

**EPLUS-GL**  
**OPERATORS MANUAL**  
*Flow Computer*  
*GAS/LIQUID Version*



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This warranty does not cover the product if it is damaged in the process of being installed or damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, or improper testing.

If the product is found otherwise defective, Dynamic Flow Computers will replace or repair the product at no charge, provided that you deliver the product along with a return material authorization (RMA) number from Dynamic Flow Computers.

Dynamic Flow Computers will not assume any shipping charge or be responsible for product damage due to improper shipping.

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# CHAPTER 1: QUICK START

## ***Introduction:***

The EPLUS-GL 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 EPLUS-GL Flow Computer has delivered and met the design intentions.

The EPLUS-GL 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 EPLUS-GL Flow Computer will be a simple pleasant experience, not intimidating in any way.

The EPLUS-GL Flow computer handles one meter run and optional two additional auxiliary meters. It includes the following flow equations: New API14.3, ISO 5167, turbine (AGA7), V-Cone, and Slotted DP Meter. Additionally, it can perform density calculations per these standard procedures: AGA8, other tables are added constantly, call our main office for current software

One multi-variable digital transducers is connected to each EPLUS-GL flow computer for temperature, pressure and DP

The EPLUS-GL flow Computer has a host of inputs and outputs beyond the built in Multi Variable transmitter.

Two turbine inputs. (Greater than 3 volts).

One analog output 16 bits.

One RS232/RS485

Optional additional RS232

Four status inputs and two digital outputs can be configured.

Three analog inputs or One analog input and one RTD input.

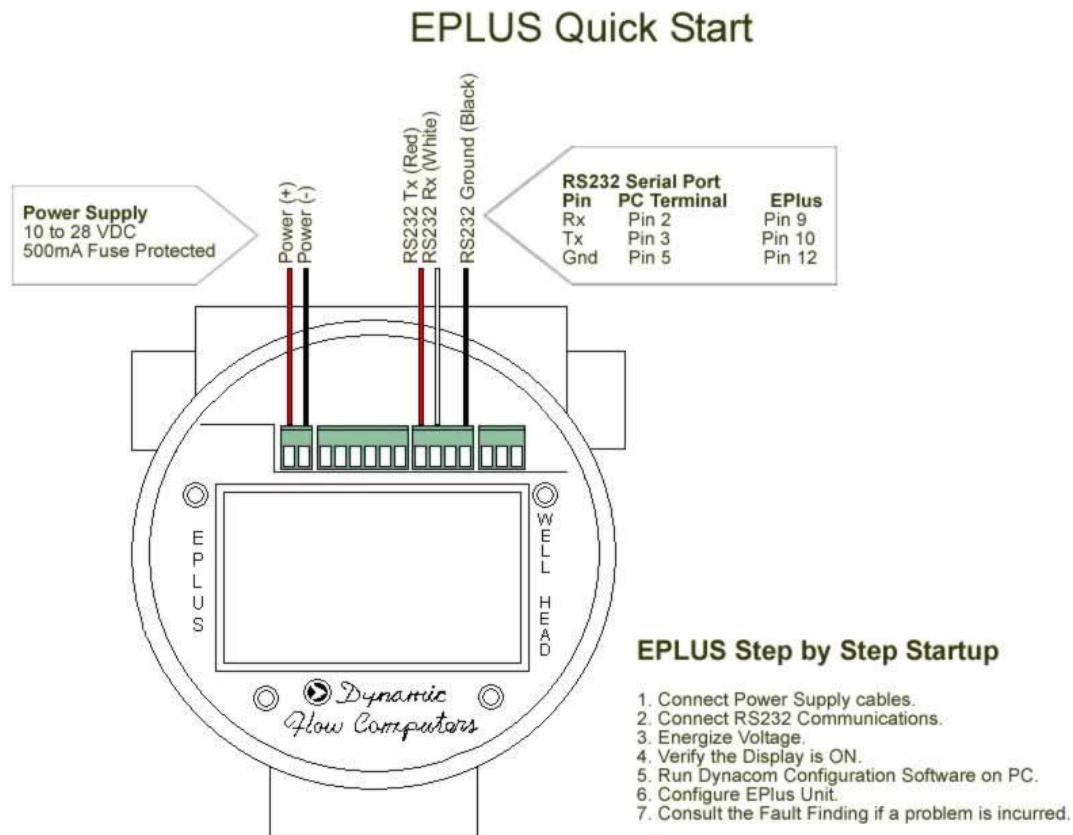
Graphic screen: 128 x 64.

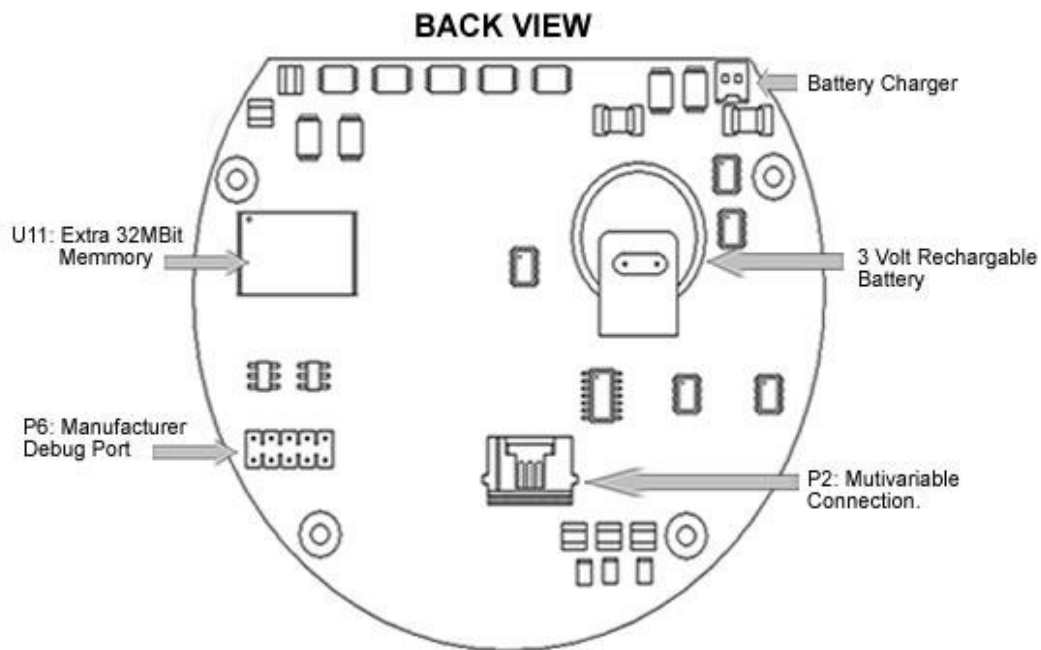
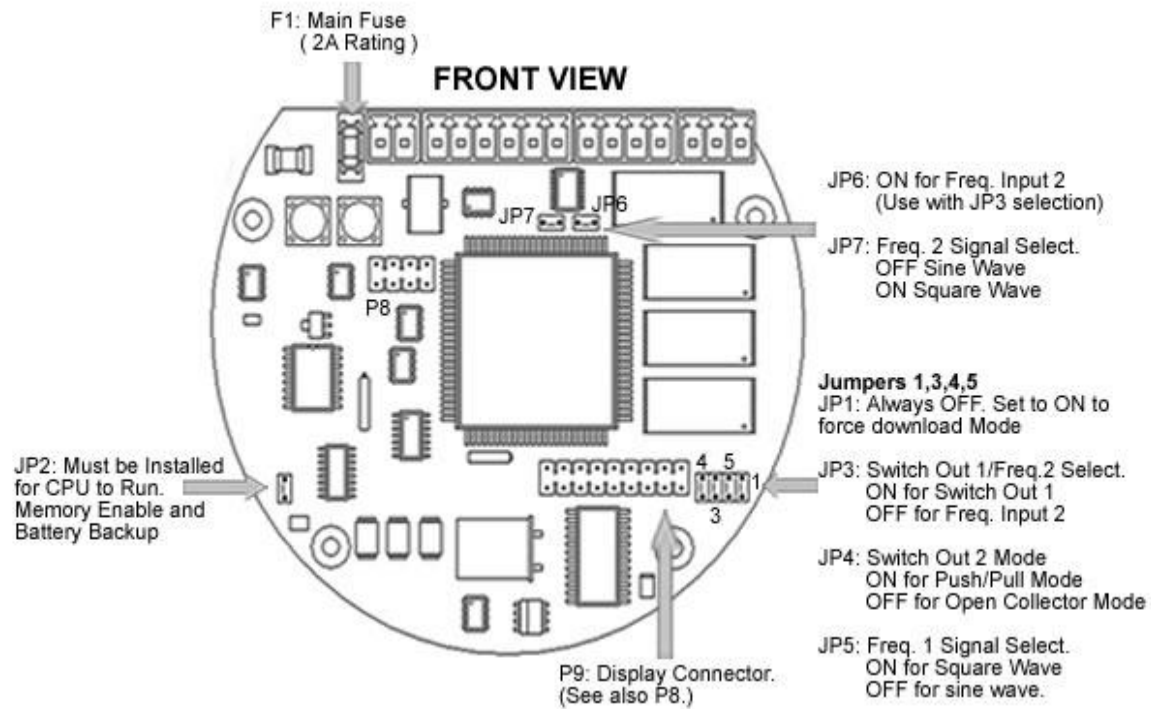
Additionally, each EPLUS Flow Computer can store up to 64 days of hourly and daily data. Optional expandable memory (Virtual Hard Drive) up to 132 Megs, combined with our customized data storage allows almost any type data logging task to become possible.

**Note: Flow equations used are continuously upgraded and new equations are added.**

**Call factory for current software library.**

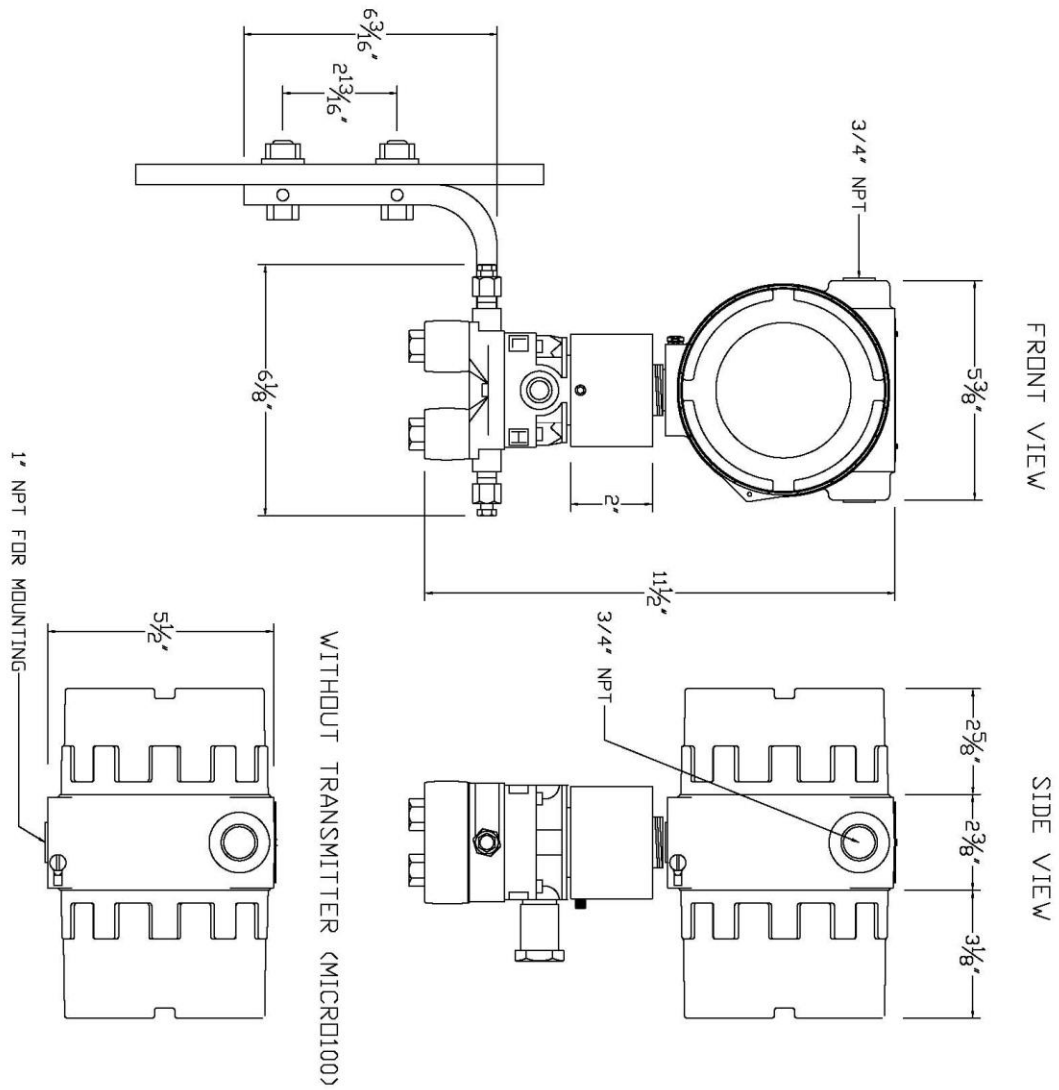
## Quick Start







## EPLUS-GL Flow Computer: Dimensions



## Technical Data

POWER	
VOLTAGE RANGE	10-28 VDC
POWER CONSUMPTION	0.3 WATT
OPERATING CONDITIONS	
TEMPERATURE	- 40 TO 185 °F
HUMIDITY	100%
HOUSING	NEMA 4X CLASS 1 DIV. 1
DISPLAY	-20 TO 70 °C WIDE ANGLE
FEATURES	
DISPLAY	Plasma 8 Lines x 16 Characters and Graphics 64x128 Pixels
PROCESSOR	32-BIT Motorola® 68332 @ 16.7 MHz
FLASH ROM	4 MB @ 70 NANO SECONDS
RAM	2 MB @ 70 NANO SECONDS
FREQUENCY INPUT	2 CHANNELS Square Wave 0 - 6kHz, Signal > 3 V Sine Wave 0 - 1200Hz, Signal > 70mVp-p Minimum 10uA @ 1KOhm resistance.
MULTIVARIABLE	Built-In Multivariable Transmitter with Direct SPI Digital Connection. Maximum Update Speed Once Every 109 Milliseconds.
ANALOG I/O	<ul style="list-style-type: none"> <li>• One 16-BITS Optically Isolated Analog Output</li> <li>• Three 24-Bit Analog Inputs or 1 Analog Input and 1 RTD Input (Max. 24mA with 50mA fuse protection).</li> <li>• Built-In Enclosure Temperature and Battery Voltage readings.</li> </ul>
DIGITAL I/O	<ul style="list-style-type: none"> <li>• 3 Digital Inputs. ( 0-24 VDC for Main Input and 0-5VDC for additional 2 inputs)</li> <li>• 2 Digital Outputs. (Max 200mA Sourcing, 300mA Sinking with 8.2 Ohm low load protection, 8-28 VDC )</li> </ul>
SERIAL COMMUNICATION	<ul style="list-style-type: none"> <li>• 1 Serial Port RS485/RS232 Selectable</li> <li>• 1 Optional RS232 Serial Port</li> </ul>
COMMUNICATION PROTOCOL	Modbus™
PID CONTROL	Flow Loop and Pressure Loop

## Parts List

Spare Parts - E-Chart / E-Plus / E-Lite	
Part #	Description
ECC	E-Chart CPU Board
EPC	E-Plus CPU Board
ELC	E-Lite CPU Board - No Expansion or RS485 capability
ELX	E-Lite EXP CPU Board
EXP	Expansion Board (For use with ELX)
WDP	Wellhead Display Board Plain (No Communication Option)
WDS	Wellhead Display Board with RS-232 Communication Option
WDW	Wellhead Display Board with Wireless Radio Communication Option
WDB	Wellhead Display Board with Bluetooth Communication Option
S6920	Explosion Proof Housing Unit for E-Chart Flow Computer
Adapter A	Adapter for 0205 Rosemount Transmitter (Accommodates E-Chart, E-Plus, E-Lite Flow Computer)
Bracket-WD	Bracket for Wellhead Display Board
O-Ring A	O-Ring Gasket for E-Chart Housing
Fuse A	250 mA Fuse
Fuse B	500 mA Fuse
Fuse C	2 Amp Fuse
Battery A	Replacement Battery for E-Chart Flow Computer (Board Mounted)
WD-LCD	LCD Screen for Wellhead Display Board

## Starting and Installing Dynacom Software

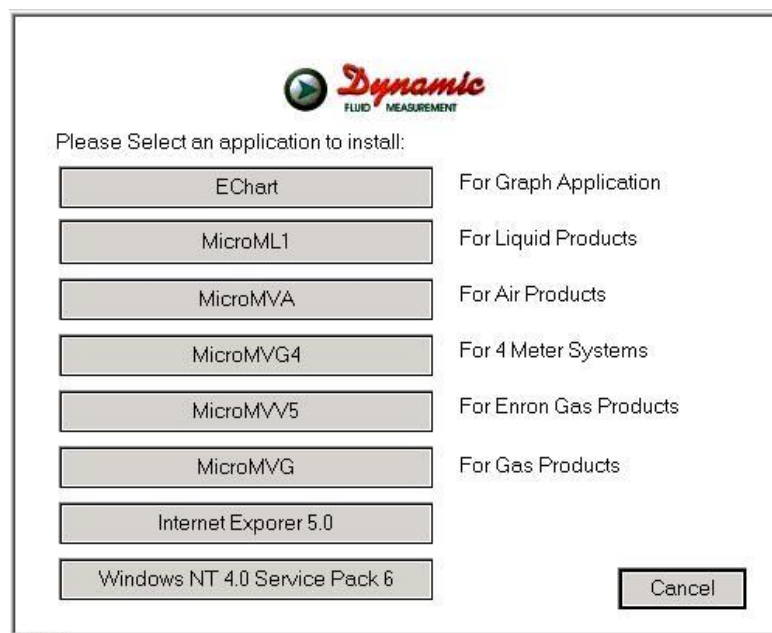
First make sure your computer has the minimum requirements to install Dynamic's Dynacom software.

### 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, Windows 7, Windows 8, Windows 10)
- For a Windows NT machine: Service Pack 3 or later.
- For an NT or Win2000 Machine: 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, just insert the installation CD in the CD unit and the following menu will pop up automatically






Click on the button for the application you are trying to install and the setup process will start and guide you through the different steps needed to install the application. If your computer doesn't pop up the installation menu automatically you can go the windows' **Start** button, select **Run...**, and type "**D:\start.exe**", where D is the letter for your CD unit.

## ***What is a configuration file?***

The configuration file is an archive that contains the information 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 lower right corner of the main window.
- 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 EPROM codes 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 **Main RS-232 port** only (Terminal 5,6 and 8).
- 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**.

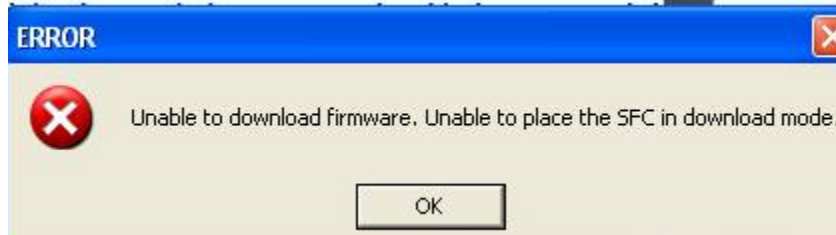
Warning messages will remind you that this action will erase **ALL** the information in the flow computer.

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

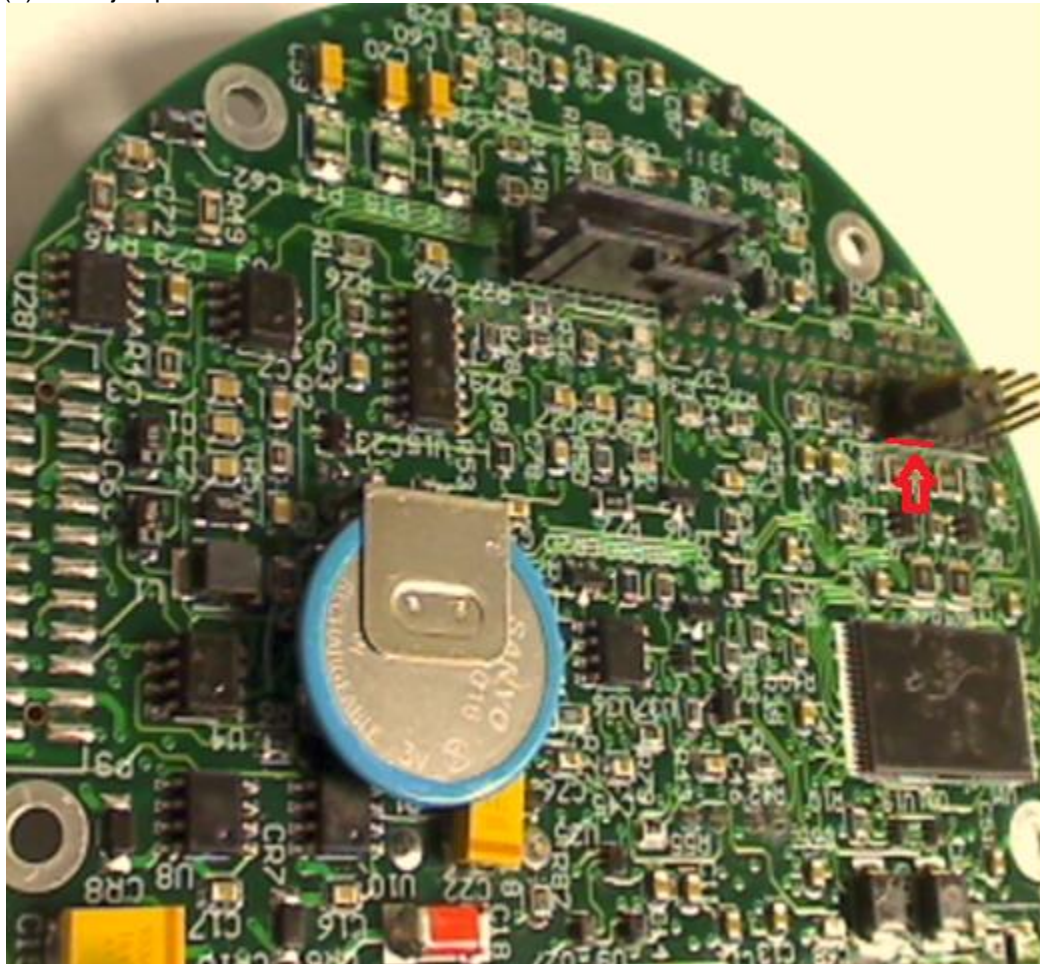
First, try to recycle the power and reload the image if the error message is displayed while downloading a new image file. Download an image file only through **Main RS-232 port** on CPU board.

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 - DFC Configuration Software

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

**Step 2.** Click on the "Downloads"



You will be presented with different product options. Click on the product that you are trying to download Dynacom or Firmware.



