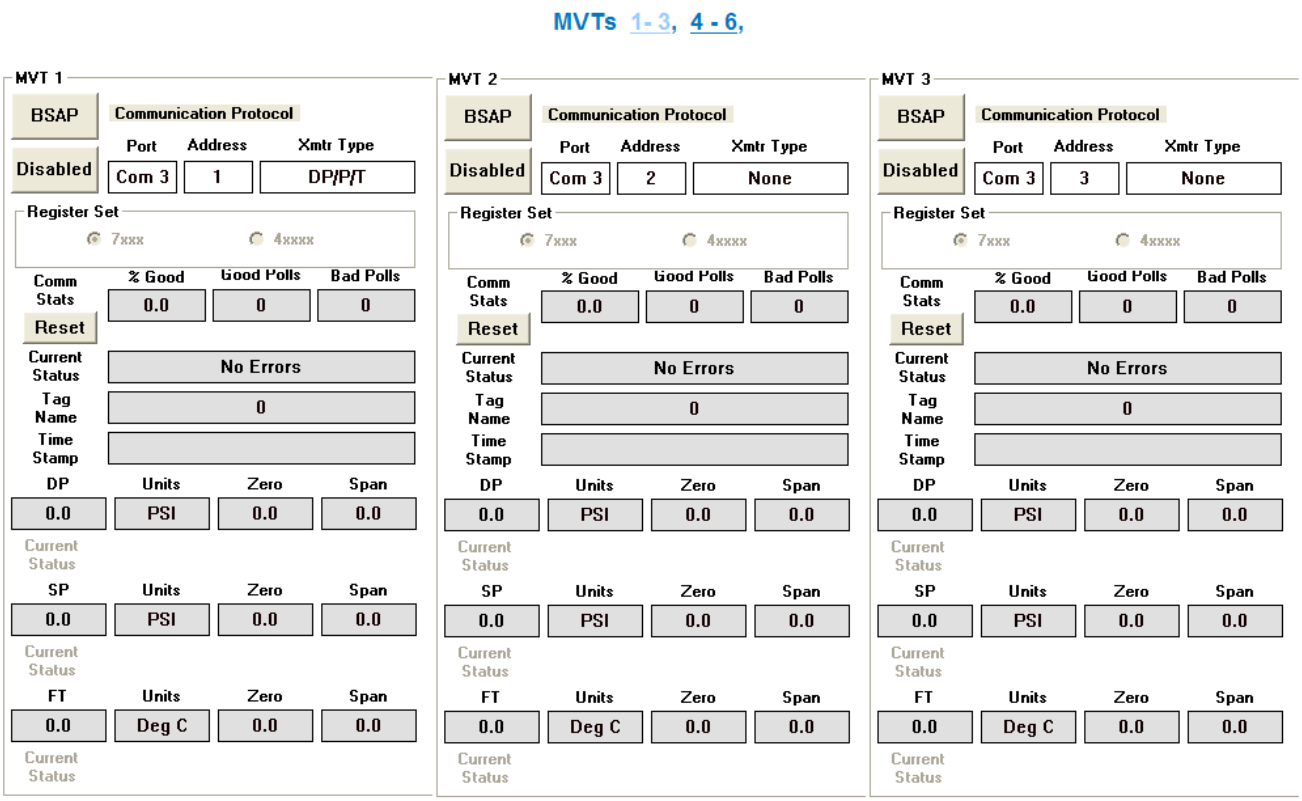


Figure 2-6. Transducers Page (Multi-Variable Transmitters)

Each MVT includes the following fields:

Field	Description
Enabled/Disabled	Click this button to enable communication from this MVT to the MRMS-IC.
Communication Protocol (BSAP/MODBUS)	Click the **BSAP/MODBUS** button to toggle the method used to communicate with this MVT between BSAP protocol and MODBUS protocol.
Port	Use the dropdown menu to specify the ControlWave Micro serial communication port which connects to this MVT. Press **[Enter]** to save the selection.

Address	Enter the address of the MVT here. Press **[Enter]** to save the selection.
Xmtr Type	Use the drop-down menu to select the type of data coming from this MVT. Choose either: Type: Data from this type: GP/T gage pressure and temperature DP/P/T differential pressure, static pressure, and temperature T temperature Press **[Enter]** to save your selection. 
Register Set	This field applies only to MODBUS communication. Click either **7xxx** or **4xxxx** to select the MODBUS register set used by this MVT.
Comm Stats	
% Good	This read-only field shows the percentage of successful communication transactions with this MVT.
Good Polls	This read-only field shows the number of good poll messages in communications with this MVT.
Bad Polls	This read-only field shows the number of bad poll messages in communications with this MVT.
Reset	This button resets the communication statistics in the **%Good**, **Good Polls**, and **Bad Polls** fields.
Current Status	These read-only fields display the most recent status messages from this MVT.
Tag Name	This read-only field shows the tag name from this MVT. (BSAP only)
Serial Number	This read-only field shows the serial number from this MVT. (MODBUS only)
Time Stamp	This read-only field shows the time stamp of the most recent value received from this MVT.
DP	This read-only field shows the most recent differential pressure reading from this MVT.
SP	This read-only field shows the most recent static

	pressure reading from this MVT.
FT	This read-only field shows the most recent temperature reading from this MVT.
Units	This read-only field shows the engineering units for this variable.
Zero	This read-only field shows the value for this variable when the MVT receives a 4mA field input.
Span	This read-only field shows the value that, when added to the **Zero** value, represents what the process variable should display when the field input to the MVT is 20mA.

2.3 Local DLM

Notes:

- The local Data Line Monitor (DLM) provides details about low-level communication messages sent through a selected serial port used by the MRMS-IC.
- Typically, you would only use the local DLM if you are a very advanced user and need to perform communication troubleshooting for a particular port.
- The local DLM only displays the first 80 characters of a message.
- The local DLM only captures messages approximately every half second, therefore, it can miss some messages.

Click the Local DLM button on the I/O tab to activate the Data Line Monitor function. The DLM includes the following fields:

Field	Description
Monitor Port	Use the dropdown menu to select the ControlWave Micro serial communication port you want the DLM to monitor. Press **[Enter]** to save the selection. **Note:** After you collect the data, if you select "None" for the monitor port, you can copy data from the window to the clipboard. You can then paste this data into another file for off-line review.
TX Data	This read-only field shows the most recent message transmitted through this port.
RX Data	This read-only field shows the most recent message received through this port.
window	The window shows successive messages detected by the DLM. Most recent messages appear at the top; you can use the scroll bar to adjust the window to show earlier messages.

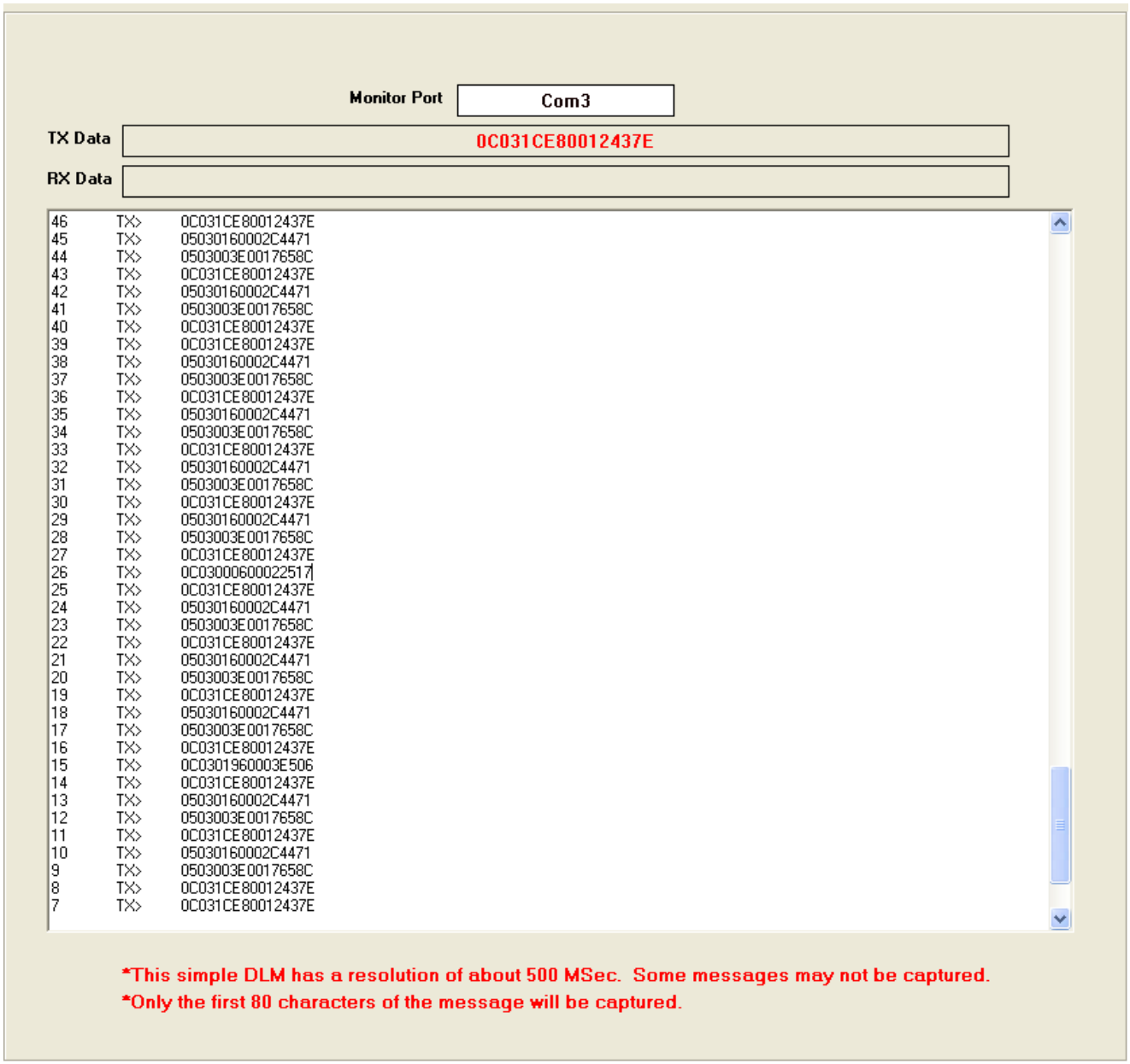


Figure 2-7. Local DLM

2.4 Customer Modbus Slave

MRMS-IC supports a single Modbus slave session you can configure to provide a Modbus slave interface to the controller.

Click the Customer Modbus Slave button on the I/O tab to bring up the Customer Modbus Slave page.

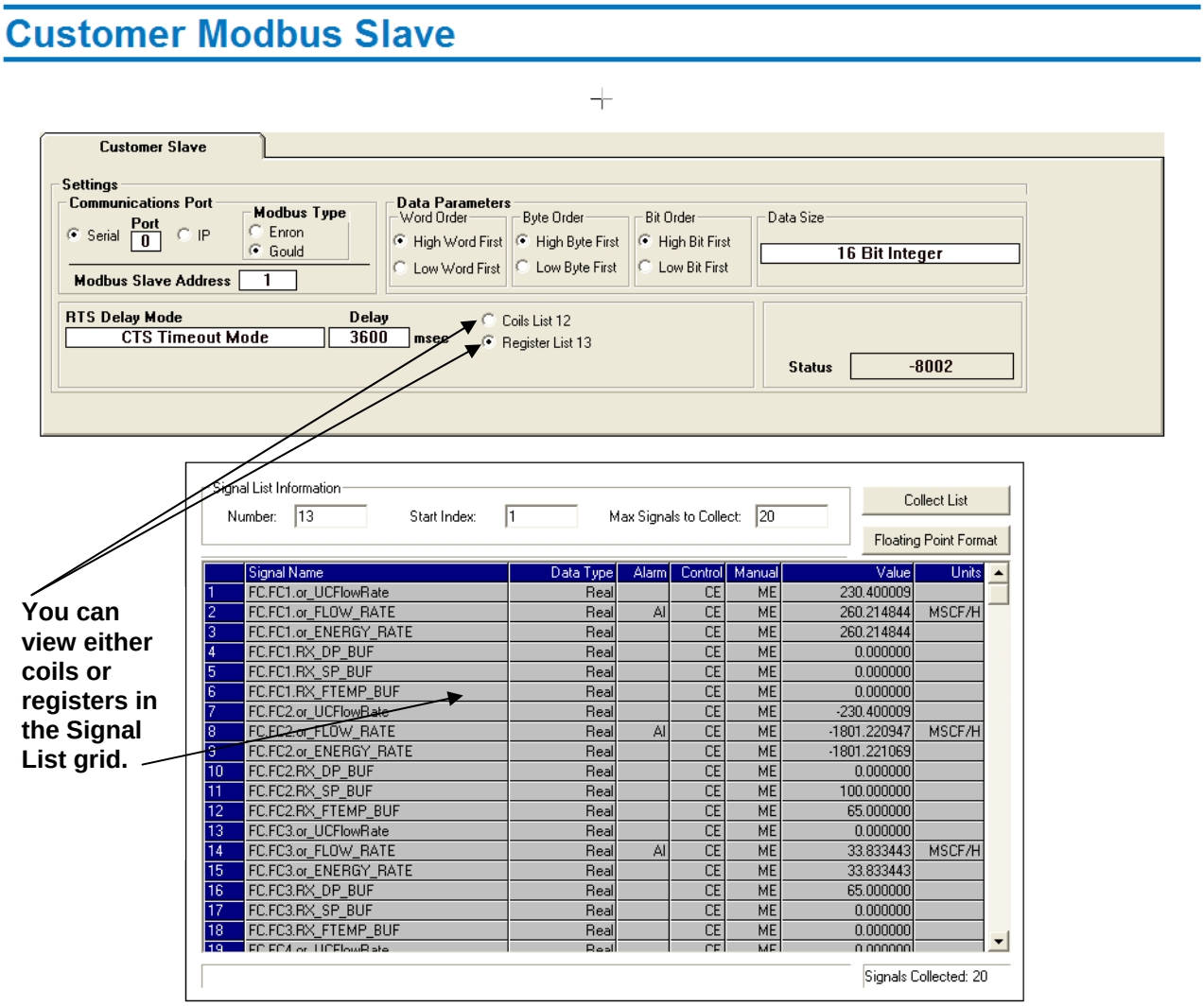


Figure 2-8. Customer Slave Page

This page includes the following fields:

Field	Description
Settings	
Communications Port	Modbus communications can use **either** serial **or** IP communications.
Serial	Click the **Serial** selection to use serial Modbus communication, and specify the port you want to use. (See **Port**).

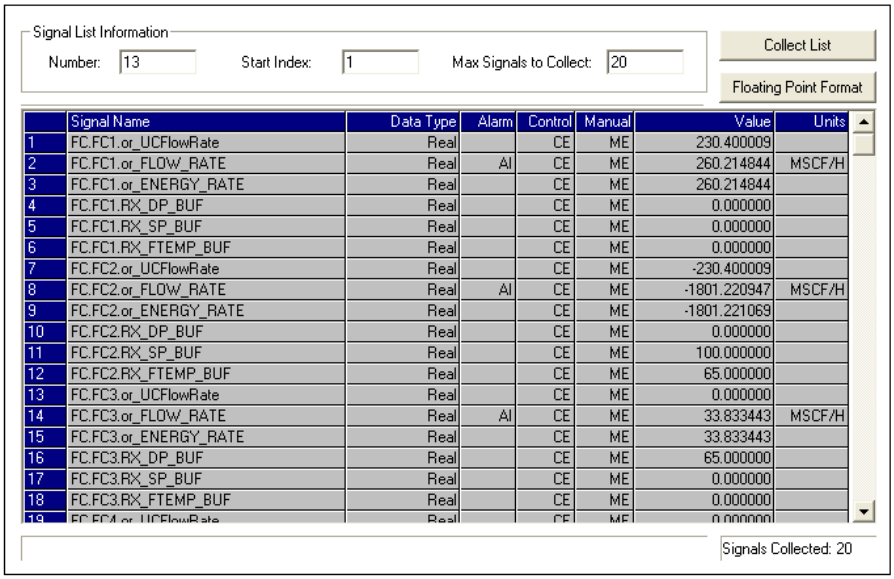
Field	Description
Port	Specify the serial communication port on the ControlWave Micro you want to use for Modbus slave communication. Use the following code: Enter this: — To select this serial CW Micro port: 1 — COM1 2 — COM2 3 — COM3 4 — COM4 5 — COM5 6 — COM6 7 — COM7 8 — COM8 9 — COM9 10 — COM10 11 — COM11 Press **[Enter]** to save the selection.
IP	Click the **IP** selection to use IP Modbus (Open Modbus) communication.
Modbus Slave Address	Enter the Modbus slave address. If the local slave address you enter has already been assigned to either the SCADA Enron Modbus slave interface, or any of the other Customer Modbus Slave sessions, you will see **a Loc Addr Conflict** message. Modify the **Modbus Slave Address** as required to resolve the conflict.
Modbus Type	
Enron	If you want to communicate using **Enron** Modbus, click this selection.
Gould	If you want to communicate using **Gould** Modbus, click this selection.
Data Parameters	
Word Order	Choose the data word order to match the data word order used by the Modbus Master that communicates with this Modbus Slave.
High Word First	Click this to specify that the high word is first.
Low Word First	Click this to specify that the low word is first.
Byte Order	Choose the data byte order to match the data byte

Field	Description
	order used by the Modbus Master that communicates with this Modbus Slave.
High Byte First	Click this to specify that the high byte is first.
Low Byte First	Click this to specify that the low byte is first.
Bit Order	Choose the data bit order to match the data bit order used by the Modbus Master that communicates with this Modbus Slave.
High Bit First	Click this to specify that the high bit is first.
Low Bit First	Click this to specify that the low bit is first.
Data Size	Select the appropriate data format for Modbus Register data from the drop down menu. The available selections are: **Single Bit** – Each Register will include a single bit **Byte Data** – Each Register will include a single byte **16 Bit Integer** – Each Register will include a single 16-bit integer **32 Bit Int., 1 Reg., Cnt*1, Adr*1** – Each Register will include a 32-bit double integer. **32 Bit Float, 1 Reg., Cnt*1, Adr*1** – Each Register will include a 32-bit floating point number **32 Bit Int., 2 Reg., Cnt*2, Adr*2** – Two registers will be used for each 32-bit double integer. The MODBUS Master must poll two registers for each 32 bit integer. **32 Bit Float, 2 Reg., Cnt*2, Adr*2** – Two registers will be used for each 32-bit floating point number. The MODBUS Master must poll two registers for each 32 bit number. **32 Bit Int., 2 Reg., Cnt*2, Adr*1** - Two registers will be used for each 32-bit double integer. The MODBUS Master must poll a single register for each 32 bit integer. **32 Bit Float, 2 Reg., Cnt*2, Adr*1** - Two registers will be used for each 32-bit floating point number. The MODBUS Master must poll a single register for each 32 bit number. Press **[Enter]** to save the selection. If you don't make a selection, the field shows **Not Set**.

Field	Description
RTS Delay Mode	Select from one of two modes for the Ready-to-Send (RTS) delay mode. **Message Delay Mode** - After the Modbus Slave port raises RTS, a delay timer starts. The length of the delay is determined by the value in the **Delay Time** field. No message is sent until after this delay expires. The value of CTS does not affect the operation of this mode. **CTS Timeout Mode** - After the Modbus slave port raises RTS, it uses the **Delay Time** value as the maximum time to wait for CTS to be received from the master. If the Modbus slave port receives CTS at any time before this time expires, the port starts to transmit the message. If the Modbus slave port does not receive a CTS from the master prior to the expiration of the **Delay Time**, it does not respond to the master and instead reports an error. Press **[Enter]** to save the selection.
Delay msec	Specify the **Delay** (in milliseconds) used by the **RTS Delay Mode and CTS Timeout Mode**.
Coils List 12	Each Modbus slave session has two dedicated lists, one for Modbus Registers and the other for Modbus Coils. To display coils in the signal list grid, click this button. See *Section 2.4.1* for instructions on using the signal list grid.
Register List 13	Each Modbus slave session has two dedicated lists, one for Modbus Registers and the other for Modbus Coils. To display registers in the signal list grid, click this button. See *Section 2.4.1* for instructions on using the signal list grid.
Status	This read-only field displays a status code indicating the health of the Modbus slave communications. If you see any code other than 0 here or see an error message above the code, see *Appendix E – Errors and Troubleshooting* for more information.

2.4.1 Signal List Grid

The Signal List grid displays lists of variables included in the MRMS-IC application.



	Signal Name	Data Type	Alarm	Control	Manual	Value	Units
1	FC.FC1.or_UCFlowRate	Real		CE	ME	230.400009	
2	FC.FC1.or_FLOW_RATE	Real	AI	CE	ME	260.214844	MSCF/H
3	FC.FC1.or_ENERGY_RATE	Real		CE	ME	260.214844	
4	FC.FC1.RX_DP_BUF	Real		CE	ME	0.000000	
5	FC.FC1.RX_SP_BUF	Real		CE	ME	0.000000	
6	FC.FC1.RX_FTEMP_BUF	Real		CE	ME	0.000000	
7	FC.FC2.or_UCFlowRate	Real		CE	ME	-230.400009	
8	FC.FC2.or_FLOW_RATE	Real	AI	CE	ME	-1801.220947	MSCF/H
9	FC.FC2.or_ENERGY_RATE	Real		CE	ME	-1801.221069	
10	FC.FC2.RX_DP_BUF	Real		CE	ME	0.000000	
11	FC.FC2.RX_SP_BUF	Real		CE	ME	100.000000	
12	FC.FC2.RX_FTEMP_BUF	Real		CE	ME	65.000000	
13	FC.FC3.or_UCFlowRate	Real		CE	ME	0.000000	
14	FC.FC3.or_FLOW_RATE	Real	AI	CE	ME	33.833443	MSCF/H
15	FC.FC3.or_ENERGY_RATE	Real		CE	ME	33.833443	
16	FC.FC3.RX_DP_BUF	Real		CE	ME	65.000000	
17	FC.FC3.RX_SP_BUF	Real		CE	ME	0.000000	
18	FC.FC3.RX_FTEMP_BUF	Real		CE	ME	0.000000	
19	FC.FC4.or_UCFlowRate	Real		CE	ME	0.000000	

Figure 2-9. Signal List Grid Control

Field	Description
Signal List Information	The list window shows the contents of lists within the application.
Number	Specifies the number of the list. In some cases, pushing a button elsewhere on the page fills in this number; in other cases, you must enter a list number directly.
Max Signals to Collect	Specifies the number of list items to retrieve into the grid control. Depending upon how many list items are collected, you may need to use a scroll bar to view them.
Start Index	Normally, the signal list grid displays variables beginning with the first variable in the list. If you want to skip further into the list, enter the number of the first list item you want to see in this field, and the grid starts displaying from that item forward.
Collect List	Click this button to force the Signal List grid to collect the specified list now.
Floating Point Format	Click this to specify the Floating Point Format dialog box. See *Figure 2-10*
Signal Name	Shows the variable name for this list item, or its descriptor.
Data Type	Shows the variable type, such as Real or Boolean.
Alarm	If this variable is an alarm, and this shows “AI” it indicates the variable is alarm inhibited. If this shows “AE” it indicates that the variable is alarm enabled.
Control	If this shows “CI” it indicates the variable is control inhibited. If this shows “CE” it indicates that the variable is control enabled.

Field	Description
Manual	If this shows “MI” it indicates the variable is manual inhibited. If this shows “ME” it indicates that the variable is manual enabled.
Value	Shows the current value of the variable.
Units	Shows the engineering units (if specified) for this variable.
Signals Collected	Displays a count of the number of variables collected into the signal list grid.

2.4.2 Floating Point Format

The floating point format is the way floating point (real) numbers display within a screen in the MRMS-IC application.

To change this format, you click the Floating Point Format button on a page, to call up the Float Format dialog box.

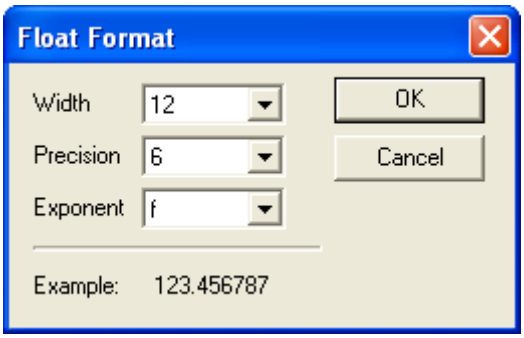


Figure 2-10. Floating Point Format dialog box

Field	Description
Width	Choose the total number of characters in the field (including the decimal point) used to display a floating point number.
Precision	Choose the number of places to the right of the decimal point which the floating point number should show.
Exponent	Select one of these formats: **e** show number in exponential notation **f** show number in floating point notation **g** allow application to choose the “best fit” format for this number.
OK	Click this to save your entries and exit the dialog box.
Cancel	Click this to discard your entries and exit the dialog

Field	Description
	box.

2.5 Generic Modbus Master

Click the Generic Modbus Master button on the I/O tab to activate the Generic Modbus page. There are multiple pages for Modbus Master 1 (MB1) to Modbus Master 5 (MB5). You click on a tab to call up the appropriate Modbus Master.

