

# **ControlWave<sup>®</sup>**

## **MRMS-IC Configuration Manual**

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# Chapter 1 – Getting Started

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

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## 1.1 What is MRMS-IC?

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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

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- 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.

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**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.

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### 1.3 Installing MRMS-IC Software

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**Note:** MRMS\_IC runs on the following Windows operating systems:  
Windows XP

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

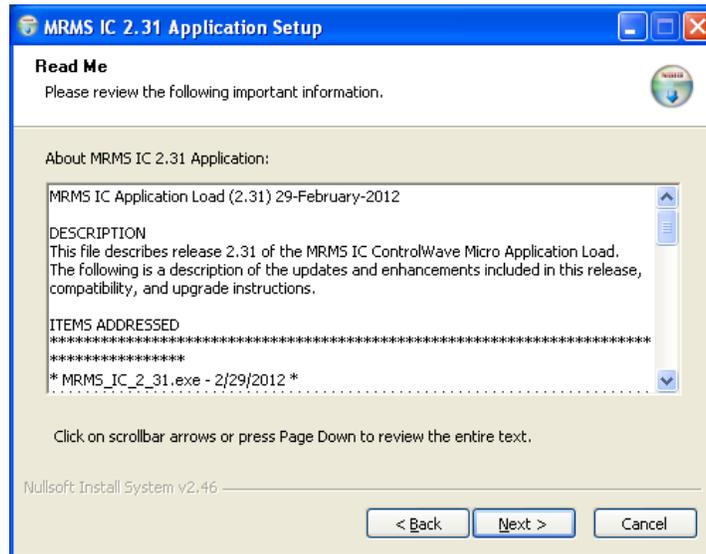


2. Click **Next** on the welcome screen of the installer.



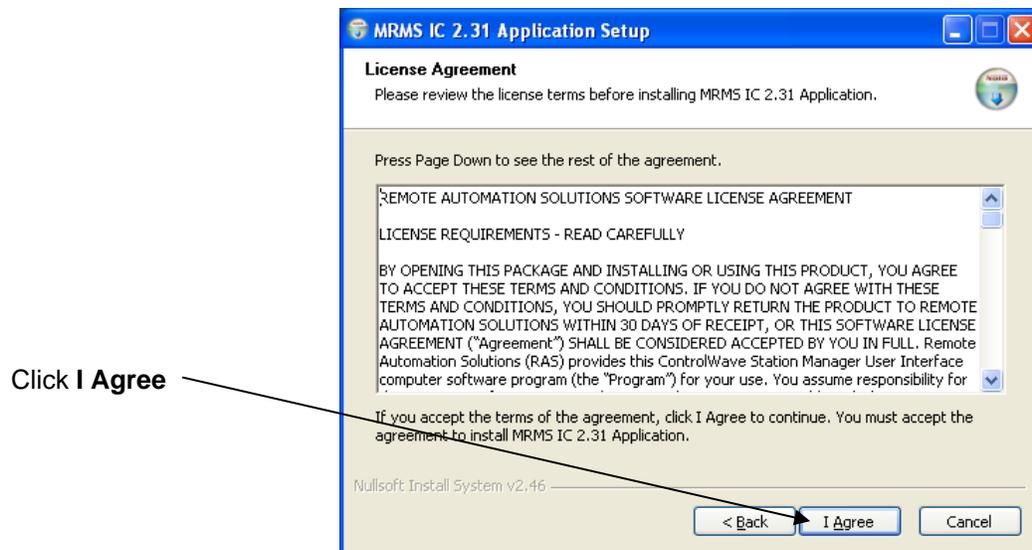
Figure 1-1. MRMS\_IC Installer – Welcome Screen

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.



*Figure 1-3. License Agreement page*

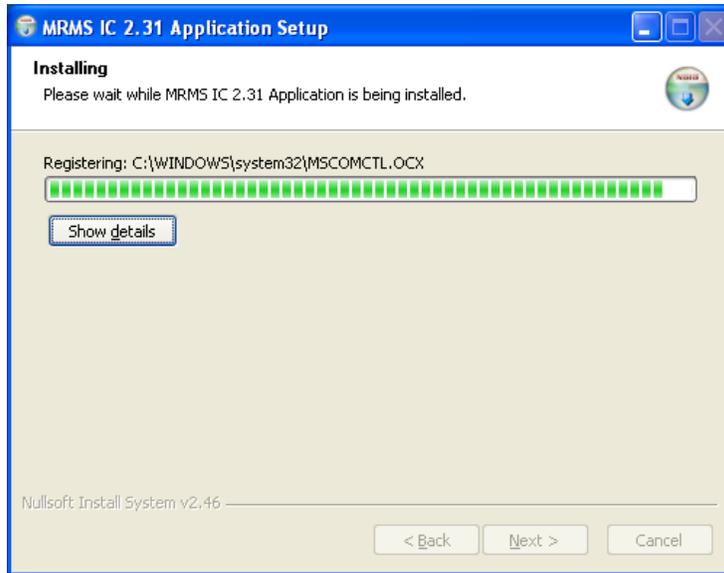


Figure 1-4. Installation in Progress

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

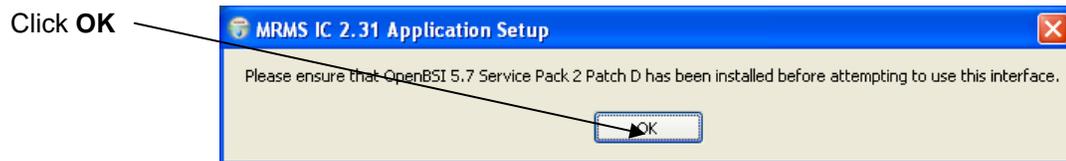


Figure 1-5. Confirm OpenBSI Version

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

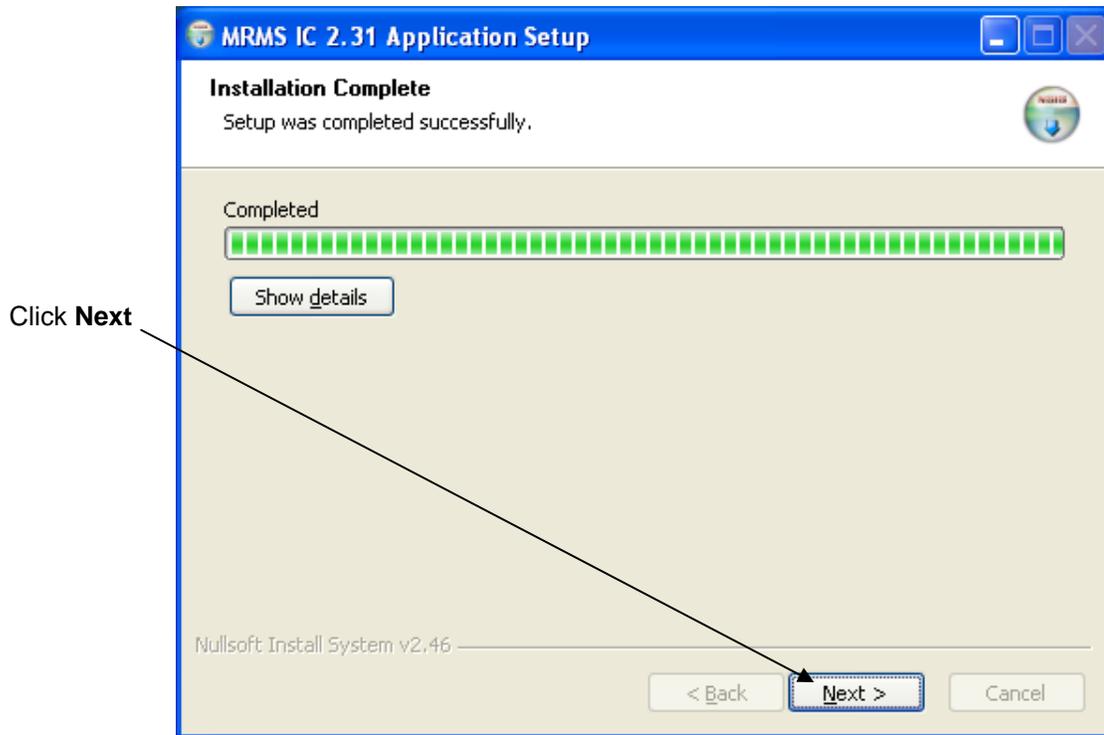


Figure 1-6. Installation Completion

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\_tv**  
For a serial connection, click: **Start > Programs > MRMS\_IC > MRMS\_IC\_Serial\_tv**

- 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 *Section 1.4.2 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

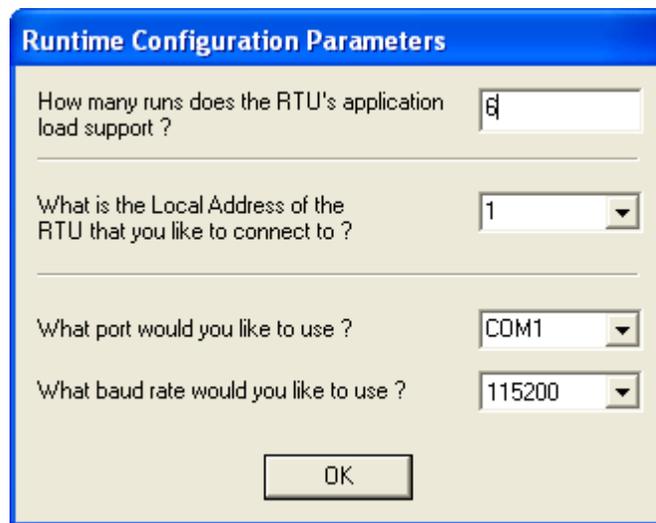
1. Ignore the number of runs; this parameter does not apply for

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.

Click on the tab you want to access, then click on any of the buttons for that tab

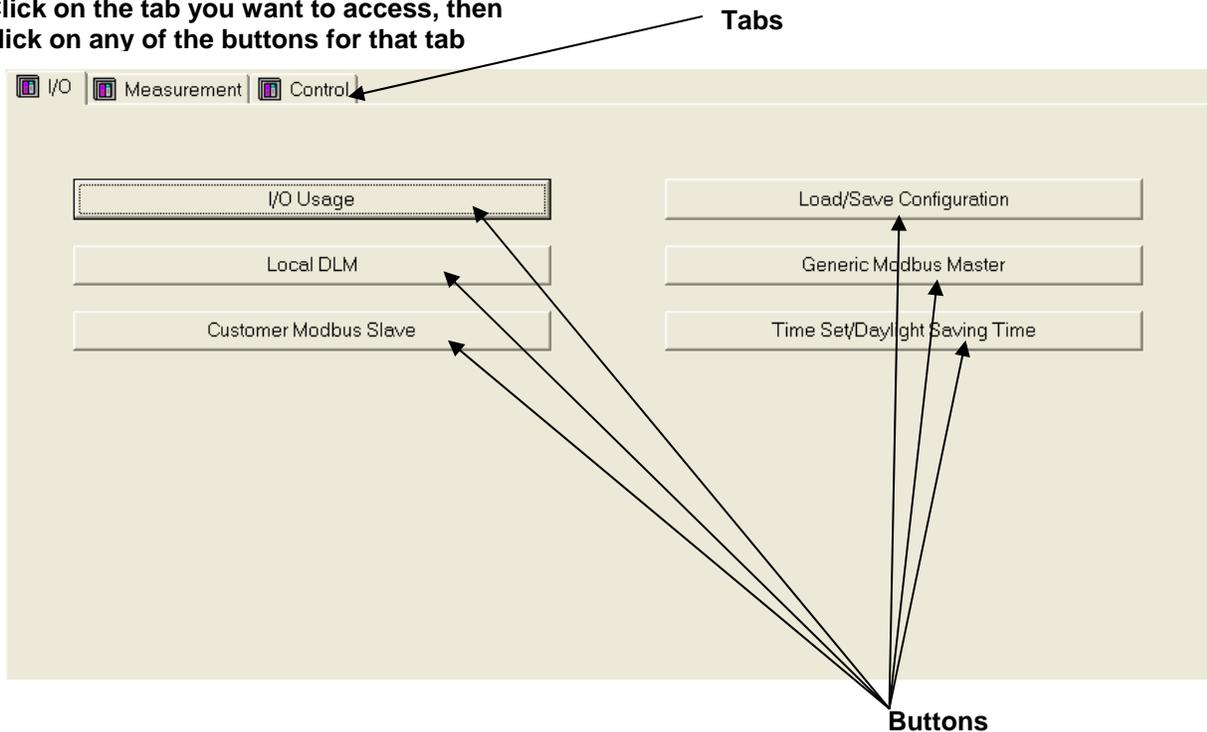


Figure 1-12. Tabs and Buttons in MRMS\_IC

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**

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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.

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### 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.

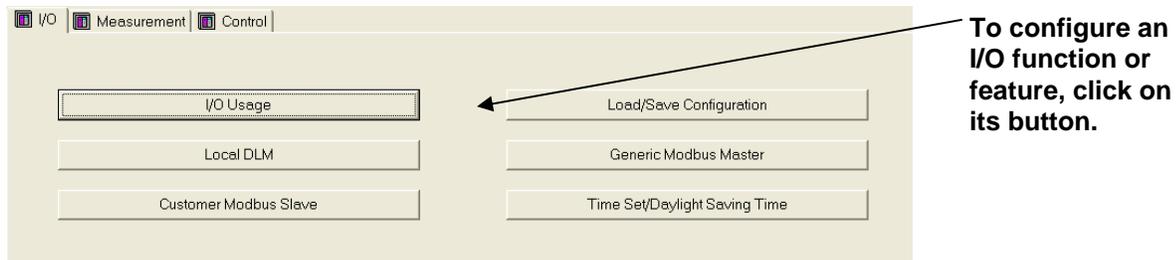


Figure 2-1. I/O Tab in MRMS-IC

## 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.

### I/O Slot Usage

### UFMs Transducers

Click Card Type below to configure I/O points ...

*These are pictures only and indicate type of cards and not specific options.*

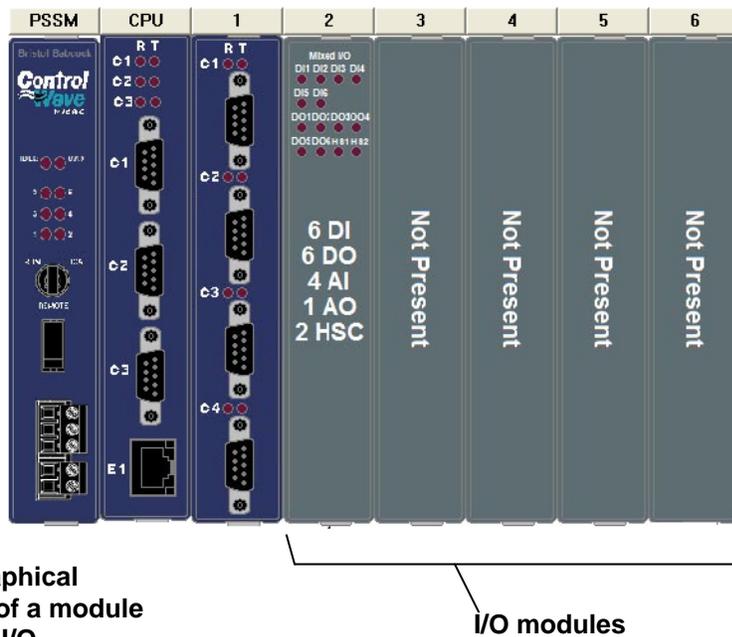


Figure 2-2. I/O Usage Screen Showing I/O Modules Detected

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*).

## Mixed I/O Card - I/O Slot 2

[Go Back](#)

Discrete Inputs

Discrete Outputs

Analog Inputs

Analog Outputs

Counter Inputs

RTD Inputs

TC Inputs



Live is actual value and input, while PV is value in use.

Discrete Input/Output Points must be jumpered for desired usage.

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 subsections 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.