### Downloads

[E-Chart Software](#)

[E-Plus Software](#)

[E-Lite Software](#)

[FloPro Software](#)

[SFC 332 Software](#)

[SFC 500 Software](#)

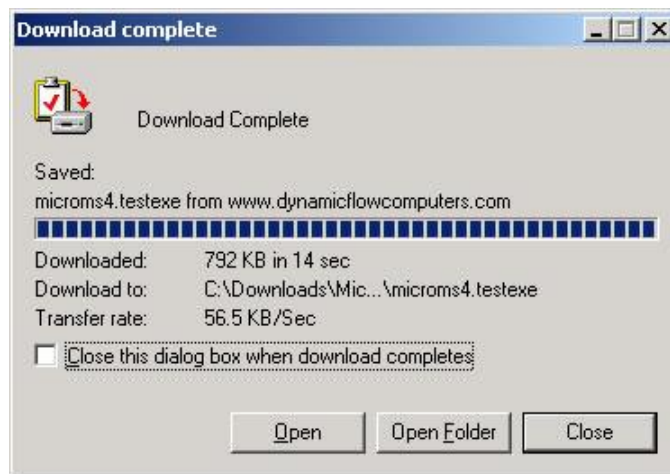
[Micro MV Software](#)

[SmartCone™ Software](#)



**Step 3.** Select application 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 your 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 “Downloads”



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

**Downloads**

- [E-Chart Software](#)
- [E-Plus Software](#)
- [E-Lite Software](#)
- [FloPro Software](#)
- [SFC 332 Software](#)
- [SFC 500 Software](#)
- [Micro MV Software](#)
- [SmartCone™ Software](#)

**Contact Us**

- [Find a local sales office](#)
- [Technical Support](#)

## E-Plus Software

### PC Configuration Software

**Gas**

- [E-Chart Suite Version 2.21](#)
- [Dynacom Software Version 1.01.78\\*](#)

**\*Notes:**

- [NET Framework 4.0 is required for the initialization](#)
- Dynacom Software does not support E-Lite

**Liquid**

- [E-Plus GL Version 2.3](#)

## Firmware

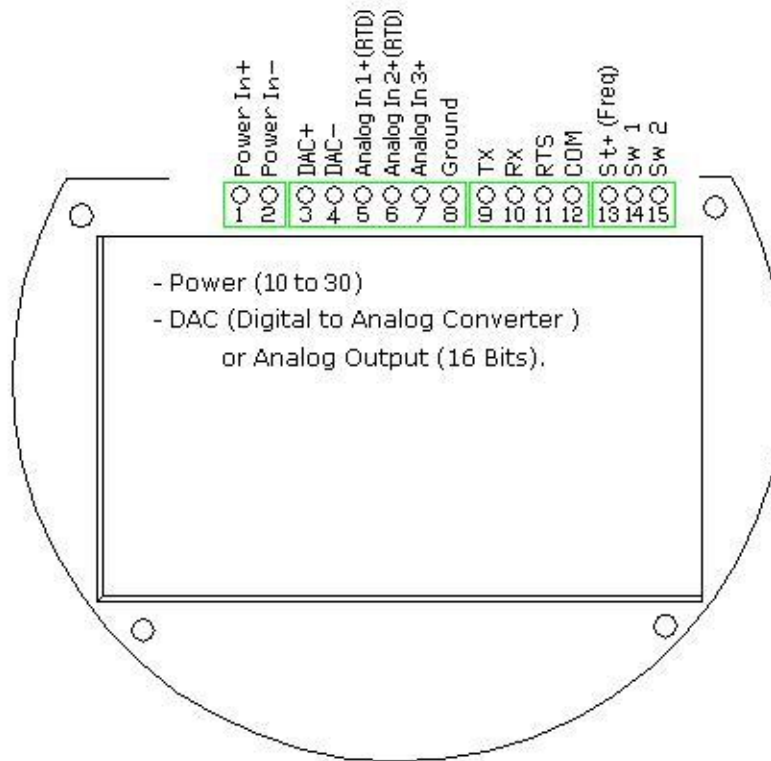
- [E-Plus Image File Version 8.00.41 \(E-Chart\)](#)
- [E-Plus GL Image File Version 9.00.25 \(E-Plus\)](#)
- [E-Plus-TS Image File Version 6.00.17](#)

**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, then follow the steps in the image downloading setup.

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

### **Terminal wiring:**



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

We will now configure your EPLUS-GL Flow Computer's inputs and outputs. The flow computer allows the user to configure the inputs and outputs.

The Multi Variable pressure and temperature can be used and the DP becomes a spare input that could be assigned for strainer differential.

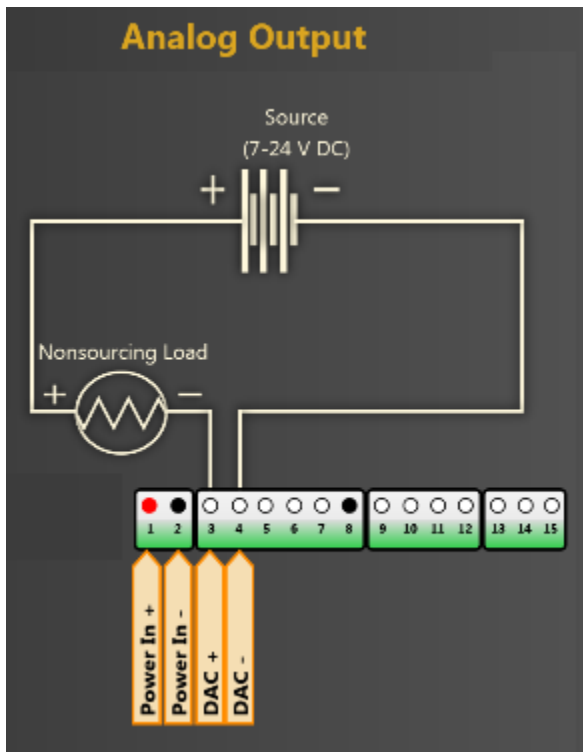
1. **Enter the high and low limits:** high limits and low limits are simply the alarm points in which you would like the flow computer to flag as an alarm condition. Enter these values with respect to the upper and lower range conditions. Try to avoid creating alarm log when conditions are normal. For 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.
2. **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).

## 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 of Analog Output:

Wiring diagram shows typical Analog output wiring. The analog output will regulate 4-20 mA current loop but DOES NOT source the power for it. **External power is required.**



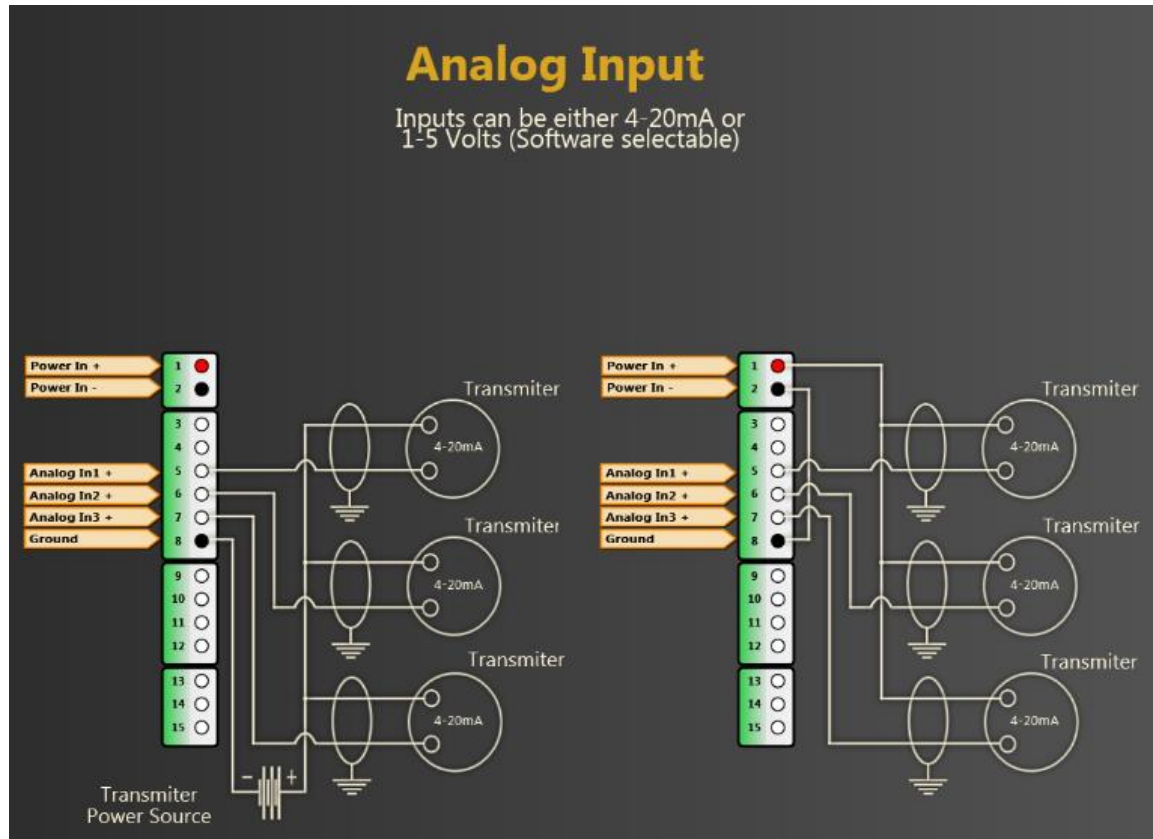
### Assigning/Ranging the 4-20mA Analog Outputs:

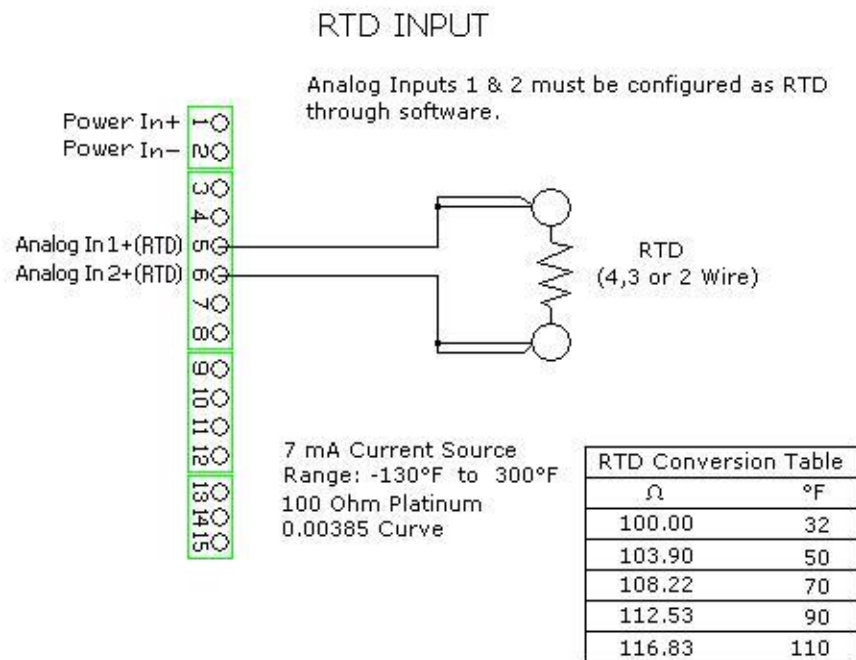
Go to the **I/O | Analog Output Assignment**. A selection menu is prompted. Enter what the 4mA output will indicate and the 20mA. Make sure that the 20mA value exceeds the upper range limit of what you assigned the Analog output for, otherwise the analog output will not update beyond 20 mA.

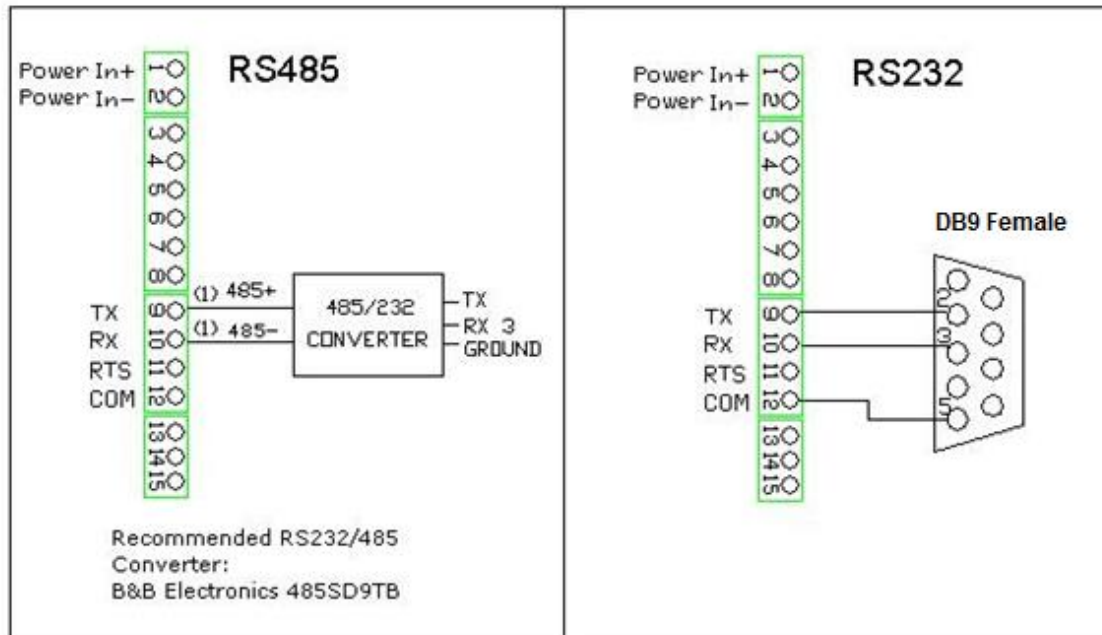
### **Wiring of Analog Inputs:**

Inputs can be configured via software to have three Analog Inputs 4-20 mA or 1-5 Volts.

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.



**Wiring of RTD Input:**

**RS-485/RS-232 connection:**

**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

**Note:** RS-485 twisted shielded cable is required. The maximum distance when 18-gauge wire is used is 4000 feet.

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

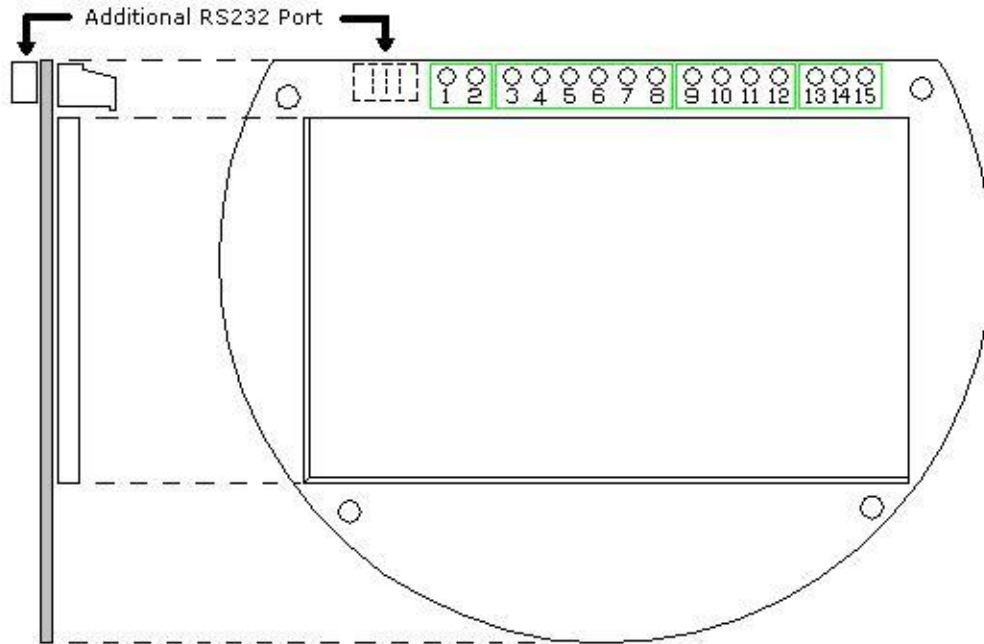
**RS485/232 Adapter**

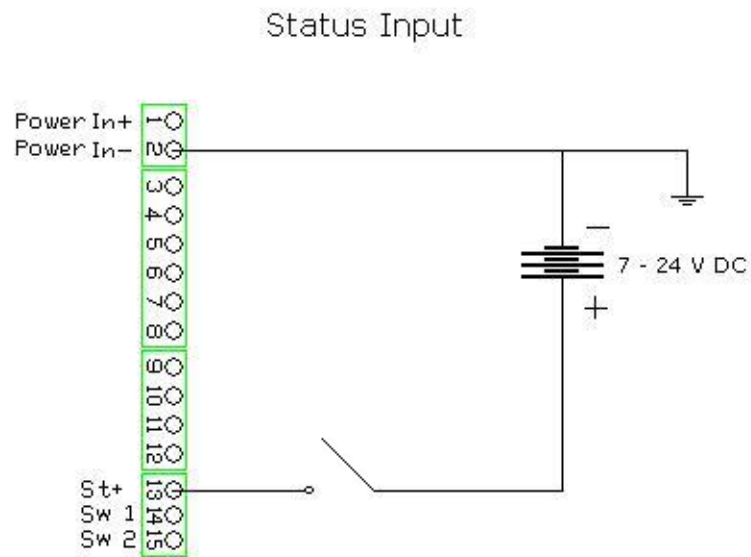
Dynamic recommends B&B Electronics. We generally use Model 485D9TB, which is a port power converter requiring only a 2-Wire connection. The 485D9TB has a terminal block which makes the wiring more convenient and provides the option of external 12V power for low power serial ports. Model 485SD9R can also be used, but it has a DB9 terminal which requires additional cables. With Model 485SD9R the pins that connect to the flow computer are pin 3 on the DB9 to TX on the flow computer and pin 8 on the DB9 goes to RX on the flow computer. For a USB to RS485 converter, we recommend Model USTL4 which is also port powered and supports half and full duplex networks.



**Additional RS-232 connection:**

Additional RS232 Port is located behind the display board and is prewired with a special connector. It has a DB9 connector provided upon request.



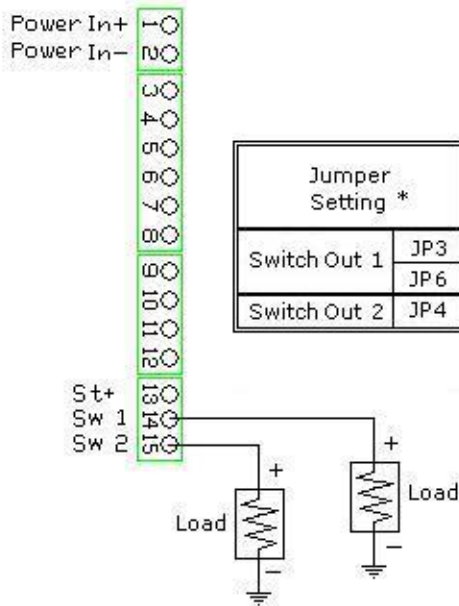
**Wiring of Status Input:**

### **Wiring of Switch Outputs:**

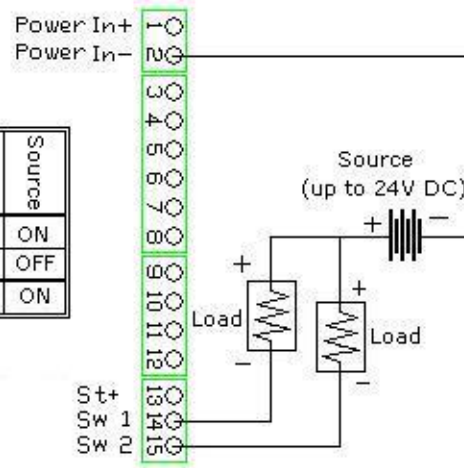
Switch Output sinking/sourcing configuration is selectable through software. Check diagram for jumper settings.

#### SWITCH OUTPUT

Sourcing Configuration  
(Sources up to 200mA)



Sinking Configuration  
(Sinks up to 300mA)



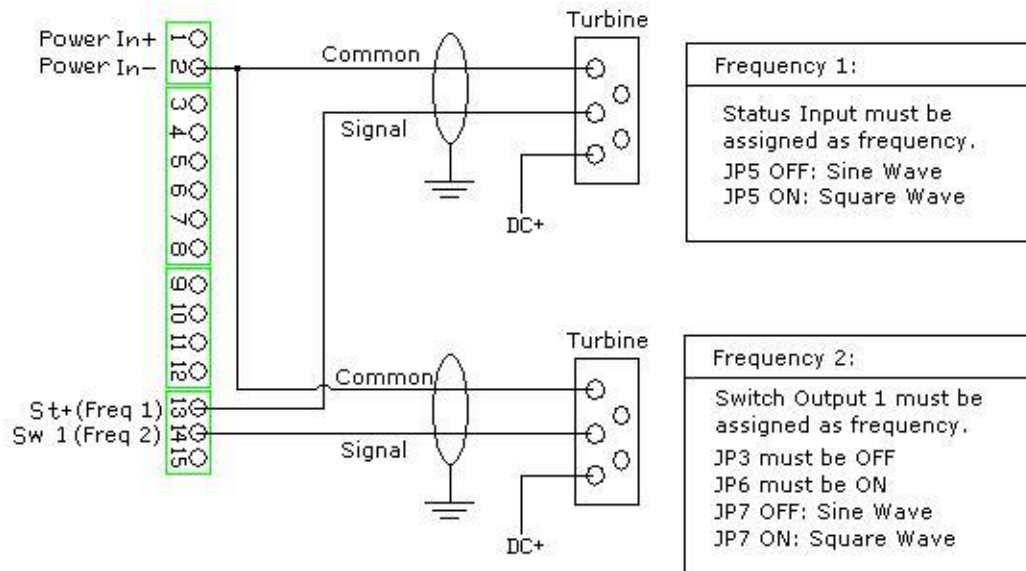
\*JP3 & JP4 are located on the CPU Board's bottom right corner next to the big display connector.

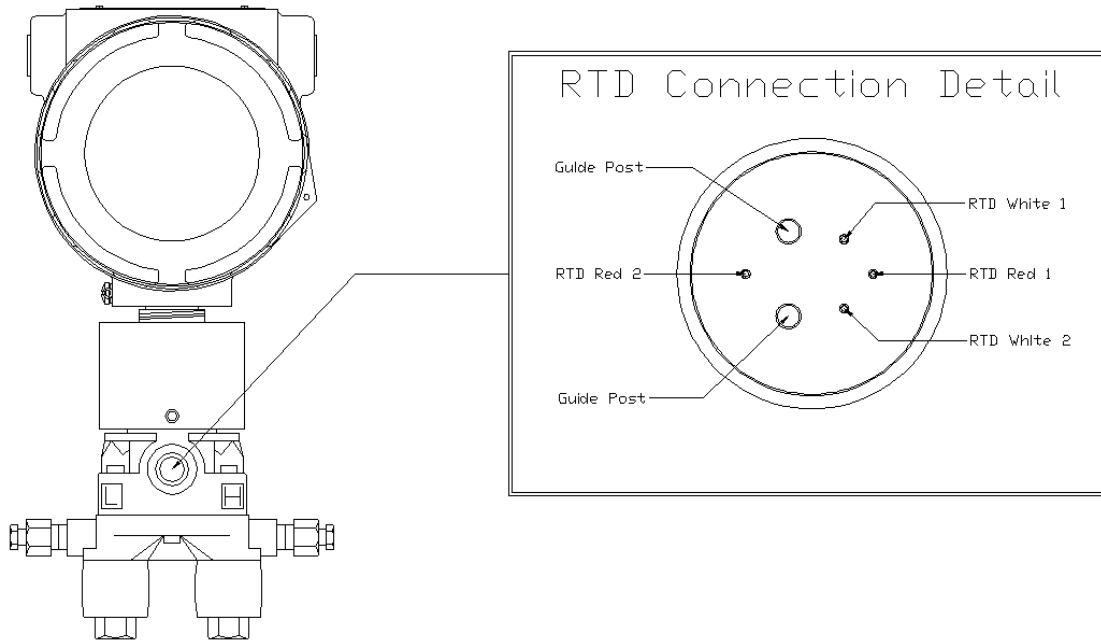
Switch one and two can be on /off or pulse type output up to 125 pulse per second. Notice that the switch outputs are transistor type outputs (open collector type with maximum DC rating of 300mA continuous at 24 VDC) connections

1	Switch output 1	Switch – Maximum rating: Max 200mA Sourcing, 300mA Sinking Switch Output Range: 8 -28 VDC
2	Switch output 2	

**Wiring of Turbine Input :**

## FREQUENCY INPUTS



**Rosemount RTD Connection:**

# **CALIBRATION**

## **Calibration of Analog Output**

Follow the following steps to calibrate the analog output against the end device:

1. Go to the calibration menu, select analog output, and then select method. Full calibration will cause the flow computer to output the minimum possible signal 4mA. Enter the live output value reading in the end device i.e. 4 mA and click OK button. Now the flow computer will output full-scale 20 mA. Enter the live output i.e. 20 then click OK button.
2. *Now verify the output against the calibration device.*

### **To use default calibration**

1. Select analog output
2. Select Reset method
3. *Now verify the live reading against the flow computer reading*

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

Calibrations are performed under **Calibration**. Select inputs to be calibrated, and then select full, single, offset calibration method.