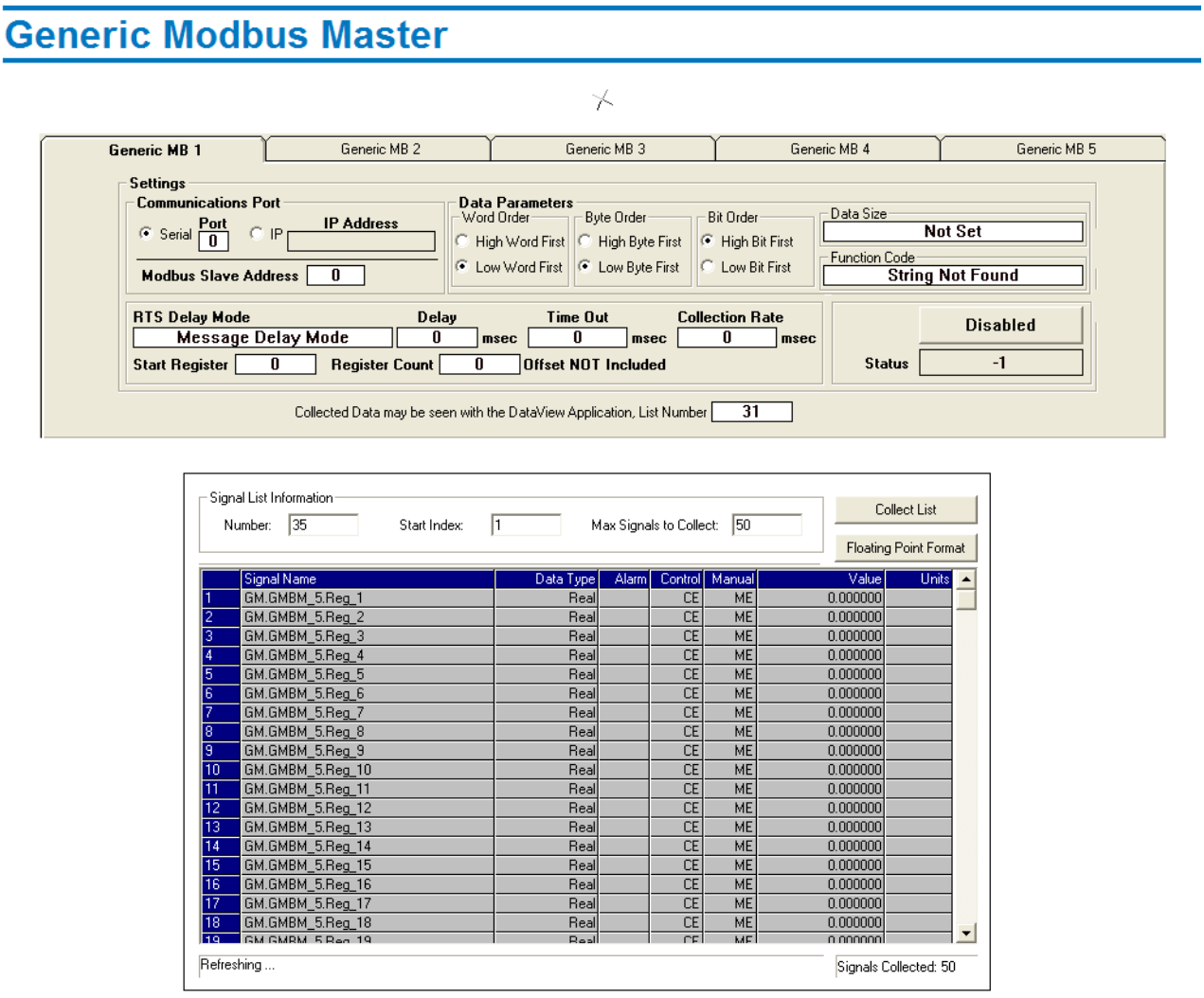


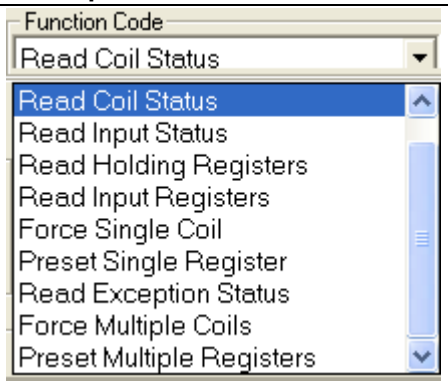
Figure 2-11. Generic Modbus Master

This page includes the following fields:

Field	Description
Settings	
Communications Port	Modbus communications can use **either** serial **or** IP communications.

Field	Description
Serial	Click the **Serial** selection to use serial Modbus communication, and specify the port you want to use. (See **Port**).
Port	Specify the serial communication port on the ControlWave Micro you want to use for Modbus master communication. Use the following code: Enter this: — To select this serial CW Micro port: 1 — COM1 2 — COM2 3 — COM3 4 — COM4 5 — COM5 6 — COM6 7 — COM7 8 — COM8 9 — COM9 10 — COM10 11 — COM11 Press **[Enter]** to save the selection.
IP	Click the **IP** selection to use IP Modbus (Open Modbus) communication.
IP Address	If you want to use IP Modbus (Open Modbus), enter the IP address of the port used by this master.
Modbus Slave Address	Enter the Modbus slave address. If the local slave address you enter has already been assigned to either the SCADA Enron Modbus slave interface, or any of the other Customer Modbus Slave sessions, you will see **a Loc Addr Conflict** message. Modify the **Modbus Slave Address** as required to resolve the conflict.
Data Parameters	
Word Order	Choose the data word order to match the data word order used by the Modbus Slave that communicates with this Modbus Master.
High Word First	Click this to specify that the high word is first.
Low Word First	Click this to specify that the low word is first.
Byte Order	Choose the data byte order to match the data byte order used by the Modbus Slave that communicates with this Modbus Master.

Field	Description
High Byte First	Click this to specify that the high byte is first.
Low Byte First	Click this to specify that the low byte is first.
Bit Order	Choose the data bit order to match the data bit order used by the Modbus Slave that communicates with this Modbus Master.
High Bit First	Click this to specify that the high bit is first in a byte of data..
Low Bit First	Click this to specify that the low bit is first in a byte of data.
Data Size	Select the appropriate data format for Modbus Register data from the drop down menu. The available selections are: **Single Bit** – Each Register will include a single bit **Byte Data** – Each Register will include a single byte **16 Bit Integer** – Each Register will include a single 16-bit integer **32 Bit Int., 1 Reg., Cnt*1, Adr*1** – Each Register will include a 32-bit double integer. **32 Bit Float, 1 Reg., Cnt*1, Adr*1** – Each Register will include a 32-bit floating point number **32 Bit Int., 2 Reg., Cnt*2, Adr*2** – Two registers will be used for each 32-bit double integer. The MODBUS Master must poll two registers for each 32 bit integer. **32 Bit Float, 2 Reg., Cnt*2, Adr*2** – Two registers will be used for each 32-bit floating point number. The MODBUS Master must poll two registers for each 32 bit number. **32 Bit Int., 2 Reg., Cnt*2, Adr*1** - Two registers will be used for each 32-bit double integer. The MODBUS Master must poll a single register for each 32 bit integer. **32 Bit Float, 2 Reg., Cnt*2, Adr*1** - Two registers will be used for each 32-bit floating point number. The MODBUS Master must poll a single register for each 32 bit number. Press **[Enter]** to save the selection. If you don't make a selection, the field shows **Not Set**.
Function Code	Select the Modbus function from the drop-down menu.

Field	Description
	 Press **[Enter]** to save the selection.
RTS Delay Mode	Select from one of two modes for the Ready-to-Send (RTS) delay mode. **Message Delay Mode** - After the Modbus Master port raises RTS, a delay timer starts. The length of the delay is determined by the value in the **Delay** field. No message is sent until after this delay expires. The value of CTS does not affect the operation of this mode. **CTS Timeout Mode** - After the Modbus Master port raises RTS, it uses the **Delay** value as the maximum time to wait for CTS to be received from the slave. If the Modbus Master port receives CTS at any time before this time expires, the port starts to transmit the message. If the Modbus master port does not receive a CTS from the slave prior to the expiration of the **Delay** it does not respond to the slave and instead reports an error. Press **[Enter]** to save the selection.
Delay msec	Specify the **Delay** (in milliseconds) used by the **RTS Delay Mode and CTS Timeout Mode**. Press **[Enter]** to save the selection.
Time Out msec	Specify the time (in milliseconds) that the Modbus master must wait for a response from the Modbus slave before the master declares that the slave timed out. Press **[Enter]** to save the selection.
Collection Rate msec	Specify the interval (in milliseconds) between poll attempts by the Modbus master. Press **[Enter]** to save the selection.
Start Register	Specify the starting address for coil or register operations. The address transmitted to the Slave is one less than the value specified here. For example, the address 7031 is sent as 7030 for Function code

Field	Description
	3. Press **[Enter]** to save the selection.
Register Count	Specify the number of coils or registers the Master should read. The value can range from 1 to 2000 for coils or 1 to 125 for 16-bit registers, or 1 to 62 for 32-bit registers. Press **[Enter]** to save the selection.
Disabled/Enabled	If this shows **Disabled**, click on it to enable the Modbus Master.
Status	This read-only field displays a status code indicating the health of the Modbus master communications. If you see any code other than 0 here or see an error message above the code, see *Appendix E – Errors and Troubleshooting* for more information.
List Number	Shows the number of the list you can open in DataView to see the collected Modbus data.

2.6 Load/Save Configuration

The Load/Save Configuration feature provides a way to save and restore MRMS-IC configuration data. It uses the Data Array Save/Restore utility and the recipe utility to accomplish the read/write operations.

Click the Load/Save Configuration button on the I/O tab to activate the Load/Save Configuration page.

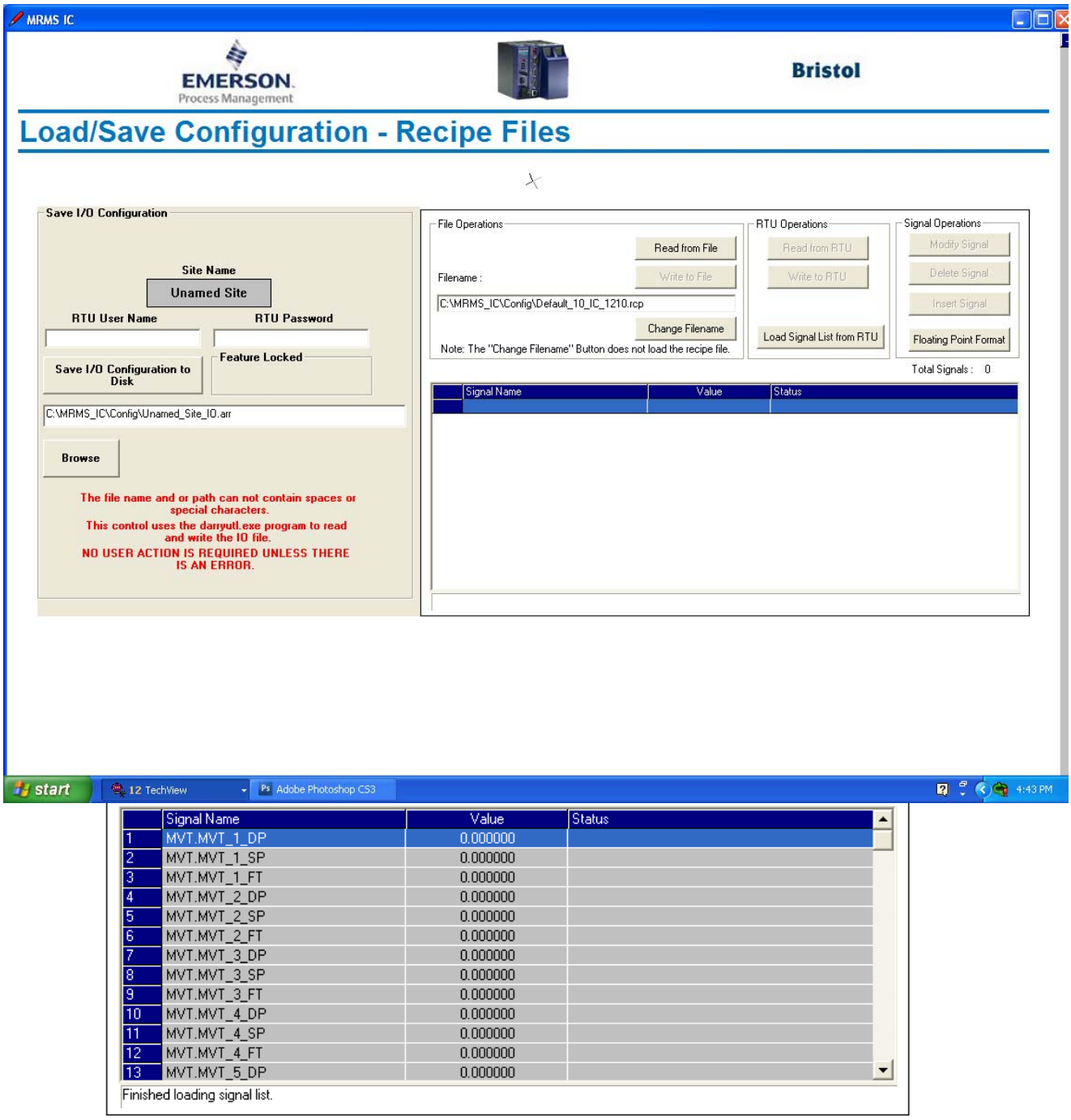


Figure 2-12. Load/Save Configuration

2.6.1 Performing I/O Array Operations.

1. Enter a valid username/password combination for the controller that has full privileges in the **RTU User Name** and **RTU Password** fields.

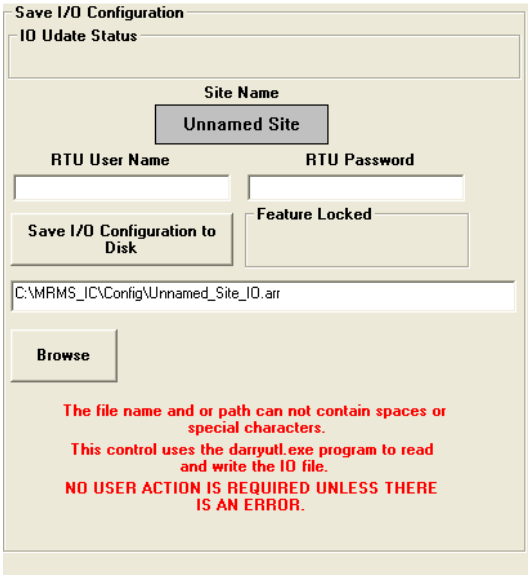


Figure 2-13. Array Read / Write

2. To read values from the I/O array in the controller and store those values in a PC disk file, click **Save I/O Configuration to Disk**.

3. The Data Array Save/Restore utility starts.

Note: Allow the Data Array/Save Restore utility to run by itself; you need not enter any values unless it generates an error.

2.6.2 Creating a Recipe

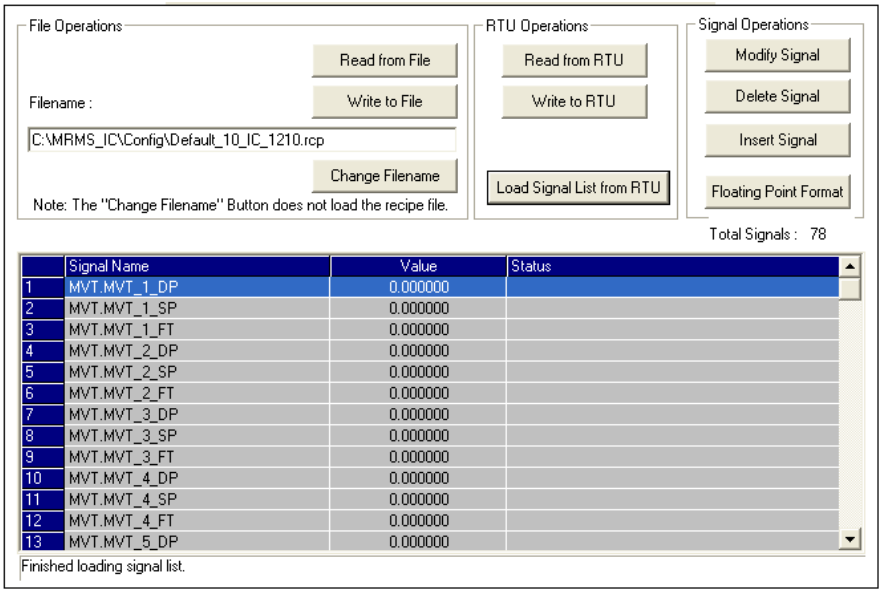


Figure 2-14. Recipe

To create a recipe you must first specify the variables you want included in the recipe. One way to do this is to *either* right-click on the grid in the center of the Recipe page and choose **"Insert Signal"** from the pop-up menu, *or* click the **Insert Signal** button.

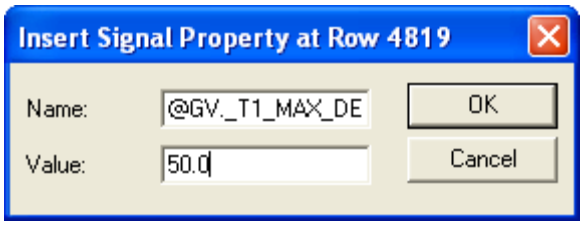


Figure 2-15. Insert Signal Property dialog box

In either case, a dialog box opens and you can enter the variable's name. If desired, you can also enter a value for the variable. Click **OK** when you are finished. Repeat for each additional variable.

If you don't enter values for the variable when you insert it you can load the current values in the MRMS-IC for all variables in the recipe by clicking on **Read From RTU**.

Figure 2-16. Signal List to Load

Another way to specify variables for the recipe is to load the variables from the list. To do this, click the **Load Signal List from RTU** button, then specify the number of the signal list and click **OK**.

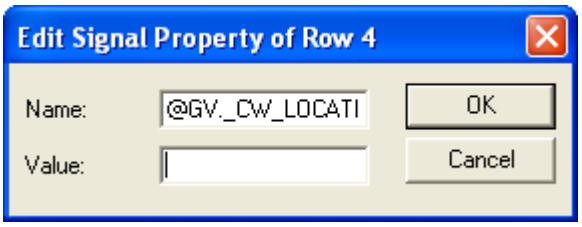


Figure 2-17. Edit Signal Property

If, as you are creating the recipe, you decide you want to change a variable or value for a particular entry, *either* right click on the entry and choose **"Edit Signal"** from the pop-up menu, *or* click the **Modify Signal** button. Make changes, as desired, and click **OK**.

If you want to delete a variable in the recipe, *either* right-click on the line for that variable and choose **"Delete Signal"** from the pop-up menu, *or* click the **Delete Signal** button. You will be prompted to confirm the deletion.

For information on changing the floating point format of values in the recipe, see *Section 2.4.2*.

2.6.3 Saving the Recipe

Type the path and filename for your recipe file in the **"Filename"** field or click **Change Filename** to select a recipe from the default recipe area. Standard recipe files are stored with a file extension of (.RCP). You also have the option of saving the file as a .CFG file (which is intended for use with Coastal Flow Measurement Inc. Flow-Cal™ software.)

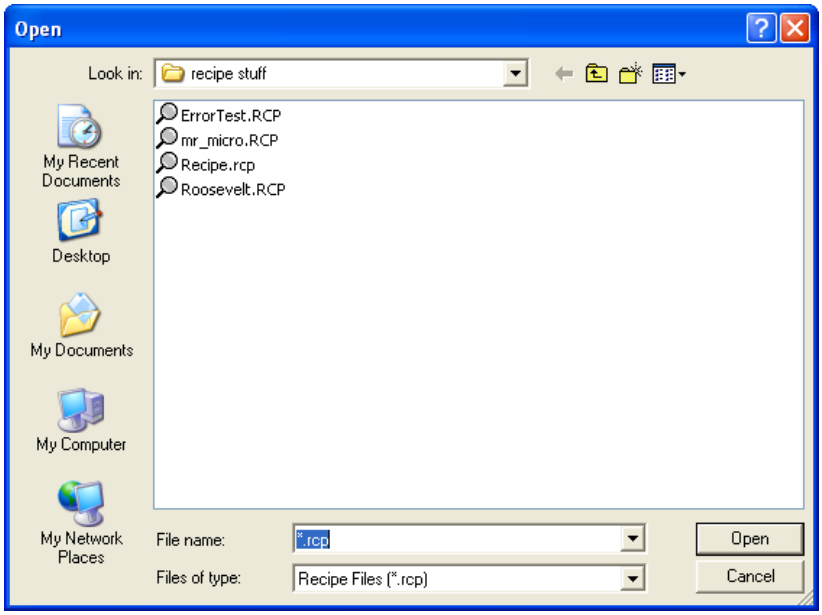


Figure 2-18. Saving the Recipe

Once you have specified the path and filename, click on the **Write to File** button; answer **Yes** to the confirmation prompt, and the control writes the recipe to the specified file.

2.6.4 Recalling a Saved Recipe, and Sending Its Values to the Controller

To recall a recipe which you have saved previously, use the **Change Filename** button to locate it, or type its path and filename in directly in the **"Filename"** field. Finally, click the **Read From File** button, and the recipe will be brought into the web page.

Once the recipe file has been loaded, you can send the recipe values to the controller by clicking on the **Write to RTU** button; answer **Yes** to the confirmation prompt, and the control writes the recipe to the controller

2.7 Time Set/Daylight Saving Time

Click the Time Set/Daylight Saving Time button on the I/O tab to open the Time Set/Daylight Saving Time page.

Time Set/Daylight Saving Time

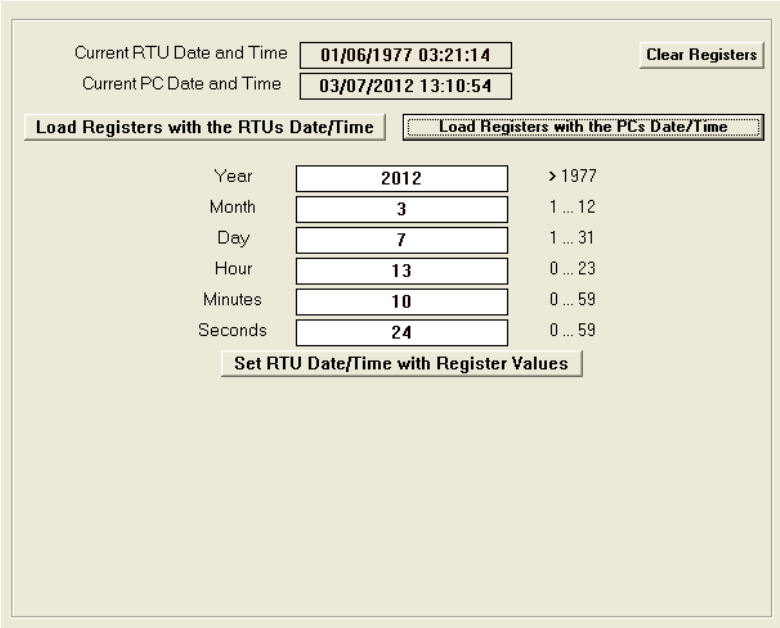


Figure 2-19. Time Set/Daylight Saving Time page

Field	Description
Current RTU Date and Time	This read-only field shows the current date and time setting at the controller.
Current PC Date and Time	This read-only field shows the current date and time at the PC workstation.
Clear Registers	Click this button to set all six time registers (**Year, Month, Day, Hour, Minutes and Seconds**) to zero.
Load Registers with the RTUs Date/Time	Click this button to store the controller time in the six time registers.
Load Registers with the PCs Date/Time	Click this button to store the PC workstation time in the six time registers.
Year	This time register holds a year value. You can set it by typing in a value, or you can load it by one of the buttons.
Month	This time register holds a month value. You can set it by typing in a value, or you can load it by one of the buttons.
Day	This time register holds a day value. You can set it by typing in a value, or you can load it by one of the buttons.

Field	Description
Hour	This time register holds an hour value. You can set it by typing in a value, or you can load it by one of the buttons.
Minutes	This time register holds a minute value. You can set it by typing in a value, or you can load it by one of the buttons.
Seconds	This time register holds a seconds value. You can set it by typing in a value, or you can load it by one of the buttons.
Set RTU Date/Time with Register Values	Click this button to update the controller's date and time with the values currently in the time registers.

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Chapter 3 – Configuring Stations and Runs (Measurement Tab)

Note: Although you can view data through an IP connection, the MRMS-IC application only allows configuration changes when you establish a physical serial connection to serial communication port 1 on the ControlWave Micro.

This chapter discusses configuring the stations and meter runs for the MRMS-IC application as well as all the measurement functions for the various meter runs. This is accomplished from the MRMS-IC Measurement tab.

In This Chapter

3.1 Measurement Tab

Click the Measurement tab to display the measurement options you can configure. We'll discuss each of these in the sections that follow.

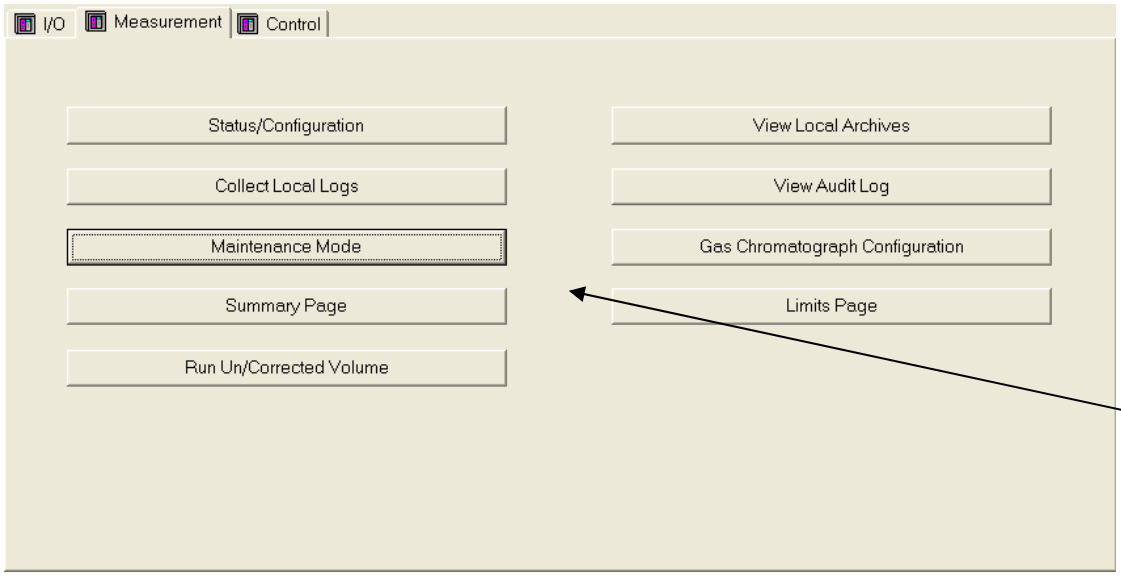


Figure 3-1. Measurement Tab in MRMS-IC

3.2 Status/Configuration

When you click the Status/Configuration button on the Measurement tab, MRMS-IC opens up a tree structure that shows the site and lists the stations and meter runs.

Calling up pages for configuring the site, station, or meter run

Double-click on items in the tree to bring up configuration pages for the site, station, or meter run.

