

**MicroMVG**  
**OPERATORS MANUAL**  
*Flow Computer*  
*Gas Version5*



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# CHAPTER 1: QUICK START

## ***Introduction:***

The micro MV Gas Flow Computer was designed after careful listening to our customers in all sectors of the oil and gas industry. It was built to address the different needs for refineries, chemical plants, gas processing plants, offshore platforms, pipeline and transmission, remote gas wells, and storage caverns. The focus has been to bring the different needs and requirements of these specialized industries into one hardware platform and therefore reducing the spare parts requirements, the training process, calibration, and overall cost of ownership. We believe the Micro MV Gas Flow Computer has delivered and met the design intentions.

The Micro MV Gas Flow Computer combines the following features:

- ◆ User Friendly
- ◆ Flexible
- ◆ Easy to understand and configure
- ◆ Rugged
- ◆ Economical to install and maintain
- ◆ Accurate

We hope that your experience with the Micro MV Gas Flow Computer will be a simple pleasant experience, not intimidating in any way.

The Micro MV Flow computer handles up to two-meter runs with bi-directional capabilities. It includes the following mass flow equations: New API14.3, venturi, turbine (AGA7), Ultrasonic meter.

Additionally, it can perform density calculations per these standard procedures: AGA8, NX19 for gas, and other tables are added constantly, call our main office for current equations

One Rosemount multi-variable digital transducers can be connected to each Micro MV flow computer for temperature, pressure (up to 3626 PSIG), and DP (up to 830 inches H<sub>2</sub>O). Other Rosemount multi variable transmitters can be connected to the Micro MV Gas Flow Computer via RS485 serial interface. Up to four meter runs can be stored and calculated in a single Micro MV Gas flow computer. The 2<sup>nd</sup> RS485 is used as a slave or a master modbus port for data acquisition and other serial functions.

The Micro MV Gas flow Computer has a host of inputs and outputs beyond the built in rosemount Multi Variable transmitter.

Three turbine inputs (Sine or Square wave), 70 mV peak to peak or sine wave 6 volts, or lighter on square wave

Four additional analog inputs, or two analog inputs and one three wire RTD inputs

One analog output expandable to four

One RS-232 and two RS-485 with Modbus protocol, one serial printer output

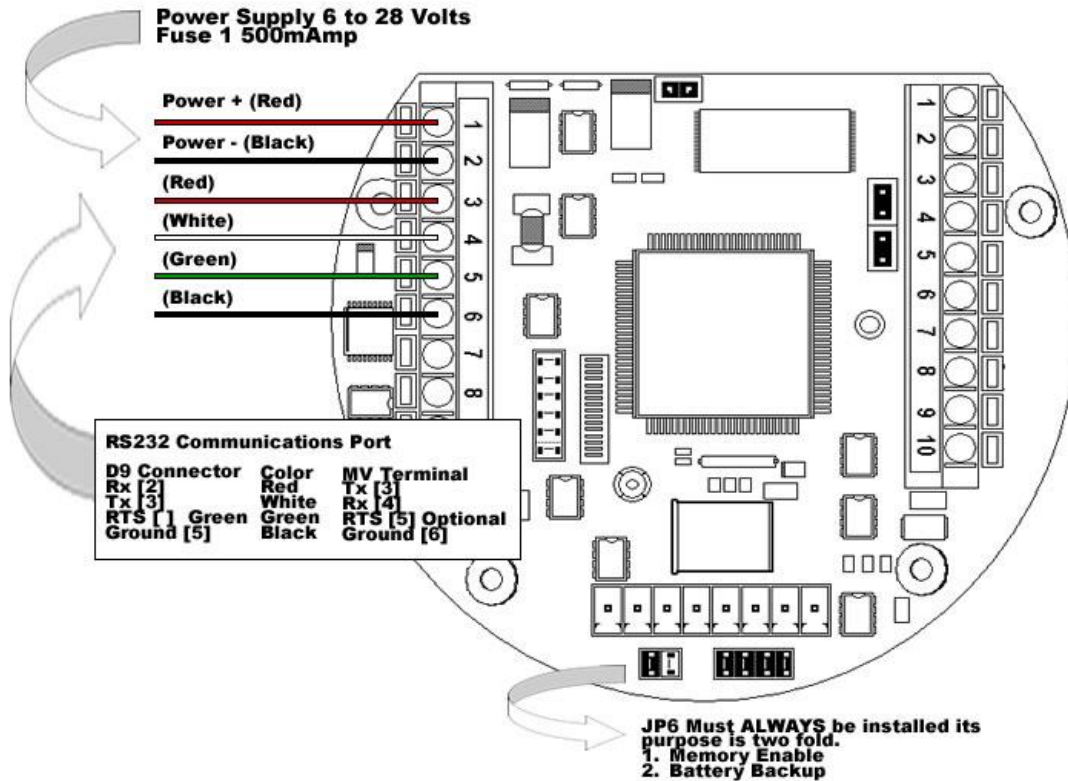
4 status inputs or digital outputs (user configurable).

Additionally, each Micro MV Gas Flow Computer can store up to 32 days of hourly and daily data.

Optional expandable memory (Virtual Hard Drive) up to 132 Megs ; combined with our customized data storage allows almost any type data logging task to become possible.

## Quick Start Up

### MicroMV Quick Start

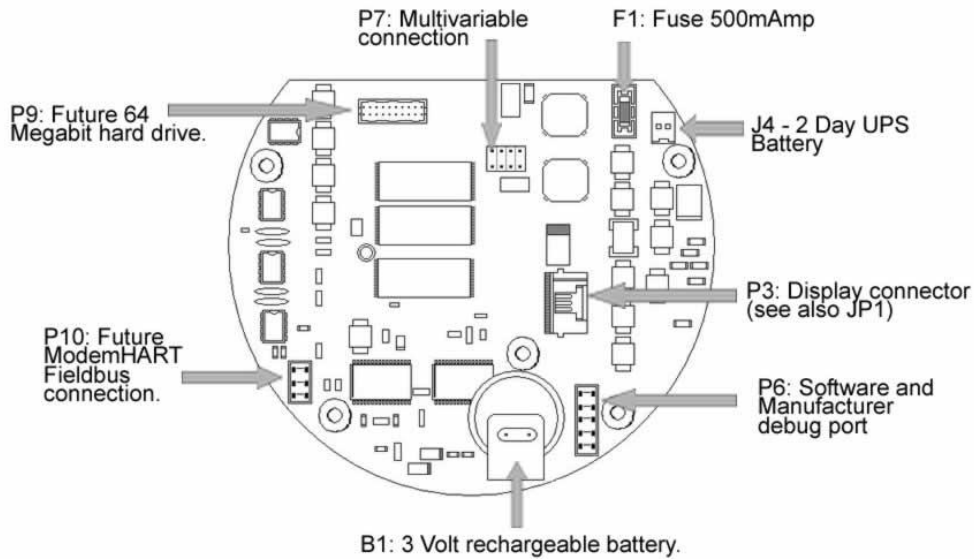
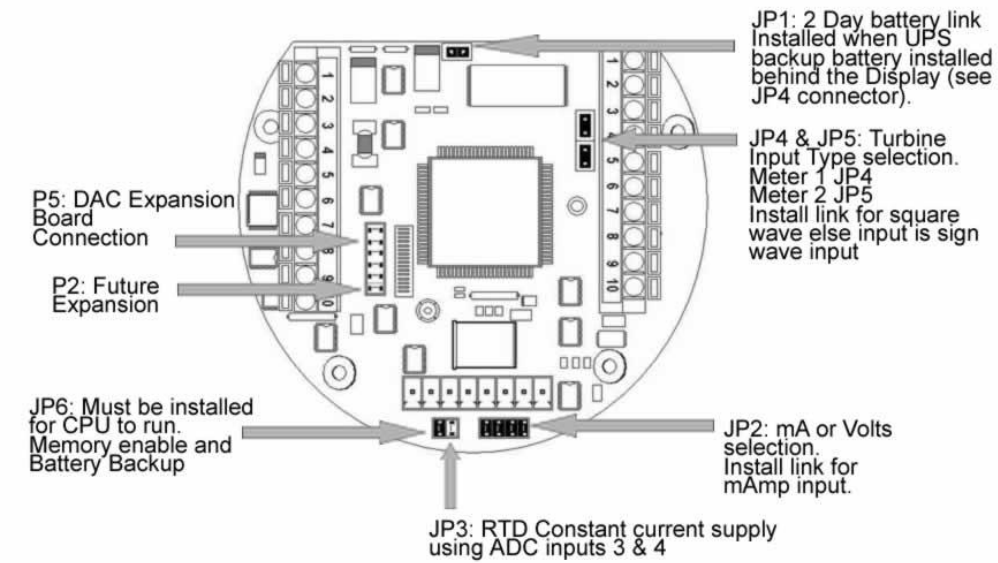


#### MV Step by Step Startup

1. Connect Power Supply cables
2. Connect RS232 Communications
3. Ensure Jumper JP6 Installed
4. Energize Voltage [24 Volts Recommended]
5. Verify the display is ON
6. Run Dynacom™ Software
7. Configure the Micro MV unit
8. Consult the Faultfinding if a problem is incurred



BERG LINKS AND CONNECTIONS



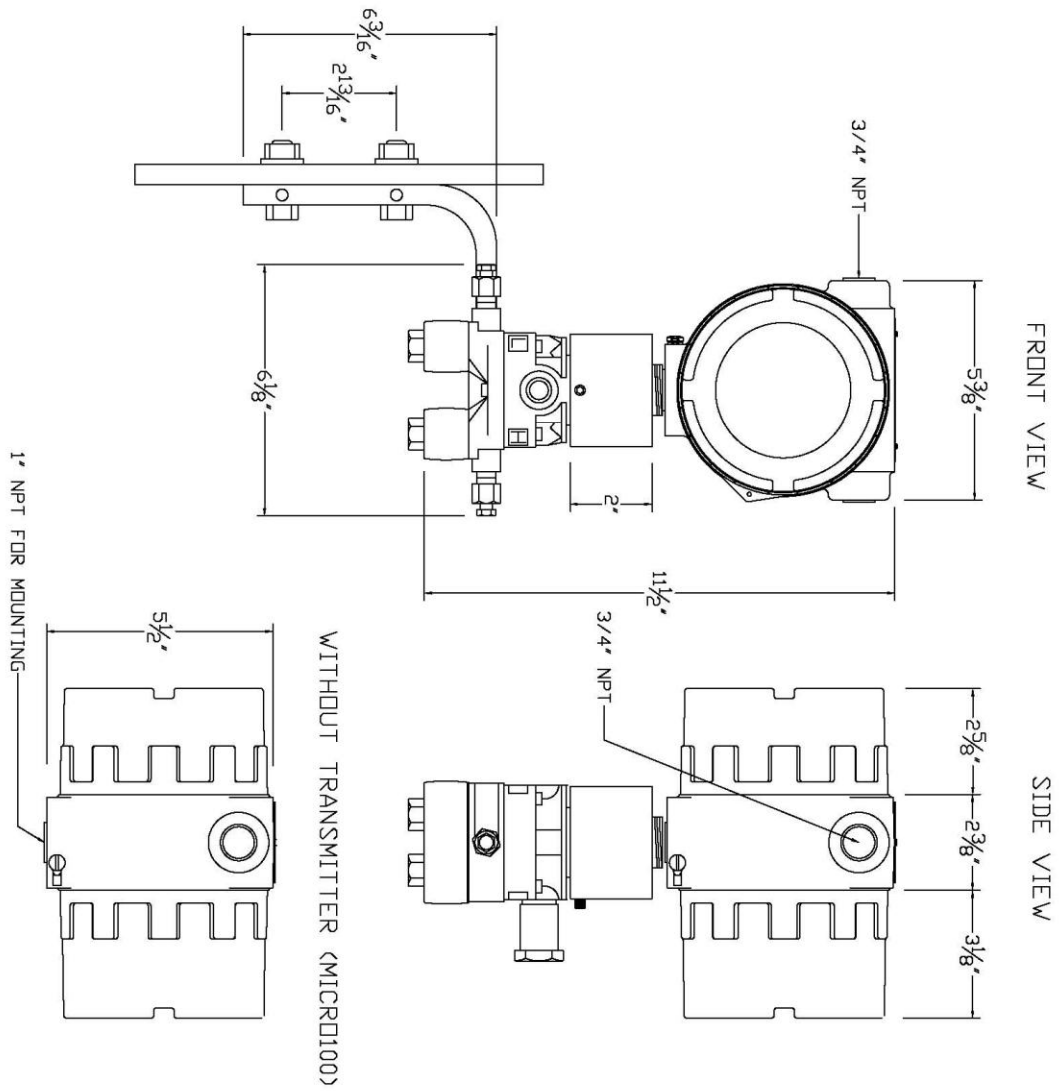
## Technical Data

<b>POWER</b>	
VOLTAGE RANGE	7-28 VDC
POWER CONSUMPTION	0.5 WATT
<b>OPERATING CONDITIONS</b>	
TEMPERATURE	- 40 TO 185 °F
HUMIDITY	100%
HOUSING	NEMA 4X CLASS 1 DIV. 1
<b>FEATURES</b>	
DISPLAY	PLASMA 4 LINES 20 CHARACTERS BACKLIT DISPLAY WITH 4 INFRARED REFLECTIVE SENSORS
PROCESSOR	32-BIT MOTOROLA 68332 @ 16.7 MHZ
FLASH ROM	4 MBITS @ 70 NANO SECONDS
RAM	2 MBITS
FREQUENCY INPUT	3 CHANNELS CHANNELS 1 & 2 ARE SINE/SQUARE WAVE CAPABLE CHANNEL 3 IS SQUARE WAVE ONLY SQUARE WAVE RANGE 0 - 6000 HZ SINE WAVE RANGE 0 - 1200 HZ SIGNAL > 40 mV FOR SINE WAVE SIGNAL > 3 VOLTS FOR SQUARE WAVE
ANALOG INPUT	4 INPUTS STANDARD EXPANDABLE UP TO 9 ANALOG INPUTS OR 7 WITH ADDITIONAL 3 WIRE RTD.
MULTIVARIABLE	BUILT-IN ROSEMOUNT MULTIVARIABLE TRANSMITTER WITH DIRECT SPI DIGITAL CONNECTION. MAXIMUM UPDATE SPEED ONCE EVERY 109 MILLISECONDS.
ANALOG OUTPUT	ONE (1) OPTICALLY ISOLATED 16 BITS EXPANDABLE TO FOUR (4)
DIGITAL I/O	4 DIGITAL INPUTS OR OUTPUTS. DIGITAL OUTPUTS HAVE 0.25 AMPS RATING.
SERIAL	2 RS485 @ 19200 BAUDS VARIABLE 1 RS232 @ 9600 BAUDS VARIABLE 1 PRINTER OUTPUT
COMMUNICATION PROTOCOL	MODBUS

## Parts List

<b>Spare Parts - Micro MV</b>	
<b>Part #</b>	<b>Description</b>
MVC	Micro MV CPU Main Board Only
MVM	Micro MV CPU Memory Board Only
MVD	Micro MV Display Board
MVI	Micro MV Analog In Board
MVO	Micro MV Analog Out Board
MVP	Micro MV Prover Board
MVR	Micro MV Rosemount Board
S6920	Explosion Proof Housing Unit for Micro MV Flow Computer
Adapter A	Adapter for 0205 Rosemount Transmitter (Accommodates Micro MV Flow Computer)
Bracket-MVD	Bracket for Micro MV Display
Bracket-MVC A	Bracket for Micro MV CPU (Without Analog)
Bracket-MVC B	Bracket for Micro MV CPU (With Analog)
MVD Cable	Micro MV Display Ribbon Cable
O-Ring A	O-Ring Gasket for Micro MV Housing
Fuse A	250 mA Fuse
Fuse B	500 mA Fuse
Fuse C	2 Amp Fuse
Battery A	Replacement Battery for Micro MV Flow Computer (Board Mounted)

Micro MV Flow Computer: Dimensions



Window Software Minimum Requirements:

Please make sure your computer has the minimum requirements to install Dynamic's Dynacom software.

### **System Minimum Requirements**

In order to install this software product the following requirements must be met:




- Windows Operating System (Win95, Win98, Win98SE, win2000, WinNT, WinXP, Vista)
- For a Windows NT machine: Service Pack 3 or later. (Service Pack 5 Update is Included in the Installation Disk)
- Internet Explorer 5 or later. (Internet Update is Included in the Installation Disk)
- For Windows NT, 2000, XP or Vista: Administrator level access to create an ODBC system DNS.
- Minimum disk space available: 16 MB.
- 1 Serial Communication Port

If your computer meets these requirements, you can run the setup file downloaded from our website

## What is a configuration file?

The configuration file is an archive that contains the data used by the flow computer to determine calculation settings (Pipe ID, Flow Equation, Meter ID, etc.) and input/output assignments.

## Downloading a configuration file to the flow computer.

- Open the configuration file using the **Configuration File | Open...** option on the main menu or pressing the open button  in the toolbar. Once the file is open the file name will appear on the upper left corner of the window, so you can verify that the desired file was open.
- Connect to the Flow Computer either by using the **Tools | Connect to Device** option on the main menu, the  button on the vertical toolbar, or by pressing the **[F5]** key on the keyboard. Once you are connected the application it will show an ONLINE status on the upper right corner of the main window. Failure to communicate can occur because of a communication wiring problem, wrong PC port selection, communication parameter mismatch between PC and MicroMV (Modbus type, parity, baud rate, etc.) or lack of power to the MicroMV Flow Computer. To use “**Tools | Com Settings | Auto Detect Settings**” option, the user must insure that **only one MicroMV** computer is connected to the PC. More than one MicroMV Flow Computer in the loop will cause data collisions and unintelligible responses.
- Go to the configure device option either by using the **Tools | Meter Configuration** option, the  button on the vertical toolbar, or by pressing the **[F10]** key on the keyboard.
- Because you are connected to a device, a window will appear asking you if you want to read the configuration from the connected meter, Press **NO** since what we want is to write the PC file to the flow computer.
- A configuration window will now appear showing you the information in the configuration file, you can check these values to make sure this is the file you want to send to the flow computer. Once you have checked that the configuration is correct, press the **[Download]** button. A blue bar indicating the progress of the download will appear at the bottom of the application window, after that the information in the configuration file will be in the flow computer.


**Note:** In case the flow computer is a liquid application, remember to End Batch after the configuration is downloaded for the changes to take effect.

## ***What is an Image File?***

An image file is an EPROM code for a certain purpose (liquid, gas, prover, etc.) **The image file is only done when an application upgrade is needed.**

When an image file is downloaded to the flow computer, all the information in the computer is lost (configuration and historical data), so make sure to retrieve all the important information before changing the image file.

## ***How to download an Image File***

- Download an image file through **RS232 port** only.
- To Download an Image File to the Flow Computer select the **Tools | Download Program** option from the main menu or press the  button in the toolbar.
- A small dialog will appear asking for the file name of the image file (Image file have the extension .img). Type it in or use the **Browse** button to locate it.
- Once the file name is in place press **Download**.
- If a retry message of small dialog appears, try to use “**Tools | Com Settings | Auto Detect Settings**” option, the user must insure that **only one MicroMV** computer is connected to the PC. More than one MicroMV Flow Computer in the loop will cause data collisions and unintelligible responses. Failure to communicate can occur because of a communication wiring problem, wrong PC port selection, communication parameter mismatch between PC and MicroMV (Modbus type, parity, baud rate, etc.) or lack of power to the MicroMV Flow Computer. After the device is detected, then you can follow steps described above.

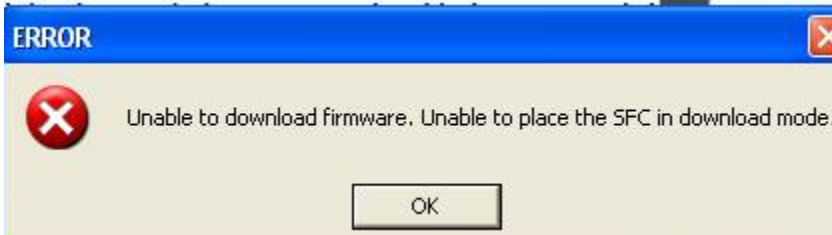
Warning messages will remind you that this action will erase **ALL** the information in the flow computer.

The download task will take about 7 minutes to be completed. Once the image file is in place, the flow computer is ready to be configured (enter calculation parameters and I/O assignments).

## How to force a board into download mode

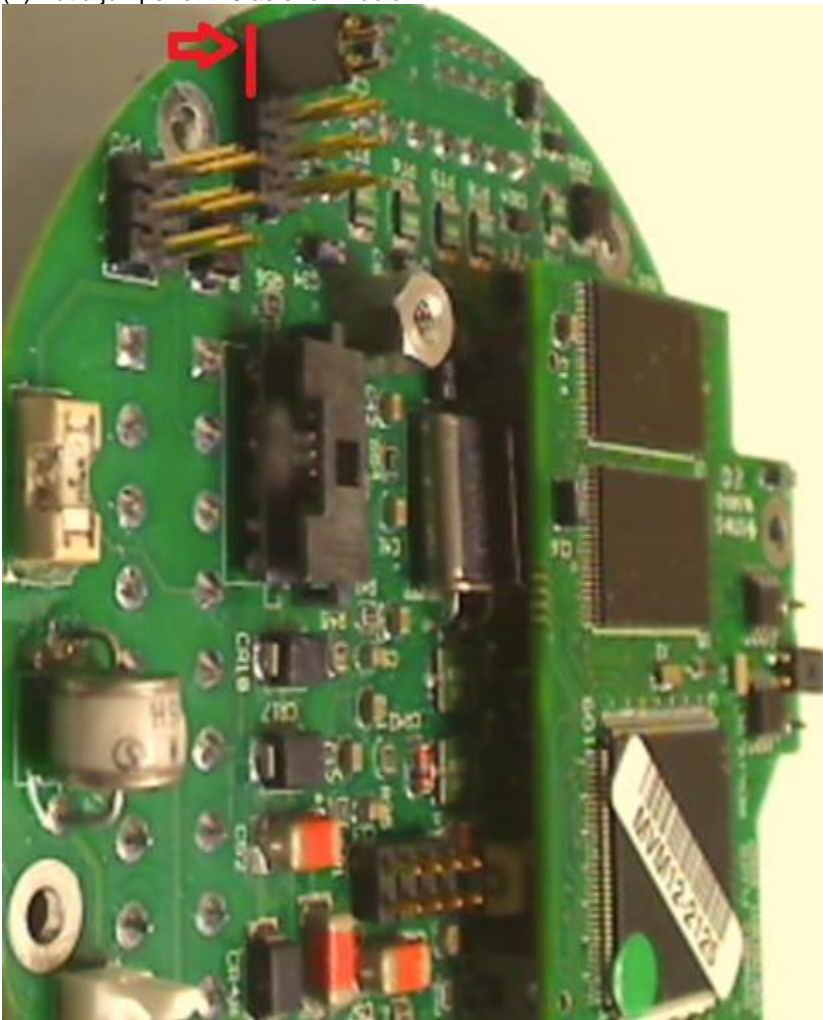
First try to recycle the power and reload the image if the error message is displayed while downloading a new image file. Download an image file only through **RS-232 port**. Contact technical support for old boards loaded with downloader v1.

Forcing download mode could be required if a wrong type of application image was loaded or other issues. Call our main office for more information



Steps to force the board into download mode.

- (1) Remove Power
- (2) Put a jumper on P6 as shown below.



- (3) Power up the board
- (4) Board is in download mode
- (5) Download image
- (6) Remove power and jumper on P6 after a new image is loaded
- (7) Board is ready



## Website - DFM Configuration Software

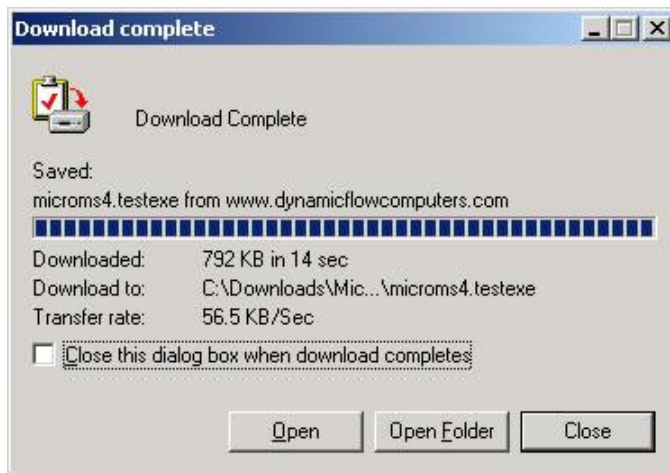
**Step 1.** Go to our website [WWW.DYNAMICFLOWCOMPUTERS.COM](http://WWW.DYNAMICFLOWCOMPUTERS.COM)

**Step 2.** Click on the **Software** link located on the left hand side of the web page. You will be presented with two options: **Windows®** software and **DOS** software.

First look for your application under Windows, if you don't see your application listed here it means it only has DOS software.

**Step 3.** Select either Windows® or DOS software based on Step 2.

**Step 4.** On the new screen presented to you click on the application that you are trying to download. Once you hit the link it will ask you if you want to run or save the file in you computer. Select **SAVE**. (See illustration 1)



**Step 5.** The file will start to transfer to your computer. The download time depends on your Internet connection speed and the type of application that being downloaded.

**Step 6.** When the download if finish. Press the **OPEN** button to start the setup process. (See Illustration)

**Step 7.** Follow the steps in the application setup.

## ***Website – Image File (Firmware)***

Check the version number of image file. **The image file is only done when an application upgrade is needed.**

**Step 1.** Go to our website [WWW.DYNAMICFLOWCOMPUTERS.COM](http://WWW.DYNAMICFLOWCOMPUTERS.COM)

**Step 2.** Click on the **Software** link located on the left hand side of the web page, then you select **Firmware** option. All our image files are available for download. Only EEPROM based models like the SFC will need actual EEPROMS to be shipped out to you.

**Step 3.** On the new screen presented to you click on the application that you are trying to download. Once you hit the link it will ask you the location and file name to be saved.

**Step 4.** The file will start to transfer to your computer. The download time depends on your Internet connection speed and the type of application that being downloaded.

**Step 5.** After the download is finished, follow the steps in the image downloading setup.

## ***Getting acquainted with the flow computer wiring:***

### **Back terminal wiring:**

The back terminal wiring indicates the overall positions of the terminal plugs and their functions. Though the back panel's jumpers are also shown, refer to the next drawing, "Back Panel Jumpers", for information on their settings and functions.

The MicroMV receives its power via the top two pins on Terminal P1, on the left of the board. Also on Terminal P1 from top to bottom are inputs to the four serial connections

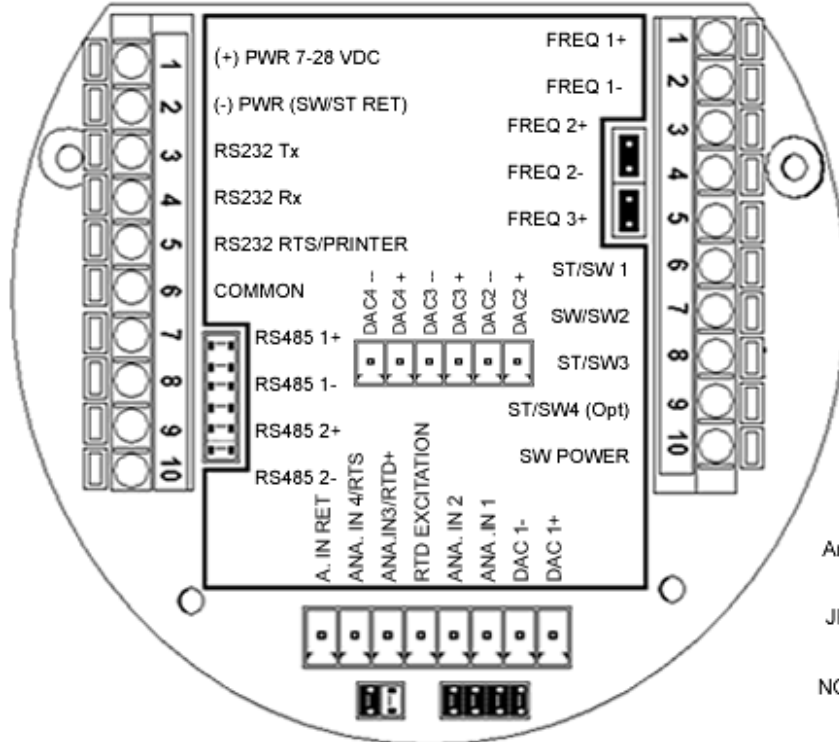
To the right (P4), from top to bottom, are two turbine inputs, density frequency input, and switch/status inputs and output.

Terminal P3, at the lower bottom, handles analog inputs and outputs. These are, in order from right to left, analog output one, analog input 1 & 2, RTD excitation, analog 3 & 4 or RTD, analog input return. Analog 3&4 can be used as RTD input 1, but the jumper for the RTD excitation has to be installed, and the flow computer has to be configured for RTD input.

**Back Panel Jumper**

In this illustration, a jumper is “ON” when the jumper block is used to connect the jumper’s to prongs. “OFF” means the jumper block is completely removed or attached to only one of the two prongs.

**4 analog outputs**



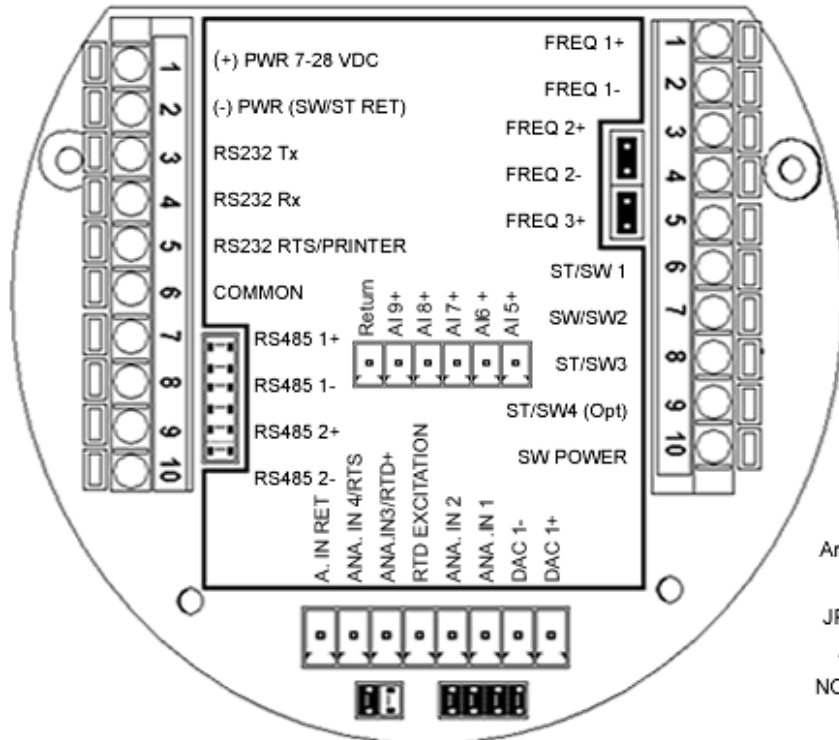
**BACK PANEL**

JP4 ON Meter 1 Square Wave  
 JP4 OFF Meter 1 Sine Wave  
 JP5 ON Meter 2 Square Wave  
 JP5 OFF Meter 2 Sine Wave  
 JP6 Always Installed  
 JP6 Can be removed after power is removed to clear RAM memory

JP3 is RTD Excitation & should never be installed when Analog 3 & 4 are as Analog Inputs

JP2 must be installed for 4-20 mA  
 JP2 removed if 1-5 Volts is used  
 NOTE: Analog 3&4 must be set for voltage input.

**9 analog inputs**



**BACK PANEL**

JP4 ON Meter 1 Square Wave  
 JP4 OFF Meter 1 Sine Wave  
 JP5 ON Meter 2 Square Wave  
 JP5 OFF Meter 2 Sine Wave  
 JP6 Always Installed  
 JP6 Can be removed after power is removed to clear RAM memory

JP3 is RTD Excitation & should never be installed when Analog 3 & 4 are as Analog Inputs

JP2 must be installed for 4-20 mA  
 JP2 removed if 1-5 Volts is used  
 NOTE: Analog 3&4 must be set for voltage input.