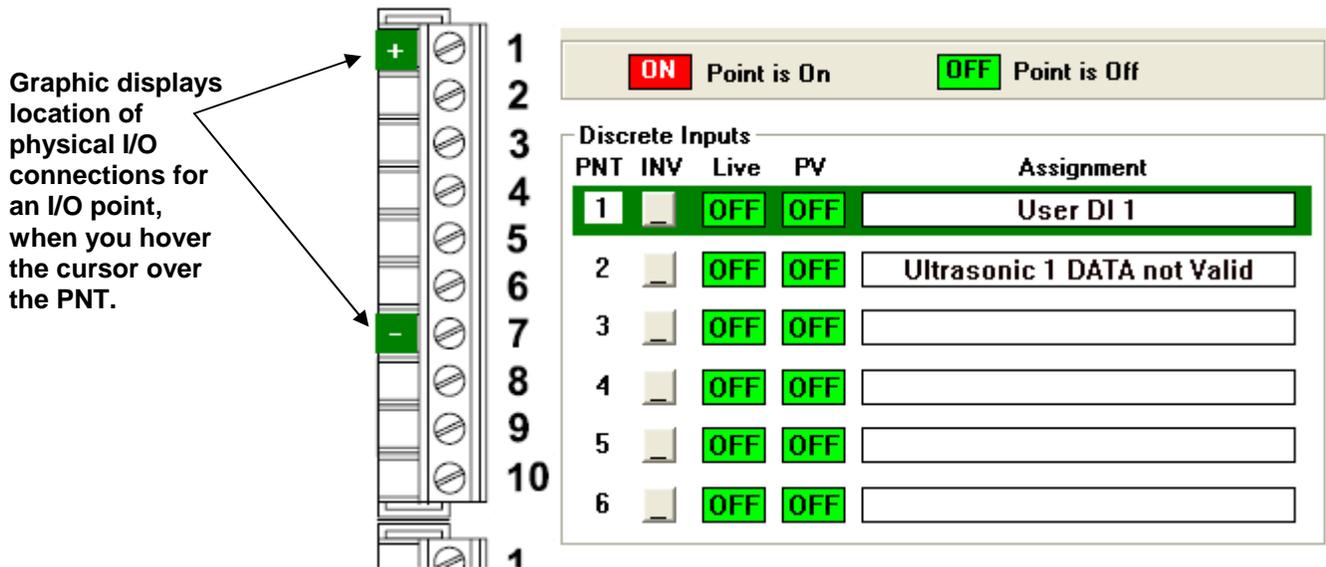


Figure 2-4. Connection Points for Physical I/O

**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 <b>Live</b> value of discrete I/O point 5 is <b>OFF</b> , and <b>INV</b> is selected for that point, <b>PV</b> is set <b>ON</b> 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 <b>ON</b> show in red. <b>ON</b> Points that are <b>OFF</b> show in green. <b>OFF</b>
PV	This read-only field shows the value of the process variable ( <b>PV</b> ) used in MRMS-IC. This matches the <b>Live</b> value unless you invert the input using <b>INV</b> .  Points that are <b>ON</b> show in red. <b>ON</b> Points that are <b>OFF</b> show in green. <b>OFF</b>
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 ( <b>PV</b> ) 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								
<b>PNT</b>	This read-only field displays the I/O point number.								
<b>PV</b>	<p>This read-only field shows the calculated value of the analog input process variable (<b>PV</b>) based on the configured <b>Zero</b> and <b>Span</b>.</p> <p>If the value shows in red, the value is questionable <b>-25.0</b>. 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.</p>								
<b>Zero</b>	Enter the value that the process variable should read when the AI field input is 4mA. Press <b>[Enter]</b> to save your selection.								
<b>Span</b>	<p>Enter the value that, when added to the <b>Zero</b> value, represents what the process variable should display when the AI field input is 20mA. Press <b>[Enter]</b> to save your selection.</p> <p>For example, if <b>Zero</b> is 5 and <b>Span</b> is 20, then:</p> <table border="1"> <thead> <tr> <th>If the AI field input is:</th> <th>PV will be:</th> </tr> </thead> <tbody> <tr> <td>4mA</td> <td>5</td> </tr> <tr> <td>20mA</td> <td>25</td> </tr> <tr> <td>12mA</td> <td>15</td> </tr> </tbody> </table>	If the AI field input is:	PV will be:	4mA	5	20mA	25	12mA	15
If the AI field input is:	PV will be:								
4mA	5								
20mA	25								
12mA	15								
<b>Units</b>	The engineering units for this process variable. Click in the field and select the proper units from the drop-down menu. Press <b>[Enter]</b> to save your selection.								
<b>Assignment</b>	This read-only field shows details of the fixed I/O assigned to this point.								
<b>Use Stacked DP Transmitter / Use Single DP Transmitter Only</b> button	<p>This button toggles I/O assignments based on whether you use a single DP transmitter, or stacked DP transmitters.</p> <p>To use stacked, click the <b>Use Stacked DP Transmitter</b> and assignments change to stacked; the label on the button then changes to <b>Use Single DP Transmitter Only</b>.</p> <p>To use a single DP transmitter, click the <b>Use Single DP Transmitter</b> and assignments change to single; the label on the button then changes to <b>Use Stacked DP Transmitter</b>.</p>								

## 2.2.4 Analog Outputs (AO)

Analog outputs (AOs) include the following fields:

Field	Description								
<b>PNT</b>	This read-only field displays the I/O point number.								
<b>PV</b>	This read-only field shows the calculated value of the analog output process variable ( <b>PV</b> ) based on the configured <b>Zero</b> and <b>Span</b> . This value will be sent to the field device.								
<b>Zero</b>	Enter the value that the process variable should read when the AO field output is 4mA. Press <b>[Enter]</b> to save your selection.								
<b>Span</b>	Enter the value that, when added to the <b>Zero</b> value, represents what the process variable should display when the AO field output is 20mA. Press <b>[Enter]</b> to save your selection.								
<p>For example, if <b>Zero</b> is 5 and <b>Span</b> is 20, then:</p> <table border="0"> <thead> <tr> <th>If PV is:</th> <th>The AO field output is:</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>4mA</td> </tr> <tr> <td>25</td> <td>20mA</td> </tr> <tr> <td>10</td> <td>8mA</td> </tr> </tbody> </table>		If PV is:	The AO field output is:	5	4mA	25	20mA	10	8mA
If PV is:	The AO field output is:								
5	4mA								
25	20mA								
10	8mA								
<b>Units</b>	The engineering units for this process variable. Click in the field and select the proper units from the drop-down menu. Press <b>[Enter]</b> to save your selection.								
<b>Assignment</b>	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:

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

---

## 2.2.6 Ultrasonic Flow Meters (UFM)

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

The screenshot shows a configuration window titled "Communications" with six sub-sections for UFM1 through UFM6. Each sub-section contains a "Disabled" button, a "Port" dropdown menu (set to "None"), an "Address" text box (set to "0"), and a "Type" dropdown menu (set to "None").

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

Configure the following fields for your ultrasonic flow meter.

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

MVTs [1-3](#), [4-6](#),

The screenshot displays three MVT configuration panels. Each panel has a 'BSAP' button and a 'Communication Protocol' dropdown. Below these are fields for 'Port', 'Address', and 'Xmtr Type'. A 'Register Set' section contains two hex input fields. The 'Comm Stats' section includes '% Good', 'Good Polls', and 'Bad Polls' fields, along with a 'Reset' button. The 'Current Status' section shows 'No Errors' and a 'Tag Name' field. The 'Time Stamp' field is empty. Below this are three rows of 'Current Status' data, each with 'DP', 'Units', 'Zero', and 'Span' fields. The values for all these fields are 0.0.

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

Each MVT includes the following fields:

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

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

pressure reading from this MVT.

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

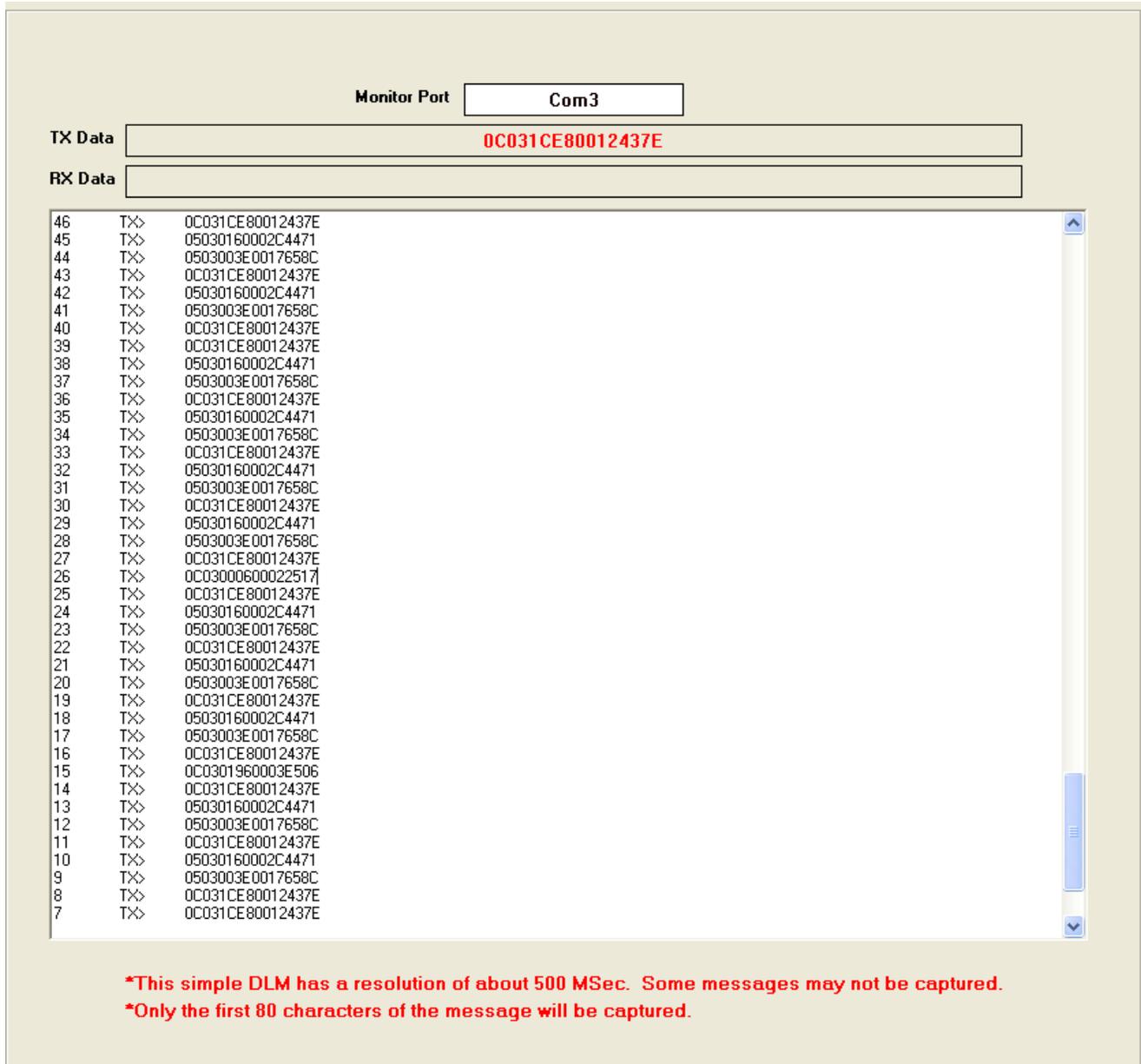
## 2.3 Local DLM

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

Field	Description
<b>Monitor Port</b>	Use the dropdown menu to select the ControlWave Micro serial communication port you want the DLM to monitor. Press <b>[Enter]</b> to save the selection. <b>Note:</b> 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.
<b>TX Data</b>	This read-only field shows the most recent message transmitted through this port.
<b>RX Data</b>	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.



Monitor Port **Com3**

TX Data **0C031CE80012437E**

RX Data

46	TX>	0C031CE80012437E
45	TX>	05030160002C4471
44	TX>	0503003E0017658C
43	TX>	0C031CE80012437E
42	TX>	05030160002C4471
41	TX>	0503003E0017658C
40	TX>	0C031CE80012437E
39	TX>	0C031CE80012437E
38	TX>	05030160002C4471
37	TX>	0503003E0017658C
36	TX>	0C031CE80012437E
35	TX>	05030160002C4471
34	TX>	0503003E0017658C
33	TX>	0C031CE80012437E
32	TX>	05030160002C4471
31	TX>	0503003E0017658C
30	TX>	0C031CE80012437E
29	TX>	05030160002C4471
28	TX>	0503003E0017658C
27	TX>	0C031CE80012437E
26	TX>	0C03000600022517
25	TX>	0C031CE80012437E
24	TX>	05030160002C4471
23	TX>	0503003E0017658C
22	TX>	0C031CE80012437E
21	TX>	05030160002C4471
20	TX>	0503003E0017658C
19	TX>	0C031CE80012437E
18	TX>	05030160002C4471
17	TX>	0503003E0017658C
16	TX>	0C031CE80012437E
15	TX>	0C0301960003E506
14	TX>	0C031CE80012437E
13	TX>	05030160002C4471
12	TX>	0503003E0017658C
11	TX>	0C031CE80012437E
10	TX>	05030160002C4471
9	TX>	0503003E0017658C
8	TX>	0C031CE80012437E
7	TX>	0C031CE80012437E

**\*This simple DLM has a resolution of about 500 MSec. Some messages may not be captured.  
\*Only the first 80 characters of the message will be captured.**

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.

### Customer Modbus Slave

You can view either coils or registers in the Signal List grid.

Signal List Information

Number:  Start Index:  Max Signals to Collect:

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	

Signals Collected: 20

Figure 2-8. Customer Slave Page

This page includes the following fields:

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

<b>Field</b>	<b>Description</b>																								
<b>Port</b>	<p>Specify the serial communication port on the ControlWave Micro you want to use for Modbus slave communication. Use the following code:</p> <table border="0"> <tr> <td><u>Enter this:</u></td> <td><u>To select this serial CW Micro port:</u></td> </tr> <tr> <td>1</td> <td>COM1</td> </tr> <tr> <td>2</td> <td>COM2</td> </tr> <tr> <td>3</td> <td>COM3</td> </tr> <tr> <td>4</td> <td>COM4</td> </tr> <tr> <td>5</td> <td>COM5</td> </tr> <tr> <td>6</td> <td>COM6</td> </tr> <tr> <td>7</td> <td>COM7</td> </tr> <tr> <td>8</td> <td>COM8</td> </tr> <tr> <td>9</td> <td>COM9</td> </tr> <tr> <td>10</td> <td>COM10</td> </tr> <tr> <td>11</td> <td>COM11</td> </tr> </table> <p>Press <b>[Enter]</b> to save the selection.</p>	<u>Enter this:</u>	<u>To select this serial CW Micro port:</u>	1	COM1	2	COM2	3	COM3	4	COM4	5	COM5	6	COM6	7	COM7	8	COM8	9	COM9	10	COM10	11	COM11
<u>Enter this:</u>	<u>To select this serial CW Micro port:</u>																								
1	COM1																								
2	COM2																								
3	COM3																								
4	COM4																								
5	COM5																								
6	COM6																								
7	COM7																								
8	COM8																								
9	COM9																								
10	COM10																								
11	COM11																								
<b>IP</b>	Click the <b>IP</b> selection to use IP Modbus (Open Modbus) communication.																								
<b>Modbus Slave Address</b>	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 <b>Loc Addr Conflict</b> message. Modify the <b>Modbus Slave Address</b> as required to resolve the conflict.																								
<u>Modbus Type</u>																									
<b>Enron</b>	If you want to communicate using <b>Enron</b> Modbus, click this selection.																								
<b>Gould</b>	If you want to communicate using <b>Gould</b> Modbus, click this selection.																								
<u>Data Parameters</u>																									
<u>Word Order</u>	Choose the data word order to match the data word order used by the Modbus Master that communicates with this Modbus Slave.																								
<b>High Word First</b>	Click this to specify that the high word is first.																								
<b>Low Word First</b>	Click this to specify that the low word is first.																								
<u>Byte Order</u>	Choose the data byte order to match the data byte																								