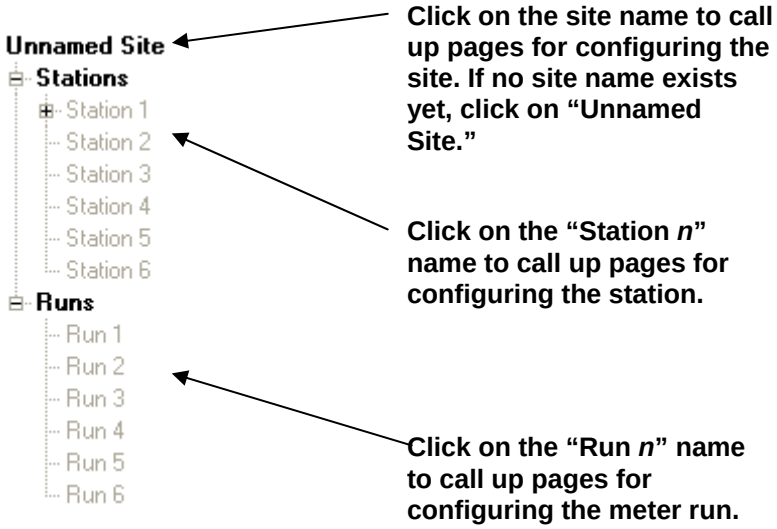


Figure 3-2. Selecting the Site, Stations, and Runs

3.2.1 Site Configuration Data Tab (Site Configuration)

The Site Configuration Data tab shows basic information about the site.

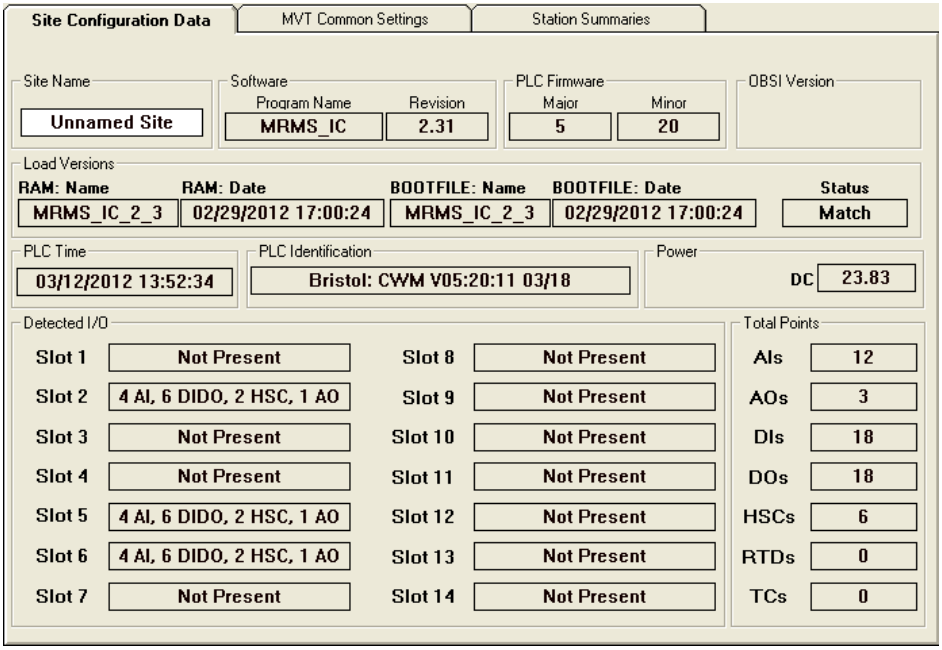


Figure 3-3. Site Configuration data tab

Field	Description
Site Name	The **site** refers to the geographical location or an organizational name associated with this MRMS-IC controller. You might name the site after the RTU node name or a place. Enter a name and press the **[Enter]** key to save your entry.
Software	
Program Name	This read-only field shows the name of the MRMS-IC software installed on the RTU.
Revision	This read-only field shows the revision of the MRMS-IC software running on the RTU. The revision is in the format *V.v* R*nn* Where: *V* is the major version number *v* is the minor version number R*nn* is the revision build number, if this is a revision release of the software.
PLC Firmware	These fields refer to the ControlWave internal system firmware that controls operation the ControlWave Micro.

Major	This read-only field shows the major revision number of the system firmware running in the ControlWave Micro.
Minor	This read-only field shows the minor revision number of the system firmware running in the ControlWave Micro.
OBSI Version	Reserved for future use.
Load Versions	The load version fields let you compare the revisions of the ControlWave project stored in flash (ControlWave bootproject) and the revision of the ControlWave project currently executing in SDRAM.
RAM: Name	This read-only field shows the name of the ControlWave project executing in the ControlWave Micro's SDRAM.
RAM: Date	This read-only field shows the date and time stamps of the ControlWave project executing in the ControlWave Micro's SDRAM. Dates use the format *mm/dd/yyyy* where *mm* is the two-digit month (01 to 12), *dd* is the two-digit day (01 to 31), and *yyyy* is the four-digit year. Timestamps are in the format *hh:mm:ss* where *hh* is the 2-digit hour (0 to 23), *mm* is the 2-digit minute (0 to 59) and *ss* is the two-digit second (0 to 59).
BOOTFILE: Name	This read-only field shows the name of the ControlWave bootproject stored in FLASH at the ControlWave Micro.
BOOTFILE: Date	This read-only field shows the date and time stamps of the ControlWave bootproject stored in FLASH at the ControlWave Micro. Dates use the format *mm/dd/yyyy* where *mm* is the two-digit month (01 to 12), *dd* is the two-digit day (01 to 31), and *yyyy* is the four-digit year. Timestamps are in the format *hh:mm:ss* where *hh* is the 2-digit hour (0 to 23), *mm* is the 2-digit minute (0 to 59) and *ss* is the two-digit second (0 to 59).
Status	This read-only field shows **Match** if the name and date of the ControlWave project executing in SDRAM is identical to that for the bootproject stored in FLASH. If this field shows **Mismatch** this indicates that the ControlWave project executing in SDRAM is **not** the same as the bootproject. This is an error condition because if the unit restarts for any reason, the bootproject overwrites the project executing in SDRAM on restart and you will lose the SDRAM project.
PLC Time	This read-only field shows the current date and time stamps of the ControlWave Micro's real time clock. Dates use the format *mm/dd/yyyy* where *mm* is the two-digit month (01 to 12), *dd* is the two-digit day (01 to 31), and *yyyy* is the four-digit year. Timestamps are in the format *hh:mm:ss* where *hh* is the 2-digit hour (0 to 23), *mm* is the 2-digit minute (0 to 59) and *ss* is the two-digit second (0 to 59).

PLC Identification	This read-only field identifies boot PROM firmware installed in the ControlWave Micro. To use the MRMS-IC application, your boot PROM firmware must have the prefix **CWM**.
Power	These fields show information about power status at the ControlWave Micro.
DC	This read-only field shows the DC voltage level at the ControlWave Micro's power supply sequencer module (PSSM).
Detected I/O	These fields show the types of I/O modules detected by the MRMS-IC as being installed in the ControlWave Micro.
Slot *n*	This read-only field shows details of the installed I/O module that the MRMS-IC detects in this ControlWave Micro slot. The slot number from 1 to 14 refers to slots in the base and expansion housings.
Total Points	These fields show the total number of different types of I/O points from all the I/O modules detected by the MRMS-IC application.
AIs	This read-only field shows the total number of analog inputs residing across all I/O modules detected by the MRMS-IC application.
AOs	This read-only field shows the total number of analog outputs residing across all I/O modules detected by the MRMS-IC application.
DIs	This read-only field shows the total number of discrete inputs residing across all I/O modules detected by the MRMS-IC application. **Note:** This count includes all possible DIs, including a DI/DO point configured as a DO.
DOs	This read-only field shows the total number of discrete outputs residing across all I/O modules detected by the MRMS-IC application. **Note:** This count includes all possible DOs, including a DI/DO point configured as a DI.
HSCs	This read-only field shows the total number of high speed counter inputs residing across all I/O modules detected by the MRMS-IC application.
RTDs	This read-only field shows the total number of resistance temperature device inputs residing across all I/O modules detected by the MRMS-IC application.
TCs	This read-only field shows the total number of thermocouple inputs residing across all I/O modules detected by the MRMS-IC application.

3.2.2 MVT Common Settings Tab (Site Configuration)

This page configures details for the multivariable transmitter/transducer (MVT).

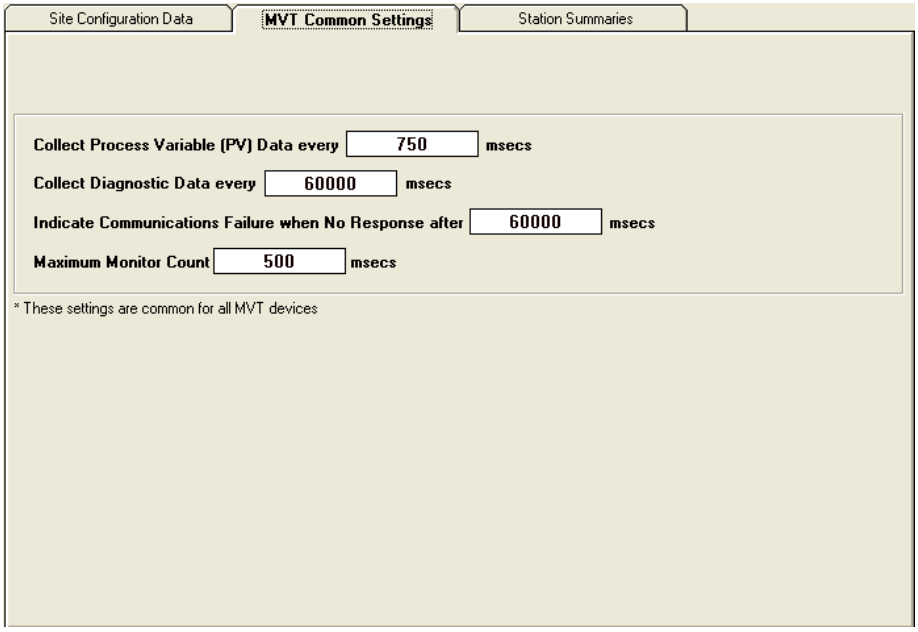


Figure 3-4. MVT Common Settings tab

Field	Description
Collect Process Variable (PV) Data every msecs	Enter how often (in milliseconds) the ControlWave Micro should collect process variable (PV) data. For natural gas measurement in custody transfer applications, the API requires updates no less frequent than 1.0 seconds (1,000 milliseconds). The ControlWave Micro can communicate with up to eight (8) MVTs per second using a single RS-485 port at 19,200 baud. Press the **[Enter]** key to save your entry.
Collect Diagnostic Data every msecs	Enter how often to collect diagnostic data from the MVT (in milliseconds). You should not set the interval of this collection to be very short, because it may interfere with the higher priority PV data collection. Press the **[Enter]** key to save your entry.
Indicate Communications Failure when No Response after msecs	Enter the period (in milliseconds) that the MRMS-IC application waits before declaring that a loss in communications to the MVT constitutes a communications timeout.
Maximum Monitor Count	Enter the maximum number of polls that the MRMS-IC application uses to count good/bad polls and determine the %good.

3.2.3 Station Summaries Tab (Site Configuration)

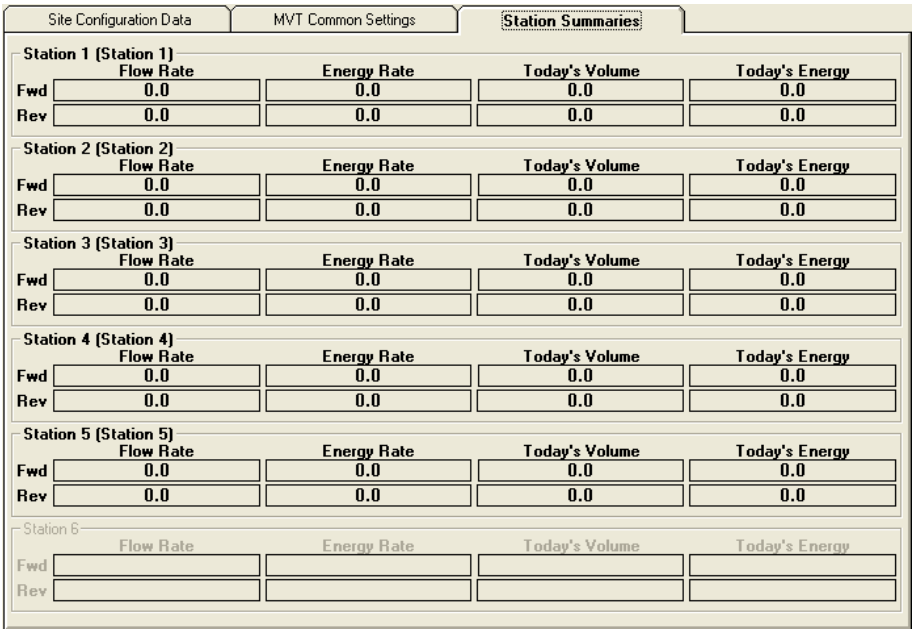


Figure 3-5. Station Summaries tab

Note: Fields appear grayed out if the station is not configured.

Field	Description
Station *n*	Identifies one of the six stations.
Flow Rate Fwd	This read-only field shows the instantaneous flow rate at this station. If this station supports bi-directional flow, this is the instantaneous forward flow rate when flow is in the forward direction (odd) or is the instantaneous reverse flow rate (even).
Flow Rate Rev	This read-only field shows the instantaneous reverse flow rate from the corresponding bi-directional even numbered station when flow is in the reverse direction. (Odd stations only.)
Energy Rate Fwd	This read-only field shows the instantaneous energy rate at this station. If this station supports bi-directional flow, this is the instantaneous forward energy rate when flow is in the forward direction (odd) or is the instantaneous reverse energy rate (even).
Energy Rate Rev	This read-only field shows the instantaneous reverse energy rate from the corresponding bi-directional even numbered station when flow is in the reverse direction. (Odd stations only.)
Today's Volume Fwd	This read-only field shows today's accumulated flow total (volume). If this station supports bi-directional flow, this is the accumulated forward flow total when flow is in the forward direction (odd) or is the

	accumulated reverse flow total (even).
Today's Volume Rev	This read-only field shows today's accumulated flow total from the corresponding bi-directional even numbered station when flow is in the reverse direction. (Odd stations only.)
Today's Energy Fwd	This read-only field shows today's accumulated energy total. If this station supports bi-directional flow, this is the accumulated forward energy total when flow is in the forward direction (odd) or is the accumulated reverse energy total (even).
Today's Energy Rev	This read-only field shows today's accumulated energy total from the corresponding bi-directional even numbered station when flow is in the reverse direction. (Odd stations only.)

3.2.4 Station Configuration Tab (Station Configuration)

MRMS-IC supports up to six individual stations.

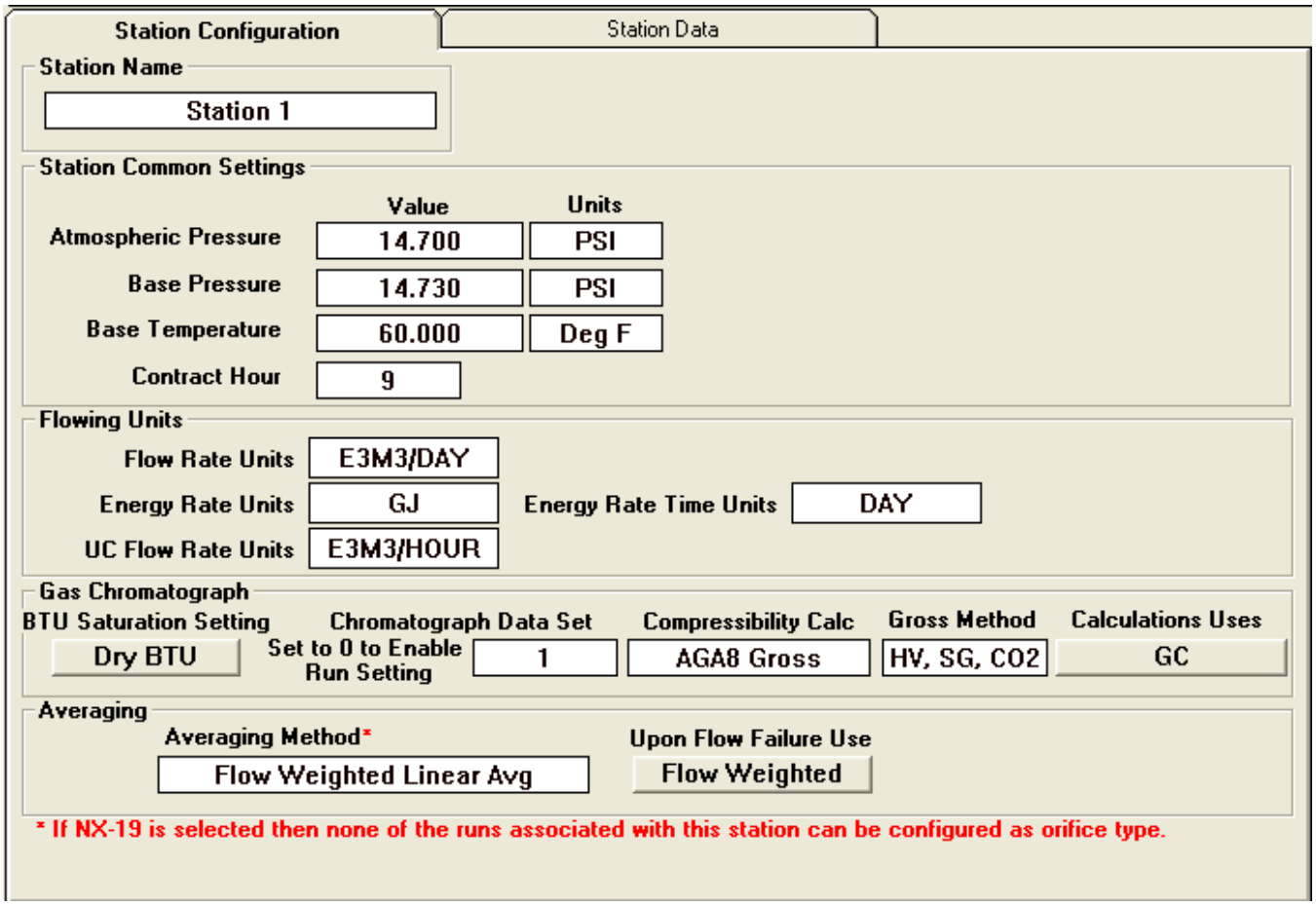


Figure 3-6. Station Configuration tab

Field	Description
Station Name	The **station** refers to a natural gas measurement station with one or more associated meter runs. Enter a name and press the **[Enter]** key to save your entry.
Station Common Settings	
Atmospheric Pressure Value, Units	Enter the standard atmospheric (barometric) pressure for the station in the **Value** field and press **[Enter]** to save your entry. Then select the desired **Units** of measure from the drop-down menu and press **[Enter]** to save your selection. The default is 14.7 PSI. **Note:** Units are absolute pressure units.
Base Pressure Value, Units	Enter the base pressure that the MRMS-IC application should use when it performs AGA calculations in the **Value** field and press **[Enter]** to save your entry. Then select the desired **Units** of measure from the drop-down menu and press **[Enter]** to save your selection. The default is 14.73 PSI

(absolute).

Base Temperature Value, Units

Enter the base temperature that the MRMS-IC application should use when it performs AGA calculations in the **Value** field and press **[Enter]** to save your entry. Then select the desired **Units** of measure from the drop-down menu and press **[Enter]** to save your selection. The default is 60 Deg F.

Contract Hour

The contract hour determines the start of the gas day. This is when the current day totals and averages get rolled over to the previous day totals and averages. The contract hour is based on a 24 hour clock; 1 PM is 13, 2 PM is 14, and so on. Midnight is 00. Enter the desired contract hour and press **[Enter]** to save your entry. The default is 9 (9AM).

Flowing Units

You can select units for corrected flow (Flow), Uncorrected (UC) Flow, and Energy rates for the combined station flow and energy rates independently of the meter run rates.

Flow Rate Units

Select the desired units of measure for the corrected flow rate from the drop-down menu and press **[Enter]** to save your selection.

Flow rate units include:

MSCF/YEAR	Thousands of Standard Cubic Feet per Year
MSCF/DAY	Thousands of Standard Cubic Feet per Day
MSCF/HOUR	Thousands of Standard Cubic Feet per Hour
MSCF/MIN	Thousands of Standard Cubic Feet per Minute
MSCF/SEC	Thousands of Standard Cubic Feet per Second
E3M3/YEAR	Thousands of Standard Cubic Meters per Year
E3M3/DAY	Thousands of Standard Cubic Meters per Day
E3M3/HOUR	Thousands of Standard Cubic Meters per Hour
E3M3/MIN	Thousands of Standard Cubic Meters per Minute
E3M3/SEC	Thousands of Standard Cubic Meters per Second
MMSCF/YEAR	Millions of Standard Cubic Feet per Year
MMSCF/DAY	Millions of Standard Cubic Feet per Day
MMSCF/HOUR	Millions of Standard Cubic Feet per Hour

	MMSCF/MIN	Millions of Standard Cubic Feet per Minute
	MMSCF/SEC	Millions of Standard Cubic Feet per Second
	E6M3/YEAR	Millions of Standard Cubic Meters per Year
	E6M3/DAY	Millions of Standard Cubic Meters per Day
	E6M3/HOUR	Millions of Standard Cubic Meters per Hour
	E6M3/MIN	Millions of Standard Cubic Meters per Minute
	E6M3/SEC	Millions of Standard Cubic Meters per Second

Energy Rate Units

Select the desired units of measure for the energy rate from the drop-down menu and press **[Enter]** to save your selection.

Energy rate units include:

MMBTU	Millions of British Thermal Units
MJ	Megajoules
KJ	Kilojoules
J	Joules
ERG	Ergs
KCAL	Kilocalories
CAL	Calories
CHU	Centigrade Heat Unit
KWH	Kilowatt Hour
QUAD	short scale quadrillion British Thermal Units
THERM	Therms
TONTNT	Tons of TNT
TONCOAL	Tons of coal
MMMBTU	Billions of British Thermal Units
GJ	Gigajoules

Energy Rate Time Units

Select the desired units of time to associate with the energy rate units from the drop-down menu and press **[Enter]** to save your selection.

UC Flow Rate Units

Select the desired units of measure for the uncorrected flow rate from the drop-down menu and press **[Enter]** to save your selection.

Uncorrected flow rate units include:

MACF/YEAR	Thousands of Actual Cubic Feet per Year

MACF/DAY	Thousands of Actual Cubic Feet per Day
MACF/HOUR	Thousands of Actual Cubic Feet per Hour
MACF/MIN	Thousands of Actual Cubic Feet per Minute
MACF/SEC	Thousands of Actual Cubic Feet per Second
E3M3/YEAR	Thousands of Cubic Meters per Year
E3M3/DAY	Thousands of Cubic Meters per Day
E3M3/HOUR	Thousands of Cubic Meters per Hour
E3M3/MIN	Thousands of Cubic Meters per Minute
E3M3/SEC	Thousands of Cubic Meters per Second
MMACF/YEAR	Millions of Actual Cubic Feet per Year
MMACF/DAY	Millions of Actual Cubic Feet per Day
MMACF/HOUR	Millions of Actual Cubic Feet per Hour
MMACF/MIN	Millions of Actual Cubic Feet per Minute
MMACF/SEC	Millions of Actual Cubic Feet per Second
E6M3/YEAR	Millions of Cubic Meters per Year
E6M3/DAY	Millions of Cubic Meters per Day
E6M3/HOUR	Millions of Cubic Meters per Hour
E6M3/MIN	Millions of Cubic Meters per Minute
E6M3/SEC	Millions of Cubic Meters per Second

Gas Chromatograph

BTU Saturation Setting

Click the **Dry BTU** button if you want MRMS-IC to use the dry BTU value from the gas chromatograph, or click the **Sat. Wet BTU** button if you want MRMS-IC to use the saturated (wet) BTU value from the gas chromatograph.

Chromatograph Data Set

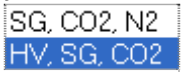
Enter the chromatograph data set you want to use and press **[Enter]** to save your entry. Specify **0** if you want to set this on a per run basis.

Compressibility Calc

Use the drop-down menu to select the calculation you want MRMS-IC to use for compressibility, and press the **[Enter]** key to save your selection.

Gross Method

If you choose AGA8 Gross for your compressibility calculations select the gross method here from the drop-down menu, and press the **[Enter]** key to save your selection.



Choices include:

SG, CO2, N2	The MRMS-IC application performs calculations using inputs of relative density (specific gravity or SG), and the mole fractions of nitrogen (N2)

		and carbon dioxide (CO2).
	HV, SG, CO2	The MRMS-IC application performs calculations using inputs of the heating value (HV), the relative density (specific gravity or SG), and the mole fraction of carbon dioxide (CO2).

Note: MRMS-IC ignores the method setting for calculations other than AGA8 Gross.

Calculations Uses	This setting determines whether the MRMS-IC application uses “In Use” or “Fixed” gas chromatograph data if the gas chromatograph (GC) fails. A GC failure could include a communication failure, a range problem and so on. Click the **Fixed - Scheduled** button to use fixed data during a GC failure, or the **GC** button to use in-use GC data during a GC failure.
Averaging	
Averaging Method	Use the drop-down menu to select the averaging method you want MRMS-IC to use, and press the **[Enter]** key to save your selection.
Upon Flow Failure Use	This setting determines whether the MRMS-IC application uses a flow weighted average, or a straight average during a no flow condition. Click the **Flow Weighted** button to use a flow weighted average when there is no flow. Click the **Straight Average** button to use a straight average when there is no flow.

3.2.5 Station Data Tab (Station Configuration)

The current station Flow and Energy rates are indicated here. The flow rate is in units of MSCF per hour and the energy rate is in units of MMBTU per hour.

Station Accumulations

The current hour, contract day and contract month, and the previous hour, contract day and contract month accumulations are displayed here, in units of MSCF and MMBTU.

Forward / Reverse

When configuring for bidirectional flow, the stations must be paired (1 and 2; 3 and 4; or 5 and 6).

The odd-numbered stations (1, 3, or 5) are the “forward” flowing stations, and the even-numbered stations (2, 4, or 6) are the “reverse” flowing stations.

When a pair of stations is configured for bidirectional flow, the Station Summary screen for the odd-numbered (forward) stations will indicate flow and energy rates in the “forward” column when flow is in the “forward” direction, and will indicate flow and energy rates in the “reverse” column when flow is in the “reverse” direction.