### **OFFSET CALIBRATION**

1. Induce live value for pressure or DP.
2. Select Multivariable DP or pressure.
3. Select offset calibration method, enter offset, and click OK button.
4. *Now read induce live values to verify the calibration.*

### **FULL SCALE CALIBRATION**

1. Induce live value for pressure or DP.
2. Select Multivariable DP or pressure
3. Select full calibration method
4. Induce the low range signal, enter the first point, and then click OK button.
5. Induce the high range signal, enter the second point, and then click OK button.
6. *Now verify the live reading against the flow computer reading.*

### **TO USE DEFAULT CALIBRATION**

1. Select Multivariable DP, temperature, or pressure
2. Select Reset calibration method
3. *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 EPLUS close reading to the induced value.

The DP reading must be re-calibrated for the zero offset after applying line pressure.

## **Calibration of Multi-Variable Transmitters (Model 205) – Temperature**

RTD Calibration is a 2-step process. The first step is a onetime 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.

### **Calibration Procedures through Windows™ Software**

At the top menu, go to Calibration and Select RTD Input.

#### **RESET TO DEFAULT CALIBRATION**

1. Select Reset calibration method
2. **Now verify the live reading against the flow computer reading**

#### **OFFSET CALIBRATION:**

1. Select offset calibration method.
2. Induce a live value and wait for 10 seconds for the reading to stabilize. Then enter the live value. The value entered must be in Degrees only.
3. **Now verify the live reading against the flow computer reading**

#### **FULL SCALE CALIBRATION:**

1. Prepare low range resistive input (i.e., 80 Ohm.) and High range resistive input (i.e., 120 Ohm).
2. Go to the calibration menu and select RTD full calibration method. Induce the low end (80 Ohm.) resistive signal and then wait 10 seconds, enter the equivalent temperature in degrees, and click OK button.
3. Induce the High range signal (120 Ohm.) and wait 10 seconds, then enter the temperature degrees equivalent to 120 Ohm and click OK button.
4. **Now verify the live reading against the flow computer reading.**



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

Calibrations are performed under **Calibration**. Select inputs to be calibrated, and then select full, single, offset calibration method.

#### **OFFSET CALIBRATION:**

For simple offset type calibration simply induce the signal into the analog input and make sure the EPLUS is reading it. After you verify that the EPLUS recognized the analog input, enter the correct mA reading, and then click OK. 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. Click inputs to be calibrated under calibration menu, click full calibration, enter the first point - the analog input value i.e. 4mA, and then click OK button.
3. Now be ready to enter the full-scale value. Simply induce the analog signal and then enter the second value i.e. 20mA, and then click OK button
4. *Induce live values to verify the calibration.*

#### **DEFAULT CALIBRATION**

1. Select Analog Input
2. Select Reset calibration method
3. *Now verify the live reading against the flow computer reading*

**RTD Calibration:**

RTD Calibration is a 2-step process. The first step is a onetime 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.

**Calibration Procedures through Windows™ Software**

At the top menu, go to Calibration and Select RTD Input.

**RESET TO DEFAULT CALIBRATION**

1. Select Reset calibration method
2. **Now verify the live reading against the flow computer reading**

**OFFSET CALIBRATION:**

1. Select offset calibration method.
2. Induce a live value and wait for 10 seconds for the reading to stabilize. Then enter the live value. The value entered must be in Ohm only.
3. **Now verify the live reading against the flow computer reading**

**FULL SCALE CALIBRATION:**

1. Prepare low range resistive input (i.e., 80 Ohm.) and High range resistive input (i.e., 120. Ohm).
2. Go to the calibration menu and select RTD full calibration method. Induce the low end (80 Ohm.) resistive signal and then wait 10 seconds, enter live value in Ohm, and click OK button.
3. Induce the High range signal (120 Ohm.) and wait 10 seconds, then enter 120 Ohm and click OK button.
4. **Now verify the live reading against the flow computer reading.**

## ***Verifying Digital Input and Outputs***

Use the diagnostic menu. A live input and output is displayed. On the top of the screen pulse input is 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 **View | Wiring Drawing| Turbine** for proper turbine input wiring. 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. The switch outputs are open collector and require external voltage.

## CHAPTER 2: Data Entry and Configuration Menus

### *Introduction to the EPLUS-GL Computer Software*

The EPLUS-GL software is constructed around a menu-driven organization

### ***Configuration File***

We will begin with the DYNACOM PC software menu. Create a new configuration file, and save it.


1. The software opens ready for you with a default configuration file. To choose an existing file go to the **Configuration File | Open...** and provide the configuration file name. If you want to create a new file, select **Configuration File | New**.
2. Now go back to **Configuration File**. Use the down arrow key to move the cursor to **Save** and press ENTER. You have just saved the file you just created. Notice that now the file name will appear in the left top corner of the screen. This indicates the name of the currently active file; if you change parameters and **Save** again, the changes will be saved to your file.

## ***Configuration File Menu***


### **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 (files with extension .SFC).

Use the cursor arrow keys to move the cursor to your selection. This function also can be reached pressing  on the toolbar.


### **Open a New File**

Create a new file to store all the programmed information for one EPLUS-GL Flow Computer. You are prompted for the new file's name. If you enter the name of a pre-existing file, the software informs you of this and prompts you if you want to overwrite the old file. After a file is opened it becomes the currently active file; its contents can be viewed and its parameters can be edited. This option can be activated pressing  on the toolbar.

### **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. If you enter the name of a pre-existing file, the software asks you if you want to overwrite the old file. 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. The system will ask you for the name you want for this file. You can also save pressing  on the toolbar.

### **Exit**

Exit the application, if changes were made to the configuration and haven't been saved you will be asked if you want to save them.

Before the Exit option there is a list of the most recently used configuration files so you can select one of them without looking for it in the disk.

## **VIEW**


### **View Drawings**

To view the wiring drawings for the Flow Computer go to the **View** menu and then select **Wiring**. The drawings available for this device will be listed.

- Terminals
- Analog Output
- RS-232/RS-485
- Status Input
- Switch Output
- Turbine Input

# TOOLS

## **Communication Port Settings**

You can access this window either through the **Tools | Comm Settings** menu option or the Comm button  on the toolbar.

This window let you set the port settings in order to communicate with the Flow Computer. You have the following options available:

### **SERIAL PARAMETERS**

#### **Port Number**

Enter the PC port used to communicate with the EPLUS-GL Flow Computer.

#### **Baud Rate**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL Flow Computer for communication to occur.*

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, 9600, or 19200.

#### **Parity**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL Flow Computer for communication to occur.*

RTU - NONE  
ASCII - EVEN or ODD

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

#### **Data Bits**

Options available: 5, 6, 7, or 8. Generally used: 8 for RTU mod, 7 for ASCII mode.

#### **Stop Bits**

Options available: 1, 1.5, or 2. Generally used: 1.

#### **Modbus Type**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL Flow Computer for communication to occur.*

The Modbus Communication Specification is either Binary RTU or ASCII.

#### **Auto Detect Settings**

Click this button and the configuration program will attempt to communicate with a single EPLUS-GL Flow Computer at different baud rates and formats.

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

## Flow Control

### RTS Flow Control

Turns the RTS flow control on and off. The Enable option turns ON the RTS line during the connection. The Handshake option turns on RTS handshaking. Disable turns OFF the RTS line. Toggle specifies that the RTS line is high if bytes are available for transmission. After all buffered bytes have been sent the RTS line will be low.

### DTR Flow Control

Specifies the DTR flow control. Enable turns ON the DTR line during the connection. Handshake turns on DTR handshaking. Disable turns off the DTR line.

### CST Flow Control

Turns the CTS flow control on and off. To use RTS/CTS flow control, specify Enable for this option and Handshake control for the RTS option.

### USE INTERNET PROTOCOL

Check the box if you are planning to communicate using an Ethernet connection instead of a serial connection.

### **IP Address**

IP Address of the target Flow Computer. This address must follow the addressing standard xxx.xxx.xxx.xxx. You must provide both IP Address and Port in order to communicate with a flow computer.

### **Port**

In conjunction with the IP Address, a port number must be specified. The default port number for Modbus/Ethernet bridges is 502 but it can be any number.

### **Protocol**

Protocol to be used through the Ethernet connection. Modbus TCP, also known as Modbus Ethernet consists of a Modbus message without CRC wrapped by a TCP/IP message. This protocol is generally used by industrial Modbus to Ethernet converters. The TCP/IP encapsulation also known as TCP/IP Pass Through Mode consists of a regular Modbus message embedded in a TCP/IP message. This protocol is generally used by general purpose Ethernet to Serial converters.

### 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.

<i>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.</i>
---

### TIME OUT

The amount of time in seconds the program will wait for an answer from the flow computer.

### RETRY TIMES

Retry times for the program to communicate with the flow computer in case of timeout.



## **Meter Configuration (Configure Device)**

### **METER SETTINGS**

#### **Day Start Hour (0-23)**

Day start hour is used for daily operation. The day will end at day start hour; all daily totalizers and flow-weighted values are reset.

#### **Company Name**

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

#### **Meter Location**

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

#### **Number of Meters**

Enter '1', or '2' meters run configuration per individual flow computer.

#### **Show Flow Rate Selection**

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

#### **Flow Rate Average Second**

The flow rate is averaged for 1-5 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.

#### **Common Parameters**

This feature allows the EPLUS-GL Computer to use the transmitters on meter one to substitute and compensate for meter two.

## Units Set Up

### Select Unit

<u>Selection</u>	<u>Description</u>	<u>Temperature</u>	<u>Pressure</u>	<u>DP</u>
0	US Unit	DEG.F	PSIG	Inches of Water
1	Metric Unit	DEG.C	BAR, KG/CM2, KPA	m.BAR, KPA

### Metric Pressure Unit

<u>Selection</u>	<u>Description</u>	<u>Pressure</u>
0	Metric Unit	BAR
1	Metric Unit	KG/CM2
2	Metric Unit	KPA

### Metric DP Unit

<u>Selection</u>	<u>Description</u>
0	m.BAR
1	KPA

### Atmospheric Pressure

This pressure is the local pressure or contracted atmospheric pressure to be used. Typical value is 14.696 PSIA for US units. *Enter zero if absolute pressure transmitter is used.*

### Base Pressure

Enter 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.

### Base Temperature

Enter the basis reference temperature for all corrections. Used when seller contracts to sell to buyer at an agreed base temperature. Typically value is 60 Deg.F in US units, 15 Deg.C in Metric Units.

### Auxiliary Meter

A spare frequency input can be used as an auxiliary meter.

### Frequency Input

To use frequency #1, status input must be assigned as frequency.

To use frequency #2, switch output#1 must be assigned as frequency.

### K Factor

K Factor is the number of pulses per flow unit volume, i.e. 1000 pulses/Barrels (us unit), M3 (metric unit).

**Daylight Saving Time (DST)**

Enabling Daylight Saving Time (also called “Summer Time”) sets the Flow Computer to automatically forward its time by one hour at 2:00 AM on a preset day (“Spring Forward”) of the year and roll back on a second date (“Fall Back”).

If left in auto mode, the computer calculates the DST dates based on USA standards, which are, Spring Forward the first Sunday of April and Fall Back the last Sunday of October.

For countries with other DST dates, the user can enter dates manually. For example, European Summer Time starts the last Sunday in March and ends the last Sunday in October.

**Effects of DST on Historical Data**

Given the sudden time change that DST creates, the historical reports will show an hour with zero flow at 2:00 AM of Spring Forward Day and an hour with double flow at 1:00 AM of Fall Back Day, to achieve consistent 24-Hour a day flow records

**METER DATA****Meter ID**

Up to 8 characters. This function will serve as meter tag.

**Meter Application Type**

0 =	Gas Application
1 =	Liquid Application

**Liquid Gravity Unit (Liquid Application: US Units)**


0 =	SG
1 =	API

Product Gravity Data Entry: Enter SG@60 if SG is selected or enter API@60 if API is selected

**Flow Equation Type (0-4)**

- 0 = API 14.3 (NEW AGA3)
- 1 = ISO5167
- 2 = AGA7 (TURBINE or Frequency Type Input)
- 3 = Cone/Smart Cone Meter
- 4 = Slotted DP Meter (US Unit Only)


All new installations are recommended to use API 14.3 for orifice calculations.

On the right hand side of the selection box is a property button  that when pressed pops up a window with the flow equation settings.

**Product Selection: Specifies the equation used to calculate density.****Gas Application**

Select	Calculation Type	Comments and Limitations
1	AGA8 Gross Method 1	Relative Density: 0.554–0.87 US Unit- Heating Value: 477–1150 BTU/SCF Metric Unit- Heating Value: 18.7 – 45.1 MJ/M3
2	AGA8 Gross Method 2	Relative Density: 0.554–0.87 US Unit – Heating Value: 477–1150 BTU/SCF Metric Unit - Heating Value: 18.7 – 45.1 MJ/M3
3	AGA8 Detail Method	Relative Density: 0.07–1.52 Heating Value 0–1800 BTU/SCF (US Unit)
4	STEAM Equation	260 <= T <= 2500 DEG.K 0 <= P <= 3000 MPA

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

On the right hand side of the selection box is a property button  that when pressed pops up a window with the density equation settings.

**Liquid Application – US UNIT**

Sel.	Table	Description	Conditions
0=	6A/24A	Crude oil, natural gasoline, drip gasoline	Density is known, Parameter - Specific Gravity at 60 Deg.F is required
1=	6B/24B	Gasoline, naphthalene, jet fuel, aviation fuel, kerosene, diesel, heating oil, furnace oil	Density is known, Parameter - Specific Gravity at 60 Deg.F is required
2=	New 24	LPG	Density is known, Parameter - Specific Gravity at 60 Deg.F is required
3=	6C/24C	Benzene, toluene, styrene, <i>ortho</i> -xylene, <i>meta</i> -xylene, acetone	Density is known, Parameter - Specific Gravity at 60 Deg.F is required, Alpha T, the number entered will be divided by 10 <sup>-6</sup> .

**Liquid Application – METRIC UNIT**

4=	54A	Crude oil, natural gasoline, drip gasoline	Density is known, Parameter - Density at 15 Deg.C is required
5=	54B	Gasoline, naphthalene, jet fuel, aviation fuel, kerosene, diesel, heating oil, furnace oil	Density is known, Parameter - Density at 15 Deg.C is required
6=	OLD 54	LPG	Density is known, Parameter - Density at 15 Deg.C is required
7=	54C	Benzene, toluene, styrene, <i>ortho</i> -xylene, <i>meta</i> -xylene, acetone	All conditions
8=	60A	Crude oil, natural gasoline, drip gasoline	Density is known, Parameter - Density at 20 Deg.C is required
9=	60B	Gasoline, naphthalene, jet fuel, aviation fuel, kerosene, diesel, heating oil, furnace oil	Density is known, Parameter - Density at 20 Deg.C is required
10=	60D		Density is known,

**Temperature, Pressure and Density Limits for Crude Oil, Refined Products, Lubricating Oils**

	Crude Oil	Refined Products	Lubricating Oils
<b>Density, kg/m<sup>3</sup>@ 60°F</b>	<b>610.6 to 1163.5</b>		<b>800.9 to 1163.5</b>
Relative Density @ 60°F	0.61120 to 1.16464		0.80168 to 1.1646
API Gravity @ 60°F	100.0 to -10.0		45.0 to -10.0
Kg/m <sup>3</sup> @ 15°C	611.16 to 1163.79	611.16 to 1163.86	801.25 to 1163.85
Kg/m <sup>3</sup> @ 20°C	606.12 to 1161.15	606.12 to 1160.62	798.11 to 1160.71
<b>Temperature, °C</b>	<b>-50.00 to 150.00</b>		
°F	-58.0 to 302.0		
<b>Pressure, psig</b>	<b>0 to 1,500</b>		
kPa (gauge)	0 to 1.034x10 <sup>4</sup>		
Bar (gauge)	0 to 103.4		
<b><i>a</i><sub>60,per</sub> °F</b>	<b>230.0x10<sup>-6</sup> to 930.0x10<sup>-6</sup></b>		
per °C	414.0x10 <sup>-6</sup> to 1674.0x10 <sup>-6</sup>		

**SG and Temperature limits for New Table 23/24**

SG	.21 to .74
Temperature	-50 Deg.F to 100 Deg.F

**SG@60 and Temperature Limits for New Table 24**

SG@60	.35 to .688
Temperature	-50 Deg.F to 100 Deg.F

**GAS Relative Density**

The real gas relative density is used in the calculations of the compressibility factor, flowing and reference densities (required only when AGA8 Gross Method 2 is used).

**GAS Heating Value**

The energy totalizer requires the heating value entry. (US Unit - BTU/SCF, Metric Unit- MJ/M3)

If AGA8 detailed method is configured and Gas Heating data entry is set to zero, EPLUS-GL will use ISO6976:2016 to calculate Heating value (Gross)

**Flow Rate Alarm High/Low Limit**

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

**Flow Unit**

<u>Selection</u>	<u>Description</u>
0	MCF
1	KM3
2	CF
3	M3
4	GALLON
5	LITER
6	BARREL

**API 14.3 Data (new AGA3)****Flow Equation Type = 0**Pipe I.D.Orifice ID

Pipe ID in inches (us unit), or in millimeter (metric unit) is the measured inside pipe diameter at reference conditions. Orifice ID is the measured diameter of the orifice at reference conditions.

DP Cutoff

The EPLUS-GL Flow Computer suspends flow rate calculations whenever the DP, in inches of water column (us unit) or in mbar or in KPA (metric unit), 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 downstream of the orifice plate. When multi-variable is used, the pressure sensor is always upstream and set Y to 1.

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 all 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 negligent. Therefore using a single value is appropriate in most cases. Enter viscosity in centipoise at typical flowing conditions. Natural gas has a typical viscosity of 0.01.

Reference Temperature of OrificeReference Temperature of Pipe

These parameters give temperature at which the bore internal diameter was measured on the orifice and pipe respectively. Commonly 68 °F (us unit) or 20 °C (metric unit) is used.

Orifice Thermal Expansion Coefficient E-6Pipe Thermal Expansion Coefficient E-6

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

	<b>Us Unit</b>	<b>Metric Unit</b>
Type 304 and 316 Stainless	9.25 E-6	16.7 E-6
Monel	7.95 E-6	14.3 E-6
Carbon Steel	6.20 E-6	11.2 E-6

**ISO5167****Flow Equation Type = 1**Pipe I.D.Orifice ID

Pipe ID in inches (us unit), or in millimeter (metric unit) is the measured inside pipe diameter to 5 decimals at reference conditions. Orifice ID is the measured diameter of the orifice at reference conditions.

DP Cutoff

The EPLUS-GL Flow Computer suspends flow calculations whenever the DP, in inches of water column (us unit) or in mbar or in KPA (metric unit), 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.

Select Position of Temperature and Pressure Sensors

<u>Selection</u>	<u>Description</u>
1	Temperature and Pressure Upstream
2	Temperature and Pressure Downstream
3	Temperature Upstream and Pressure Downstream
4	Temperature Downstream and Pressure Upstream

***Note:** When the multi-variable is used, the pressure sensor is always upstream.*

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 OrificeReference Temperature of Pipe

These parameters give temperature at which the bore internal diameter was measured on the orifice and pipe respectively. Commonly 68 °F (us unit) or 20 °C (metric unit) is used.

Orifice Thermal Expansion Coefficient E-6Pipe Thermal Expansion Coefficient. E-6

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

	<b>Us Unit</b>	<b>Metric Unit</b>
Type 304 and 316 Stainless	9.25 E-6	16.7 E-6
Monel	7.95 E-6	14.3 E-6
Carbon Steel	6.20 E-6	11.2 E-6

Distance of Upstream Tapping

Distance of upstream tapping from the upstream face of the plate

Distance of Downstream Tapping

Distance of upstream tapping from the face of the orifice plate



**AGA 7 Data (Frequency)****Flow Equation Type = 2**Frequency I/O Position

Selection	Description
0	None
1	Freq. Input#1
2	Freq. Input#2

K Factor

K Factor is the number of pulses per flow unit volume, i.e. 1000 pulses/CF (us unit), M3 (metric unit). The meter's tag would normally indicate the K Factor.

K Factor Unit

Selection	Description
0	M3
1	BARREL
2	GALLON
3	M3
4	LITER

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 EPLUS-GL 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.

Gross Include Meter Factor

Enter '1' to include meter factor in gross flow.

Select Mass Pulse

Enter '1' for Mass Pulse Input (US- Units BBL, Metric Units-KG)

Slow Pulse Application

Enter '1' to select slow pulse resolution.

Flow Rate Cut Off Time

Flow Rates go to zero when no pulse occur within cut off time. (Slow pulse application only).

Flow Rate Threshold/Linear Factor

Enter the different correction factors for the meter at different flow rates. The EPLUS-GL 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.

## Cone/Smart Cone

**Flow Equation Type = 3**

### Meter I.D.

#### Cone ID

Meter ID in inches (us unit), or in millimeter (metric unit) is the measured inside diameter at reference conditions. Cone ID is the measured diameter of the Cone at reference conditions.

#### DP Cutoff

The EPLUS-GL Flow Computer suspends flow rate calculations whenever the DP, in inches of water column (us unit) or in mbar or in KPA (metric unit), 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

Selection	Description
0	Non-Compressible
1	Compressible Fluids – Precision Tube
2	Compressible Fluids – Wafer and Cone

#### 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 all cases it is assumed as a constant.

#### Flow Coefficient

Enter flow coefficient of the meter. Using zero is a command to use the flow coefficient linear factor.

#### Pipe and Cone Thermal Expansion Coefficient E-6

Enter the Pipe and cone material coefficient of thermal expansion.

**Note:** the value is typically between 5.0e-6 and 10.0e-6(US Unit)

	Us Unit	Metric Unit
Type 304 and 316 Stainless	9.25 E-6	16.7 E-6

#### Viscosity in Centipoise

This value is used to calculate Reynolds number. Enter viscosity in centipoise.

#### Reynolds Number Threshold/Flow Coefficient Linear Factor

Enter the different correction factors for the meter at different Reynolds numbers. The EPLUS GL will perform linear interpolation each second. Notice that even though using this feature enhances the measurement accuracy and range, performing audit trail on a linear flow coefficient factor is very difficult.

**Slotted DP Meter (US Unit Only)****Flow Equation Type = 4**Pipe I.D.

Pipe ID in inches (us unit) is the measured inside pipe diameter at reference conditions.

Beta

Enter ratio of beta for the slotted DP meter.

Flow Coefficient A, B, E, F

Enter flow coefficients of the meter.

Mass of FT3 Air

Typical value is .07647. Base Density = S.G. x .07647

Viscosity in LBM/FT s E-6

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. Slotted DP Meter has a typical viscosity of 1.4 E-6.

FPV

Enter super-compressibility factor.