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

Field	Description
<b>RTS Delay Mode</b>	<p>Select from one of two modes for the Ready-to-Send (RTS) delay mode.</p> <p><b>Message Delay Mode</b> - After the Modbus Slave port raises RTS, a delay timer starts. The length of the delay is determined by the value in the <b>Delay Time</b> field. No message is sent until after this delay expires. The value of CTS does not affect the operation of this mode.</p> <p><b>CTS Timeout Mode</b> - After the Modbus slave port raises RTS, it uses the <b>Delay Time</b> 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 <b>Delay Time</b>, it does not respond to the master and instead reports an error.</p> <p>Press <b>[Enter]</b> to save the selection.</p>
<b>Delay msec</b>	Specify the <b>Delay</b> (in milliseconds) used by the <b>RTS Delay Mode</b> and <b>CTS Timeout Mode</b> .
<b>Coils List 12</b>	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 <i>Section 2.4.1</i> for instructions on using the signal list grid.
<b>Register List 13</b>	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 <i>Section 2.4.1</i> for instructions on using the signal list grid.
<b>Status</b>	<p>This read-only field displays a status code indicating the health of the Modbus slave communications.</p> <p>If you see any code other than 0 here or see an error message above the code, see <i>Appendix E – Errors and Troubleshooting</i> for more information.</p>

### 2.4.1 Signal List Grid

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

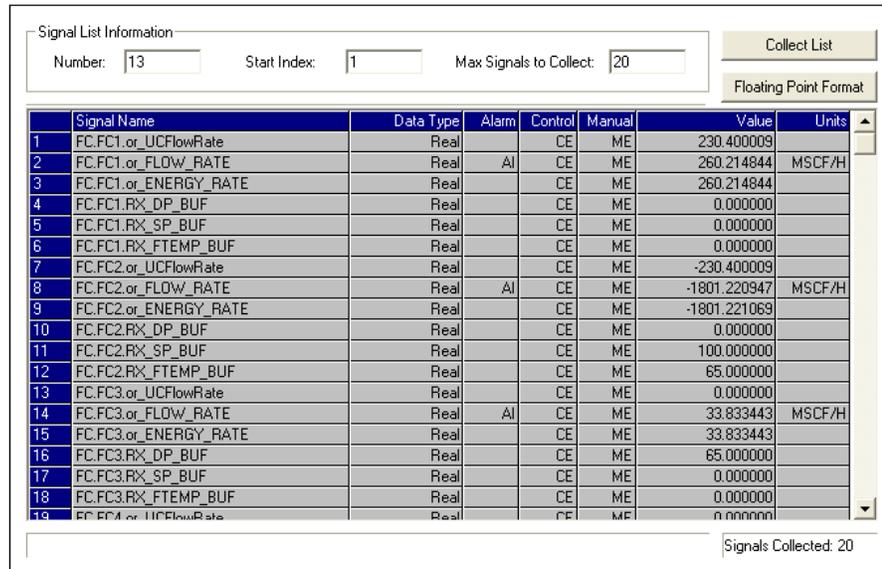


Figure 2-9. Signal List Grid Control

Field	Description
<b>Signal List Information</b>	The list window shows the contents of lists within the application.
<b>Number</b>	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.
<b>Max Signals to Collect</b>	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.
<b>Start Index</b>	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.
<b>Collect List</b>	Click this button to force the Signal List grid to collect the specified list now.
<b>Floating Point Format</b>	Click this to specify the Floating Point Format dialog box. See <i>Figure 2-10</i>
<b>Signal Name</b>	Shows the variable name for this list item, or its descriptor.
<b>Data Type</b>	Shows the variable type, such as Real or Boolean.
<b>Alarm</b>	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.
<b>Control</b>	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
<b>Manual</b>	If this shows “MI” it indicates the variable is manual inhibited. If this shows “ME” it indicates that the variable is manual enabled.
<b>Value</b>	Shows the current value of the variable.
<b>Units</b>	Shows the engineering units (if specified) for this variable.
<b>Signals Collected</b>	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  button on a page, to call up the Float Format dialog box.

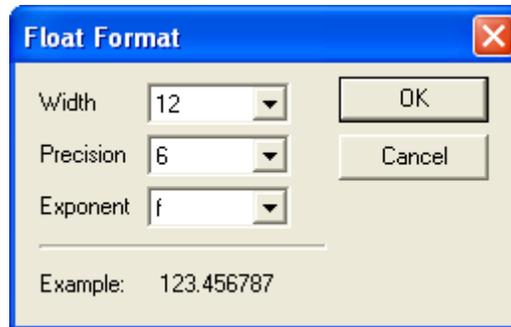
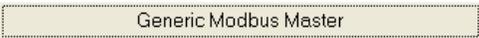


Figure 2-10. Floating Point Format dialog box

Field	Description
<b>Width</b>	Choose the total number of characters in the field (including the decimal point) used to display a floating point number.
<b>Precision</b>	Choose the number of places to the right of the decimal point which the floating point number should show.
<b>Exponent</b>	Select one of these formats: <ul style="list-style-type: none"> <li><b>e</b> show number in exponential notation</li> <li><b>f</b> show number in floating point notation</li> <li><b>g</b> allow application to choose the “best fit” format for this number.</li> </ul>
<b>OK</b>	Click this to save your entries and exit the dialog box.
<b>Cancel</b>	Click this to discard your entries and exit the dialog

Field	Description
	box.

## 2.5 Generic Modbus Master

Click the  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.

### Generic Modbus Master

Signal List Information

Number:  Start Index:  Max Signals to Collect:

Signal Name	Data Type	Alarm	Control	Manual	Value	Units
1 GM.GMBM_5.Reg_1	Real		CE	ME	0.000000	
2 GM.GMBM_5.Reg_2	Real		CE	ME	0.000000	
3 GM.GMBM_5.Reg_3	Real		CE	ME	0.000000	
4 GM.GMBM_5.Reg_4	Real		CE	ME	0.000000	
5 GM.GMBM_5.Reg_5	Real		CE	ME	0.000000	
6 GM.GMBM_5.Reg_6	Real		CE	ME	0.000000	
7 GM.GMBM_5.Reg_7	Real		CE	ME	0.000000	
8 GM.GMBM_5.Reg_8	Real		CE	ME	0.000000	
9 GM.GMBM_5.Reg_9	Real		CE	ME	0.000000	
10 GM.GMBM_5.Reg_10	Real		CE	ME	0.000000	
11 GM.GMBM_5.Reg_11	Real		CE	ME	0.000000	
12 GM.GMBM_5.Reg_12	Real		CE	ME	0.000000	
13 GM.GMBM_5.Reg_13	Real		CE	ME	0.000000	
14 GM.GMBM_5.Reg_14	Real		CE	ME	0.000000	
15 GM.GMBM_5.Reg_15	Real		CE	ME	0.000000	
16 GM.GMBM_5.Reg_16	Real		CE	ME	0.000000	
17 GM.GMBM_5.Reg_17	Real		CE	ME	0.000000	
18 GM.GMBM_5.Reg_18	Real		CE	ME	0.000000	
19 GM.GMBM_5.Reg_19	Real		CE	ME	0.000000	

Refreshing ... Signals Collected: 50

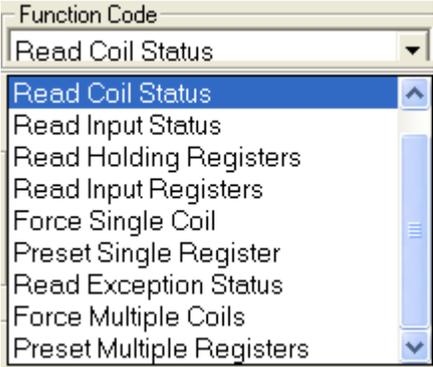
Figure 2-11. Generic Modbus Master

This page includes the following fields:

Field	Description
<u>Settings</u>	
<u>Communications Port</u>	Modbus communications can use <b>either</b> serial <b>or</b> IP communications.

<b>Field</b>	<b>Description</b>																								
<b>Serial</b>	Click the <b>Serial</b> selection to use serial Modbus communication, and specify the port you want to use. (See <b>Port</b> ).																								
<b>Port</b>	<p>Specify the serial communication port on the ControlWave Micro you want to use for Modbus master communication. Use the following code:</p> <table border="0"> <thead> <tr> <th><u>Enter this:</u></th> <th><u>To select this serial CW Micro port:</u></th> </tr> </thead> <tbody> <tr><td>1</td><td>COM1</td></tr> <tr><td>2</td><td>COM2</td></tr> <tr><td>3</td><td>COM3</td></tr> <tr><td>4</td><td>COM4</td></tr> <tr><td>5</td><td>COM5</td></tr> <tr><td>6</td><td>COM6</td></tr> <tr><td>7</td><td>COM7</td></tr> <tr><td>8</td><td>COM8</td></tr> <tr><td>9</td><td>COM9</td></tr> <tr><td>10</td><td>COM10</td></tr> <tr><td>11</td><td>COM11</td></tr> </tbody> </table> <p>Press <b>[Enter]</b> to save the selection.</p>	<u>Enter this:</u>	<u>To select this serial CW Micro port:</u>	1	COM1	2	COM2	3	COM3	4	COM4	5	COM5	6	COM6	7	COM7	8	COM8	9	COM9	10	COM10	11	COM11
<u>Enter this:</u>	<u>To select this serial CW Micro port:</u>																								
1	COM1																								
2	COM2																								
3	COM3																								
4	COM4																								
5	COM5																								
6	COM6																								
7	COM7																								
8	COM8																								
9	COM9																								
10	COM10																								
11	COM11																								
<b>IP</b>	Click the <b>IP</b> selection to use IP Modbus (Open Modbus) communication.																								
<b>IP Address</b>	If you want to use IP Modbus (Open Modbus), enter the IP address of the port used by this master.																								
<b>Modbus Slave Address</b>	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 <b>Loc Addr Conflict</b> message. Modify the <b>Modbus Slave Address</b> as required to resolve the conflict.																								
<u>Data Parameters</u>																									
<u>Word Order</u>	Choose the data word order to match the data word order used by the Modbus Slave that communicates with this Modbus Master.																								
<b>High Word First</b>	Click this to specify that the high word is first.																								
<b>Low Word First</b>	Click this to specify that the low word is first.																								
<u>Byte Order</u>	Choose the data byte order to match the data byte order used by the Modbus Slave that communicates with this Modbus Master.																								

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

Field	Description
	 <p>Press <b>[Enter]</b> to save the selection.</p>
RTS Delay Mode	<p>Select from one of two modes for the Ready-to-Send (RTS) delay mode.</p> <p><b>Message Delay Mode</b> - After the Modbus Master port raises RTS, a delay timer starts. The length of the delay is determined by the value in the <b>Delay</b> field. No message is sent until after this delay expires. The value of CTS does not affect the operation of this mode.</p> <p><b>CTS Timeout Mode</b> - After the Modbus Master port raises RTS, it uses the <b>Delay</b> 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 <b>Delay</b> it does not respond to the slave and instead reports an error.</p> <p>Press <b>[Enter]</b> to save the selection.</p>
Delay msec	<p>Specify the <b>Delay</b> (in milliseconds) used by the <b>RTS Delay Mode and CTS Timeout Mode</b>. Press <b>[Enter]</b> to save the selection.</p>
Time Out msec	<p>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 <b>[Enter]</b> to save the selection.</p>
Collection Rate msec	<p>Specify the interval (in milliseconds) between poll attempts by the Modbus master. Press <b>[Enter]</b> to save the selection.</p>
Start Register	<p>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</p>

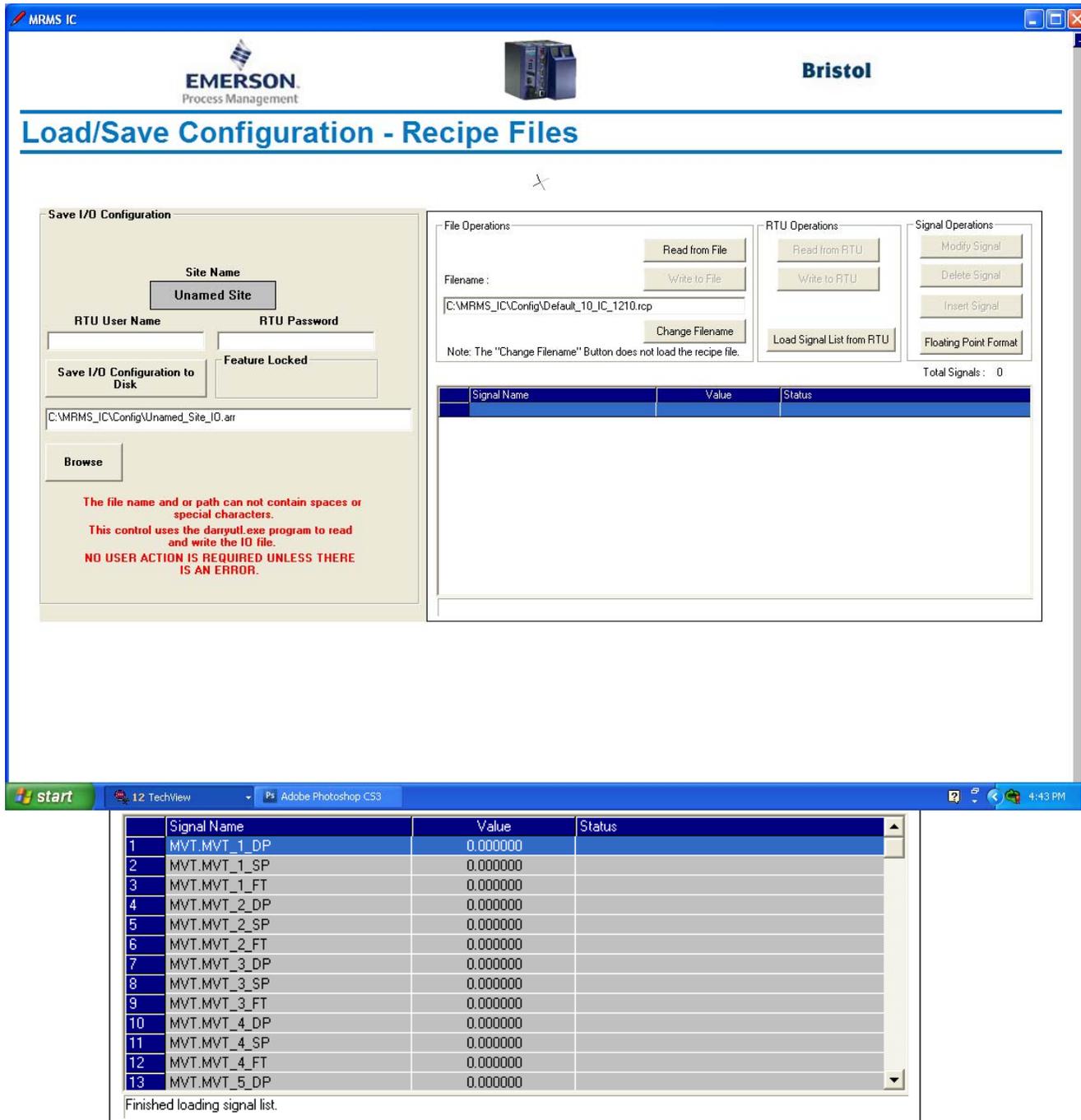
<b>Field</b>	<b>Description</b>
	3. Press <b>[Enter]</b> to save the selection.
<b>Register Count</b>	Specify the number of coils or registers the Master should read. The value can range from 1 to 2000 for coils or 1 to 125 for 16-bit registers, or 1 to 62 for 32-bit registers. Press <b>[Enter]</b> to save the selection.
<b>Disabled/Enabled</b>	If this shows <b>Disabled</b> , click on it to enable the Modbus Master.
<b>Status</b>	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 <i>Appendix E – Errors and Troubleshooting</i> for more information.
<b>List Number</b>	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  button on the I/O tab to activate the Load/Save Configuration page.