## ***INPUT/OUTPUT: Assigning and Ranging Inputs***

### ***Input/Output Assignment***

We will now configure your Micro MV Gas Flow Computer's inputs and outputs. The flow computer allows the user to configure the inputs and outputs. The flow computer will not use the unassigned inputs.

### ***How to assign a transmitter to an I/O point through window program:***

- 1 Click "Configure Device", configuration menu is prompted
- 2 On configuration menu, click "Input Assignment"
- 3 Enter assignments for DP, temperature, pressure, density and spare inputs.
- 4 **Assignment (1-n)**. Assignments 1-4 are analog inputs attached to terminal of the back panel. These inputs accept 4-20mA or 1-5 volts input and are suitable for temperature, pressure, density, or spare inputs. An assignment 5 is strictly RTD (temperature) input only for the meter, densitometer or spare. Assignment 7 indicates a density frequency input; it is assigned automatically once you choose live density frequency input in the setup menu at density type Assignment 10 (module 1) is for Rosemount multi-variable module only. DP, pressure, and temperature for the meter can be assigned. When a frequency type primary element is hooked to the flow computer, the Multi Variable pressure and temperature can be used and the DP becomes a spare input that could be assigned for strainer differential.

### ***How to assign a transmitter to an I/O point through DOS program:***

Before beginning the procedure of assigning inputs and outputs, it is advisable to set up the meter (**Meter | Set Up**). This is because certain parameters on the **Transducer Input Assignment** page change (or may not appear, etc.) based on **Meter | Set Up**.

(Note: This menu scrolls further down the screen for entering 4-20 ma )

- 1 Use your arrow keys to scroll to menu item **I/O** (between **Meter** and **Report**). Its first entry is **Transducer Input Assignment**. Press ENTER.
2. Use the down/up arrow keys to scroll through this menu. The first four parameters are not used. Spare inputs are inputs that the flow computer will read and display in the diagnostic data but are not used in the calculations. Spare inputs high and low limit alarms are documented in the historical alarm report.
3. **Assignment (1-n)**. Assignments 1-4 are analog inputs attached to terminal of the back panel. These inputs accept 4-20mA or 1-5 volts input and are suitable for temperature, pressure, density, or spare inputs. Assignment 5 is strictly RTD (temperature) input only for the meter, densitometer or spare. Assignment 7 indicates a density frequency input; it is assigned automatically once you choose live density frequency input in the setup menu at density type selection (and it can *only* be assigned via **Meter | Set Up | Density #n**, where  $n = 1$  to 5). Assignment 10 (module 1) is for Rosemount multi-variable module only. DP, pressure, and temperature for the meter can be assigned. When a frequency type primary element is hooked to the flow computer, the Multi Variable pressure and temperature can be used and the DP becomes a spare input that could be assigned for strainer differential.

### **Ranging the Transmitter Inputs:**

- 1. Enter the range values:** after assigning the inputs scroll down the transducer inputs assignment menu to scale the 4-20mA. Enter the value at **@4mA** and **@20mA**. Enter both values similar to the way the transmitter is ranged. 1-5 volt is equivalent to 4-20mA. Enter the 1 volt value at the 4mA, and 5 volt value at 20mA. When the Multi Variable is used the 4-20 ma scale has no effect on anything and does not need to be configured for that input. The reason is simply that the flow computer gets the data via digital communication from the transmitter in engineering units, and therefore a scale is not needed. Normal pressure range is 0-3626, temperature -40 to 1200, DP -250 to 250, or -830 to 830 inches of water.
- 2. Enter the high and low limits:** high limits and low limits are simply the alarm points in which you would like the flow computer to flag as an alarm condition. Enter these values with respect to the upper and lower range conditions. Try to avoid creating alarm log when conditions are normal. For example: If the line condition for the pressure is between 0 to 500 PSIG. Then you should program less than zero for low pressure alarm, and 500 or more for high pressure alarm. High limits are also used in the SCALE for the Modbus variables. The high limit is equal to 32767 or 4095. The low limit is not used for calculating the scale. The scale starts at zero to wherever the high limit value.
- 3. Set up the fail code: Maintenance and Failure Code** values tell the flow computer to use a default value in the event the transmitter fails. The default value is stored in **Maintenance**. There are three outcomes: the transmitter value is always used, no matter what (**Failure Code = 0**); the **Maintenance** value is always used, no matter what (**Failure Code = 1**); and the **Maintenance** value is used only when the transmitter's value indicates that the transmitter has temporarily failed (**Failure Code = 2**).

RTD inputs will skip 4-20 mA assignment because RTD is a raw signal of 50Ω (ohms) to 156Ω. Readings beyond that range require a 4-20 mA signal to the flow computer or using the built in Rosemount Multi Variable transmitter. The Rosemount Multivariable has a range of -40-1200 degrees Fahrenheit. Density coefficients for raw frequency inputs are programmed in this menu. The menu will only show parameters relevant to the live density selected (i.e., Solartron or UGC, etc.).

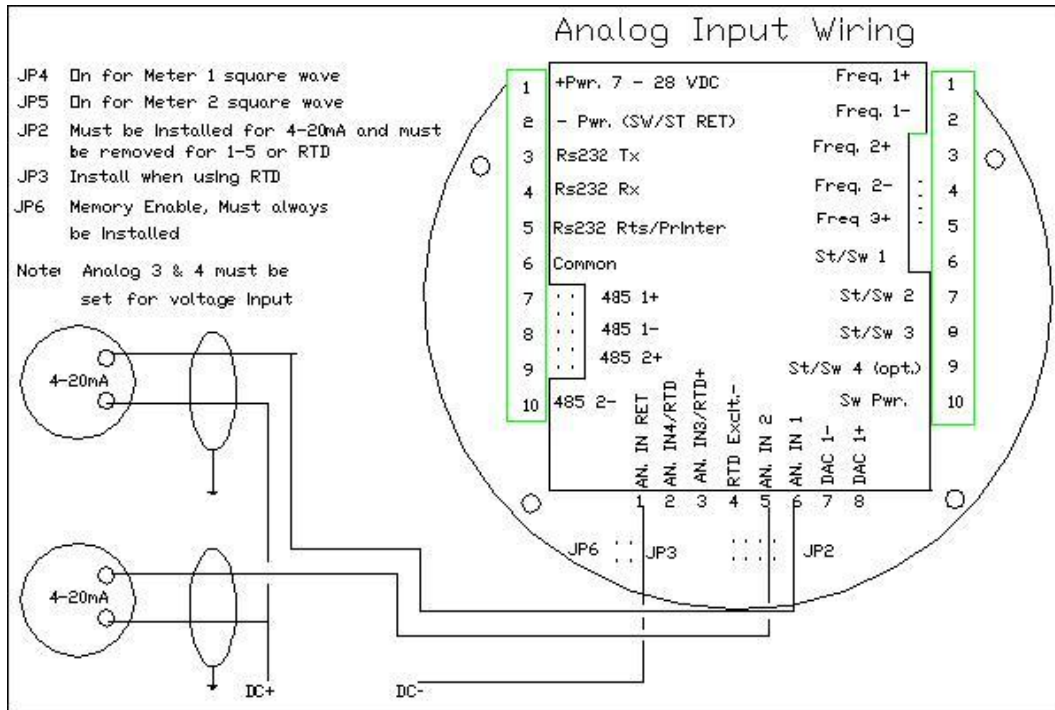
## WIRING:

Wiring to the flow computer is very straightforward and simple. But still it is very important to get familiar with the wiring diagram.

### Wiring the analog inputs:

Typical wiring for analog inputs 1 and 2 are shown in the drawing. Analog inputs 3 and 4 are to the left of analog 1 and 2 separated by the RTD excitation. Note that the analog input has only one common return that is the -Ve signal of power supply powering the transmitters.

When wiring 1-5 volts, make sure to calibrate the flow computer for the 1-5 volt signal because the flow computer calibration defaults for the 4-20 ma, which is different from the 1-5 volts. JP2 must be removed for 1-5 volt inputs. The jumpers for analog 1-4 are in order from right to left. It is possible to remove the first two jumpers for analog 1 & 2 in for 1-5 volts signal and have analog in 3 & 4 as 4-20 mA signal. Signal line impedance provided by our flow computer is 250Ω.



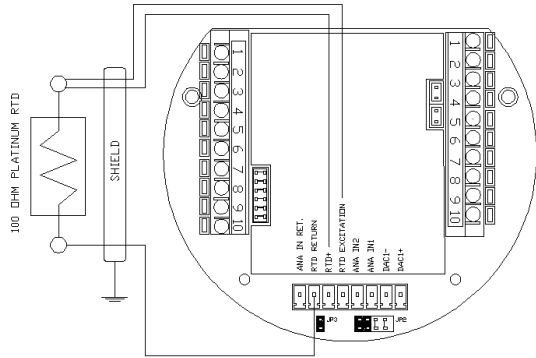
**NOTE:** The 4-20mA or 1-5 volt DOES NOT source power to the transmitters. You can use the DC power feeding the flow computer to power the 4-20mA loops IF that power supply is FILTERED.

**RTD**

100Ω platinum **must** be used; a temperature range of -43°F to +300°F can be measured. RTD is to the left of analog in 1&2. The RTD excitation jumper has to be installed for the RTD to function. In the figure below, notice that the RTD requires three wire connections. Internal excitation current source generated is in the micro AMP range.

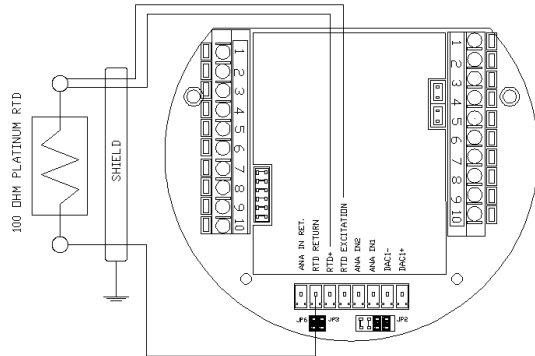
WIRING RTD DIRECTLY INTO CPU BOARD

MICROMV 2009 & LATER MODEL



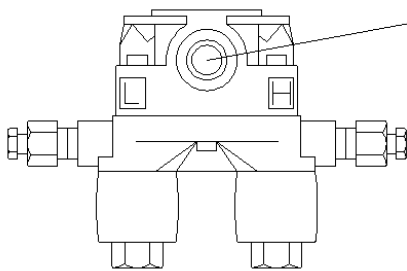
JUMPER SETTINGS:  
 JP3 MUST BE ON  
 JP2: TWO (2) RIGHT JUMPERS MUST BE OFF  
 FOR 4-WIRE RTD TIE TWO RETURN WIRES TOGETHER  
 AND WIRE AS 3-WIRE RTD

OLDER MICROMV MODELS



JUMPER SETTINGS:  
 JP3 MUST BE ON  
 JP2: TWO (2) LEFT JUMPERS MUST BE OFF  
 FOR 4-WIRE RTD TIE TWO RETURN WIRES TOGETHER  
 AND WIRE AS 3-WIRE RTD

WIRING RTD INTO ROSEMOUNT MULTIVARIABLE

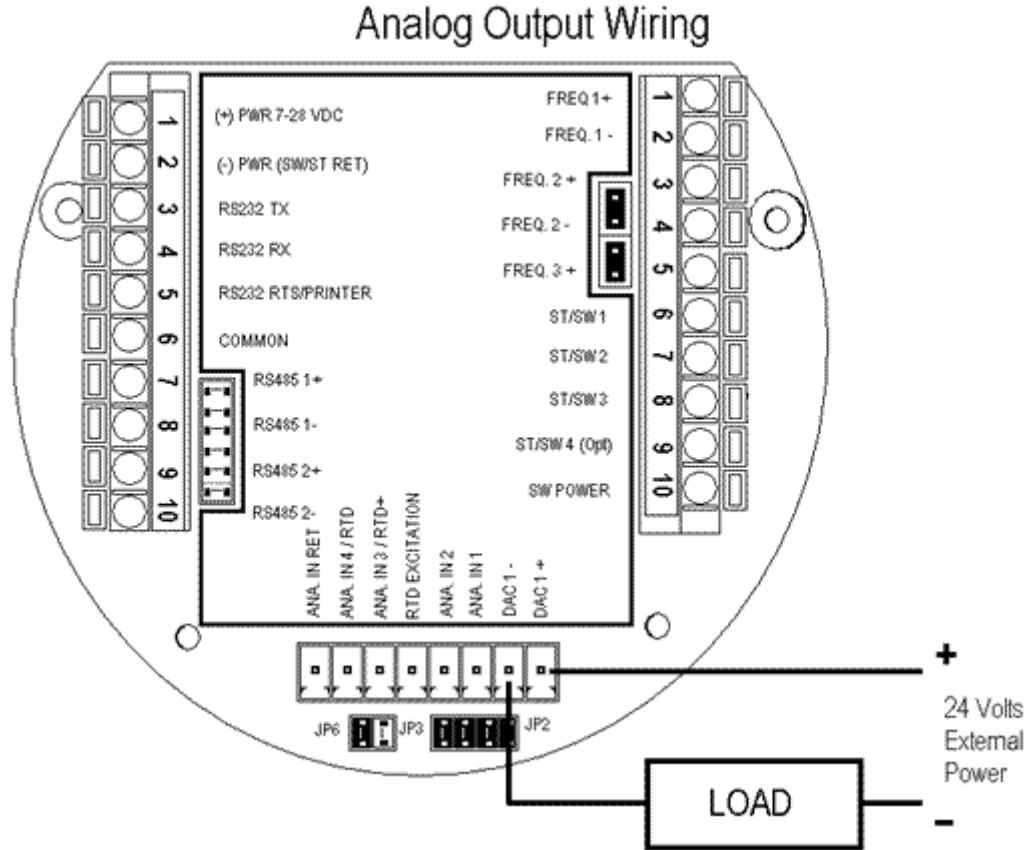


PLUG THE CUSTOM RTD PLUG INTO THE RTD PORT LOCATED ON THE FRONT OF THE MULTIVARIABLE SENSOR.  
 TO USE YOUR OWN RTD INSTEAD OF ROSEMOUNT'S ARMORED ASSEMBLY YOU CAN ORDER THE CUSTOM PLUG WITH WIRE ENDS.



### **Wiring analog output:**

Wiring diagram shows typical Analog output wiring. Notice that analog outputs will regulate 4-20 mA current loops but DOES NOT source the power for it. External power is required.

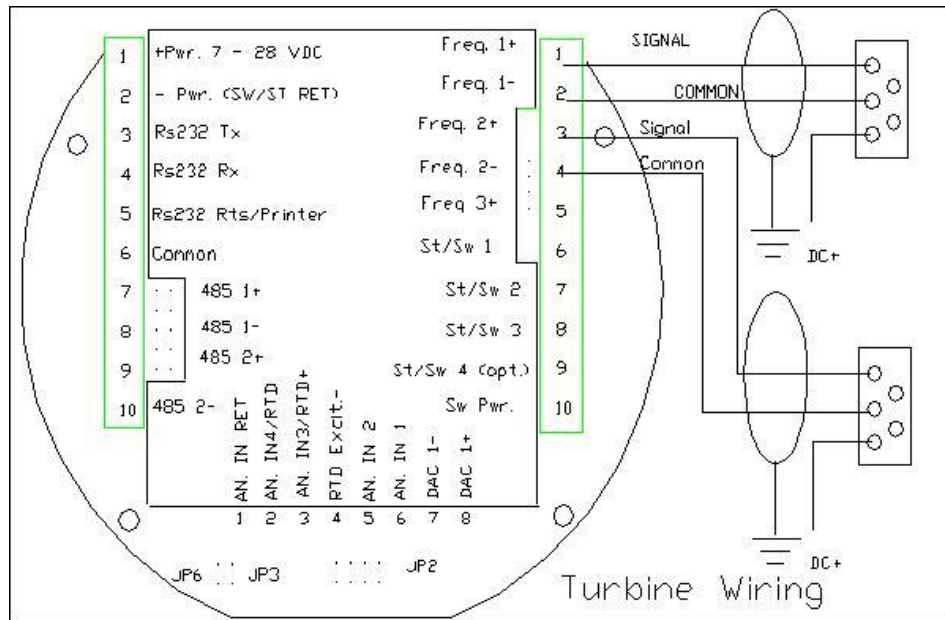


### **ASSIGNING/RANGING THE 4-20MA ANALOG OUTPUTS:**

Go to the **I/O** assignment main menu and click **Analog Output Assignment**. A selection menu is prompted. Select the analog output number, and then enter what the 4 mA output will indicate and the 20 mA. Make sure that the 20 mA assignment value exceeds the upper range limit of what you assigned the Analog output for, otherwise the analog output will not update beyond 20 mA.

### **Turbine input wiring**

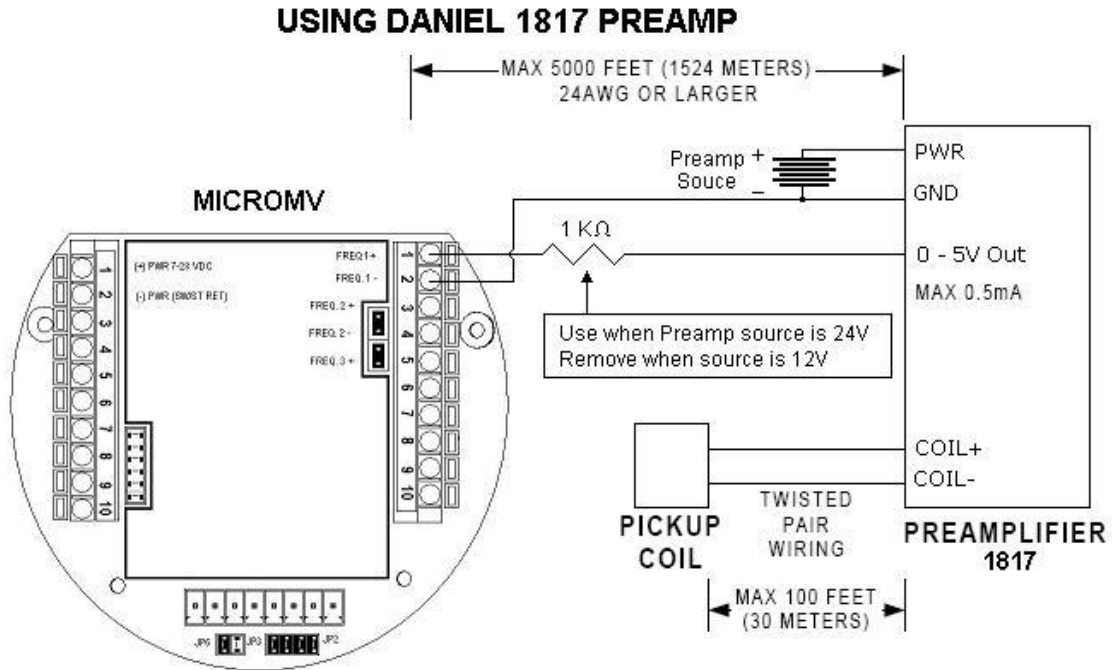
Go to view main menu, click turbine under **Wiring Drawings**. Two drawings above each other will show typical wiring for turbine meter 1 and turbine meter 2. When dual pick ups from the same turbine are connected, use the inputs for turbine 1 for pickup 1 and turbine 2 for the second pickup coil. When connecting sine wave directly from the pickup coil make sure the distance from the pickup coil to the flow computer is very short—less than 50 feet with shielded cable. In the event there is presence of noise, the distance must be shortened. When connecting sine wave signal, the JP4 jumper for meter 1 must not be installed and JP5 jumper for meter 2 must not be installed. (*JP4 and JP5 must be off when using sine wave*). On the other hand, when using square wave, the square wave signal can be sinusoidal but has to be above 5 volts peak to peak with less than 0.4 volts offset in order for the flow computer to read it. The JP4 jumper for meter 1 must be installed and JP5 jumper for meter 2 must be installed.



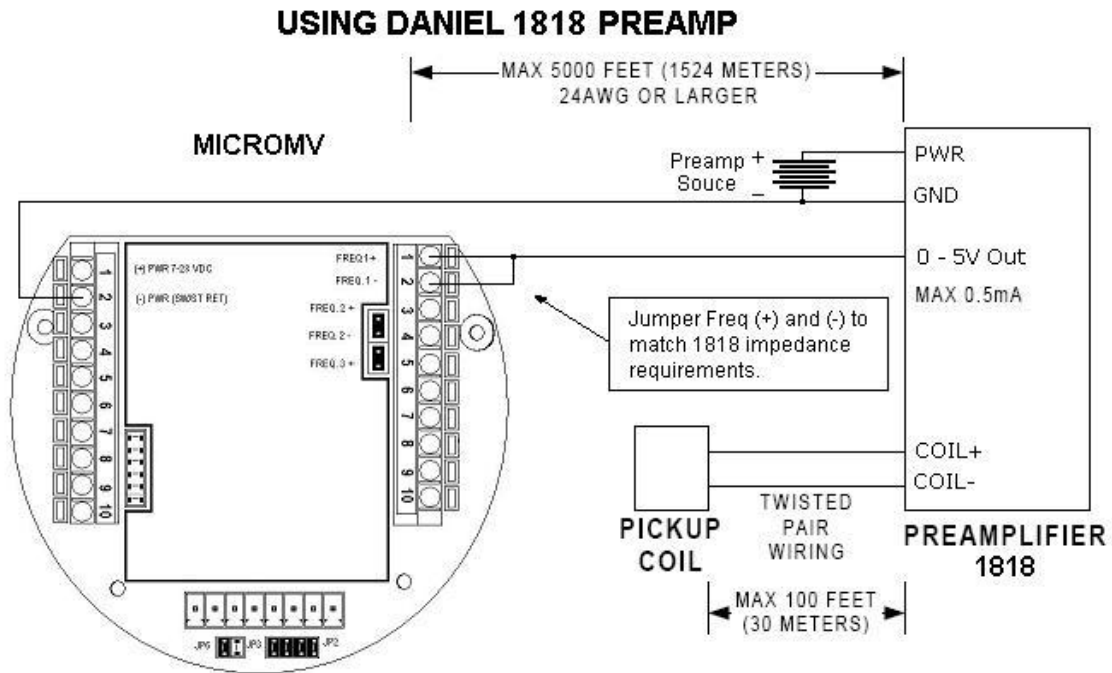
**Note:** When connecting square wave input, the JP4 and JP5 connect the turbine return to the flow computer power return. Therefore, signal polarity is very important. Reverse polarity could result in some **damage or power loss**. When sine wave is used the signal polarity is usually of no significance.

The turbine input is on the top of terminal P3 The third pin down from the top is Turbine/PD input 2 plus and below it is Turbine 2 minus. The third frequency input (fifth pin down) has the positive input and the negative is the power input ground. If a different power supply is used to power the densitometer then the power return for that input needs to be connected to the Micro MV power ground.

**Turbine input wiring – Using Daniel 1817 Preamp**



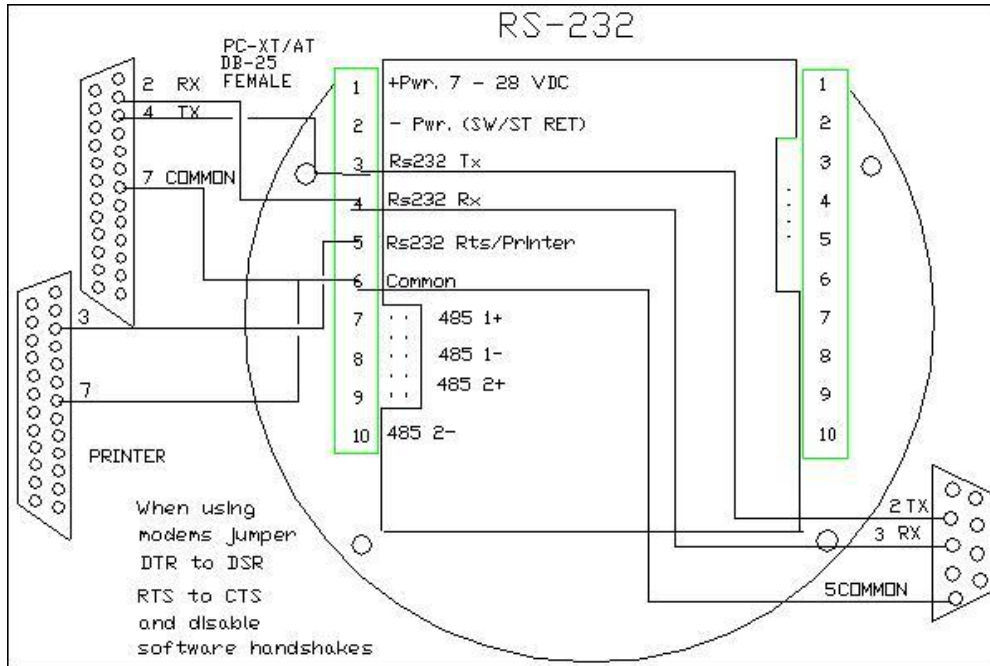
**Turbine input wiring – Using Daniel 1818 Preamp**



**RS-232 connection:**

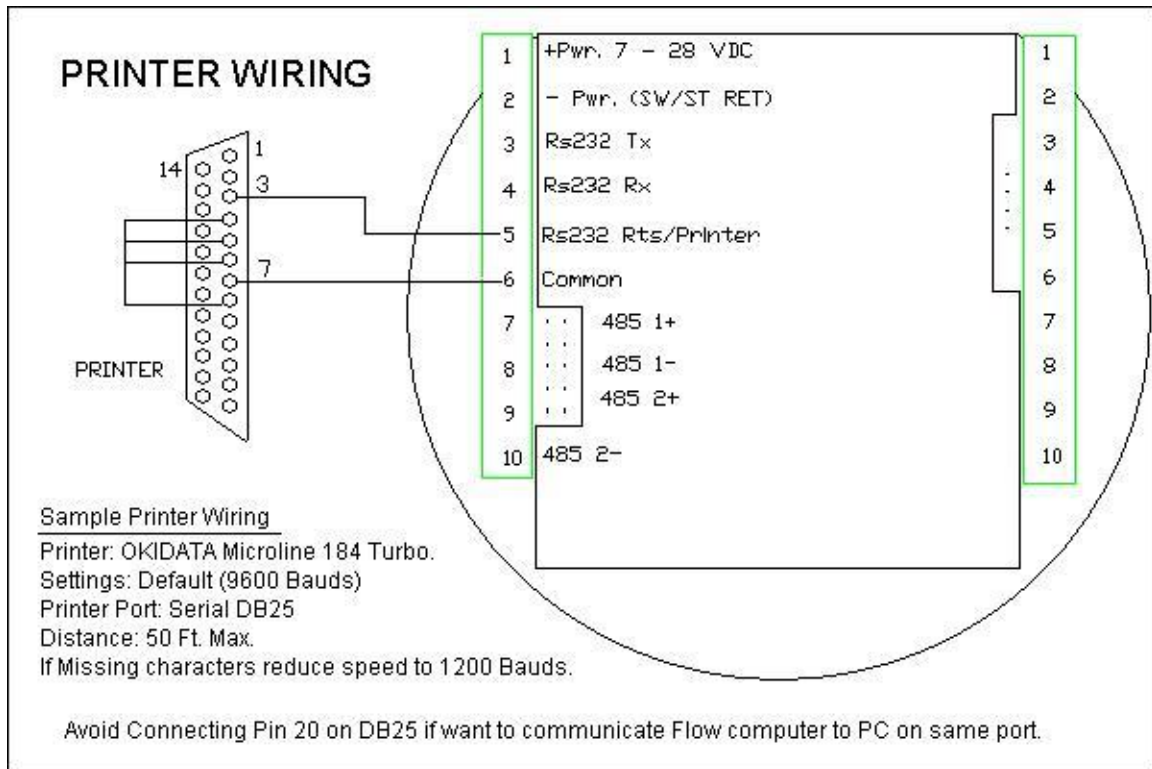
The RS-232 is located on the left terminal block. The third, fourth, fifth, and sixth pins of the RS232 below the power input. The RS-232 RTS pin can be used for printing reports or shares common pin with the regular RS232 port.

*Note: Twisted shielded cable is required.*



**WARNING:** When the RS-232 terminal is used with a modem, external protection on the phone line is required. Jumper DTR to DSR, RTS to CTS, and disable software handshake on the modem RS232 connection

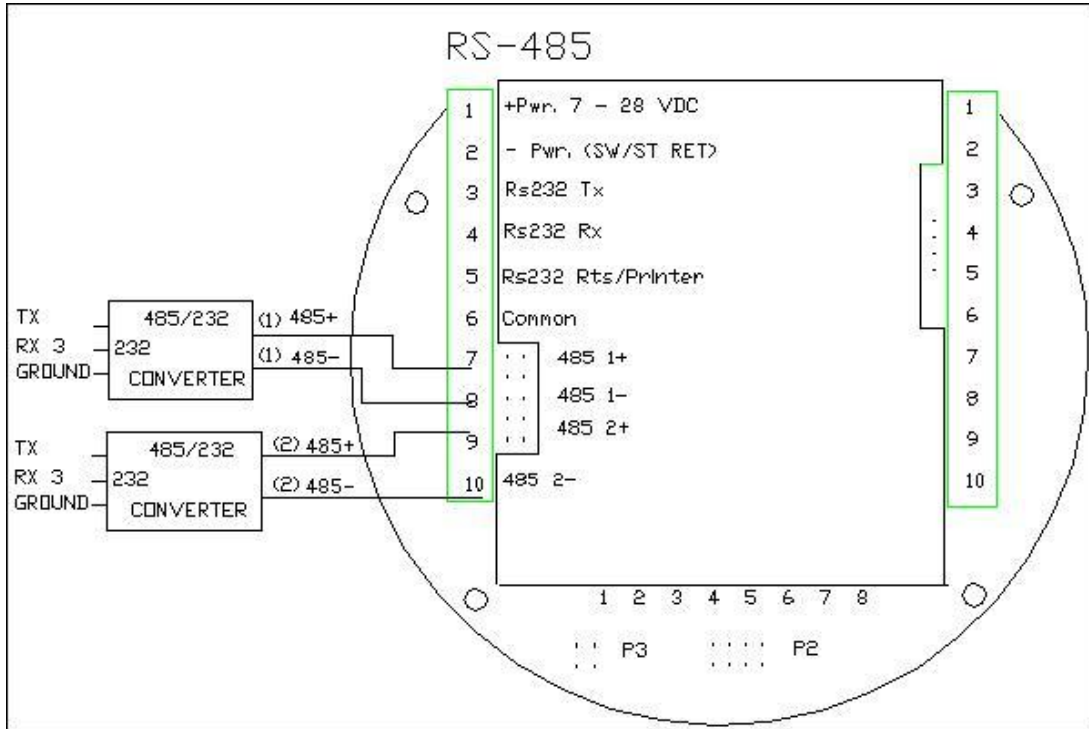
**Printer Connection:**



**RS-485:**

RS-485 wiring is shown in the wiring diagram under **RS-485**. Two Rs485 channels are available for Modbus communication or as a master to other slave devices. i.e. gas G.C., external Modbus slave devices and token passing ring. The maximum distance when 18-gauge wire is used is 4000 feet.