DP/P Ratio Limit

Enter ratio limit of DP / Pressure.

DP Cutoff

The EPLUS-GL Flow Computer suspends flow rate calculations whenever the DP, in inches of water column (us unit), 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.

## **FLOW COMPUTER COMMUNICATION PORTS**

### **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.

### **Flow Computer Ports**

#### **Port #1/#2 Modbus Type**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL  
Flow Computer for communication to occur.*

The Modbus Communication Specification is either Binary RTU or ASCII.

#### **Port #1/#2 Parity**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL  
Flow Computer for communication to occur.*

RTU - NONE

ASCII - EVEN or ODD

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

#### **Port #1/#2 Baud Rate**

*Note: this parameter must be set the same for both the PC and the EPLUS-GL  
Flow Computer for communication to occur.*

Baud rate is defined as number of bits per second. The available selections are 1200, 2400, 4800, 9600, or 19200.

#### **Port #1/#2 RTS Delay**

This function allows modem delay time before transmission. The EPLUS-GL Flow Computer will turn the RTS line high before transmission for the entered time delay period.

#### **Main Port RS232/RS485 Selection**

Selection	Description
0	RS-232
1	RS-485

The main port can be configured to RS-232 or RS-485. RS-232 is the default value.

**Floating Point Mode**Number of Bytes

Selection	Description
4 Bytes	One Register - 4 Bytes
2 Bytes	Two Registers – 4 Bytes

Bytes Order

Selection	Description
HI, LO	Data - 4 Bytes HI HI LO LO
LO, HI	Data - 4 Bytes LO LO HI HI

**I/O CONFIGURATION****INPUT ASSIGNMENT**

Enter the assignment for each input. In order for the EPLUS-GL to read live input, the input must be properly assigned and properly wired.

**DP Assignment**

Assignment	Description
0	None
1	Analog Input #1
2	Analog Input #2
3	Analog Input #3
10	Multivariable

**Pressure Assignment**

Assignment	Description
0	None
1	Analog Input #1
2	Analog Input #2
3	Analog Input #3
10	Multivariable

**Temperature Assignment**

To use RTD, the analog input#1 and analog input#2 must be configured as RTD

Assignment	Description
0	None
1	Analog Input #1
2	Analog Input #2
3	Analog Input #3
4	RTD
10	Multivariable

**BS&W Assignment**

Assignment	Description
0	None
1	Analog Input #1
2	Analog Input #2
3	Analog Input #3

**Spare Assignment**

Spare input is used for display, alarm purpose, and tank level monitoring. It is not used in the calculation process.

**TANK GAUGING****Tank Gauging (Liquid application only)**

Enable this feature to monitor the tank level of the liquid column, tank volumes in barrels, or batch operation. **DP must be below DP cut off for tank level to function to monitor tank liquid level. SG or API is also required.**

**Tank Type**

Type	Description
0	Vertical Tank
1	Horizontal Tank

**Tank Offset**

Enter the offset in barrels for the volume of liquid in the tank

**Tank Input Assignment**

This Input is the DP reading for the liquid level in the tank.

Assignment	Description
0	None
1	Spare Input #1
2	Spare Input #2
3	Spare Input #3
4	Spare Input #4

**Tank ID**

Tank ID is the inside diameter in inches of the tank at reference condition

**Tank Length / Tank Height**

Enter the inside length in inches of the Horizontal tank at reference condition or the actual height of the Vertical tank.

**Thermal Expansion**

This parameter gives the linear expansion coefficients of the tank materials respectively.

**Reference Temperature**

Enter the reference temperature of tank diameter and length.

**MULTI-VARIABLE SETTINGS****TAG ID**

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

**Low/High Limit**

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

**Maintenance Value**

Enter the value to be used when the multivariable fails, or while calibrating. Set fail code to 1 while calibrating.

**Fail Code**

Fail Code	Description
0	Always use the live value even if the multivariable failed.
1	Always use the maintenance value
2	Use maintenance value if multivariable failed



**TRANSDUCER INPUT SETTINGS****Input #1 and Input #2**

0 – Use Input#1 and Input#2 as RTD
1 - Use Input#1 and Input#2 as Analog Inputs

**Input #3**

0 – Analog Input – 1-5 V
1 - Analog Input – 4-20 mA
2 – Status Input

**TAG ID**

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

**Range Values for Analog Inputs**

Enter the value at **@4mA** and **@20mA**. Enter both values similar to the way the transmitter is ranged

**Low/High Limit**

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

**Maintenance Value**

Enter the value to be used when the multivariable fails, or while calibrating. Set fail code to 1 while calibrating.

**Fail Code**

- Fail Code 0: always use the live value even if the input failed.
- Fail Code 1: always use the maintenance value
- Fail Code 2: use maintenance value if input failed

**STATUS INPUT /SWITCH OUTPUT ASSIGNMENT****Status Input Assignment**

	Assignment	Comments
<b>0</b>	None	
<b>1</b>	Spare	
<b>2</b>	Calibration Mode	
<b>4</b>	Alarm Acknowledge	Reset the previous occurred alarms output bit
<b>5</b>	Frequency Input	
<b>6</b>	Slow Pulse Input	
<b>7</b>	Meter #1 Batch Request	Toggle to start or end a batch. Batch will be ended automatically after no flow for 60 minutes
<b>8</b>	Meter #2 Batch Request	Toggle to start or end a batch. Batch will be ended automatically after no flow for 60 minutes

**Switch Output Assignment**

User can assign an output to each of the EPLUS-GL Flow Computer's output switches from this list. The EPLUS-GL Flow Computer switch outputs are open collector type, requiring external D.C power applied to the SW power.

**To use switch output #1 to be frequency input, set switch output #1 assignment to 55.**

Outputs in the top list, "Pulse Outputs", require a definition of pulse output per unit volume and "Pulse Output Width".

Outputs in the bottom list, "Contact Type Outputs", are ON/OFF type outputs

**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 EPLUS-GL 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 EPLUS-GL Flow Computer can produce up to 50 pulses per second.

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

**Assignments - Pulse Outputs**

	<b>Meter #1</b>	<b>Meter #2</b>
<b>Gross</b>	1	31
<b>Net</b>	2	32
<b>Mass</b>	3	33
<b>Energy</b>	4	34

**50 – Auxiliary Meter Gross****Assignments - Contact Type Outputs**

	<b>Meter #1</b>	<b>Meter #2</b>
<b>Meter Down</b>	7	21
<b>Density Out of Range</b>	8	22
<b>Flow Rate High</b>	9	23
<b>Flow Rate Low</b>	10	24

<b>Day Ended</b>	5
<b>Month Ended</b>	6
<b>Multi-Variable DP High</b>	11
<b>Multi-Variable DP Low</b>	12
<b>Multi-Variable PF High</b>	13
<b>Multi-Variable PF Low</b>	14
<b>Multi-Variable TF High</b>	15
<b>Multi-Variable TF Low</b>	16
<b>Active Alarms</b>	17
<b>Occurred Alarms</b>	18
<b>Watchdog</b>	19
<b>Remote Control</b>	20
<b>Analog Output Over Range</b>	25
<b>Battery Low Alarm</b>	26
<b>Analog Input #1 High</b>	35
<b>Analog Input #1 Low</b>	36
<b>Analog Input #2 High</b>	37
<b>Analog Input #2 Low</b>	38
<b>Analog Input #3 High</b>	39
<b>Analog Input #3 Low</b>	40
<b>RTD High</b>	41
<b>RTD Low</b>	42

**ANALOG OUTPUT ASSIGNMENT**

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

**Analog Output 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.

**Assignments:**

Description	Selection
Meter #1 Gross Flow Rate	11
Meter #1 Net Flow Rate	12
Meter #1 Mass Flow Rate	13
Meter #1 Energy Flow Rate	14
Meter #2 Net Flow Rate	15
Meter #2 Mass Flow Rate	16
Meter #2 Energy Flow Rate	17
Meter #1 DP	21
Meter #1 Temperature	22
Meter #1 Pressure	23
Meter #1 Density	24
Auxiliary Meter Gross Flow Rate	25
Meter #1 Density.b	26
Meter #1 SG/API	27
Meter # 2 Gross Flow Rate	28
Meter #2 DP	29
Meter #2 Temperature	30
Meter #2 Pressure	31
Meter #2 Density	32
Meter #2 Density.b	33
Meter #2 SG/API	34
Spare #1 Data	35
Spare #2 Data	36
Spare #3 Data	37
Spare #4 Data	38
Meter #1 BS&W	39
Meter #2 BS&W	40

	Assignment
PID Control	1
Remote Control	2

**Analog Output 4mA/20mA**

4-20mA selection must be proportional and within the range of the selected parameter. The 4-20mA output signal is 12 bits.

**FLOW COMPUTER DISPLAY ASSIGNMENT****Text Assignment**

Display text selections are up to three screens. Each screen has four selections. The EPLUS-GL Flow Computer will scroll through them at the assigned delay time.

Meter #1 Gross Flow Rate	1	Meter #2 Gross Cumulative Total	55
Meter #1 Net Flow Rate	2	Meter #2 Gross Month Total	56
Meter #1 Mass Flow Rate	3	Meter #2 Previous Day – Gross Total	57
Meter #1 Energy Flow Rate	4	Meter #2 Previous Day – Gross Cum.	58
Meter #1 Gross Daily Total	5	Meter #2 Orifice ID/ K Factor	59
Meter #1 Net Daily Total	6	Meter #2 Pipe ID/ Meter Factor	60
Meter #1 Mass Daily Total	7	Program Variable #1	61
Meter #1 Energy Daily Total	8	Program Variable #2	62
Meter #1 Gross Cumulative Total	9	Program Variable #3	63
Meter #1 Net Cumulative Total	10	Program Variable #4	64
Meter #1 Mass Cumulative Total	11	Program Variable #5	65
Meter #1 Energy Cumulative Total	12	Program Variable #6	66
Meter #1 Gross Monthly Total	13	Program Variable #7	67
Meter #1 Net Monthly Total	14	Program Variable #8	68
Meter #1 Mass Monthly Total	15	Meter #2 Mass Cumulative Total	70
Meter #1 Energy Monthly Total	16	Meter #2 Energy Cumulative Total	71
Meter #1 DP	17	Meter #2 Net Monthly Total	72
Meter #1 Temperature	18	Meter #2 Mass Monthly Total	73
Meter #1 Pressure	19	Meter #2 Energy Monthly Total	74
Meter #1 Density	20	Meter #2 DP	75
Meter #1 SG/API	21	Meter #2 Temperature	76
Meter #1 CO2 %	22	Meter #2 Pressure	77
Meter #1 N2 %	23	Meter #2 Density	78
Meter #1 Heating Value	24	Meter #2 SG/API	79
Meter #1 Meter ID	25	Meter #2 Heating Value	80
Meter #1 Orifice ID/ K Factor	26	Meter #2 Meter ID	81
Meter #1 Pipe ID/ Meter Factor	27	Meter #2 Previous Daily Net Total	82
PID Flow	28	Meter #2 Previous Daily Mass Total	83
PID Pressure	29	Meter #2 Previous Daily Energy Total	84
PID Output	30	Meter #2 Previous Day Cum. Net	85
Date	31	Meter #2 Previous Day Cum. Mass	86
Time	32	Meter #2 Previous Day Cum. Energy	87
Alarms	33	Meter #2 Previous Daily FWA DP	88
Meter #2 Net Flow Rate	34	Meter #2 Previous Daily FWA Temp	89
Meter #2 Mass Flow Rate	35	Meter #2 Previous Daily FWA Pressure	90
Meter #2 Energy Flow Rate	36	Meter #2 Previous Daily FWA SG/API	91
Meter #2 Net Daily Total	37	Spare #1 Data	92
Meter #2 Mass Daily Total	38	Spare #2 Data	93
Meter #2 Energy Daily Total	39	Spare #3 Data	94
Meter #2 Net Cumulative Total	40	Spare #4 Data	95
Meter #1 Previous Daily Gross Total	41	Battery Voltage	96
Meter #1 Previous Daily Net Total	42	Enclosure Temperature	97
Meter #1 Previous Daily Mass Total	43	Image Version	98
Meter #1 Previous Daily Energy Total	44	Auxiliary Meter Gross Daily Total	100
Meter #1 Previous Day Cum. Gross	45	Auxiliary Meter Gross Cum Total	101
Meter #1 Previous Day Cumulative Net	46	Auxiliary Meter Previous Day Gross	102
Meter #1 Previous Day Cum. Mass	47	Auxiliary Meter Previous Day Cum	103
Meter #1 Previous Day Cum. Energy	48	Auxiliary Meter Gross Flow Rate	104
Meter #1 Previous Daily FWA DP	49	Meter #1 BS&W	105
Meter #1 Previous Daily FWA Temp	50	Meter #2 BS&W	106
Meter #1 Previous Daily FWA Pressure	51	Meter #2 CO2 %	107
Meter #1 Previous Daily FWA SG/API	52	Meter #2 N2 %	108
Meter #2 Gross Flow Rate	53	Meter#1 Batch Status	109
Meter #2 Gross Daily Total	54	Meter#2 Batch Status	110

<b>Meter #1 Tank Level</b>	111
<b>Meter #1 Tank Volume</b>	112
<b>Meter #1 Batch Open Gross BBL</b>	113
<b>Meter #1 Batch Cum Gross BBL</b>	114
<b>Meter #1 Batch Open Net BBL</b>	115
<b>Meter #1 Batch Open Net BBL</b>	116

<b>Meter #2 Tank Level</b>	117
<b>Meter #2 Tank Volume</b>	118
<b>Meter #2 Batch Open Gross BBL</b>	119
<b>Meter #2 Batch Cum Gross BBL</b>	120
<b>Meter #2 Batch Open Net BBL</b>	121
<b>Meter #2 Batch Open Net BBL</b>	122

## Graphic Screen Assignment

Display graphic selections are up to three screens. Each screen has two selections. The first trend will be shown as a thick line and the second trend as a thin line. The EPLUS-GL Flow Computer will scroll through them at the assigned delay time.

(2 Digit Selection)

First Digit	
1	Meter #1 Average
2	Meter #1 Minimum
3	Meter #1 Maximum
4	Meter #2 Average
5	Meter #2 Minimum
6	Meter #2 Maximum

Second Digit	
1	Hour DP
2	Hour Pressure
3	Hour Temperature
4	Hour Flow
5	Day DP
6	Day Pressure
7	Day Temperature
8	Day Flow

Example for graphic screen selection

1 <sup>st</sup> Trend	2 <sup>nd</sup> Trend
11	21

The first screen will show meter#1 hourly average DP (a thick line) and meter#1 hourly minimum DP (a thin line).

## Graphic Maximum Values

Graphic is established the maximum-highest point on the screen. They are approximately 60 vertical pixels that represent the highest point. The value for each pixel would be scaled to the set maximum.

**ADDITIONAL OPTIONS****MODBUS SHIFT- 2 OR 4 BYTES**

Reassigns Modbus address registers on the EPLUS-GL Flow Computer to predefined Modbus registers for easy polling and convenience. Use Modbus Shift to collect values in scattered Modbus registers into a consecutive order. The EPLUS-GL Flow Computer will repeat the assigned variables into the selected locations.

Note: some Modbus registers are 2 byte/16 bit, and some are 4 byte/32 bit. Register size incompatibility could cause rejection to certain address assignments. Refer to the Modbus Address Table Registers in Chapter 5.

Example: you want to read the current status of switches #1 and #2 (addresses 2751 and 2752) and the Daily Gross Total for Meter #1 (address 3131). Make assignments such as:

3082=2751      (2 bytes)

3083=2752      (2 bytes)

3819=3131      (4 bytes)

**MODBUS SHIFT – FLOATING POINT**

Use Modbus Shift to collect values in scattered Modbus floating point registers into a consecutive order. The EPLUS-GL Flow Computer will repeat the assigned variables. (Refer to the Modbus Address Table Registers in Chapter 4) into the selected locations. (7501-7600)

**\*Note: Modbus shift registers are READ ONLY registers.**



**PID PARAMETERS****PID CONFIGURATION**

(PID) Proportional Integral Derivative control– We call this function PID, however the flow computer performs Proportional Integral control. And does not apply the Derivative. The Derivative is not normally used in flow and pressure control operations and complicates the tuning operation

**Use Flow Loop**

(Valid entries are 0 or 1)

Enter 1 if the computer performs flow control.

Enter 0 if the flow computer does not perform flow control.

**Flow Loop Maximum Flow rate**

Enter the maximum flow rate for this meter. This rate will be basis for maximum flow rate to control at.

**Flow Set Point**

Enter the set point. The set point is the flow rate that the flow computer will try to control at.

**Flow Acting – forward or reverse**

Enter 0 if the control is direct acting, Enter 1 if the control is reverse acting.

Direct acting is when the output of the controller causes the flow rate to follow in the same direction. The output goes up and the flow rate increases. A fail Close valve located in line with the meter will typically be direct acting. If the Controller output signal increases, the control valve will open more causing the flow rate to increase.

Reverse acting is when the output of the controller causes the opposite action in the flow rate. A fail open valve in line with the meter will typically be reverse acting. If the Controller output increases the control valve will close some causing the flow rate to decrease.

Care must be taken to study where the valves are located in relation to the meter and whether the valves are fail open or fail close to understand if the controller should be direct or reverse acting. Some control valves can be fail in position (especially Electrically actuated control valves). This valve should be studied to understand if the actuators themselves are direct or reverse acting.

**PID Flow Base**

PID flow rate base can be gross, net, or mass flow rate.

**Use Pressure Loop**

(Valid entries are 0 or 1)

Enter 1 if the computer performs pressure control.

Enter 0 if the flow computer does not perform pressure control.

**Pressure Maximum**

Enter the Maximum pressure for this meter. This pressure will be basis for Maximum pressure to control at.

**Pressure Set Point**

Enter the set point. The set point is the pressure that the flow computer will try to control at.

**Pressure Acting – forward or reverse**

Enter 0 if the control is direct acting, Enter 1 if the control is reverse acting.

Direct acting is when the output of the controller causes the pressure to follow in the same direction. The output goes up and the pressure increases. A fail open valve located in the line downstream of the meter will typically be direct acting to maintain the pressure at the meter. An Increase in the output from the controller will cause the control valve to close thus causing the pressure to increase.

Reverse acting is when the output of the controller causes the opposite action in the flow rate. A fail close valve in the line downstream of the meter will typically be reverse acting to maintain the pressure at the meter. An increase in the output signal will cause the valve to open, which will cause the pressure to be released thus causing the pressure to decrease.

Care must be taken to study where the valves are located in relation to the meter and whether the valves are fail open or fail close to understand if the controller should be direct or reverse acting. Some control valves can be fail in position (especially Electrically actuated control valves). These valves should be studied to understand if the actuators themselves are direct or reverse acting.

**PID Pressure Base**

PID Pressure base can be meter pressure or spare input data.

**System Data Minimum Output**

Enter the minimum output percent (default to 0)

**System Data Maximum Output**

Enter the maximum output percent (default to 100.0)

**Signal Selection**

If flow and pressure loops are both configured in the PID control loop, select high or low signal to be the output.

**PID TUNING****Flow Controller Gain**

(Allowable Entries 0.0 – 9.99)

The gain is effectively  $1/\text{Proportional Band}$ .

The basis of theory for proportional band is the relationship of the percentage of the output of the controller to the percentage of the change of the process. In this case, if the control output changes 5% the flow rate should change 5%, the proportional band would be 1.0 and the gain would be 1.0.

If the percentage of the output is 5% and the flow rate would change by 10%, the proportional band would be 2 and the Gain would be 0.5

However since you do not know until you are flowing the effect of the output on the flow rate, you have to start somewhere. A good starting point is to use a proportional band of 0.5 if the valve is properly sized.

**Flow Controller Reset**

(Allowable Range 0.0 – 9.99)

Reset is the number of minutes per repeat is the time interval controller adjusts the output to the final control element. If the reset is set at 2, the flow computer will adjust the signal to the flow control valve every 2 minutes. If the Reset is set at 0.3, the output signal will be adjusted approximately every 20 seconds, until the process and set point are the same.

The rule of thumb is the reset per minute should be set slightly slower that the amount of time it takes for the control valve and the flow rate to react to the flow computer output signal changing.

This can only be determined when there is actual flow under normal conditions. It is best to start the reset at 0.3 or reset the signal every 3 minutes, if the control valve is properly sized.

**Pressure Controller Gain**

(Allowable Entries 0.0 – 9.99)

The gain is effectively  $1/\text{Proportional Band}$ .

The basis of theory for proportional band is the relationship of the percentage of the output of the controller to the percentage of the change of the process. In this case, if the control output changes 5% the pressure should change 5%, the proportional band would be 1.0 and the gain would be 1.0.

If the percentage change of the output is 5% and the pressure would change by 10%, the proportional band would be 2 and the Gain would be 0.5.

However since you do not know until you are flowing the effect of the output on the pressure, you have to start somewhere. A good starting point is to use a proportional band of 0.5 if the control element is properly sized.

**Pressure Controller Reset**

(Allowable Range 0.0 – 9.99)

Reset is the number of times per minute the controller adjusts the output to the control valve. If the reset is set at 2, the flow computer will adjust the signal to the final control element every 2 minutes. If the Reset is set at 0.3, the output signal will be adjusted approximately every 20 seconds, until the process and the set point are the same.

The rule of thumb is the reset per minute should be set slightly slower that the amount of time it takes for the control valve and the pressure to react to the flow computer changing the output.

This can only be determined when there is actually flow under normal conditions. It is best to start the reset at 0.3 or reset the signal every 3 minutes, if the control element is properly sized.

**PROGRAM VARIABLE STATEMENTS**

From the EPLUS-GL Configuration Software, Point cursor to '**Program Variable Statements**' and a window will pop up allowing you to enter the statements.

Enter the user programmable statements (**no space allowed**, 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)

**Example:**

7832 is equal to total of variable#1 (Modbus addr.7801) and variable#2 (Modbus addr.7802)  
32=7801+7802

**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
<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 7801-7899 (floating points) Variable within the range of 5031-5069 (long integer)
<b>IF STATEMENT</b>	<b>)</b>	Compares the variable to another Example: 7801)T7835 (if variable is greater to or is equal to 1 then go to 7835) 7801)7802=#0 (if variable is greater to or is equal to 1 then set variable 7802 to 0)
<b>GOTO STATEMENT</b>	<b>T</b>	Go to a different statement ( <b>forward only</b> ) Example: 7801%#60T7836 (if variable is equal to 60 then go to statement 7836)
<b>COMPARE</b>	<b>%</b>	Compare a value ( <b>EQUAL TO</b> )
<b>GREATER/EQUAL</b>	<b>&gt;</b>	Compare a value ( <b>GREATER OR EQUAL TO</b> ) Example: 7801>7802T7836 (If variable 1 is greater to or equal to variable 2 then go to 7836)
<b>Natural Log</b>	<b>L</b>	Natural Log of variable

Order of precedence – absolute, power, multiply, divide, add and subtract.

Same precedence – left to right

**Variables stored on the hourly report – 7975- 7979** will be **reset** at the end of hour.

**Variables stored on the daily report – 7980 - 7984** will be **reset** at the end of day.

**Variables stored on the month report – 7985- 7989** will be **reset** at the end of month.

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

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

**7756-7760 – Last Hour Program Variables (Read Only)**

**7761-7765 – Yesterday Program Variables (Read Only)**

**7766-7770 – Last Month Program Variables (Read Only)**

#### **Historical Program Variables**

**7252-7256 – Historical Hour Program Variables (Read Only)**

**7262-7266 – Historical Month/Day Program Variables (Read Only)**

**VARIABLE STATEMENT TAGS**

These tags are provided to add a meaningful description for the program variables.

**BOOLEAN STATEMENTS AND FUNCTIONS**

Enter the Boolean statements (**no space allowed**, 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)

Example:

The statement is true if either temperature or pressure override is in use.