The screenshot shows the 'Load/Save Configuration - Recipe Files' window. The 'Save I/O Configuration' section includes a 'Site Name' field with 'Unnamed Site', 'RTU User Name', and 'RTU Password' fields, and a 'Save I/O Configuration to Disk' button. The 'File Operations' section has a 'Filename' field containing 'C:\MRMS\_IC\Config\Default\_10\_IC\_1210.rcp' and buttons for 'Read from File', 'Write to File', and 'Change Filename'. The 'RTU Operations' section has buttons for 'Read from RTU', 'Write to RTU', and 'Load Signal List from RTU'. The 'Signal Operations' section has buttons for 'Modify Signal', 'Delete Signal', 'Insert Signal', and 'Floating Point Format'. A table at the bottom displays the following data:

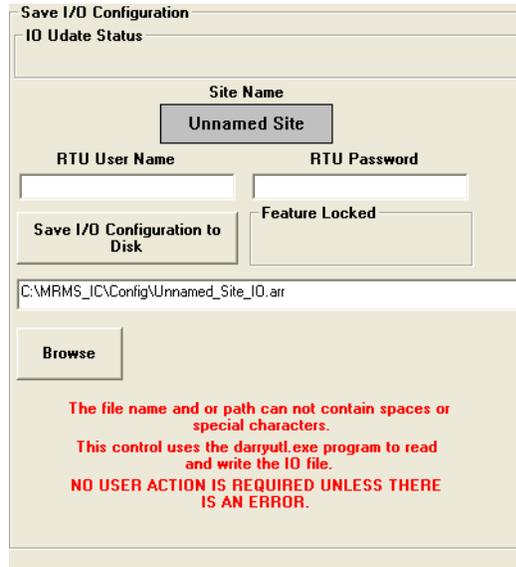
Signal Name	Value	Status
1 MVT.MVT_1_DP	0.000000	
2 MVT.MVT_1_SP	0.000000	
3 MVT.MVT_1_FT	0.000000	
4 MVT.MVT_2_DP	0.000000	
5 MVT.MVT_2_SP	0.000000	
6 MVT.MVT_2_FT	0.000000	
7 MVT.MVT_3_DP	0.000000	
8 MVT.MVT_3_SP	0.000000	
9 MVT.MVT_3_FT	0.000000	
10 MVT.MVT_4_DP	0.000000	
11 MVT.MVT_4_SP	0.000000	
12 MVT.MVT_4_FT	0.000000	
13 MVT.MVT_5_DP	0.000000	

Finished loading signal list.

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.



Save I/O Configuration

IO Update Status

Site Name  
Unnamed Site

RTU User Name      RTU Password

Save I/O Configuration to Disk      Feature Locked

C:\MRMS\_IC\Config\Unnamed\_Site\_IO.arr

Browse

The file name and or path can not contain spaces or special characters.  
This control uses the darryutl.exe program to read and write the IO file.  
**NO USER ACTION IS REQUIRED UNLESS THERE IS AN ERROR.**

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

The screenshot shows a software interface for creating a recipe. It is divided into three main sections: File Operations, RTU Operations, and Signal Operations. Below these are buttons for 'Read from File', 'Write to File', 'Change Filename', 'Read from RTU', 'Write to RTU', 'Load Signal List from RTU', 'Modify Signal', 'Delete Signal', 'Insert Signal', and 'Floating Point Format'. A text box shows the filename 'C:\MRMS\_IC\Config\Default\_10\_IC\_1210.rcp'. A note states: 'Note: The "Change Filename" Button does not load the recipe file.' The total number of signals is 78.

Signal Name	Value	Status
1 MVT.MVT_1_DP	0.000000	
2 MVT.MVT_1_SP	0.000000	
3 MVT.MVT_1_FT	0.000000	
4 MVT.MVT_2_DP	0.000000	
5 MVT.MVT_2_SP	0.000000	
6 MVT.MVT_2_FT	0.000000	
7 MVT.MVT_3_DP	0.000000	
8 MVT.MVT_3_SP	0.000000	
9 MVT.MVT_3_FT	0.000000	
10 MVT.MVT_4_DP	0.000000	
11 MVT.MVT_4_SP	0.000000	
12 MVT.MVT_4_FT	0.000000	
13 MVT.MVT_5_DP	0.000000	

Finished loading signal list.

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.

The dialog box is titled 'Insert Signal Property at Row 4819'. It has two input fields: 'Name:' with the value '@GV\_T1\_MAX\_DE' and 'Value:' with the value '50.0'. There are 'OK' and 'Cancel' buttons.

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**.

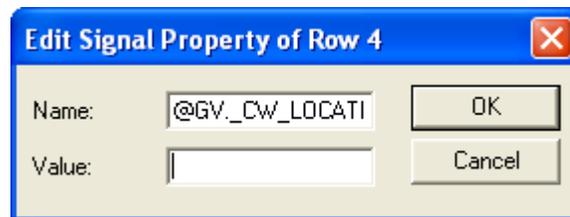


Figure 2-17. Edit Signal Property

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.)

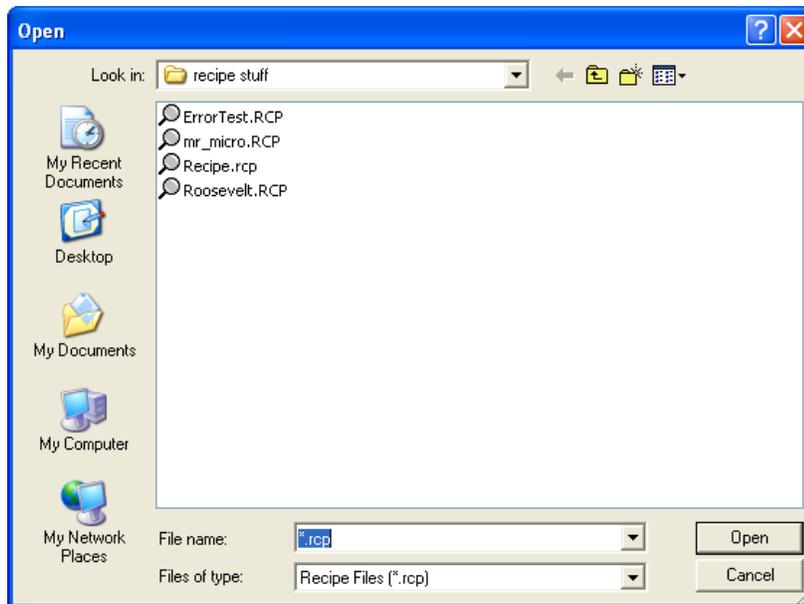


Figure 2-18. Saving the Recipe

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

## Time Set/Daylight Saving Time

Current RTU Date and Time

Current PC Date and Time

Year  > 1977

Month  1 ... 12

Day  1 ... 31

Hour  0 ... 23

Minutes  0 ... 59

Seconds  0 ... 59

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

Field	Description
<b>Current RTU Date and Time</b>	This read-only field shows the current date and time setting at the controller.
<b>Current PC Date and Time</b>	This read-only field shows the current date and time at the PC workstation.
<b>Clear Registers</b>	Click this button to set all six time registers ( <b>Year, Month, Day, Hour, Minutes and Seconds</b> ) to zero.
<b>Load Registers with the RTUs Date/Time</b>	Click this button to store the controller time in the six time registers.
<b>Load Registers with the PCs Date/Time</b>	Click this button to store the PC workstation time in the six time registers.
<b>Year</b>	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.
<b>Month</b>	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.
<b>Day</b>	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.

<b>Field</b>	<b>Description</b>
<b>Hour</b>	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.
<b>Minutes</b>	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.
<b>Seconds</b>	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.
<b>Set RTU Date/Time with Register Values</b>	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.

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### 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.

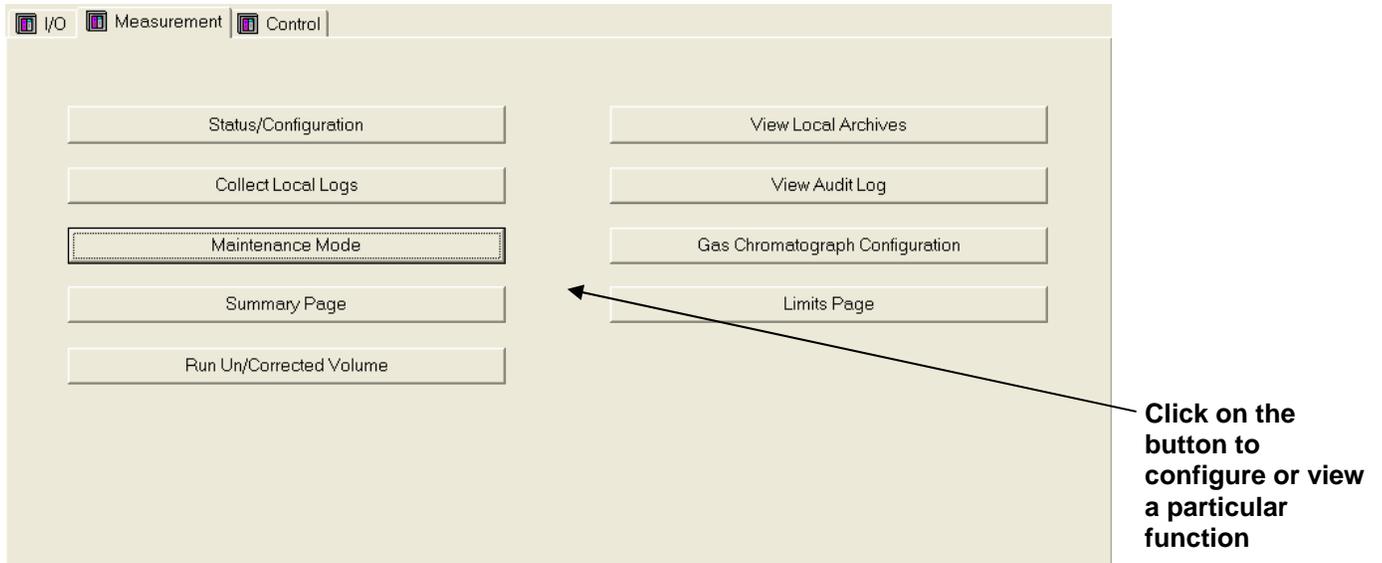


Figure 3-1. Measurement Tab in MRMS-IC

## 3.2 Status/Configuration

When you click the  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.

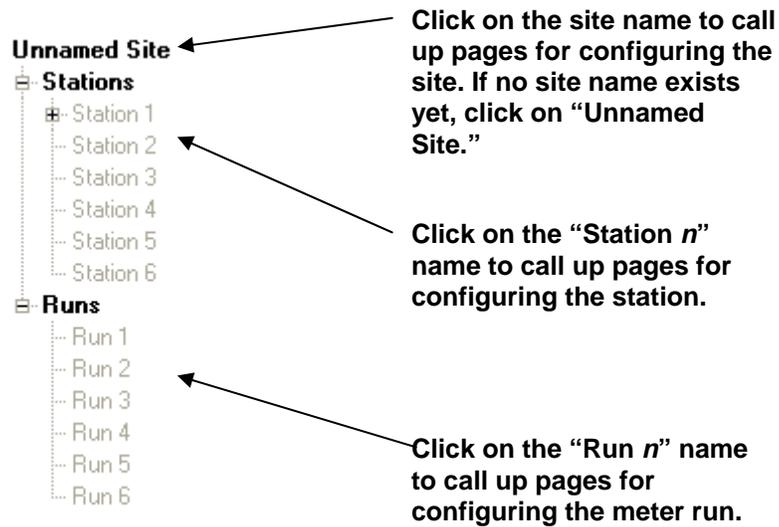


Figure 3-2. Selecting the Site, Stations, and Runs

### 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						
<u>Site Name</u>	The <b>site</b> 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 <b>[Enter]</b> key to save your entry.						
<u>Software</u>							
<b>Program Name</b>	This read-only field shows the name of the MRMS-IC software installed on the RTU.						
<b>Revision</b>	This read-only field shows the revision of the MRMS-IC software running on the RTU.  The revision is in the format <i>V.v Rnn</i>  Where:  <table style="margin-left: 40px;"> <tr> <td><i>V</i></td> <td>is the major version number</td> </tr> <tr> <td><i>v</i></td> <td>is the minor version number</td> </tr> <tr> <td><i>Rnn</i></td> <td>is the revision build number, if this is a revision release of the software.</td> </tr> </table>	<i>V</i>	is the major version number	<i>v</i>	is the minor version number	<i>Rnn</i>	is the revision build number, if this is a revision release of the software.
<i>V</i>	is the major version number						
<i>v</i>	is the minor version number						
<i>Rnn</i>	is the revision build number, if this is a revision release of the software.						
<u>PLC Firmware</u>	These fields refer to the ControlWave internal system firmware that controls operation the ControlWave Micro.						

<b>Major</b>	This read-only field shows the major revision number of the system firmware running in the ControlWave Micro.
<b>Minor</b>	This read-only field shows the minor revision number of the system firmware running in the ControlWave Micro.
<b>OBSI Version</b>	Reserved for future use.
<b>Load Versions</b>	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.
<b>RAM: Name</b>	This read-only field shows the name of the ControlWave project executing in the ControlWave Micro's SDRAM.
<b>RAM: Date</b>	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 <i>mm/dd/yyyy</i> where <i>mm</i> is the two-digit month (01 to 12), <i>dd</i> is the two-digit day (01 to 31), and <i>yyyy</i> is the four-digit year. Timestamps are in the format <i>hh:mm:ss</i> where <i>hh</i> is the 2-digit hour (0 to 23), <i>mm</i> is the 2-digit minute (0 to 59) and <i>ss</i> is the two-digit second (0 to 59).
<b>BOOTFILE: Name</b>	This read-only field shows the name of the ControlWave bootproject stored in FLASH at the ControlWave Micro.
<b>BOOTFILE: Date</b>	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 <i>mm/dd/yyyy</i> where <i>mm</i> is the two-digit month (01 to 12), <i>dd</i> is the two-digit day (01 to 31), and <i>yyyy</i> is the four-digit year. Timestamps are in the format <i>hh:mm:ss</i> where <i>hh</i> is the 2-digit hour (0 to 23), <i>mm</i> is the 2-digit minute (0 to 59) and <i>ss</i> is the two-digit second (0 to 59).
<b>Status</b>	<p>This read-only field shows <b>Match</b> if the name and date of the ControlWave project executing in SDRAM is identical to that for the bootproject stored in FLASH.</p> <p>If this field shows <b>Mismatch</b> this indicates that the ControlWave project executing in SDRAM is <b>not</b> the same as the bootproject.</p> <p>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.</p>
<b>PLC Time</b>	This read-only field shows the current date and time stamps of the ControlWave Micro's real time clock. Dates use the format <i>mm/dd/yyyy</i> where <i>mm</i> is the two-digit month (01 to 12), <i>dd</i> is the two-digit day (01 to 31), and <i>yyyy</i> is the four-digit year. Timestamps are in the format <i>hh:mm:ss</i> where <i>hh</i> is the 2-digit hour (0 to 23), <i>mm</i> is the 2-digit minute (0 to 59) and <i>ss</i> is the two-digit second (0 to 59).

<u>PLC Identification</u>	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 <b>CWM</b> .
<u>Power</u>	These fields show information about power status at the ControlWave Micro.
<b>DC</b>	This read-only field shows the DC voltage level at the ControlWave Micro's power supply sequencer module (PSSM).
<u>Detected I/O</u>	These fields show the types of I/O modules detected by the MRMS-IC as being installed in the ControlWave Micro.
<b>Slot <i>n</i></b>	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.
<u>Total Points</u>	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.
<b>Als</b>	This read-only field shows the total number of analog inputs residing across all I/O modules detected by the MRMS-IC application.
<b>AOs</b>	This read-only field shows the total number of analog outputs residing across all I/O modules detected by the MRMS-IC application.
<b>DIs</b>	This read-only field shows the total number of discrete inputs residing across all I/O modules detected by the MRMS-IC application. <b>Note:</b> This count includes all possible DIs, including a DI/DO point configured as a DO.
<b>DOs</b>	This read-only field shows the total number of discrete outputs residing across all I/O modules detected by the MRMS-IC application. <b>Note:</b> This count includes all possible DOs, including a DI/DO point configured as a DI.
<b>HSCs</b>	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.
<b>RTDs</b>	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.
<b>TCs</b>	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).