However, the Station Summary screen for the even-numbered (reverse) stations, will indicate flow and energy rates in the “forward” column when flow for the combined station is in the “reverse” direction, and will always indicate no flow or energy rate in the “reverse” column.

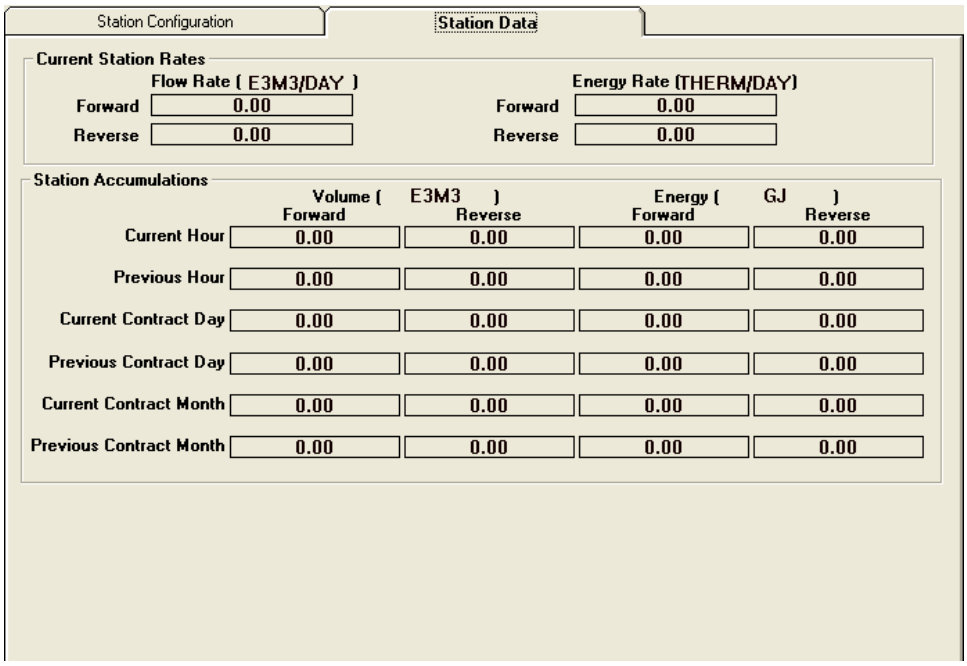


Figure 3-7. Station Data tab

3.2.6 Run Configuration Tab

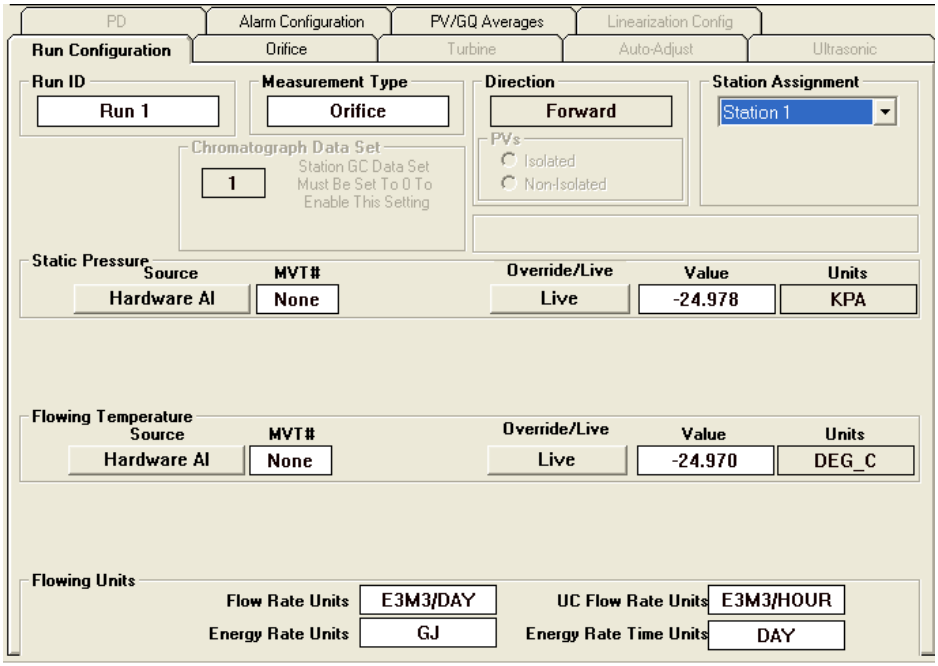
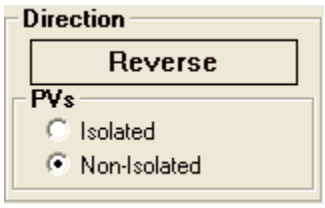


Figure 3-8. Run Configuration tab

Field	Description
Run ID	Enter a name and press the **[Enter]** key to save your entry. The generic Run ID of Run 1 will be replaced by the user specific Run ID.
Measurement Type	Select the measurement type from the drop-down menu.
Chromatograph Data Set	The chromatograph stream used for measurement of this run may be assigned at the Station level, or at the Run level. If a chromatograph stream is assigned at the Station level, the user will be unable to assign the stream at the run level.  If the chromatograph stream is assigned as 0 at the Station level, the user will be able to assign the stream at the run level.
Direction	If the run being configured has been assigned to a station configured as a forward flowing station, this will be indicated on this screen as “Forward”, and the PV’s section will be grayed out.
PVs	If the run being configured has been assigned to a station configured as a reverse flowing station, this will be indicated on this screen as “Reverse.” It will then be possible to configure the PVs (Process Variables) section. The user may then select

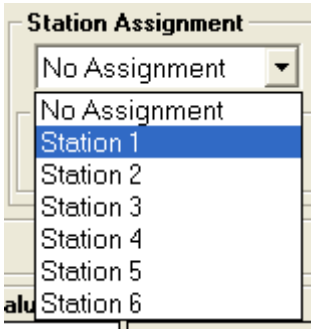
between Isolated and Non-Isolated PVs**.**
Isolated PV is used when the forward run and reverse run each are using different Input Sources.

Non-Isolated PV is used when the forward run and reverse run are using the same Input Sources.



Station Assignment

To assign the run to a station, click on the Station Assignment box.



Select a station from the drop down menu, and press **[Enter]**. (Note, if the Station ID has been changed on the Station Configuration screen, the user defined Station Name will appear in the drop down menu, instead of the generic Station Name.) After assigning a run to a station, the run will appear under the station in the Site Tree.

Static Pressure and Flowing Temperature

Every type of measurement requires a static pressure measurement and a temperature measurement.

Source

The source for these measurements may come from either Analog Inputs via the I/O cards (Hardware AI) or via serial communications to the Multi-Variable Transmitters (MVT).

The selection of the source is made by clicking on the button.

MVT#

If MVT is chosen, the user may select from any of the 12 MVTs.

Override/Live	The user may override the measurement values in use by selecting Override instead of Live When Override is selected, the user may enter the desired value for the measurement to be used. When Live is selected, the Value will be driven by the appropriate input value. **Note:** the action of changing from Live to Override or Override to Live is entered in the Audit trail. When in Override, any changes made to the Value are entered in the Audit Trail. **Note:** These overrides are done at the Run Measurement level, not at the I/O level. Because of this, care needs to be taken when overriding runs configured for bidirectional measurement, because the logic overriding the measurement values occurs after the logic for routing the measurement inputs to the proper run.
Value	The static pressure and flowing temperature values in use are shown here. When "Live" is selected via the "Override/Live" button, this value is the value coming from the Static Pressure or Flowing Temperature Source. When "Override" is selected via the "Override/Live" button, this value may be entered by the user, and the entered value will be used in the measurement calculation.
Units	The units for the measurement inputs come from the input source.
Flowing Units	Flow Rate and Energy Rate units may be assigned on a per run basis. Flow Rate Units MSCF/YEAR MSCF/DAY MSCF/HOUR MSCF/MIN MSCF/SEC E3M3/YEAR E3M3/DAY E3M3/HOUR E3M3/MIN E3M3/SEC MMSCF/YEAR MMSCF/DAY MMSCF/HOUR MMSCF/MIN MMSCF/SEC

E6M3/YEAR
E6M3/DAY
E6M3/HOUR
E6M3/MIN
E6M3/SEC

where:
MSCF – Thousands of Standard Cubic Feet
MMSCF – Millions of Standard Cubic Feet
E3M3 – Thousands of Cubic Meters
E6M6 – Millions of Cubic Meters
MIN – Minutes
SEC - Seconds

Uncorrected (UC) Flow Rate Units
MACF/YEAR
MACF/DAY
MACF/HOUR
MACF/MIN
MACF/SEC
E3M3/YEAR
E3M3/DAY
E3M3/HOUR
E3M3/MIN
E3M3/SEC
MMACF/YEAR
MMACF/DAY
MMACF/HOUR
MMACF/MIN
MMACF/SEC
E6M3/YEAR
E6M3/DAY
E6M3/HOUR
E6M3/MIN
E6M3/SEC

where:
ACF – Actual Cubic Feet
E3M3 – Thousands of Cubic Meters
E6M3 –Millions of Cubic Meters

Energy Rate Units
MMBTU
MJ
KJ
J
ERG
KCAL
CAL
CHU
KWH
QUAD
THERM
TONTNT
TONCOAL
MMMBTU
GJ

where:
MMBTU – Millions of British Thermal Units
MJ – Mega joules
KJ – Kilojoules
J – Joules
ERG – Ergs
KCAL – Kilocalories
CAL – Calories
CHU - Celsius-heat unit
KWH – Kilowatt Hours
QUAD - short-scale quadrillion
THERM – Therms
TONTNT – Tons of TNT
TONCOAL – Tons of Coal
MMMBTU – Billions of BTU
GJ – Gigajoules

Energy Rate Time Units:
YEAR
DAY
HOUR
MIN
SEC

3.2.7 Alarm Configuration Tab (Run Configuration)

The MRMS-IC program allows for certain items to be configured as alarms.

When an item is configured as an alarm, then any time the value goes into or out of the alarm state, an entry will be made in the Audit Trail.

In addition, if the MRMS-IC controller is being used in a BSAP network, then these alarms will be reported to the SCADA host, if the SCADA host supports BSAP alarms.

To configure the alarm limits for run specific data, click on the Alarm Configuration Tab

This screen opens.

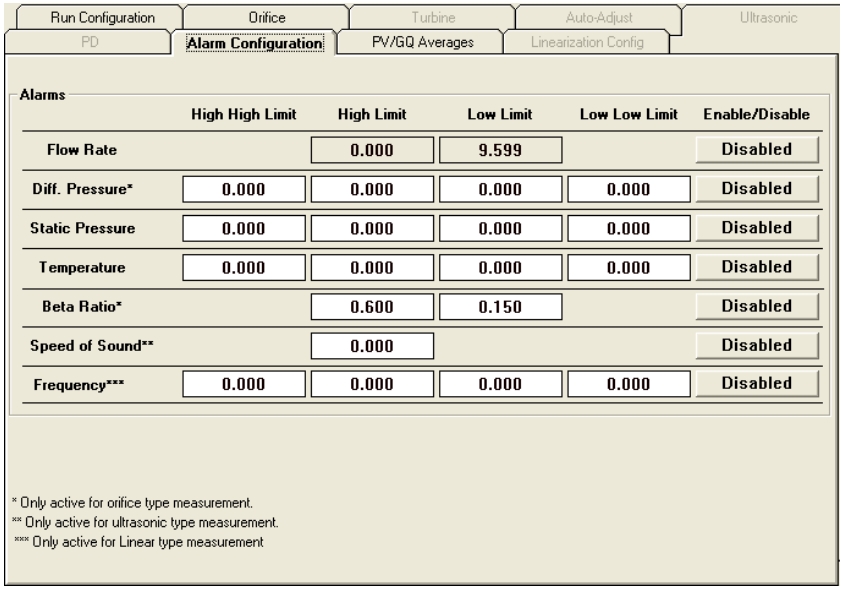


Figure 3-9. Alarm Configuration tab

The following items may be configured for alarms.

Field	Description
Flow Rate	The High and Low Limits for the flow rate are automatically calculated, based on the Maximum and Minimum flow rates through the meter run.
Diff Pressure	For an orifice meter only, High-High, High, Low, and Low-Low alarm limits may be set for the differential pressure input.
Static Pressure	For all meter types, High-High, High, Low, and Low-Low alarm limits may be set for the static pressure input.

Temperature	For all meter types, High-High, High, Low, and Low-Low alarm limits may be set for the flowing temperature input.
Beta Ratio	For an orifice meter only, High and Low alarm limits may be set for the calculated beta ratio.
Speed of Sound	For an ultrasonic meter only, the High alarm limit for the deviation between the speed of sound as calculated using AGA 10 and the speed of sound reported from the ultrasonic meter may be configured.
Frequency	For linear meter types (ultrasonic, turbine, AutoAdjust, and positive displacement (PD) meters, High-High, High, Low, and Low-Low alarm limits may be set for the frequency input.
Enabled/Disabled	An alarm may be Enabled or Disabled via the Enable/Disable button. By default, the alarms are disabled. When an alarm is disabled, no entries are made into the Audit Trail if the value goes in to or out of alarm.

3.2.8 Linearization Config Tab (Run Configuration)

The MRMS-IC program allows for the linearization of the frequency outputs of turbine meters.

To configure the linearization table, click on the Linearization Config Tab

This screen opens.

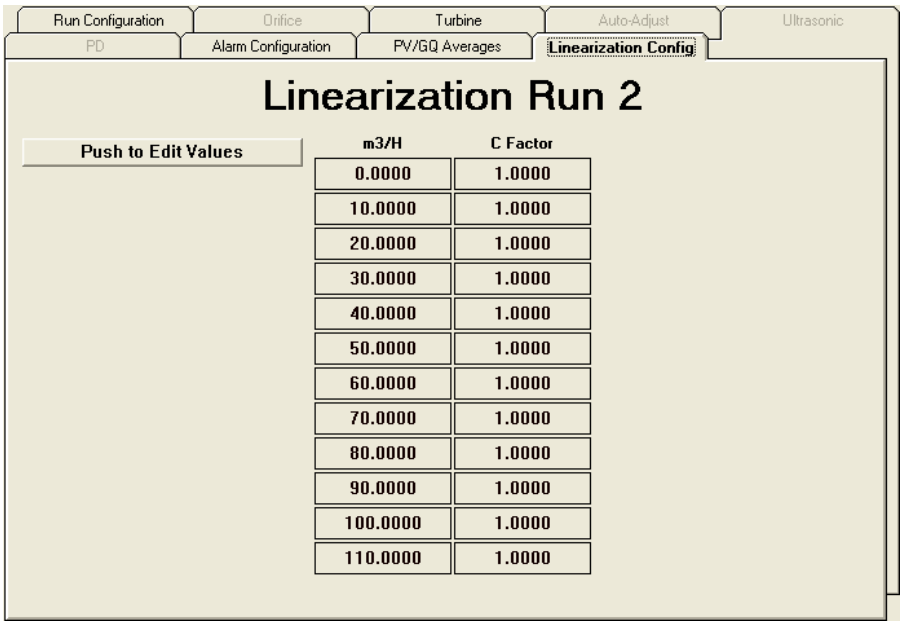


Figure 3-10. Linearization Config tab

This linearization table must be configured by the user. Click the **Push to Edit Values** button to makes your entries. For up to 12 points, the user must enter an uncorrected flow rate in units of Actual Cubic Feet per hour, and an associated correction factor (C factor). The MRMS-IC program will interpolate between any two points on this table to calculate the C Factor for a specific flow rate. When you finish making your entries, click the **Push to Confirm and Lock Values** button.

⚠ Caution **If the user does not configure all 12 points, then the last non-zero entry for ACF/H will be used as the last correction factor. Any uncorrected flow rate above this point will use the correction factor for this point, there will be no interpolation performed.**

3.2.9 PV/GQ Averages Tab (Run Configuration)

The MRMS-IC program calculates and displays averages for the process values used for measurement, and the gas quality data used by the measurement for each run.

To view the averages for the process variables and gas quality data, click on the PV/GQ Averages Tab. This screen will appear.

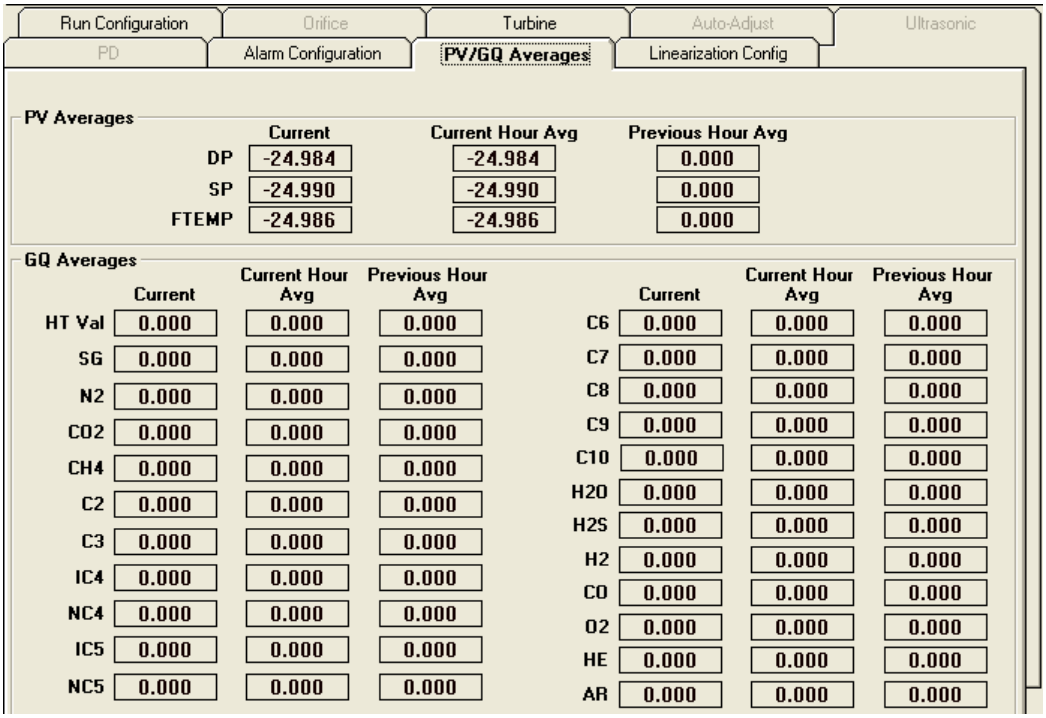


Figure 3-11. PV/GQ Averages tab

The averaging method for the differential pressure is always flow-dependent time-weighted linear averaging.

The averaging method for the static pressure and flowing temperature may be any of the API averaging methods.

The averaging method for the gas quality data is always time-weighted linear averaging.

3.2.10 Orifice Tab (Run Configuration)

To configure a run as an orifice meter, click on the Measurement Type on the Run Configuration tab and select Orifice from the drop down menu, then press **Enter**.

Click on the Orifice tab, and the following screen opens.

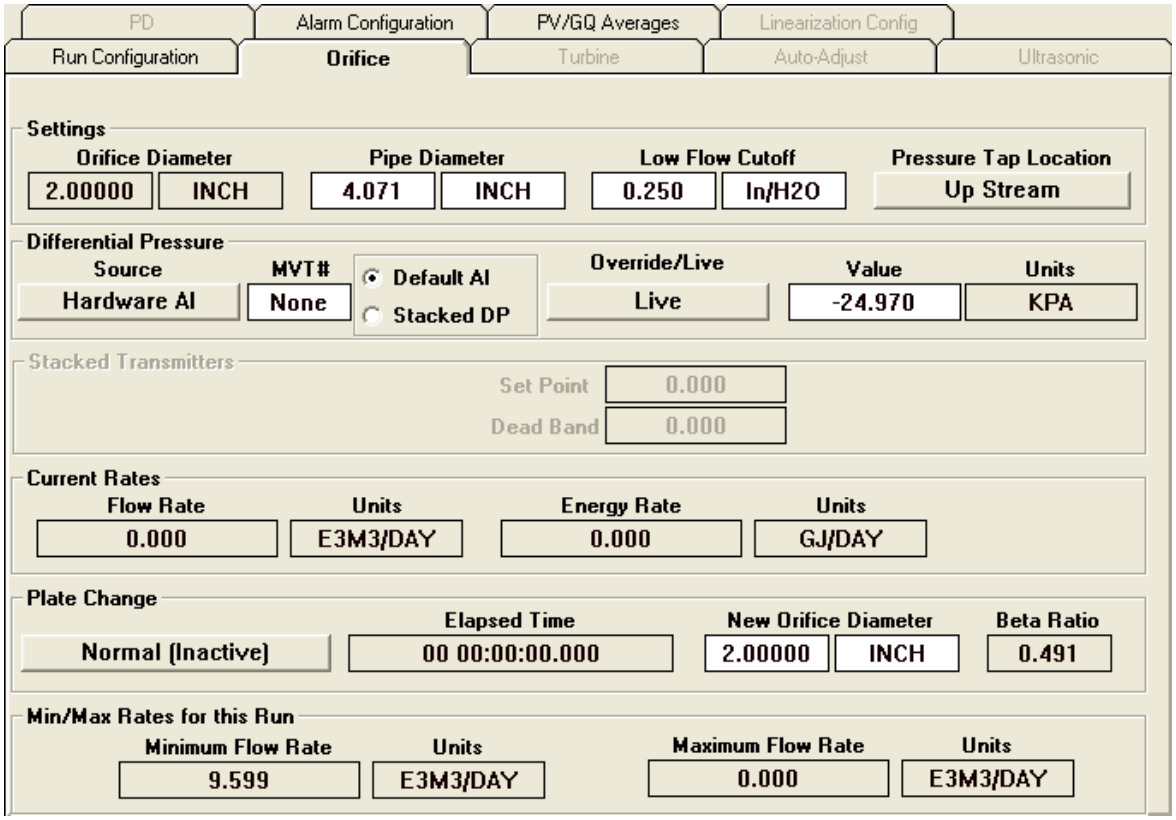
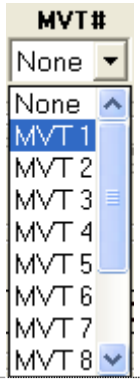
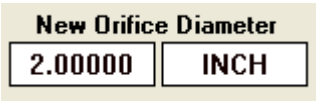


Figure 3-12. Orifice tab

Field	Description
Settings	
Orifice Diameter	The Orifice Diameter in use is displayed in the "Settings" section of this screen. To change the orifice diameter, see the "Plate Change" section.
Pipe Diameter	The pipe diameter change may be made by clicking on the box with the pipe diameter value in it and entering the desired pipe diameter value. When the new value of the pipe diameter is entered, a new beta ratio will be calculated and displayed in the "Plate Change" section.

Low Flow Cutoff	The low flow cutoff is the minimum value for differential pressure where measurement will be performed. If the differential pressure drops below this value, the measured flow goes to zero. The user may change the low flow cutoff value by clicking on the box with the low flow cutoff value and entering a new value, and clicking OK. The user may change the units that the low flow cutoff value is measured, by clicking on the units box, and selecting the desired units from the drop down menu.
Pressure Tap Location	The user may change the pressure tap location by clicking on Pressure Tap Location button.
Differential Pressure	
Source	The source for the Differential Pressure measurement may come from either Analog Inputs via the I/O cards (Hardware AI) or via serial communications to the Multi-Variable Transmitters (MVT). The selection of the source is made via the Hardware AI/MVT button on the screen:
MVT#	If MVT is chosen, the user may select from any of 12 MVTs. 
Default AI / Stacked DP	The user may select from either the default AI (as specified in the Run *x* Differential Pressure field on the I/O configuration page) or a pair of stacked transmitters (Stacked DP *x* Lo/Hi selections the on I/O configuration page).
Override / Live	The user may override the measurement values in use by selecting Override instead of Live When Override is selected, the user may enter the desired value for the measurement to be used. When Live is selected, the Value will be driven by the appropriate input value. **Note**: the action of changing from Live to Override or

	Override to Live is entered in the Audit trail. When in Override, any changes made to the Value are entered in the Audit Trail. **Note:** This override is done at the Run Measurement level, not at the I/O level. Because of this, care needs to be taken when overriding runs configured for bidirectional measurement, because the logic overriding the measurement values occurs after the logic for routing the measurement inputs to the proper run.
Value	The differential pressure value in use is shown here. When "Live" is selected via the "Override/Live" button, this value is the value coming from the Differential Pressure Source. When "Override" is selected via the "Override/Live" button, this value may be entered by the user, and the entered value will be used in the measurement calculation.
Units	The units for the measurement inputs come from the input source.
Stacked Transmitters	Stacked Transmitters operate such that one transmitter measures at a low range of measurement, and a second transmitter measures at a higher range. These selections are not available if you choose "Default AI."
Set Point	When using Stacked Transmitters, the user must enter a set point where the measurement will transition from the low range transmitter to the high range transmitter.
Dead Band	A deadband may be entered, that will prevent the measurement from switching back and forth between the high and low transmitters.
Current Rate	The current flow and energy rates are displayed on this screen. The units of flow and energy rates are set from the Run Configuration page.
Plate Change	To change the orifice diameter, the user must change the Plate Change mode from Normal (Inactive) to Plate Change (Active) While the Plate Change mode is Active, the Differential Pressure, Static Pressure and Temperature values are frozen.
Elapsed Time	While the Plate Change mode is Active, the elapsed time is displayed.

New Orifice Diameter	The new orifice diameter and orifice diameter units may be entered here.  The orifice diameter in use does not change until the plate change mode changes from “Plate Change (Active)” to “Normal (Inactive)”. The Orifice Diameter in use appears in the Settings section
Beta Ratio	The beta ratio is the orifice diameter divided by the pipe diameter.  The beta ratio is displayed on this screen. If the beta ratio is out of range, it will appear in red text. The low limit for the beta ratio is 0.15 and the high limit for the beta ratio is 0.60.
Min/Max Rates for this Run	The minimum and maximum flow rates for an orifice run are calculated outputs of the AGA3I. The DP minimum is always 10 inches and the DP maximum is equal to the DP span

3.2.11 Turbine Tab (Run Configuration)

Click on the Turbine tab, and the following screen opens.