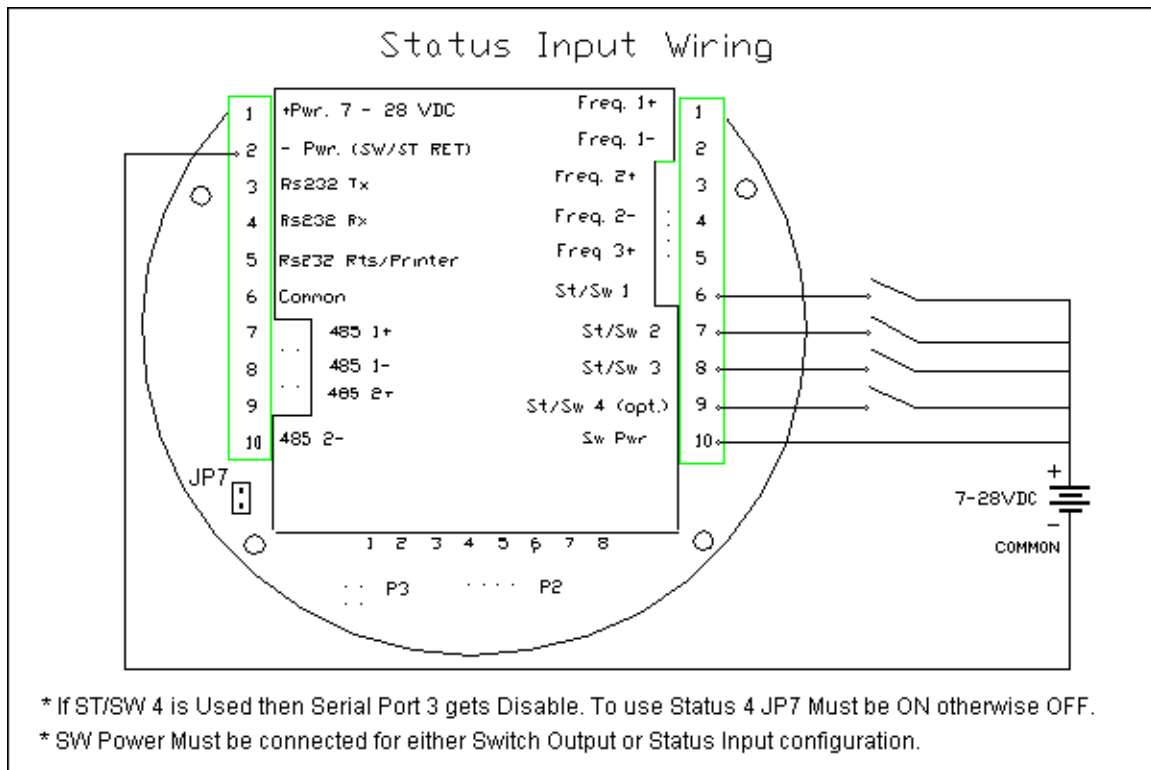
*Note: Twisted shielded cable is required.*



**WARNING:** When the RS-485 terminal is used, external transient protection and optical isolation is required, especially for long distance wiring.

### **Wiring of status inputs:**

There are 4 digital inputs or outputs that are user configurable. The configuration software will configure the input to be a status input or a switch output. The fourth digital I/O is optional and can only be used if the 2<sup>nd</sup> RS485 is not used. The standard status input has 4 volts of noise hysteresis, with on trigger point of 5 volts and an off point of 1 Volt.

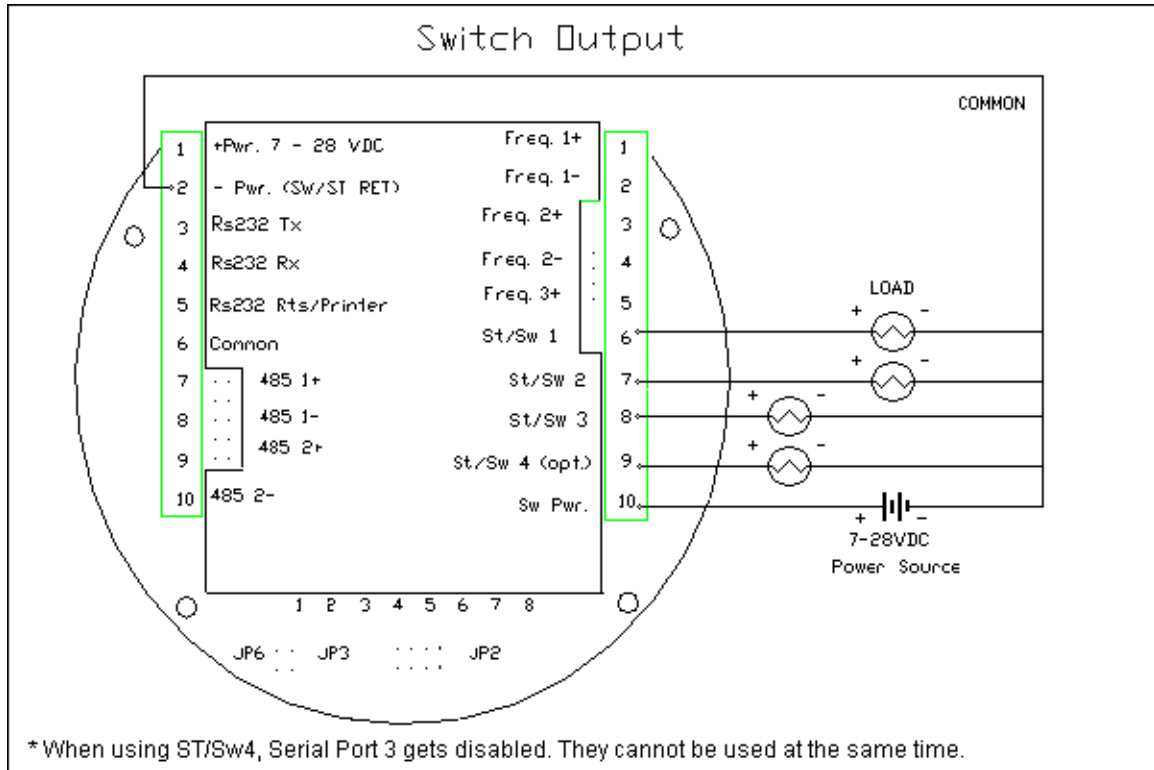




**Wiring of switch/pulse outputs:**

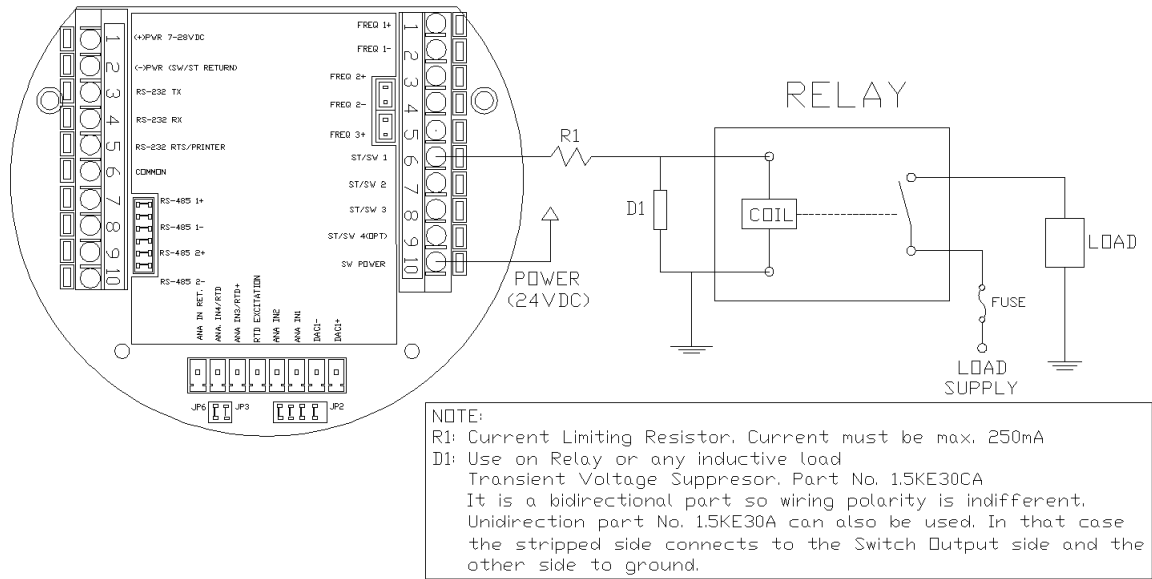
Switch one and two can be on /off or pulse type output up to 125 pulse per second. Notice that the switch outputs are transistor type outputs (open collector type with maximum DC rating of 350 mA continuous at 24 VDC) connections

1	Status Input /switch output 1	Switch - Maximum rating: 350mA @24 volts Switch Output Range: 5-28 VDC Status Input Rating: 6-28 VDC
2	Status Input/switch output 2	
3	Status Input /switch output 3	
4	Status Input /switch output 4	



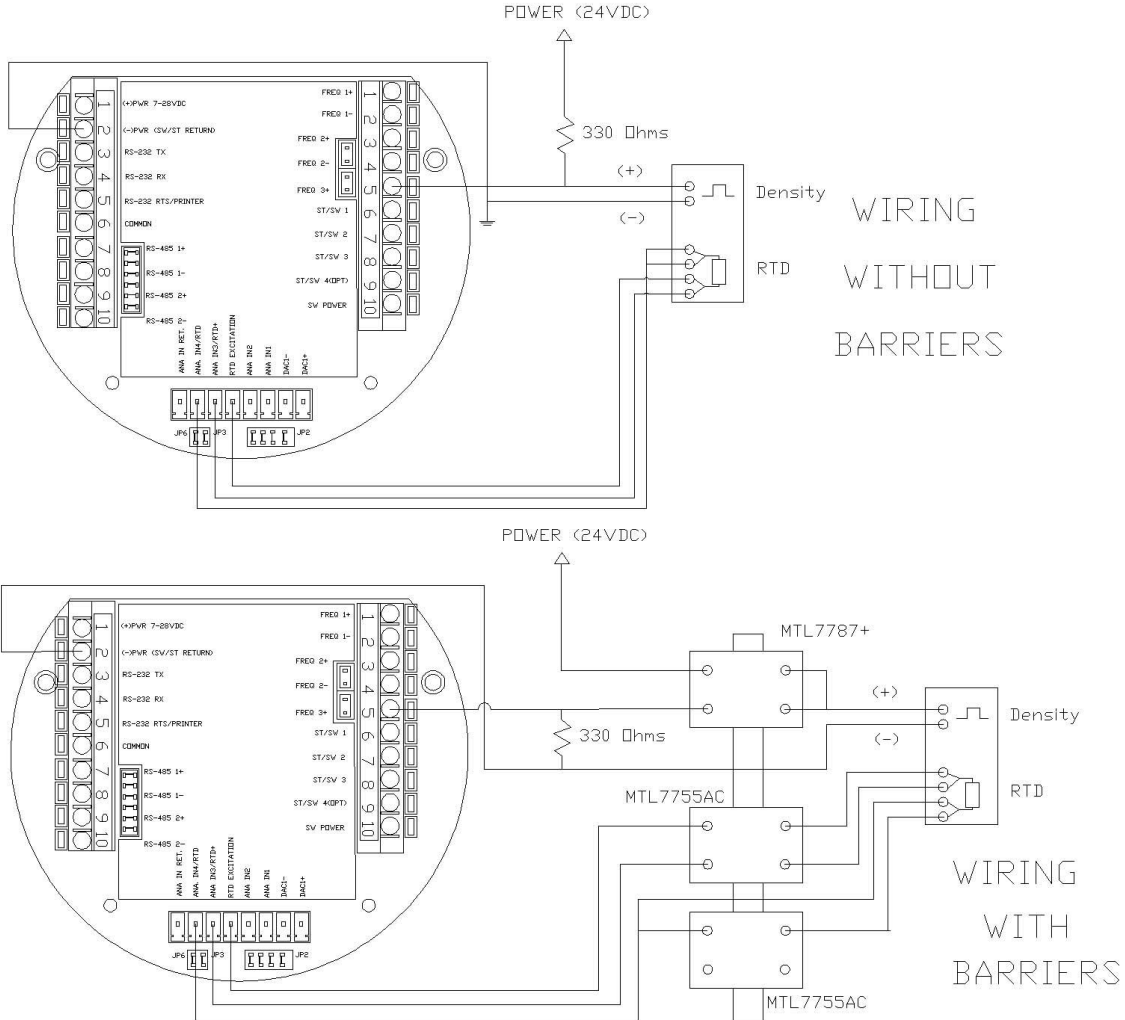
### Switch Output to Relay Wiring Diagram

When wiring the Switch Outputs to an inductive load such as a relay, it is better to add transient protection to the flow computer's electronics due to the surge in voltage that inductive loads may create. This protection can be added as shown in the drawing below.



**Density input wiring:**

When using a live densitometer input with frequency signal, the signal can be brought into the MicroMV in its raw form. The MicroMV accepts a sine wave or square with or without DC offset.



MTL7787+ : BARRIER FOR SWITCHES OR DIGITAL INPUTS  
 MTL7755AC: BARRIER WITH LOW RESITANCE FOR LOW POWER I/O

**Note:** When wiring the density input polarity is of significance and reverse polarity could result in some damage or power loss. When Density input is 4-20mA it should be connected as a regular 4-20mA signal to the analog input and not the density frequency input.

## **CALIBRATION Through DOS Program**

### **Analog Input 4-20mA or 1-5 volt signal**

Calibrations are performed under **I/O | Calibration**. Use the arrow keys to scroll to **Calibration** and press <ENTER>. After you press <ENTER> the screen should show **COMMUNICATION STATUS: OK**.

### **OFFSET CALIBRATION:**

For simple offset type calibration simply induce the signal into the analog input and make sure the MicroMV is reading it. After you verify that the MicroMV recognized the analog input press <F8>. The screen will freeze. Scroll down to the analog input you are calibrating and enter the correct mA reading. Then press <ENTER> followed by <F3> to download. To read the current live readings press <F2> and then the flow computer will display the readings. The offset type calibration is mainly used when a small offset adjustment needs to be changed in the full-scale reading. The offset will apply to the zero and span. Offset is the recommended method for calibrating the temperature input.

### **FULL CALIBRATION METHOD:**

To perform full calibration be prepared to induce zero and span type signal.

1. Induce the low end signal i.e. 4mA in the analog input.
2. Press <F8> and scroll down to the reading then press <ALT><R> (alternate key and the letter R simultaneously). Then enter the analog input value i.e. 4mA. Follow that by <ENTER> and the download <F3> button.
3. Now be ready to enter the full-scale value. Simply induce the analog signal and then enter the value i.e. 20mA, and then download by pressing <ENTER>, then <F3> key.
4. ***Induce live values to verify the calibration.***

*While calibrating it is advisable to read the live data by pressing F2 while in the calibration screen and in calibration mode which will give single update.*

*When doing full calibration, you should not escape this menu without performing both calibration points.*

<p><b>Note:</b> To go back to the default calibration simply press &lt;F8&gt; and scroll to the analog input or multi-variable input, and press &lt;ALT&gt;&lt;R&gt; followed by &lt;F3&gt; Key.</p>
--

### **RTD calibration:**

RTD Calibration is a 2-step process. The first step is a one time procedure to verify transducer linearity and is done at the time the meter is being setup. The second step is the routine calibration sequence.

#### **Step 1 – Linearity Verification**

1. Use a Decade box with 0-150 °F settings.
2. Connect RTD cable to this resistive element for verification of linearity. Verify low and high points. It must be within ½ degree.
3. Connect the actual RTD element and compare with a certified thermometer.
4. If not within ½ degree do a Full Calibration (See Full Calibration below). If problem persists verify other elements such as RTD Probe, connections, shield, conductivity of connectors, etc.

The purpose of the above procedure is to verify zero and span and make sure that the two points fall within the expected tolerance.

#### **Step 2 – Routine Calibration**

Once Linearity has been verified through Step 1, the routine calibration procedure is reduced to simply connecting the actual RTD and doing an offset point calibration (see offset calibration below).

Calibration after that will be simple verification for the stability of the transmitter. If it drifts abnormally then you need to verify the other parts involved.

### **RESET TO DEFAULT CALIBRATION**

To go back to the default calibration simply press <F8> and scroll to the RTD input, and press <ALT> <R> key followed by <F3> function key.

### **OFFSET CALIBRATION:**

For offset calibration simply go to **I/O | Calibration** and press <ENTER>. Once the flow computer shows communication status OK press <F8> function key and scroll to **RTD**. Induce a live value and wait for 10 seconds for the reading to stabilize. Then enter the live value followed by <F3> function key to download the direct reading. The value entered must be in ohms only.

### **FULL SCALE CALIBRATION:**

1. Prepare low range resistive input (i.e., 80Ω) and High range resistive input (i.e., 120Ω). Go to the calibration menu and press <F8> function key. Scroll to the RTD input you are calibrating and press <ALT> <R> (key <ALT> and the letter R at the same time). Induce the low end (80Ω) resistive signal and then wait 10 seconds and enter 80 followed by pressing the <F3> function key.
2. Induce Higher range signal (120Ω) and wait 10 seconds, then enter the number 120 ohm and press the <F3> key.
3. *Now verify the live reading against the flow computer reading.*

**Calibration of analog output:**

To calibrate the analog output against the end device follow the following steps:

1. Go to the calibration menu and press <F8>. Scroll down to analog output and press <ENTER>, and then <ALT><R>. This will cause the flow computer to output the minimum possible signal 4 mA. Enter the live output value reading in the end device i.e. 4 mA and press <F3>. Now the flow computer will output full scale 20 mA. Enter the live output i.e. 20 then press the <F3> key.
2. *Now verify the output against the calibration device.*

## **Multi-Variable Transmitters (Model 205) – DP and Pressure**

Calibrations are performed under **I/O | Calibration**. Use the arrow keys to scroll to **Calibration-Multi-Variable** and press <ENTER>. After you press <ENTER> the screen should show **COMMUNICATION STATUS: OK**.

### **OFFSET CALIBRATION**

1. Induce live value for pressure or DP.
2. Go to **Calibration - Multi-Variable** menu.
3. Press <F8>, point to the value being calibrated, enter the correct value followed by <ENTER>, then press <F3> key to download data.
4. *Now read induce live values to verify the calibration.*

### **FULL SCALE CALIBRATION**

1. Press <F8>. Scroll to the parameter to be calibrated, then press <ALT><R>.
2. Induce the low range signal, then press <ENTER> followed by <F3>.
3. Induce the high range signal, then press <ENTER> followed by <F3>.
4. *Now verify the live reading against the flow computer reading.*

While doing calibration before downloading any of the calibrated values, it is a good practice to verify that the Micro MV close reading to the induced value by pressing F2 to get a single update as many times as needed. Do not use the escape key when performing full calibration until calibration is completed. The DP reading must be re-calibrated for the zero offset after applying line pressure.

## **Multi-Variable Transmitters (Model 205)- RTD**

Calibrations are performed under **I/O | Calibration**. Use the arrow keys to scroll to **Calibration-Multi-Variable** and press <ENTER>. After you press <ENTER> the screen should show **COMMUNICATION STATUS : OK**.

RTD Calibration is a 2-step process. The first step is a one time procedure to verify transducer linearity and is done at the time the meter is being setup. The second step is the routine calibration sequence.

### **Step 1 – Linearity Verification**

1. Use a Decade box with 0-150 °F settings.
2. Connect RTD cable to this resistive element for verification of linearity. Verify low and high points. It must be within ½ degree.
3. Connect the actual RTD element and compare with a certified thermometer.
4. If not within ½ degree do a Full Calibration (See Full Calibration below). If problem persists verify other elements such as RTD Probe, connections, shield, conductivity of connectors, etc.

The purpose of the above procedure is to verify zero and span and make sure that the two points fall within the expected tolerance.

### **Step 2 – Routine Calibration**

Once Linearity has been verified through Step 1, the routine calibration procedure is reduced to simply connecting the actual RTD and doing an offset point calibration (see offset calibration below).

Calibration after that will be simple verification for the stability of the transmitter. If it drifts abnormally then you need to verify the other parts involved.

### **RESET TO DEFAULT CALIBRATION**

To go back to the default calibration simply press <F8> and scroll to the RTD input, and press <ALT> <R> key followed by <F3> function key.

### **OFFSET CALIBRATION:**

For offset calibration simply go to **I/O | Calibration** and press <ENTER>. Once the flow computer shows communication status OK press <F8> function key and scroll to **RTD**. Induce a live value and wait for 10 seconds for the reading to stabilize. Then enter the live value followed by <F3> function key to download the direct reading. The value entered must be in degrees only.

### **FULL SCALE CALIBRATION:**

1. Prepare low range resistive input (i.e., 80Ω) and High range resistive input (i.e., 120Ω). Go to the calibration menu and press <F8> function key. Scroll to the RTD input you are calibrating and press <ALT> <R> (key <ALT> and the letter R at the same time). Induce the low end (80Ω) resistive signal and then wait 10 seconds and enter the equivalent temperature in degrees followed by pressing the <F3> function key.
2. Induce Higher range signal (120Ω) and wait 10 seconds, then enter the temperature degrees equivalent to 120 followed by pressing the <F3> function key.
3. *Now verify the live reading against the flow computer reading.*



## ***Verifying digital inputs and outputs***

Use the diagnostic menu. Scroll down by using the arrow keys to **Diag | Diagnostic Data** and press <ENTER>. A live input and output is displayed. On the top of the screen pulse inputs and density frequency input are shown. Compare the live value against the displayed value on the screen. Failure to read turbine input could be a result of a bad preamplifier or the jumper selection for sine and square wave input are not in the correct position. Refer to wiring diagram **Wiring | Turbine** for proper turbine input wiring. Density input can be sine or square wave with or without DC offset. Minimum accepted signal has to be greater than 1.2 volt peak to peak. Status input is shown below the frequency input to the left of the screen. When the status input is on, the live diagnostic data will show **ON**. Minimum voltage to activate the status is 6 volts with negative threshold of 2 volts. To activate the switch outputs to the on and off position press <F8> in the diagnostic menu. After the screen freeze the cursor will point to switch output one. Use the space bar to toggle the switch on/off and the <ENTER> key to advance to the next switch. To exit press <ESC>. The switch outputs are open collector and require external voltage.

# CHAPTER 2: Data Entry and Configuration Menus

## *Introduction to the MicroMVG Software*

The Micro MV Gas software is constructed around a menu-driven organization

## *Configuration File through DOS Program*

The Micro MV Gas software is constructed around a menu-driven organization. Begin your Micro MV Gas software and, across the top of your screen, you see a bar like this:

```

┌ File  Port  Diag  Meter  I/O  Report  Wiring  Print  TEST ────┐

```

This is called the *menu bar*. It consists primarily of series of topics—**Port**, **Diag**, and so forth. When you move the cursor to a topic you will see a list—we will call it a *menu list*—of topics related to the main topic on the menu bar.

At the bottom of the screen is the *prompt bar*. It informs you of appropriate actions that you can perform while your cursor is at its present location. In this example:

```

↑ ↓ ← → to Choose Enter to Select F1=Help

```

you are informed that your valid choices are the four arrow keys, the <ENTER> key, and the <F1> key. Another important area of the screen is the *filename area*. This is the rightmost section of the menu bar; it informs you what configuration file you are presently viewing and editing. In the example above, you are editing the file `TEST`. When you first begin the SFC software, however, it will display `?????????` because no file has yet been chosen. Until you choose a file to edit or view, by opening either an existing file or a new one, you will not be able to move from the **File** menu item.

The center portion of the screen is simply called the *viewing area*. Here you view either various menu lists or the *prompt window* associated with an item in a menu list after it is selected (that is, after you press <ENTER>). When you are in a prompt window the message `PROMPT` appears in the filename area. Under certain conditions you will have a screen where the viewing area takes up the whole screen and the menu and/or prompt bars disappear. Examples of these are: the wiring diagrams, the calibration windows, and the **Diag** windows.

### About

Displays the version number of EPROM and PC configuration menu. Press <Esc> to Exit.

## **File**

### **Open a File**

Use this function to open an existing configuration file. After a file is opened it becomes the currently active file; its contents can be viewed and its parameters can be edited.

When this function is chosen a list of existing configuration files is displayed. Use the cursor arrow keys to move the cursor to your selection, then press the <ENTER> key.

### **Open a New File**

Create a new file to store all the programmed information for one Micro MV Gas Flow Computer. You are prompted for the new file's name of eight characters or less. If you enter the name of a pre-existing file, the software informs you of this and prompts you for your file's name again. After a file is opened it becomes the currently active file; its contents can be viewed and its parameters can be edited.

### **Delete a File**

Delete a file when that file is no longer needed.

When this function is chosen a list of existing configuration files is displayed. Use the arrow keys to move the cursor to your selection, then press <ALT><D> to delete the file.

### **Load File**

Use this function to exchange parameter values between the PC and the Micro MV Gas Flow Computer. After this action is performed all parameter values in the Micro MV Gas Flow Computer and the currently active file in the PC are identical.

To read all current parameters from the Micro MV Gas Flow Computer to the currently active file in the PC, press the <F2> function key; this is called "uploading".

To write all current parameters from the currently active file in the PC to the Micro MV Gas Flow Computer, press the <F3> function key; this is called "downloading".

### **View File**

Unlike every other file function, View File does not act upon configuration files. Instead, View File allows the user to view files that were previously captured in a report. For capturing data in a report, look for these items under the **Report** menu header:

- Prev. Hourly Data**
- Prev. Daily Data**
- Prev. Month Data**
- Alarm Data**
- Audit Trail Report**
- Auto Data Retrieval**
- Current Data**

When viewing a file use PageUp and PageDown to browse through it.

**Save As**

Use Save As to save the parameters in the currently active file (that is, the parameter values currently being edited) to a new file. You are prompted for the new file's name of eight characters or less. If you enter the name of a pre-existing file, the software informs you of this and prompts you for your file's name again. The original file will remain in memory.

**Save**

When permanent modifications are performed on a file, user must save the new changes before exiting the program, or proceeding to open a different file.

**Save and Exit**

Exit the program and save the parameters that were changed.

**Exit**

Exit without saving new modified parameters.

# PORT

## PC Communication Set Up

### COMMUNICATION PORT NUMBER (1,2,3,4)

Enter the PC port used to communicate with the Micro MV Gas Flow Computer.

### FLOW COMPUTER PORT NUMBER

There are three available ports in the Flow Computer. Port 1 is the RS-485 port that can only be a Modbus port. Port 2 is the RS-232 port that can be user configurable as printer/Modbus. Port 3 is the RS-485 port that can only be a Modbus port. The PC set up must match the Micro MV Gas Flow Computer port set up.

### UNIT ID NUMBER

The Unit ID Number is used strictly for communication purposes; it can take any value from 1 to 247. Only one master can exist in each loop.

*Note: Do not duplicate the Unit ID number in a single communication loop!  
This situation will lead to response collisions and inhibit communications to units with duplicate ID numbers.*

### MODBUS TYPE

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

The Modbus Communication Specification is either Binary RTU or ASCII.

### PARITY

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

RTU - NONE

ASCII - EVEN or ODD

Set the parity to match the **Modbus Type**.

### BAUD RATE

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, or 9600.

### TRANSMIT DELAY

This Delay in milliseconds is used to allow handshaking between the PC and the Micro MV Gas Flow Computer. The PC will hold the RTS line high for the specified Transmit Delay time. After that time expires the data stream will begin transmitting. Transmit Delay is applicable regardless of the type of communication with the Micro MV Gas Flow Computer (RS-232 or RS-485).

This function can be very useful, especially when using a half-duplex RS-485 port; otherwise the RS-485 port will never turn off. A delay of 50 milliseconds is normally sufficient.

## **Flow Computer Communication Set Up**

### **UNIT ID NUMBER**

The Unit ID Number is used strictly for communication purposes; it can take any value from 1 to 247.

*Note: Do not duplicate the Unit ID number in a single communication loop!  
This situation will lead to response collisions and inhibit communications to units with duplicate ID numbers.*

Only one master can exist in each loop.

### **PORT #1/#3 MODBUS TYPE**

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

The Modbus Communication Specification is either Binary RTU or ASCII.

### **PORT #1/#3 PARITY**

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

RTU - NONE

ASCII - EVEN or ODD

Set the parity to match the **Modbus Type**.

### **PORT #1/#3 BAUD RATE**

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, or 9600.

### **PORT #1/#3 RTS DELAY**

This function allows modem delay time before transmission. The Micro MV Gas Flow Computer will turn the RTS line high before transmission for the entered time delay period.

### **PORT #2 BAUD RATE**

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, or 9600.

### **PORT #2 MODBUS TYPE**

*Note: this parameter must be set the same for both the PC and the Micro MV Gas Flow Computer for communication to occur.*

The Modbus Communication Specification is either Binary RTU or ASCII.

### **PORT #2 PARITY**

RTU - NONE

ASCII - EVEN or ODD

Set the parity to match the **Modbus Type**.

### **SELECT 0=RTS, 1=PRINTER**

RTS line has dual function selection : either RTS for driving request to send or transmit to serial printer. To use serial printer interface for printing reports, ie. batch, daily, and interval Connect the serial printer to RTS and common return, and select 1 for printer.

### **PORT 2 RTS DELAY**

This function allows modem delay time before transmission. The Micro MV Gas Flow Computer will turn the RTS line high before transmission for the entered time delay period.

**PRINTER BAUD RATE**

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, or 9600.

**PRINTER NUMBER OF NULLS**

This function is used because no hand shaking with the printer is available and data can become garbled as the printer's buffer is filled. The Micro MV Gas Flow Computer will send nulls at the end of each line to allow time for the carriage to return. Printers with large buffers do not require additional nulls. If data is still being garbled, try reducing the baud rate to 1200.

**Dial**

Use the cursor arrow keys to move the cursor to the desired phone number and press ←ENTER. Dial's display indicates the owner of each phone number according to the Phone Book.

Dial cannot add new phone numbers; it can only dial numbers that have previously been entered in the Phone Book.

**Example:** T,9,1800-530-5539 instructs the dialer to use tone dialing, pause, dial 9 for an outside line, pause, then dial the number. See Phone Book for more information.

**Phone Book**

Phone Book lists all the phone numbers with the phone's owner. New numbers can be added to the list.

- <Arrow Keys> Select Number to Modify or Delete.
- <A> Add new entry to phonebook.
- <ALT> + <D> Delete selected entry.
- <M> or <ENTER> Modify selected entry.
- <Esc> Exit and save changes.

**Phone Book Edit**

Type name, press <TAB>, and type phone number. Press <ENTER> to save, <Esc> to leave entry unchanged.

In the phone number the following codes may be used:

- <0-9> Dial digit
- <P> Change to pulse dialing
- <T> Change to tone dialing
- <Comma> Pause

**Example:** T,9,1800-530-5539 instructs the dialer to use tone dialing, pause, dial 9 for an outside line, pause, then dial the number.

**Modem Setup**

<Modem Dial Prefix> Enter the string sent to the modem before the phone number. Normally either "ATDT" (dial tone) or "ATDP" (dial pulse)

<Modem Dial Suffix> Enter the string sent to the modem after the phone number. Normally just "^M" (CR)

<Modem Hangup String> Enter the string sent to the modem to hang-up the phone.

See your modem manual for other characters.

**Hang-up Phone**

Press ←ENTER to send the Modem Hang-up string (Defined in Modem Setup) to the modem.

**Note :** Hand shake and error checking should be turned off. Commands to turn off the hand shake vary between modems. Check your modem manual. Typical command - AT&K0, AT&Y0.



## **DIAG**

### **Read Single Flow Computer Communication Setup**

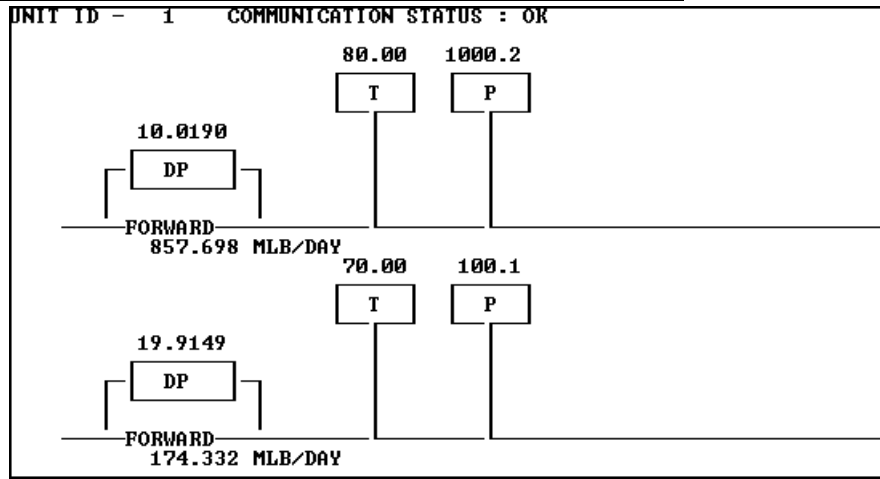
Press <F2> and the configuration program will attempt to communicate with a single Micro MV Gas Flow Computer at different baud rates and formats.