0070=0112+0113

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).

Boolean Functions	Symbol
NOT	/
AND	&
OR	+
EXCLUSIVE OR	*

**Boolean points are numbered as follows:**

**0001 through 0050      Digital I/O Points 1 through 50**

<b>0001</b>	Status Input #1
<b>0002</b>	Status Input #2
<b>0003</b>	Status Input #3
<b>0004</b>	Status Input #4
<b>0005</b>	Spare
<b>0006</b>	Digital Output #1
<b>0007</b>	Digital Output #2
<b>0008-0050</b>	Spare

**0070 through 0099      Programmable Boolean Points**

**0100 through 400      Meter Boolean Points****1<sup>st</sup> digit—always 0, 2<sup>nd</sup> digit—always 1, 3<sup>rd</sup> and 4<sup>th</sup> digit—Selection**

0n01	Meter Active
0n02	AGA 8 Out of Range
0n03	Flow Rate High Alarm
0n04	Flow Rate Low Alarm
0n05	DP Override in Use
0n06	Pressure Override in Use
0n07	Temperature Override in Use
0n08-0400	Spare

**1<sup>st</sup> digit—always 0, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> digit—Selection**

0401	Calibration Mode
0402	Any Active Alarms
0403	Spare
0404	Spare
0405	Spare
0406	Spare
0407	Spare
0408	Multivariable DP High Alarm
0409	Multivariable DP Low Alarm
0410	Multivariable Pressure High Alarm
0411	Multivariable Pressure Low Alarm
0412	Multivariable Temperature High Alarm
0413	Multivariable Temperature Low Alarm
0414	Analog Output Out of Range
0415	Battery Low Alarm
0416	Analog Input #1 High Alarm
0417	Analog Input #1 Low Alarm
0418	Analog Input #2 High Alarm
0419	Analog Input #2 Low Alarm
0420	Analog Input #3 High Alarm
0421	Analog Input #3 Low Alarm
0422	RTD Input High Alarm
0423	RTD Input Low Alarm
0424-0700	Spare
0701	Day Ended Flag (Last 5 Seconds)
0702	Month Ended Flag (Last 5 Seconds)
0703-0800	Spare

**0801 through 0899 Command Boolean Points**

0801	Alarm Acknowledge
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### **Download Firmware/Image File**

To Download an Image File to the Flow Computer select the Tools option from the menu, and then Download Program.

A small dialog will appear asking for the file name of the image file. Type it in or use the Browse option to locate it. Once the file name is in place press Download. This task will take about 5 minutes to be completed.

### **Security Codes**

The desktop application provides 4 security areas to prevent users from entering data into certain areas. The four areas are:

**Configuration:** Allow user to modify device configuration settings.

**Override:** Allow user to change values directly on the device.

**Calibration:** Let the user to calibrate the device inputs.

**Image File Download:** Let user download an image file to the device. This procedure will erase all the information and configuration stored in the device.

**Master Access:** Once the master access is granted, the user can access to all four areas.

Use the **Tools|Security Codes** option to modify the access code; a form will appear showing the five different security areas and the actual access status (at bottom of the form). To put a new access code log in to the desired security area and press Change security Code, type in the code and retype it on the confirm space to avoid mistyped codes. Then click [OK].

The system will update the security access every time the application connects to the device and every time data is written to the device it will check for security access before writing.

**NOTE:** In case the access code is forgotten contact our offices for a reset code.



## ***PID OPERATING***

Click PID Loops icon to display PID output percentage, flow, and pressure data. To change setup, select entries under PID menu.

## ***CALIBRATION***

Calibrations are performed under **Calibration**.

### **Calibrate Mode**

To calibrate Flow Computer, totalizers will continue at same rate where live parameters will show actual value, i.e. flow rate, 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 EPLUS-GL Flow Computer will resume its normal operation.

### **View Diagnostic Data**

Diagnostic data will show live data changing real time. To control the switch outputs manually, check "Enable Switch Output Diagnostic Mode".

### **Data Verification**

Data verification will not affect the calibration, but will be documented into calibration and verification report.

## ***Parameter Overrides:***

### **Temperature Override**

This value is entered when no live temperature is available, or when a different value from the live value should be used.

### **Pressure Override**

Pressure override can be used when no live pressure transmitter is connected to the EPLUS-GL Flow Computer.

### **FPV Override**

Entering a value to override NX19 super-compressibility factor. Using zero is a command to use the live value.

### **CTL Override**

Entering a value to override temperature correction factor. Using zero is a command to use the live value.

### **CPL Override**

Entering a value to override pressure correction factor factor. Using zero is a command to use the live value.

### **BS&W Override**

BS&W override can be used when no live BS&W transmitter is connected to the EPLUS-GL Flow Computer.

### **Water Factor Override**

The value is used in the AGA7 equation.

Gross Flow Rate = Frequency / K Factor x Linear Meter Factor.

Net Flow Rate = Gross Flow Rate x Flowing Density / Base Density x ***Water Factor Override***.

### **Base Density Override LB/FT3(US Units), KG/M3(Metric Units)**

In the event the user would like to override the calculated base density. This number would affect the net calculations only. Using zero is a command to use the live value.

### **Flowing Density Override LB/FT3(US Units), KG/M3(Metric Units)**

In the event the user would like to override the calculated flow density. This number would affect the net calculations only. Using zero is a command to use the live value

### **Multi-variables Input Override**

The value can be used when the multivariable fails.

### **Orifice ID Override**

Orifice ID in inches is the measured diameter of the orifice at reference conditions.

### **Composition Override**

Entering a value to change composition factors of AGA8 method.

### **Start/End a Batch**

The batch will start or end if requested through this menu. The flow weighted data will reset to zero. Non-resettable totalizers are not affected by the batch resetting.

**SYSTEM****DATE AND TIME**

Change the date and time for the flow computer.


**RESET CUMULATIVE TOTALIZER**

Enter reset code to reset cumulative totalizer.


**CLEAR SYSTEM**

Enter reset system code to reset all data.

## HISTORICAL DATA

To retrieve historical data, go to **Historical Data** menu. It retrieves the information, shows it on the screen and stores in one report. Use the different names to save new reports. The data will be overwritten by the same file name. Select reports, enter the file name, click  button to save all data in one report.

Templates are created for each report. The user can edit, modify the report template, and save as a new

formatted report. Go to “**Tools | Settings...**”, then click  button to specify the location or directory for the new report, and the location of the reports to be saved. Check “DFM File” box to generate the additional binary format of reports.

The available types of reports are:

### **Alarm Report**

Up to 60 previous alarm data can be retrieved. The data are starting from the most recent to the oldest.

### **Audit Report**

The audit trail report shows configuration parameters that have changed which could influence the calculated numbers. The Flow Computer provides up to 60 event logs. One purpose for audit trail is to back track calculation errors that result from mistakes by the operator of the flow computer operator.

### **Previous Hourly Data**

Up to 750 previous hourly data are stored in the Flow Computer. Enter meter number and the computer will go backward from that selected time. Current hour cannot be selected.

### **Calibration Data**

Up to 20 previous calibration data are stored in the Flow Computer.

### **Previous Daily Data**

Up to 35 previous daily reports can be retrieved.

### **Previous Day Hourly Data**

Up to 35 previous daily of hour by hour reports can be retrieved.

### **Previous Month Data**

Last two months data are stored in the Flow Computer. Select number of previous month data to capture. Current month data cannot be retrieved.

### **Last Month Daily Data**

Last Month of daily data are stored in the Flow Computer. Current month data cannot be retrieved.

### **Previous Batch Data**

Up to 10 previous batch reports can be retrieved.

### **Get Data that has not been collected**

By checking this option the application will collect all the information available in the EPLUS-GL flow computer that has not been previously retrieved. For example, the information in the meter was collected 2 weeks ago, now we want to collect all the data for the last two weeks, it is only necessary to specify which information we want (audit, alarm, hourly, etc.), and then check the data not collected option, there is no need to specify the number of days or records that we want.

Once the information is retrieved it will remain in the flow computer but it will now be flagged as already collected.

### **Report Name**

The reports generated by “Dynacom Software” are extension DFM. The name can have any combination of letters and numbers.

### **Use Meter id as Report Name**

By checking this option, the “Dynacom Software” will use meter ID to name the report.

### **Generate Additional files**

The report generated by “Dynacom Software” can be only viewed using “Dynacom Software”.

Additional report formats are provided to be viewed by other software applications.

#### **HTML Reports:**

This format can be viewed with endless number of software applications, among them are Internet Explorer, Microsoft Excel, Microsoft Word, etc.

#### **CFX Format:**

Using this proprietary format, the user can import data into Flow-CAL’s custody transfer system. The extension of this report is CFX.

#### **PGAS Format:**

This option allows users to import historical information into a PGAS system. When this option is selected, four files will be generated( \*.vol, \*.arm, \*.ana, \*.evt) and needed to import all the information into PGAS. The PGAS report is created monthly and can have 3 different formats.

### **Viewing Saved Reports**

Once a report is saved with DFM extension, the report can be viewed from this option. The browse button can be used to locate the report.

## **SCHEDULED AUTO POLLING**

### **Automatic Data Polling**

Use the **Historical Data|Scheduled Auto Polling** to retrieve report information from devices in a periodic basis automatically.

These are the following settings:

**Enable Automatic Data Retrieval:** Check this option to enable the automatic polling. If the automatic polling function is enabled an “AUTOPOLL” message will appear on the application’s status bar (bottom-right corner of the application window).

**Reports to Retrieve:** check the reports you want to get from the devices, you can select as many as you want, just make sure the polling interval is long enough to allow the PC to retrieve the archive. For example, if the computer is programmed to poll 100 reports every 10 seconds, there will not be enough time to get the report before the next poll starts and data will be overlapped.

**Report Name:** provide a name to the reports captured so they will be available for viewing, printing and exporting.

**Starting Day:** Type the date where the poll is going to start. Select “Every Day” is the date doesn’t matter.

**Polling Time:** select the time you want the automatic polling to start, then select “Poll One Time” if you want to execute these poll only once or select “Poll Every...” and type the polling interval for periodic polls. For example, to poll every hour and a half select “Poll Every...” and type 90 in the Minutes field.

**IMPORTANT:** Do not use straight hours as starting time (i.e. 7:00, 8:00). The flow computer calculates and updates its information at the beginning of the hour so if data is retrieved at this time it might be erroneous. Allow about 5 minutes for the flow computer to update the data.

**Polling List:** Add all the units you want to get data from on every poll. You can add up to 100 units. To add a unit just click “Add” and then type the unit’s **Modbus** ID number.

**NOTE:** The file C:\AutoPoll.log will contain all the logs for the automatic poll, it will tell if there was a problem or if the data was retrieved successfully.

## CHAPTER 3: FLOW EQUATIONS

### Common Terms

The following terms are used throughout this chapter.

The following terms are used throughout this chapter.

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

### 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
$l$ , $P$	Refers to the pipe	
$flowing$	At flow conditions	$\rho_{flowing}$ = density at flow conditions
$cal$	Calibration conditions	$T_{cal}$ , $P_{cal}$
$m$	At measured conditions	$D_m$ = pipe diameter at measured temp.

## API 14.3

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

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

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

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

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

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	Metric Unit
$N_c$	323.279	.036
Density	lb/ft <sup>3</sup>	kg/m <sup>3</sup>
Gross Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Net Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Mass Flow Rate/HR	MLB	TONNE
Energy Flow Rate/HR	MMBTU	GJ



**ISO5167**

$$\text{Mass Flowrate} = \frac{\pi}{4} \times N_c \times FA \times E_v \times d^2 Y \sqrt{2000 \times DP \times \rho}$$

$$= \mathbf{q_{mass}} \text{ (TON/Hr)}$$

$$\text{Net Flowrate} = \frac{q_{mass}}{\rho_{reference}} = \text{KM}^3/\text{Hr}$$

$$\text{Gross Flowrate} = \frac{q_{mass}}{\rho_{flowing}} = \text{KM}^3/\text{Hr}$$

$$\text{Energy Flowrate} = \text{Net Flowrate} \times \text{HeatingValue} / 1000.0 = \text{GJ} / \text{HR}$$

Where :

$$N_c = \text{ALPHA}$$

$$Y = 10^{-6}$$

$$E_v = \text{Exp.} \times 3600$$

## AGA 7 – Gross Pulse

### Gross Include Linear Meter Factor

$$\text{Gross Flow Rate} = \frac{\text{Pulses per second} \times \text{Linear Meter Factor} \times \text{Conversion Factor}}{K \text{ Factor}}$$

$$\text{Net Flow Rate} = \frac{\text{Gross Flow} \times \text{Flowing Density}}{\text{Base Density}} \times (1 - \text{BS\&W}\%) \times \text{Water Factor} \times \text{Conversion Factor}$$

$$\text{Mass Flow Rate} = \text{Gross Flow} \times \text{Flowing Density} \times \text{Conversion Factor}$$

### Gross Not Include Linear Meter Factor

$$\text{Gross Flow Rate} = \frac{\text{Pulses per second} \times \text{Conversion Factor}}{K \text{ Factor}}$$

$$\text{Net Flow Rate} = \frac{\text{Gross Flow} \times \text{Linear Meter Factor} \times \text{Flowing Density}}{\text{Base Density}} \times (1 - \text{BS\&W}\%) \times \text{Water Factor} \times \text{Conversion Factor}$$

$$\text{Mass Flow Rate} = \text{Gross Flow} \times \text{Linear Meter Factor} \times \text{Flowing Density} \times \text{Conversion Factor}$$

### Energy Flow Rate (Gas Meter) =

$$\text{Net Flow} \times \text{Heating Value} \times \text{Conversion Factor}$$

Where:

Gas Application	US unit	Metric Unit
Density	$lb/ft^3$	$kg/m^3$
K Factor	Pulses/CF	Pulses/M3
Gross Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Net Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Mass Flow Rate/HR	MLB	TONNE
Energy Flow Rate/HR	MMBTU	GJ

Liquid Application	US unit	Metric Unit
Density	$lb/ft^3$	$kg/m^3$
K Factor	Pulses/BBL	Pulses/M3
Gross Flow Rate/HR	BBL	M3
Net Flow Rate/HR	BBL	SM3
Mass Flow Rate/HR	MLB	TONNE

## AGA 7 – Mass Pulse

### Mass Include Linear Meter Factor

$$\text{Mass Flow Rate} = \frac{\text{Pulses per second} \times \text{Linear Meter Factor} \times \text{Conversion Factor}}{K \text{ Factor}}$$

$$\text{Net Flow Rate} = \frac{\text{Mass Flow}}{\text{Base Density}} \times (1 - \text{BS\&W}\%) \times \text{Water Factor} \times \text{Conversion Factor}$$

$$\text{Gross Flow Rate} = \frac{\text{Mass Flow}}{\text{Flowing Density} \times \text{Linear Meter Factor}} \times \text{Conversion Factor}$$

### Mass Not Include Linear Meter Factor

$$\text{Mass Flow Rate} = \frac{\text{Pulses per second} \times \text{Conversion Factor}}{K \text{ Factor}}$$

$$\text{Net Flow Rate} = \frac{\text{Mass Flow} \times \text{Linear Meter Factor}}{\text{Base Density}} \times (1 - \text{BS\&W}\%) \times \text{Water Factor} \times \text{Conversion Factor}$$

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

### Energy Flow Rate (Gas Meter) =

$$\text{Net Flow} \times \text{Heating Value} \times \text{Conversion Factor}$$

Where:

Gas Application	US unit	Metric Unit
Density	lb/ft <sup>3</sup>	kg/m <sup>3</sup>
K Factor	Pulses/CF	Pulses/M3
Gross Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Net Flow Rate/HR	Selectable by Data Entry	Selectable by Data Entry
Mass Flow Rate/HR	MLB	TONNE
Energy Flow Rate/HR	MMBTU	GJ

Liquid Application	US unit	Metric Unit
Density	lb/ft <sup>3</sup>	kg/m <sup>3</sup>
K Factor	Pulses/BBL	Pulses/M3
Gross Flow Rate/HR	BBL	M3
Net Flow Rate/HR	BBL	SM3
Mass Flow Rate/HR	MLB	TONNE

## Cone/Smart Cone

$$\text{MassFlowrate} = \frac{\pi}{4} \times \sqrt{2g_c \times \rho} \times \frac{D^2 \times \beta^2}{\sqrt{1 - \beta^4}} \times C_f \times Y \times \sqrt{Psf} \times Fa$$

$$= \mathbf{q_{mass/second}} (LB - US, KG - Metric)$$

$$\text{Net Flowrate} = \frac{q_{mass}}{\rho_{reference}}$$

$$\text{Gross Flowrate} = \frac{q_{mass}}{\rho_{flowing}}$$

$$\text{Energy Flowrate} = \text{Net Flowrate} \times \text{HeatingValue} / 1000$$

Where:

$g_c$  = Dimensional Conversion Constant

$C_f$  = Flow Coefficient of the Meter

$\rho$  = Density (LB/FT<sup>3</sup>-US, KG/M<sup>3</sup>-Metric)

D = Meter Inside Diameter (Feet-US, Meters-Metric)

$Psf$  = D.Pressure(Pounds force per square foot-US, Pascal-Metric)

Y = Adiabatic Expansion Factor for Contoured Elements

$$\beta = \sqrt{1 - \frac{d^2}{D^2}}$$

d = Cone Diameter, D=Meter Inside Diameter (Inches-US, Millimeters-Metric)

Fa = Thermal Expansion Factor

## ***Slotted DP Meter – US unit only***

**Mass Flow Rate in MLB**

**Net Flow Rate in MCF =**

$$\frac{MassFlowRate}{BaseDensity}$$

**Gross Flow Rate in MCF =**

$$\frac{MassFlowRate}{FlowingDensity}$$

## Tank Liquid Level Equations

### Vertical Tanks

$$V_c = (\pi * (D_{\text{Tank}}')^2 * H) / 4$$

Where:

$V_c$ : Volume of the liquid at current conditions in Inch<sup>3</sup>

Height of the liquid column,  $H = \frac{\text{Differential Pressure}}{SG \times CTL}$

CTL: Temperature Correction Factor

Diameter of Tank at current condition:  $D_{\text{tank}}' = D_{\text{tank}} \times CTSh$

$D_{\text{tank}}$ : Tank ID in Inches (Data Entry)

$CTSh$ : Shell Temperature correction Factor =  $1 + (\alpha_s \times \Delta TS) + (\alpha_s^2 \times \Delta TS^2)$

$\alpha_s$  = Thermal Expansion E-6 (Data Entry)

$\Delta TS$  = Temperature – Reference Temperature (Data Entry)

### Horizontal Tanks

When  $H \leq (D_{\text{Tank}} / 2)$  the Volume of liquid at current conditions is

$$V_c = \frac{\pi * H^2 * L'_{\text{Tank}}}{2}$$

When  $H > (D_{\text{Tank}} / 2)$  the Volume of liquid at current conditions is

$$V_c = \pi * L'_{\text{Tank}} * \left[ \frac{(D_{\text{Tank}}')^2}{4} - \frac{(D'_{\text{Tank}} - H)^2}{2} \right]$$

Where:

$V_c$ : Volume of the liquid at current conditions in Inch<sup>3</sup>

Height of the liquid column,  $H = \frac{\text{Differential Pressure}}{SG \times CTL}$

CTL: Temperature Correction Factor

Inside Length of the Horizontal Tank:  $L_{\text{tank}}' = L_{\text{tank}} \times CTSh$

$L_{\text{tank}}$  = Tank Length in Inches (Data Entry)

$CTSh$ : Shell Temperature correction Factor =  $1 + (\alpha_s \times \Delta TS) + (\alpha_s^2 \times \Delta TS^2)$

$\alpha_s$  = Thermal Expansion E-6 (Data Entry)

$\Delta TS$  = Temperature – Reference Temperature (Data Entry)

Diameter of Tank at current condition:  $D_{\text{tank}}' = D_{\text{tank}} \times CTSh$

$D_{\text{tank}}$ : Tank ID in Inches (Data Entry)

## DENSITY EQUATIONS

### Sarasota Density(GM/CC-US Unit, KG/M3-Metric Unit)

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<sub>0</sub> = Calibration constant, mass/volume, gm/cm<sup>3</sup>*

*t = Densitometer oscillation period in microseconds.*

*t<sub>0</sub> = A calibration constant in microseconds*

*T<sub>coef</sub> = Temperature coefficient in microseconds/°F(USUnit)or°C(MetricUnit)*

*P = Flowing pressure in PSIG(USUnit), BAR, or KG / CM (MetricUnit)*

*P<sub>coef</sub> = Pressure coefficient in microseconds/PSIG (US Unit), BAR, or KG/CM(Metric Unit)*

*P<sub>cal</sub> = Calibration pressure in PSIG(USUnit), BAR, or KG / CM (MetricUnit)*

**UGC Density(GM/CC-US Unit, KG/M3-Metric Unit)**

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

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

Where :

$$d = K_0 + K_1 t + K_2 t^2$$

$K_0, K_1, K_2 = \text{Calibration Constants}$

$t = \text{Densitometer oscillation period in microseconds}$

$DCF = \text{Density Correction Factor}$

$K = \text{Pressure Constant}$

$P_{\text{off}} = \text{Pressure Offset}$

$K_T = \text{Temperature Coefficient}$

$T_{\text{cal}} = \text{Temperature coefficient } t \text{ in microseconds/}^\circ\text{F (US Unit), or }^\circ\text{C (Metric Unit)}$



**Solartron Density (GM/CC-US Unit, KG/M3-Metric Unit)**

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**

$$D = K_0 + K_1 t + K_2 t^2$$

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>. **Contact Solartron to get information about KR and KJ constants.**

$$DA = DT + (1 + K3 / (DT + K4)) \times 0.00236 - G / (T + 273)$$

G = Gas Specific Gravity / Ratio of Specific Heats.

$$\text{Density (GM/CC)} = \text{Density(KG/M3)} / 1000.0$$

**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

**ISO 6976**

Refer to ISO 6976: 2016

**Steam NBS Equation**

Refer to NBS/NRC Steam Tables.

# CHAPTER 4: 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	ERROR 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 no one will respond when the write function is broadcasted.

## MODBUS EXAMPLES

### **FUNCTION CODE 03 (Read Single or Multiple Register Points)**

Each Modbus System has a different Modbus address range. For example, 40000 or 90000 is the high level message generated through the host Modbus system. The set up and offset are different for each host Modbus system.

#### **Read a Short (Single) Word Numeric Variable**

The short word numeric variable is a 16-bit integer

Data: 16 bits (short word: two 8-bit bytes - high byte, low byte),

Short Integer Variable Modbus Address: from 2001 to 3030

#### **RTU MODE**

Read Address 3001

ADDR	FUNC CODE	STARTING POINT		# OF POINTS		CRC CHECK	
		HI	LO	HI	LO		
01	03	0B	B9	00	01	57	CB

**Response - Data - 02 63 (Hex), 611 (Decimal)**

ADDR	FUNC CODE	BYTE COUNTS	DATA		CRC CHECK	
			HI	LO		
01	03	02	02	63	F9	0D

#### **ASCII MODE**

Read Address 3076

ADDR				FUNC CODE		STARTING POINT				# OF POINTS				LRC CHECK			
						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					
:	30	31	30	33	30	32	30	30	30	31	46	39	CR	LF

### **Read a Long Word Numeric Variable**

The long word numeric variable is a *two 16-bit integers* with decimal places inferred

Data: two 16-bit (32 bits, two words: high word, low word ).