The screenshot shows the 'MVT Common Settings' tab with the following values:

- Collect Process Variable (PV) Data every: 750 msec
- Collect Diagnostic Data every: 60000 msec
- Indicate Communications Failure when No Response after: 60000 msec
- Maximum Monitor Count: 500 msec

\* These settings are common for all MVT devices

Figure 3-4. MVT Common Settings tab

Field	Description
<b>Collect Process Variable (PV) Data every msec</b>	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 <b>[Enter]</b> key to save your entry.
<b>Collect Diagnostic Data every msec</b>	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 <b>[Enter]</b> key to save your entry.
<b>Indicate Communications Failure when No Response after msec</b>	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.
<b>Maximum Monitor Count</b>	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)

Site Configuration Data		MVT Common Settings		Station Summaries	
<b>Station 1 (Station 1)</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd	0.0	0.0	0.0	0.0	
Rev	0.0	0.0	0.0	0.0	
<b>Station 2 (Station 2)</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd	0.0	0.0	0.0	0.0	
Rev	0.0	0.0	0.0	0.0	
<b>Station 3 (Station 3)</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd	0.0	0.0	0.0	0.0	
Rev	0.0	0.0	0.0	0.0	
<b>Station 4 (Station 4)</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd	0.0	0.0	0.0	0.0	
Rev	0.0	0.0	0.0	0.0	
<b>Station 5 (Station 5)</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd	0.0	0.0	0.0	0.0	
Rev	0.0	0.0	0.0	0.0	
<b>Station 6</b>					
	<b>Flow Rate</b>	<b>Energy Rate</b>	<b>Today's Volume</b>	<b>Today's Energy</b>	
Fwd					
Rev					

Figure 3-5. Station Summaries tab

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

Field	Description
Station <i>n</i>	Identifies one of the six stations.
<b>Flow Rate Fwd</b>	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).
<b>Flow Rate Rev</b>	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.)
<b>Energy Rate Fwd</b>	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).
<b>Energy Rate Rev</b>	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.)
<b>Today's Volume Fwd</b>	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.

Station Configuration		Station Data	
Station Name			
Station 1			
Station Common Settings			
	Value	Units	
Atmospheric Pressure	14.700	PSI	
Base Pressure	14.730	PSI	
Base Temperature	60.000	Deg F	
Contract Hour	9		
Flowing Units			
Flow Rate Units	E3M3/DAY		
Energy Rate Units	GJ	Energy Rate Time Units	DAY
UC Flow Rate Units	E3M3/HOUR		
Gas Chromatograph			
BTU Saturation Setting	Chromatograph Data Set	Compressibility Calc	Gross Method
Dry BTU	Set to 0 to Enable Run Setting 1	AGA8 Gross	HV, SG, CO2
Calculations Uses			
GC			
Averaging			
Averaging Method*		Upon Flow Failure Use	
Flow Weighted Linear Avg		Flow Weighted	
* If NX-19 is selected then none of the runs associated with this station can be configured as orifice type.			

Figure 3-6. Station Configuration tab

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

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(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**

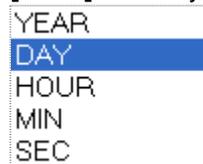
Select the desired units of measure for the energy rate from the drop-down menu and press **[Enter]** to save your selection.

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.

SG, CO2, N2  
 HV, SG, CO2

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)
-------------	--

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HV, SG, CO2	and carbon dioxide (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).
-------------	--

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

---

<b>Calculations Uses</b>	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 <b>Fixed - Scheduled</b> button to use fixed data during a GC failure, or the <b>GC</b> button to use in-use GC data during a GC failure.
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#### Averaging

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<b>Averaging Method</b>	Use the drop-down menu to select the averaging method you want MRMS-IC to use, and press the <b>[Enter]</b> key to save your selection.
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<b>Upon Flow Failure Use</b>	This setting determines whether the MRMS-IC application uses a flow weighted average, or a straight average during a no flow condition. Click the <b>Flow Weighted</b> button to use a flow weighted average when there is no flow. Click the <b>Straight Average</b> button to use a straight average when there is no flow.
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### 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.

Station Configuration		Station Data			
<b>Current Station Rates</b>					
		Flow Rate ( E3M3/DAY )		Energy Rate (THERM/DAY)	
Forward	<input type="text" value="0.00"/>	Forward	<input type="text" value="0.00"/>	Reverse	<input type="text" value="0.00"/>
Reverse	<input type="text" value="0.00"/>	Reverse	<input type="text" value="0.00"/>	Reverse	<input type="text" value="0.00"/>
<b>Station Accumulations</b>					
		Volume ( E3M3 )		Energy ( GJ )	
		Forward	Reverse	Forward	Reverse
Current Hour	<input type="text" value="0.00"/>				
Previous Hour	<input type="text" value="0.00"/>				
Current Contract Day	<input type="text" value="0.00"/>				
Previous Contract Day	<input type="text" value="0.00"/>				
Current Contract Month	<input type="text" value="0.00"/>				
Previous Contract Month	<input type="text" value="0.00"/>				

Figure 3-7. Station Data tab

### 3.2.6 Run Configuration Tab

The screenshot shows the 'Run Configuration' tab with the following settings:

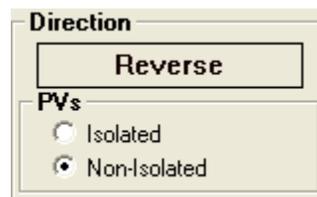
- Run ID:** Run 1
- Measurement Type:** Orifice
- Direction:** Forward
- Station Assignment:** Station 1
- Chromatograph Data Set:** 1 (Note: Station GC Data Set Must Be Set To 0 To Enable This Setting)
- Static Pressure:**
  - Source: Hardware AI
  - MVT#: None
  - Override/Live: Live
  - Value: -24.978
  - Units: KPA
- Flowing Temperature:**
  - Source: Hardware AI
  - MVT#: None
  - Override/Live: Live
  - Value: -24.970
  - Units: DEG\_C
- Flowing Units:**
  - Flow Rate Units: E3M3/DAY
  - UC Flow Rate Units: E3M3/HOUR
  - Energy Rate Units: GJ
  - Energy Rate Time Units: DAY

Figure 3-8. Run Configuration tab

Field	Description
<u>Run ID</u>	Enter a name and press the <b>[Enter]</b> key to save your entry. The generic Run ID of Run 1 will be replaced by the user specific Run ID.
<u>Measurement Type</u>	Select the measurement type from the drop-down menu.
<u>Chromatograph Data Set</u>	<p>The chromatograph stream used for measurement of this run may be assigned at the Station level, or at the Run level.</p> <p>If a chromatograph stream is assigned at the Station level, the user will be unable to assign the stream at the run level.</p>  <p>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.</p>
<u>Direction</u>	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.
<u>PVs</u>	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

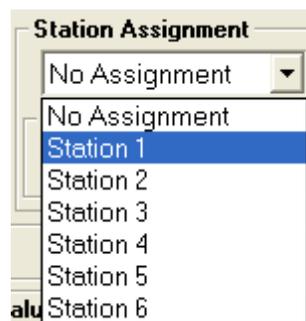
between Isolated and Non-Isolated PVs.  
**Isolated PV** is used when the forward run and reverse run each are using different Input Sources.

**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.

<b>Override/Live</b>	<p>The user may override the measurement values in use by selecting Override instead of Live</p> <p>When Override is selected, the user may enter the desired value for the measurement to be used.</p> <p>When Live is selected, the Value will be driven by the appropriate input value.</p> <p><b>Note:</b> 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.</p> <p><b>Note:</b> 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.</p>
<b>Value</b>	<p>The static pressure and flowing temperature values in use are shown here.</p> <p>When "Live" is selected via the "Override/Live" button, this value is the value coming from the Static Pressure or Flowing Temperature Source.</p> <p>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.</p>
<b>Units</b>	<p>The units for the measurement inputs come from the input source.</p>
<b>Flowing Units</b>	<p>Flow Rate and Energy Rate units may be assigned on a per run basis.</p> <p><u>Flow Rate Units</u> 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</p>

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  
MMBTU  
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

MMBTU – 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.

Run Configuration		Orifice		Turbine		Auto-Adjust		Ultrasonic	
PD		<b>Alarm Configuration</b>		PV/GQ Averages		Linearization Config			
<b>Alarms</b>									
		<b>High High Limit</b>	<b>High Limit</b>	<b>Low Limit</b>	<b>Low Low Limit</b>	<b>Enable/Disable</b>			
<b>Flow Rate</b>			0.000	9.599		Disabled			
<b>Diff. Pressure*</b>	0.000	0.000	0.000	0.000	0.000	Disabled			
<b>Static Pressure</b>	0.000	0.000	0.000	0.000	0.000	Disabled			
<b>Temperature</b>	0.000	0.000	0.000	0.000	0.000	Disabled			
<b>Beta Ratio*</b>		0.600	0.150			Disabled			
<b>Speed of Sound**</b>		0.000				Disabled			
<b>Frequency***</b>	0.000	0.000	0.000	0.000	0.000	Disabled			
<small>* Only active for orifice type measurement.  ** Only active for ultrasonic type measurement.  *** Only active for Linear type measurement</small>									

Figure 3-9. Alarm Configuration tab

The following items may be configured for alarms.

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

<b>Temperature</b>	For all meter types, High-High, High, Low, and Low-Low alarm limits may be set for the flowing temperature input.
<b>Beta Ratio</b>	For an orifice meter only, High and Low alarm limits may be set for the calculated beta ratio.
<b>Speed of Sound</b>	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.
<b>Frequency</b>	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.
<b>Enabled/Disabled</b>	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.

Linearization Run 2	
m3/H	C Factor
0.0000	1.0000
10.0000	1.0000
20.0000	1.0000
30.0000	1.0000
40.0000	1.0000
50.0000	1.0000
60.0000	1.0000
70.0000	1.0000
80.0000	1.0000
90.0000	1.0000
100.0000	1.0000
110.0000	1.0000

Figure 3-10. Linearization Config tab

This linearization table must be configured by the user. Click the **Push to Edit Values** button to make 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.

Run Configuration		Orifice		Turbine		Auto-Adjust		Ultrasonic	
PD		Alarm Configuration		PV/GQ Averages		Linearization Config			
<b>PV Averages</b>									
	<b>Current</b>	<b>Current Hour Avg</b>	<b>Previous Hour Avg</b>						
DP	-24.984	-24.984	0.000						
SP	-24.990	-24.990	0.000						
FTEMP	-24.986	-24.986	0.000						
<b>GQ Averages</b>									
	<b>Current</b>	<b>Current Hour Avg</b>	<b>Previous Hour Avg</b>		<b>Current</b>	<b>Current Hour Avg</b>	<b>Previous Hour Avg</b>		
HT Val	0.000	0.000	0.000	C6	0.000	0.000	0.000		
SG	0.000	0.000	0.000	C7	0.000	0.000	0.000		
N2	0.000	0.000	0.000	C8	0.000	0.000	0.000		
CO2	0.000	0.000	0.000	C9	0.000	0.000	0.000		
CH4	0.000	0.000	0.000	C10	0.000	0.000	0.000		
C2	0.000	0.000	0.000	H20	0.000	0.000	0.000		
C3	0.000	0.000	0.000	H2S	0.000	0.000	0.000		
IC4	0.000	0.000	0.000	H2	0.000	0.000	0.000		
NC4	0.000	0.000	0.000	CO	0.000	0.000	0.000		
IC5	0.000	0.000	0.000	O2	0.000	0.000	0.000		
NC5	0.000	0.000	0.000	HE	0.000	0.000	0.000		
				AR	0.000	0.000	0.000		

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**.

**Measurement Type**

Orifice

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

PD	Alarm Configuration	PV/GQ Averages	Linearization Config
Run Configuration	<b>Orifice</b>	Turbine	Auto-Adjust
			Ultrasonic
<b>Settings</b>			
Orifice Diameter	Pipe Diameter	Low Flow Cutoff	Pressure Tap Location
2.00000 INCH	4.071 INCH	0.250 In/H2O	Up Stream
<b>Differential Pressure</b>			
Source	MVT#	<input checked="" type="radio"/> Default AI <input type="radio"/> Stacked DP	Override/Live
Hardware AI	None		Live
			Value
			-24.970
			Units
			KPA
<b>Stacked Transmitters</b>			
	Set Point	0.000	
	Dead Band	0.000	
<b>Current Rates</b>			
Flow Rate	Units	Energy Rate	Units
0.000	E3M3/DAY	0.000	GJ/DAY
<b>Plate Change</b>			
	Elapsed Time	New Orifice Diameter	Beta Ratio
Normal [Inactive]	00 00:00:00.000	2.00000 INCH	0.491
<b>Min/Max Rates for this Run</b>			
Minimum Flow Rate	Units	Maximum Flow Rate	Units
9.599	E3M3/DAY	0.000	E3M3/DAY

Figure 3-12. Orifice tab

Field	Description
<b>Settings</b>	
<b>Orifice Diameter</b>	The Orifice Diameter in use is displayed in the "Settings" section of this screen. To change the orifice diameter, see the "Plate Change" section.
<b>Pipe Diameter</b>	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.

<b>Value</b>	<p>The differential pressure value in use is shown here.</p> <p>When "Live" is selected via the "Override/Live" button, this value is the value coming from the Differential Pressure Source.</p> <p>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.</p>
<b>Units</b>	The units for the measurement inputs come from the input source.
<b><u>Stacked Transmitters</u></b>	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."
<b>Set Point</b>	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.
<b>Dead Band</b>	A deadband may be entered, that will prevent the measurement from switching back and forth between the high and low transmitters.
<b><u>Current Rate</u></b>	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.
<b><u>Plate Change</u></b>	<p>To change the orifice diameter, the user must change the Plate Change mode from Normal (Inactive) to Plate Change (Active)</p> <p>While the Plate Change mode is Active, the Differential Pressure, Static Pressure and Temperature values are frozen.</p>
<b>Elapsed Time</b>	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.



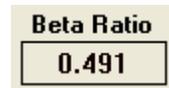
The screenshot shows a configuration window titled "New Orifice Diameter". It contains two input fields: the first field contains the numerical value "2.00000" and the second field contains the unit "INCH".

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 screenshot shows a configuration window titled "Beta Ratio". It contains a single input field with the numerical value "0.491".

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.

PD	Alarm Configuration	PV/GQ Averages	Linearization Config	
Run Configuration	Orifice	<b>Turbine</b>	Auto-Adjust	Ultrasonic
<b>Settings</b>				
<b>HSC#</b>	<b>Maximum Input</b>	<b>Low Flow Cutoff</b>	<b>Correction Factor (K)</b>	
Default HSC	5000.000 Frequency (Hz)	0.000 Frequency (Hz)	1.000	m3/Pulse
<b>Linearization</b>		<b>C Factor</b>		
Disabled		1.000		
<b>Current</b>				
<b>Counts</b>	<b>Pulse Counter Input Override/Live</b>	<b>Frequency (Hz)</b>	<b>Correction Factor/Pulse/Second</b>	<b>(K) Used</b>
0.000	Live	0.000	0.041	35.315
<b>Corrected Flow Rate</b>		<b>Energy Rate</b>		<b>Uncorrected Flow Rate</b>
0.000	E3M3/DAY	0.000	GJ/DAY	0.000 E3M3/HOUR
<b>Min/Max Rates for this Run</b>				
<b>Minimum Flow Rate</b>		<b>Units</b>	<b>Maximum Flow Rate</b>	<b>Units</b>
25088.293		E3M3/DAY	451589.313	E3M3/DAY

Figure 3-13. Turbine tab

Field	Description
<u>Settings</u>	
<b>HSC#</b>	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.
<b>Maximum Input</b>	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
<b>Low Flow Cutoff</b>	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.

<b>Correction Factor (K)</b>	<p>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.</p>
<b>Linearization Enabled / Disabled</b>	<p>Enables/disables use of the linearization table.</p>
<b>C Factor</b>	<p>The current linearization factor being used.</p>
<b>Current Counts</b>	<p>The "Counts" value represents the total number of events (pulses) in the most recent execution cycle coming from the High Speed Counter Input.</p>
<b>Pulse Counter Input Override / Input</b>	<p>The user may override the measurement values in use by selecting Override instead of Live</p> <p>When Override is selected, the user may enter the desired value for the frequency to be used.</p> <p>When Live is selected, the Value will be driven by the appropriate high speed counter input value.</p> <p><b>Note:</b> 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.</p> <p><b>Note:</b> 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.</p>
<b>Frequency (Hz)</b>	<p>The frequency value in use is shown here.</p> <p>When "Live" is selected via the "Override/Live" button, this value is the value coming from the HSC input.</p> <p>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.</p>
<b>Correction Factor / Pulse/ Second</b>	<p>This is the correction factor calculated by the AGA 7 equation.</p> <p>This correction factor multiplied by the frequency will</p>

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.