Failure to communicate can occur because of a communication wiring problem, wrong PC port selection, communication parameter mismatch between PC and Micro MV Gas Flow Computer (Modbus type, parity, baud rate, etc.) or lack of power to the Micro MV Gas Flow Computer. To use this feature, the user must insure that only one Micro MV Gas Flow Computer is connected to the PC. More than one Micro MV Gas Flow Computer in the loop will cause data collisions and unintelligible responses.

### **Diagnostic Data**

**Diagnostic Data** shows real-time, live data. Use it to monitor switch outputs, status inputs, analog inputs and outputs, analog frequency, failure codes and so forth. To control the switch outputs manually use the <F8> function key, press the SPACE BAR to change activity, and use <ENTER> key to move to next switch.

**Micro MV Gas Flow Computer Configuration Diagram**



Meter Run configuration for the current configuration file. Live data are displayed above the transmitters' icons. Response of the various metering devices is indicated in either standard US or metric units, per the chart below.

	<i>1. Standard US Units</i>
<b>Flow Rate (Mass)</b>	MLb
<b>DP</b>	Inches H <sub>2</sub> O column
<b>Pressure</b>	PSIG
<b>Temperature</b>	°F

# METER

## Set Up

All items in this section are listed in the submenu **Meter | Set Up | ...**.

### METER BANK

Configure for single or dual meters per individual Micro MV Gas Flow Computer. Enter “1” if two meters will be connected to the flow computer.

### SINGLE OR DUAL STREAMS

Single stream can be single meter or bank of two meters. Dual streams allow the user to monitor independent products on separate streams simultaneously.

### STATION TOTAL

Station total can add meter one and two, subtract meter one from meter two, or just ignore this feature by selecting none. Station Total does not affect, destroy or otherwise alter the data from either meter. When Station Total is other than none, an additional data parameter, Station Total, is generated by the Micro MV Gas Flow Computer and appears in reports and on the live display monitor.

Station total is not accessible when **Meter Bank = 0**.

### COMMON PARAMETERS

#### **Meter | Set Up | Common [Temperature/Pressure/Density]**

This feature allows the Micro MV Gas Flow Computer to use the transmitters on meter one to substitute and compensate for meter two.

### USE STACK DP

The Micro MV Gas Flow Computer allows the user to select dual DP transmitters on each meter for better accuracy and a higher range flow. Use in conjunction with the DP Switch High % parameter setting.

### DP SWITCH HIGH %

The Micro MV Gas Flow Computer will begin using the high DP when the low DP reaches the percent limit assigned in this entry. Example: DP low was ranged from 0-25 inches and switch % was set at 95%. When low DP reaches 23.75 in (= 0.95 \* 25) the Micro MV Gas Flow Computer will begin using the high DP provided the high DP did not fail. When the high DP cell drops below 23.75, the Flow Computer will start using the Low DP for measurement.

### DENSITY TYPE

If live density is connected to the flow computer, user must enter the density type. Raw density frequency or a 4-20mA input can be selected. This density will be used to calculate mass flow and net flow.

Density Type	Densitometer		
Type 0	None		
Type 1	4–20 mA	Density 4–20 mA Type*	
		Type 0	Density Signal 4-20mA in LB/FT3
Type 1		Type 1	SG Signal 4-20mA
Type 2	UGC		
Type 3	Sarasota		
Type 4	Solartron		

### DENSITY 4-20MA TYPE\*

Note that this type of input requires the user to choose a subtype, as indicated in the table above.

*\*Note: Only Type 1 calculation (Density in LB/FT3) is appropriate for gas measurements; therefore the software chooses that option for you automatically. Density is calculated in LB/FT3.*

**USE METER TEMPERATURE AS DENSITY TEMPERATURE****Meter | Set Up | Use Meter Temp as Dens.Temp#1****Meter | Set Up | Use Meter#2 Temp as Dens.Temp#2**

To allow the meter temperature to calculate the effect of temperature on the densitometer. Make sure the meter and density temperature are similar to avoid measurement errors.

**Meter Data**

All items in this section are listed in the submenu **Meter | Meter Data | ...**.

**METER LOCATION**

Up to 20 characters. This entry appears only in the report and serves no other function.

**METER ID**

Up to 8 characters. This function will serve as Meter Tag.

**FLOW EQUATION TYPE (0-3)**

- 0 = AGA3 (OLD AGA3, 1985 Orifice Equations)
- 1 = API 14.3 (NEW AGA3, 1992 Orifice Equations)
- 2 = AGA7 (Frequency Type Input)
- 3 = Venturi

Select the desired calculation mode. API 14.3 is the latest orifice calculations introduced in 1992. AGA3 is the orifice calculation that was used previously. All new installations are recommended to use API 14.3 for orifice calculations.

Here is the prompt window for one equation type. This prompt window pops up when you enter a valid value in the **Flow Equation Type** line and press ←ENTER.

**DENSITY OF DRY AIR MLB/MOL**

Typical value would be 28.9625.

**RELATIVE DENSITY**

The real gas relative density is used in the calculations of the compressibility factor, flowing and reference densities (required only when AGA8 or NX19 is used).

**FLOW RATE LOW/HIGH LIMIT**

The high/low flow rate alarm is activated, when the flowrate exceeds or is below the set limit. The alarm will be documented with time, date, and totalizer.

**DENSITY CALCULATION TYPE (0-3)**

Calc. #	Calculation Type	Comments and Limitations
0 =	NX19	
1 =	AGA8 Gross Method 1	Relative Density: 0.554–0.87 Heating.Value: 477–1150 BTU/SCF
2 =	AGA8 Gross Method 2	Relative Density: 0.554–0.87 Heating.Value 477–1150 BTU/SCF
3 =	AGA8 Detail Method	Relative Density: 0.07–1.52 Heating.Value 0–1800 BTU/SCF

AGA 8 detail method can be used for gases other than natural gas, such as methane, carbon dioxide, ethane, and hydrogen sulfide.

**AGA3 DATA**

To set AGA3 flow parameters, set **Meter | Meter Data | Flow Equation Type = 0** and press ←ENTER. You will then access a submenu in which you can set the parameters below.

**Pipe I.D. Inches****Orifice ID Inches**

Pipe ID in inches is the measured inside pipe diameter to 5 decimals at reference conditions. Orifice ID in inches is the measured diameter of the orifice at reference conditions.

**DP Cutoff**

The Micro MV Gas Flow Computer suspends all calculations whenever the DP, in inches of water column, is less than this value. This function is vital for suppressing extraneous data when the DP transmitter drifts around the zero mark under no-flow conditions.

**Y Factor (0=None,1=Upstream,2=Downstream)**

Y factor is the expansion factor through the orifice. The user must enter the position of the pressure and temperature sensors. Select y=1 if the sensors are installed upstream of the orifice plate. Select y=2 if the sensors are down stream of the orifice plate.

**Select 0=Flange Tap, 1=Pipe Tap**

Tap position is where the differential transmitter is fitted. Select 0 = flange fitted or 1 = pipe fitted.

**Isentropic Exponent (Specific Heat)**

Ratio of specific heat is a constant associated with each product. Even though it varies slightly with temperature and pressure, in most cases it is assumed to be a constant.

**Viscosity in Centipoise**

Even though viscosity will shift with temperature and pressure changes, the effect on the calculations is negligent. Therefore using a single value is appropriate in most cases. Enter viscosity in centipoise.

**Reference Temperature of Orifice**

Reference temperature of orifice is the temperature at which the orifice bore internal diameter was measured. Commonly 68 °F is used.

**Orifice Thermal Expansion Coeff. E-6**

Orifice thermal expansion is the linear expansion coefficient of orifice material.

Type 304 and 316 Stainless	9.25 E-6
Monel	7.95 E-6
Carbon Steel	6.20 E-6

**API 14.3 DATA (NEW AGA3)**

To set API 14.3 flow parameters, set **Meter | Meter Data | Flow Equation Type = 1** and press ←ENTER. You will then access a submenu in which you can set the parameters below.

**Pipe I.D. Inches****Orifice ID Inches**

Pipe ID in inches is the measured inside pipe diameter to 5 decimals at reference conditions. Orifice ID in inches is the measured diameter of the orifice at reference conditions.

**DP Cutoff**

The Micro MV Gas Flow Computer suspends all calculations whenever the DP, in inches of water column, is less than this value. This function is vital for suppressing extraneous data when the DP transmitter drifts around the zero mark under no-flow conditions.

**Y Factor (0=None,1=Upstream,2=Downstream)**

Y factor is the expansion factor through the orifice. The user must enter the position of the pressure and temperature sensors. Select y=1 if the sensors are installed upstream of the orifice plate. Select y=2 if the sensors are down stream of the orifice plate.

**Isentropic Exponent (Specific Heat)**

Ratio of specific heat is a constant associated with each product. Even though it varies slightly with temperature and pressure, in most cases it is assumed as a constant.

**Viscosity in Centipoise**

Even though viscosity will shift with temperature and pressure changes, the effect on the calculations is negligible. Therefore using a single value is appropriate in most cases. Enter viscosity in centipoise.

**Reference Temperature of Orifice****Reference Temperature of Pipe**

These parameters give temperature at which the bore internal diameter was measured on the orifice and pipe respectively. Commonly 68 °F is used.

**Orifice Thermal Expansion Coeff. E-6****Pipe Thermal Expansion Coeff. E-6**

These parameters give the linear expansion coefficients of the orifice and pipe materials respectively.

Type 304 and 316 Stainless	9.25 E-6
Monel	7.95 E-6
Carbon Steel	6.20 E-6

**AGA 7 DATA (FREQUENCY)**

To set AGA 7 flow parameters, set **Meter | Meter Data | Flow Equation Type = 2** and press ←ENTER. You will then access a submenu in which you can set the parameters below.

**K Factor**

K Factor is the number of pulses per unit volume, i.e. 1000 pulses/CF. The meter's tag would normally indicate the K Factor.

**Meter Factor**

Meter Factor is a correction to the K Factor for this individual meter, applied multiplicatively to the K factor.

**Flow Cutoff Frequency**

The Micro MV Gas Flow Computer will quit totalizing when the turbine frequency (or other frequency input) is below this set limit. This feature is to reduce extraneous noise appearing as volume data when the meter is down for period of time.

This value is entered as pulses per second.

**VENTURI DATA**

To set Venturi flow parameters, set **Meter | Meter Data | Flow Equation Type = 3** and press ←ENTER. You will then access a submenu in which you can set the parameters below.

**Pipe I.D. Inches****Orifice ID Inches**

Pipe ID in inches is the measured inside pipe diameter to 5 decimals at reference conditions. Orifice ID in inches is the measured diameter of the orifice at reference conditions.

**DP Cutoff**

The Micro MV Gas Flow Computer suspends all calculations whenever the DP, in inches of water column, is less than this value. This function is vital for suppressing extraneous data when the DP transmitter drifts around the zero mark under no-flow conditions.

**Y Factor (0=None,1=Upstream,2=Downstream)**

Y factor is the expansion factor through the venturi. The user must enter the position of the pressure and temperature sensors. Select y=1 if the sensors are installed upstream of the venturi. Select y=2 if the sensors are down stream of the venturi.

**Isentropic Exponent (Specific Heat)**

Ratio of specific heat is a constant associated with each product. Even though it varies slightly with temperature and pressure, in most cases it is assumed as a constant.

**Reference Temperature of Orifice****Reference Temperature of Pipe**

These parameters give temperature at which the bore internal diameter was measured on the orifice and pipe respectively. Commonly 68 °F is used.

**Pipe Thermal Expansion Coeff. E-6**

Pipe thermal expansion is the linear expansion coefficient of pipe material.

Type 304 and 316 Stainless	9.25 E-6
Monel	7.95 E-6
Carbon Steel	6.20 E-6

**Discharge Coefficient C**

Typical value is 0.995.

$$\text{Mass (MLB/HR)} = 0.0997424 \times \frac{C \times Y \times F_a \times d^2}{\sqrt{1 - \beta^4}} \times \sqrt{\rho \times DP} \times 3.6$$



## Linear Factor

### Meter | Linear Factor

Edit Linear Factor			
Meter#1	CF/HR	Threshold #1	0.000
		Linear Factor #1	1.0000
	CF/HR	Threshold #2	0.000
		Linear Factor #2	1.0000
	CF/HR	Threshold #3	0.000
		Linear Factor #3	1.0000
	CF/HR	Threshold #4	0.000
		Linear Factor #4	1.0000
Meter#2	CF/HR	Threshold #1	0.000
		Linear Factor #1	1.0000
	CF/HR	Threshold #2	0.000
		Linear Factor #2	1.0000
	CF/HR	Threshold #3	0.000
		Linear Factor #3	1.0000
	CF/HR	Threshold #4	0.000
		Linear Factor #4	1.0000

Enter the different correction factors for the meter at different flow rates. The Micro MV Gas Flow Computer will perform linear interpolation each second. Notice that even though using this feature enhances the measurement accuracy and range, performing audit trail on a linearized meter factor is very difficult.

## **Other Parameters**

All parameters in this section are in the submenu **Meter | Other Parameters** | ... unless otherwise noted.

Edit Parameters	
Day Start Hour (0-23)	0
Company Name	
Select Flow Rate 0=Hour,1=Day,2=Minute	0
Flow Rate Averaged Seconds (1-10)	1
Disable Alarms ? (1=Yes)	0
Print Interval in Minutes (0-1440)	0
Base Temperature Deg.F	0.000
Base Pressure PSIA	0.000
Atmospheric Pressure PSIA	14.696
Run Switch High Set Point	0.00
Low Set Point	0.00
Delay in Seconds	0
Pulse Output #1 Pulses per Unit	0.000
Pulse Output #2 Pulses per Unit	0.000
Pulse Output Width (4-5000 ms)	0

### **DAY START HOUR (0-23)**

Day start hour is used for daily totalizer reset operation.

### **COMPANY NAME**

Up to 20 characters. The company name appears in the reports.

### **FLOW RATE SELECTION**

The flow rate will be based on daily basis, hourly, or minute.

### **FLOW RATE AVERAGED SECOND**

The flow rate is averaged for 1-10 seconds to minimize fluctuating flow rate conditions. This number averages the current flow rate by adding it to the previous seconds' flow rate, and then displays an averaged smoothed number. Only a low resolution pulse meter requires this function.

### **DISABLE ALARMS**

Use Disable Alarms to ignore alarms. When the alarm function is disabled alarms are not logged. Alarms are also not logged if the DP is below the cut-off limit.

### **PRINT INTERVALS IN MINUTES (0-1440)**

When the second port (RS-232) of the Micro MV Gas Flow Computer is configured as printer port, a snapshot report is generated every print interval (i.e., every five minutes, every hour, or every ten hours).

### **BASE TEMPERATURE**

The basis reference temperature for all corrections. Used, for example, when seller contracts to sell to buyer at an agreed base temperature. Typically 60.0 °F in US units, 15 °C in Metric units.

### **BASE PRESSURE**

The basis reference pressure for all corrections. Used, for example, when seller contracts to sell to buyer at an agreed base pressure. Typical values are 14.73 PSIA for US units, 1.01325 bar in Metric units.

### **ATMOSPHERIC PRESSURE**

This pressure is the local pressure or contracted atmospheric pressure to be used. Typical value is 14.696 PSIA.

**RUN SWITCHING**

Run switching is used to switch from tube one to tube two, when flow rate reaches certain limits. The Micro MV Gas Flow Computer has one active output that can be dedicated to this function. The time delay allows for some delay in switching.

*Note: if Run Switching is being used, then the meter should be configured for a single stream (see Set Up under Meter).*

**RUN SWITCH HIGH SET POINT**

When this flow rate value is exceeded and after the delay timer expires, the switch output will activate. This output normally opens meter run two. The Micro MV Gas Flow Computer provides open collector type output that requires external power.

**RUN SWITCH LOW SET POINT**

When the flow rate drops below this value and stays below it until the delay timer expires, the output switch will be turned off to shut meter two.

**PULSE OUTPUT AND PULSE OUTPUT WIDTH**

Pulse Output is used to activate a sampler or external totalizer. The number selected will be pulses per unit volume or per unit mass. If 0.1 pulse is selected, the one pulse will be given every 10 unit volumes has passed through the meter.

Pulse Output Width is the duration, in milliseconds, of one complete pulse cycle (where each cycle is the pulse plus a wait period, in a 50/50 ratio). For example: if POW = 500 msec, the Micro MV Gas Flow Computer at most can produce one pulse each second regardless of the pulse per unit volume selected (500 msec pulse + 500 msec wait). If POW = 10 msec the Micro MV Gas Flow Computer can produce up to 50 pulses per second.

The Micro MV Gas Flow Computer's maximum pulse output is 125 pulses/sec. The Pulse Output in combination with the Pulse Output Width should be set appropriately.

**Date and Time****Meter | Date/Time**

The PC software will show the current date and time from the PC. Press  to download that date and time to the flow computer. Press  to upload the date and time from the flow computer.

**Parameter Overrides****Temperature Override****Meter | Temperature Override****Pressure Override****Meter | Pressure Override****Heating Value Override****Meter | Heating Value Override****Base Density Override****Meter | Base Dens Override****FPV Override****Meter | Fpv Override**

Edit Temperature Override	
Meter Number	1
Temperature Override	60.00

An override value is entered when no live parameter value is available, or when a different value from live value should be used. In the diagnostic screen, the fail code will appear as 9. Zero in the data entry indicates use live value.

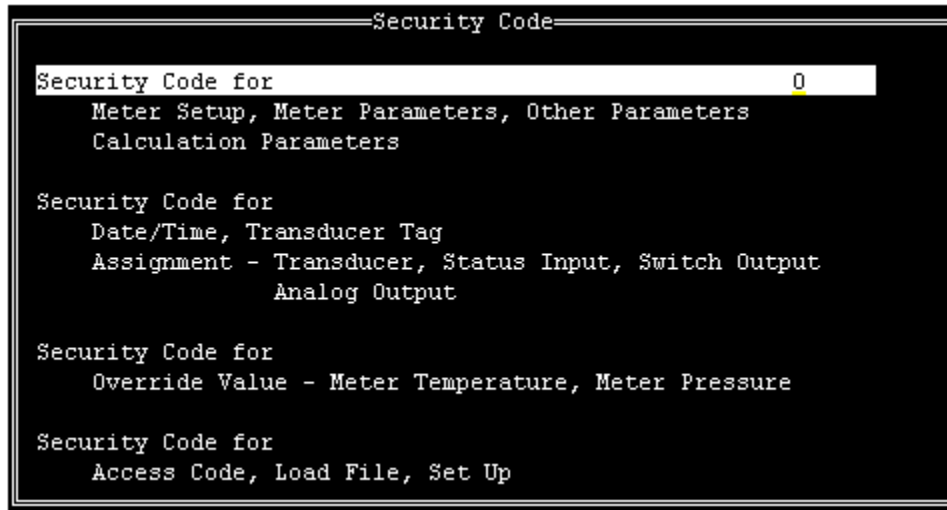
**Heating Value Override** is used in the AGA8 calculation GROSS METHOD 1. In addition the heating value totalizer requires the heating value; without a BTU override value entered, the Energy Flowrate will always equal zero. Enter this number in BTU/SCF(standard cubic feet).

**Base Density Override** is used to override the calculated base density and affects the net calculations only. For products other than natural gas, you must enter base density override for net calculations.

**FPV override:** used to enter a value to override the NX19 supercompressibility factor.

## Security Code

### Meter | Security Code



Several levels of security codes have been selected to fit different levels of responsibility. Up to six numeric code can be used for each entry. If the security code is not used, then there will not be any security code prompt in the menu.

# INPUT/OUTPUT

## Transducer Input Assignment

Parameters in this section are in the submenu **I/O | Transducer Input Assignment | ...** unless otherwise noted. Throughout this section the label **[Parameter]** includes all these parameters unless otherwise noted: **DP, Temperature, Pressure, Density, and Dens.Temperature.**

*Note: This prompt window has more parameters that can be seen in the above example. Others may be reached by scrolling down the list. The actual number of parameters that need to be set is a function of the number of (nonzero) input assignments on Meters 1 and 2.*

### TRANSUCER INPUT ASSIGNMENT

This discussion applies to all **[Parameter] Assignment** parameters.

The Micro MV Gas Flow Computer provides 4 analog inputs, 4 status input/ switch outputs, one density frequency input, two turbine inputs, one 4 wire RTD inputs, and 2 multi variable inputs.. In order for the Micro MV Gas Flow Computer to read the live input, the input must be properly assigned and properly wired.

0=	Not Used
1=	Analog#1
2=	Analog#2
3=	Analog#3

4=	Analog#4
5=	RTD

7 =	Dens.Freq (Not Selectable)
10 =	Multi. Variable Module #1
11 =	Multi. Variable Module #2

### SPARE ASSIGNMENT

Spare input is used for display and alarm purpose only. It is not used in the calculation process. To read spare input value, use the diagnostic screen.

### 4mA

Enter the 4mA value for the transducer.

Note that this value cannot be edited if **[Parameter] Assignment = 0**. Therefore to set the parameter **Meter#1 Temperature @4mA** the **Temperature Assignment** parameter cannot equal zero.

Note that any **[Parameter]** can potentially have a **@4mA** setting.

### 20mA

Enter the 20mA value for the transducer.

Note that this value cannot be edited if **[Parameter] Assignment = 0**. Therefore to set the parameter **Meter#1 Temperature @20mA** the **Temperature Assignment** parameter cannot equal zero.

Note that any **[Parameter]** can potentially have a **@20mA** setting.

### LOW/HI LIMIT

Enter the low and high limits. When live value exceeds high limit or less than low limit, a alarm log will be generated.

Note that this value cannot be edited if **[Parameter] Assignment = 0**. Therefore to set the parameter **Meter#1 Temperature Low Limit** the **Temperature Assignment** parameter cannot equal zero.

**MAINTENANCE VALUE**

The value to be used when the transmitter fails, or while calibrating. For calibration, set fail code to 1 while calibrating.

Note that this value cannot be edited if **[Parameter] Assignment = 0**. Therefore to set the parameter **Meter#1 Temperature Maintenance** the **Temperature Assignment** parameter cannot equal zero.

Note that any **[Parameter]** can potentially have a **Maintenance** setting.

**FAIL CODE**

Fail Code 0: always use the live value even if the transmitter failed.

Fail Code 1: always use the maintenance value

Fail Code 2: use maintenance value if transmitter failed. i.e. 4-20mA is above 21.75 or below 3.25)

Note that this value cannot be edited if **[Parameter] Assignment = 0**. Therefore to set the parameter **Meter#1 Temperature Maintenance** the **Temperature Assignment** parameter cannot equal zero.

Note that any **[Parameter]** can potentially have a **Maintenance** setting.

**DENSITY PERIOD LOW/HIGH LIMITS**

Density Period is the time period in micro-second. The densitometer fails if the density period exceeds the density period low or high limits. If the densitometer fails and density fail code is set to 2, the maintenance value will be used.

**Transducer Tag ID**

**I/O | Transducer Tag ID**

Up to 8 alphanumeric ID number. The transmitters are referred to according to the TAG ID. All alarms are labeled according to TAG ID.

## **Calibration Mode**

**I/O | Calibrate Mode**

### **CALIBRATE MODE**

To calibrate Flow Computer, totalizers will continue at same rate where live parameters will show actual value, i.e. flowrate, DP, pressure etc. Enter '1' to enable this feature.

### **SET TIME (1-9 HOUR)**

This entry is the duration for the calibrate mode. After time expires, the Micro MV Gas Flow Computer will resume its normal operation.

### **METER #1/#2 MASS FLOWRATE**

Override the mass flowrate during the calibration.

## **Calibration**

See details in chapter 1



### **Status Input /Switch Output Assignment**

#### **I/O | Status Input/Switch Output Assignment**

	<b>Assignment</b>	<i>1. Comments</i>
<b>1.</b>	N/A	
<b>2</b>	Calibration Mode	
<b>3</b>	Event Status	
<b>4</b>	Alarm Acknowledge	Reset the previous occurred alarms output bit

### **Switch Output Assignment**

User can assign an output to each of the Micro MV Gas Flow Computer's output switches from this list. The Micro MV Gas Flow Computer switch outputs are open collector type, requiring external D.C power. Outputs in the top list, "Pulse Outputs", require a definition of pulse output per unit volume. Therefore a Pulse Output Width must be defined when one of these switch types are chosen. These outputs are available through switches 1 or 2 only.

Outputs in the bottom list, "Contact Type Outputs", are ON/OFF type outputs. They can be assigned to any of the four switch outputs.

Switches 1 and 2 can be pulse or contact type output; switches 3, 4 are contact-type output only.

#### **ASSIGNMENTS - PULSE OUTPUTS**

	<b>Meter 1</b>	<b>Meter 2</b>	<b>Station</b>
<b>Gross</b>	101	105	109
<b>Net</b>	102	106	110
<b>Mass</b>	103	107	111
<b>Energy</b>	104	108	112

#### **ASSIGNMENTS - CONTACT TYPE OUTPUTS**

	<b>Meter 1</b>	<b>Meter2</b>
<b>Temperature Low</b>	126	136
<b>Temperature High</b>	127	137
<b>Pressure Low</b>	128	138
<b>Pressure High</b>	129	139
<b>Density Low</b>	130	140
<b>Density High</b>	131	141
<b>Dens.Temp Low</b>	132	142
<b>Dens.Temp High</b>	133	143
<b>DP Low</b>	134	144
<b>DP High</b>	135	145
<b>Meter Down</b>	120	123
<b>Flow Rate Low</b>	121	124
<b>Flow Rate High</b>	122	125
<b>N/A</b>		
<b>N/A</b>		

<b>Meter-Independent Parameters</b>	
<b>Day Ended</b>	119
<b>Dens. Period Low</b>	146
<b>Dens. Period High</b>	147
<b>AGA8 Out of Range</b>	148
<b>NX19 Out of Range</b>	149
<b>N/A</b>	150
<b>Active Alarms</b>	151
<b>Occurred Alarms</b>	152
<b>WatchDog</b>	157
<b>Remote Control</b>	158
<b>Run Switch</b>	159

*Note: Assignments 113–118 are not used.*

## **Analog Output Assignment**

4-20mA selection must be proportional and within the range of the selected parameter.

### **ASSIGNMENTS:**

	Meter 1	Meter 2	Station
Gross Flow Rate	1	5	9
Net Flow Rate	2	6	10
Mass Flow Rate	3	7	11
Energy Flow Rate	4	8	12

	Meter 1	Meter2
DP	13	21
Temperature	14	22
Pressure	15	23
Density	16	24
Density Temp	17	25
Dens.b	18	26
DP LOW	19	27
DP HIGH	20	28
Specific Gravity	30	32

Meter-Independent Parameters	
Spare #1	33
Spare #2	34
Remote Control*	35

### **Examples:**

9 = Station Gross Flowrate

30 = Meter 1 Specific Gravity

25 = Meter 2 Density Temperature

*Note: Assignments 29 and 31 are not used.*

*\*Note : Remote control output can be controlled through the Modbus communication link.*

*Note: Dens.b = Base Density  
DP = Differential Pressure*

## **Remote Control Analog Output Setpoint**

Set analog output assignment to 35 (remote control), then enter 0-100 percentage to control the analog output.

### **Micro MV Gas Flow Computer Display Assignment**

Display assignment select up to 16 assignments. The Micro MV Gas Flow Computer will scroll through them at the assigned delay time.

#### **ASSIGNMENT**

4 Digits –        1<sup>st</sup> : Forward/Reverse – 0:Forward,1:Reverse  
                       2<sup>nd</sup> – Meter Number – 1:Meter#1, 2:Meter#2, 3:Station  
                       3rd, 4<sup>th</sup> : Selection

<b>Selection</b>	<b>Description</b>
<b>01</b>	Flow Rate
<b>02</b>	Daily Total
<b>03</b>	Cum. Total
<b>04</b>	Previous Daily total
<b>05</b>	DP/DP Low, High
<b>06</b>	Temperature, Pressure
<b>07</b>	Density, Density at Base
<b>08</b>	Density Freq, Dens.Period, Un-Corr. Density
<b>09</b>	Density Temperature, Density Pressure
<b>10</b>	Flow and Density Calculation Type
<b>11</b>	Spare #1, Spare #2
<b>12</b>	Previous Day AVG Temperature, Pressure, SG
<b>13</b>	Alarms
<b>14</b>	Date, Time

#### **Examples:**

101= Meter#1 Flowrate  
 102= Meter #1 Daily Total  
 302= Station Daily Total  
 113= Meter#1 Alarm  
 14= Date, Time



**BOOLEAN STATEMENTS**

From the Micro MV Gas Flow Computer Configuration Software, Point cursor to '**I/O**', scroll down to '**Boolean Statements**', then press '**Enter**' and the following menu will be displayed:

**Boolean Points – 4 digits (0001-0800, 7831-7899) F2:UPLOAD,F3:DOWNLOAD**

#70	#80	#90
#71	#81	#91
#72	#82	#92
#73	#83	#93
#74	#84	#94
#75	#85	#95
#76	#86	#96
#77	#87	#97
#78	#88	#98
#79	#89	#99

Enter the boolean statements (up to 30 statements). Each statement contains up to two boolean variables (optionally preceded by '/') and one of the boolean function (&, +, \*). **4 digits are required** for referencing programmable variables or boolean points. (Example: 0001)

**PROGRAM VARIABLE STATEMENTS**

From the Micro MV Gas Flow Computer Configuration Software, Point cursor to '**I/O**', scroll down to '**Program Variable Statements**', then press '**Enter**' and the following menu will be displayed:

**Program Variable Statements – 78xx (4 digits), F2:UPLOAD, F3:DOWNLOAD**

#31	#54	#77
#32	#55	#78
#33	#56	#79
#34	#57	#80
#35	#58	#81
#36	#59	#82
#37	#60	#83
#38	#61	#84
#39	#62	#85
#40	#63	#86
#41	#64	#87
#42	#65	#88
#43	#66	#89
#44	#67	#90
#45	#68	#91
#46	#69	#92
#47	#70	#93
#48	#71	#94
#49	#72	#95
#50	#73	#96
#51	#74	#97
#52	#75	#98
#53	#76	#99

Enter the user programmable statements (up to 69 statements). Each statement contains up to three variables and separated by one of the mathematical functions. **4 digits are required** for referencing programmable variables or boolean points. (Example: 0001+7801)

### **BOOLEAN STATEMENTS AND FUNCTIONS**

Each programmable boolean statement consists of two boolean variables optionally preceded a boolean 'NOT' function (/) and separated by one of the boolean functions (&, +,\*). Each statement is evaluated every 100 milliseconds. Boolean variables have only two states 0 (False, OFF) or 1 (True, ON). Any variable (integer or floating point) can be used in the boolean statements. The value of Integer or floating point can be either positive (TRUE) or negative (FALSE).

<b>Boolean Functions</b>	<b>Symbol</b>
NOT	/
AND	&
OR	+
EXCLUSIVE OR	*

#### **Boolean points are numbered as follows:**

<b>0100 through 0199</b>	<b>Meter #1 Boolean Points</b>
<b>0200 through 0299</b>	<b>Meter #2 Boolean Points</b>
	1 <sup>st</sup> digit – always 0, 2 <sup>nd</sup> digit – meter number.
0n01	Gross Flow Pulses
0n02	Net Flow Pulses
0n03	Mass Flow Pulses
0n04	Energy Flow Pulses
0n05	Meter Active
0n06	Spare
0n07	Any Alarms
0n08-0n10	Spare
0n11	DP Override in use
0n12	Temperature Override in use
0n13	Pressure Override in use
0n14	Density Override in use
0n15	Densitometer Temperature Override in use
0n16-0n19	Spare
0n20	Flow Rate High Alarm
0n21	Flow Rate Low Alarm
0n22	Temperature High Alarm
0n23	Temperature Low Alarm
0n24	Pressure High Alarm
0n25	Pressure Low Alarm
0n26	Density High Alarm
0n27	Density Low Alarm
0n28	Density Temp High Alarm
0n29	Density Temp Low Alarm
0n30	DP High Alarm
0n31	DP Low Alarm
<b>301 through 0699</b>	<b>Spare</b>
<b>0701 through 0799</b>	<b>Station Boolean Points</b>
0701	Station Gross Flow Pulses
0702	Station Net Flow Pulses
0703	Station Mass Flow Pulses
0704	Station Energy Flow Pulses
0705-0710	Spare
0711	Run Switch
<b>0801 through 0899</b>	<b>Command Boolean Points</b>
0801	Spare
0802	Alarm Acknowledge

See Boolean Statements.