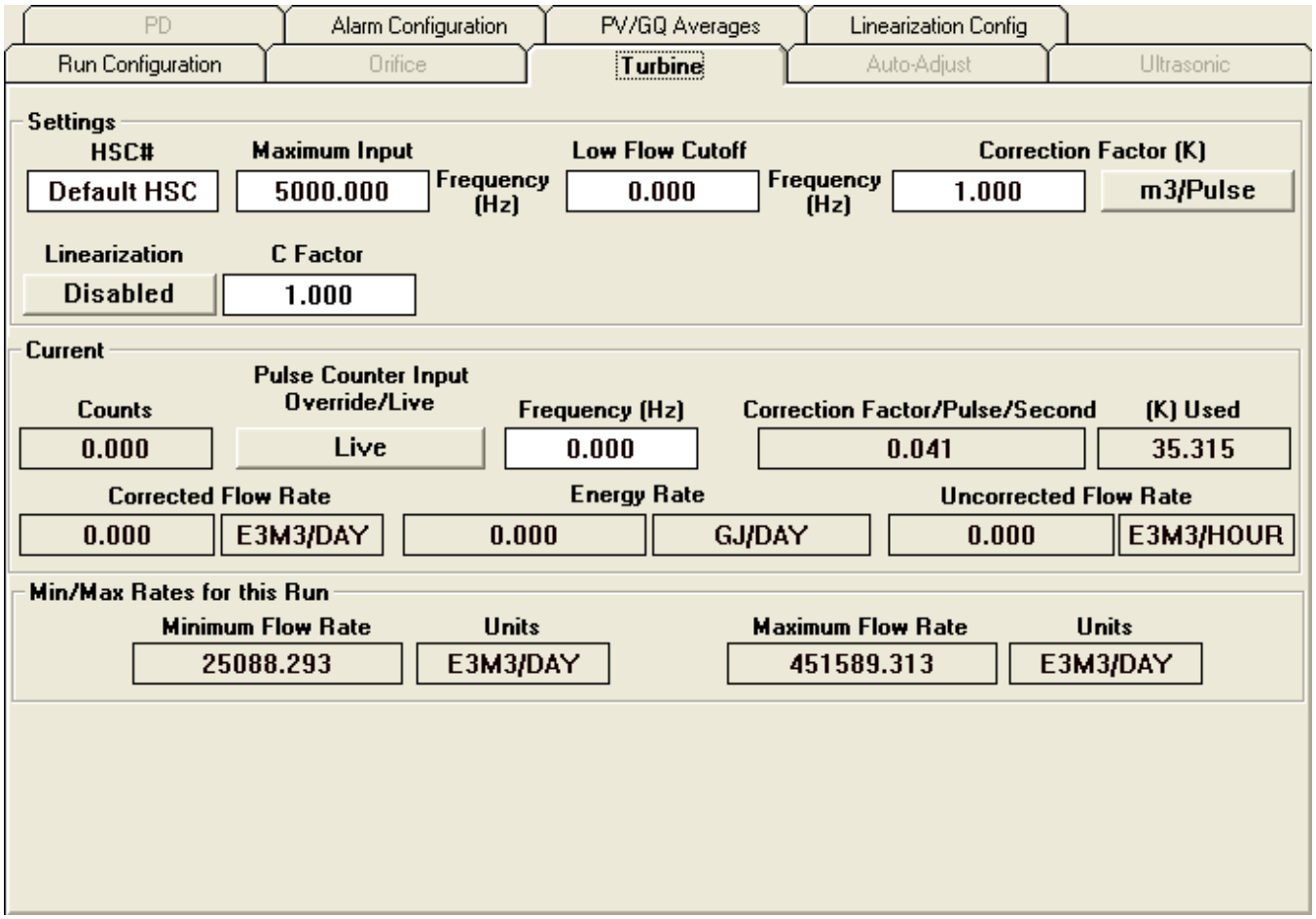


Figure 3-13. Turbine tab

Field	Description
Settings	
HSC#	The source for the High Speed Counter (HSC) comes from a High Speed Counter Input via the I/O cards. The user may select from the Default HSC (this would be the "Run X AGA7 Hz" selection from the I/O configuration page), or from a Shared Hz input.
Maximum Input	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
Low Flow Cutoff	The low flow cutoff is the minimum frequency that will still be considered valid for flow measurement. If the frequency of the inputs from the high speed counter fall below this number, volume will not be measured.

Correction Factor (K)	The correction factor represents either the volume (in Cubic Feet) per pulse, or the number of pulses per volume (in Cubic Feet). The K factor value is entered as shown in the box below, while the K factor units are selected by using the pushbutton. This information is available from the turbine meter data plate.
Linearization Enabled / Disabled	Enables/disables use of the linearization table.
C Factor	The current linearization factor being used.
Current	
Counts	The "Counts" value represents the total number of events (pulses) in the most recent execution cycle coming from the High Speed Counter Input.
Pulse Counter Input Override / Input	The user may override the measurement values in use by selecting Override instead of Live When Override is selected, the user may enter the desired value for the frequency to be used. When Live is selected, the Value will be driven by the appropriate high speed counter input value. **Note:** The action of changing from Live to Override or Override to Live is entered in the Audit trail. When in Override, any changes made to the Value are entered in the Audit Trail. **Note:** This override is done at the Run Measurement level, not at the I/O level. Because of this, care needs to be taken when overriding runs configured for bidirectional measurement, because the logic overriding the measurement values occurs after the logic for routing the measurement inputs to the proper run.
Frequency (Hz)	The frequency value in use is shown here. When "Live" is selected via the "Override/Live" button, this value is the value coming from the HSC input. When "Override" is selected via the "Override/Live" button, this value may be entered by the user. The entered value will be used in the measurement calculation.
Correction Factor / Pulse/ Second	This is the correction factor calculated by the AGA 7 equation. This correction factor multiplied by the frequency will

provide the corrected flow rate.

(K) Used	The AGA 7 calculation requires the K factor to be input in units of Cubic Feet/Pulse. The (K) Used value always represents the K factor in the units of Cubic Feet/Pulse.
Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate	The current corrected flow, energy rate, and uncorrected flow rate are displayed on this screen. The units of flow and energy rates are set from the Run Configuration page.
Min / Max Rates for this Run	The minimum and maximum flow rates for a turbine meter run are calculated as follows: Minimum Flow Rate = max frequency * AGA7 Factor * (Min /100) Maximum Flow Rate = max frequency * AGA7 Factor * (Max/100) Where: Min defaults to 5 Max defaults to 90

3.2.12 Auto-Adjust Tab (Run Configuration)

Click on the Auto-Adjust tab, and the following screen opens.

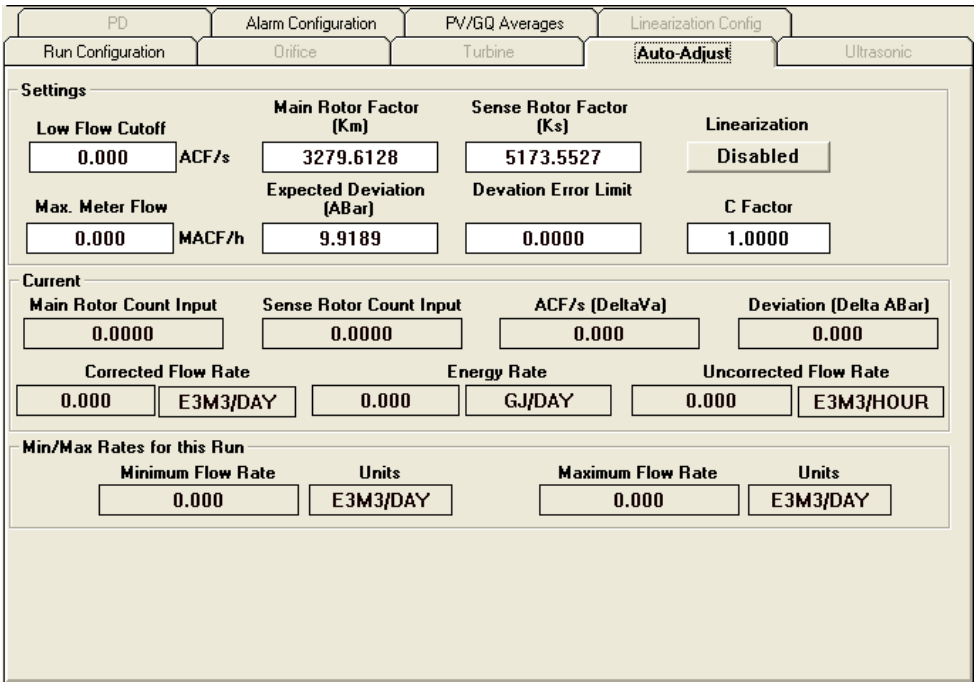


Figure 3-14. Auto-Adjust tab

Field	Description
Settings	
Low Flow Cutoff	The low flow cutoff is the minimum flow, in units of Actual Cubic Feet per second that will still be considered valid for flow measurement. If the flow rate falls below this number, volume will not be measured.
Main Rotor Factor (Km)	The main rotor is the upstream rotor and has a greater blade angle to the flow of gas.
Sense Rotor Factor (Ks)	The sense rotor is the downstream rotor and has a shallower blade angle to the flow of gas.
Linearization Enabled / Disabled	Enable / disable use of the linearization table.
Max Meter Flow	The maximum meter flow is the maximum flow rate through the meter, in units of thousands of actual cubic feet per hour. This number is used to calculate the Minimum and maximum flow rate through the meter.
Expected Deviation (Abar)	Average relative adjustment between main and sense rotors.

Deviation Error Limit	This sets a limit on the difference between the expected Abar and the calculated Abar.
C Factor	Current linearization factor.
Current	
Main Rotor Count Input	Pulse count from main rotor.
Sense Rotor Count Input	Pulse count from sense rotor.
ACF/s (DeltaVa)	The ACF/s (DeltaVa) reading is displayed here.
Deviation (Delta Abar)	The Deviation (Delta ABar) reading is displayed here.
Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate	The current corrected flow, energy rate, and uncorrected flow rate are displayed on this screen. The units of flow and energy rates are set from the Run Configuration page.
Min / Max Rates for this Run	The minimum and maximum flow rates for an auto-adjust meter run are calculated as follows: Minimum Flow Rate = max frequency * AGA7 Factor * (Min /100) Maximum Flow Rate = max frequency * AGA7 Factor * (Max/100) Where: Min defaults to 5 Max defaults to 90

3.2.13 Ultrasonic Tab (Run Configuration)

Click on the Ultrasonic tab, and the following screen opens.

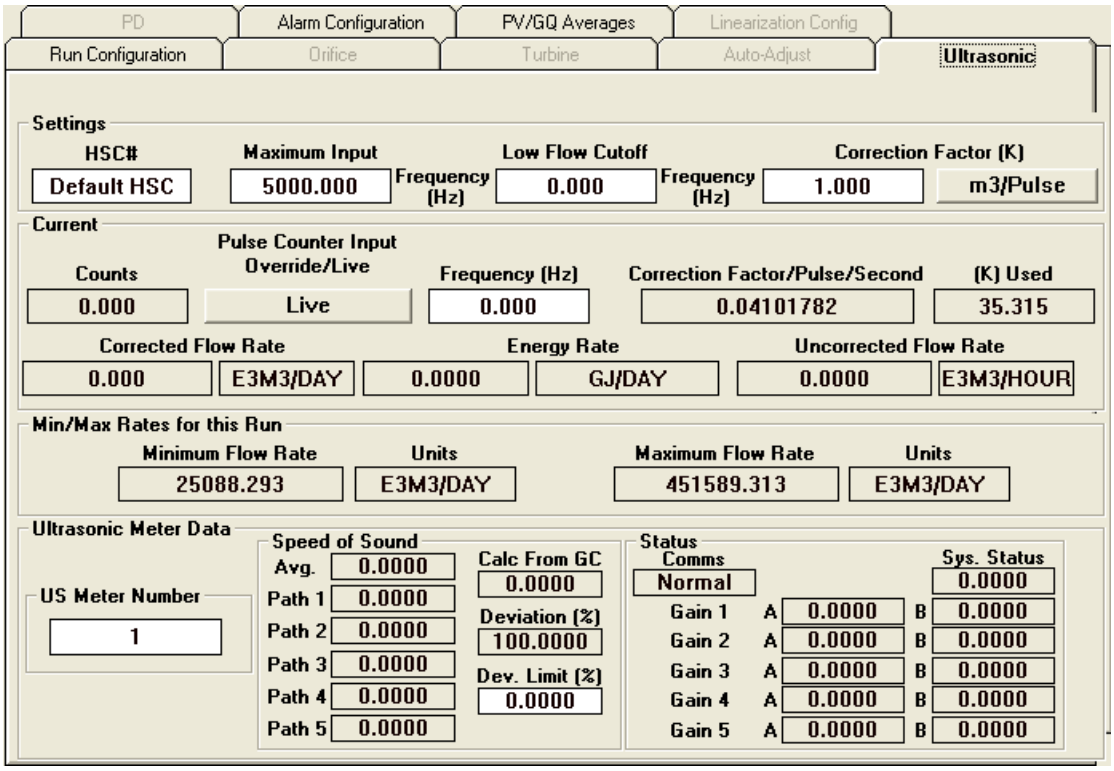


Figure 3-15. Ultrasonic tab

Field	Description
Settings	
HSC#	The source for the Counter input comes from a High Speed Counter Input via the I/O cards. The user may select from the Default HSC (this would be the "Run X AGA7 Hz" selection from the I/O configuration page), or from a Shared Hz input.
Maximum Input	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
Low Flow Cutoff	The low flow cutoff is the minimum frequency that will still be considered valid for flow measurement. If the frequency of the inputs from the high speed counter fall below this number, volume will not be measured.
Correction Factor (K)	The correction factor represents either the volume (in Cubic Feet) per pulse, or the number of pulses per volume (in Cubic Feet). The K factor value is entered as shown in the box below, while the K factor units are selected by using the push button. This information is available from the UFM meter data plate.
Current	
Counts	The "Counts" value represents the event (pulse) total during the most recent execution cycle coming from the High Speed Counter Input.

Pulse Counter Input Override / Live	The user may override the measurement values in use by selecting Override instead of Live When Live is selected, the Value will be driven by the appropriate high speed counter input value. **Note:** the action of changing from Live to Override or Override to Live is entered in the Audit trail. When in Override, any changes made to the Value are entered in the Audit Trail. **Note:** This override is done at the Run Measurement level, not at the I/O level. Because of this, care needs to be taken when overriding runs configured for bidirectional measurement, because the logic overriding the measurement values occurs after the logic for routing the measurement inputs to the proper run.
Frequency (Hz)	When Override is selected, the user may enter the desired value for the frequency to be used.
Correction Factor / Pulse/ Second	This is the correction factor calculated by the AGA 7 equation. This correction factor multiplied by the frequency will provide the corrected flow rate.
(K) Used	The AGA 7 calculation requires the K factor to be input in units of Cubic Feet/Pulse. The (K) Used value always represents the K factor in the units of Cubic Feet/Pulse.
Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate	The current corrected flow, energy rate, and uncorrected flow rate are displayed on this screen. The units of flow and energy rates are set from the Run Configuration page.
Min / Max Rates for this Run	The minimum and maximum flow rates for an ultrasonic meter run are calculated as follows: Minimum Flow Rate = max frequency * AGA7 Factor * (Min /100) Maximum Flow Rate = max frequency * AGA7 Factor * (Max/100) Where: Min defaults to 5 Max defaults to 90
Ultrasonic Meter Data	If a MODBUS interface to the ultrasonic meter has been configured from the I/O Configuration section, the data collected from the ultrasonic meter is displayed here.
US Meter Number	To select the ultrasonic meter that data is being collected from, right click on the US Meter Number box, and enter the appropriate meter number.
Speed of Sound	The Speed of Sound (SOS) readings from each path of the ultrasonic meter are displayed, and the average is calculated. At the same time, the Multi-Run Multi-Station controller calculates the Speed of Sound per the AGA 10 equations. The calculated value is

	compared to the average value from the ultrasonic meter, and if the deviation is greater than the deviation limit, an alarm will be generated. This alarm will be entered into the Audit Trail, and will be available via both the BSAP Slave communications and MODBUS communications interfaces.
Status	Diagnostics information relating to communications with the ultrasonic meter, the gain on each path, and the overall status of the ultrasonic meter is collected and displayed here.

3.2.14 PD Tab (Run Configuration)

Click on the PD tab, and the following screen opens.

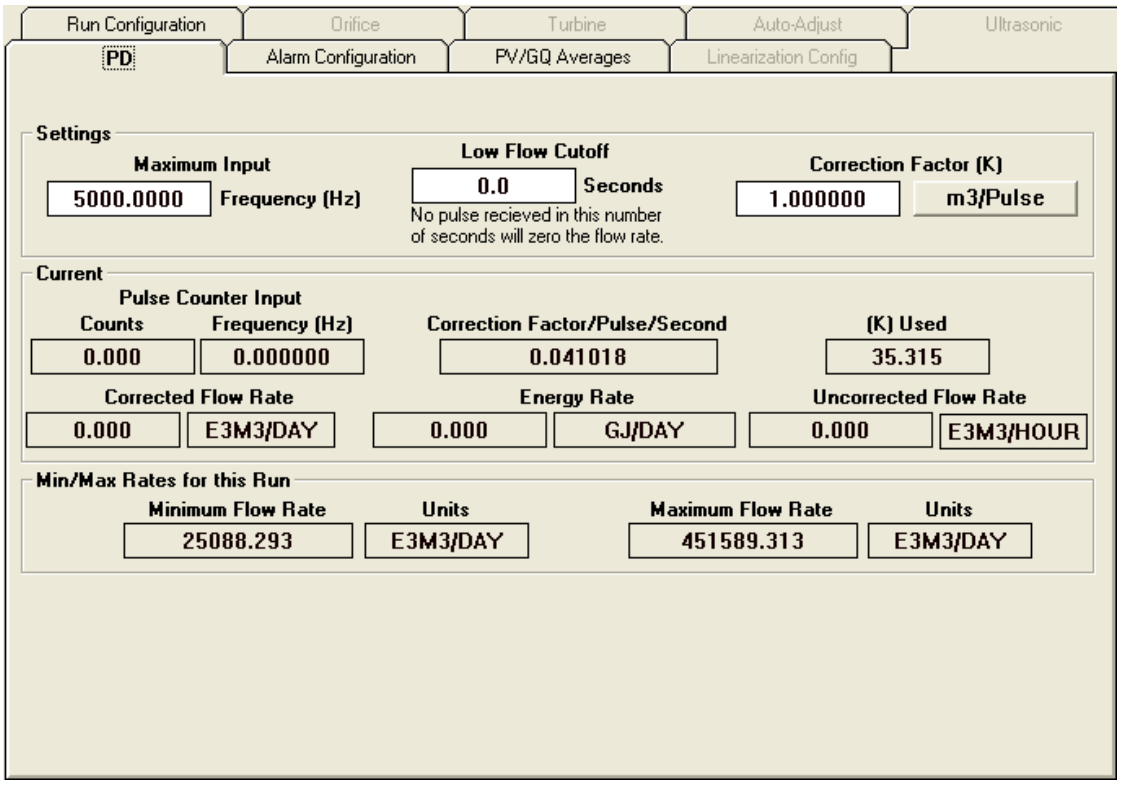


Figure 3-16. PD tab

Field	Description
Settings	
Maximum Input	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
Low Flow Cutoff	A positive displacement meter typically has very low frequency counts. A valid frequency may be well below 1 Hz, that is, it can be several seconds between pulses. It is not unusual to see 30 seconds or more between pulses from a PD meter, during normal flowing conditions. Therefore, the low flow cutoff for a PD meter is the maximum amount of time allowed between two consecutive pulses before the flow rate is zeroed. However, all pulses received by the MRMS-IC controller from a PD meter are included in volume totalization for the meter run.
Correction Factor (K)	The correction factor represents either the volume (in Cubic Feet) per pulse, or the number of pulses per volume (in Cubic Feet). The K factor value is entered as shown in the box below, while the K factor units are selected by using the push button. This information is available from the PD meter data plate.

Current

Counts	This shows the number of pulses received at the high speed counter input.
Frequency (Hz)	This is the derived frequency. Because a positive displacement meter can have very low frequency pulses (< 1 Hz), this number can be a fraction less than 1.0.
Correction Factor / Pulse/ Second	This is the correction factor calculated by the AGA 7 equation. This correction factor multiplied by the frequency will provide the corrected flow rate.
(K) Used	The AGA 7 calculation requires the K factor to be input in units of Cubic Feet/Pulse. The (K) Used value always represents the K factor in the units of Cubic Feet/Pulse.
Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate	The current corrected flow, energy rate, and uncorrected flow rate are displayed on this screen. The units of flow and energy rates are set from the Run Configuration page.
Min / Max Rates for this Run	The minimum and maximum flow rates for a PD meter run are calculated as shown below: Minimum Flow Rate = max freq * (Min /100) * AGA7 Factor Maximum Flow Rate = max freq* (Max /100) * AGA7 Factor Where: Min defaults to 5 Max defaults to 90

3.3 View Local Archives

Note: To collect the Archives for storage on the PC hard drive, it is recommended that the Collect Local Logs function be used.

The MRMS-IC controller maintains Hourly Archives (Logs) for each meter run and each gas chromatograph stream. To view the Archive, select the Measurement tab, and click on the

button.

The following screen opens:

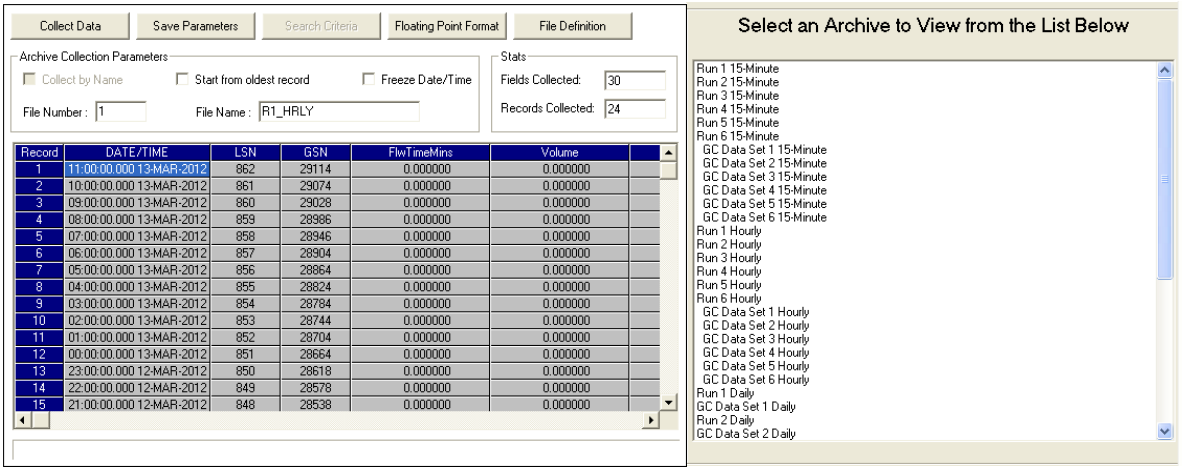


Figure 3-17. Selecting a Log to View

3.3.1 Selecting Logs to View

To view the desired archive:

1. Click on the description for the desired archive in the Select an Archive from the List Below box. This updates the File Number in the Archive Collection Parameters field.
2. Now click the **[Collect Data]** button. (See *Figure 3-17*.)

Record	ACC_ENERGY	AVG_STATIC_PRESS	AVG_TEMPERATURE	AVG_DIFF_PRESS	AVG
1	0.000000	0.000000	0.000000	0.000000	
2	0.000000	0.000000	0.000000	0.000000	
3	0.000000	0.000000	0.000000	0.000000	
4	0.000000	0.000000	0.000000	0.000000	
5	0.000000	0.000000	0.000000	0.000000	
6	0.000000	0.000000	0.000000	0.000000	
7	0.000000	0.000000	0.000000	0.000000	
8	0.000000	0.000000	0.000000	0.000000	
9	0.000000	0.000000	0.000000	0.000000	
10	0.000000	0.000000	0.000000	0.000000	
11	0.000000	0.000000	0.000000	0.000000	
12	0.000000	0.000000	0.000000	0.000000	
13	0.000000	0.000000	0.000000	0.000000	
14	0.000000	0.000000	0.000000	0.000000	
15	0.000000	0.000000	0.000000	0.000000	

Figure 3-18. Archive

3.4 Collect Local Logs

One or more Archives can be selected for collection. From the MRMS-IC Measurement tab, click the 

button to begin.

3.4.1 Selecting Archives for Collection

To select an Archive or for collection click on the desired description in the log collection control.

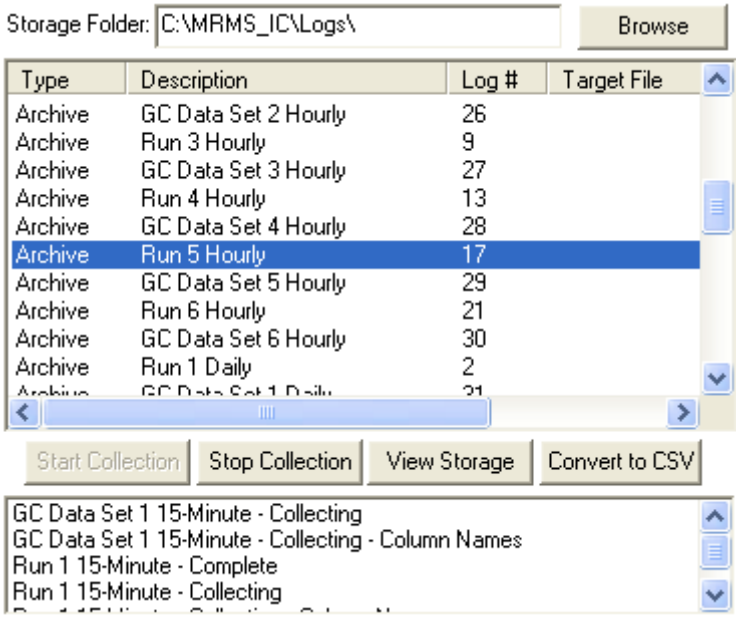


Figure 3-19. Selecting Logs for Collection

3.4.2 Collecting a Single Archive

To collect one of the Archives, listed for collection, highlight the desired item in the list, then click on the **[Start Collection]** button.