PD	Alarm Configuration	PV/GQ Averages	Linearization Config
Run Configuration	Orifice	Turbine	<b>Auto-Adjust</b>
<b>Settings</b>			
<b>Low Flow Cutoff</b> <input type="text" value="0.000"/> ACF/s	<b>Main Rotor Factor (Km)</b> <input type="text" value="3279.6128"/>	<b>Sense Rotor Factor (Ks)</b> <input type="text" value="5173.5527"/>	<b>Linearization</b> <input type="button" value="Disabled"/>
<b>Max. Meter Flow</b> <input type="text" value="0.000"/> MACF/h	<b>Expected Deviation (Abar)</b> <input type="text" value="9.9189"/>	<b>Devation Error Limit</b> <input type="text" value="0.0000"/>	<b>C Factor</b> <input type="text" value="1.0000"/>
<b>Current</b>			
<b>Main Rotor Count Input</b> <input type="text" value="0.0000"/>	<b>Sense Rotor Count Input</b> <input type="text" value="0.0000"/>	<b>ACF/s (DeltaVa)</b> <input type="text" value="0.000"/>	<b>Deviation (Delta ABar)</b> <input type="text" value="0.000"/>
<b>Corrected Flow Rate</b> <input type="text" value="0.000"/> E3M3/DAY	<b>Energy Rate</b> <input type="text" value="0.000"/> GJ/DAY	<b>Uncorrected Flow Rate</b> <input type="text" value="0.000"/> E3M3/HOUR	
<b>Min/Max Rates for this Run</b>			
<b>Minimum Flow Rate</b> <input type="text" value="0.000"/>	<b>Units</b> <input type="text" value="E3M3/DAY"/>	<b>Maximum Flow Rate</b> <input type="text" value="0.000"/>	<b>Units</b> <input type="text" value="E3M3/DAY"/>

Figure 3-14. Auto-Adjust tab

Field	Description
<b>Settings</b>	
<b>Low Flow Cutoff</b>	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.
<b>Main Rotor Factor (Km)</b>	The main rotor is the upstream rotor and has a greater blade angle to the flow of gas.
<b>Sense Rotor Factor (Ks)</b>	The sense rotor is the downstream rotor and has a shallower blade angle to the flow of gas.
<b>Linearization Enabled / Disabled</b>	Enable / disable use of the linearization table.
<b>Max Meter Flow</b>	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.
<b>Expected Deviation (Abar)</b>	Average relative adjustment between main and sense rotors.

---

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

---

### 3.2.13 Ultrasonic Tab (Run Configuration)

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

Figure 3-15. Ultrasonic tab

Field	Description
<u>Settings</u>	
<b>HSC#</b>	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.
<b>Maximum Input</b>	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
<b>Low Flow Cutoff</b>	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.
<b>Correction Factor (K)</b>	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.
<u>Current</u>	
<b>Counts</b>	The “Counts” value represents the event (pulse) total during the most recent execution cycle coming from the High Speed Counter Input.

<b>Pulse Counter Input Override / Live</b>	<p>The user may override the measurement values in use by selecting Override instead of Live</p> <p>When Live is selected, the Value will be driven by the appropriate high speed counter input value.</p> <p><b>Note:</b> 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.</p> <p><b>Note:</b> 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.</p>
<b>Frequency (Hz)</b>	When Override is selected, the user may enter the desired value for the frequency to be used.
<b>Correction Factor / Pulse/ Second</b>	<p>This is the correction factor calculated by the AGA 7 equation.</p> <p>This correction factor multiplied by the frequency will provide the corrected flow rate.</p>
<b>(K) Used</b>	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.
<b>Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate</b>	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.
<b>Min / Max Rates for this Run</b>	<p>The minimum and maximum flow rates for an ultrasonic meter run are calculated as follows:</p> $\text{Minimum Flow Rate} = \text{max frequency} * \text{AGA7 Factor} * (\text{Min} / 100)$ $\text{Maximum Flow Rate} = \text{max frequency} * \text{AGA7 Factor} * (\text{Max} / 100)$ <p>Where: Min defaults to 5 Max defaults to 90</p>
<b>Ultrasonic Meter Data</b>	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.
<b>US Meter Number</b>	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.
<b>Speed of Sound</b>	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.

---

<u>Status</u>	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.
---------------	--

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### 3.2.14 PD Tab (Run Configuration)

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

The screenshot shows the PD Tab (Run Configuration) screen with the following data:

Settings	
Maximum Input	5000.0000 Frequency (Hz)
Low Flow Cutoff	0.0 Seconds No pulse received in this number of seconds will zero the flow rate.
Correction Factor (K)	1.000000 m3/Pulse

Current			
Pulse Counter Input	Counts	Frequency (Hz)	
	0.000	0.000000	
		Correction Factor/Pulse/Second	(K) Used
		0.041018	35.315
Corrected Flow Rate	Energy Rate	Uncorrected Flow Rate	
0.000 E3M3/DAY	0.000 GJ/DAY	0.000 E3M3/HOUR	

Min/Max Rates for this Run			
Minimum Flow Rate	Units	Maximum Flow Rate	Units
25088.293	E3M3/DAY	451589.313	E3M3/DAY

Figure 3-16. PD tab

Field	Description
<u>Settings</u>	
<b>Maximum Input</b>	The maximum input is used to calculate the minimum and maximum flow rates through the meter run.
<b>Low Flow Cutoff</b>	<p>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.</p> <p>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.</p>
<b>Correction Factor (K)</b>	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

<b>Counts</b>	This shows the number of pulses received at the high speed counter input.
<b>Frequency (Hz)</b>	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.
<b>Correction Factor / Pulse/ Second</b>	This is the correction factor calculated by the AGA 7 equation. This correction factor multiplied by the frequency will provide the corrected flow rate.
<b>(K) Used</b>	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.
<b>Corrected Flow Rate, Energy Rate, Uncorrected Flow Rate</b>	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.
<u>Min / Max Rates for this Run</u>	The minimum and maximum flow rates for a PD meter run are calculated as shown below:  $\text{Minimum Flow Rate} = \text{max freq} * (\text{Min} / 100) * \text{AGA7 Factor}$ $\text{Maximum Flow Rate} = \text{max freq} * (\text{Max} / 100) * \text{AGA7 Factor}$ 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



The following screen opens:

The screenshot shows a software window with several tabs: 'Collect Data', 'Save Parameters', 'Search Criteria', 'Floating Point Format', and 'File Definition'. The 'File Definition' tab is active. Below the tabs are 'Archive Collection Parameters' (with checkboxes for 'Collect by Name', 'Start from oldest record', and 'Freeze Date/Time'), 'Stats' (with 'Fields Collected' set to 30 and 'Records Collected' set to 24), and input fields for 'File Number' (1) and 'File Name' (R1\_HRLY). A table of records is displayed with columns: Record, DATE/TIME, LSN, GSN, FlwTimeMins, and Volume. To the right, a list of archives is shown, including 'Run 1 15-Minute', 'GC Data Set 1 15-Minute', 'Run 1 Hourly', 'GC Data Set 1 Hourly', 'Run 1 Daily', etc.

Record	DATE/TIME	LSN	GSN	FlwTimeMins	Volume
1	11:00:00.000 13-MAR-2012	862	29114	0.000000	0.000000
2	10:00:00.000 13-MAR-2012	861	29074	0.000000	0.000000
3	09:00:00.000 13-MAR-2012	860	29028	0.000000	0.000000
4	08:00:00.000 13-MAR-2012	859	28986	0.000000	0.000000
5	07:00:00.000 13-MAR-2012	858	28946	0.000000	0.000000
6	06:00:00.000 13-MAR-2012	857	28904	0.000000	0.000000
7	05:00:00.000 13-MAR-2012	856	28864	0.000000	0.000000
8	04:00:00.000 13-MAR-2012	855	28824	0.000000	0.000000
9	03:00:00.000 13-MAR-2012	854	28784	0.000000	0.000000
10	02:00:00.000 13-MAR-2012	853	28744	0.000000	0.000000
11	01:00:00.000 13-MAR-2012	852	28704	0.000000	0.000000
12	00:00:00.000 13-MAR-2012	851	28664	0.000000	0.000000
13	23:00:00.000 12-MAR-2012	850	28618	0.000000	0.000000
14	22:00:00.000 12-MAR-2012	849	28578	0.000000	0.000000
15	21:00:00.000 12-MAR-2012	848	28538	0.000000	0.000000

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.

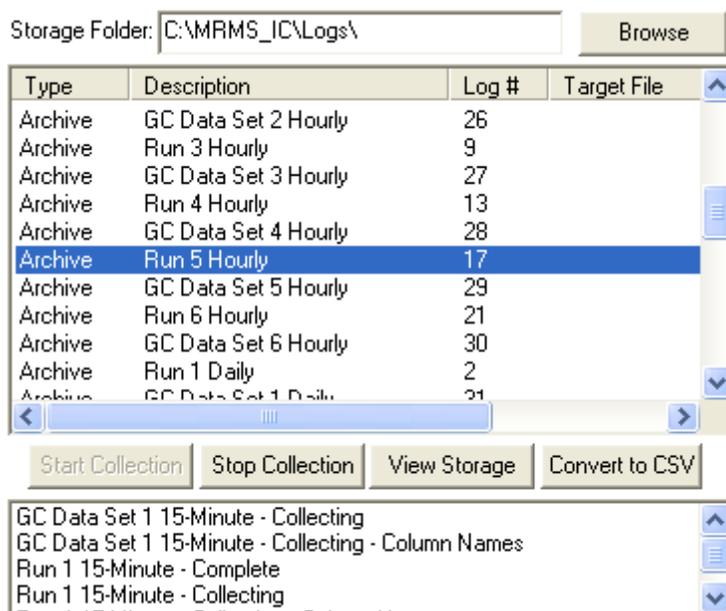


Figure 3-19. Selecting Logs for Collection

### 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.

<b>Field</b>	<b>Description</b>
<b>Site Name</b>	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.
<b>Storage Folder</b>	<p>By default, the storage folder for the Archive collections is C:\Mrms_ic\Logs.</p> <p>This may be changed by clicking on the <b>Browse</b> 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.</p>
<b>Type</b>	The type of log, either Audit or Archive.
<b>Description</b>	A description of the log.
<b>Log #</b>	The log number is populated automatically, when the Archive or Audit is selected from the "Hourly Logs" table
<b>Target File</b>	<p>The Target File name will be automatically created.</p> <p>The file base name will be the Site Name (in this case "Unnamed Site") and the extension will be one of the following:</p> <p><i>Rnn</i> Where R indicates an Archive for a measurement run, and <i>nn</i> indicates the run number.</p> <p><i>Gnn</i> Where G indicates an Archive for a gas chromatograph stream, and <i>nn</i> indicates the stream number</p> <p>AUD Represents the Audit Trail collection.</p> <p>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.</p> <p>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.</p>

**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:

Date/Time	Local Size#	Global Size#	FlatTimeMins	Volume	Energy	AVGSP	AVSFT
21-SEP-10 13:12:04	182	21100	0	0	0	-999999	-999999
21-SEP-10 13:12:04	183	21205	0	0	0	-999999	-999999
21-SEP-10 13:12:04	184	21220	0	0	0	-999999	-999999
21-SEP-10 13:12:04	185	21235	0	0	0	-999999	-999999
21-SEP-10 13:12:04	186	21250	0	0	0	-999999	-999999
21-SEP-10 13:12:04	187	21265	0	0	0	-999999	-999999
21-SEP-10 13:12:08	188	21280	0	0	0	-999999	-999999
21-SEP-10 13:12:08	189	21295	0	0	0	-999999	-999999
21-SEP-10 13:12:08	200	21310	0	0	0	-999999	-999999
21-SEP-10 13:12:08	201	21325	0	0	0	-999999	-999999
21-SEP-10 13:12:08	202	21340	0	0	0	-999999	-999999
21-SEP-10 13:12:08	203	21355	0	0	0	-999999	-999999
21-SEP-10 13:12:08	204	21370	0	0	0	-999999	-999999
21-SEP-10 13:12:08	205	21385	0	0	0	-999999	-999999
21-SEP-10 13:12:12	206	21400	0	0	0	-999999	-999999
21-SEP-10 13:12:12	207	21415	0	0	0	-999999	-999999
21-SEP-10 13:12:12	208	21430	0	0	0	-999999	-999999
21-SEP-10 13:12:12	209	21445	0	0	0	-999999	-999999
21-SEP-10 13:12:12	210	21460	0	0	0	-999999	-999999
21-SEP-10 13:12:12	211	21475	0	0	0	-999999	-999999
21-SEP-10 13:12:12	212	21490	0	0	0	-999999	-999999
21-SEP-10 13:12:12	213	21505	0	0	0	-999999	-999999
21-SEP-10 13:12:16	214	21520	0	0	0	-999999	-999999
21-SEP-10 13:12:16	215	21535	0	0	0	-999999	-999999
21-SEP-10 13:12:16	216	21550	0	0	0	-999999	-999999
21-SEP-10 13:12:16	217	21565	0	0	0	-999999	-999999
21-SEP-10 13:12:16	218	21580	0	0	0	-999999	-999999
21-SEP-10 13:12:16	219	21595	0	0	0	-999999	-999999

**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*

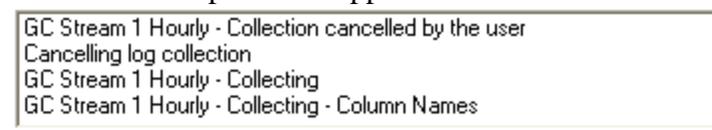
Where:

*sitename* is the Site Name.

*originelextension* 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.



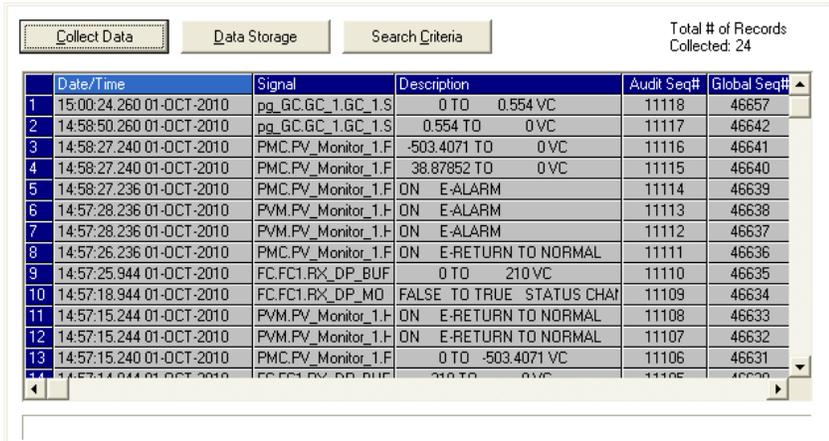
## 3.5 View Audit Log

**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  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



	Date/Time	Signal	Description	Audit Seq#	Global Seq#
1	15:00:24.260 01-OCT-2010	pg_GC.GC_1_GC_1.S	0 TO 0.554 VC	11118	46657
2	14:58:50.260 01-OCT-2010	pg_GC.GC_1_GC_1.S	0.554 TO 0 VC	11117	46642
3	14:58:27.240 01-OCT-2010	PMC.PV_Monitor_1.F	-503.4071 TO 0 VC	11116	46641
4	14:58:27.240 01-OCT-2010	PMC.PV_Monitor_1.F	38.87852 TO 0 VC	11115	46640
5	14:58:27.236 01-OCT-2010	PMC.PV_Monitor_1.F	ON E-ALARM	11114	46639
6	14:57:28.236 01-OCT-2010	PVM.PV_Monitor_1.F	ON E-ALARM	11113	46638
7	14:57:28.236 01-OCT-2010	PVM.PV_Monitor_1.F	ON E-ALARM	11112	46637
8	14:57:26.236 01-OCT-2010	PMC.PV_Monitor_1.F	ON E-RETURN TO NORMAL	11111	46636
9	14:57:25.944 01-OCT-2010	FC.FC1.RX_DP_BUF	0 TO 210 VC	11110	46635
10	14:57:18.944 01-OCT-2010	FC.FC1.RX_DP_MD	FALSE TO TRUE STATUS CHA	11109	46634
11	14:57:15.244 01-OCT-2010	PVM.PV_Monitor_1.F	ON E-RETURN TO NORMAL	11108	46633
12	14:57:15.244 01-OCT-2010	PVM.PV_Monitor_1.F	ON E-RETURN TO NORMAL	11107	46632
13	14:57:15.240 01-OCT-2010	PMC.PV_Monitor_1.F	0 TO -503.4071 VC	11106	46631

Figure 3-20. Audit Log

The buttons associated with audit collection are.