**VARIABLE STATEMENTS AND MATHEMATICAL FUNCTIONS**

Each statement can contain up to 3 variables or constants.

<b><u>Function</u></b>	<b><u>Symbol</u></b>	
<b>ADD</b>	<b>+</b>	Add the two variables or constant
<b>SUBTRACT</b>	<b>-</b>	Subtract the variable or constant
<b>MULTIPLY</b>	<b>*</b>	Multiply the two variables or constant
<b>DIVIDE</b>	<b>/</b>	Divide the two variables or constants
<b>CONSTANT</b>	<b>#</b>	The number following is interpreted as a constant Example: 7801=#2
<b>POWER</b>	<b>&amp;</b>	1 <sup>st</sup> variable to the power of 2 <sup>nd</sup> variable
<b>ABSOLUTE</b>	<b>\$</b>	unsigned value of variable
<b>EQUAL</b>	<b>=</b>	Move result to another variable Variable within the range of 7801-7830, 7831-7899 (floating points) Variable within the range of 5031-5069 (long integer)
<b>IF STATEMENT</b>	<b>)</b>	Compares the variable to another Example- 7801)T7832 (Go to 7832 if var 7801 >= 0)
<b>GOTO STATEMENT</b>	<b>T</b>	Go to a different statement
<b>COMPARE</b>	<b>%</b>	Compare a value (equal to)
<b>Natural Log</b>	<b>L</b>	Natural Log of variable
<b>Greater</b>	<b>&gt;</b>	Greater than or equal to Example: 7801>7802T7832 (Go to 7832 if 7801>=7802)

Order of precedence – absolute, power, multiply, divide, add and subtract.  
Same precedence – left to right

**Variables stored on the hourly report –****7791-7800 –**

The variables 7801-7810 will be stored at 7791-7800

First 5 Variables (7801-7805) will be **reset** at the end of hour.

**Scratch Pad Variables – Floating Point - 7801-7830 (Read or Write)**

**- Long Integer – 5031 – 5069 (Read or Write)**

**7791-7800 – Last Hour Program Variables (Read Only)**

**7831-7899 – Programmable Variable Statements**



## REPORTS

### Current Data - Snapshot Totalizer Updates

This report consists of two sections. The upper section is primarily the non-changing parameters, the bottom section is the dynamic. Press any key to move from one section of the report to the other. Press <F8> to pause, then press <F5> to print, or enter the file name and press <F6> to capture the snapshot data.

### Previous Hourly Data

Up to 32 previous hourly data are stored in the Micro MV Gas Flow Computer. Enter starting hour and date, the Micro MV Gas Flow Computer will go backward from that selected time and date. Current hour cannot be selected. Press <F4> to display, then press <F5> to print, or enter the file name and press <F6> to capture the **Previous Hourly Report**.

### Previous Daily Data

Enter start date, and the Micro MV Gas Flow Computer will move backward from the entered data and time. Up to 32 previous daily reports can be retrieved. Current day data cannot be retrieved. Press <F4> to display, press <F5> to print, or enter the file name and press <F6> to capture the **Previous Daily Report**.

### Previous Month Data

Up to 12 previous month data are stored in the Micro MV Gas Flow Computer. Select number of previous month data to display, print, or capture. Current month data cannot be retrieved. Press <F4> to display, press <F5> to print, or enter the file name and press <F6> to capture the "Previous

### Previous Alarm Data

Up to 100 previous alarm data can be retrieved. Starting from the most recent to the oldest. Press <F4> to display, press <F5> to print, or enter the file name and press <F6> to capture the **Previous Alarm Report**.

F7 : ABORT		COMMUNICATION STATUS : OK		Press Any Key to Continu	
DATE 07/05/97	TIME 12:37:41			ANAOUT#2	OUERRANGE
	M1F DAILY MASS	451.145		M2F DAILY MASS	91.92
DATE 07/03/97	TIME 15:35:21	METER#2	AGA8	OUT OF RANGE	
	M1F DAILY MASS	215.415		M2F DAILY MASS	.00
DATE 07/03/97	TIME 15:35:19			METER#2	MASS HI
	M1F DAILY MASS	215.415		M2F DAILY MASS	.00

## Audit Trail Report

The audit trail report shows changed configuration parameters that could influence the calculated numbers. The Micro MV Gas Flow Computer provides up to 100 event logs (100 pairs of new and old parameters; some zero parameters cannot be logged). One purpose for audit trail is to backtrack calculation errors that result from mistakes by the operator of the flow computer. Press <F4> to display, press <F5> to print, or enter the file name and press <F6> to capture the "Audit Trail Report".

F7 : ABORT		COMMUNICATION STATUS : OK		Press Any Key to Continue	
SYSTEM START	DATE 07/06/97	TIME 13:02:15			
POWER FAILED	DATE 07/06/97	TIME 12:54:35			
DATE 07/05/97	TIME 12:37:21	M1F MASS	450.947	M2F MASS	91.884
		PULSE OUTPUT #1 VOLUME	OLD .029	NEW	10.000
SYSTEM START	DATE 07/03/97	TIME 16:44:33			
POWER FAILED	DATE 07/03/97	TIME 16:44:21			
DATE 07/03/97	TIME 15:50:52	M1F MASS	224.805	M2F MASS	1.340
METER#2	PRESSURE ASSIGNMENT		OLD 10	NEW	11
DATE 07/03/97	TIME 15:50:52	M1F MASS	224.805	M2F MASS	1.340
METER#2	TEMPERATURE ASSIGNMENT		OLD 10	NEW	11
DATE 07/03/97	TIME 15:50:52	M1F MASS	224.805	M2F MASS	1.340
METER#2	DP LOW ASSIGNMENT		OLD 10	NEW	11
DATE 07/03/97	TIME 15:36:35	M1F MASS	216.289	M2F MASS	.110
METER#2	TEMPERATURE FAIL CODE		OLD 2	NEW	1
DATE 07/03/97	TIME 15:36:35	M1F MASS	216.289	M2F MASS	.110
63FT6590	TEMPERATURE FAIL CODE		OLD 2	NEW	1
DATE 07/03/97	TIME 15:35:18	M1F MASS	215.405	M2F MASS	.000
METER#2	PRESSURE FAIL CODE		OLD 0	NEW	2
DATE 07/03/97	TIME 15:25:18	M1F MASS	215.405	M2F MASS	.000

## Build User Report

One screen can be built or edited with this menu. Any text can be used. Modbus register must follow the "^" sign in order for the program to retrieve the address location.

Available Address - 3001-3130, 3131-3817, 4181-4999,5041-5101,7001-7096,7776-7831,9001-9387,9401-9403.

## View User Report

To monitor the **Build User Report**. Print user reports through the PC's parallel port.

F8:Pause		Esc:Main Menu		COMMUNICATION STATUS : OK	
TEST 1					
METER 1	FLOW TOTAL		0		
METER 2			1		
METER 3			8390455		
			8387099		

## **Build User Report**

One screen can be built or edited with this menu. Any text can be used. Modbus register must follow the "^" sign in order for the program to retrieve the address location.

## **View User Report**

To monitor the **Build User Report**. User reports can be printed through the PC parallel port—see **Print | Files**.

## **Formatted Ticket Report**

```

F7 : ABORT      COMMUNICATION STATUS : TIMEOUT      Press Any Key to Continuu
                                DATE 00/00/00      TIME 00:00:00
COMPANY NAME
METER LOCATION
UNIT NO      1      METER ID  63FT6590
PIPE ID.IN.      7.98200
ORIFICE ID.IN.   4.75000
DENS.CORR.FACTOR 1.00000
DENS DRY AIR LBM/MOL 28.96250
HEATING VALUE BTU 1000.000
ENTROPY BTU/LB  0.000000
K FACTOR      1000.000

DAILY TOTAL
GROS MCF      184.669
NET MCF       15050.631
MASS MLB      857.645
MMBTU         15050.631
CUMULATIVE TOTAL
GROS MCF      1096.723
NET MCF       69122.688
MASS MLB      3938.885
MMBTU         65320.944
MSBTU         .000
  
```

The Micro MV Gas Flow Computer allow the user to make personal ticket report. This ticket report is just for display and printing purposes. To make this report, user must use "Last Daily Data Area" in the Modbus registers (3431-3703).

### ***Example:***

```

                DYNAMIC FLUID BATCH REPORT
METER 1 GROSS TOTAL    ^3453
METER 1 MASS TOTAL     ^3459
  
```

### ***Results - The report will look as follows:***

```

                DYNAMIC FLUID BATCH REPORT
METER 1 GROSS TOTAL    3000
METER 1 MASS TOTAL     1258
  
```

## **Ticket Report**

Select 0=Standard Report, 1=Format Ticket Report

Standard is the default report format that is programmed in the Micro MV Gas Flow Computer. Format is according to the formatted daily report.

*Capture File Name* - capture that file under certain name.

## **Auto Data Retrieval**

This function is made to replace printers and use a PC to poll the configured units on time basis (Hourly or Daily). All parameters polled will be stored in the configured file name. Each unit ID will have an individual file name. The PC or laptop must be on at the time it has to get the data, and the user must activate that function by pressing <F3> and leaving the PC on. The data format can be either standard or user defined format. This function is to eliminate the need for paper and make the process more environmentally friendly. Echo to the local printer can be enabled where reports will be stored on hard drive and printed to a parallel printer.

## ***PRINT***

### **Print "Help" File**

Turn on parallel printer, point the cursor to **Help**, press <ENTER>, and then press <F5> to print **Help** file.

### **Print Modbus Registers**

Turn on parallel printer, point the cursor to **Modbus Reg**, press <ENTER>, and then press <F5> to print Modbus registers.

### **Print Calibration Data**

Calibration data are programmed parameters in the data file. To print, turn on parallel printer, point the cursor to the **Calib.Data**, press <ENTER>, and then press <F5>.

### **Print Files**

The user can print the files that were captured. Turn on parallel printer, point the cursor to the desired file, and then press <ENTER>.

# CHAPTER 3: Data Entry

## Through Front Panel Display

The Data entry is a menu driven type construction.

### **Four Keys – ESC/Mode, Enter/Select, Down Arrow, Right Arrow**

These keys can be used by using a reflective object. The reflective object must be placed in front of the key to get a response.

### **Function**

#### **ESC/Mode Key**

This key serves dual functions. In order to access the data entry, the mode key has to be activated. The mode key is on/off type key. This key will get the security code prompt, and then using select, enter key with the arrow keys to access the program. Place the reflective object on and then off for each step. Once the data menu function access is completed, exit by using the escape key.

#### **Select/Enter Key**

It is used to stop screen from scrolling, to select data entry, and accept the data configurations. It is on/off type key. Place the reflective object in front of key, and then move away before the next step.

#### **Down Arrow Key, Right Arrow Key**

Scrolling keys, the **Right Key** function is to scroll **right** way for selecting the number to be changed, and then changing the number by using **Down Arrow Key**

## **MAIN MENU**

It consists primarily of series of topics. Your valid choices are the two Arrow Keys and select/enter key. Use Down or Right Arrow keys to make your selection and then use select/enter key. Use Esc/Mode key to go back to previous mode.

### **Security Code**

Enter Security Code      00000

Enter the right security code to be able to change data.

### **Calibrate /1=M.Var**

Enter 0 to calibrate analog input 1-4, RTD, analog output 1-4, or enter '1' to calibrate multi.variable

Calibrate/1=M.Var  
Override Meter No.  
Date Time  
Configuration

Enable Calib. Mode  
Analog Input (1-4)  
RTD Input  
Analog Output (1-4)

### **Enable Calibrate Mode**

Enter '1' to enable calibrate mode. Calibration mode will set the flow computer to continue totalizing at same rate while all values are still showing live readings.

### **Calibrate Analog Input, RTD**

**0=Offset** is a single point calibration that will offset zero and span.

**1=Full** – zero and span must be calibrated.

**2=Reset** to factory calibration.

0=Offset, 1=Full  
2=Reset

### **Offset (Single Point)**

Induce the signal into the analog input, wait for 10 seconds for the reading to stabilize, then enter the offset.

Enter Offset                    8.000  
  
Current Value  
                                     7.9000

**FULL (ZERO AND SPAN CALIBRATION)**

1. Calibrate Low Point (4mA or 75  $\Omega$ ), induce the known live value for the low set point, and wait for 10 seconds for the reading to stabilize. Now enter in that value.

First Point	0.000
Current Value	0.9000

2. Calibrate High Point (20mA or 120  $\Omega$ ), induce the known live value for the high set point, and then wait for 10 seconds for the reading to stabilize. Now enter in that value.

Second Point	20.000
Current Value	19.900

**Reset (Use Default)**

Enter '2' to use manufacture default.

**Calibrate Analog Output**

0=Offset is a single point calibration that will offset zero and span.

1=Full – zero and span must be calibrated.

2=Reset to factory calibration.

0=Offset, 1=Full
2=Reset

**Offset (Single Point)**

Enter the live output value reading in the end device.

Enter mA	4.000
Reading mA	4.000

**Full (Zero and Span Calibration)**

1. The screen will show the minimum possible signal 4mA. Enter the live output value reading in the end device i.e. 4mA.

Enter 4mA	4.000
Reading mA	4.000

2. Now the flow computer will output full scale 20mA. Enter the live output i.e. 20mA



Enter 20mA	20.000
Reading mA	20.000

**Reset (Use Default)**

Enter '2' to use manufacture default.

**Calibrate Multivariable**

Select DP, Pressure, or Temperature to be calibrated.

Calibrate Muli.Var.
DP Inches
Pressure PSIG
Temperature DEG.F

Enter the calibrate method (0=Offset, 1=Full, 2=Reset).

0=Offset, 1=Full
2=Reset

**OFFSET (SINGLE POINT)**

Induce the live value, then enter the offset.

Enter Offset	10.0000
Current Value	10.9000

**Full (Zero and Span Calibration)**

1. Calibrate Low Point - induce the low range signal, and enter in that value.

First Point	0.0000
Current Value	0.9000

2. Calibrate High Point - induce the high range signal, and enter in that value.

Second Point	250.0000
Current Value	250.0000

**Reset (Use Default)**

Enter '2' to use manufacture default.



**Change Time**

Hour	09
Minute	08
Second	00
Change Time 1=Yes	

Enter Hour (0-23), Minute (0-59), Second (0-59) and then enter '1' to change time.

**Configuration**

Configuration

Configure Meter No 1

Configure I/O

Pulse Output

Others

**Configure Meter**

Flow Equation 0-3 1

0=AGA3,1=New AGA3,

2=AGA7,3=Venturi

**Flow Equation Type (0-3)**

- 0 = AGA3 (OLD AGA3, 1985 Orifice Equations)
- 1 = API 14.3 (NEW AGA3, 1992 Orifice Equations)
- 2 = AGA7 (Frequency Type Input)
- 3 = Venturi

**AGA3/New AGA3/Venturi**

Orifice ID	10.00000
Pipe ID,	5.00000
DP Cut Off	1.0000
Viscosity	.024500

**Pipe I.D. Inches****Orifice ID Inches**

Pipe ID in inches is the measured inside pipe diameter to 5 decimals at reference conditions. Orifice ID in inches is the measured diameter of the orifice at reference conditions.

**DP Cutoff**

The Micro MV Gas Flow Computer suspends all calculations whenever the DP, in inches of water column, is less than this value. This function is vital for suppressing extraneous data when the DP transmitter drifts around the zero mark under no-flow conditions.

**Viscosity in Centipoise**

Even though viscosity will shift with temperature and pressure changes, the effect on the calculations is negligent. Therefore using a single value is appropriate in most cases. Enter viscosity in centipoise.

**AGA7**

K Factor	1000.000
Meter Factor	1.00000
Flow Cut Off Freq.	1

**K FACTOR**

K Factor is the number of pulses per unit volume, i.e. 1000 pulses/barrel. The tag on the meter would normally indicate the K Factor.

**Meter Factor**

Meter Factor is a correction to the K Factor for this individual meter, applied multiplicatively to the K factor.

**FLOW CUTOFF FREQUENCY**

The Smart Flow Computer will quit totalizing, when frequency is below the set limit. This feature is to reduce noise effect when the meter is down for period of time. The totalizer will stop totalizing when the frequency is below the cut off limit.

**Configure I/O**

Analog Output
Meter I/O
Status/Switch
F.C.Display

**Analog Output**

Ana.Out#1 Assign	1
Ana.Out#2 Assign	0
Ana.Out#3 Assign	0
Ana.Out#4 Assign	0

**ASSIGNMENTS:**

4-20mA selection must be proportional and within the range of the selected parameter.

**ASSIGNMENTS:**

	Meter 1	Meter 2	Station
<b>Gross Flowrate</b>	1	5	9
<b>Net Flowrate</b>	2	6	10
<b>Mass Flowrate</b>	3	7	11
<b>Energy Flowrate</b>	4	8	12

	Meter 1	Meter2
<b>DP</b>	13	21
<b>Temperature</b>	14	22
<b>Pressure</b>	15	23
<b>Density</b>	16	24
<b>Density Temp</b>	17	25
<b>Dens.b</b>	18	26
<b>DP LOW</b>	19	27
<b>DP HIGH</b>	20	28
<b>Specific Gravity</b>	30	32

<b>Meter-Independent Parameters</b>	
<b>Spare #1</b>	33
<b>Spare #2</b>	34
<b>Remote Control*</b>	35

**Examples:**

- 9 = Station Gross Flowrate
- 30 = Meter 1 Specific Gravity
- 25 = Meter 2 Density Temperature

*Note: Assignments 29 and 31 are not used.*

*\*Note : Remote control output can be controlled through the Modbus communication link.*

*Note: Dens.b = Base Density  
DP = Differential Pressure*



**Meter I/O**

Temperature Deg.F

Pressure PSIG

DP Inches

Densitometer

**ASSIGNMENTS**

0=	Not Used
1=	Analog#1
2=	Analog#2
3=	Analog#3

4=	Analog#4
5=	RTD

7 =	Dens.Freq (Not Selectable)
10 =	Multi. Variable Module #1
11 =	Multi. Variable Module #2

**4mA**

Enter the 4mA value for the transducer.

**20mA**

Enter the 20mA value for the transducer.

### **Status Input /Switch Output Assignment**

Status/Switch#1	000
Status/Switch#2	001
Status/Switch#3	000
Status/Switch#4	000

	<b>Assignment</b>	<b>Comments</b>
<b>1.</b>	N/A	
<b>2.</b>	Calibration Mode	
<b>3.</b>	Event Status	
<b>4.</b>	Alarm Acknowledge	Reset the previous occurred alarms output bit

### **Switch Output Assignment**

User can assign an output to each of the Micro MV Gas Flow Computer's output switches from this list. The Micro MV Gas Flow Computer switch outputs are sourcing through switch power input power.

Outputs in the top list, "Pulse Outputs", require a definition of pulse output per unit volume. Therefore a Pulse Output Width must be defined when one of these switch types are chosen. These outputs are available through switches 1 or 2 only.

Outputs in the bottom list, "Contact Type Outputs", are ON/OFF type outputs. They can be assigned to any of the four switch outputs.

Switches 1 and 2 can be pulse or contact type output; switches 3, 4 are contact-type output only.

**Assignments - Pulse Outputs**

	<b>Meter 1</b>	<b>Meter 2</b>	<b>Station</b>
<b>Gross</b>	101	105	109
<b>Net</b>	102	106	110
<b>Mass</b>	103	107	111
<b>Energy</b>	104	108	112

**ASSIGNMENTS - CONTACT TYPE OUTPUTS**

	<b>Meter1</b>	<b>Meter2</b>
<b>Temperature Low</b>	126	136
<b>Temperature High</b>	127	137
<b>Pressure Low</b>	128	138
<b>Pressure High</b>	129	139
<b>Density Low</b>	130	140
<b>Density High</b>	131	141
<b>Dens.Temp Low</b>	132	142
<b>Dens.Temp High</b>	133	143
<b>DP Low</b>	134	144
<b>DP High</b>	135	145
<b>Meter Down</b>	120	123
<b>Flow Rate Low</b>	121	124
<b>Flow Rate High</b>	122	125
<b>N/A</b>	153	155
<b>N/A</b>	154	156

<b>Meter-Independent Parameters</b>	
<b>Day Ended</b>	119
<b>Dens. Period Low</b>	146
<b>Dens. Period High</b>	147
<b>AGA8 Out of Range</b>	148
<b>NX19 Out of Range</b>	149
<b>N/A</b>	150
<b>Active Alarms</b>	151
<b>Occurred Alarms</b>	152
<b>WatchDog</b>	157
<b>Remote Control</b>	158
<b>Run Switch</b>	159

**Examples:**

110= Station Net Flowrate (pulse output)

148= AGA8 out of Range

## **Flow Computer Display Assignment**

FC.Display#1	000
FC.Display#2	001
FC.Display#3	000
FC.Display#4	000

Display assignment select up to 16 assignments. The Micro MV Gas Flow Computer will scroll through them at the assigned delay time.

### **ASSIGNMENT**

4 Digits – 1<sup>st</sup> : Forward/Reverse – 0:Forward,1:Reverse  
 2<sup>nd</sup> – Meter Number – 1:Meter#1, 2:Meter#2, 3:Station  
 3<sup>rd</sup>, 4<sup>th</sup> : Selection

<b>Selection</b>	<b>5. <u>Description</u></b>
<b>01</b>	Flow Rate
<b>02</b>	Daily Total
<b>03</b>	Cum. Total
<b>04</b>	Previous .Daily total
<b>05</b>	DP/DP Low, High
<b>06</b>	Temperature, Pressure
<b>07</b>	Density, Density at Base
<b>08</b>	Density Freq, Dens.Period, Un-Corr. Density
<b>09</b>	Density Temperature,Pressure
<b>10</b>	Flow and Density Calculation Type
<b>11</b>	Spare #1, Spare #2
<b>12</b>	Previous Day.AVG Temperature, Pressure, SG
<b>13</b>	Alarms
<b>14</b>	Date, Time

### **Examples:**

101= Meter#1 Flowrate  
 102= Meter #1 Daily Total  
 302= Station Daily Total  
 113= Meter #1 Alarms  
 14= Date, Time

**Pulse Output**

Pulse Output	
#1 P/Unit#1	1.000
#2 P/Unit#2	1.000
Pulse Width	50

**PULSE OUTPUT AND PULSE OUTPUT WIDTH**

Pulse Output is used to activate a sampler or external totalizer. The number selected will be pulses per unit volume or per unit mass. If 0.1 pulse is selected, the one pulse will be given every 10 unit volumes has passed through the meter.

Pulse Output Width is the duration, in milliseconds, of one complete pulse cycle (where each cycle is the pulse plus a wait period, in a 50/50 ratio). For example: if POW = 500 msec, the Micro MV Gas Flow Computer at most can produce one pulse each second regardless of the pulse per unit volume selected (500 msec pulse + 500 msec wait). If POW = 10 msec the Micro MV Gas Flow Computer can produce up to 50 pulses per second.

The Micro MV Gas Flow Computer's maximum pulse output is 125 pulses/sec. The Pulse Output in combination with the Pulse Output Width should be set appropriately.

**Others**

Day Start Hour	7
Print Interval	1440
0=Hour,1=Day,2=Min	0
Disable Alarms	0

**DAY START HOUR (0-23)**

Day start hour is used for daily totalizer reset operation.

**PRINT INTERVALS IN MINUTES (0-1440)**

When the second port (RS-232) of the Micro MV Gas Flow Computer is configured as printer port, a snapshot report is generated every print interval (i.e., every five minutes, every hour, or every ten hours).

**FLOW RATE SELECTION**

The flow rate will be based on hourly basis, daily, or minute.

**DISABLE ALARMS**

Use Disable Alarms to ignore alarms. When the alarm function is disabled alarms are not logged. Alarms are also not logged if the DP is below the cut-off limit.

# CHAPTER 4: FLOW EQUATIONS

## Common Terms

The following terms are used throughout this chapter.

Term	Definition	Units	Examples
$q$	Flowrate: volume or mass displaced per unit time	See equations	$q_{mass}, q_{energy}$
$T$	Temperature	°F unless noted	
$DP$	Differential Pressure across measuring device	Inches H <sub>2</sub> O column	
$d$	Orifice Diameter	Inches	$d, d_r, d_m$
$D$	Pipe Diameter	Inches	$D, D_r, D_m$
$\beta$	$= \frac{d}{D} = \frac{\text{Orifice diameter}}{\text{Pipe diameter}}$	Dimensionalless ratio	$\beta, \beta_r$
$\rho$	Density (usually of the fluid)	Lb/ft <sup>3</sup>	$\rho_{\text{flowing}}, \rho_m$
$\mu$	Viscosity	centipoise	
$HN$	Heating Value		
$Y$	Expansion factor	Dimensionalless	

### Subscripts: Conventions Used

This Subscript	Means	Examples
$r$	At reference conditions	$T_{r,p}$ = reference temperature of the pipe
$O$ (letter o)	Refers to the orifice	$T_{r,o}$ = reference temperature of the orifice
$P$	Refers to the pipe	
$\text{flowing}$	At flow conditions	$\rho_{\text{flowing}}$ = density at flow conditions
$\text{cal}$	Calibration conditions	$T_{\text{cal}}, P_{\text{cal}}$
$m$	At measured conditions	$D_m$ = pipe diameter at measured temp.

### Other Common Expressions

For all equations,

$$\text{Energy Flowrate} = q_{net} \times HN \times 10^{-3} = \text{MMBTU/Hr}$$

## AGA3

Please see *Common Terms* at the beginning of this chapter. For more information, please see AGA3 Publication.

$$\begin{aligned} \text{Mass Flowrate} &= \mathbf{q_{mass}} = K \times F_a \times A \times 3.6 \\ &= \mathbf{MLb/Hr} \end{aligned}$$

$$\text{Net Flowrate} = \frac{q_{mass}}{\rho_{reference}} = \mathbf{MCF/Hr}$$

$$\text{Gross Flowrate} = \frac{q_{mass}}{\rho_{flowing}} = \mathbf{MCF/Hr}$$

Where:

$$\begin{aligned} F_a &= \text{Orifice Thermal Expansion Factor} \\ &= 1 + C_O(T_{flowing} - T_{r,O}) \end{aligned}$$

$C_O$  = Thermal Coefficient of expansion for orifice

$T_{r,O}$  = Reference Temperature of the orifice

$$K = \frac{\sqrt{\frac{4K_0E}{A \times B} + K_0^2}}{2}$$

$$A = 0.099742275d^2Y\sqrt{\rho_{flowing} \times DP}$$

$$B = \frac{7.142974 \times 10^4}{\pi \times \mu \times d}$$

## API 14.3

For more information, please see *Orifice Metering of Natural Gas*, 3<sup>rd</sup> edition.

$$\text{Mass Flow Rate} = \frac{\pi}{4} \times N_c \times C_d \times E_v \times d^2 \times Y \times \sqrt{2DP \times \text{Density}} \times .001$$

$$\text{Net Flow Rate} = \frac{\text{Mass Flow}}{\text{Base Density}}$$

$$\text{Gross Flow Rate} = \frac{\text{Mass Flow}}{\text{Flowing Density}}$$

$$\text{Energy Flow Rate} = \text{Net Flow Rate} \times \text{Heating Value} \times .001$$

Where:

$N_c$  = Units Conversion Constant

$C_d$  = Orifice Plate Coefficient of Discharge

$E_v = \frac{1}{\sqrt{1-\beta^4}}$  = Velocity of Approach Factor

$d$  = Orifice plate bore diameter

$Y$  = Expansion Factor

$DP$  = Orifice Differential Pressure

	US unit
$N_c$	323.279
Density	$lb/ft^3$
Gross Flow Rate/HR	MCF
Net Flow Rate/HR	MSCF
Mass Flow Rate/HR	MLB
Energy Flow Rate/HR	MMBTU



## AGA 7

Please see *Common Terms* at the beginning of this chapter.

$$\text{Gross Flowrate} = \frac{v_{\text{signal}} \times F_M \times F_L \times 3.6}{F_K} = \mathbf{q_{\text{gross}} \text{ (MCF/Hr)}}$$

$$\text{Net Flowrate} = \frac{q_{\text{gross}} \rho_{\text{flowing}}}{\rho_{\text{reference}}} = \mathbf{\text{MCF/Hr}}$$

$$\text{Mass Flowrate} = q_{\text{gross}} \rho_{\text{flowing}} = \mathbf{\text{MCF/Hr}}$$

$v_{\text{signal}}$  = Frequency of the signal input, pulses/sec

$F_M$  = Meter Factor

$F_L$  = Linear Factor

$F_K$  = Nominal K Factor

## Venturi

Please see *Common Terms* at the beginning of this chapter. For further information please see *Measurement Engineering Handbook*.

$$\text{Mass Flowrate} = 0.3590722 \sqrt{\rho_{\text{flowing}} \times DP} \times \frac{C \times F_a \times d^2 Y}{\sqrt{1 - \beta^4}}$$
$$= q_{\text{mass}} \text{ (MLB/HR)}$$

$$\text{Net Flowrate (MCF/HR)} = \frac{q_{\text{mass}}}{\rho_{\text{reference}}}$$

$$\text{Gross Flowrate (MCF/HR)} = \frac{q_{\text{mass}}}{\rho_{\text{flowing}}}$$

Where :

$C$  = Discharge coefficient t  $C$  (manual entry)

## DENSITY EQUATIONS

### Sarasota Density GM/CC

Sarasota density is calculated using the frequency signal produced by a Sarasota densitometer, and applying temperature and pressure corrections as shown below.

$$\text{Corrected Density} = DCF \times \frac{2D_0(t-T_{0p})}{T_{0p} \times \frac{1+K(t-T_{0p})}{2T_{0p}}}$$

Where :

$$T_{0p} = T_{coef} \times (T - T_{cal}) + P_{coef} \times (P - P_{cal}) + T_0$$

$DCF =$  Density Correction Factor

$D_0 =$  Calibration constant, mass/volume, gm/cm<sup>3</sup>

$t =$  Densitometer oscillation period in microseconds.

$t_0 =$  A calibration constant in microseconds

$T_{coef} =$  Temperature coefficient in microseconds/°F

$P =$  Flowing pressure in PSIG

$P_{coef} =$  Pressure coefficient in microseconds/PSIG

$P_{cal} =$  Calibration pressure in PSIG

### UGC Density GM/CC

UGC density is calculated using the frequency signal produced by a UGC densitometer, and applying temperature and pressure corrections as shown below

$$\text{Corrected Density} = DCF \times P_{flowing} \{ [K(P_{off} + d) \times 10^{-6}] + [K_T(T_{flowing} - T_{cal})] + d \}$$

Where :

$$d = K_0 + K_1t + K_2t^2$$

$K_0, K_1, K_2 =$  Calibration Constants

$t =$  Densitometer oscillation period in microseconds

$DCF =$  Density Correction Factor

$K =$  Pressure Constant

$P_{off} =$  Pressure Offset

$K_T =$  Temperature Coefficient

$T_{cal} =$  Temperature coefficient in microseconds/°F

**Solartron Density GM/CC**

Solartron density is calculated using the frequency signal produced by a Solartron densitometer, and applying temperature and pressure corrections as shown below.