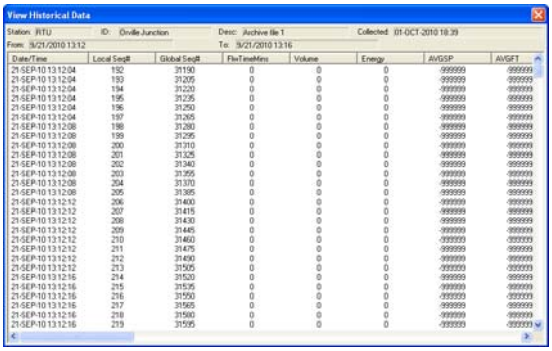
3.4.3 Collecting Multiple Archives

To collect more than one Archive hold down the **[Ctrl]** key to highlight multiple items, and then click on the "Start Collection" button.

3.4.4 Log Collection Parameters

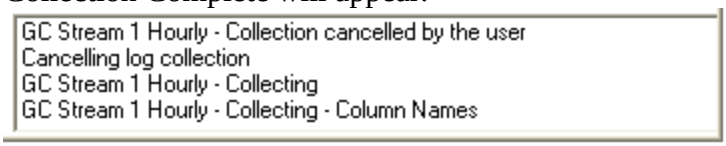
There are several different log collection parameters and read-only fields which govern or report how the log collections operate.

Field	Description
Site Name	The Site Name is defined by the user on the Site Configuration screen, via the Status/Configuration menu item. The Site Name is used as the base name for the files created by the collection and conversion processes.
Storage Folder	By default, the storage folder for the Archive collections is C:\Mrms_ic\Logs. This may be changed by clicking on the **Browse** button, and locating a different folder. However, this change is not permanent, and the next time the "Collect Local Logs" screen is opened, the Storage Folder will revert to C:\Mrms_ic\Logs.
Type	The type of log, either Audit or Archive.
Description	A description of the log.
Log #	The log number is populated automatically, when the Archive or Audit is selected from the "Hourly Logs" table
Target File	The Target File name will be automatically created. The file base name will be the Site Name (in this case "Unamed Site") and the extension will be one of the following: R*nn* Where R indicates an Archive for a measurement run, and *nn* indicates the run number. *Gnn* Where G indicates an Archive for a gas chromatograph stream, and *nn* indicates the stream number AUD Represents the Audit Trail collection. If a file of the same name exists in the Storage Folder, any new Archive data collected since the last Archive data was collected will be appended to the file. The Archive Data will not include duplicate data. However, whenever the Audit Trail is collected, the entire audit trail is collected. If there is an existing Audit Trail file on the PC hard drive, the data from this collection is appended to the existing file. There may be duplicate data in the .AUD file.

Start Collection	Click here to start the log collection.
Stop Collection	While an Archive or the Audit Trail is being collected, the user may stop the collection by clicking on the **Stop Collection** button.
View Storage	It is possible to view the stored data locally. Select the item that includes local data, and then click on “View Storage” button. **Note:** Only one item may be selected for the View Storage feature to be available. A screen similar to this one will appear: 
Convert to CSV	It is possible to convert the stored data to a comma separated variable (CSV) file. Select the item that includes local data, and then click on “Convert to CSV” button. **Note**: Only one item may be selected for the Convert to CSV feature to be available. A message will appear in the message window indicating that the conversion is complete. A file with an extension of CSV will now be located in the same folder as the stored data. The file name will be of the format *sitename_originalextension*.CSV Where: *sitename* is the Site Name. *originalextension* is the original extension (Rnn, Gnn, or AUD)

Collection Status Messages

While collections are in progress, status messages will be posted in the message window. When the collection is complete, the message “Log Collection Complete will appear.



3.5 View Audit Log

Note: To collect the Audit Trail for storage on the PC hard drive, it is recommended that the Collect Local Logs function be used.

The MRMS-IC controller maintains an Audit Trail. The audit trail includes entries any time a configuration change is made that could affect measurement.

To view the Audit Trail:

1. Select the "Measurement" tab, and click the View Audit Log button.
2. The following screen will appear. Click on the **[Collect Data]** button.
3. This will collect the first set of records (typically 24 records). To view additional records, scroll down using the vertical scroll bars

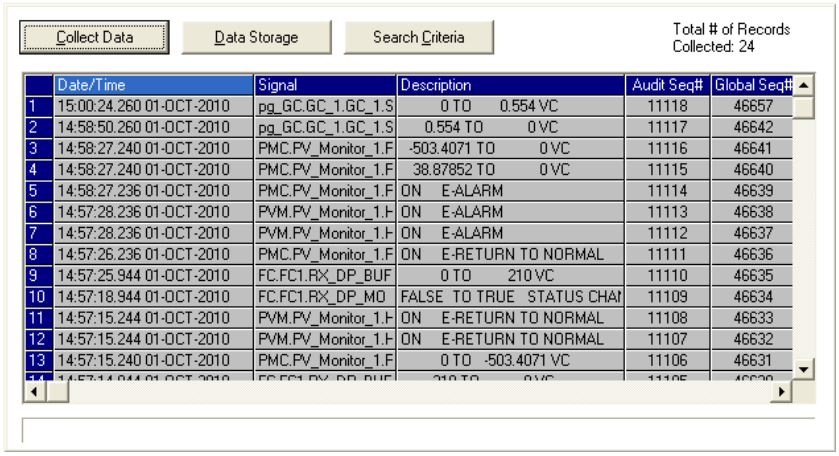


Figure 3-20. Audit Log

The buttons associated with audit collection are.

Field	Description
Collect Data	To view the current entries in the Audit Trail, click on the Collect Data button.
Data Storage	To store the collected data, click on the Data Storage button. **Note:** It is recommended that the "Collect Local Logs" function be used to collect and store Audit Trail data to the PC hard drive, rather than this function, since more features are available for collecting, storing, and viewing the data.
Search Criteria	Click this button to specify search criteria.

3.5.1 Data Storage Parameters dialog box

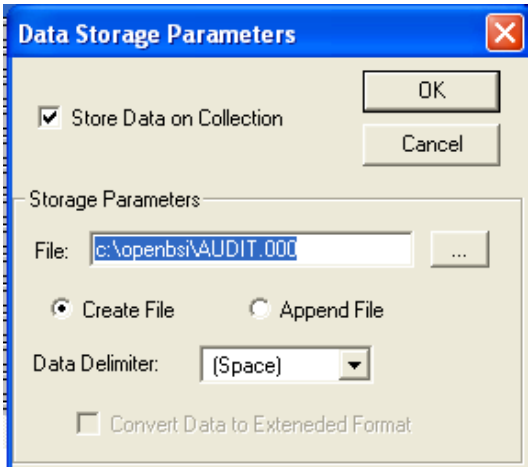


Figure 3-21. Data Storage Parameters dialog box

Field	Description
Store Data on Collection	When this box is checked, the data will be stored automatically on collection. This means as additional data is collected by scrolling down using the vertical scroll bar, this data is automatically written to the PC hard drive.
Storage Parameters	
File	Define the storage location and file name for the collected data.
Create File	If Create File is selected, a new file will be created every time data is collected. If the name of the file is one previously created, all previous data will be lost.
Append File	If Append File is selected, newly collected data will be added to previously collected data, in the file of the same name.
Data Delimiter	The following data delimiters may be selected – Space, Comma, or Semicolon. This will be the delimiter used to separate the data fields (Date/Time, Signal, Description, Audit Seq#, Global Seq#).
Convert Data to Extended Format	Not applicable

3.5.2 Search Data Collection Criteria dialog box

The following search criteria may be applied:

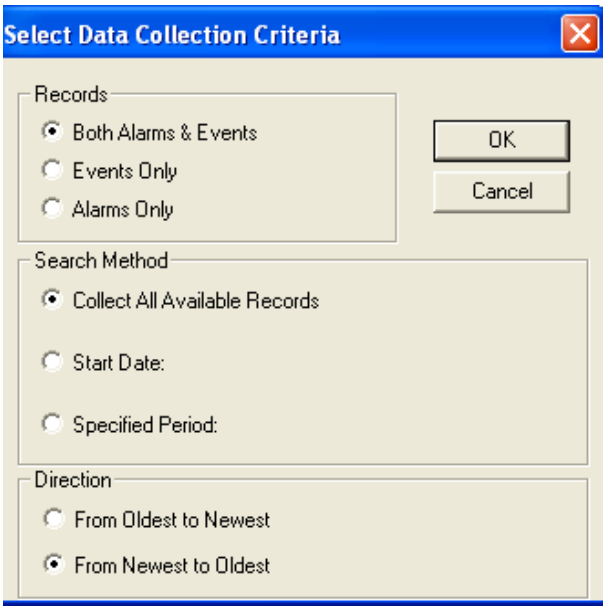


Figure 3-22. Select Data Collection Criteria dialog box

Field	Description
Records	The user may elect to collect to view Alarms and Events, Events Only, or Alarms Only
Search Method	The user may elect to **Collect All Available Records**, or may specify the time period. **Start Date** Enter the start date here. All records that occurred on or after that date will be collected. **Period** The user may specify a period from which to collect the data. The available selections are Today, This Week, or This Month.
Direction	The data may be collected and viewed from the Oldest entry to the Newest entry or from the Newest entry to the Oldest entry.

3.6 Maintenance Mode

It is possible to put the Site, Stations, Runs, or individual analog inputs into maintenance mode.

To enter Maintenance Mode, select the "Measurement" tab, and click on the Maintenance Mode button.

The following screen opens:

3.6.1 Site Tab

Figure 3-23 Maintenance Mode - Site tab

The entire site may be placed in Maintenance Mode. When this occurs, all runs at the site are placed in Maintenance Mode.

The following items are available on the Site Maintenance Mode screen.

Field	Description
Site	This section of the screen controls the maintenance mode for the site.
Maint Off / Maintenance	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
Auto Rst Off	If Auto Reset is enabled, maintenance mode for the site will be disabled automatically after the period set under the Maintenance Mode Auto Reset Timer If Auto Reset is disabled, maintenance mode for the site will never be disabled automatically **Note**: if Auto Reset is set at the Station level or Run Level, it

takes precedence over the setting at the site level. To disable Auto Reset, make certain that it is disabled at the site, station, and run level.

Maintenance Mode Time

The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S

Where:

DD	number of days
HH	number of hours
MM	number of minutes
SS.S	number of seconds (resolution of 10ths)

The maximum time allowed for the maintenance mode auto reset timer is

24 20:31:23.9 – (24 Days, 20 hours, 31 minutes, 23.9 seconds)

Elapsed Time

This is the amount of time the site has been in maintenance mode.

Remaining Time

When Auto Reset is enabled, this is the time remaining until the maintenance mode is automatically reset.

When Auto Reset is disabled, this field remains at 00 00:00:00.0.

Summary

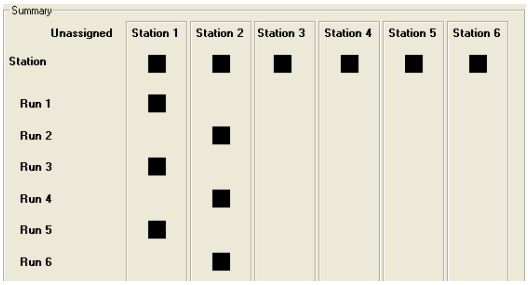
In this section of the display, the maintenance mode status will be indicated.

Any runs not assigned to stations are shown in the “Unassigned” column.

Runs assigned to stations are displayed in the appropriate Station n columns.

In this example, the runs are assigned as follows:

Run 1 to Station 1
Run 2 to Station 2
Run 3 to Station 1
Run 4 to Station 2
Run 5 to Station 1
Run 6 to Station 2



Runs or Stations in Maintenance mode will be indicated with a magenta outline around the black box.

When not in Maintenance mode, the box will be black, with no border

3.6.2 Station Tab

Individual stations may be put into Maintenance Mode. When this occurs, all runs assigned to the station are placed in Maintenance Mode.

The following items are available on the Station Maintenance Mode screen.

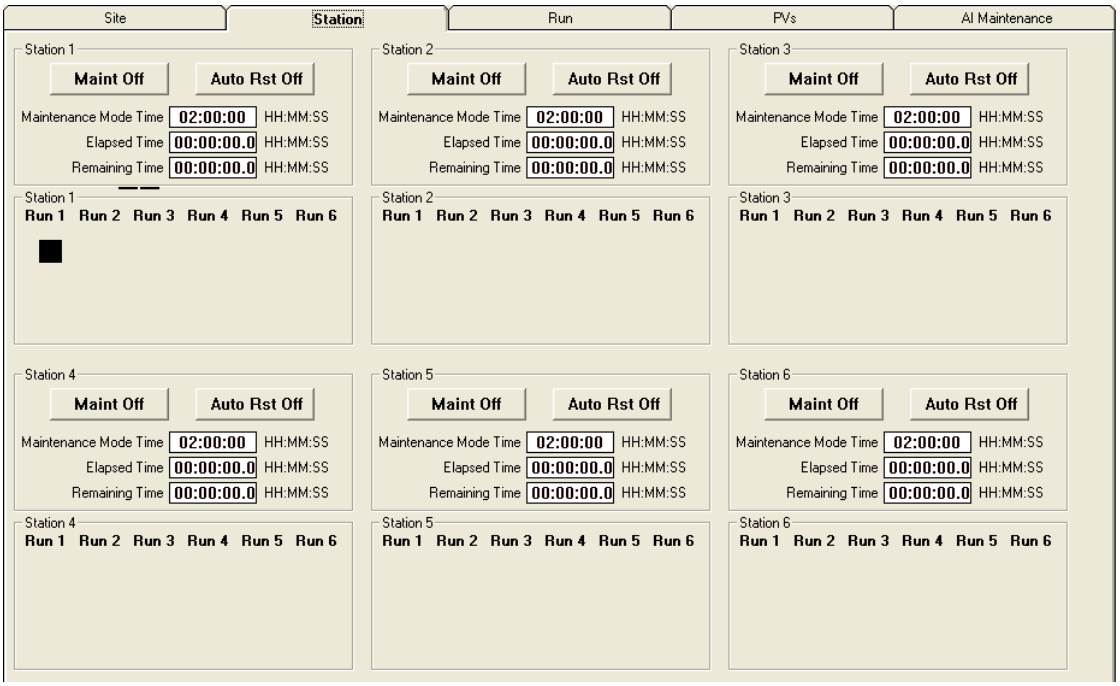


Figure 3-24. Maintenance Mode - Station tab

Field	Description
Station *n*	This section of the screen controls the maintenance mode for the selected station.
Maint Off / Maintenance	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
Auto Rst Off	I If Auto Reset is enabled, maintenance mode for the station will be disabled automatically after the period set under the Maintenance Mode Auto Reset Timer If Auto Reset is disabled, maintenance mode for the station will never be disabled automatically. **Note:** If Auto Reset is set at the Station level, it takes precedence over the setting at the site and run level. To disable Auto Reset, make certain that it is disabled at the site, station, and run level.

Maintenance Mode Time

The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S

Where:

DD	number of days
HH	number of hours
MM	number of minutes
SS.S	number of seconds (resolution of 10ths)

The maximum time allowed for the maintenance mode auto reset timer is

24 20:31:23.9 – (24 Days, 20 hours, 31 minutes, 23.9 seconds)

Elapsed Time

This is the amount of time the station has been in maintenance mode.

Remaining Time

When Auto Reset is enabled, this is the time remaining until the maintenance mode is automatically reset.

When Auto Reset is disabled, this field remains at 00 00:00:00.0.

Summary

For each station, the runs assigned to that station are displayed.

Runs in Maintenance mode will be indicated with a magenta outline around the black box.

When not in Maintenance mode, the box will be black, with no border

3.6.3 Run Tab

Individual runs may be put into Maintenance Mode.

The following items are available on the Run Maintenance Mode screen.

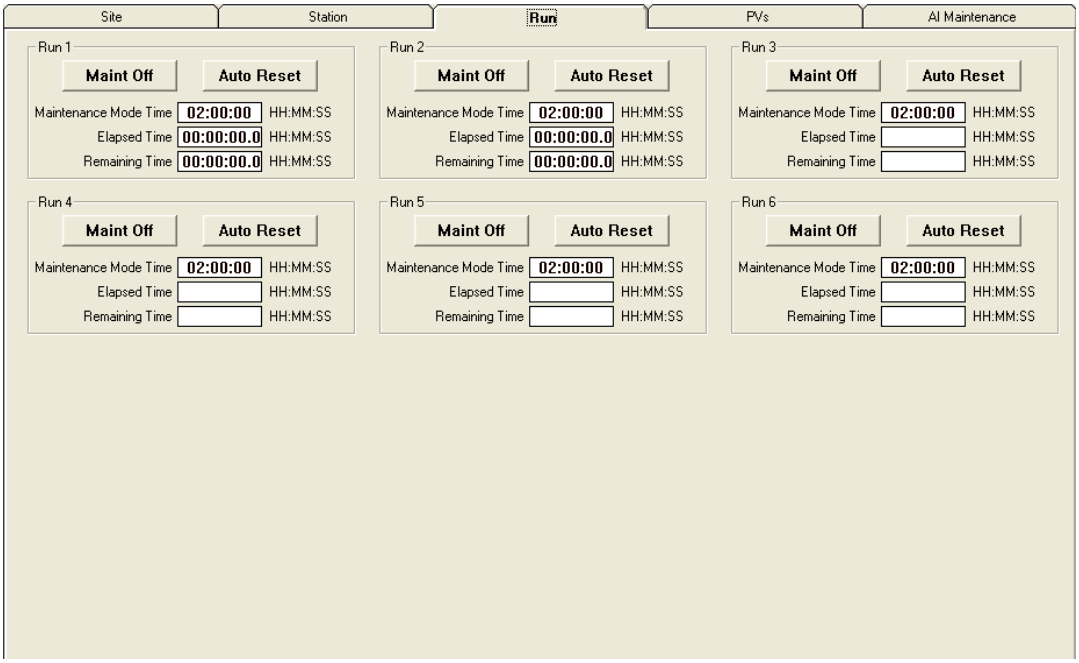


Figure 3-25. Maintenance Mode - Run tab

Field	Description
Run *n*	This section of the screen controls the maintenance mode for the selected run.
Maint Off / Maintenance	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
Auto Rst Off	If Auto Reset is enabled, maintenance mode for the run will be disabled automatically after the period set under the Maintenance Mode Auto Reset Timer If Auto Reset is disabled, maintenance mode for the site will never be disabled automatically. NOTE – if Auto Reset is set at the Run level, it takes precedence over the setting at the site or station level. To disable Auto Reset, make certain that it is disabled at the site, station, and run level.

Maintenance Mode Time	The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S Where: DD number of days HH number of hours MM number of minutes SS.S number of seconds (resolution of 10ths) The maximum time allowed for the maintenance mode auto reset timer is 24 20:31:23.9 – (24 Days, 20 hours, 31 minutes, 23.9 seconds)
Elapsed Time	This is the amount of time the run has been in maintenance mode.
Remaining Time	When Auto Reset is enabled, this is the time remaining until the maintenance mode is automatically reset. When Auto Reset is disabled, this field remains at 00 00:00:00.0.

3.6.4 PVs Tab

From this screen, you can view individual process variables for each run.

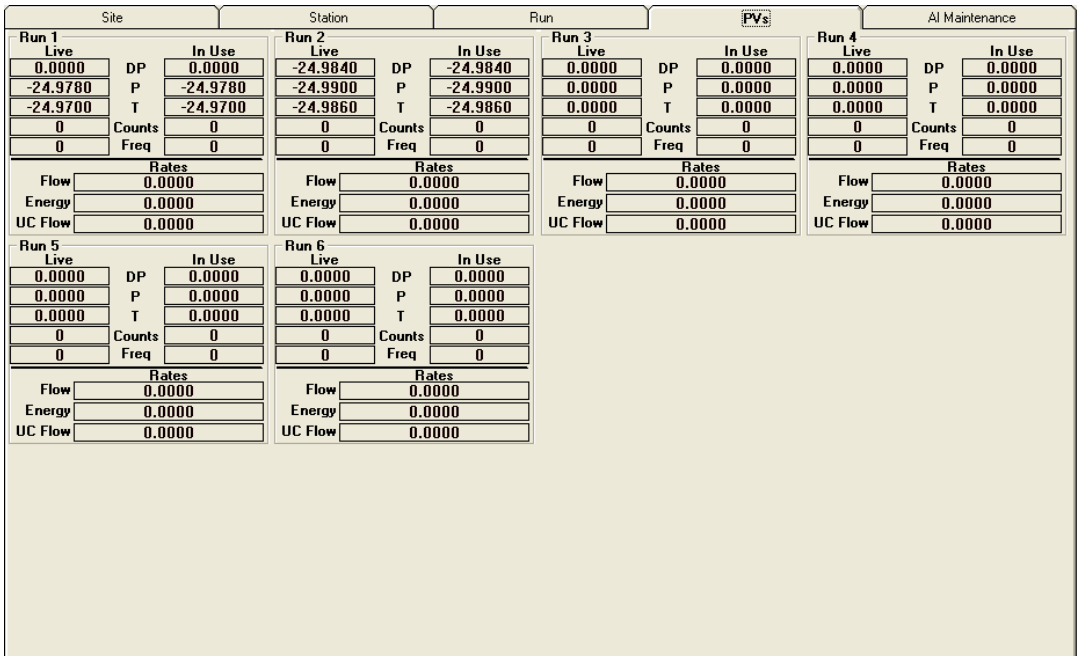


Figure 3-26. Maintenance Mode - PVs tab

The Live values always show the live value coming into the MRMS-IC controller (either through an analog input, or a multi-variable transmitter (MVT).

The In Use values are the values currently in use for measurement.

3.6.5 AI Maintenance Tab

It is possible to put any analog input into maintenance mode.

The following items are available on the AI Maintenance Mode screen.

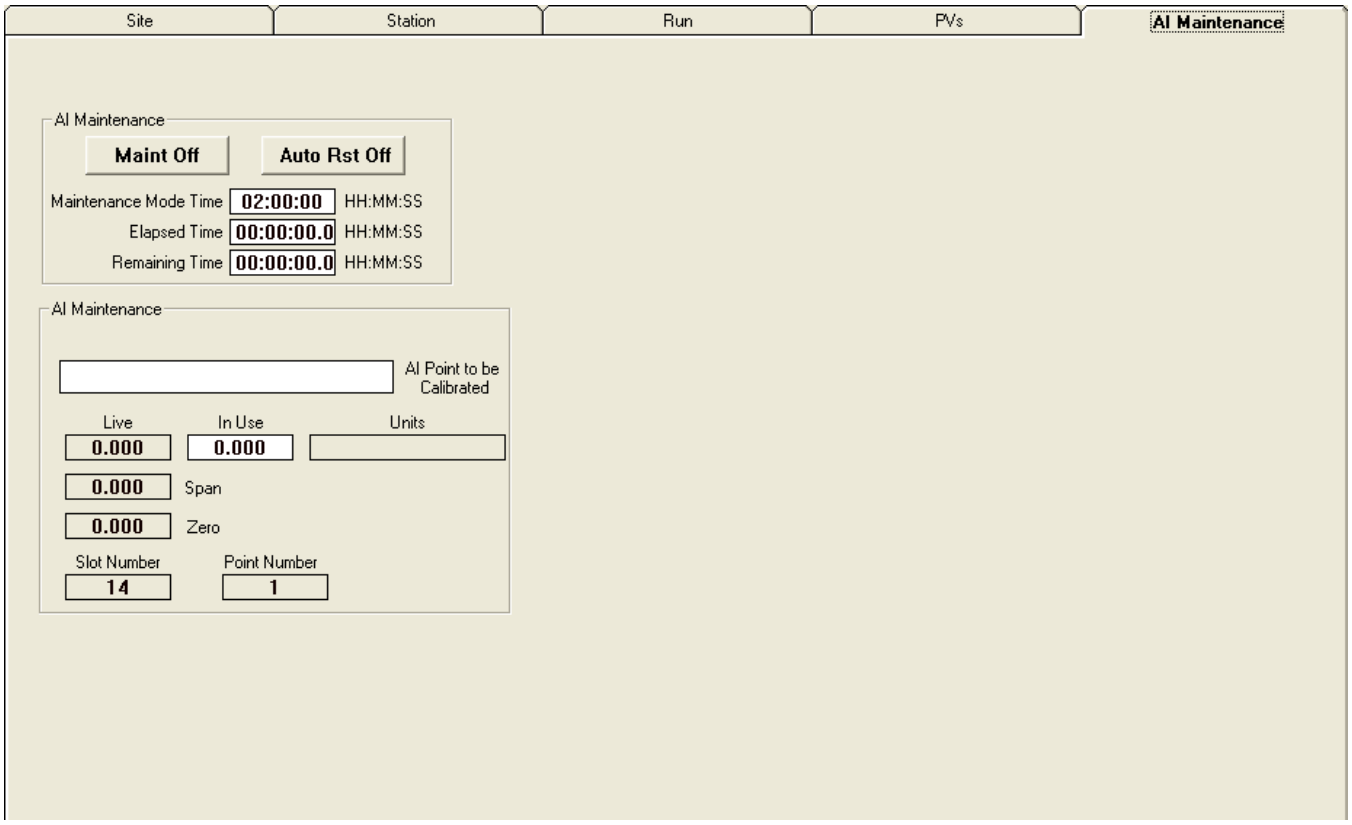


Figure 3-27. Maintenance Mode – AI Maintenance tab

Field	Description
AI Maintenance	This section of the screen controls the maintenance mode for the selected AI input.
Maint Off / Maintenance	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
Auto Rst Off	If Auto Reset is enabled, maintenance mode for the AI input will be disabled automatically after the period set under the Maintenance Mode Auto Reset Timer If Auto Reset is disabled, maintenance mode for the AI input will never be disabled automatically.
Maintenance Mode Time	The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S

Where:

DD	number of days
HH	number of hours
MM	number of minutes
SS.S	number of seconds (resolution of 10ths)

The maximum time allowed for the maintenance mode auto reset timer is

24 20:31:23.9 – (24 Days, 20 hours, 31 minutes, 23.9 seconds)

Elapsed Time	This is the amount of time the AI input has been in maintenance mode.
Remaining Time	When Auto Reset is enabled, this is the time remaining until the maintenance mode is automatically reset. When Auto Reset is disabled, this field remains at 00 00:00:00.0.
AI Point to be Calibrated	Select the AI point to be calibrated from the drop down menu.
Live	The live value, coming from the Analog Input.
In Use	The value in use. When maintenance mode is off, this will be the live value. When maintenance mode is on, this value may be overridden by the user.
Units	This will be the units of the variable, assigned from the I/O configuration page.
Span	This will be span of the variable, assigned from the I/O configuration page
Zero	This will be the zero of the variable, assigned from the I/O configuration page.
Slot Number	This is the I/O Slot Number that this point is assigned to.
Point Number	This is the I/O point on the I/O slot that this variable is assigned to.