Field	Description
<b>Collect Data</b>	To view the current entries in the Audit Trail, click on the Collect Data button.
<b>Data Storage</b>	To store the collected data, click on the Data Storage button.  <b>Note:</b> 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.
<b>Search Criteria</b>	Click this button to specify search criteria.

### 3.5.1 Data Storage Parameters dialog box

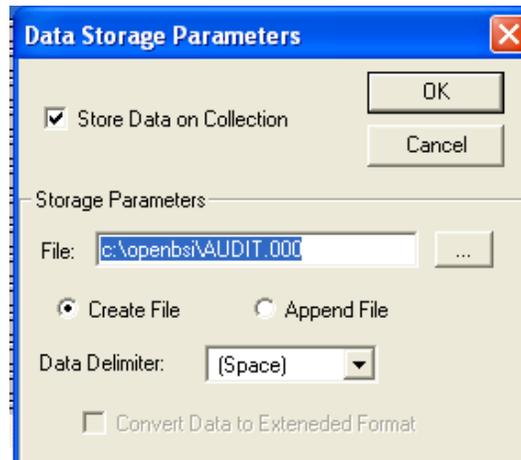


Figure 3-21. Data Storage Parameters dialog box

Field	Description
<b>Store Data on Collection</b>	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.
<b>Storage Parameters</b>	
<b>File</b>	Define the storage location and file name for the collected data.
<b>Create File</b>	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.
<b>Append File</b>	If Append File is selected, newly collected data will be added to previously collected data, in the file of the same name.
<b>Data Delimiter</b>	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#).
<b>Convert Data to Extended Format</b>	Not applicable

### 3.5.2 Search Data Collection Criteria dialog box

The following search criteria may be applied:

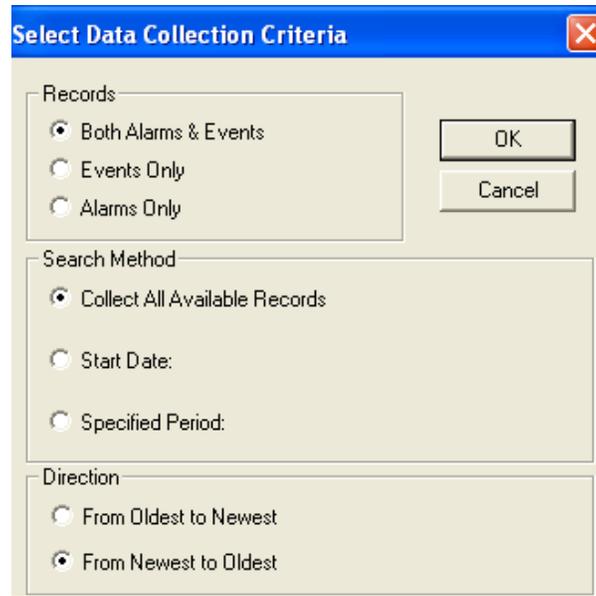
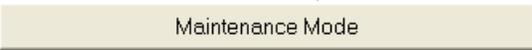


Figure 3-22. Select Data Collection Criteria dialog box

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

The following screen opens:

#### 3.6.1 Site Tab

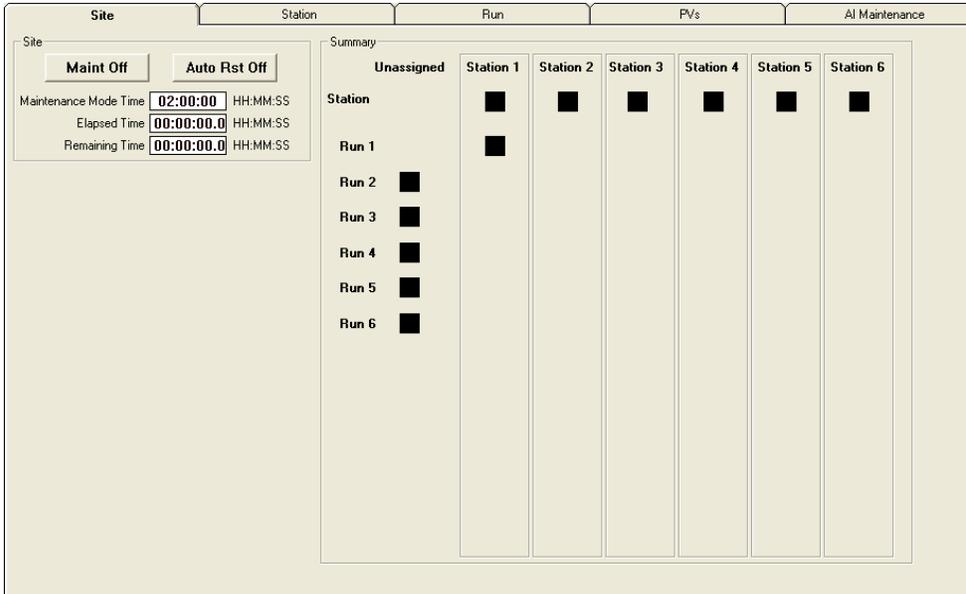


Figure 3-23 Maintenance Mode - Site tab

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
<b>Note:</b> 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

---

Summary	Unassigned	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Station		■	■	■	■	■	■
Run 1		■					
Run 2			■				
Run 3		■					
Run 4			■				
Run 5		■					
Run 6			■				

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
<u>Station <i>n</i></u>	This section of the screen controls the maintenance mode for the selected station.
<b>Maint Off / Maintenance</b>	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
<b>Auto Rst Off</b>	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.  <b>Note:</b> 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.



### 3.6.3 Run Tab

Individual runs may be put into Maintenance Mode.

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

The screenshot displays the 'Run' tab interface for maintenance mode. It features a grid of six run panels, labeled Run 1 through Run 6. Each panel includes a 'Maint Off' button and an 'Auto Reset' button. Below these buttons are three time-related fields: 'Maintenance Mode Time', 'Elapsed Time', and 'Remaining Time', each with a digital display and 'HH:MM:SS' labels. Run 1, 2, and 3 show '02:00:00' for Maintenance Mode Time and '00:00:00.0' for Elapsed and Remaining Time. Runs 4, 5, and 6 show '02:00:00' for Maintenance Mode Time and empty fields for Elapsed and Remaining Time. The top navigation bar includes 'Site', 'Station', 'Run', 'PVs', and 'All Maintenance' tabs.

Figure 3-25. Maintenance Mode - Run tab

Field	Description
<u>Run <i>n</i></u>	This section of the screen controls the maintenance mode for the selected run.
<b>Maint Off / Maintenance</b>	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
<b>Auto Rst Off</b>	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.

<b>Maintenance Mode Time</b>	The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S								
	Where:								
	<table> <tr> <td>DD</td> <td>number of days</td> </tr> <tr> <td>HH</td> <td>number of hours</td> </tr> <tr> <td>MM</td> <td>number of minutes</td> </tr> <tr> <td>SS.S</td> <td>number of seconds (resolution of 10ths)</td> </tr> </table>	DD	number of days	HH	number of hours	MM	number of minutes	SS.S	number of seconds (resolution of 10ths)
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)								
<b>Elapsed Time</b>	This is the amount of time the run has been in maintenance mode.								
<b>Remaining Time</b>	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.

Site		Station		Run		PVs		AI Maintenance																																																																																																																																																																																	
<table border="1"> <thead> <tr> <th colspan="2">Run 1</th> <th colspan="2">Run 2</th> <th colspan="2">Run 3</th> <th colspan="2">Run 4</th> </tr> <tr> <th>Live</th> <th>In Use</th> <th>Live</th> <th>In Use</th> <th>Live</th> <th>In Use</th> <th>Live</th> <th>In Use</th> </tr> </thead> <tbody> <tr> <td>0.0000</td> <td>0.0000</td> <td>-24.9840</td> <td>-24.9840</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> </tr> <tr> <td>-24.9780</td> <td>-24.9780</td> <td>-24.9900</td> <td>-24.9900</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> </tr> <tr> <td>-24.9700</td> <td>-24.9700</td> <td>-24.9860</td> <td>-24.9860</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td colspan="2">Rates</td> <td colspan="2">Rates</td> <td colspan="2">Rates</td> <td colspan="2">Rates</td> </tr> <tr> <td>Flow</td> <td>0.0000</td> <td>Flow</td> <td>0.0000</td> <td>Flow</td> <td>0.0000</td> <td>Flow</td> <td>0.0000</td> </tr> <tr> <td>Energy</td> <td>0.0000</td> <td>Energy</td> <td>0.0000</td> <td>Energy</td> <td>0.0000</td> <td>Energy</td> <td>0.0000</td> </tr> <tr> <td>UC Flow</td> <td>0.0000</td> <td>UC Flow</td> <td>0.0000</td> <td>UC Flow</td> <td>0.0000</td> <td>UC Flow</td> <td>0.0000</td> </tr> <tr> <td colspan="2">Run 5</td> <td colspan="2">Run 6</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <th>Live</th> <th>In Use</th> <th>Live</th> <th>In Use</th> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td colspan="2">Rates</td> <td colspan="2">Rates</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>Flow</td> <td>0.0000</td> <td>Flow</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>Energy</td> <td>0.0000</td> <td>Energy</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td>UC Flow</td> <td>0.0000</td> <td>UC Flow</td> <td>0.0000</td> <td colspan="2"></td> <td colspan="2"></td> </tr> </tbody> </table>										Run 1		Run 2		Run 3		Run 4		Live	In Use	0.0000	0.0000	-24.9840	-24.9840	0.0000	0.0000	0.0000	0.0000	-24.9780	-24.9780	-24.9900	-24.9900	0.0000	0.0000	0.0000	0.0000	-24.9700	-24.9700	-24.9860	-24.9860	0.0000	0.0000	0.0000	0.0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Rates		Rates		Rates		Rates		Flow	0.0000	Flow	0.0000	Flow	0.0000	Flow	0.0000	Energy	0.0000	Energy	0.0000	Energy	0.0000	Energy	0.0000	UC Flow	0.0000	Run 5		Run 6						Live	In Use	Live	In Use					0.0000	0.0000	0.0000	0.0000					0.0000	0.0000	0.0000	0.0000					0.0000	0.0000	0.0000	0.0000					0	0	0	0					0	0	0	0					Rates		Rates						Flow	0.0000	Flow	0.0000					Energy	0.0000	Energy	0.0000					UC Flow	0.0000	UC Flow	0.0000																
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UC Flow	0.0000	UC Flow	0.0000																																																																																																																																																																																						

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
<u>AI Maintenance</u>	This section of the screen controls the maintenance mode for the selected AI input.
<b>Maint Off / Maintenance</b>	To disable the maintenance mode, toggle the button to Maint Off. To enable the maintenance mode, toggle the button to Maintenance.
<b>Auto Rst Off</b>	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.
<b>Maintenance Mode Time</b>	The Maintenance Mode Auto Reset Timer is in the format DD HH:MM:SS.S



## 3.7 Gas Chromatograph Configuration

When you click the  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.

### Gas Chromatograph Configuration

Data Set	Comm Mode	Port	Addr	GC IP Address	Comms	Status	GC Type	Stream	Source
1	<input checked="" type="radio"/> Serial <input type="radio"/> IP	None	1		Disabled	0	Daniels Custom Mapping	1	Gas Chrom.
Status: No Errors						Data Set Date	0	Time	0

Current	Component Ranges	Delta Limit	Normalization	Custom					
When All Disabled, Use Fixed		Fixed Status	Scheduled Status						
Last Good GC		Data Value In Use	No Errors						
		LAST							
<input type="checkbox"/> Allow Local Entry									
Scheduled Data <input type="checkbox"/> Disabled Date <input type="text" value="9999"/> Time <input type="text" value="9999"/>									
	Scheduled	GC	Fixed	In Use		Scheduled	GC	Fixed	In Use
HT Val	1014.0000	1000.0000	1014.0000	1000.0000	C6	0.0000	0.0000	0.0000	0.0000
SG	0.5600	0.6000	0.5600	0.6000	C7	0.0000	0.0000	0.0000	0.0000
N2	0.5000	0.0000	0.5000	0.0000	C8	0.0000	0.0000	0.0000	0.0000
CO2	0.0000	0.0000	0.0000	0.0000	C9	0.0000	0.0000	0.0000	0.0000
CH4	99.0000	89.0000	99.0000	89.0000	C10	0.0000	0.0000	0.0000	0.0000
C2	0.5000	8.0000	0.5000	8.0000	H20	0.0000	0.0000	0.0000	0.0000
C3	0.0000	3.0000	0.0000	3.0000	H25	0.0000	0.0000	0.0000	0.0000
IC4	0.0000	0.0000	0.0000	0.0000	H2	0.0000	0.0000	0.0000	0.0000
NC4	0.0000	0.0000	0.0000	0.0000	CO	0.0000	0.0000	0.0000	0.0000
NeoC5	0.0000	0.0000	0.0000	0.0000	O2	0.0000	0.0000	0.0000	0.0000
IC5	0.0000	0.0000	0.0000	0.0000	HE	0.0000	0.0000	0.0000	0.0000
NC5	0.0000	0.0000	0.0000	0.0000	AR	0.0000	0.0000	0.0000	0.0000
Wobbe Index	0.0000				Totals	100.0000	0.0000	100.0000	

Figure 3-28. Gas Chromatograph Configuration

### 3.7.1 General

Field	Description
<b>Data Set</b>	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.

---

<b>Comm Mode</b>	<p>Communications to the gas chromatograph may be via either a Serial (RS-232 or RS-485) or an IP (Ethernet) connection.</p> <p>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.</p>
<b>Port</b>	<p>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.</p> <p>The serial port must be configured for the proper protocol, baud rate, etc. via the Flash Configuration Profile communication port settings.</p>
<b>Addr</b>	<p>The local address of the gas chromatograph will be specified here.</p> <p>Every gas chromatograph will have a local address (from 1 to 255).</p>
<b>GC IP Address</b>	<p>If the IP communications mode is selected, the IP address of the gas chromatograph will be specified here.</p> <p>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.</p>
<b>Comms</b>	<p>This button will be used to enable or disable communications to the gas chromatograph.</p> <p>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.</p> <p>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.</p>
<b>Status</b>	<p>A status code indicating the health of the communications between the MRMS-IC controller and the chromatograph will be displayed here.</p> <p>If any code other than 0 is displayed here, see <i>Appendix E – Troubleshooting</i>.</p>

---

**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 <i>Section 3.7.6</i> 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.

---

<b>Date</b>	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.
<b>Time</b>	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.

Current					Component Ranges		Delta Limit		Normalization		Custom							
When All Disabled, Use Fixed					Fixed Status				Scheduled Status									
<input type="checkbox"/> Last Good GC					No Errors				No Errors									
					Data Value In Use													
					LAST													
					<input type="checkbox"/> Allow Local Entry				Scheduled Data									
									Disabled		Date		MMDD		HHMM			
									9999		9999		9999		9999			
									Scheduled		GC		Fixed		In Use			
HT Val					1014.0000		1000.0000		1014.0000		1000.0000		C6		0.0000		0.0000	
SG					0.5600		0.6000		0.5600		0.6000		C7		0.0000		0.0000	
N2					0.5000		0.0000		0.5000		0.0000		C8		0.0000		0.0000	
CO2					0.0000		0.0000		0.0000		0.0000		C9		0.0000		0.0000	
CH4					99.0000		89.0000		99.0000		89.0000		C10		0.0000		0.0000	
C2					0.5000		8.0000		0.5000		8.0000		H20		0.0000		0.0000	
C3					0.0000		3.0000		0.0000		3.0000		H2S		0.0000		0.0000	
IC4					0.0000		0.0000		0.0000		0.0000		H2		0.0000		0.0000	
NC4					0.0000		0.0000		0.0000		0.0000		C0		0.0000		0.0000	
NeoC5					0.0000		0.0000		0.0000		0.0000		O2		0.0000		0.0000	
IC5					0.0000		0.0000		0.0000		0.0000		HE		0.0000		0.0000	
NC5					0.0000		0.0000		0.0000		0.0000		AR		0.0000		0.0000	
Wobbe Index					0.0000								Totals		100.0000		0.0000	
															100.0000			

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

Field	Description
When All Disabled, Use Fixed	<p>Enable or Disable the use of fixed data by toggling this button.</p> <p>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.</p> <p>When Enabled, the fixed properties will be used if communications to the gas chromatograph are disabled, or if there is a failure detected.</p>
Data Value in Use	Shows "LAST" when the last good GC value is used, or "FIXED" when a fixed value is used.
Fixed Status	<p>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:</p> <p>No Errors</p> <p>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</p> <p>HtVal Check Fail – Heating value checksum failure.</p>

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.