**DENSITY AT 20 DEG.C AND 0 BAR**

$$D = K_0 + K_1t + K_2t^2$$

Where :

$t =$  Densitometer Oscillation Period in microseconds

$K_0, K_1, K_2 =$  Calibration Constants Supplied by Solartron

**TEMPERATURE CORRECTED DENSITY**

$$DT = D[1 + K_{18}(T - 20) + K_{19}(T - 20)^2]$$

**ADDITIONAL EQUATION FOR GAS OFFSET DATA**

The following equation can provide more accurate measurement for Argon/Methane Gas Mixture over density range 60 to 200 kg/m<sup>3</sup>.

$$DA = DT + (1 + K_3 / (DT + K_4)) \times 0.00236 - G / (T + 273)$$

G = Gas Specific Gravity / Ratio of Specific Heats.

Density (GM/CC) = Density(KG/M3) / 1000.0

**AGA8 Gross Method 1**

Refer to Transmission Measurement Committee Report No. 8

**AGA8 Gross Method 2**

Refer to Transmission Measurement Committee Report No. 8

**AGA8 Detail Method**

Refer to Transmission Measurement Committee Report No. 8

## CHAPTER 5: MODBUS DATA

### ***MODBUS PROTOCOL***

#### ***TRANSMISSION MODE***

	ASCII	RTU
DATA BITS	7	8
START BITS	1	1
PARITY	EVEN,ODD	NONE
STOP BITS	1	1
ERROR CHECKING	LRC	CRC
BAUD RATE	1200-9600	1200-9600

#### ***ASCII FRAMING***

Framing is accomplished by using colon (:) character indicating the beginning of frame and carriage (CR), line feed (LF) for the end of frame

#### ***ASCII MESSAGE FORMAT***

	ADDRESS	FUNCTION	DATA	ERR\CHECK		
:	2 CHAR	2 CHAR	Nx2 CHAR	2 CHAR	CR	LF
8 BITS	16 BITS	16 BITS	Nx16 BITS	16 BITS	8 BITS	8 BITS

#### ***RTU FRAMING***

Frame synchronization is done by time basis only. The Smart Flow Computer allows 3.5 characters time without new characters coming in before proceeding to process the message and resetting the buffer.

#### ***RTU MESSAGE FORMAT***

ADDRESS	FUNCTION	DATA	CRC
8 BITS	8 BITS	Nx8 BITS	16 BITS

**FUNCTION CODE**

To inform the slave device of what function to perform

FUNCTION CODE	ACTION
01	
03	Read Strings or Multiple 16 Bits
16	Write Strings or Multiple 16 Bits

**ERROR CHECK****LRC MODE**

The LRC check is transmitted as two ASCII hexadecimal characters. First, the message has to be stripped of the :, LF, CR, and then converted the HEX ASCII to Binary. Add the Binary bits and then two's complement the result.

**CRC MODE**

The entire message is considered in the CRC mode. Most significant bit is transmitted first. The message is pre-multiplied by 16. The integer quotient digits are ignored and the 16-bit remainder is appended to the message as the two CRC check bytes. The resulting message including the CRC, when divided by the same polynomial ( $X^{16}+X^{15}+X^2+1$ ) at the receiver which will give zero remainder if no error has occurred.

**EXCEPTION RESPONSE**

Exception response comes from the slave if it finds errors in communication. The slave responds to the master echoing the slave address, function code (with high bit set), exception code and error check. To indicate that the response is notification of an error, the high order bit of the function code is set to 1.

EXCEPTION CODE	DESCRIPTION
01	Illegal Function
02	Illegal Data Address
03	Illegal Data Value

**BROADCAST COMMAND**

All units listen to Unit ID Zero, and none will respond when that write function is broadcasted.

**MODBUS EXAMPLES****FUNCTION CODE 03 (Read Single or Multiple Register Points)****RTU MODE - Read Address 3076**

ADDR	FUNC CODE	STARTING POINT		# OF POINTS		CRC CHECK	
		HI	LO	HI	LO		
01	03	0C	04	00	01	C6	9B

**Response**

ADDR	FUNC CODE	BYTE COUNTS	DATA		CRC CHECK	
			HI	LO		
01	03	02	00	01	79	84

**Write Address 3076**

ADDR	FUNC CODE	START POINT		# OF POINTS		BYTE COUNTS	DATA		CRC CHECK	
		HI	LO	HI	LO		HI	LO		
01	10	0C	04	00	01	02	00	01	AA	14

**Response**

ADDR	FUNC CODE	START ADDR	# OF POINTS	CRC CHECK	
C	10	0C 04	01	43	58

**ASCII MODE - Read Address 3076**

ADDR	FUNC CODE	STARTING POINT				# OF POINTS				LRC CHECK	
		HI	LO	HI	LO	HI	LO	HI	LO		
:	30 31	30 33	30 43	30 43	30 30	30 31	45 42	CR	LF		

**Response**

ADDR	FUNC CODE	BYTE COUNT	DATA				LRC CHECK	
			HI	LO	HI	LO		
:	30 31	30 32	30 30	30 31	46 39	CR	LF	



## MODBUS ADDRESS TABLE – 16 BITS

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2534	Flow Copmputer Display Delay	0 Inferred	Read/Write
2535	Flow Copmputer Assignment #1	0 Inferred	Read/Write
2536	Flow Copmputer Assignment #2	0 Inferred	Read/Write
2537	Flow Copmputer Assignment #3	0 Inferred	Read/Write
2538	Flow Copmputer Assignment #4	0 Inferred	Read/Write
2539	Flow Copmputer Assignment #5	0 Inferred	Read/Write
2540	Flow Copmputer Assignment #6	0 Inferred	Read/Write
2541	Flow Copmputer Assignment #7	0 Inferred	Read/Write
2542	Flow Copmputer Assignment #8	0 Inferred	Read/Write
2543	Flow Copmputer Assignment #9	0 Inferred	Read/Write
2544	Flow Copmputer Assignment #10	0 Inferred	Read/Write
2545	Flow Copmputer Assignment #11	0 Inferred	Read/Write
2546	Flow Copmputer Assignment #12	0 Inferred	Read/Write
2547	Flow Copmputer Assignment #13	0 Inferred	Read/Write
2548	Flow Copmputer Assignment #14	0 Inferred	Read/Write
2549	Flow Copmputer Assignment #15	0 Inferred	Read/Write
2550	Flow Copmputer Assignment #16	0 Inferred	Read/Write
2551	Flow Copmputer ID or Unit ID	0 Inferred	Read/Write
2552	reserved		
2553	Port 1 Modbus Type (0=RTU,1=ASCII)	0 Inferred	Read/Write
2554	Port 1 Parity(0=None,1=Odd,2=Even)	0 Inferred	Read/Write
2555	Port 1 Baud Rate(0=1200,1=2400,3=4800,4=9600)		
2556	reserved		
2557	Port 1 RTS Delay in Milliseconds	0 Inferred	Read/Write
2558-2559	reserved		
2560	Port 2 Select 0=RTS,1=Printer	0 Inferred	Read/Write
2561	Port 2 Modbus Type (0=RTU,1=ASCII)	0 Inferred	Read/Write
2562	Port 2 Parity(0=None,1=Odd,2=Even)	0 Inferred	Read/Write
2563	Port 2 Baud Rate(0=1200,1=2400,3=4800,4=9600)		
2564	Reserved		
2565	Port 2 RTS Delay in Milliseconds	0 Inferred	Read/Write
2566	Printer- Number of Nulls	0 Inferred	Read/Write
2567	Reserved		
2568	Spare		
2569	Meter Bank 0=One Meter,1=Two Meters	0 Inferred	Read/Write
2570	Select 0=Single, 1=Dual Streams	0 Inferred	Read/Write
2571	Station Total 0=None,1=Add,2=Sub	0 Inferred	Read/Write
2572	Meter #1 Use Stack DP (1=Yes)	0 Inferred	Read/Write
2573	Meter #2 Use Stack DP (1=Yes)	0 Inferred	Read/Write
2574	Common Temperature 1=Yes	0 Inferred	Read/Write
2575	Common Pressure 1=Yes	0 Inferred	Read/Write
2576	Density#1 0=None,1=4-20mA,2=S,3=U,3=S	0 Inferred	Read/Write
2577	Spare		

2578	Use Meter Temp as Dens.Temp#1 0=N,1=Y	0 Inferred	Read/Write
2579	Spare		
2580	Common Density 1=Yes	0 Inferred	Read/Write
2581	Density#2 0=None,1=4-20mA,2=S,3=U,3=S	0 Inferred	Read/Write
2582	Spare		
2583	Use Meter Temp#2 as Dens.Temp 1=Yes	0 Inferred	Read/Write
2584	Spare		
2585-2592	Reserved		
2593	Flow Rate Display 0=Hour,1=Day,2=Minute	0 Inferred	Read/Write
2594	Flowrate Averaged Seconds (1-10)	0 Inferred	Read/Write
2595	Day Start Hour (0-23)	0 Inferred	Read/Write
2596-2605	Company Name	40 Chars	Read/Write
2606	Disable Alarms ? (0=No, 1=Yes)	0 Inferred	Read/Write
2607	Print Interval in Minutes (0-1440)	0 Inferred	Read/Write
2608	Run Switch Delay	0 Inferred	Read/Write
2609	Pulse Width	0 Inferred	Read/Write
2610-2612	Spare		
2613-2616	Spare		
2617	Status Input/Switch Output #1 (0=OFF,1=ON)	0 Inferred	Read/Write
2618	Status Input/Switch Output #2 (0=OFF,1=ON)	0 Inferred	Read/Write
2619	Status Input/Switch Output #3 (0=OFF,1=ON)	0 Inferred	Read/Write
2620	Status Input/Switch Output #4 (0=OFF,1=ON)	0 Inferred	Read/Write
2621	Spare		
2622	Meter #1 Flow Cut Off Freq. (0-99)	0 Inferred	Read/Write
2623	Meter #2 Flow Cut Off Freq. (0-99)	0 Inferred	Read/Write
2624-2633	Meter Location	40 Chars.	Read/Write
2634-2637	Meter #1 ID	8 Chars.	Read/Write
2638	Meter#1 Density Calction Type	0 Inferred	Read/Write
2639	Spare		
2640-2643	Meter #2 ID	8 Chars.	Read/Write
2644	Meter#2 Density Calction Type	0 Inferred	Read/Write
2645-2646	reserved		
2647	Meter #1 AGA7 Select Mass Pulses (1=Yes)	0 Inferred	Read/Write
2648	Meter #2 AGA7 Select Mass Pulses (1=Yes)	0 Inferred	Read/Write
2649-2651	Reserved		
2652-2797	Sapre		
2798	Meter #1 DP Low Assignment	0 Inferred	Read/Write
2799	Meter #1 Temperature Assignment	0 Inferred	Read/Write
2800	Meter #1 Pressure Assignment	0 Inferred	Read/Write
2801	Meter #1 Density Assignment	0 Inferred	Read/Write
2802	Meter #1 Density Temp. Assignment	0 Inferred	Read/Write
2803	Meter #1 DP High Assignment	0 Inferred	Read/Write
2804	Meter #2 DP Low Assignment	0 Inferred	Read/Write
2805	Meter #2 Temperature Assignment	0 Inferred	Read/Write
2806	Meter #2 Pressure Assignment	0 Inferred	Read/Write
2807	Meter #2 Density Assignment	0 Inferred	Read/Write
2808	Meter #2 Density Temp. Assignment	0 Inferred	Read/Write

## Modbus Address Table – 16 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2809	Meter #2 DP High Assignment	0 Inferred	Read/Write
2810	Spare #1 Assignment	0 Inferred	Read/Write
2811	Spare #2 Assignment	0 Inferred	Read/Write
2812	Meter #1 DP Fail Code	0 Inferred	Read/Write
2813	Meter #1 Temperature Fail Code	0 Inferred	Read/Write
2814	Meter #1 Pressure Fail Code	0 Inferred	Read/Write
2815	Meter #1 Density Fail Code	0 Inferred	Read/Write
2816	Meter #1 Density Temp Fail Code	0 Inferred	Read/Write
2817	Spare		
2818	Meter #2 DP Fail Code	0 Inferred	Read/Write
2819	Meter #2 Temperature Fail Code	0 Inferred	Read/Write
2820	Meter #2 Pressure Fail Code	0 Inferred	Read/Write
2821	Meter #2 Density Fail Code	0 Inferred	Read/Write
2822	Meter #2 Density Temp Fail Code	0 Inferred	Read/Write
2823	Spare		
2824	Spare #1 Failure Code	0 Inferred	Read/Write
2825	Spare #2 Failure Code	0 Inferred	Read/Write
2826	Spare		
2827	Analog Output #1 Assign	0 Inferred	Read/Write
2828	Analog Output #2 Assign	0 Inferred	Read/Write
2829	Analog Output #3 Assign	0 Inferred	Read/Write
2830	Analog Output #4 Assign	0 Inferred	Read/Write
2831	Meter#1 NX19 Method (1=Analysis Method)	0 Inferred	Read/Write
2832	Meter#2 NX19 Method (1=Analysis Method)	0 Inferred	Read/Write
2833	Spare		
2834	Meter#1 Y Factor Select (1=Y1, 2=Y2)	0 Inferred	Read/Write
2835	Meter#1 Tap Select (0=Flange, 1=Pipe)	0 Inferred	Read/Write
2836	Meter#2 Y Factor Select (1=Y1, 2=Y2)	0 Inferred	Read/Write
2837	Meter#2 Tap Select (0=Flange, 1=Pipe)	0 Inferred	Read/Write
2838	Meter#1 Calculation Method	0 Inferred	Read/Write
2839	Meter#2 Calculation Method	0 Inferred	Read/Write
2840	Meter#2 Nozzle Type	0 Inferred	Read/Write
2841-2844	Analog Input #1 Tag Name	8 Chars	Read/Write
2845-2848	Analog Input #2 Tag Name	8 Chars	Read/Write
2849-2852	Analog Input #3 Tag Name	8 Chars	Read/Write
2853-2856	Analog Input #4 Tag Name	8 Chars	Read/Write
2857-2860	RTD Input Tag Name	8 Chars	Read/Write
2861-2864	Density Input Tag Name	8 Chars	Read/Write
2865-2868	Analog Output #1 Tag Name	8 Chars	Read/Write
2869-2872	Analog Output #2 Tag Name	8 Chars	Read/Write
2873-2876	Analog Output #3 Tag Name	8 Chars	Read/Write
2877-2880	Analog Output #4 Tag Name	8 Chars	Read/Write
2881-2932	Spare		
2933	Status Input/Switch Output #1 Assign	0 Inferred	Read/Write
2934	Status Input/Switch Output #2 Assign	0 Inferred	Read/Write
2935	Status Input/Switch Output #3 Assign	0 Inferred	Read/Write
2936	Status Input/Switch Output #4 Assign	0 Inferred	Read/Write
2937-2960	Spare		

**Modbus Address Table – 16 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
2961-2964	Multi.Var.#1 DP Tag	8 Chars.	Read/Write
2965-2968	Multi.Var.#1 Pressure Tag	8 Chars.	Read/Write
2969-2972	Multi.Var.#1 Temperature Tag	8 Chars.	Read/Write
2973-2976	Multi.Var.#2 DP Tag	8 Chars.	Read/Write
2977-2980	Multi.Var.#2 Pressure Tag	8 Chars.	Read/Write
2981-2984	Multi.Var.#2 Temperature Tag	8 Chars.	Read/Write
2985	Analog Output#1 –Remote Control (0-100)	0 Inferred	Read/Write
2986	Analog Output#2 –Remote Control (0-100)	0 Inferred	Read/Write
2987	Analog Output#3 –Remote Control (0-100)	0 Inferred	Read/Write
2988	Analog Output#4 –Remote Control (0-100)	0 Inferred	Read/Write

## **Modbus Address Table – 16 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
3001	Version Number	2 Inferred	Read
3002-3006	Spare		
3007	Meter #1 Product Used	0 Inferred	Read
3008-3011	Meter #1 ID	8 Chars	Read
3012	Spare		
3013	Meter #2 Product Used	0 Inferred	Read
3014-3017	Meter #2 ID	8 Chars	Read
3018	Flow Computer Unit Number	0 Inferred	Read
3019	Disable Alarms (1=Yes)	0 Inferred	Read
3020-3023	Spare		
3024	Enable Calibration Mode (1=Yes)	0 Inferred	Read
3025	Calibration – Set Time (1-9 Hours)	0 Inferred	Read
3026	Last Daily Report Request (1=Latest,35=Oldest) Daily Data Area in Location 3431-3753	0 Inferred	Read/Write
3027	Last Monthly Report Request(1=Latest,12=Oldest) Set Last Monthly Report Request to 1 Monthly Data Area in Location 3431-3753	0 Inferred	Read/Write
3028	Last Hourly Report Request – Starting Hour	0 Inferred	Read/Write
3029	Last Hourly Report Request	0 Inferred	Read/Write
3030	Last Alarm Report Request	0 Inferred	Read/Write
3031	Last Audt Report Request	0 Inferred	Read/Write

## **Modbus Address Table – 16 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
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### **Scaled Data Area**

3032	Meter #1 Gross Flowrate	0 Inferred	Read
3033	Meter #1 Net Flowrate	0 Inferred	Read
3034	Meter #1 Mass Flowrate	0 Inferred	Read
3035	Meter #1 Energy Flowrate	0 Inferred	Read
3036-3043	Spare		
3044	Meter #2 Gross Flowrate	0 Inferred	Read
3045	Meter #2 Net Flowrate	0 Inferred	Read
3046	Meter #2 Mass Flowrate	0 Inferred	Read
3047	Meter #2 Energy Flowrate	0 Inferred	Read
3048-3055	Spare		
3056	Spare #1 Data	0 Inferred	Read
3057	Spare #2 Data	0 Inferred	Read
3058	Meter #1 DP	0 Inferred	Read
3059	Meter #1 Temperature	0 Inferred	Read
3060	Meter #1 Pressure	0 Inferred	Read
3061	Meter #1 Density	0 Inferred	Read
3062	Meter #1 Dens.Temperature	0 Inferred	Read
3063	Meter #2 DP	0 Inferred	Read
3064	Meter #2 Temperature	0 Inferred	Read
3065	Meter #2 Pressure	0 Inferred	Read
3066	Meter #2 Density	0 Inferred	Read
3067	Meter #2 Dens.Temperature	0 Inferred	Read

### **SCALED DATA AREA ENDS**

<b>3123</b>	<b>Retrieve History Data ACK Flag</b>	<b>0 Inferred</b>	<b>Read/Write</b>
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### **Modbus 16-bit Address Table Ends**

## Modbus Address Table – 32 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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\*Non-resettable accumulated volume will roll over at 9999999.

3131	Meter #1 Gross Flowrate	2 inferred	Read
3133	Meter #1 Net Flowrate	2 inferred	Read
3135	Meter #1 Mass Flowrate	2 inferred	Read
3137	Meter #1 Energy Flowrate	2 inferred	Read
3139	Meter #1 DP Low	4 Inferred	Read
3141	Meter #1 DP High	4 Inferred	Read
3143	Meter #1 DP	4 Inferred	Read
3145	Meter #1 Temperature	1 Inferred	Read
3147	Meter #1 Pressure	1 Inferred	Read
3149	Meter #1 Density	6 Inferred	Read
3151	Meter #1 Density Temperature	1 Inferred	Read
3153	Meter #1 Density.b	6 Inferred	Read
3155	Meter #1 SG	6 Inferred	Read
3157	Meter #1 Y Factor	6 Inferred	Read
3159	Meter #1 K/CD/LMF	6 Inferred	Read
3161	Meter #1 FA	6 Inferred	Read
3163	Meter #1 FPV/FRA	6 Inferred	Read
3165	Meter #1 Meter Factor	6 Inferred	Read
3167	Meter #1 Linear Factor	6 Inferred	Read
3169-3171	Spare		
3173	Meter #1 Daily Gross Total	0 inferred	Read
3175	Meter #1 Daily Net Total	0 inferred	Read
3177	Meter #1 Daily Mass Total	0 Inferred	Read
3179	Meter #1 Daily Energy Total	0 Inferred	Read
3181	Meter #1 Cumulative Gross Total*	0 Inferred	Read
3183	Meter #1 Cumulative Net Total*	0 Inferred	Read
3185	Meter #1 Cumulative Mass Total*	0 Inferred	Read
3187	Meter #1 Cumulative Energy Total*	0 Inferred	Read
3189-3203	Spare		
3205	Meter #2 Gross Flowrate	2 Inferred	Read
3207	Meter #2 Net Flowrate	2 Inferred	Read
3209	Meter #2 Mass Flowrate	2 Inferred	Read
3211	Meter #2 Energy Flowrate	2 Inferred	Read
3213	Meter #2 DP Low	4 Inferred	Read
3215	Meter #2 DP High	4 Inferred	Read
3217	Meter #2 DP	4 Inferred	Read
3219	Meter #2 Temperature	1 Inferred	Read
3221	Meter #2 Pressure	1 Inferred	Read

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
3223	Meter #2 Density	6 Inferred	Read
3225	Meter #2 Density Temperature	1 Inferred	Read
3227	Meter #2 Density.b	6 Inferred	Read
3229	Meter #2 SG	6 Inferred	Read
3231	Meter #2 Y Factor	6 Inferred	Read
3233	Meter #2 K/CD/LMF	6 Inferred	Read
3235	Meter #2 FA	6 Inferred	Read
3237	Meter #2 FPV/FRA	6 Inferred	Read
3239	Meter #2 Meter Factor	6 Inferred	Read
3241	Meter #2 Linear Factor	6 Inferred	Read
3243-3245	Spare		
3247	Meter #2 Daily Gross Total	0 Inferred	Read
3249	Meter #2 Daily Net Total	0 Inferred	Read
3251	Meter #2 Daily Mass Total	0 Inferred	Read
3253	Meter #2 Daily Energy Total	0 Inferred	Read
3255	Meter #2 Cumulative Gross Total*	0 Inferred	Read
3257	Meter #2 Cumulative Net Total*	0 Inferred	Read
3259	Meter #2 Cumulative Mass Total*	0 Inferred	Read
3261	Meter #2 Cumulative Energy Total*	0 Inferred	Read
3263-3277	Spare		
3279	Station Gross Flowrate	2 Inferred	Read
3281	Station Net Flowrate	2 Inferred	Read
3283	Station Mass Flowrate	2 Inferred	Read
3285	Station Energy Flowrate	2 Inferred	Read
3287	Station Daily Gross Total	0 Inferred	Read
3289	Station Daily Net Total	0 Inferred	Read
3291	Station Daily Mass Total	0 Inferred	Read
3293	Station Daily. Energy Total	0 Inferred	Read
3295	Station Cum. Gross Total	0 Inferred	Read
3297	Station Cum. Net Total	0 Inferred	Read
3299	Station Cum. Mass Total	0 Inferred	Read
3301	Station Cum. Energy Total	0 Inferred	Read
3303-3317	Spare		
3319	Meter #1 Hourly Gross Total	0 Inferred	Read
3321	Meter #1 Hourly Net Total	0 Inferred	Read
3323	Meter #1 Hourly Mass Total	0 Inferred	Read
3325	Meter #1 Hourly Energy Total	0 Inferred	Read
3327-3333	Spare		
3335	Meter #2 Hourly Gross Total	0 Inferred	Read
3337	Meter #2 Hourly Net Total	0 Inferred	Read
3339	Meter #2 Hourly Mass Total	0 Inferred	Read
3341	Meter #2 Hourly Energy Total	0 Inferred	Read
3343-3349	Spare		
3351	Meter #1 Monthly Gross Total	0 Inferred	Read
3353	Meter #1 Monthly Net Total	0 Inferred	Read



**Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
3353	Meter #1 Monthly Net Total	0 Inferred	Read
3355	Meter #1 Monthly Mass Total	0 Inferred	Read
3357	Meter #1 Monthly Energy Total	0 Inferred	Read
3359-3365	Spare		
3367	Meter #2 Monthly Gross Total	0 Inferred	Read
3369	Meter #2 Monthly Net Total	0 Inferred	Read
3371	Meter #2 Monthly Mass Total	0 Inferred	Read
3373	Meter #2 Monthly Energy Total	0 Inferred	Read
3375-3381	Spare		
3383	Spare #1	4 Inferred	Read
3385	Spare #2	4 Inferred.	Read
3387	Analog Output #1 Output %	2 Inferred	Read
3389	Analog Output #2 Output %	2 Inferred	Read
3391	Meter #1 Uncorrected Density	6 Inferred	Read
3393	Meter #2 Uncorrected Density	6 Inferred	Read
3395-3429	Spare		

## **Modbus Address Table – 32 Bits**

**ADDRESS DESCRIPTION DECIMAL READ/WRITE**

### **Last Daily or Monthly Data Area**

**Set Last Daily Report Request (3026) to 1=Latest,32=Oldest  
Daily Data Area in Location 3431-3753**

**Set Last Monthly Report Request (3027) to 1=Latest,12=Oldest  
Monthly Data Area in Location 3431-3753**

3431	Batch Type/Disp/Bank/Station Flag	0 Inferred	Read
3433	Day/Month Start Date	0 Inferred	Read
3435	Day/Month Start Time	0 Inferred	Read
3437	Meter#1 ID	8 Chars.	Read
3439	Meter#2 ID	8 Chars.	Read
3441	Meter#1 Flowing Times	1 Inferred	Read
3443	Meter #1 Gross Total	0 Inferred	Read
3445	Meter #1 Net Total	0 Inferred	Read
3447	Meter #1 Mass Total	0 Inferred	Read
3449	Meter #1 Energy Total	0 Inferred	Read
3451	Meter #1 Average DP	4 Inferred	Read
3453	Meter #1 Average Temperature	1 Inferred	Read
3455	Meter #1 Average Pressure	1 Inferred	Read
3457	Meter #1 Average DP_EXT	4 Inferred	Read
3459	Meter #1 Average Heating Value	3 Inferred	Read
3461	Meter #1 Average SG	6 Inferred	Read
3473	Meter #1 Average N2	4 Inferred	Read
3475	Meter #1 Average CO2	4 Inferred	Read
3477	Meter #1 Average Methane	4 Inferred	Read
3479	Meter #1 Average Ethane	4 Inferred	Read
3481	Meter #1 Average Propane	4 Inferred	Read
3483	Meter #1 Average Water	4 Inferred	Read
3485	Meter #1 Average H2S	4 Inferred	Read
3487	Meter #1 Average H2	4 Inferred	Read
3489	Meter #1 Average CO	4 Inferred	Read
3481	Meter #1 Average Oxygen	4 Inferred	Read
3483	Meter #1 Average i-Butane	4 Inferred	Read
3485	Meter #1 Average n-Butane	4 Inferred	Read
3487	Meter #1 Average i-Pentane	4 Inferred	Read
3489	Meter #1 Average n-Pentane	4 Inferred	Read
3491	Meter #1 Average n-Hexane	4 Inferred	Read
3493	Meter #1 Average n-Heptane	4 Inferred	Read
3495	Meter #1 Average n-Octane	4 Inferred	Read
3497	Meter #1 Average n-Nonane	4 Inferred	Read
3499	Meter #1 Average n-Decane	4 Inferred	Read
3501	Meter #1 Average Helium	4 Inferred	Read
3503	Meter #1 Average Argon	4 Inferred	Read
3505-3567	Spare		

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
3569-3571	Meter#2 ID	8 Chars	Read
3573	Meter#2 Flowing Times	0 Inferred	Read
3575	Meter#2 Gross Total	0 Inferred	Read
3577	Meter #2 Net Total	0 Inferred	Read
3579	Meter #2 Mass Total	0 Inferred	Read
3581	Meter #2 Energy Total	0 Inferred	Read
3583	Meter #2 Average DP	4 Inferred	Read
3585	Meter #2 Average Temperature	1 Inferred	Read
3587	Meter #2 Average Pressure	1 Inferred	Read
3589	Meter #2 Average DP_EXT	4 Inferred	Read
3591	Meter #2 Average Heating Value	3 Inferred	Read
3593	Meter #2 Average SG	6 Inferred	Read
3595	Meter #2 Average N2	4 Inferred	Read
3597	Meter #2 Average CO2	4 Inferred	Read
3599	Meter #2 Average Methane	4 Inferred	Read
3601	Meter #2 Average Ethane	4 Inferred	Read
3603	Meter #2 Average Propane	4 Inferred	Read
3605	Meter #2 Average Water	4 Inferred	Read
3607	Meter #2 Average H2S	4 Inferred	Read
3609	Meter #2 Average H2	4 Inferred	Read
3611	Meter #2 Average CO	4 Inferred	Read
3613	Meter #2 Average Oxygen	4 Inferred	Read
3615	Meter #2 Average i-Butane	4 Inferred	Read
3617	Meter #2 Average n-Butane	4 Inferred	Read
3619	Meter #2 Average i-Pentane	4 Inferred	Read
3621	Meter #2 Average n-Pentane	4 Inferred	Read
3623	Meter #2 Average n-Hexane	4 Inferred	Read
3625	Meter #2 Average n-Heptane	4 Inferred	Read
3627	Meter #2 Average n-Octane	4 Inferred	Read
3629	Meter #2 Average n-Nonane	4 Inferred	Read
3631	Meter #2 Average n-Decane	4 Inferred	Read
3633	Meter #2 Average Helium	4 Inferred	Read
3635	Meter #2 Average Argon	4 Inferred	Read
3637-3699	Spare		
3701	Station Gross	0 Inferred	Read
3703	Station Net	0 Inferred	Read
3705	Station Mass	0 Inferred	Read
3707	Station Energy	0 Inferred	Read
3709-3715	Spare		

**LAST DAILY OR MONTHLY DATA AREA ENDS**

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
3549-3553	Spare		
3705-3765	Spare		
3767-3785	Reserved		
3787	Request Start Date	0 Inferred	Read/Write
3789-4149	Reserved		
4151	Meter #1 Densitometer Period	3 Inferred	Read
4153	Meter #2 Densitometer Period	3 Inferred	Read
4155-4199	Spare		
4201	Date (MMDDYY)	0 Inferred	Read/Write
4203	Time (HHMMSS)	0 Inferred	Read/Write
4205-4243	Spare		

### **NX19 Method**

4245	Meter#1 Mol Percentage of Methane	4 Inferred	Read/Write
4247	Meter#1 Mol Percentage of Ethane	4 Inferred	Read/Write
4249	Meter#1 Mol Percentage of Propane	4 Inferred	Read/Write
4251	Meter#1 Mol Percentage of Iso-Butane	4 Inferred	Read/Write
4253	Meter#1 Mol Percentage of N-Butane	4 Inferred	Read/Write
4255	Meter#1 Mol Percentage of Iso-Pentane	4 Inferred	Read/Write
4257	Meter#1 Mol Percentage of N-Pentane	4 Inferred	Read/Write
4259	Meter#1 Mol Percentage of N-Hexane	4 Inferred	Read/Write
4261	Meter#1 Mol Percentage of Heptane	4 Inferred	Read/Write
4263	Meter#1 Mol Percentage of N-Octane	4 Inferred	Read/Write
4265	Meter#1 Mol Percentage of CO2	4 Inferred	Read/Write
4267	Meter#1 Mol Percentage of N2	4 Inferred	Read/Write
4269-4285	Spare		
4287	Meter#2 Mol Percentage of Methane	4 Inferred	Read/Write
4289	Meter#2 Mol Percentage of Ethane	4 Inferred	Read/Write
4291	Meter#2 Mol Percentage of Propane	4 Inferred	Read/Write
4293	Meter#2 Mol Percentage of Iso-Butane	4 Inferred	Read/Write
4295	Meter#2 Mol Percentage of N-Butane	4 Inferred	Read/Write
4297	Meter#2 Mol Percentage of Iso-Pentane	4 Inferred	Read/Write
4299	Meter#2 Mol Percentage of N-Pentane	4 Inferred	Read/Write
4301	Meter#2 Mol Percentage of N-Hexane	4 Inferred	Read/Write
4303	Meter#2 Mol Percentage of Heptane	4 Inferred	Read/Write
4305	Meter#2 Mol Percentage of N-Octane	4 Inferred	Read/Write
4307	Meter#2 Mol Percentage of CO2	4 Inferred	Read/Write
4309	Meter#2 Mol Percentage of N2	4 Inferred	Read/Write
4311-4327	Spare		

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
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### **AGA 8 GROSS METHOD 1**

4245	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4247	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4249	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4251-4285	Spare		
4287	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4289	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4291	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4293-4327	Spare		