3.7 Gas Chromatograph Configuration

When you click the Gas Chromatograph Configuration button on the Measurement tab, MRMS-IC opens up the Gas Chromatograph Configuration pages.

The Gas Chromatograph Configuration page includes a general configuration area at the top, and then multiple tabs with additional information.

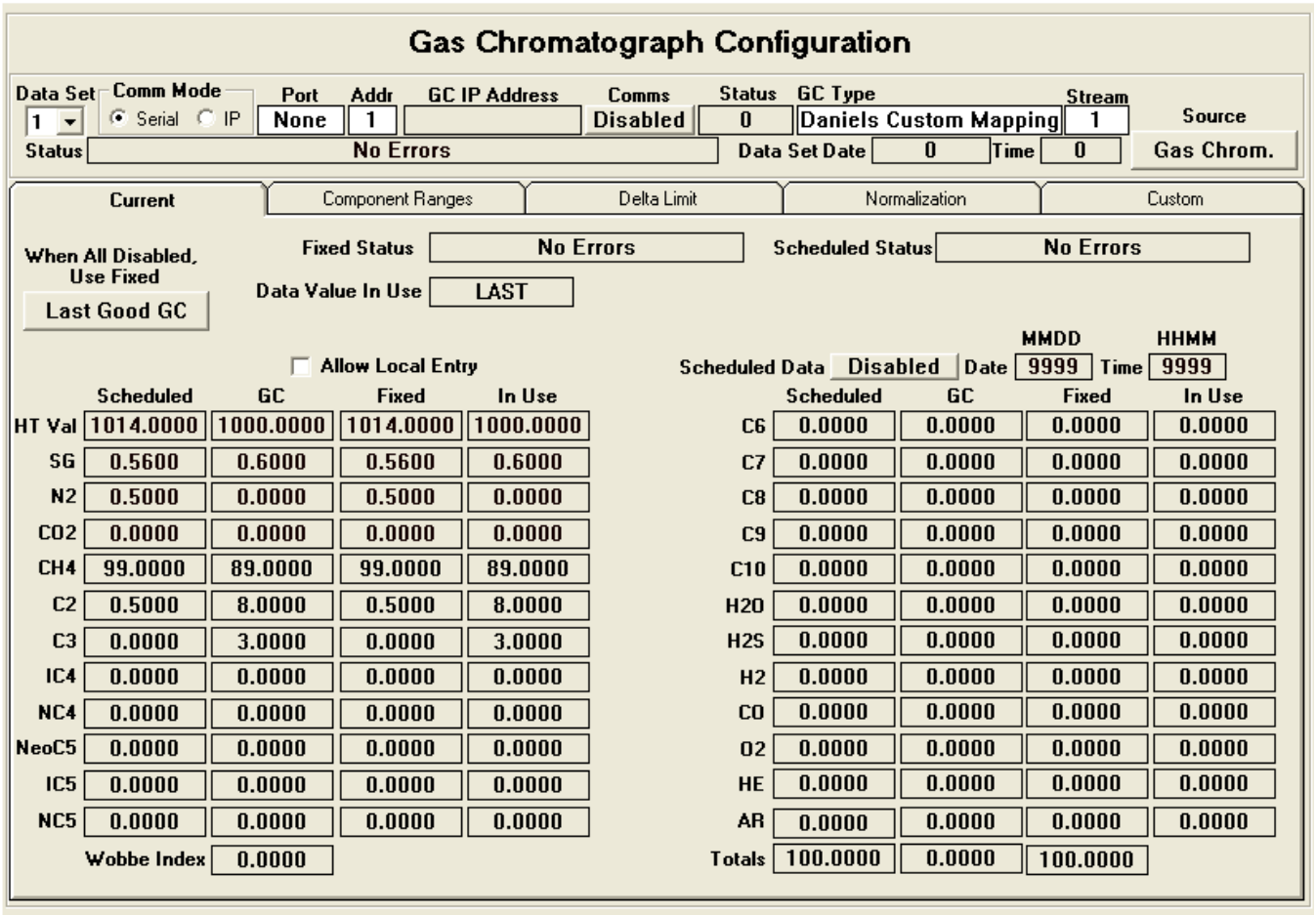


Figure 3-28. Gas Chromatograph Configuration

3.7.1 General

Field	Description
Data Set	The MRMS-IC can poll from 1 to 6 gas chromatographs. The polling can be done for a single stream or multiple streams of data from each chromatograph. Each polled stream is considered a data set. For each data set, the communications mode, chromatograph address, data mapping, and stream must be configured. The data set to be configured is selected from the drop down list.

Comm Mode	Communications to the gas chromatograph may be via either a Serial (RS-232 or RS-485) or an IP (Ethernet) connection. For serial communications to the gas chromatograph, the serial port must be configured for the proper protocol, baud rate, etc. via the Flash Configuration Profile communication port settings.
Port	If the serial communication mode is selected, the serial port on the MRMS-IC controller that will be connected to the gas chromatograph will be specified here. The serial port must be configured for the proper protocol, baud rate, etc. via the Flash Configuration Profile communication port settings.
Addr	The local address of the gas chromatograph will be specified here. Every gas chromatograph will have a local address (from 1 to 255).
GC IP Address	If the IP communications mode is selected, the IP address of the gas chromatograph will be specified here. It is necessary to configure the IP address and routing for the MRMS-IC controller so that the IP address of the gas chromatograph is reachable.
Comms	This button will be used to enable or disable communications to the gas chromatograph. If communications are disabled, and valid data has never been retrieved from the gas chromatograph for this data set, the default (Fixed) chromatograph values will be seen in the GC column of the Current GC Data section on this page. If communications are disabled, and valid data has been retrieved from the gas chromatograph for this data set, the last valid data will be seen in the GC column of the Current GC Data section on this page.
Status	A status code indicating the health of the communications between the MRMS-IC controller and the chromatograph will be displayed here. If any code other than 0 is displayed here, see *Appendix E – Troubleshooting*.

GC Type

The MRMS-IC load is configured to communicate to gas chromatographs that emulate the Daniel 2251 MODBUS communications scheme.

GC Type	Explanation
Daniel Default Mapping	The Daniel 2251 has a default data map, where the gas components are located in a set of specific registers.
Daniel Custom Mapping	The Daniel 2251 and other compatible GCs also allow for a custom data map, where the gas components can be assigned to a user defined set of registers. When the gas chromatograph is configured in this way, the MRMS-IC controller determines the custom register map automatically. However, a Daniel C9+ chromatograph register assignments cannot be auto-detected.
User Defined	In the case where the gas chromatograph does not support either the Daniel Default Mapping or the Daniel Custom Mapping, a user defined data map can be configured. If this option is selected, it is then necessary to make the register assignments on the Custom tab. (See *Section 3.7.6* for details on configuring a custom map.)
European Encal 2000	This configuration is rarely used in North America. Most Encal chromatographs deployed in North America support the Daniel 2251 emulation. This communication scheme is necessary for the European version of the Encal 2000 chromatograph because not all of the registers required by the Daniel emulation are supported.
El Paso Mapping	This is a Daniel GC with El Paso data mapping.

Stream

Many chromatographs can support multiple gas streams. The gas stream to be collected is specified here.

Source

Choose between gas chromatograph (GC) or analog input (AI) for the source.

Status

There are a number of failure conditions that can be reported. These failure conditions are either reported by the gas chromatograph, or may be derived by the MRMS-IC controller.

The messages are:

No Errors – No errors are reported or detected

Checksum Fail – A checksum failure has been reported by the gas chromatograph (GC)

Analyzer Fail (GC) – The GC reports an analyzer failure

PreAmp Fail (GC) – The GC reports a PreAmp failure

Component Out of Range – The MRMS-IC controller has detected a component out of range. One of the components exceeds the out-of-range limits defined on the Component Ranges screen

HtVal Checksum Fail – Heating value checksum failure. The MRMS-IC controller calculates the expected heating value, based on the mole percent of each gas component. It compares the reported heating value with the calculated heating value, and if the values are not within x %, a HtVal Checksum Fail is reported.

SG Checksum Fail – Specific Gravity checksum failure. The MRMS-IC controller calculates the expected specific gravity, based on the mole percent of each gas component. It compares the reported specific gravity with the calculated specific value, and if the values are not within x %, an SG Checksum Fail is reported.

Total Out of Range – The mole percent of each component is added. If the value is not 100% +/- some limit, the Total Out-of-Range failure is reported.

General Fail – General failure from the GC. This comes from a Modbus register.

General Fail DI – General failure from the GC. This comes from a discrete input (DI).

Stale Time Fail – If the data from the gas chromatograph has not updated within a specified limit, a Stale Time Failure will be reported.

Comm Fail – This indicates a communication failure between the MRMS-IC controller and the GC. See the “Comm Status Code” section for more details.

	Delta Fail – This indicates that the change in one or more of the values reported back by the GC have had a change from one poll to the next that is larger than the limit allowed. Fixed Data Fail – This message indicates an error in the Fixed Data configured for this data set. The details of this error will be found in the Fixed Properties Status message. Timed Data Fail – This message indicates an error in the Scheduled Data configured for this data set. The details of this error will be found in the Scheduled Data Status message.
Date	When the gas quality data is being collected from a gas chromatograph, the date of the most recent update will be reported here. The date format is MMDDYYYY.
Time	When the gas quality data is being collected from a gas chromatograph, the time of the most recent update will be reported here. The time format is hhmmss.

3.7.2 Current Tab (Gas Chromatograph Configuration)

The Current gas chromatograph data is reported on this sub tab.

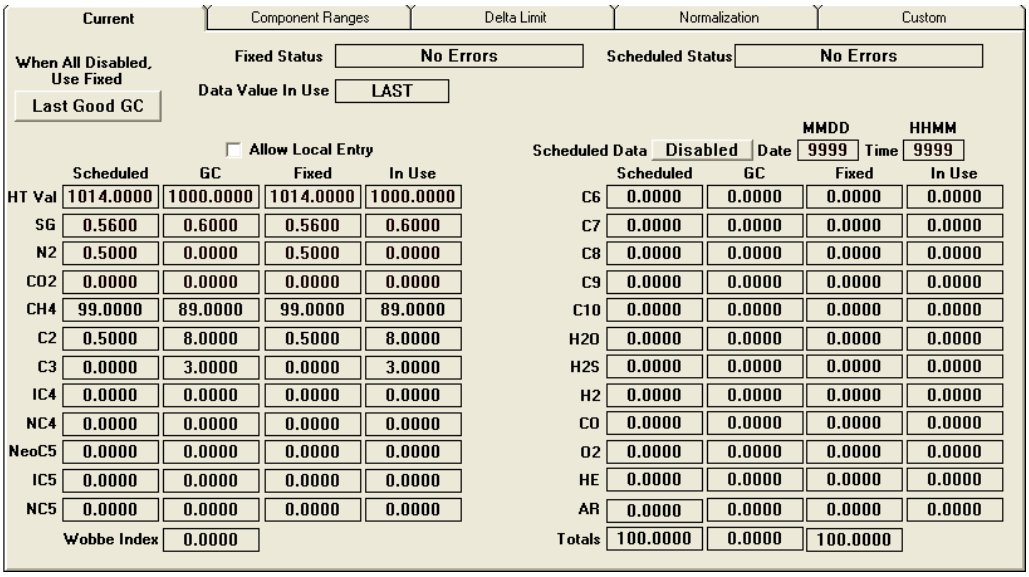


Figure 3-29. Gas Chromatograph Configuration – Current sub-tab

Field	Description
When All Disabled, Use Fixed	Enable or Disable the use of fixed data by toggling this button. When Disabled, fixed properties will not be used if communications to the gas chromatograph are disabled, or if there is a failure detected. Instead, the last good values will be used. When Enabled, the fixed properties will be used if communications to the gas chromatograph are disabled, or if there is a failure detected.
Data Value in Use	Shows “LAST” when the last good GC value is used, or “FIXED” when a fixed value is used.
Fixed Status	The fixed data status message will be reported here. If the fixed data entries are valid, No Errors will be reported. If there is a problem with the fixed data entries, a “Fixed Data Fail” message will be reported as a “GC Failure Message”, and the specific error will be reported here. The errors are: No Errors Value Out of Range – The MRMS-IC controller has detected a component out of range. One of the components exceeds the out-of-range limits defined on the Component Ranges screen HtVal Check Fail – Heating value checksum failure.

The MRMS-IC controller calculates the expected heating value, based on the mole percent of each gas component. It compares the entered heating value with the calculated heating value, and if the values are not within x %, a HtVal Checksum Fail is reported.

SG Check Fail – Specific Gravity checksum failure. The MRMS-IC controller calculates the expected specific gravity, based on the mole percent of each gas component. It compares the entered specific gravity with the calculated specific value, and if the values are not within x %, an SG Checksum Fail is reported.

Value Sum Fail – The mole percent of each component is added. If the value is not 100% +/- some programmable limit, the Value Sum failure is reported.

Scheduled Status

The scheduled data status message will be reported here.

If the scheduled data entries are valid, No Errors will be reported. If there is a problem with the scheduled data entries, a “Timed Data Fail” message will be reported as a “GC Failure Message”, and the specific error will be reported here. The errors are:

No Errors

Value Out of Range – The MRMS-IC controller has detected a component out of range. One of the components exceeds the out-of-range limits defined on the Component Ranges screen

HtVal Check Fail – Heating value checksum failure. The MRMS-IC controller calculates the expected heating value, based on the mole percent of each gas component. It compares the entered heating value with the calculated heating value, and if the values are not within x %, a HtVal Checksum Fail is reported.

SG Check Fail – Specific Gravity checksum failure. The MRMS-IC controller calculates the expected specific gravity, based on the mole percent of each gas component. It compares the entered specific gravity with the calculated specific value, and if the values are not within x %, an SG Checksum Fail is reported.

Value Sum Fail – The mole percent of each component is added. If the value is not 100% +/- some programmable limit, the Value Sum failure is reported.

Allow Local Entry	When the “Allow Local Entry” check box is marked, it is possible to enter the Scheduled and Fixed data locally. When is it not marked, this data may only be downloaded via the SCADA Host, using either the Enron MODBUS or BSAP protocols.
Scheduled Data Disabled / Enabled	It is possible to load gas component data to the MRMS-IC controller, and then schedule when this data will become the in-use data. Scheduled data is written to the fixed data at the scheduled time. To enable this feature, toggle the Scheduled Data Disabled/Enabled button.
Date, Time	The scheduled data and the Date and Time for the scheduled data to be used may be downloaded via the SCADA Host, using either the Enron MODBUS or BSAP protocols. The data may also be entered locally, if the “Allow Local Entry” check box is marked.
Scheduled	The Scheduled Data appears when you click this box. When the “Allow Local Entry” box is marked, this data may be entered locally. Otherwise, the data may only be downloaded via the SCADA Host. By default, these values are 0.0. This data will be moved to the In Use data column at the date and time specified in the Scheduled Data Date and Time fields. Format for Date is MMDD, format for Time is hhmm.
GC	The data retrieved from the gas chromatograph appears as shown. When there are no errors from the chromatograph, this data will reflect the most recent data polled from the gas chromatograph. If there are errors from the chromatograph, this data will represent the last good data retrieved from the gas chromatograph. The default values are shown above. If no valid communications are ever established with a gas chromatograph, these values will be used.
Component name	The name of the component appears in red if the gas component is out-of-range.
Fixed	The Fixed Data appears as shown. When the “Allow Local Entry” box is marked, this data may be entered locally. Otherwise, the data may only be downloaded via the SCADA Host. The default values are shown.

	If the Use Fixed Properties state is set to Enabled, this data will be moved to the In Use data column if communications to the gas chromatograph are disabled, or there is a failure indicated with the gas chromatograph. However, if there is an error with the fixed data, this data will not be moved to the In Use data column; instead, the last good values from the gas chromatograph will be used.
In Use	The In Use data appears as shown. The In Use data is the data that will be used for measurement. The In Use data is the validated data from the source specified (GC, Fixed, or Scheduled). If data from the specified source is not valid, the last good data is used.

3.7.3 Component Tab (Gas Chromatograph Configuration)

The minimum and maximum ranges for each of the gas components may be set here.

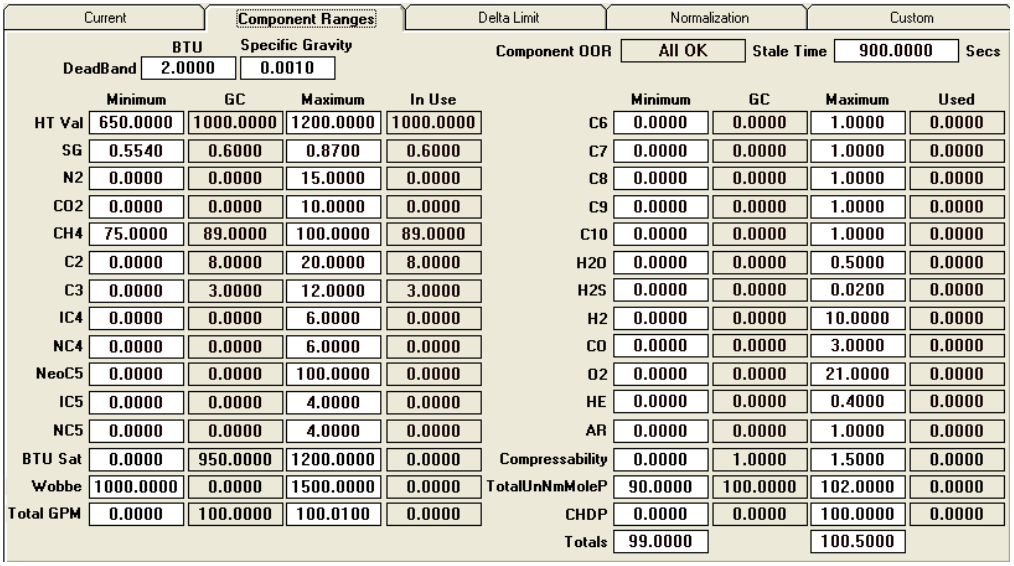


Figure 3-30. Gas Chromatograph Configuration – Component sub-tab

Field	Description
Deadband BTU	The Deadband to use between GC BTU and MRMS-IC calculated BTU from GC components. This is an absolute value.
Deadband Specific Gravity	The Deadband to use between GC specific gravity and MRMS-IC calculated specific gravity from GC components. This is an absolute value.
Component OOR	Shows “All OK” if all components are within the specified range. Otherwise shows the most recently detected out of range component.
Stale Time	The stale data time limit (in seconds) is entered here. If data from the gas chromatograph has not been updated within this time limit, the data will be declared stale.
Component name	The name of the component appears in red if the gas component is out-of-range.
Minimum, Maximum	The minimum and maximum values for this gas component
GC	**GC** When there are no errors from the chromatograph, this data will reflect the most recent data polled from

	the gas chromatograph. If there are errors from the chromatograph, this data will represent the last good data retrieved from the gas chromatograph. If no valid communications are ever established with a gas chromatograph, the default values will be used.
In Use	The In Use data appears as shown. The In Use data is the data that will be used for measurement. The In Use data is the validated data from the source specified (GC, Fixed, or Scheduled). If data from the specified source is not valid, the last good data is used.

3.7.4 Delta Limit Tab (Gas Chromatograph Configuration)

The maximum change allowed (+/-) per component is entered here.

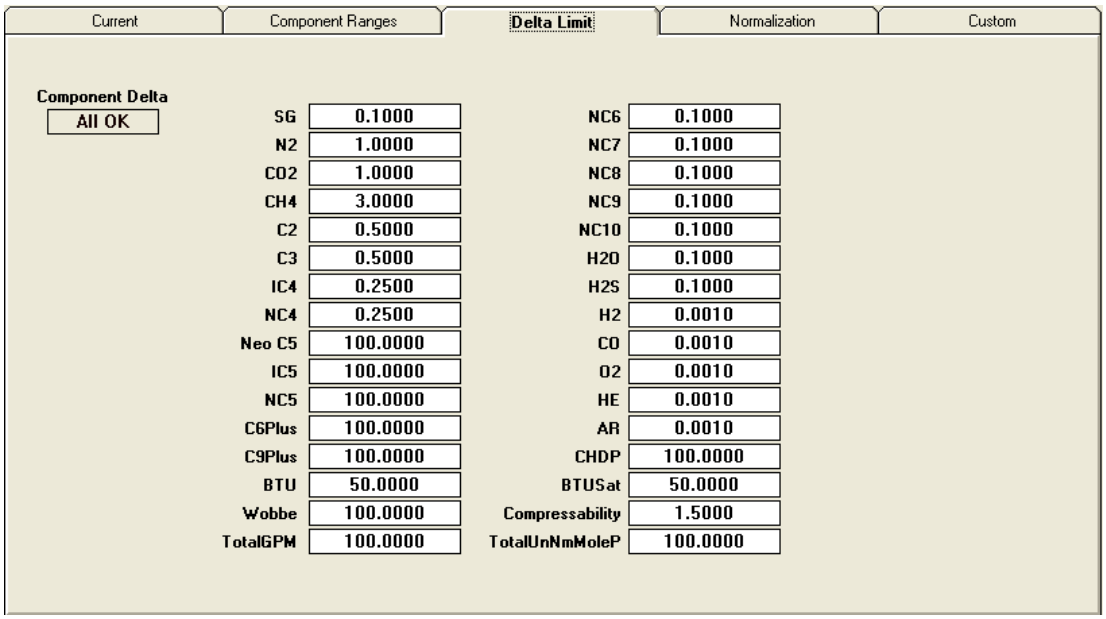


Figure 3-31. Gas Chromatograph Configuration – Delta Limit sub-tab

Field	Description
Delta Limit	If a gas component has changed beyond the delta limit entered here, MRMS-IC highlights its name in red.
Component Delta	Shows “All OK” if no gas components have changed beyond the delta limit. Otherwise, it shows the most recently detected component that has changed beyond the delta limit.

3.7.5 Normalization Tab (Gas Chromatograph Configuration)

For chromatographs that support C6+ or C6+/C9+, normalization of that data is done here.

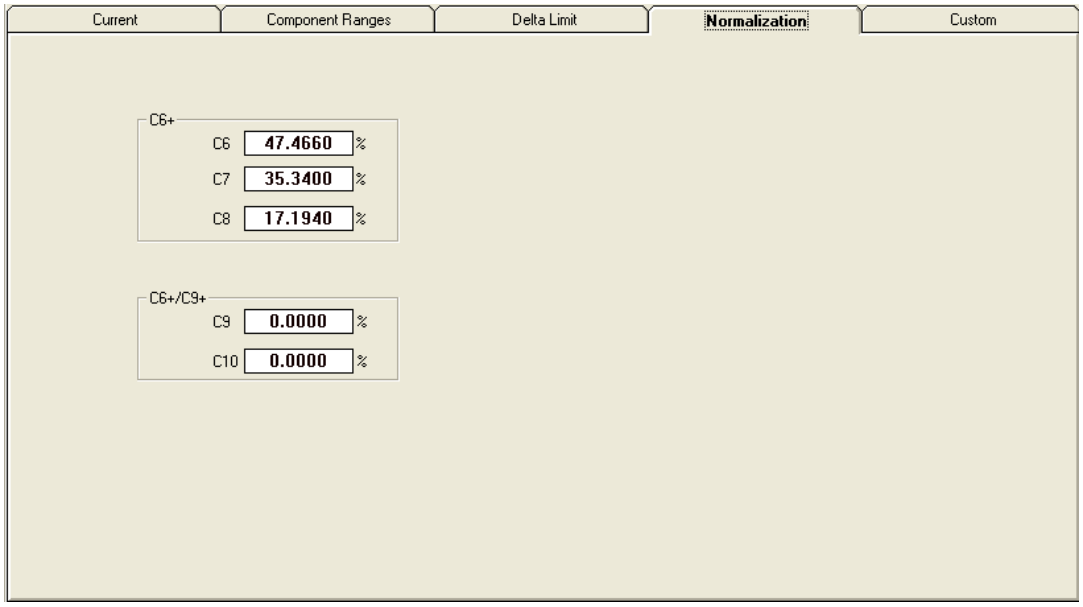


Figure 3-32. Gas Chromatograph Configuration – Normalization sub-tab

The gas chromatograph will report a single value for either C6+ or C6+ and C9+. The percentage applied to each component (C6, C7, C8, C9 and C10) will be how the number reported by the gas chromatograph will be distributed across the components.

3.7.6 Custom Tab (Gas Chromatograph Configuration)

You configure the user defined Custom Data Map here. This map is used when you choose"User Defined" as the **GC Type** on the **Current** tab. (See *Section 3.7.1* for information on setting the GC Type.)

Daniel User Defined

When this is the **GC Type**, click on any gas component and use the drop-down menu to select which Modbus register (7001 to 7016) holds that value. (See *Figure 3-33* below.) Otherwise, leave the component "Unassigned." Press the **Enter** key after you make each selection.

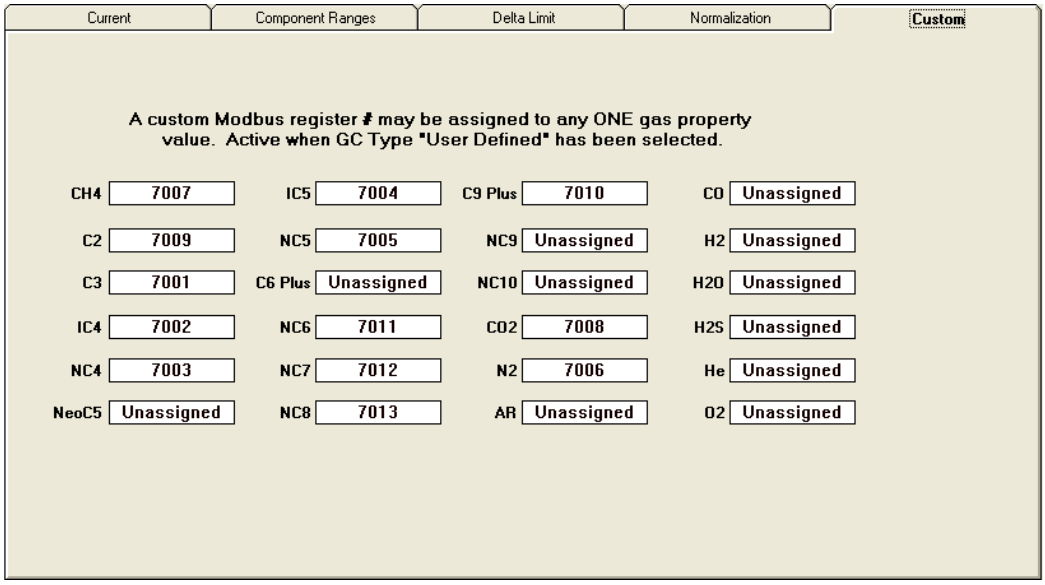


Figure 3-33. Gas Chromatograph Configuration – Custom sub-tab – Daniel User Defined

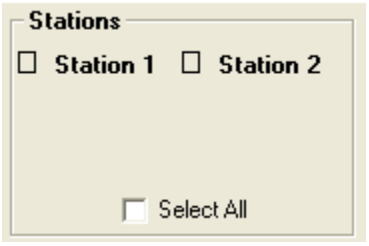
User Defined (List)

When this is the **GC Type**, click on any gas component and enter the list element number (1 to *n* where *n* is the highest numbered list element) which holds that value. Otherwise, leave the component as **0** which is equivalent to "Unassigned." Press the **Enter** key after you make each entry.