---

<b>Allow Local Entry</b>	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.
<b>Scheduled Data Disabled / Enabled</b>	<p>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.</p> <p>To enable this feature, toggle the Scheduled Data Disabled/Enabled button.</p>
<b>Date, Time</b>	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.
<b>Scheduled</b>	<p>The Scheduled Data appears when you click this box.</p> <p>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.</p> <p>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.</p>
<b>GC</b>	<p>The data retrieved from the gas chromatograph appears as shown.</p> <p>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.</p>
<b>Component name</b>	The name of the component appears in red if the gas component is out-of-range.
<b>Fixed</b>	<p>The Fixed Data appears as shown.</p> <p>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.</p>

---

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.

Current		Component Ranges		Delta Limit	Normalization	Custom			
DeadBand		BTU	Specific Gravity	Component OOR	All OK	Stale Time	900.0000 Secs		
		2.0000	0.0010						
	Minimum	GC	Maximum	In Use	Minimum	GC	Maximum	Used	
HT Val	650.0000	1000.0000	1200.0000	1000.0000	C6	0.0000	0.0000	1.0000	0.0000
SG	0.5540	0.6000	0.8700	0.6000	C7	0.0000	0.0000	1.0000	0.0000
N2	0.0000	0.0000	15.0000	0.0000	C8	0.0000	0.0000	1.0000	0.0000
CO2	0.0000	0.0000	10.0000	0.0000	C9	0.0000	0.0000	1.0000	0.0000
CH4	75.0000	89.0000	100.0000	89.0000	C10	0.0000	0.0000	1.0000	0.0000
C2	0.0000	8.0000	20.0000	8.0000	H20	0.0000	0.0000	0.5000	0.0000
C3	0.0000	3.0000	12.0000	3.0000	H25	0.0000	0.0000	0.0200	0.0000
IC4	0.0000	0.0000	6.0000	0.0000	H2	0.0000	0.0000	10.0000	0.0000
NC4	0.0000	0.0000	6.0000	0.0000	CO	0.0000	0.0000	3.0000	0.0000
NeoC5	0.0000	0.0000	100.0000	0.0000	O2	0.0000	0.0000	21.0000	0.0000
IC5	0.0000	0.0000	4.0000	0.0000	HE	0.0000	0.0000	0.4000	0.0000
NC5	0.0000	0.0000	4.0000	0.0000	AR	0.0000	0.0000	1.0000	0.0000
BTU Sat	0.0000	950.0000	1200.0000	0.0000	Compressability	0.0000	1.0000	1.5000	0.0000
Wobbe	1000.0000	0.0000	1500.0000	0.0000	TotalUnNmMoleP	90.0000	100.0000	102.0000	0.0000
Total GPM	0.0000	100.0000	100.0100	0.0000	CHDP	0.0000	0.0000	100.0000	0.0000
					Totals	99.0000		100.5000	

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

Field	Description
<b>Deadband BTU</b>	The Deadband to use between GC BTU and MRMS-IC calculated BTU from GC components. This is an absolute value.
<b>Deadband Specific Gravity</b>	The Deadband to use between GC specific gravity and MRMS-IC calculated specific gravity from GC components. This is an absolute value.
<b>Component OOR</b>	Shows "All OK" if all components are within the specified range. Otherwise shows the most recently detected out of range component.
<b>Stale Time</b>	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.
<b>Component name</b>	The name of the component appears in red if the gas component is out-of-range.
<b>Minimum, Maximum</b>	The minimum and maximum values for this gas component
<b>GC</b>	<b>GC</b> When there are no errors from the chromatograph, this data will reflect the most recent data polled from

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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.

Current	Component Ranges	Delta Limit	Normalization	Custom
<b>Component Delta</b>				
<input type="text" value="All OK"/>				
	SG	<input type="text" value="0.1000"/>	NC6	<input type="text" value="0.1000"/>
	N2	<input type="text" value="1.0000"/>	NC7	<input type="text" value="0.1000"/>
	CO2	<input type="text" value="1.0000"/>	NC8	<input type="text" value="0.1000"/>
	CH4	<input type="text" value="3.0000"/>	NC9	<input type="text" value="0.1000"/>
	C2	<input type="text" value="0.5000"/>	NC10	<input type="text" value="0.1000"/>
	C3	<input type="text" value="0.5000"/>	H20	<input type="text" value="0.1000"/>
	IC4	<input type="text" value="0.2500"/>	H2S	<input type="text" value="0.1000"/>
	NC4	<input type="text" value="0.2500"/>	H2	<input type="text" value="0.0010"/>
	Neo C5	<input type="text" value="100.0000"/>	CO	<input type="text" value="0.0010"/>
	IC5	<input type="text" value="100.0000"/>	O2	<input type="text" value="0.0010"/>
	NC5	<input type="text" value="100.0000"/>	HE	<input type="text" value="0.0010"/>
	C6Plus	<input type="text" value="100.0000"/>	AR	<input type="text" value="0.0010"/>
	C9Plus	<input type="text" value="100.0000"/>	CHDP	<input type="text" value="100.0000"/>
	BTU	<input type="text" value="50.0000"/>	BTUSat	<input type="text" value="50.0000"/>
	Wobbe	<input type="text" value="100.0000"/>	Compressability	<input type="text" value="1.5000"/>
	TotalGPM	<input type="text" value="100.0000"/>	TotalUnNmMoleP	<input type="text" value="100.0000"/>

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

Field	Description
<b>Delta Limit</b>	If a gas component has changed beyond the delta limit entered here, MRMS-IC highlights its name in red.
<b>Component Delta</b>	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.

Category	Component	Value (%)
C6+	C6	47.4660
	C7	35.3400
	C8	17.1940
C6+/C9+	C9	0.0000
	C10	0.0000

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.

Current	Component Ranges	Delta Limit	Normalization	Custom			
A custom Modbus register # may be assigned to any ONE gas property value. Active when GC Type "User Defined" has been selected.							
CH4	7007	IC5	7004	C9 Plus	7010	CO	Unassigned
C2	7009	NC5	7005	NC9	Unassigned	H2	Unassigned
C3	7001	C6 Plus	Unassigned	NC10	Unassigned	H2O	Unassigned
IC4	7002	NC6	7011	CO2	7008	H2S	Unassigned
NC4	7003	NC7	7012	N2	7006	He	Unassigned
NeoC5	Unassigned	NC8	7013	AR	Unassigned	O2	Unassigned

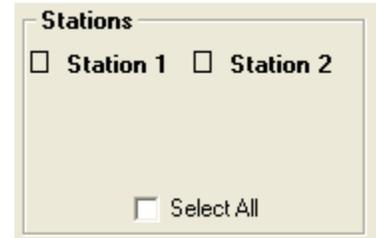
*Figure 3-33. Gas Chromatograph Configuration – Custom sub-tab – Daniel User Defined*

**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.

Maintenance Mode Off

Stations  
 Station 1  Station 2  
 Select All

Runs Assigned  
 Run 1  Run 2  Run 3  
 Run 4

---

Measurement
Alarm

Station 2

**Station Summary**

	Corrected Flow Rate	Energy Rate
Forward	0.000000	0.000000
Reverse	0.000000	0.000000

Current Contract Hour		Previous Contract Hour	
Volume	Energy	Volume	Energy
Forward	0.000000	0.000000	0.000000
Reverse	0.000000	0.000000	0.000000

Current Contract Day		Previous Contract Day	
Volume	Energy	Volume	Energy
Forward	0.000000	0.000000	0.000000
Reverse	0.000000	0.000000	0.000000

Run 2

Measurement Type	Uncorrected Flow Rate	Pressure	Temp	Corrected Flow Rate	Energy Rate
Turbine	0.000000	-24.990005	-24.986019	0.000000 E3M3/D	0.000000

Current Contract Hour		Previous Contract Hour	
Volume	Energy	Volume	Energy
0.000000	0.000000	0.000000	0.000000

Current Contract Day		Previous Contract Day		Non-Resettable	
Volume	Energy	Volume	Energy	Volume	Energy
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

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.

Measurement
Alarm

**Run 1 Alarm Details**

**Quality Bit**

**Diff. Pressure**

**Delta ABAR**

**Beta**

**Static Pressure**

**Frequency**

**Speed of Sound**

**Temperature**

**Flow Rate**

**Show Alarm Limits**

**Alarm Set Points**

Type	Hi Hi Limit	Hi Limit	Low Limit	Low Low Limit	Status
Flow Rate	Not Applicable	<input type="text" value="451580.3750"/>	<input type="text" value="25087.7969"/>	Not Applicable	<input type="text" value="OFF"/>
Diff. Pressure*	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="OFF"/>
Static Pressure	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="OFF"/>
Temperature	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="OFF"/>
Beta Ratio*	Not Applicable	<input type="text" value="0.6000"/>	<input type="text" value="0.1500"/>	Not Applicable	<input type="text" value="OFF"/>
Speed of Sound**	Not Applicable	<input type="text" value="0.0000"/>	Not Applicable	Not Applicable	<input type="text" value="OFF"/>
Frequency***	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="0.0000"/>	<input type="text" value="OFF"/>

\* Only active for orifice type measurement.  
 \*\* Only active for ultrasonic type measurement.  
 \*\*\* Only active for Linear type measurement

Figure 3-35. Summary Page – Alarm tab

### 3.9 Limits Page (Gas Composition Allowable Ranges)

When you click the  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  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

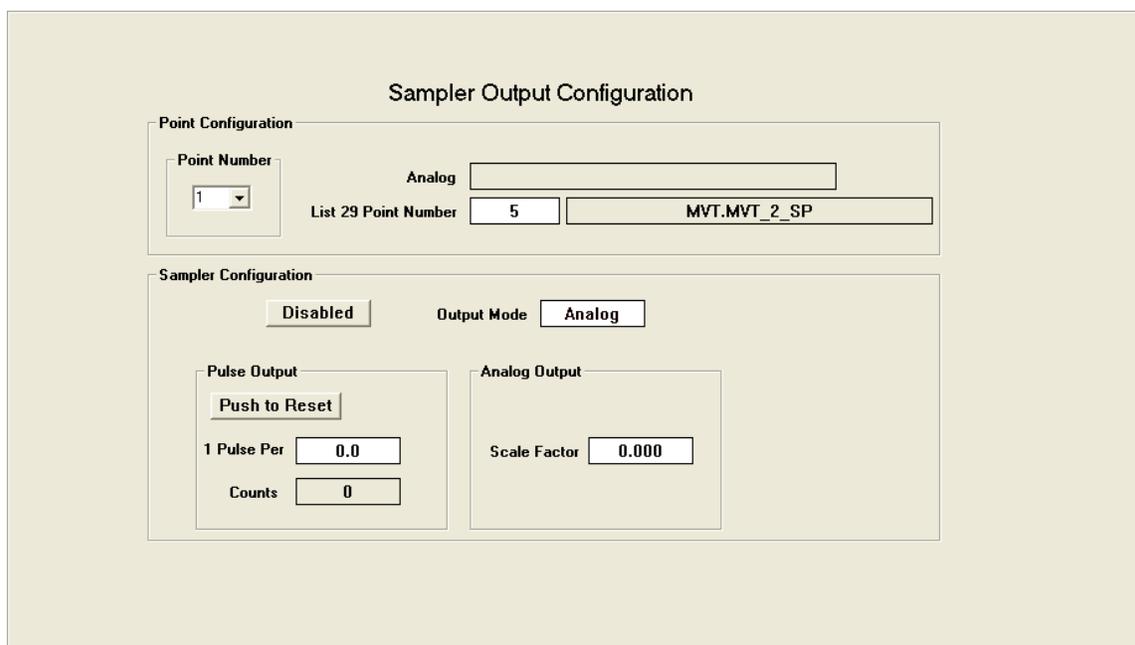
Click the  button on the Control tab to configure the Sampler.

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:



The screenshot shows the 'Sampler Output Configuration' window. It contains the following fields and controls:

- Point Configuration:**
  - Point Number:** A dropdown menu showing '1'.
  - Analog:** An empty text input field.
  - List 29 Point Number:** A text input field containing '5'.
  - MVT.MVT\_2\_SP:** A text input field containing 'MVT.MVT\_2\_SP'.
- Sampler Configuration:**
  - Disabled:** A button.
  - Output Mode:** A dropdown menu showing 'Analog'.
  - Pulse Output:**
    - Push to Reset:** A button.
    - 1 Pulse Per:** A text input field containing '0.0'.
    - Counts:** A text input field containing '0'.
  - Analog Output:**
    - Scale Factor:** A text input field containing '0.000'.

Figure 4-1. Sampler Output Configuration

<b>Field</b>	<b>Description</b>
<u>Point Configuration</u>	
<b>Point Number</b>	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.
<b>Analog</b>	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.
<b>List 29 Point Number</b>	<p>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.</p> <p>List 29 is a modifiable list, and may be edited using the On-Line Edit tool to add or remove items from the list.</p>
<u>Sampler Configuration</u>	
	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.
<b>Disabled / Enabled</b>	The Sampler output is Enabled/Disabled by toggling the button
<b>Output Mode</b>	The output mode may be selected as an analog output (Analog) or pulsed digital output (Pulse).
<u>Pulse Output</u>	If the Output Mode is selected as Pulse, the items in this frame configure the Pulse Output.
<b>Push to Reset</b>	By clicking on the 'Push to Reset' button, the 'Counts' value will be set to 0.
<b>1 Pulse Per</b>	<p>The user is required to enter the ratio of pulses per input quantity.</p> <p>For instance:</p>

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_REENERGYRATE	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_REENERGYRATE	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_REENERGYRATE	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_REENERGYRATE	Station 4 Reverse Energy Rate

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## Appendix E - Troubleshooting

### Error Codes

Error Code(s)	Possible Remedy
<b>-8001 Mode not supported</b> <b>-8002 Invalid mode for serial port</b>	<p>These codes indicate that the serial port is not configured properly in the Flash Configuration Profile.</p> <ul style="list-style-type: none"> <li>▪ Verify that the MODE for the serial port connected to the gas chromatograph is configured as a MODBUS Master.</li> </ul>
<b>-8006 Invalid Slave address</b>	<p>This code indicates that the Addr setting is incorrect. typically, this means it is less than 1 or greater than 255</p> <ul style="list-style-type: none"> <li>▪ Set the “Addr” value to the proper local slave address of the gas chromatograph, which should be a number from 1 to 255.</li> </ul>
<b>-8017 Invalid response received from slave</b>	<p>This code indicates that the gas chromatograph is responding with data, however, the response message cannot be interpreted properly.</p> <ul style="list-style-type: none"> <li>▪ For a serial connection, verify that the data bits, stop bits, and parity are configured to match the settings on the chromatograph.</li> <li>▪ For an RS-485 connection, verify that the “Ignore Echo” setting is set to TRUE. Verify that terminating and biasing resistors are set properly.</li> </ul>
<b>-8018 Timeout waiting for response from slave.</b>	<ul style="list-style-type: none"> <li>▪ Verify the gas chromatograph is turned on.</li> <li>▪ Verify that the communications cables between the-Station Manager controller and the gas chromatograph are wired correctly and connected at both ends.</li> <li>▪ 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.</li> <li>▪ Verify the gas chromatograph supports the MODBUS Slave protocol.</li> <li>▪ 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.</li> </ul>
<b>-8020 Communication Port failure.</b>	<p>The following message indicates that no data is being received from the gas chromatograph</p> <ul style="list-style-type: none"> <li>▪ Verify the communication port is physically installed on the Station Manager controller.</li> <li>▪ 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.</li> </ul>

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