### **AGA 8 GROSS METHOD 2**

4245	Meter#1 Mol % of Nitrogen	4 Inferred	Read/Write
4247	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4249	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4251	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4253-4285	Spare		
4287	Meter#2 Mol % of Nitrogen	4 Inferred	Read/Write
4289	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4291	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4293	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4295-4327	Spare		

## **Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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### **AGA 8 Detail Method**

4245	Meter#1 Mol % of Methane	4 Inferred	Read/Write
4247	Meter#1 Mol % of Nitrogen	4 Inferred	Read/Write
4249	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4251	Meter#1 Mol % of Ethane	4 Inferred	Read/Write
4253	Meter#1 Mol % of Propane	4 Inferred	Read/Write
4225	Meter#1 Mol % of Water	4 Inferred	Read/Write
4257	Meter#1 Mol % of Hydrogen Sulfide	4 Inferred	Read/Write
4259	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4261	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4263	Meter#1 Mol % of Oxygen	4 Inferred	Read/Write
4265	Meter#1 Mol % of i-Butane	4 Inferred	Read/Write
4267	Meter#1 Mol % of n-Butane	4 Inferred	Read/Write
4269	Meter#1 Mol % of i-Pentane	4 Inferred	Read/Write
4271	Meter#1 Mol % of n-Pentane	4 Inferred	Read/Write
4273	Meter#1 Mol % of i-Hexane	4 Inferred	Read/Write
4275	Meter#1 Mol % of n-Heptane	4 Inferred	Read/Write
4277	Meter#1 Mol % of i-Octane	4 Inferred	Read/Write
4279	Meter#1 Mol % of i-Nonane	4 Inferred	Read/Write
4281	Meter#1 Mol % of i-Decane	4 Inferred	Read/Write
4283	Meter#1 Mol % of Helium	4 Inferred	Read/Write
4285	Meter#1 Mol % of Argon	4 Inferred	Read/Write
4287	Meter#2 Mol % of Methane	4 Inferred	Read/Write
4289	Meter#2 Mol % of Nitrogen	4 Inferred	Read/Write
4291	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4293	Meter#2 Mol % of Ethane	4 Inferred	Read/Write
4295	Meter#2 Mol % of Propane	4 Inferred	Read/Write
4297	Meter#2 Mol % of Water	4 Inferred	Read/Write
4299	Meter#2 Mol % of Hydrogen Sulfide	4 Inferred	Read/Write
4301	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4303	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4305	Meter#2 Mol % of Oxygen	4 Inferred	Read/Write
4307	Meter#2 Mol % of i-Butane	4 Inferred	Read/Write
4309	Meter#2 Mol % of n-Butane	4 Inferred	Read/Write
4311	Meter#2 Mol % of i-Pentane	4 Inferred	Read/Write
4313	Meter#2 Mol % of n-Pentane	4 Inferred	Read/Write
4315	Meter#2 Mol % of i-Hexane	4 Inferred	Read/Write
4317	Meter#2 Mol % of n-Heptane	4 Inferred	Read/Write
4319	Meter#2 Mol % of i-Octane	4 Inferred	Read/Write
4321	Meter#2 Mol % of i-Nonane	4 Inferred	Read/Write
4323	Meter#2 Mol % of i-Decane	4 Inferred	Read/Write
4325	Meter#2 Mol % of Helium	4 Inferred	Read/Write
4327	Meter#2 Mol % of Argon	4 Inferred	Read/Write

### **AGA 8 DETAIL METHOD ENDS**

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
4329	Meter #1 Heating Value BTU/FT3	3 Inferred	Read/Write
4331	Meter #2 Heating Value BTU/FT3	3 Inferred	Read/Write
4333	Meter #1 FPV Override	6 Inferred	Read/Write
4335	Meter #2 FPV Override	6 Inferred	Read/Write
4337	Meter #1 Temperature Override	1 Inferred	Read/Write
4339	Meter #2 Temperature Override	1 Inferred	Read/Write
4341	Meter #1 Pressure Override	1 Inferred	Read/Write
4343	Meter #2 Pressure Override	1 Inferred	Read/Write
4345	Meter #1 Base Density Override	6 Inferred	Read/Write
4347	Meter #2 Base Density Override	6 Inferred	Read/Write
4349	Meter #1 DP Cut Off	4 Inferred	Read/Write
4351	Meter #1 Flowrate Low Limit	2 Inferred	Read/Write
4353	Meter #1 Flowrate High Limit	2 Inferred	Read/Write
4355	Meter #1 Pipe ID	5 Inferred	Read/Write
4357	Meter #1 Orifice ID	5 Inferred	Read/Write
4359	Meter #2 DP Cut Off	4 Inferred	Read/Write
4361	Meter #2 Flowrate Low Limit	2 Inferred	Read/Write
4363	Meter #2 Flowrate High Limit	2 Inferred	Read/Write
4365	Meter #2 Pipe ID	5 Inferred	Read/Write
4367	Meter #2 Orifice ID	5 Inferred	Read/Write
4369	Meter #1 Density Dry Air	5 Inferred	Read/Write
4371	Meter #1 Relative Density	6 Inferred	Read/Write
4373	Meter #1 Ratio of Heat	4 Inferred	Read/Write
4375	Meter #1 Viscosity	6 Inferred	Read/Write
4377	Meter #1 Pipe Thermal E-6	2 Inferred	Read/Write
4379	Meter #1 Orifice Thermal E-6	2 Inferred	Read/Write
4381	Meter #1 Reference Temp of Pipe	2 Inferred	Read/Write
4383	Meter #1 Reference Temp of Orifice	2 Inferred	Read/Write
4385	Meter #2 Density Dry Air	5 Inferred	Read/Write
4387	Meter #2 Relative Density	6 Inferred	Read/Write
4389	Meter #2 Ratio of Heat	4 Inferred	Read/Write
4391	Meter #2 Viscosity	6 Inferred	Read/Write
4393	Meter #2 Pipe Thermal E-6	2 Inferred	Read/Write
4395	Meter #2 Orifice Thermal E-6	2 Inferred	Read/Write
4397	Meter #2 Reference Temp of Pipe	2 Inferred	Read/Write
4399	Meter #2 Reference Temp of Orifice	2 Inferred	Read/Write
4401	Meter #1 DP Switch High %	2 Inferred	Read/Write
4403	Meter #2 DP Switch Low %	2 Inferred	Read/Write
4405	Meter #1 K Factor	3 Inferred	Read/Write
4407	Meter #1 Meter Factor	6 Inferred	Read/Write
4409	Meter #2 K Factor	3 Inferred	Read/Write
4411	Meter #2 Meter Factor	6 Inferred	Read/Write
4413	Meter #1 Flow Threshold #1	2 Inferred	Read/Write
4415	Meter #1 Flow Threshold #2	2 Inferred	Read/Write
4417	Meter #1 Flow Threshold #3	2 Inferred	Read/Write
4419	Meter #1 Flow Threshold #4	2 Inferred	Read/Write
4421	Meter #1 Linear Factor #1	6 Inferred	Read/Write

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
4423	Meter #1 Linear Factor #2	6 Inferred	Read/Write
4425	Meter #1 Linear Factor #3	6 Inferred	Read/Write
4427	Meter #1 Linear Factor #4	6 Inferred	Read/Write
4429	Meter #2 Flow Threshold #1	2 Inferred	Read/Write
4431	Meter #2 Flow Threshold #2	2 Inferred	Read/Write
4433	Meter #2 Flow Threshold #3	2 Inferred	Read/Write
4435	Meter #2 Flow Threshold #4	2 Inferred	Read/Write
4437	Meter #2 Linear Factor #1	6 Inferred	Read/Write
4439	Meter #2 Linear Factor #2	6 Inferred	Read/Write
4441	Meter #2 Linear Factor #3	6 Inferred	Read/Write
4443	Meter #2 Linear Factor #4	6 Inferred	Read/Write
4445-4655	Spare		
4657	Meter #1 DP Low @4mA	4 Inferred	Read/Write
4659	Meter #1 DP Low @20mA	4 Inferred	Read/Write
4661	Meter #1 DP Low Limit	4 Inferred	Read/Write
4663	Meter #1 DP High Limit	4 Inferred	Read/Write
4665	Meter #1 DP Maintenance	4 Inferred	Read/Write
4667	Meter #1 Temperature Deg.F @4mA	1 Inferred	Read/Write
4669	Meter #1 Temperature Deg.F @20mA	1 Inferred	Read/Write
4671	Meter #1 Temperature Deg.F Low Limit	1 Inferred	Read/Write
4673	Meter #1 Temperature Deg.F High Limit	1 Inferred	Read/Write
4675	Meter #1 Temperature Deg.F Maintenance	1 Inferred	Read/Write
4677	Meter #1 Pressure PSIG @4mA	1 Inferred	Read/Write
4679	Meter #1 Pressure PSIG @20mA	1 Inferred	Read/Write
4681	Meter #1 Pressure PSIG Low Limit	1 Inferred	Read/Write
4683	Meter #1 Pressure PSIG High Limit	1 Inferred	Read/Write
4685	Meter #1 Pressure PSIG Maintenance	1 Inferred	Read/Write
4687	Meter #1 Density @4mA	6 Inferred	Read/Write
4689	Meter #1 Density @20mA	6 Inferred	Read/Write
4691	Meter #1 Density Low Limit	6 Inferred	Read/Write
4693	Meter #1 Density High Limit	6 Inferred	Read/Write
4695	Meter #1 Density Maintenance	6 Inferred	Read/Write
4697	Meter #1 Dens.Temp DEG.F @4mA	1 Inferred	Read/Write
4699	Meter #1 Dens.Temp DEG.F @20mA	1 Inferred	Read/Write
4701	Meter #1 Dens.Temp DEG.F Low Limit	1 Inferred	Read/Write
4703	Meter #1 Dens.Temp DEG.F High Limit	1 Inferred	Read/Write
4705	Meter #1 Dens.Temp DEG.F Maintenance	1 Inferred	Read/Write
4707	Meter #1 DP High @4mA	4 Inferred	Read/Write
4709	Meter #1 DP High @20mA	4 Inferred	Read/Write
4711-4715	Spare		
4717	Meter #1 Density Correction Factor	5 Inferred	Read/Write



## Modbus Address Table – 32 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4719	Meter #1 Dens.Period Low Limit	3 Inferred	Read/Write
4721	Meter #1 Dens.Period High Limit	3 Inferred	Read/Write
4723-4725	Spare		
4727	Meter #2 DP Low @4mA	4 Inferred	Read/Write
4729	Meter #2 DP Low @20mA	4 Inferred	Read/Write
4731	Meter #2 DP Low Limit	4 Inferred	Read/Write
4733	Meter #2 DP High Limit	4 Inferred	Read/Write
4735	Meter #2 DP Maintenance	4 Inferred	Read/Write
4737	Meter #2 Temperature DEG.F @4mA	1 Inferred	Read/Write
4739	Meter #2 Temperature DEG.F @20mA	1 Inferred	Read/Write
4741	Meter #2 Temperature DEG.F Low Limit	1 Inferred	Read/Write
4743	Meter #2 Temperature DEG.F High Limit	1 Inferred	Read/Write
4745	Meter #2 Temperature DEG.F Maintenance	1 Inferred	Read/Write
4747	Meter #2 Pressure PSIG @4mA	1 Inferred	Read/Write
4749	Meter #2 Pressure PSIG @20mA	1 Inferred	Read/Write
4751	Meter #2 Pressure PSIG Low Limit	1 Inferred	Read/Write
4753	Meter #2 Pressure PSIG High Limit	1 Inferred	Read/Write
4755	Meter #2 Pressure PSIG Maintenance	1 Inferred	Read/Write
4757	Meter #2 Density @4mA	6 Inferred	Read/Write
4759	Meter #2 Density @20mA	6 Inferred	Read/Write
4761	Meter #2 Density Low Limit	6 Inferred	Read/Write
4763	Meter #2 Density High Limit	6 Inferred	Read/Write
4765	Meter #2 Density Maintenance	6 Inferred	Read/Write
4767	Meter #2 Dens.Temp DEG.F @4mA	1 Inferred	Read/Write
4769	Meter #2 Dens.Temp DEG.F @20mA	1 Inferred	Read/Write
4771	Meter #2 Dens.Temp DEG.F Low Limit	1 Inferred	Read/Write
4773	Meter #2 Dens.Temp DEG.F High Limit	1 Inferred	Read/Write
4775	Meter #2 Dens.Temp DEG.F Maintenance	1 Inferred	Read/Write
4777	Meter #2 DP High @4mA	4 Inferred	Read/Write
4779	Meter #2 DP High @20mA	4 Inferred	Read/Write
4781-4785	Spare		
4787	Meter #2 Density Correction Factor	5 Inferred	Read/Write
4789	Meter #2 Dens.Period Low Limit	3 Inferred	Read/Write
4791	Meter #2 Dens.Period High Limit	3 Inferred	Read/Write
4793-4796	Spare		
4797	Spare#1 @4mA	4 Inferred	Read/Write
4799	Spare#1 @20mA	4 Inferred	Read/Write
4801	Spare#1 Lo-Limit	4 Inferred	Read/Write
4803	Spare#1 Hi-Limit	4 Inferred	Read/Write
4805	Spare#1 Maintenance	4 Inferred	Read/Write
4807	Spare#2 @4mA	4 Inferred	Read/Write
4809	Spare#2 @20mA	4 Inferred	Read/Write
4811	Spare#2 Lo-Limit	4 Inferred	Read/Write

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
4813	Spare#2 Hi-Limit	4 Inferred	Read/Write
4815	Spare#2 Maintenance	4 Inferred	Read/Write
4817	Spare		
4819	Base Temperature DEG.F	3 Inferred	Read/Write
4821	Base Pressure PSIA	3 Inferred	Read/Write
4823	Run Switch Low Set Point	2 Inferred	Read/Write
4825	Run Switch High Set Point	2 Inferred	Read/Write
4827	Atmospheric Pressure PSIA	3 Inferred	Read/Write
4829	Pulse Output Volume #1 Pulses/Unit	3 Inferred	Read/Write
4831	Pulse Output Volume #2 Pulses/Unit	3 Inferred	Read/Write
4833	Analog Output #1 at 4 mA		
4835	Analog Output #1 at 20 mA		
4837	Analog Output #2 at 4 mA		
4839	Analog Output #2 at 20 mA		
4841	Analog Output #3 at 4 mA		
4843	Analog Output #3 at 20 mA		
4845	Analog Output #4 at 4 mA		
4847	Analog Output #4 at 20 mA		

### ***Scratch Pad for Program Variables – (Long Integer) 5031,5033-5069***

5031	Scratch Pad – Program Variable Integer
5033	
5035	
5037	
5039	
5041	
5043	
5045	
5047	
5049	
5051	

## **Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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### **Last Hourly Data Area**

3787 = Requested Date (mmddyy) (32 bits)

3028 = Requested Hour (16 bits)

3029 = Last Hourly Report Request (16 bits)

Set requested date, set requested hour, and then set last hourly report request to 1 in that order.

3787 = Requested Date (mmddyy) (32 bits)

3028 = Requested Hour (16 bits)

3029 = Last Hourly Report Request (16 bits)

Set requested date, set requested hour, and then set last hourly report request to 1 in that order.

8001	Date (mm/dd/yy)	0 Inferred	Read
8003	Time (hh/mm/ss)	0 Inferred	Read
8005	Meter#1 Hourly Duration of Flow	1 Inferred	Read
8007	Meter#1 GrossTotal	0 Inferred	Read
8009	Meter#1 Net Total	0 Inferred	Read
8011	Meter#1 Mass Total	0 Inferred	Read
8013	Meter#1 Energy Total	0 Inferred	Read
8015	Meter#1 Average Temperature	1 Inferred	Read
8017	Meter#1 Average Pressure	1 Inferred	Read
8019	Meter#1 Average DP	4 Inferred	Read
8021	Meter#1 Average DP EXT	4 Inferred	Read
8023	Meter#1 Average SG	6 Inferred	Read
8025	Meter#2 Hourly Duration of Flow	1 Inferred	Read
8027	Meter#2 Gross Total	0 Inferred	Read
8029	Meter#2 Net Total	0 Inferred	Read
8031	Meter#2 Mass Total	0 Inferred	Read
8033	Meter#2 Energy Total	0 Inferred	Read
8035	Meter#2 Average Temperature	1 Inferred	Read
8037	Meter#2 Average Pressure	1 Inferred	Read
8039	Meter#2 Average DP	4 Inferred	Read
8041	Meter#2 Average DP EXT	4 Inferred	Read
8043	Meter#2 Average SG	6 Inferred	Read

**LAST HOURLY DATA AREA ENDS**

## Modbus Address Table – 32 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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\*Non-resettable accumulated volume will roll over at 9999999.

### CURRENT DATA AREA

9001	Meter #1 Calculation Type	0 Inferred	Read
9003	Meter #1 Flow Flag/Flow Dir	0 Inferred	Read
9005	Meter #1 Alarm Status Flag	0 Inferred	Read
9007	Meter #1 Daily Gross Total	0 inferred	Read
9009	Meter #1 Daily Net Total	0 inferred	Read
9011	Meter #1 Daily Mass Total	0 inferred	Read
9013	Meter #1 Daily Energy Total	0 inferred	Read
9015	Meter #1 N2	4 Inferred	Read
9017	Meter #1 Co2	4 Inferred	Read
9019	Meter #1 Methane	4 Inferred	Read
9021	Meter #1 Ethane	4 Inferred	Read
9023	Meter #1 Propane	4 Inferred	Read
9025	Meter #1 Water	4 Inferred	Read
9027	Meter #1 H2S	4 Inferred	Read
9029	Meter #1 H2	4 Inferred	Read
9031	Meter #1 CO	4 Inferred	Read
9033	Meter #1 Oxygen	4 Inferred	Read
9035	Meter #1 I-Butane	4 Inferred	Read
9037	Meter #1 n-Butane	4 Inferred.	Read
9039	Meter#1 Heating Value	3 Inferred	Read
9041	Meter #1 Gross Flowrate	2 Inferred	Read
9043	Meter #1 Net Flowrate	2 Inferred	Read
9045	Meter #1 Mass Flowrate	2 Inferred	Read
9047	Meter #1 Energy Flowrate	2 Inferred	Read
9049	Meter #1 DP	4 Inferred	Read
9051	Meter #1 Temperature	1 Inferred	Read
9053	Meter #1 Pressure	1 Inferred	Read
9055	Meter #1 Density	6 Inferred	Read
9057	Meter #1 Dens.Temp	1 Inferred	Read
9059	Meter #1 Dens.b	6 Inferred	Read
9061	Meter #1 SG	6 Inferred	Read
9063	Meter #1 Y Factor	6 Inferred	Read
9065	Meter #1 K /CD/LMF	6 Inferred	Read
9067	Meter #1 FA	6 Inferred	Read
9069	Meter #1 FPV	6 Inferred	Read
9071-9081	Spare		
9083	Meter #1 I-Pentane	4 Inferred	Read
9085	Meter #1 n-Pentane	4 Inferred	Read
9087	Meter #1 n-Hexane	4 Inferred	Read
9089	Meter #1 n-Heptane	4 Inferred	Read
9091	Meter #1 n-Octane	4 Inferred	Read
9093	Meter #1 n-Nonane	4 Inferred	Read
9095	Meter #1 n-Decane	4 Inferred	Read
9097	Meter #1 Helium	4 Inferred	Read

## **Modbus Address Table – 32 Bits**

<b>ADDRESS</b>	<b>DESCRIPTION</b>	<b>DECIMAL</b>	<b>READ/WRITE</b>
9099	Meter #1 Argon	4 Inferred	Read
9101	Meter #1 DP EXT	4 Inferred	Read
9103-9131	Spare		
9133	Meter #1 Cum. Gross Total*	0 Inferred	Read
9135	Meter #1 Cum. Net Total*	0 Inferred	Read
9137	Meter #1 Cum. Mass Total*	0 Inferred	Read
9139	Meter #1 Cum. Energy Total*	0 Inferred	Read
9141	Meter #1 Density Calc. Type	0 Inferred	Read
9143-9145	Meter #1 Meter ID	8 Chars.	Read
9147	Meter #1 Pipe ID	5 Inferred	Read
9149	Meter #1 Orifice ID	5 Inferred	Read
9151	Meter #1 Density Correction Factor	5 Inferred	Read
9153	Meter #1 Density of Dry Air	5 Inferred	Read
9155	Meter #1 Heating Value BTU/FT3	3 Inferred	Read
9157	Meter #1 K Factor	3 Inferred	Read
9159	Date (mmddyy)	0 Inferred	Read
9161	Time (hhmmss)	0 Inferred	Read
9163-9199	Spare		
9201	Meter #2 Calculation Type	0 Inferred	Read
9203	Meter #2 Flow Flag/Flow Dir	0 Inferred	Read
9205	Meter #2 Alarm Status Flag	0 Inferred	Read
9207	Meter #2 Daily Gross	0 inferred	Read
9209	Meter #2 Daily Net	0 inferred	Read
9211	Meter #2 Daily Mass	0 inferred	Read
9213	Meter #2 Daily Energy	0 inferred	Read
9215	Meter #2 N2	4 Inferred	Read
9217	Meter #2 Co2	4 Inferred	Read
9219	Meter #2 Methane	4 Inferred	Read
9221	Meter #2 Ethane	4 Inferred	Read
9223	Meter #2 Propane	4 Inferred	Read
9225	Meter #1 Water	4 Inferred	Read
9227	Meter #2 H2S	4 Inferred	Read
9229	Meter #2 H2	4 Inferred	Read
9231	Meter #2 CO	4 Inferred	Read
9233	Meter #2 Oxygen	4 Inferred	Read
9235	Meter #2 I-Butane	4 Inferred	Read
9237	Meter #2 n-Butane	4 Inferred.	Read
9239	Meter#2 Heating Value	3 Inferred	Read
9241	Meter #2 Gross Flowrate	2 Inferred	Read
9243	Meter #2 Net Flowrate	2 Inferred	Read
9245	Meter #2 Mass Flowrate	2 Inferred	Read
9247	Meter #2 Energy Flowrate	2 Inferred	Read
9249	Meter #2 DP	4 Inferred	Read

## Modbus Address Table – 32 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
9251	Meter #2 Temperature	1 Inferred	Read
9253	Meter #2 Pressure	1 Inferred	Read
9255	Meter #2 Density	6 Inferred	Read
9257	Meter #2 Dens.Temp	1 Inferred	Read
9259	Meter #2 Dens.b	6 Inferred	Read
9261	Meter #2 SG	6 Inferred	Read
9263	Meter #2 Y Factor	6 Inferred	Read
9265	Meter #2 K /CD/LMF	6 Inferred	Read
9267	Meter #2 FA	6 Inferred	Read
9269	Meter #2 FPV	6 Inferred	Read
9271-9281	Spare		
9283	Meter #2 I-Pentane	4 Inferred	Read
9285	Meter #2 n-Pentane	4 Inferred	Read
9287	Meter #2 n-Hexane	4 Inferred	Read
9289	Meter #2 n-Heptane	4 Inferred	Read
9291	Meter #2 n-Octane	4 Inferred	Read
9293	Meter #2 n-Nonane	4 Inferred	Read
9295	Meter #2 n-Decane	4 Inferred	Read
9297	Meter #2 Helium	4 Inferred	Read
9299	Meter #2 Argon	4 Inferred	Read
9301	Meter #2 DP EXT	4 Inferred	Read
9303-9331	Spare		
9333	Meter #2 Cum. Gross Total*	0 Inferred	Read
9335	Meter #2 Cum. Net Total*	0 Inferred	Read
9337	Meter #2 Cum. Mass Total*	0 Inferred	Read
9339	Meter #2 Cum. Energy Total*	0 Inferred	Read
9341	Meter #2 Density Calc. Type	0 Inferred	Read
9343-9345	Meter #2 Meter ID	8 Chars.	Read
9347	Meter #2 Pipe ID	5 Inferred	Read
9349	Meter #2 Orifice ID	5 Inferred	Read
9351	Meter #2 Density Correction Factor	5 Inferred	Read
9353	Meter #2 Density of Dry Air	5 Inferred	Read
9355	Meter #2 Heating Value BTU/FT3	3 Inferred	Read
9357	Meter #2 K Factor	3 Inferred	Read
9359-9399	Spare		
9401	Spare #1 Data	4 Inferred	Read
9403	Spare #2 Data	4 Inferred	Read

**FLOATING POINT - CURRENT DATA AREA – METER #1**

7098	Daily Archive Record Number
7099	Hourly Archive Record Number
7100	Spare
7101	Meter #1 Gross Flowrate
7102	Meter #1 Net Flowrate
7103	Meter #1 Mass Flowrate
7104	Meter #1 Energy Flowrate
7105	Meter #1 Daily Gross Total
7106	Meter #1 Daily Net Total
7107	Meter #1 Daily Mass Total
7108	Meter #1 Daily Energy Total
7109	Meter #1 Cum. Gross Total
7110	Meter #1 Cum. Net Total
7111	Meter #1 Cum. Msss Total
7112	Meter #1 Cum. Energy Total
7113	Meter#1 Dp
7114	Meter #1 Temperature
7115	Meter #1 Pressure
7116	Meter #1 Density
7117	Meter #1 Heating Value
7118	Meter #1 Dens.b
7119	Meter #1 SG
7120	Meter #1 Y Factor
7121	Meter #1 K/CD/LMF
7122	Meter #1 FA
7123	Meter #1 FPV
7124	Meter #1 N2
7125	Meter #1 CO2
7126	Meter #1 Methane
7127	Meter #1 Etnane
7128	Meter #1 Propane
7129	Meter #1 Water
7130	Meter #1 H2S
7131	Meter #1 H2
7132	Meter #1 CO
7133	Meter #1 Oxygen
7134	Meter #1 I-Butane
7135	Meter #1 n-Butane
7136	Meter #1 I-Pentane
7137	Meter #1 n-Pentane
7138	Meter #1 n-Hexane
7139	Meter #1 n-Heptane
7140	Meter #1 n-Octane
7141	Meter #1 n-Nonane
7142	Meter #1 n-Decane
7143	Meter #1 Helium
7144	Meter #1 Argon

**FLOATING POINT - CURRENT DATA AREA**

7145-7153 Spare  
7154 Meter #1 Alarms (4th byte | 3rd byte | 2nd byte | 1st byte)  
1 st Btye –  
B0 : Flowrate High Alarm  
B1 : Flowrate Low Alarm  
B2 : Temperature High Alarm  
B3 : Temperature Low Alarm  
B4 : Pressure High Alarm  
B5 : Pressure Low Alarm  
B6 : Density/Gravity High Alarm  
B7 : Density/Gravity Low Alarm  
2 nd Byte  
B0 : Dens.Temperature High Alarm  
B1 : Dens.Temperature Low Alarm  
B2 : DP High Alarm  
B3 : DP Low Alarm  
B4 : Dens.Period High Alarm  
B5 : Dens.Period Low Alarm  
3 rd Byte  
B0 : Down  
B1 : NX19 Out of Range  
B2 : AGA8 Out of Range



**FLOATING POINT- CURRENT DATA AREA – METER #2**

7301	Meter #2 Gross Flowrate
7302	Meter #2 Net Flowrate
7303	Meter #2 Mass Flowrate
7304	Meter #2 Energy Flowrate
7305	Meter #2 Daily Gross Total
7306	Meter #2 Daily Net Total
7307	Meter #2 Daily Mass Total
7308	Meter #2 Daily Energy Total
7309	Meter #2 Cum. Gross Total
7310	Meter #2 Cum. Net Total
7311	Meter #2 Cum. Msss Total
7312	Meter #2 Cum. Energy Total
7313	Meter#2 Dp
7314	Meter #2 Temperature
7315	Meter #2 Pressure
7316	Meter #2 Density
7317	Meter #2 Heating Value
7318	Meter #2 Dens.b
7319	Meter #2 SG
7320	Meter #2 Y Factor
7321	Meter #2 K/CD/LMF
7322	Meter #2 FA
7323	Meter #2 FPV
7324	Meter #2 N2
7325	Meter #2 CO2
7326	Meter #2 Methane
7327	Meter #2 Etnane
7328	Meter #2 Propane
7329	Meter #2 Water
7330	Meter #2 H2S
7331	Meter #2 H2
7332	Meter #2 CO
7333	Meter #2 Oxygen
7334	Meter #2 I-Butane
7335	Meter #2 n-Butane
7336	Meter #2 I-Pentane
7337	Meter #2 n-Pentane
7338	Meter #2 n-Hexane
7339	Meter #2 n-Heptane
7340	Meter #2 n-Octane
7341	Meter #2 n-Nonane
7342	Meter #2 n-Decane
7343	Meter #2 Helium
7344	Meter #2 Argon

**FLOATING POINT- CURRENT DATA AREA – METER #2**

7345-7352 Spare  
7353 Meter #2 Alarms (4 th byte | 3rd byte | 2nd byte | 1st byte)  
1 st Btye –  
B0 : Flowrate High Alarm  
B1 : Flowrate Low Alarm  
B2 : Temperature High Alarm  
B3 : Temperature Low Alarm  
B4 : Pressure High Alarm  
B5 : Pressure Low Alarm  
B6 : Density/Gravity High Alarm  
B7 : Density/Gravity Low Alarm  
2 nd Byte  
B0 : Dens.Temperature High Alarm  
B1 : Dens.Temperature Low Alarm  
B2 : DP High Alarm  
B3 : DP Low Alarm  
B4 : Dens.Period High Alarm  
B5 : Dens.Period Low Alarm  
3 rd Byte  
B0 : Down  
B1 : NX19 Out of Range  
B2 : AGA8 Out of Range

**FLOATING POINT – Previous Daily Data Area – Meter #1**

7201	Date
7202	Time
7203	Flow Time (Min)
7204	Meter #1 Average DP
7205	Meter #1 Average Pressure
7206	Meter #1 Average Temperature
7207	Meter #1 Average DP/EXT
7208	Meter #1 Gross Total
7209	Meter #1 Net Total
7210	Meter #1 Mass Total
7211	Meter #1 Energy Total
7212	Meter #1 Average Heating Value
7213	Meter #1 Average SG
7214	Meter #1 Average N2
7215	Meter #1 Average CO2
7216	Meter #1 Average Methane
7217	Meter #1 Average Ethane
7218	Meter #1 Average Propane
7219	Meter #1 Average Water
7220	Meter #1 Average H2S
7221	Meter #1 Average H2
7222	Meter #1 Average CO
7223	Meter #1 Average Oxygen
7224	Meter #1 Average I-Butane
7225	Meter #1 Average n-Butane
7226	Meter #1 Average I-Pentane
7227	Meter #1 Average n-Pentane
7228	Meter #1 Average n-Hexane
7229	Meter #1 Average n-Heptane
7230	Meter #1 Average n-Octane
7231	Meter #1 Average n-Nonane
7232	Meter #1 Average n-Decane
7233	Meter #1 Average Helium
7234	Meter #1 Average Argon

**FLOATING POINT – Previous Hourly Data Area – Meter #1**

7241	Date
7242	Time
7243	Flow Time
7244	Meter #1 Average DP
7245	Meter #1 Average Pressure
7246	Meter #1 Average Temperature
7247	Meter #1 Average DP/EXT
7248	Meter #1 Hourly Gross
7249	Meter #1 Hourly Net
7250	Meter #1 Hourly Mass
7251	Meter #1 Hourly Energy
7252	Program Variable #1
7253	Program Variable #2
7254	Program Variable #3
7255	Program Variable #4
7256	Program Variable #5
7257	Program Variable #6
7258	Program Variable #7
7259	Program Variable #8
7260	Program Variable #9
7261	Program Variable #10

**FLOATING POINT – Previous Daily Data Area – Prog.Var**

7262	Flow Time (Min)
7263	Program Variable #1
7264	Program Variable #2
7265	Program Variable #3
7266	Program Variable #4
7267	Program Variable #5
7268	Program Variable #6
7269	Program Variable #7
7270	Program Variable #8
7271	Program Variable #9
7272	Program Variable #10

**FLOATING POINT – Previous Daily Data Area – Meter #2**

7401	Date
7402	Time
7403	Flow Time (Min)
7404	Meter #2 Average DP
7405	Meter #2 Average Pressure
7406	Meter #2 Average Temperature
7407	Meter #2 Average DP/EXT
7408	Meter #2 Gross Total
7409	Meter #2 Net Total
7410	Meter #2 Mass Total
7411	Meter #2 Energy Total
7412	Meter #2 Average Heating Value
7413	Meter #2 Average SG
7414	Meter #2 Average N2
7415	Meter #2 Average CO2
7416	Meter #2 Average Methane
7417	Meter #2 Average Ethane
7418	Meter #2 Average Propane
7419	Meter #2 Average Water
7420	Meter #2 Average H2S
7421	Meter #2 Average H2
7422	Meter #2 Average CO
7423	Meter #2 Average Oxygen
7424	Meter #2 Average I-Butane
7425	Meter #2 Average n-Butane
7426	Meter #2 Average I-Pentane
7427	Meter#2 Average n-Pentane
7428	Meter #2 Average n-Hexane
7429	Meter #2 Average n-Heptane
7430	Meter #2 Average n-Octane
7431	Meter #2 Average n-Nonane
7432	Meter #2 Average n-Decane
7433	Meter #2 Average Helium
7434	Meter #2 Average Argon

**FLOATING POINT – Previous Hourly Data Area Meter #2**

7441	Date
7442	Time
7443	Meter#1 Flow Time
7444	Meter #2 Average DP
7445	Meter #2 Average Pressure
7446	Meter #2 Average Temperature
7447	Meter #2 Average DP/EXT
7448	Meter #2 Hourly Gross Total
7449	Meter #2 Hourly Net Total
7450	Meter #2 Hourly Mass Total
7451	Meter #2 Hourly Energy Total

**3123 (16 bits) ACK FLAG****0 Inferred****Read/Write****FLOATING POINT – (701) Previous Daily Data Area – Meter #1**

701           Date  
              Time  
              Average Heating Value  
              Average SG  
              Average Carbon Dioxide  
              Average Nitrogen  
              Average Methane  
              Average Ethane  
              Average Propane  
              Average Iso-Butane  
              Average n-Butane  
              Average I-Pentane  
              Average n-Pentane  
              Average Hexane  
              Average Heptane  
              Average Nonane  
              Average Octane  
              Average H2S  
              Average Hydrogen  
              Average Helium  
              Average Oxygen  
              Average Carbon Monoxide

**FLOATING POINT – (702) Previous Daily Data Area – Meter #2**

702           Date  
              Time  
              Average Heating Value  
              Average SG  
              Average Carbon Dioxide  
              Average Nitrogen  
              Average Methane  
              Average Ethane  
              Average Propane  
              Average Iso-Butane  
              Average n-Butane  
              Average I-Pentane  
              Average n-Pentane  
              Average Hexane  
              Average Heptane  
              Average Nonane  
              Average Octane  
              Average H2S  
              Average Hydrogen  
              Average Helium  
              Average Oxygen  
              Average Carbon Monoxide

**FLOATING POINT – (703) Previous Daily Data Area – Meter #1**

703            Date  
                 Time  
                 Flow Time (Min.)  
                 Average Pressure  
                 Average Temperature  
                 Gross Total  
                 Net Total  
                 Mass Total  
                 Energy  
                 Average DP  
                 Average DP/EXT

**FLOATING POINT – (704) Previous Hourly Data Area – Meter #1**

704            Date  
                 Time  
                 Flow Time (Min.)  
                 Average Pressure  
                 Average Temperature  
                 Gross Total  
                 Net Total  
                 Mass Total  
                 Energy Total  
                 Average DP  
                 Average DP/EXT



**FLOATING POINT – (705) Previous Daily Data Area – Meter #2**

705            Date  
                 Time  
                 Flow Time (Min.)  
                 Average Pressure  
                 Average Temperature  
                 Gross Total  
                 Net Total  
                 Mass Total  
                 Energy Total  
                 Average DP  
                 Average DP/EXT

**FLOATING POINT – (706) Previous Hourly Data Area – Meter #2**

706            Date  
                 Time  
                 Flow Time (Min.)  
                 Average Pressure  
                 Average Temperature  
                 Gross Total  
                 Net Total  
                 Mass Total  
                 Energy Total  
                 Average DP  
                 Average DP/EXT

### **Programmable Floating Point Variable**

Scratch Pad for Floating Point Variables – 7801-7830

**7791-7800 – Last Hour Program Variables**

**7801-7810** –first 5 Variables, will be reset at the end of hour.

**7831-7899 – Programmable Variable Statements**

#### **Hourly Programmable Variables 7052-7061**

3787 = Requested Date (mmddy) (32 bits)

3028 = Requested Hour (16 bits)

3029 = Last Hourly Report Request (16 bits)

Set requested date, set requested hour, and then set last hourly report request to 1 in that order.