Sign bit - first bit of high word (0:positive, 1:negative)

Long Integer Variable Modbus Address: from 3131 to 9549

Read Address 3131

ADDR	FUNC CODE	STARTING Address		# OF Registers		CRC CHECK	
		HI	LO	HI	LO		
01	03	0C	3B	00	02	B6	96

Response - Data - 4 Bytes - 00 05 6A 29 (Hex), 611 (Decimal)

ADDR	FUNC CODE	BYTE COUNTS	DATA				CRC CHECK	
			HI Word		LO Word			
01	03	04	00	05	6A	29	05	4C

**Data Bytes - 00 05 6A 29 (Hex) = 354857 (decimal)**

**Data with 2 decimal places inferred = 3548.57**

For Example:

Honeywell Modbus System - read address **93131**

Delta-V Modbus system - read address **43131**

Data Calculation

**Value = High Word x 65536 + Low Word**

High Word = 00 05 (Hex), 5 (Decimal)

Low Word = 6A 29 (Hex), 27177 (Decimal)

= 5 x 65536 + 27177

= 354857

**Two decimal places inferred**

= 3548.57

**Read a Floating Point Variable**

The floating point variable is a single precision floating point value. It can be configured to be one register or two registers with 4 data bytes (high/low or low/high word)

Modbus Address: From 7001 to 7999

**IEEE Floating Point Format**

Sign	Exponent	Mantissa
1 bit	8 bits	23 bits

**Sample Floating Point Value - Read Register 7047 (one register with 4 data bytes)**

ADDR	FUNC CODE	STARTING Address		# OF Registers		CRC CHECK	
		HI	LO	HI	LO		
01	03	1B	87	00	01	32	C7

Response - Four Data Bytes - **47 6C 4A 00 (HEX) = 60490.0 (high word first, low word)**

ADDR	FUNC CODE	BYTE COUNTS	DATA				CRC CHECK	
			HI Word		LO Word			
01	03	04	47	6C	4A	00	19	FA

Response - Four Data Bytes - **47 6C 4A 00 (HEX) = 60490.0 (low word first, high word)**

ADDR	FUNC CODE	BYTE COUNTS	DATA				CRC CHECK	
			LO Word		HI Word			
01	03	04	4A	00	47	6C	DF	F6

**Sample Floating Point Value - Read Register 7047 (two registers with 4 data bytes)**

ADDR	FUNC CODE	STARTING Address		# OF Registers		CRC CHECK	
		HI	LO	HI	LO		
01	03	1B	87	00	02	72	C6

Response - Four Data Bytes - **47 6C 4A 00 (HEX) = 60490.0 (high word first, low word)**

ADDR	FUNC CODE	BYTE COUNTS	DATA				CRC CHECK	
			HI Word		LO Word			
01	03	04	47	6C	4A	00	19	FA

Response - Four Data Bytes - **47 6C 4A 00 (HEX) = 60490.0 (low word first, high word)**

ADDR	FUNC CODE	BYTE COUNTS	DATA				CRC CHECK	
			LO Word		HI Word			
01	03	04	4A	00	47	6C	DF	F6

## Modbus Address Table – 16 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2049	Meter#1 SG/API Decimal Inferred	0 Inferred	Read
2050	Meter#2 SG/API Decimal Inferred	0 Inferred	Read
2106	Reserved		
2107	Unit ID	0 Inferred	Read
2108	Frequency #2	0 Inferred	Read
2109	Frequency #1	0 Inferred	Read
2110-2533	Reserved		
2534	Flow Copmputer Display Delay	0 Inferred	Read/Write
2535-2540	Reserved		
2541	Flow Computer Graphic Screen #1 Assignment #1	0 Inferred	Read/Write
2542	Flow Computer Graphic Screen #1 Assignment #2	0 Inferred	Read/Write
2543	Flow Computer Graphic Screen #2 Assignment #1	0 Inferred	Read/Write
2544	Flow Computer Graphic Screen #2 Assignment #2	0 Inferred	Read/Write
2545	Flow Computer Graphic Screen #3 Assignment #1	0 Inferred	Read/Write
2546	Flow Computer Graphic Screen #3 Assignment #2	0 Inferred	Read/Write
2547-2550	Spare		
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
2566-2567	Reserved	0 Inferred	Read/Write
2568	Main Port – RS232 or RS485 Selection	0 Inferred	Read/Write
2569	Select 0=US, 1=Metric Unit	0 Inferred	Read/Write
2570	Metric Pressure Units? 0=Bar,1=KG/CM2,2=KPA	0 Inferred	Read/Write
2571	Meter #1 Flow Units?	0 Inferred	Read/Write
2572	Meter #1 AGA 7 Unit ?	0 Inferred	Read/Write
2573	Metric DP Units ? 0=m.BAR,1=KPA	0 Inferred	Read/Write
2574	Meter#1 Application Type – 0=Gas,1=Liquid	0 Inferred	Read/Write
2575	Meter#2 Application Type – 0=Gas,1=Liquid	0 Inferred	Read/Write
2576	Number of Meters (0=1 Meter,1=2 Meters)	0 Inferred	Read/Write
2577	Meter #1 Gross Include Meter Factor	0 Inferred	Read/Write
2578	Meter #2 Flow Units	0 Inferred	Read/Write
2579	Meter #1 Slow Pulse Application (1=Yes)	0 Inferred	Read/Write
2580	Meter #1 Flow Rate Cut Off Time (Slow Pulse)	0 Inferred	Read/Write



**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2581	Flow Rate Display 0=Hour,1=Day,2=Minute	0 Inferred	Read/Write
2582	Flowrate Averaged Seconds (1-5)	0 Inferred	Read/Write
2583	Day Start Hour (0-23)	0 Inferred	Read/Write
2584	Disable Alarms ? (0=No, 1=Yes)	0 Inferred	Read/Write
2585	Pulse Width	0 Inferred	Read/Write
2586	Common Temperature	0 Inferred	Read/Write
2587	Common Pressure	0 Inferred	Read/Write
2588	Auxiliary Meter Freq. Position	0 Inferred	Read/Write
2589	Reserved		
2590	Status Input #2 Assignment	0 Inferred	Read/Write
2591	Status Input #3 Assignment	0 Inferred	Read/Write
2592	Status Input #4 Assignment	0 Inferred	Read/Write
2593-2596	Meter #2 ID	8 Chars	Read/Write
2597	Status Input #1 Assignment	0 Inferred	Read/Write
2598	Switch Output #1 Assignment	0 Inferred	Read/Write
2599	Switch Output #2 Assignment	0 Inferred	Read/Write
2600	Analog Output Assignment	0 Inferred	Read/Write
2601	Meter#1 Slow Pulse – No of Debounce in m.Sec.	0 Inferred	Read/Write
2602	Meter#1 AGA7–Freq I/O 1=Freq#1,2=Freq#2	0 Inferred	Read/Write
2603-2610	Meter#1 Product Name	16 Chars	Read/Write
2611-2620	Company Name	20 Chars	Read/Write
2621-2630	Meter Location	20 Chars.	Read/Write
2631-2634	Meter ID	8 Chars	Read/Write
2635	Flow Computer Text Screen #1 Assignment#1	0 Inferred	Read/Write
2636	Flow Computer Text Screen #1 Assignment#2	0 Inferred	Read/Write
2637	Flow Computer Text Screen #1 Assignment#3	0 Inferred	Read/Write
2638	Flow Computer Text Screen #1 Assignment#4	0 Inferred	Read/Write
2639	Flow Computer Text Screen #2 Assignment#1	0 Inferred	Read/Write
2640	Flow Computer Text Screen #2 Assignment#2	0 Inferred	Read/Write
2641	Flow Computer Text Screen #2 Assignment#3	0 Inferred	Read/Write
2642	Flow Computer Text Screen #2 Assignment#4	0 Inferred	Read/Write
2643	Flow Computer Text Screen #3 Assignment#1	0 Inferred	Read/Write
2644	Flow Computer Text Screen #3 Assignment#2	0 Inferred	Read/Write
2645	Flow Computer Text Screen #3 Assignment#3	0 Inferred	Read/Write
2646	Flow Computer Text Screen #3 Assignment#4	0 Inferred	Read/Write
2647	Common BS&W (1=Yes)	0 Inferred	Read/Write
2648	Meter #2 Slow Pulse – No of Debounce in m.Sec	0 Inferred	Read/Write
2649-2651	Reserved		
2652	Meter#2 Slow Pulse Application	0 Inferred	Read/Write
2653	Meter#2 AGA7–Freq I/O 1=Freq#1,2=Freq#2	0 Inferred	Read/Write
2654	Meter#2 AGA 7 Unit ?	0 Inferred	Read/Write
2655	Meter #2 Gross Include Meter Factor	0 Inferred	Read/Write
2656	Meter #2 Flow Rate Cut Off Time (Slow Pulse)	0 Inferred	Read/Write
2657	Meter#2 Y Factor Select	0 Inferred	Read/Write
2658	Meter#2 Flow Cut Off	0 Inferred	Read/Write
2659	Meter#1 Flow Cut Off	0 Inferred	Read/Write
2660	Meter #1 Flow Equation Type	0 Inferred	Read/Write
2661	Meter#1 Y Factor Select	0 Inferred	Read/Write

**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
---------	-------------	---------	------------

2662	Meter #1 Product Selection	0 Inferred	Read/Write
------	----------------------------	------------	------------

Gas Application	
Selection	Product
1	AGA8 Gross#1
2	AGA8 Gross#2
3	AGA8 Detail Method

Liquid Appl.	
Selection	Product
0	Table 6A/24A (US only)
1	Table 6B/24B (US only)
2	New Table 24 (US only)
3	Table 6C/24C (US only)
4	Table 54A (Metric only)
5	Table 54B (Metric only)
6	OLD Table 54 (Metric)
7	Table 54C (Metric)
8	Table 60A (Metric)
9	Table 60B (Metric)
10	Table 60D (Metric)

2663	Meter #2 Flow Equation Type	0 Inferred	Read/Write
2664	Meter #2 Product Selection	0 Inferred	Read/Write

Gas Application	
Selection	Product
1	AGA8 Gross#1
2	AGA8 Gross#2
3	AGA8 Detail Method

Liquid Appl.	
Selection	Product
0	Table 6A/24A (US only)
1	Table 6B/24B (US only)
2	New Table 24 (US only)
3	Table 6C/24C (US only)
4	Table 54A (Metric only)
5	Table 54B (Metric only)
6	OLD Table 54 (Metric)
7	Table 54C (Metric)
8	Table 60A (Metric)
9	Table 60B (Metric)
10	Table 60D (Metric)

2665	Meter#1 Detailed Month Report Var#1 Format	0 Inferred	Read/Write
2666	Meter#1 Detailed Month Report Var#2 Format	0 Inferred	Read/Write
2667	Meter#2 Detailed Month Report Var#1 Format	0 Inferred	Read/Write
2668	Meter#2 Detailed Month Report Var#2 Format	0 Inferred	Read/Write

2669	Meter #1 Hourly Report – Variable #1 Selection	0 Inferred	Read/Write
2670	Meter #1 Hourly Report – Variable #2 Selection	0 Inferred	Read/Write
2671	Meter #2 Hourly Report – Variable #1 Selection	0 Inferred	Read/Write
2672	Meter #2 Hourly Report – Variable #2 Selection	0 Inferred	Read/Write
2673	Meter#1 DP Assignment	0 Inferred	Read/Write
2674	Meter#1 Pressure Assignment	0 Inferred	Read/Write
2675	Meter#1 Temperature Assignment	0 Inferred	Read/Write
2676	Meter#2 DP Assignment	0 Inferred	Read/Write
2677	Meter#2 Pressure Assignment	0 Inferred	Read/Write
2678	Meter#2 Temperature Assignment	0 Inferred	Read/Write

**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2679	Spare Input #1 Assignment	0 Inferred	Read/Write
2680	Spare Input #2 Assignment	0 Inferred	Read/Write
2681	Spare Input #3 Assignment	0 Inferred	Read/Write
2682	Spare Input #4 Assignment	0 Inferred	Read/Write
2683	Analog Input or RTD Input Selection	0 Inferred	Read/Write
2684	Analog Input #1 Voltage or mA Selection	0 Inferred	Read/Write
2685	Analog Input #2 Voltage or mA Selection	0 Inferred	Read/Write
2686	Analog Input #3 Voltage or mA Selection	0 Inferred	Read/Write
2687	Meter#1 BS&W Input Assignment	0 Inferred	Read/Write
2688	Meter#2 BS&W Input Assignment	0 Inferred	Read/Write
2689-2696	Meter#2 Product Name	16 Chars	Read/Write
2697	Meter#1 Liquid Application 0=SG, 1=API Gravity	0 Inferred	Read/Write
2698	Meter#2 Liquid Application 0=SG, 1=API Gravity	0 Inferred	Read/Write
2699	Meter#1 Tank Type 0=Vertical, Horizontal	0 Inferred	Read/Write
2700	Meter#1 Tank Input Assignment	0 Inferred	Read/Write
2701	Meter#1 Enable Tank Gauging/Batching	0 Inferred	Read/Write
2702	Meter#2 Tank Type 0=Vertical, Horizontal	0 Inferred	Read/Write
2703	Meter#2 Tank Input Assignment	0 Inferred	Read/Write
2704	Meter#2 Enable Tank Gauging/Batching	0 Inferred	Read/Write
2705	Switch Output Wiring 0=Sourcing, 1=Sinking	0 Inferred	Read/Write
2706-2734	Spare		
2735	Spring Forward Month	0 Inferred	Read/Write
2736	Spring Forward Day	0 Inferred	Read/Write
2737	Fall Back Month	0 Inferred	Read/Write
2738	Fall Back Day	0 Inferred	Read/Write
2739	Enable Daylight Time Saving	0 Inferred	Read/Write
2740	Spare		
2741	Muti.Var.DP Fail Code	0 Inferred	Read/Write
2742	Muti.Var.Pressure Fail Code	0 Inferred	Read/Write
2743	Muti.Var.Temperature Fail Code	0 Inferred	Read/Write
2744	Analog Input #1 Fail Code	0 Inferred	Read/Write
2745	Analog Input #2 Fail Code	0 Inferred	Read/Write
2746	Analog Input #3 Fail Code	0 Inferred	Read/Write
2747	RTD Input Fail Code	0 Inferred	Read/Write
2748	Status Input #2 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2749	Status Input #3 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2750	Status Input #4 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2751	Status Input #1 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2752	Switch Output #1 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2753	Switch Output #2 Status (0=OFF,1=ON)	0 Inferred	Read/Write
2754	Spare		
2755-2756	Reserved		
2757-2760	Spare		
2761-2860	Reserved		
2861-2874	Spare		

**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2875	Analog Input #1 Calibration Index	0 Inferred	Read/Write
2876	Analog Input #2 Calibration Index	0 Inferred	Read/Write
2877	Analog Input #3 Calibration Index	0 Inferred	Read/Write
2878	Analog Input #4 Calibration Index	0 Inferred	Read/Write
2879	RTD Input Calibration Index	0 Inferred	Read/Write
2880	Analog Output Calibration Index	0 Inferred	Read/Write
2881	Multi-Variable DP	0 Inferred	Read/Write
2882	Multi-Variable Pressure	0 Inferred	Read/Write
2883	Multi-Variable Temperature	0 Inferred	Read/Write
2884-2887	Spare		
2888	Reserved		
2889-2890	Spare		
2891	Boolean Scratch Pad#1	0 Inferred	Read/Write
2892	Boolean Scratch Pad#2	0 Inferred	Read/Write
2893	Boolean Scratch Pad#3	0 Inferred	Read/Write
2894	Boolean Scratch Pad#4	0 Inferred	Read/Write
2895	Boolean Scratch Pad#5	0 Inferred	Read/Write
2896-2910	Spare		
2909	Meter#1 Start/End Batch Command	0 Inferred	Read/Write
2910	Meter#2 Start/End Batch Command	0 Inferred	Read/Write
2911-2914	Analog Input #1 Tag Name	8 Chars.	Read/Write
2915-2918	Analog Input #2 Tag Name	8 Chars.	Read/Write
2919-2922	Analog Input #3 Tag Name	8 Chars.	Read/Write
2923-2926	RTD Input Tag Name	8 Chars.	Read/Write
2927-2930	Analog Output Tag Name	8 Chars	Read/Write
2931-2934	Multi.Var. DP Tag	8 Chars.	Read/Write
2935-2938	Multi.Var. Pressure Tag	8 Chars.	Read/Write
2939-2942	Multi.Var. Temperature Tag	8 Chars.	Read/Write
2943	Meter PID Auto/Manual	0 Inferred	Read/Write
2944	Meter PID Flow Loop Used (1=Yes)	0 Inferred	Read/Write
2945	Meter PID Flow Direct/Reverse Act	0 Inferred	Read/Write
2946	Meter PID Pressure Loop Used (1=Yes)	0 Inferred	Read/Write
2947	Meter PID Pressure Direct/Reverse Act	0 Inferred	Read/Write
2948	Meter PID Flow Loop in Service	0 Inferred	Read/Write
2949	Meter PID Pressure Loop in Service	0 Inferred	Read/Write
2950	Meter PID 0=Low,1=High Signal	0 Inferred	Read/Write
2951	Meter PID Flow Base 0=Gross,1=Net,2=Mass	0 Inferred	Read/Write
2952	Select PID Meter Number (0=None)	0 Inferred	Read/Write
2953	Meter PID Pressure Base	0 Inferred	Read/Write

PID Pressure Base Selection	Description
0	Meter Pressure
1	Spare Input #1 Data
2	Spare Input #2 Data
3	Spare Input #3 Data
4	Spare Input #4 Data

**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
2954	Meter#1 Selection Frequency Meter Pulse– 0:Gross, 1:Mass Cone Meter Linear Factor Thresold Selection – 0: Reynold Number, 1: Mass	0 Inferred	Read/Write
2955	Meter#2 Selection Frequency Meter Pulse– 0:Gross, 1:Mass Cone Meter Linear Factor Thresold Selection – 0: Reynold Number, 1: Mass	0 Inferred	Read/Write
2956-2979	Spare		
2980	Spare		
2981-2984	Spare		
2985	Analog Output –Remote Control (0-100)	0 Inferred	Read
2986-2990	Spare		
2991	Reset PID		

**Modbus Address Table – 16 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
3001	Version Number	2 Inferred	Read
3002	Reserved		
3003	Reserved		
3004	Prev. Day of Current or Last Month Data Request ( + ) Day for the Current Month ( - ) Day for the Previous Month  Error Checking – Invalid Data -> 999 Valid Data -> 900 + Day	0 Inferred	Read/Write
3005	Last Batch Report Request	0 Inferred	Write
3006	Meter #2 Product Used	0 Inferred	Read
3007	Meter #1 Product Used	0 Inferred	Read
3008-3011	Meter #1 ID	8 Chars	Read
3012	Spare		
3013-3017	Reserved	0 Inferred	Read
3018	Flow Computer Unit Number	0 Inferred	Read
3019	Disable Alarms (1=Yes)	0 Inferred	Read/Write
3020	Last Calibration Data Reprot Request	0 Inferred	Write
3021	Last Month Summary Report Request	0 Inferred	Write
3022	Last Month Summary Report Pointer	0 Inferred	Write
3023	Applicaton Tag	0 Inferred	Read
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 3431-3653	0 Inferred	Write
3027	Last Month Report Request(1=Latest,2=Oldest) Set Last Month Report Request to 1 Monthly Data Area in Location 3431-3653	0 Inferred	Write
3028	Reserved		
3029	Last Hourly Report Request(1=Latest,750=Oldest)	0 Inferred	Write
3030	Last Alarm Report Request (1=Latest,60=Oldest)	0 Inferred	Write
3031	Last Audit Report Request (1=Latest,60=Oldest)	0 Inferred	Write
3032	Time Clock – Month		Read
3033	Time Clock – Day		Read
3034	Time Clock – Year (2 Digits)		Read
3035	Time Clock – Hour		Read
3036	Time Clock – Minute		Read
3037	Time Clock – Second		Read
3038-3081	Spare		
3081-3121	Modbus Shift Data Area – 2 Bytes		

**Modbus 16-bit Address Table Ends**

## Modbus Address Table – 32 Bits

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

3131	Meter#1 Daily Gross Total	*1 or 2 inferred	Read
3133	Meter#1 Daily Net Total	*1 or 2 inferred	Read
3135	Meter#1 Daily Mass Total	*1 or 2 inferred	Read
3137	Meter#1 Daily Energy Total	*1 or 2 inferred	Read
3139	Meter#1 Hourly Gross Total	*1 or 2 Inferred	Read
3141	Meter#1 Hourly Net Total	*1 or 2 Inferred	Read
3143	Meter#1 Hourly Mass Total	*1 or 2 Inferred	Read
3145	Meter#1 Hourly Energy Total	*1 or 2 Inferred	Read
3147	Meter#1 Monthly Gross Total	*1 or 2 Inferred	Read
3149	Meter#1 Monthly Net Total	*1 or 2 Inferred	Read
3151	Meter#1 Monthly Mass Total	*1 or 2 Inferred	Read
3153	Meter#1 Monthly Energy Total	*1 or 2 Inferred	Read
3155	Meter#1 Cumulative Gross Total	0 Inferred	Read
3157	Meter#1 Cumulative Net Total	0 Inferred	Read
3159	Meter#1 Cumulative Mass Total	0 Inferred	Read
3161	Meter#1 Cumulative Energy Total	0 Inferred	Read
3163	Meter#1 Meter Factor	6 Inferred	Read
3165	Meter#1 Linear Factor	6 Inferred	Read
3167	Meter#2 Meter Factor	6 Inferred	Read
3169	Meter#2 Linear Factor	6 Inferred	Read
3171-3179	Spare		
3181	Meter#2 Hourly Gross Total	*1 or 2 Inferred	Read
3183	Meter#2 Hourly Net Total	*1 or 2 Inferred	Read
3185	Meter#2 Hourly Mass Total	*1 or 2 Inferred	Read
3187	Meter#2 Hourly Energy Total	*1 or 2 Inferred	Read
3189	Meter#2 Monthly Gross Total	*1 or 2 Inferred	Read
3191	Meter#2 Monthly Net Total	*1 or 2 Inferred	Read
3193	Meter#2 Monthly Mass Total	*1 or 2 Inferred	Read
3195	Meter#2 Monthly Energy Total	*1 or 2 Inferred	Read
3197-3209	Spare		
3211-3223	Reserved		
3225-3229	Spare		
3231	Current Prove Point1–Master Meter Linear Factor	6 Inferred	Read
3233	Current Prove Point2–Master Meter Linear Factor	6 Inferred	Read
3235	Current Prove Point3–Master Meter Linear Factor	6 Inferred	Read
3237	Current Prove Point4–Master Meter Linear Factor	6 Inferred	Read
3239	Current Prove Point5–Master Meter Linear Factor	6 Inferred	Read
3241	Current Prove Point6–Master Meter Linear Factor	6 Inferred	Read
3243	Current Prove Point7–Master Meter Linear Factor	6 Inferred	Read
3245	Current Prove Point8–Master Meter Linear Factor	6 Inferred	Read
3247	Current Prove Point9–Master Meter Linear Factor	6 Inferred	Read
3249	Current Prove Point10–Master Meter Linear Factor	6 Inferred	Read
3251	Current Prove Point11–Master Meter Linear Factor	6 Inferred	Read
3253	Current Prove Point12–Master Meter Linear Factor	6 Inferred	Read
3255	Current Prove Point13–Master Meter Linear Factor	6 Inferred	Read
3257	Current Prove Point14–Master Meter Linear Factor	6 Inferred	Read
3259	Current Prove Point15–Master Meter Linear Factor	6 Inferred	Read