3.8 Summary Pages

When you click the Summary Page button on the Measurement tab, MRMS-IC opens up a series of summary pages, which you can access by clicking on its own tabs.

Click on the box(es) for a station you want to view. This displays the basic information for that station, or if you choose "Select All" displays information for all stations for the site.



3.8.1 Measurement Tab

The Measurement tab provides detailed information for a station including the station name, the run name, pressure, flow, and temperature, the forward and reverse flow and energy rates, as well as current and previous hour and day totals and non-resettable volume and energy totals.

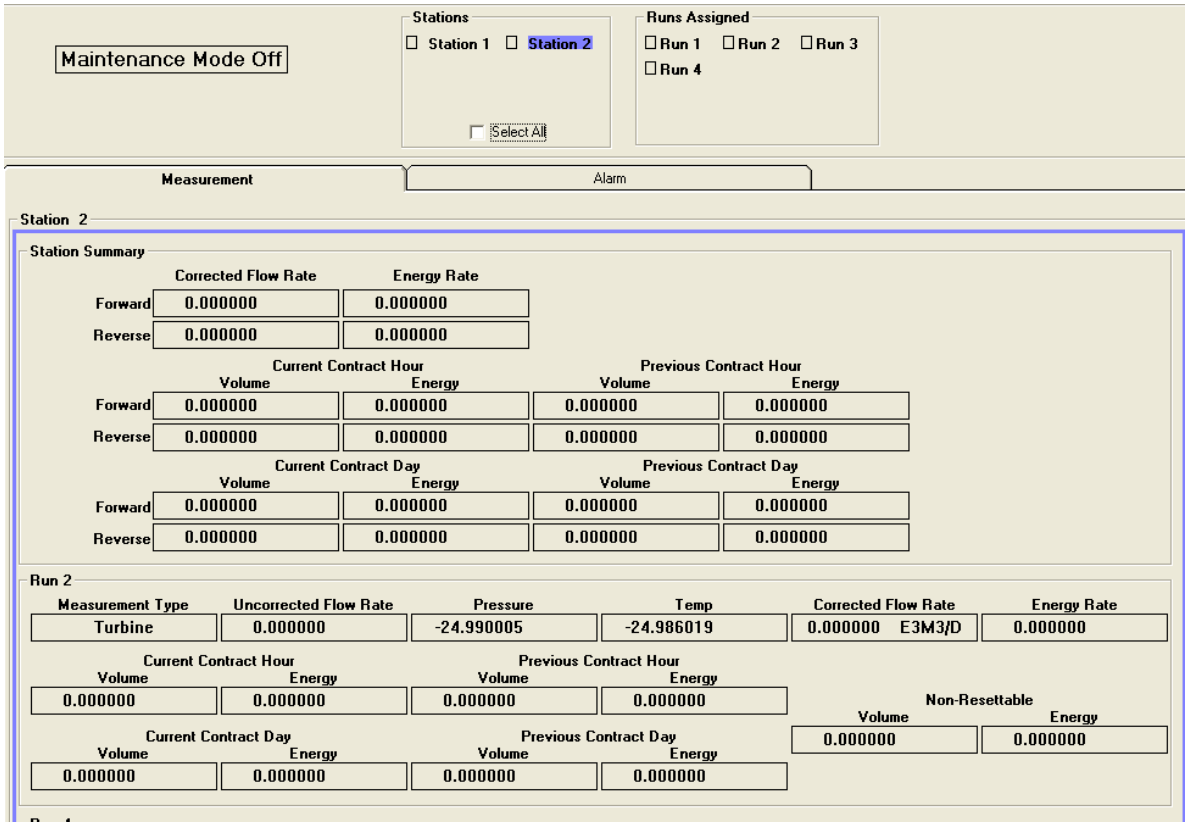


Figure 3-34. Summary Page – Measurement tab

3.8.2 Alarm Tab

The Alarm tab shows the Run Quality Bit, DP, SP, FT, Beta, Speed of Sound, Delta ABAR, Frequency, and Flow Rate current values and alarm status.

You can check the **Show Alarm Limits** box to display alarm limits and the current status.

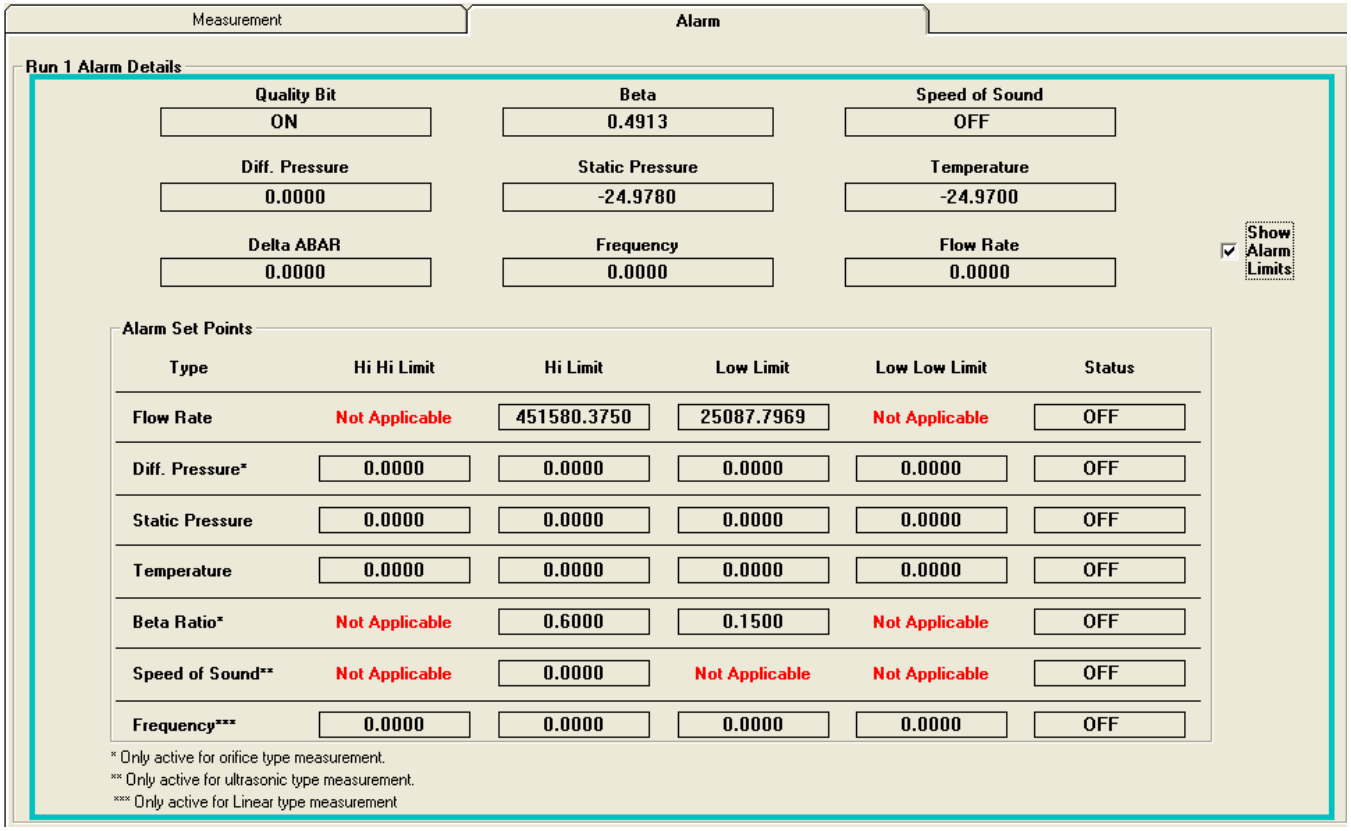


Figure 3-35. Summary Page – Alarm tab

3.9 Limits Page (Gas Composition Allowable Ranges)

When you click the Limits Page button on the Measurement tab, MRMS-IC opens up a page which displays the allowable ranges for each gas component.

Gas Composition Allowable Ranges*

Component	Allowed Range - %	Component	Allowed Range - %
Methane - C1	0 - 100.0	Butane - IC4, NC4	0 - 6.0
Nitrogen - N2	0 - 100.0	Pentane - IC5, NC5	0 - 4.0
Carbon Dioxide - CO2	0 - 100.0	Hexanes Plus	0 - Dew Point
Ethane - C2	0 - 100.0	Helium - He	0 - 3.0
Propane - C3	0 - 12.0		
Water - H2O	0 - Dew Point	Maximum Pressure	280,000 kPa
Hydrogen Sulfide - H2S	0 - 100.0	Temperature Range	-130.0 - 400.0 Deg C
Hydrogen - H2	0 - 100.0	Atmospheric Pressure	99.285 - 103.594 kPa
Carbon - CO Monoxide	0 - 3.0	**Beta Ratio Range	0.2 - 0.67
Oxygen - O2	0 - 21.0		
Argon	0 - 1.0	Specific Gravity	0.07 - 1.52

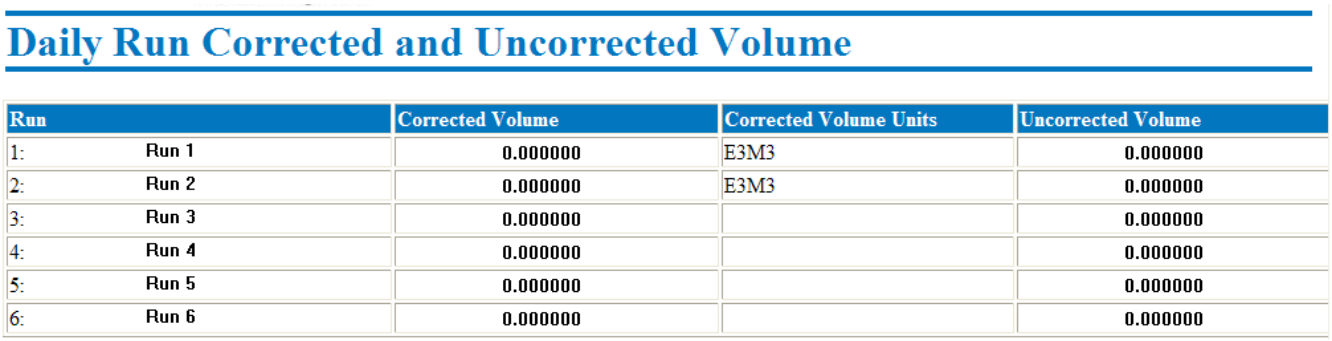
*Referencing AGA3, AGA7 and AGA8 detail (1992)

**Beta Ratio - Derived from Orifice Diameter / Pipe diameter. Used to limit ranges of Orifice and Pipe Diameters relative to each other.

Figure 3-36. Gas Composition Allowable Ranges page

3.10 Daily Run Corrected and Uncorrected Volume

When you click the Run Un/Corrected Volume button on the Measurement tab, MRMS-IC opens up a page which displays the corrected and uncorrected volume for each meter run.



Daily Run Corrected and Uncorrected Volume

Run		Corrected Volume	Corrected Volume Units	Uncorrected Volume
1:	Run 1	0.000000	E3M3	0.000000
2:	Run 2	0.000000	E3M3	0.000000
3:	Run 3	0.000000		0.000000
4:	Run 4	0.000000		0.000000
5:	Run 5	0.000000		0.000000
6:	Run 6	0.000000		0.000000

Figure 3-37. Daily Run Corrected and Uncorrected Volume page

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Chapter 4 – Sampler (Control Tab)

This chapter discusses the Sampler accessed from the Control tab.

4.1 Sampler

Click the Sampler button on the Control tab to configure the Sampler.

The Station Manager allows up to 12 outputs (any combination of analog outputs and pulsed digital outputs) to be configured for 'sampling' functions.

When an analog output is configured as a Sampler output, then any analog input or process variable may be mapped to the Sampler output. The analog output will vary as the analog input or process variable varies, depending on the scale factor and the zeroes and spans selected for the inputs and outputs.

When a pulsed digital output is configured as a Sampler output, then a process variable representing some accumulated value (run flow or energy, station flow or energy) should be mapped to the output. Other analog inputs and process variables may be mapped to the pulsed digital output, but it may not make sense to do so.

The following screen opens:

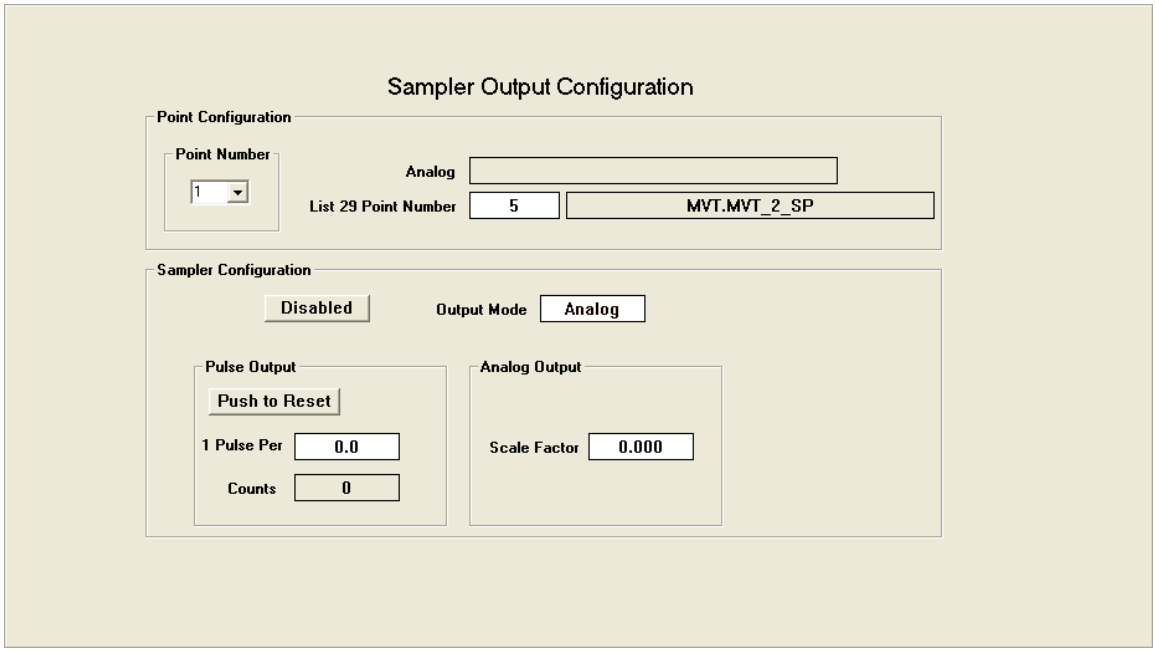

Figure 4-1. Sampler Output Configuration

Field	Description
Point Configuration	
Point Number	Select the point to be configured (1 through 12) from the drop down menu. These points correspond to the ‘Sampler 1’ through ’Sampler 12’ selections in the Analog Output and Digital Output assignment screens.
Analog	If the value to be mapped to the sampler output is an analog input; then select the desired input from the drop down menu next to the Analog label.
List 29 Point Number	If the sampler is to be mapped to some other process variable, rather than an analog input, it may be mapped from List 29. Select the List 29 point number which corresponds to the particular process variable, and the variable name shows at right. List 29 is a modifiable list, and may be edited using the On-Line Edit tool to add or remove items from the list.
Sampler Configuration	After the source is configured, the Sampler Configuration itself must be completed. The items in this frame enable the sampler, select the output mode, configure the way the pulse output behaves (if Pulse is the selected Output Mode) and determine scaling.
Disabled / Enabled	The Sampler output is Enabled/Disabled by toggling the button
Output Mode	The output mode may be selected as an analog output (Analog) or pulsed digital output (Pulse).
Pulse Output	If the Output Mode is selected as Pulse, the items in this frame configure the Pulse Output.
Push to Reset	By clicking on the ‘Push to Reset’ button, the ‘Counts’ value will be set to 0.
1 Pulse Per	The user is required to enter the ratio of pulses per input quantity. For instance:

	Assume the pulse output is mapped to the station accumulated volume. The station accumulated volume is in units of MSCF (thousands of standard cubic feet). If the user wants a pulse for every 1.0 MSCF, then the entry should be 1.0 (1 pulse per 1.0 MSCF). If the user wants a pulse for every 100 SCF (100 standard cubic feet), then the entry should be 0.1 (1 pulse per 0.1 MSCF) If the user wants a pulse for every 2.0 MSCF, then the entry should be 2.0 (1 pulse per 2.0 MSCF) If the user wants a pulse for every 200 SCF (200 standard cubic feet), then the entry should be 0.2 (1 pulse per 0.2 MSCF).
Counts	The 'Counts' value represents the total number of pulses output since the last time the 'Push to Reset' button was pressed.
Analog Output	
Scale Factor	If the Output Mode is selected as analog, then the user must apply a scale factor to the output. If no scaling is required, the scale factor should be set to 1.0. Below are some examples of using the Scale Factor: To convert a flow rate in units of MSCF/Hour to MMSCF/Hour, the scale factor should be 0.001 (1/1000). To convert a flow rate in units of MMSCF/Hour to MSCF/Hour, the scale factor should be 1000.0. To convert a flow rate in units of MSCF/Hour to MSCF/Day, the scale factor should be 24.0 To convert a flow rate in units of MSCF/Day to MSCF/Hour, the scale factor should be 0.04167 (1/24). Any scale factor needed to perform the proper units conversion may be entered here.

4.1.1 List 29

List 29 is a modifiable list, and may be edited using the On-Line Edit tool to add or remove items from the list. By default, List 29 includes these values:

Position in the List	Variable Name	Variable Description
1	MVT.MVT_1_DP	MVT 1 Static Pressure
2	MVT.MVT_1_SP	MVT 1 Differential Pressure
3	MVT.MVT_1_FT	MVT 1 Temperature
4	MVT.MVT_2_DP	MVT 2 Static Pressure
5	MVT.MVT_2_SP	MVT 2 Differential Pressure
6	MVT.MVT_2_FT	MVT 2 Temperature
7	MVT.MVT_3_DP	MVT 3 Static Pressure
8	MVT.MVT_3_SP	MVT 3 Differential Pressure
9	MVT.MVT_3_FT	MVT 3 Temperature
10	MVT.MVT_4_DP	MVT 4 Static Pressure
11	MVT.MVT_4_SP	MVT 4 Differential Pressure
12	MVT.MVT_4_FT	MVT 4 Temperature
13	MVT.MVT_5_DP	MVT 5 Static Pressure
14	MVT.MVT_5_SP	MVT 5 Differential Pressure
15	MVT.MVT_5_FT	MVT 5 Temperature
16	MVT.MVT_6_DP	MVT 6 Static Pressure
17	MVT.MVT_6_SP	MVT 6 Differential Pressure
18	MVT.MVT_6_FT	MVT 6 Temperature
19	MVT.MVT_7_DP	MVT 7 Static Pressure
20	MVT.MVT_7_SP	MVT 7 Differential Pressure
21	MVT.MVT_7_FT	MVT 7 Temperature
22	MVT.MVT_8_DP	MVT 8 Static Pressure
23	MVT.MVT_8_SP	MVT 8 Differential Pressure
24	MVT.MVT_8_FT	MVT 8 Temperature
25	MVT.MVT_9_DP	MVT 9 Static Pressure
26	MVT.MVT_9_SP	MVT 9 Differential Pressure
27	MVT.MVT_9_FT	MVT 9 Temperature
28	MVT.MVT_10_DP	MVT 10 Static Pressure
29	MVT.MVT_10_SP	MVT 10 Differential Pressure
30	MVT.MVT_10_FT	MVT 10 Temperature
31	MVT.MVT_11_DP	MVT 11 Static Pressure
32	MVT.MVT_11_SP	MVT 11 Differential Pressure
33	MVT.MVT_11_FT	MVT 11 Temperature
34	MVT.MVT_12_DP	MVT 12 Static Pressure
35	MVT.MVT_12_SP	MVT 12 Differential Pressure
36	MVT.MVT_12_FT	MVT 12 Temperature
37	FC.FC1.OR_FLOW_RATE	Run 1 Flow Rate
38	FC.FC1.OR_UCFLOWRATE	Run 1 Uncorrected Flow Rate
39	FC.FC1.OR_ENERGY_RATE	Run 1 Energy Rate
40	FC.FC2.OR_FLOW_RATE	Run 2 Flow Rate
41	FC.FC2.OR_UCFLOWRATE	Run 2 Uncorrected Flow Rate
42	FC.FC2.OR_ENERGY_RATE	Run 2 Energy Rate

43	FC.FC3.OR_FLOW_RATE	Run 3 Flow Rate
44	FC.FC3.OR_UCFLOWRATE	Run 3 Uncorrected Flow Rate
45	FC.FC3.OR_ENERGY_RATE	Run 3 Energy Rate
46	FC.FC4.OR_FLOW_RATE	Run 4 Flow Rate
47	FC.FC4.OR_UCFLOWRATE	Run 4 Uncorrected Flow Rate
48	FC.FC4.OR_ENERGY_RATE	Run 4 Energy Rate
49	FC.FC5.OR_FLOW_RATE	Run 5 Flow Rate
50	FC.FC5.OR_UCFLOWRATE	Run 5 Uncorrected Flow Rate
51	FC.FC5.OR_ENERGY_RATE	Run 5 Energy Rate
52	FC.FC6.OR_FLOW_RATE	Run 6 Flow Rate
53	FC.FC6.OR_UCFLOWRATE	Run 6 Uncorrected Flow Rate
54	FC.FC6.OR_ENERGY_RATE	Run 6 Energy Rate
55	FC.FC7.OR_FLOW_RATE	Run 7 Flow Rate
56	FC.FC7.OR_UCFLOWRATE	Run 7 Uncorrected Flow Rate
57	FC.FC7.OR_ENERGY_RATE	Run 7 Energy Rate
58	FC.FC8.OR_FLOW_RATE	Run 8 Flow Rate
59	FC.FC8.OR_UCFLOWRATE	Run 8 Uncorrected Flow Rate
60	FC.FC8.OR_ENERGY_RATE	Run 8 Energy Rate
61	FC.STATION_1_FFLOWRATE	Station 1 Forward Flow Rate
62	FC.STATION_1_RFLOWRATE	Station 1 Reverse Flow Rate
63	FC.STATION_1_FENERGYRATE	Station 1 Forward Energy Rate
64	FC.STATION_1_RENERGYRATE	Station 1 Reverse Energy Rate
65	FC.STATION_2_FFLOWRATE	Station 2 Forward Flow Rate
66	FC.STATION_2_RFLOWRATE	Station 2 Reverse Flow Rate
67	FC.STATION_2_FENERGYRATE	Station 2 Forward Energy Rate
68	FC.STATION_2_RENERGYRATE	Station 2 Reverse Energy Rate
69	FC.STATION_3_FFLOWRATE	Station 3 Forward Flow Rate
70	FC.STATION_3_RFLOWRATE	Station 3 Reverse Flow Rate
71	FC.STATION_3_FENERGYRATE	Station 3 Forward Energy Rate
72	FC.STATION_3_RENERGYRATE	Station 3 Reverse Energy Rate
73	FC.STATION_4_FFLOWRATE	Station 4 Forward Flow Rate
74	FC.STATION_4_RFLOWRATE	Station 4 Reverse Flow Rate
75	FC.STATION_4_FENERGYRATE	Station 4 Forward Energy Rate
76	FC.STATION_4_RENERGYRATE	Station 4 Reverse Energy Rate

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Appendix E - Troubleshooting

Error Codes

Error Code(s)	Possible Remedy
-8001 Mode not supported **-8002 Invalid mode for serial port**	These codes indicate that the serial port is not configured properly in the Flash Configuration Profile. ▪ Verify that the MODE for the serial port connected to the gas chromatograph is configured as a MODBUS Master.
-8006 Invalid Slave address	This code indicates that the Addr setting is incorrect. typically, this means it is less than 1 or greater than 255 ▪ Set the “Addr” value to the proper local slave address of the gas chromatograph, which should be a number from 1 to 255.
-8017 Invalid response received from slave	This code indicates that the gas chromatograph is responding with data, however, the response message cannot be interpreted properly. ▪ For a serial connection, verify that the data bits, stop bits, and parity are configured to match the settings on the chromatograph. ▪ For an RS-485 connection, verify that the “Ignore Echo” setting is set to TRUE. Verify that terminating and biasing resistors are set properly.
-8018 Timeout waiting for response from slave.	▪ Verify the gas chromatograph is turned on. ▪ Verify that the communications cables between the-Station Manager controller and the gas chromatograph are wired correctly and connected at both ends. ▪ If this is an IP (Ethernet connection), verify that both the gas chromatograph and the controller can be pinged at the IP addresses assigned to them. ▪ Verify the gas chromatograph supports the MODBUS Slave protocol. ▪ Verify that the baud rate, data bits, stop bits, and parity settings on the serial port of the controller match the settings on the gas chromatograph.
-8020 Communication Port failure.	The following message indicates that no data is being received from the gas chromatograph ▪ Verify the communication port is physically installed on the Station Manager controller. ▪ Replace the CPU or Communications Expansion Card with a known good card. If the same error is indicated, replace the ControlWave Micro chassis with a known good chassis.

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Index

D

E

F

G

H

I

K

N

O

P

T

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