7052 Hourly Programmable Variables #1

7053 Hourly Programmable Variables #2

7054 Hourly Programmable Variables #3

7055 Hourly Programmable Variables #4

7056 Hourly Programmable Variables #5

7057 Hourly Programmable Variables #6

7058 Hourly Programmable Variables #7

7059 Hourly Programmable Variables #8

7060 Hourly Programmable Variables #9

7061 Hourly Programmable Variables #10

# CHAPTER 6: Installation Drawings

## Explosion-Proof Installation Drawings

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA				

**12.** INSTALLATION TO BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE.

**9.** NON-INCENDIVE FIELD WIRING METHODS MAY BE USED FOR CONNECTING THE TEMPERATURE SENSING ASSEMBLY. WHEN USING NON-INCENDIVE FIELD WIRING, THE CONNECTION HEAD AND TEMPERATURE SENSOR ASSEMBLY NEED NOT BE EXPLOSION PROOF, BUT ALL COMPONENTS CONNECTED TO THE TEMP SENSOR CONNECTOR MUST BE CLASSIFIED "SIMPLE APPARATUS". SIMPLE APPARATUS ARE DEVICES WHICH ARE INCAPABLE OF GENERATING OR STORING MORE THAN 1.2V, 0.1A, 25MW, OR 20uJ (RTD'S QUALIFY AS SIMPLE APPARATUS).

**8.** DIVISION 2 WIRING METHOD.

**6.** CLASS II INSTALLATIONS MUST USE A CSA APPROVED DUST-INGITIONPROOF SENSOR.

**5.** IN AMBIENTS GREATER THAN 40°C, SPRING LOADED TEMPERATURE SENSORS USED WITHOUT AN EXPLOSION PROOF THERMOWELL MUST BE RATED FOR AT LEAST 85°C.

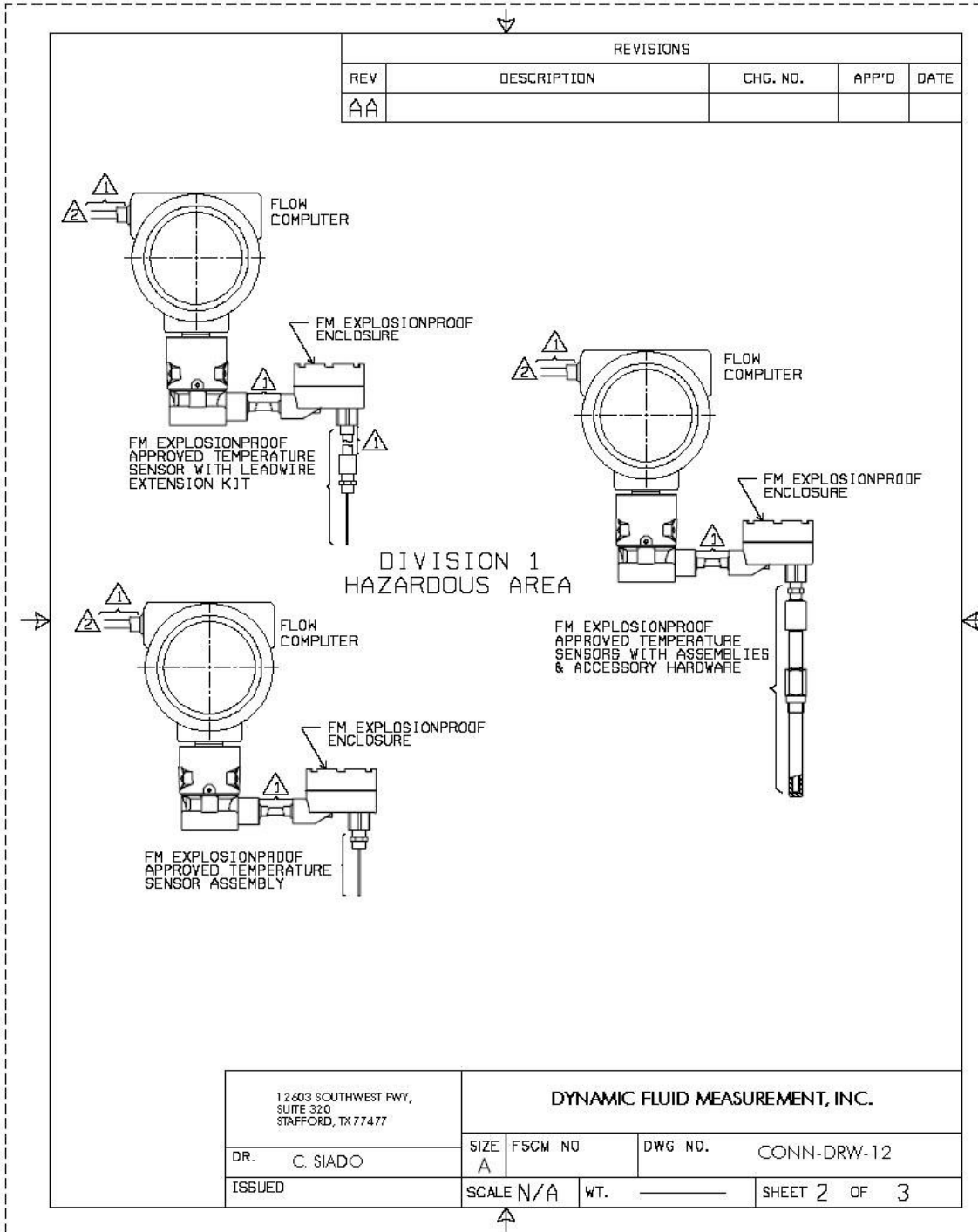
**4.** COMPONENTS REQUIRED TO BE APPROVED MUST BE FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.

**3.** ALL CONDUITS THREADS TO BE ASSEMBLED WITH FIVE FULL THREADS MINIMUM.

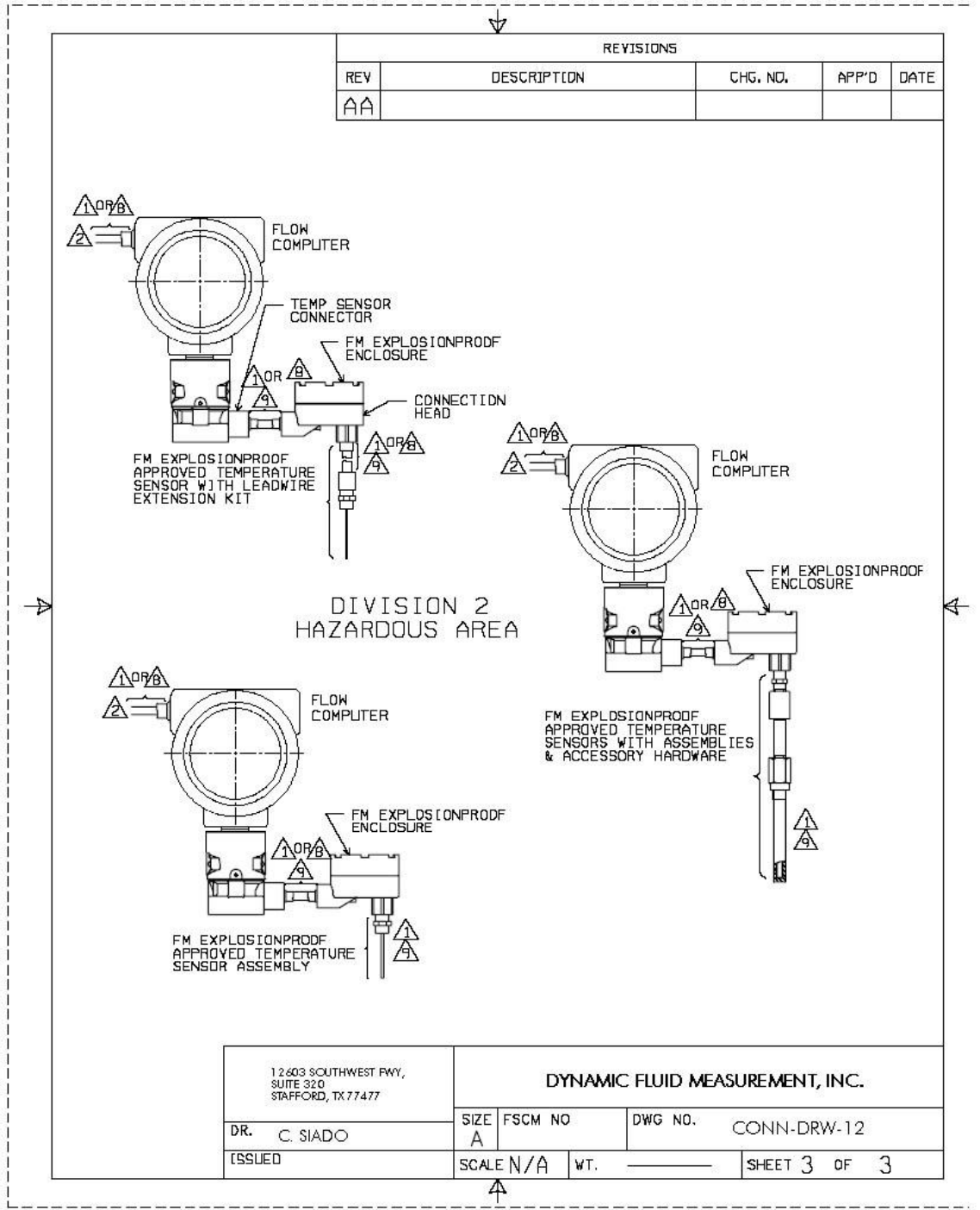
**2.** TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250VAC.

**1.** WIRING METHOD SUITABLE FOR CLASS I, DIV 1, ANY LENGTH.

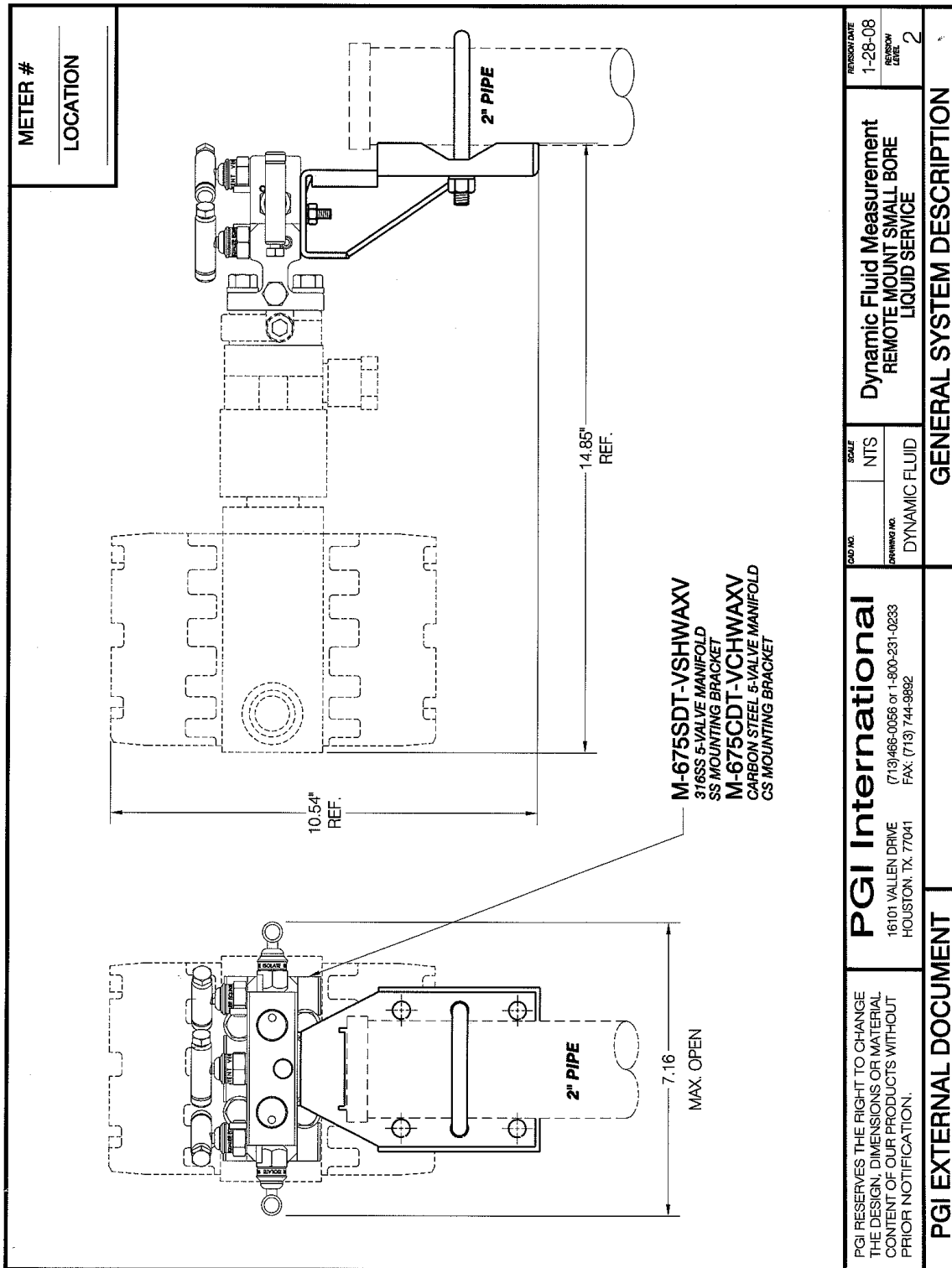
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES (mm). REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125  -TOLERANCE- .X * .1 [2.5] .XX * .02 [0.5] .XXX * .010 [0.25]  FRACTIONS * 1/32    ANGLES * 2°  DO NOT SCALE PRINT	CONTRACT NO.	<b>DYNAMIC FLUID MEASUREMENT, INC.</b>		12603 SOUTHWEST FWY, SUITE 320 STAFFORD, TX 77477
	DR. C. SIADO	TITLE MODEL MICROMV AND ECHART EXPLOSIONPROOF INSTALLATION DRAWING, FACTORY MUTUAL		
CHK'D				
APP'D. S. HALILAH	SIZE A	FSCM NO	DWG NO. CONN-DRW-12	
APP'D. GOVT.	SCALE	WT. _____	SHEET 1 OF 3	

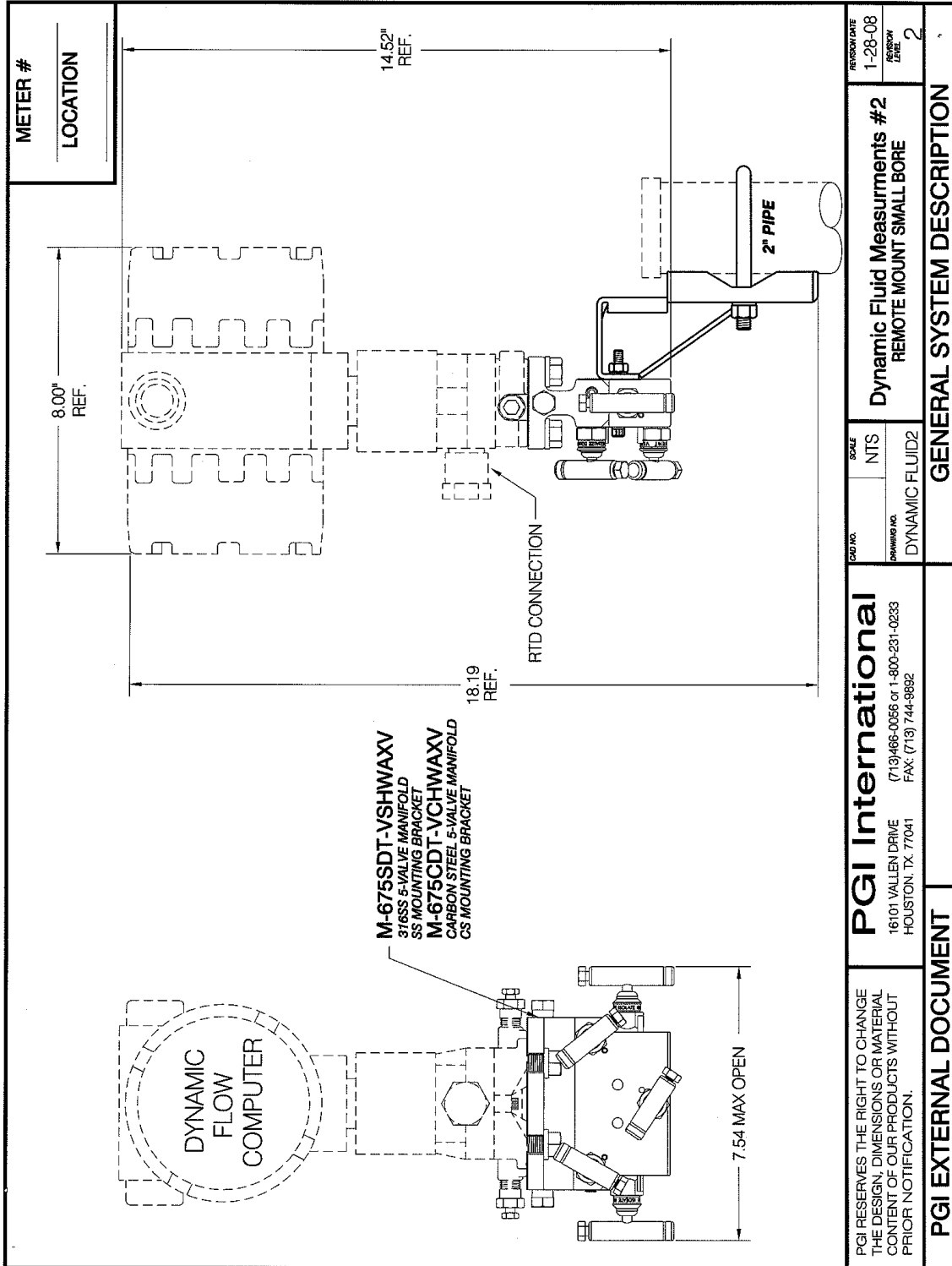


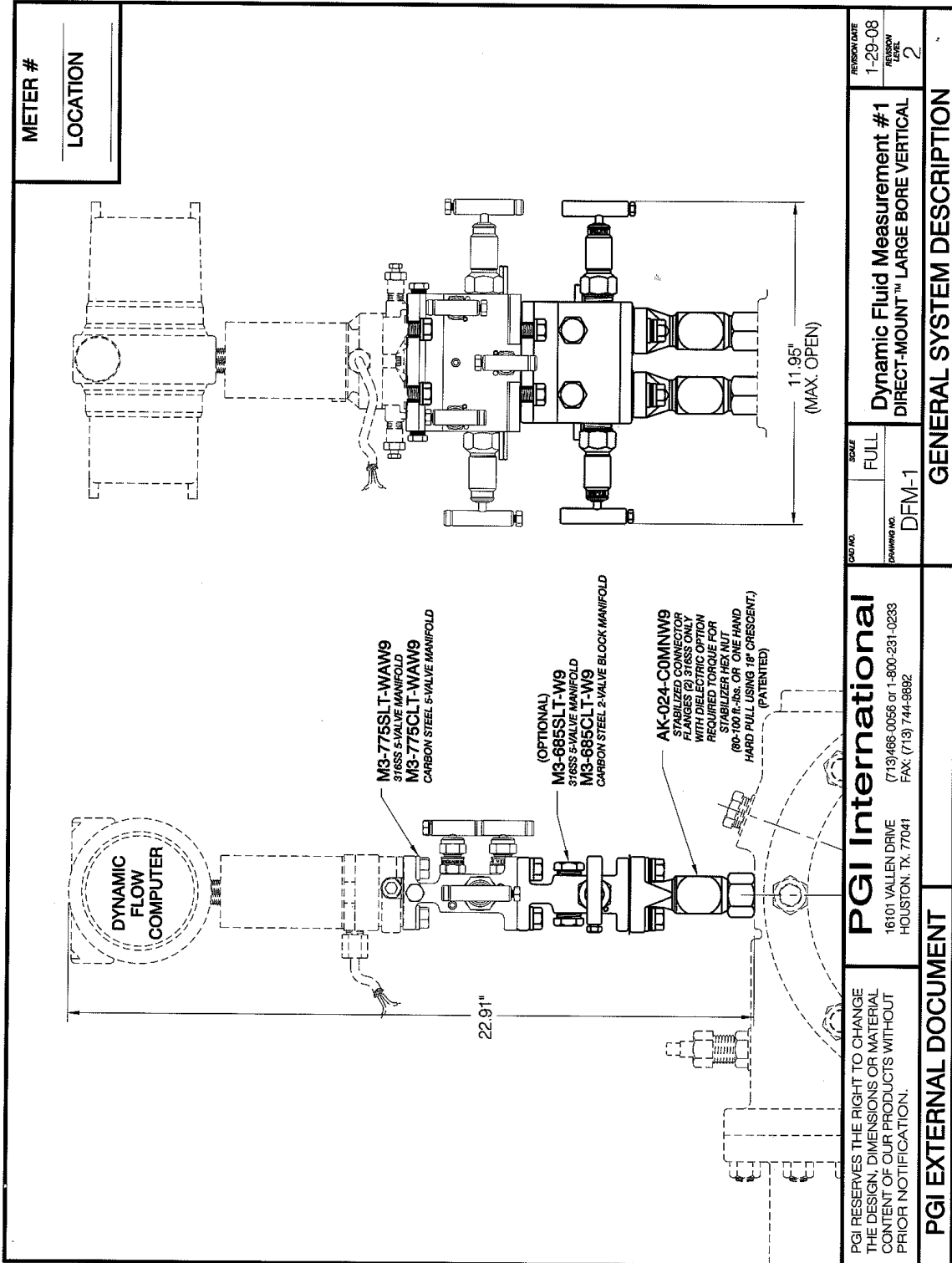
12603 SOUTHWEST FWY, SUITE 320 STAFFORD, TX 77477		<b>DYNAMIC FLUID MEASUREMENT, INC.</b>		
DR. C. SIADO	SIZE A	F5CM NO	DWG. NO.	CONN-DRW-12
ISSUED	SCALE N/A	WT. _____	SHEET 2 OF 3	



# Manifold Installation Drawings







METER #  
LOCATION

RESPONSE DATE  
1-29-08  
REVISION  
LEVEL  
2

Dynamic Fluid Measurement #1  
DIRECT-MOUNT™ LARGE BORE VERTICAL

SCALE  
FULL  
DRAWING NO.  
DFM-1

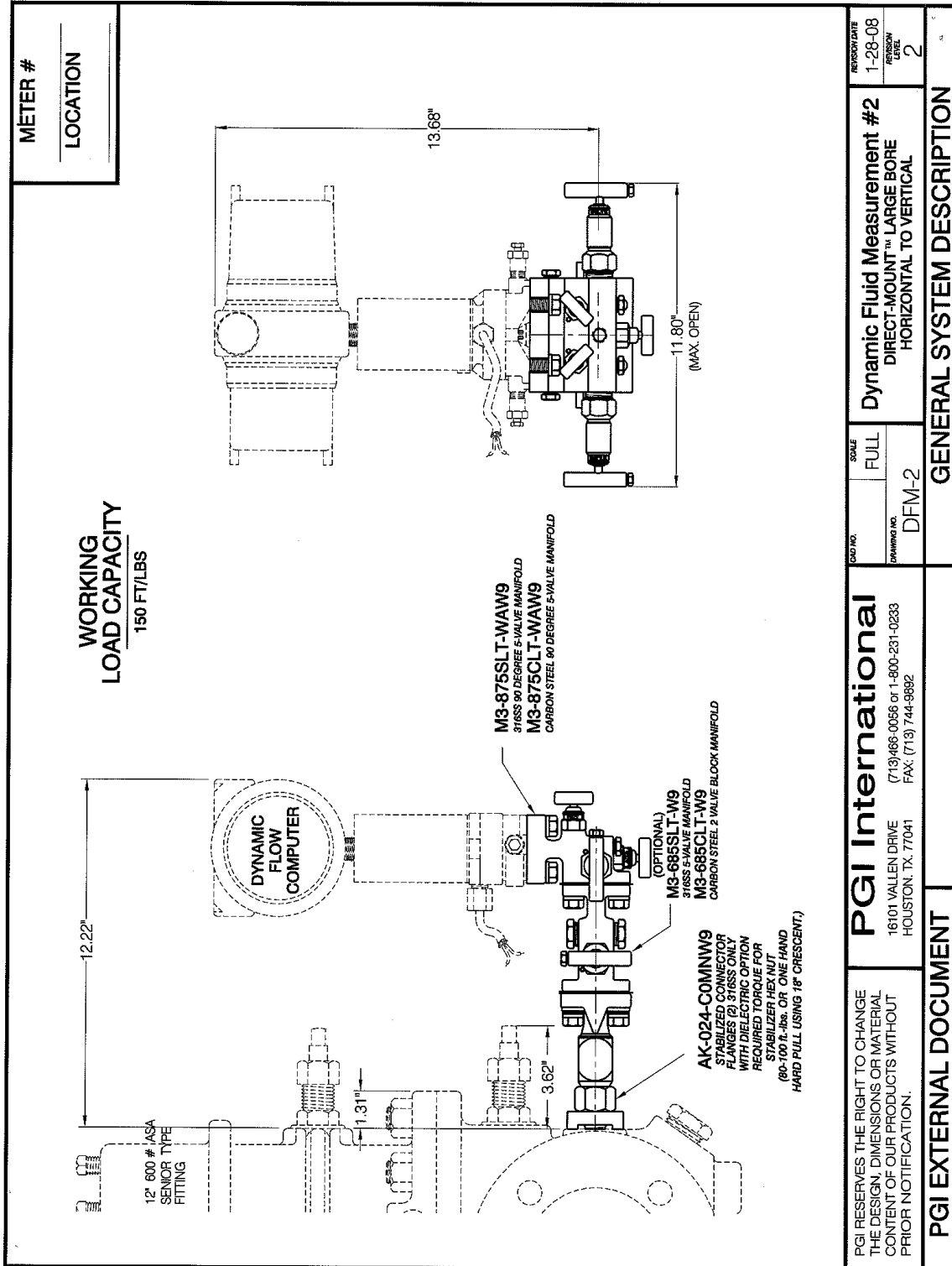
PGI International  
16101 VALLEN DRIVE  
HOUSTON, TX. 77041  
(713) 466-0056 or 1-800-231-0233  
FAX: (713) 744-9892

PGI RESERVES THE RIGHT TO CHANGE THE DESIGN, DIMENSIONS OR MATERIAL CONTENT OF OUR PRODUCTS WITHOUT PRIOR NOTIFICATION.

GENERAL SYSTEM DESCRIPTION

PGI EXTERNAL DOCUMENT





PGI RESERVES THE RIGHT TO CHANGE THE DESIGN, DIMENSIONS OR MATERIAL CONTENT OF OUR PRODUCTS WITHOUT PRIOR NOTIFICATION.		<b>PGI International</b> 16101 VALLEN DRIVE HOUSTON, TX. 77041 (713) 466-0056 or 1-800-231-0233 FAX: (713) 744-9892		CO. NO. _____ DRAWING NO. <b>DFM-2</b>	SCALE <b>FULL</b>	REVISION DATE 1-28-08 REVISION LEVEL <b>2</b>
<b>Dynamic Fluid Measurement #2</b> DIRECT-MOUNT™ LARGE BORE HORIZONTAL TO VERTICAL			<b>GENERAL SYSTEM DESCRIPTION</b>			