3261	Current Prove Point16–Master Meter Linear Factor	6 Inferred	Read
3263	Current Prove Point17–Master Meter Linear Factor	6 Inferred	Read
3265	Current Prove Point18–Master Meter Linear Factor	6 Inferred	Read
3267	Current Prove Point19–Master Meter Linear Factor	6 Inferred	Read
3269	Current Prove Point20–Master Meter Linear Factor	6 Inferred	Read
3271	Current Prove Point#1 DP Meter Actual CD	6 Inferred	Read
3273	Current Prove Point#2 DP Meter Actual CD	6 Inferred	Read
3275	Current Prove Point#3 DP Meter Actual CD	6 Inferred	Read
3277	Current Prove Point#4 DP Meter Actual CD	6 Inferred	Read
3279	Current Prove Point#5 DP Meter Actual CD	6 Inferred	Read
3281	Current Prove Point#6 DP Meter Actual CD	6 Inferred	Read
3283	Current Prove Point#7 DP Meter Actual CD	6 Inferred	Read
3285	Current Prove Point#8 DP Meter Actual CD	6 Inferred	Read
3287	Current Prove Point#9 DP Meter Actual CD	6 Inferred	Read
3289	Current Prove Point#10 DP Meter Actual CD	6 Inferred	Read
3291	Current Prove Point#11 DP Meter Actual CD	6 Inferred	Read
3293	Current Prove Point#12 DP Meter Actual CD	6 Inferred	Read
3295	Current Prove Point#13 DP Meter Actual CD	6 Inferred	Read
3297	Current Prove Point#14 DP Meter Actual CD	6 Inferred	Read
3299	Current Prove Point#15 DP Meter Actual CD	6 Inferred	Read
3301	Current Prove Point#16 DP Meter Actual CD	6 Inferred	Read
3303	Current Prove Point#17 DP Meter Actual CD	6 Inferred	Read
3305	Current Prove Point#18 DP Meter Actual CD	6 Inferred	Read
3307	Current Prove Point#19 DP Meter Actual CD	6 Inferred	Read
3309	Current Prove Point#20 DP Meter Actual CD	6 Inferred	Read
3311	Current Prove Point#1 DP Meter DP	6 Inferred	Read
3313	Current Prove Point#2 DP Meter DP	6 Inferred	Read
3315	Current Prove Point#3 DP Meter DP	6 Inferred	Read
3317	Current Prove Point#4 DP Meter DP	6 Inferred	Read
3319	Current Prove Point#5 DP Meter DP	6 Inferred	Read
3321	Current Prove Point#6 DP Meter DP	6 Inferred	Read
3323	Current Prove Point#7 DP Meter DP	6 Inferred	Read
3325	Current Prove Point#8 DP Meter DP	6 Inferred	Read
3327	Current Prove Point#9 DP Meter DP	6 Inferred	Read
3329	Current Prove Point#10 DP Meter DP	6 Inferred	Read
3331	Current Prove Point#11 DP Meter DP	6 Inferred	Read
3333	Current Prove Point#12 DP Meter DP	6 Inferred	Read
3335	Current Prove Point#13 DP Meter DP	6 Inferred	Read
3337	Current Prove Point#14 DP Meter DP	6 Inferred	Read
3339	Current Prove Point#15 DP Meter DP	6 Inferred	Read
3341	Current Prove Point#16 DP Meter DP	6 Inferred	Read
3343	Current Prove Point#17 DP Meter DP	6 Inferred	Read
3345	Current Prove Point#18 DP Meter DP	6 Inferred	Read
3347	Current Prove Point#19 DP Meter DP	6 Inferred	Read
3349	Current Prove Point#20 DP Meter DP	6 Inferred	Read
3351	Analog Output MA Value	3 Inferred	Read
3353	Display Contrast	0 Inferred	Read
3355	Current Prove Status	0 Inferred	Read
3357	Current Prove-Master Meter Frequency	0 Inferred	Read
3359	Current Prove-DP Meter DP	4 Inferred	Read
3361	Current Prove-DP Meter Pipe ID	5 Inferred	Read
3363	Current Prove- DP Meter Blockage Number	5 Inferred	Read
3365	Current Prove- DP Meter Viscosity	6 Inferred	Read



3367-3371	Spare		
3373-3375	Reserved		
3377	Spare		
3379	Reserved		
3381	Current Prove Cone Meter Point#20– Actual CD	6 Inferred	Read
3383	Analog Output Output %	2 Inferred	Read
3385	Current Prove Point#1 DP METER CD	6 Inferred	Read
3387	Current Prove Point#2 DP METER CD	6 Inferred	Read
3389	Current Prove Point#3 DP METER CD	6 Inferred	Read
3391	Current Prove Point#4 DP METER CD	6 Inferred	Read
3393	Current Prove Point#5 DP METER CD	6 Inferred	Read
3395	Current Prove Point#6 DP METER CD	6 Inferred	Read
3397	Current Prove Point#7 DP METER CD	6 Inferred	Read
3399	Current Prove Point#8 DP METER CD	6 Inferred	Read
3401	Current Prove Point#9 DP METER CD	6 Inferred	Read
3403	Current Prove Point#10 DP METER CD	6 Inferred	Read
3405	Current Prove Point#11 DP METER CD	6 Inferred	Read
3407	Current Prove Point#12 DP METER CD	6 Inferred	Read
3409	Current Prove Point#13 DP METER CD	6 Inferred	Read
3411	Current Prove Point#14 DP METER CD	6 Inferred	Read
3413	Current Prove Point#15 DP METER CD	6 Inferred	Read
3415	Current Prove Point#16 DP METER CD	6 Inferred	Read
3417	Current Prove Point#17 DP METER CD	6 Inferred	Read
3419	Current Prove Point#18 DP METER CD	6 Inferred	Read
3421	Current Prove Point#19 DP METER CD	6 Inferred	Read
3423-3429	Reserved		

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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**Last Daily or Monthly Data Area****Set Last Daily Report Request (3026) to 1=Latest,35=Oldest**

(3026,16bits Integer,Write only)

**Daily Data Area in Location 3431-3653****Set Last Monthly Report Request (3027) to 1=Latest,2=Oldest**

(3027,16bits Integer,Write only)

**Monthly Data Area in Location 3431-3653**

3431	Meter #1 Product	0 Inferred	Read
3433	Day/Month Start Date	0 Inferred	Read
3435	Day/Month Start Time	0 Inferred	Read
3437-3439	Meter#1 ID	8 Chars.	Read
3441	Meter#1 Flowing Time	1 Inferred	Read
3443	Meter#1 Daily/Monthly Gross Total	**1 or 2 Inferred	Read
3445	Meter#1 Daily/Monthly Net Total	**1 or 2 Inferred	Read
3447	Meter#1 Daily/Monthly Mass Total	**1 or 2 Inferred	Read
3449	Meter#1 Daily/Monthly Energy Total	**1 or 2 Inferred	Read
3451	Meter#1 Average DP	4 Inferred	Read
3453	Meter#1 Average Temperature	2 Inferred	Read
3455	Meter#1 Average Pressure	2 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/API	*6 or 1 Inferred	Read
3463	Meter#1 Average N2	4 Inferred	Read
3465	Meter#1 Average CO2	4 Inferred	Read
3467	Meter#1 Average Methane	4 Inferred	Read
3469	Meter#1 Average Ethane	4 Inferred	Read
3471	Meter#1 Average Propane	4 Inferred	Read
3473	Meter#1 Average Water	4 Inferred	Read
3475	Meter#1 Average H2S	4 Inferred	Read
3477	Meter#1 Average H2	4 Inferred	Read
3479	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	Meter#1 Cumulative Gross Total	0 Inferred	Read
3507	Meter#1 Cumulative Net Total	0 Inferred	Read
3509	Meter#1 Cumulative Mass Total	0 Inferred	Read
3511	Meter#1 Cumulative Energy Total	0 Inferred	Read
3513-3515	Spare		

(Month total roll over at 999999999. Use the following method to get correct value with 1 decimal inferred.

Total (Double) = (Roll Over Number x 999999999+ Total) / 10.

\*Note: 2049=Meter#1 SG/API Decimal Places,2050=Meter#2 SG/API Decimal Places

\*\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
3533	Meter#1 Average- Density US Unit – Gas Application 5 decimal inferred, Liquid Application 3 decimal Inferred Metric Unit – Gas Application 5 decimal inferred, Liquid Application 1 decimal inferred	1, 3, or 5 Inferred	Read
3535	Meter#1 Average- Density@60,@15,@20 US unit – Gas Application 6 decimal inferred, Liquid Application 3 decimal Inferred Metric Unit – Gas Application 6 decimal inferred , Liquid Application 1 decimal inferred	1, 3 or 6 Inferred	Read
3517	Roll Over Number – Meter#1 Gross Month Total	0 Inferred	Read
3519	Roll Over Number – Meter#1 Net Month Total	0 Inferred	Read
3521	Roll Over Number – Meter#1 Mass Month Total	0 Inferred	Read
3523	Roll Over Number – Meter#1 Energy Month Total	0 Inferred	Read
3525	Roll Over Number – Meter#2 Gross Month Total	0 Inferred	Read
3527	Roll Over Number – Meter#2 Net Month Total	0 Inferred	Read
3529	Roll Over Number – Meter#2 Mass Month Total	0 Inferred	Read
3531	Roll Over Number – Meter#2 Energy Month Total	0 Inferred	Read
3537	Meter#1 Average K/CD/LMF	6 Inferred	Read
3539	Meter#1 Average CTL	5 Inferred	Read
3541	Meter#1 Average CPL	5 Inferred	Read
3543	Meter#1 Average BS&W Percentage	2 Inferred	Read
3545	Meter#2 Average BS&W Percentage	2 Inferred	Read
3547	Meter#1 Average CTPL	5 Inferred	Read
3549	Meter#2 Average CTPL	5 Inferred	Read
3551	Spare		
3553	Spare		
3555	Meter#2 Product	0 Inferred	Read
3557-3559	Meter#2 ID	8 Chars.	Read
3561	Meter#2 Flowing Time	1 Inferred	Read
3563	Meter#2 Daily/Monthly Gross Total	*1 or 2 Inferred	Read
3565	Meter#2 Daily/Monthly Net Total	*1 or 2 Inferred	Read
3567	Meter#2 Daily/Monthly Mass Total	*1 or 2 Inferred	Read
3569	Meter#2 Daily/Monthly Energy Total	*1 or 2 Inferred	Read
3571	Meter#2 Average DP	4 Inferred	Read
3573	Meter#2 Average Temperature	2 Inferred	Read
3575	Meter#2 Average Pressure	2 Inferred	Read
3577	Meter#2 Average DP_EXT	4 Inferred	Read
3579	Meter#2 Average Heating Value	3 Inferred	Read
3581	Meter#2 Average SG/API	*6 or 1 Inferred	Read

\*Note: 2049=Meter#1 SG/API Decimal Places,2050=Meter#2 SG/API Decimal Places

\*\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
3583	Meter#2 Average N2	4 Inferred	Read
3585	Meter#2 Average CO2	4 Inferred	Read
3587	Meter#2 Average Methane	4 Inferred	Read
3589	Meter#2 Average Ethane	4 Inferred	Read
3591	Meter#2 Average Propane	4 Inferred	Read
3593	Meter#2 Average Water	4 Inferred	Read
3595	Meter#2 Average H2S	4 Inferred	Read
3597	Meter#2 Average H2	4 Inferred	Read
3599	Meter#2 Average CO	4 Inferred	Read
3601	Meter#2 Average Oxygen	4 Inferred	Read
3603	Meter#2 Average i-Butane	4 Inferred	Read
3605	Meter#2 Average n-Butane	4 Inferred	Read
3607	Meter#2 Average i-Pentane	4 Inferred	Read
3609	Meter#2 Average n-Pentane	4 Inferred	Read
3611	Meter#2 Average n-Hexane	4 Inferred	Read
3613	Meter#2 Average n-Heptane	4 Inferred	Read
3615	Meter#2 Average n-Octane	4 Inferred	Read
3617	Meter#2 Average n-Nonane	4 Inferred	Read
3619	Meter#2 Average n-Decane	4 Inferred	Read
3621	Meter#2 Average Helium	4 Inferred	Read
3623	Meter#2 Average Argon	4 Inferred	Read
3625	Meter#2 Cumulative Gross Total	0 Inferred	Read
3627	Meter#2 Cumulative Net Total	0 Inferred	Read
3629	Meter#2 Cumulative Mass Total	0 Inferred	Read
3631	Meter#2 Cumulative Energy Total	0 Inferred	Read
3633	Meter#2 Average- Density US Unit – Gas Application 5 decimal inferred, Liquid Application 3 decimal Inferred Metric Unit – Gas Application 5 decimal inferred, Liquid Application 1 decimal inferred	5,3,or 1 Inferred	Read
3635	Meter#2 Average- Density@60,@15,@20 US Unit – Gas Application 6 decimal inferred, Liquid Application 3 decimal Inferred Metric Unit – Gas Application 6 decimal inferred , Liquid Application1 decimal inferred	6,3,or 1 Inferred	Read
3637	Meter#2 Average K/CD/LMF	6 Inferred	Read
3639	Meter#2 Average CTL	5 Inferred	Read
3641	Meter#2 Average CPL	5 Inferred	Read
3643	Spare Input #1 Averaged Data	2 Inferred	Read
3645	Spare Input #2 Averaged Data	2 Inferred	Read
3647	Spare Input #3 Averaged Data	2 Inferred	Read
3649	Spare Input #4 Averaged Data	2 Inferred	Read
3651	Auxiliary Meter Daily or Monthly Total	0 Inferred	Read
3653	Auxiliary Meter Cumulative Total	0 Inferred	Read

**Last Daily or Monthly Data Area Ends**

## **Modbus Address Table – 32 Bits**

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

**Set Last Batch Report Request (3005) to 1=Latest,10=Oldtest**  
(3005,16bits Integer,Write only)

**Batch Data Area in Location 3657-3685**

3657	Start Date	0 Inferred	Read
3659	Start Time	0 Inferred	Read
3661	End Date	0 Inferred	Read
3663	End Time	0 Inferred	Read
3665	Opening Gross Total	2 Inferred	Read
3667	Closing Gross Total	2 Inferred	Read
3669	Opening Net Total	2 Inferred	Read
3671	Closing Net Total	2 Inferred	Read
3673	Averaged Temperature	2 Inferred	Read
3675	Averaged Pressure	2 Inferred	Read
3677	Averaged API/SG	4 Inferred	Read
3679	Averaged CTL	5 Inferred	Read
3681	Averaged CPL	5 Inferred	Read
3683-3685	Meter ID	8 Chars	Read
3687	Averaged CTPL	5 Inferred	Read

### **Last Batch Data Area Ends**

3689	Spare		
3691	Current Prove Point#1 DP Meter ReynoldNo	1 Inferred	Read
3693	Current Prove Point#2 DP Meter ReynoldNo	1 Inferred	Read
3695	Current Prove Point#3 DP Meter ReynoldNo	1 Inferred	Read
3697	Current Prove Point#4 DP Meter ReynoldNo	1 Inferred	Read
3699	Current Prove Point#5 DP Meter ReynoldNo	1 Inferred	Read
3701	Current Prove Point#6 DP Meter ReynoldNo	1 Inferred	Read
3703	Current Prove Point#7 DP Meter ReynoldNo	1 Inferred	Read
3705	Current Prove Point#8 DP Meter ReynoldNo	1 Inferred	Read
3707	Current Prove Point#9 DP Meter ReynoldNo	1 Inferred	Read
3709	Current Prove Point#10 DP Meter Reynold No	1 Inferred	Read
3711	Current Prove Point#11 DP Meter Reynold No	1 Inferred	Read
3713	Current Prove Point#12 DP Meter Reynold No	1 Inferred	Read
3715	Current Prove Point#13 DP Meter Reynold No	1 Inferred	Read
3717	Current Prove Point#14 DP Meter Reynold No	1 Inferred	Read
3719	Current Prove Point#15 DP Meter Reynold No	1 Inferred	Read
3721	Current Prove Point#16 DP Meter Reynold No	1 Inferred	Read
3723	Current Prove Point#17 DP Meter Reynold No	1 Inferred	Read
3725	Current Prove Point#18 DP Meter Reynold No	1 Inferred	Read
3727	Current Prove Point#19 DP Meter Reynold No	1 Inferred	Read
3729	Current Prove Point#20 DP Meter Reynold No	1 Inferred	Read
3731-3761	Spare		
3763-3765	Reserved		
3767-3817	Spare		

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL READ/WRITE	
3819-3999	Modbus Shift Data Area – 4 Bbytes		
4001-4089	Reserved		
4091-4109	Spare		
4111	Meter PID – Pressure	2 Inferred	Read
4113	Meter PID – Flow	2 Inferred	Read
4115	Meter PID – Output %	2 Inferred	Read
4117	Meter PID – Flow Output %	2 Inferred	Read
4119	Meter PID – Pressure Output %	2 Inferred	Read
4121-4153	Spare		
4155-4157	Reserved		
4161-4165	Spare		
4167-4177	Reserved		
4179-4199	Spare		

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4201	Date (MMDDYY)	0 Inferred	Read/Write
4203	Time (HHMMSS)	0 Inferred	Read/Write
<b>AGA 8 GROSS METHOD 1</b>			
4205	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4207	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4209	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4211-4373	Spare		
<b>AGA 8 GROSS METHOD 2</b>			
4205	Meter#1 Mol % of Nitrogen	4 Inferred	Read/Write
4207	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4209	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4211	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4213-4373	Spare		
<b>AGA 8 Detail Method</b>			
4205	Meter#1 Mol % of Methane	4 Inferred	Read/Write
4207	Meter#1 Mol % of Nitrogen	4 Inferred	Read/Write
4209	Meter#1 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4211	Meter#1 Mol % of Ethane	4 Inferred	Read/Write
4213	Meter#1 Mol % of Propane	4 Inferred	Read/Write
4215	Meter#1 Mol % of Water	4 Inferred	Read/Write
4217	Meter#1 Mol % of Hydrogen Sulfide	4 Inferred	Read/Write
4219	Meter#1 Mol % of Hydrogen	4 Inferred	Read/Write
4221	Meter#1 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4223	Meter#1 Mol % of Oxygen	4 Inferred	Read/Write
4225	Meter#1 Mol % of i-Butane	4 Inferred	Read/Write
4227	Meter#1 Mol % of n-Butane	4 Inferred	Read/Write
4229	Meter#1 Mol % of i-Pentane	4 Inferred	Read/Write
4231	Meter#1 Mol % of n-Pentane	4 Inferred	Read/Write
4233	Meter#1 Mol % of i-Hexane	4 Inferred	Read/Write
4235	Meter#1 Mol % of n-Heptane	4 Inferred	Read/Write
4237	Meter#1 Mol % of i-Octane	4 Inferred	Read/Write
4239	Meter#1 Mol % of i-Nonane	4 Inferred	Read/Write
4241	Meter#1 Mol % of i-Decane	4 Inferred	Read/Write
4243	Meter#1 Mol % of Helium	4 Inferred	Read/Write
4245	Meter#1 Mol % of Argon	4 Inferred	Read/Write

**AGA 8 Detail Method Ends**

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4247	DP Verification Point	4 Inferred	Read/Write
4249	Pressure Verification Point	2 Inferred	Read/Write
4251	Temperature Verification Point	2 Inferred	Read/Write
4253-4255	Spare		
4257	Meter#2 Cone Threshold #7	1 Inferred	Read/Write
4259	Meter#2 Cone Threshold #8	1 Inferred	Read/Write
4261	Meter#2 Cone Threshold #9	1 Inferred	Read/Write
4263	Meter#2 Cone Threshold #10	1 Inferred	Read/Write
4265	Meter#2 Cone Threshold #11	1 Inferred	Read/Write
4267	Meter#2 Cone Threshold #12	1 Inferred	Read/Write
4269	Meter#2 Cone Threshold #13	1 Inferred	Read/Write
4271	Meter#2 Cone Threshold #14	1 Inferred	Read/Write
4273	Meter#2 Cone Threshold #15	1 Inferred	Read/Write
4275	Meter#2 Cone Threshold #16	1 Inferred	Read/Write
4277	Meter#2 Cone Threshold #17	1 Inferred	Read/Write
4279	Meter#2 Cone Threshold #18	1 Inferred	Read/Write
4281	Meter#2 Cone Threshold #19	1 Inferred	Read/Write
4283	Meter#2 Cone Threshold #20	1 Inferred	Read/Write
4285	Meter#2 Cone Threshold #1	1 Inferred	Read/Write
4287	Meter#2 Cone Threshold #2	1 Inferred	Read/Write
4289	Meter#2 Cone Threshold #3	1 Inferred	Read/Write
4291	Meter#2 Cone Threshold #4	1 Inferred	Read/Write
4293	Meter#2 Cone Threshold #5	1 Inferred	Read/Write
4295	Meter#2 Cone Threshold #6	1 Inferred	Read/Write
4297	Meter#2 Cone – Flow Coeff. Linear Factor #1	6 Inferred	Read/Write
4299	Meter#2 Cone – Flow Coeff. Linear Factor #2	6 Inferred	Read/Write
4301	Meter#2 Cone – Flow Coeff. Linear Factor #3	6 Inferred	Read/Write
4303	Meter#2 Cone – Flow Coeff. Linear Factor #4	6 Inferred	Read/Write
4305	Meter#2 Cone – Flow Coeff. Linear Factor #5	6 Inferred	Read/Write
4307	Meter#2 Cone – Flow Coeff. Linear Factor #6	6 Inferred	Read/Write
4309	Meter#2 Density of Dry Air	5 Inferred	Read/Write
4311	Meter#2 Relative Density (Base Specific Gravity)	6 Inferred	Read/Write
4313	Meter#2 Ratio of Heat	4 Inferred	Read/Write
4315	Meter#2 Viscosity	6 Inferred	Read/Write
4317	Meter#2 Pipe Thermal E-6	2 Inferred	Read/Write
4319	Meter#2 Orifice Thermal E-6	2 Inferred	Read/Write
4321	Meter#2 Reference Temperature of Pipe	2 Inferred	Read/Write
4323	Meter#2 Reference Temperature of Orifice	2 Inferred	Read/Write
4325	Meter#2 ISO5167 up-stream Tapping	2 Inferred	Read/Write
4327	Meter#2 ISO5167 down-stream Tapping	2 Inferred	Read/Write
4329	Meter#2 DP Cut Off	4 Inferred	Read/Write
4331	Spare		
4333	Meter#2 Meter Factor	6 Inferred	Read/Write
4335	Meter#2 Flow Threshold #1	2 Inferred	Read/Write
4337	Meter#2 Flow Threshold #2	2 Inferred	Read/Write
4339	Meter#2 Flow Threshold #3	2 Inferred	Read/Write
4341	Meter#2 Flow Threshold #4	2 Inferred	Read/Write
4343	Meter#2 Linear Factor #1	6 Inferred	Read/Write
4345	Meter#2 Linear Factor #2	6 Inferred	Read/Write
4347	Meter#2 Linear Factor #3	6 Inferred	Read/Write
4349	Meter#2 Linear Factor #4	6 Inferred	Read/Write



**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4351	Meter#1 Cone Threshold #1	1 Inferred	Read/Write
4353	Meter#1 Cone Threshold #2	1 Inferred	Read/Write
4355	Meter#1 Cone Threshold #3	1 Inferred	Read/Write
4357	Meter#1 Cone Threshold #4	1 Inferred	Read/Write
4359	Meter#1 Cone Threshold #5	1 Inferred	Read/Write
4361	Meter#1 Cone Threshold #6	1 Inferred	Read/Write
4363	Meter#1 Cone – Flow Coeff. Linear Factor #1	6 Inferred	Read/Write
4365	Meter#1 Cone – Flow Coeff. Linear Factor #2	6 Inferred	Read/Write
4367	Meter#1 Cone – Flow Coeff. Linear Factor #3	6 Inferred	Read/Write
4369	Meter#1 Cone – Flow Coeff. Linear Factor #4	6 Inferred	Read/Write
4371	Meter#1 Cone – Flow Coeff. Linear Factor #5	6 Inferred	Read/Write
4373	Meter#1 Cone – Flow Coeff. Linear Factor #6	6 Inferred	Read/Write
4375	Meter#1 Density of Dry Air	5 Inferred	Read/Write
4377	Meter#1 Relative Density (Base Specific Gravity)	6 Inferred	Read/Write
4379	Meter#1 Ratio of Heat	4 Inferred	Read/Write
4381	Meter#1 Viscosity	6 Inferred	Read/Write
4383	Meter#1 Pipe Thermal E-6	2 Inferred	Read/Write
4385	Meter#1 Orifice Thermal E-6	2 Inferred	Read/Write
4387	Meter#1 Reference Temperature of Pipe	2 Inferred	Read/Write
4389	Meter#1 Reference Temperature of Orifice	2 Inferred	Read/Write
4391	Meter#1 ISO5167 up-stream Tapping	2 Inferred	Read/Write
4393	Meter#1 ISO5167 down-stream Tapping	2 Inferred	Read/Write
4395	Meter#1 DP Cut Off	4 Inferred	Read/Write
4397	Spare		
4399	Meter#1 Meter Factor	6 Inferred	Read/Write
4401	Meter#1 Flow Threshold #1	2 Inferred	Read/Write
4403	Meter#1 Flow Threshold #2	2 Inferred	Read/Write
4405	Meter#1 Flow Threshold #3	2 Inferred	Read/Write
4407	Meter#1 Flow Threshold #4	2 Inferred	Read/Write
4409	Meter#1 Linear Factor #1	6 Inferred	Read/Write
4411	Meter#1 Linear Factor #2	6 Inferred	Read/Write
4413	Meter#1 Linear Factor #3	6 Inferred	Read/Write
4415	Meter#1 Linear Factor #4	6 Inferred	Read/Write
4417	Meter #1 Graphic Setup – DP Maximum	0 Inferred	Read/Write
4419	Meter #1 Graphic Setup – Pressure Maximum	0 Inferred	Read/Write
4421	Meter #1 Graphic Setup – Temperature Maximum	0 Inferred	Read/Write
4423	Meter #1 Graphic Setup – Flow Maximum	0 Inferred	Read/Write
4425	Meter #2 Graphic Setup – DP Maximum	0 Inferred	Read/Write
4427	Meter #2 Graphic Setup – Pressure Maximum	0 Inferred	Read/Write
4429	Meter #2 Graphic Setup – Temperature Maximum	0 Inferred	Read/Write
4431	Meter #2 Graphic Setup – Flow Maximum	0 Inferred	Read/Write
4433	Spare		
4435	Meter#1 Annubar Manometer Factor	6 Inferred	Read/Write
4437	Meter#1 Annubar Location Factor	6 Inferred	Read/Write
4439	Meter#1 Annubar Reynolds Number Factor	6 Inferred	Read/Write
4441	Meter#1 Annubar Flow Coefficient K	6 Inferred	Read/Write
4443	Meter#1 Annubar Thermal Expansion Factor	6 Inferred	Read/Write
4445	Meter#2 Annubar Manometer Factor	6 Inferred	Read/Write
4447	Meter#2 Annubar Location Factor	6 Inferred	Read/Write
4449	Meter#2 Annubar Reynolds Number Factor	6 Inferred	Read/Write
4451	Meter#2 Annubar Flow Coefficient K	6 Inferred	Read/Write
4453	Meter#2 Annubar Thermal Expansion Factor	6 Inferred	Read/Write

**Modbus Address Table – 32 Bits****ADDRESS      DESCRIPTION      DECIMAL      READ/WRITE****AGA 8 GROSS METHOD 1**

4455	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4457	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4459	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4461-4495	Spare		

**AGA 8 GROSS METHOD 2**

4455	Meter#2 Mol % of Nitrogen	4 Inferred	Read/Write
4457	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4459	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4461	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4463-4495	Spare		

**AGA 8 Detail Method**

4455	Meter#2 Mol % of Methane	4 Inferred	Read/Write
4457	Meter#2 Mol % of Nitrogen	4 Inferred	Read/Write
4459	Meter#2 Mol % of Carbon Dioxide	4 Inferred	Read/Write
4461	Meter#2 Mol % of Ethane	4 Inferred	Read/Write
4463	Meter#2 Mol % of Propane	4 Inferred	Read/Write
4465	Meter#2 Mol % of Water	4 Inferred	Read/Write
4467	Meter#2 Mol % of Hydrogen Sulfide	4 Inferred	Read/Write
4469	Meter#2 Mol % of Hydrogen	4 Inferred	Read/Write
4471	Meter#2 Mol % of Carbon Monoxide	4 Inferred	Read/Write
4473	Meter#2 Mol % of Oxygen	4 Inferred	Read/Write
4475	Meter#2 Mol % of i-Butane	4 Inferred	Read/Write
4477	Meter#2 Mol % of n-Butane	4 Inferred	Read/Write
4479	Meter#2 Mol % of i-Pentane	4 Inferred	Read/Write
4481	Meter#2 Mol % of n-Pentane	4 Inferred	Read/Write
4483	Meter#2 Mol % of i-Hexane	4 Inferred	Read/Write
4485	Meter#2 Mol % of n-Heptane	4 Inferred	Read/Write
4487	Meter#2 Mol % of i-Octane	4 Inferred	Read/Write
4489	Meter#2 Mol % of i-Nonane	4 Inferred	Read/Write
4491	Meter#2 Mol % of i-Decane	4 Inferred	Read/Write
4493	Meter#2 Mol % of Helium	4 Inferred	Read/Write
4495	Meter#2 Mol % of Argon	4 Inferred	Read/Write

**AGA 8 Detail Method Ends**

4497	Meter #1 Tank Volumes Offset	2 Inferred	Read/Write
4499	Meter #1 Tank – Thermal Expansion	2 Inferred	Read/Write
4501	Meter #1 Tank – Reference Temperature	2 Inferred	Read/Write
4503	Meter #2 Tank Volumes Offset	2 Inferred	Read/Write
4505	Meter #2 Tank – Thermal Expansion	2 Inferred	Read/Write
4507	Meter #2 Tank – Reference Temperature	2 Inferred	Read/Write
4509-4519	Spare		

4521	Meter#2 Cone – Flow Coeff. Linear Factor #7	6 Inferred	Read/Write
4523	Meter#2 Cone – Flow Coeff. Linear Factor #8	6 Inferred	Read/Write
4525	Meter#2 Cone – Flow Coeff. Linear Factor #9	6 Inferred	Read/Write
4527	Meter#2 Cone – Flow Coeff. Linear Factor #10	6 Inferred	Read/Write
4529	Meter#2 Cone – Flow Coeff. Linear Factor #11	6 Inferred	Read/Write
4531	Meter#2 Cone – Flow Coeff. Linear Factor #12	6 Inferred	Read/Write

4533	Meter#2 Cone – Flow Coeff. Linear Factor #13	6 Inferred	Read/Write
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**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4535	Meter#2 Cone – Flow Coeff. Linear Factor #14	6 Inferred	Read/Write
4537	Meter#2 Cone – Flow Coeff. Linear Factor #15	6 Inferred	Read/Write
4539	Meter#2 Cone – Flow Coeff. Linear Factor #16	6 Inferred	Read/Write
4541	Meter#2 Cone – Flow Coeff. Linear Factor #17	6 Inferred	Read/Write
4543	Meter#2 Cone – Flow Coeff. Linear Factor #18	6 Inferred	Read/Write
4545	Meter#2 Cone – Flow Coeff. Linear Factor #19	6 Inferred	Read/Write
4547	Meter#2 Cone – Flow Coeff. Linear Factor #20	6 Inferred	Read/Write
4549	Multi.Var. DP Low Limit	4 Inferred	Read/Write
4551	Multi.Var. DP High Limit	4 Inferred	Read/Write
4553	Multi.Var. DP Maintenance	4 Inferred	Read/Write
4555	Multi.Var. Pressure Low Limit	2 Inferred	Read/Write
4557	Multi.Var. Pressure High Limit	2 Inferred	Read/Write
4559	Multi.Var. Pressure Maintenance	2 Inferred	Read/Write
4561	Multi.Var. Temperature Low Limit	2 Inferred	Read/Write
4563	Multi.Var. Temperature High Limit	2 Inferred	Read/Write
4565	Multi.Var. Temperature Maintenance	2 Inferred	Read/Write
4567	Multi.Var DP Override	4 Inferred	Read/Write
4569	Multi.Var Pressure Override	2 Inferred	Read/Write
4571	Multi.Var Temperature Override	2 Inferred	Read/Write
4573-4611	Spare		
4613	Spare		
4615	Spare		
4617	Multivar.DP Calibration Value	4 Inferred	Read/Write
4619	Multivar.Pressure Calibration Value	2 Inferred	Read/Write
4621	Multivar.Temperature Calibration Value	2 Inferred	Read/Write
4623-4635	Spare		
4637	Ana/RTD Input Calibration Value	3 Inferred	Read/Write
4639-4651	Spare		
4653	Analog Output Percentage	2 Inferred	Read/Write
4655	Meter#1 Water Factor Override	6 Inferred	Read/Write
4657	Meter#1 Heating Value Override	3 Inferred	Read/Write
4659	Meter#1 FPV Override	6 Inferred	Read/Write
4661	Meter#1 Temperature Override	2 Inferred	Read/Write
4663	Meter#1 Pressure Override	2 Inferred	Read/Write
4665	Meter#2 Water Factor Override	6 Inferred	Read/Write
4667	Meter#2 Heating Value Override	3 Inferred	Read/Write
4669	Meter#2 FPV Override	6 Inferred	Read/Write
4671	Meter#2 Temperature Override	2 Inferred	Read/Write
4673	Meter#2 Pressure Override	2 Inferred	Read/Write
4675	Meter#2 BS&W Percentage Override	2 Inferred	Read/Write
4677	Meter#1 BS&W Percentage Override	2 Inferred	Read/Write
4679	Meter#1 CTL Override	5 Inferred	Read/Write
4681	Meter#1 CPL Override	5 Inferred	Read/Write
4683	Meter#2 CTL Override	5 Inferred	Read/Write
4685	Meter#2 CPL Override	5 Inferred	Read/Write
4687-4721			

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4723	Meter#1 Flow Threshold #5	2 Inferred	Read/Write
4725	Meter#1 Flow Threshold #6	2 Inferred	Read/Write
4727	Meter#1 Flow Threshold #7	2 Inferred	Read/Write
4729	Meter#1 Flow Threshold #8	2 Inferred	Read/Write
4731	Meter#1 Flow Threshold #9	2 Inferred	Read/Write
4733	Meter#1 Flow Threshold #10	2 Inferred	Read/Write
4735	Meter#1 Linear Factor #5	6 Inferred	Read/Write
4737	Meter#1 Linear Factor #6	6 Inferred	Read/Write
4739	Meter#1 Linear Factor #7	6 Inferred	Read/Write
4741	Meter#1 Linear Factor #8	6 Inferred	Read/Write
4743	Meter#1 Linear Factor #9	6 Inferred	Read/Write
4745	Meter#1 Linear Factor #10	6 Inferred	Read/Write
4747	Meter#2 Flow Threshold #5	2 Inferred	Read/Write
4749	Meter#2 Flow Threshold #6	2 Inferred	Read/Write
4751	Meter#2 Flow Threshold #7	2 Inferred	Read/Write
4753	Meter#2 Flow Threshold #8	2 Inferred	Read/Write
4755	Meter#2 Flow Threshold #9	2 Inferred	Read/Write
4757	Meter#2 Flow Threshold #10	2 Inferred	Read/Write
4759	Meter#2 Linear Factor #5	6 Inferred	Read/Write
4761	Meter#2 Linear Factor #6	6 Inferred	Read/Write
4763	Meter#2 Linear Factor #7	6 Inferred	Read/Write
4765	Meter#2 Linear Factor #8	6 Inferred	Read/Write
4767	Meter#2 Linear Factor #9	6 Inferred	Read/Write
4769	Meter#2 Linear Factor #10	6 Inferred	Read/Write
4771	Meter#1 Cone Threshold #7	1 Inferred	Read/Write
4773	Meter#1 Cone Threshold #8	1 Inferred	Read/Write
4775	Meter#1 Cone Threshold #9	1 Inferred	Read/Write
4777	Meter#1 Cone Threshold #10	1 Inferred	Read/Write
4779	Meter#1 Cone Threshold #11	1 Inferred	Read/Write
4781	Meter#1 Cone Threshold #12	1 Inferred	Read/Write
4783	Meter#1 Cone Threshold #13	1 Inferred	Read/Write
4785	Meter#1 Cone Threshold #14	1 Inferred	Read/Write
4787	Meter#1 Cone Threshold #15	1 Inferred	Read/Write
4789	Meter#1 Cone Threshold #16	1 Inferred	Read/Write
4791	Meter#1 Cone Threshold #17	1 Inferred	Read/Write
4793	Meter#1 Cone Threshold #18	1 Inferred	Read/Write
4795	Meter#1 Cone Threshold #19	1 Inferred	Read/Write
4797	Meter#1 Cone Threshold #20	1 Inferred	Read/Write
4799	Meter#1 Cone – Flow Coeff. Linear Factor #7	6 Inferred	Read/Write
4801	Meter#1 Cone – Flow Coeff. Linear Factor #8	6 Inferred	Read/Write
4803	Meter#1 Cone – Flow Coeff. Linear Factor #9	6 Inferred	Read/Write
4805	Meter#1 Cone – Flow Coeff. Linear Factor #10	6 Inferred	Read/Write
4807	Meter#1 Cone – Flow Coeff. Linear Factor #11	6 Inferred	Read/Write
4809	Meter#1 Cone – Flow Coeff. Linear Factor #12	6 Inferred	Read/Write
4811	Meter#1 Cone – Flow Coeff. Linear Factor #13	6 Inferred	Read/Write
4813	Meter#1 Cone – Flow Coeff. Linear Factor #14	6 Inferred	Read/Write
4815	Meter#1 Cone – Flow Coeff. Linear Factor #15	6 Inferred	Read/Write
4817	Meter#1 Cone – Flow Coeff. Linear Factor #16	6 Inferred	Read/Write
4819	Meter#1 Cone – Flow Coeff. Linear Factor #17	6 Inferred	Read/Write

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
4821	Meter#1 Cone – Flow Coeff. Linear Factor #18	6 Inferred	Read/Write
4823	Meter#1 Cone – Flow Coeff. Linear Factor #19	6 Inferred	Read/Write
4825	Meter#1 Cone – Flow Coeff. Linear Factor #20	6 Inferred	Read/Write
4827	Pulse Output Volume #1 Pulses/Unit	3 Inferred	Read/Write
4829	Pulse Output Volume #2 Pulses/Unit	3 Inferred	Read/Write
4831	Meter PID Output %	2 Inferred	Read/Write
4833	Meter PID Flow	2 Inferred	Read/Write
4835	Meter PID Flow Set Point	2 Inferred	Read/Write
4837	Meter PID Flow Controller Gain	2 Inferred	Read/Write
4839	Meter PID Flow Controller Reset	2 Inferred	Read/Write
4841	Meter PID Pressure Maximum	2 Inferred	Read/Write
4843	Meter PID Pressure Set Point	2 Inferred	Read/Write
4845	Meter PID Flow Controller Gain	2 Inferred	Read/Write
4847	Meter PID Flow Controller Reset	2 Inferred	Read/Write
4849	Meter PID Minimum Output %	2 Inferred	Read/Write
4851	Meter PID Maximum Output %	2 Inferred	Read/Write
4853-4971	Spare		
4973-4975	Spare		
4975-5019	Reserved		
5021-5029	Spare		

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

5031-5069      Scratch Pad – Program Variable Integer

## Modbus Address Table – 32 Bits

ADDRESS DESCRIPTION DECIMAL READ/WRITE

**3029 = Last Hourly Report Request (1=Lastest, 750=Oldest)**  
(3029,16bits Integer,Write only)

### Last Hourly Data Area

8001	Date (mm/dd/yy)	0 Inferred	Read
8003	Time - Hour (hh)	0 Inferred	Read
8005	Meter#1 Hourly Duration of Flow	1 Inferred	Read
8007	Meter#1 GrossTotal	*1 or 2 Inferred	Read
8009	Meter#1 Net Total	*1 or 2 Inferred	Read
8011	Meter#1 Mass Total	*1 or 2 Inferred	Read
8013	Meter#1 Energy Total	*1 or 2 Inferred	Read
8015	Meter#1 Average Temperature	1 Inferred	Read
8017	Meter#1 Average Pressure	1 Inferred	Read
8019	User Defined Variable#1	0 Inferred	Read
8021	User Defined Variable#2	0 Inferred	Read
8023	User Defined Variable#3	*6 or 1 Inferred	Read
8025-8401	Reserved		
8403	Input Oveerride Status (1=ON,0=OFF)	0 Inferred	Read

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
M#2	M#2	M#2	M#2	M#1	M#1	M#1	M#1
BS&W	TF	PF	DP	BS&W	TF	PF	DP

8405	Meter#2 Hourly Duration of Flow	1 Inferred	Read
8407	Meter#2 GrossTotal	*1 or 2 Inferred	Read
8409	Meter#2 Net Total	*1 or 2 Inferred	Read
8411	Meter#2 Mass Total	*1 or 2 Inferred	Read
8413	Meter#2 Energy Total	*1 or 2 Inferred	Read
8415	Meter#2 Average Temperature	1 Inferred	Read
8417	Meter#2 Average Pressure	1 Inferred	Read
8419	User Defined Variable#1	0 Inferred	Read
8421	User Defined Variable#2	0 Inferred	Read
8423	User Defined Variable#3	*6 or 1 Inferred	Read

\*Note: 2049=Meter#1 SG/API Decimal Places,2050=Meter#2 SG/API Decimal Places

\*\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

### Last Hourly Data Area Ends

## Modbus Address Table – 32 Bits

ADDRESS DESCRIPTION DECIMAL READ/WRITE

**3021 = Day of the month (1-31)**

**3022 = Last Month Data Request (1=Lastest, 2=Oldest)**

(3021-3022, 16bits Integer, Write only)

### Last Month Data Area

8025	Meter#1 Gas Data - SG	*6 or 1 Inferred	Read
8027	Meter#1 Gas Data - N2 Percentage	4 Inferred	Read
8029	Meter#1 Gas Data - CO2 Percentage	4 Inferred	Read
8031	Meter #1 Heating Value	3 Inferred	Read
8033	Meter #1 Pipe ID	5 Inferred	Read
8035	Meter #1 Orifice ID	5 Inferred	Read
8037	Base Temperature	2 Inferred	Read
8039	Base Pressure	4 Inferred	Read
8041	Atmospheric Pressure	4 Inferred	Read
8043	Meter#1 Gas Data - DP Cut Off	4 Inferred	Read
8045	Date	0 Inferred	Read
8047	Month	0 Inferred	Read
8049	Year	0 Inferred	Read
8051	Index	0 Inferred	Read
8053	Meter#1 Daily Flowing Time	1 Inferred	Read
8055	Meter#1 Daily Total – User Defined Variable #1	*1 or 2 Inferred	Read
8057	Meter#1 Daily Total – User Defined Variable #2	*1 or 2 Inferred	Read
8059	Meter#1 Daily Average Temperature	2 Inferred	Read
8061	Meter#1 Daily Average Pressure	2 Inferred	Read
8063	Meter#1 Daily Average DP	4 Inferred	Read
8065	Meter#1 Daily Average DP/EXT	4 Inferred	Read
8067	Meter#1 Month Flowing Time	1 Inferred	Read
8069	Meter#1 Month Total – User Defined Variable #1	*1 or 2 Inferred	Read
8071	Meter#1 Month Total – User Defined Variable #2	*1 or 2 Inferred	Read
8073	Meter#1 Month Average Temperature	2 Inferred	Read
8075	Meter#1 Month Average Pressure	2 Inferred	Read
8077	Meter#1 Month Average DP	4 Inferred	Read
8079	Meter#1 Month Average DP/EXT	4 Inferred	Read
8081	Last Month Cofiguration Code	0 Inferred	Read

8 bits	4 bits	4bits	8 bits	4 bits	4 bits
M#2 Gas/Liquid	M#2 Product	M#2 Y Factor Selection	M#1 Gas/Liquid	M#1 Product	M#1 Y Factor Selection

8083 Spare

8085 Spare

8087 Meter#1 Roll Over Number of Regiser 8069 0 Inferred Read

8089 Meter#1 Roll Over Number of Regiser 8071 0 Inferred Read

\*\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
8447	Meter #2 Heating Value	3 Inferred	Read
8449	Meter #2 Pipe ID	5 Inferred	Read
8451	Meter #2 Orifice ID	5 Inferred	Read
8453	Meter#2 Daily Flowing Time	1 Inferred	Read
8455	Meter#2 Daily Total – User Defined Variable#1	*1 or 2 Inferred	Read
8457	Meter#2 Daily Total – User Defined Variable#2	* 1 or 2 Inferred	Read
8459	Meter#2 Daily Average Temperature	2 Inferred	Read
8461	Meter#2 Daily Average Pressure	2 Inferred	Read
8463	Meter#2 Daily Average DP	4 Inferred	Read
8465	Meter#2 Daily Average DP/EXT	4 Inferred	Read
8467	Meter#2 Month Flowing Time	1 Inferred	Read
8469	Meter#2 Month Total – User Defined Variable#1	*1 or 2 Inferred	Read
8471	Meter#2 Month Total – User Defined Variable#2	*1 or 2 Inferred	Read
8473	Meter#2 Month Average Temperature	2 Inferred	Read
8475	Meter#2 Month Average Pressure	2 Inferred	Read
8477	Meter#2 Month Average DP	4 Inferred	Read
8479	Meter#2 Month Average DP/EXT	4 Inferred	Read
8481	Meter#2 Roll Over Number of Register 8455	0 Inferred	Read
8483	Meter#2 Roll Over Number of Register 8457	0 Inferred	Read
8485-8499	Spare		

**\*\*Note**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

(Month total roll over at 999999999. Use the following method to get correct value with 1 decimal inferred.

$$\text{Total (Double)} = (\text{Roll Over Number} \times 999999999 + \text{Total}) / 10.$$

(Month total roll over at 999999999. Use the following method to get correct value with 1 decimal inferred.

$$\text{Total (Double)} = (\text{Roll Over Number} \times 999999999 + \text{Total}) / 10.$$

**Last Month Data Area Ends**

8091-8099	Spare
8101-8249	Reserved – Audit Report Data Area
8251-8399	Reserved – Calibration Report Data Area



**Modbus Address Table – 32 Bits****ADDRESS      DESCRIPTION      DECIMAL      READ/WRITE**

\*Note: Available for Firmware Version 9.00.29 or newer

8501	Current Prove Point#21 Master Meter LinearFactor	6 Inferred	Read
8503	Current Prove Point#22 Master Meter LinearFactor	6 Inferred	Read
8505	Current Prove Point#23 Master Meter LinearFactor	6 Inferred	Read
8507	Current Prove Point#24 Master Meter LinearFactor	6 Inferred	Read
8509	Current Prove Point#25 Master Meter LinearFactor	6 Inferred	Read
8511	Current Prove Point#26 Master Meter LinearFactor	6 Inferred	Read
8513	Current Prove Point#27 Master Meter LinearFactor	6 Inferred	Read
8515	Current Prove Point#28 Master Meter LinearFactor	6 Inferred	Read
8517	Current Prove Point#29 Master Meter LinearFactor	6 Inferred	Read
8519	Current Prove Point#30 Master Meter LinearFactor	6 Inferred	Read
8521	Current Prove Point#31 Master Meter LinearFactor	6 Inferred	Read
8523	Current Prove Point#32 Master Meter LinearFactor	6 Inferred	Read
8525	Current Prove Point#33 Master Meter LinearFactor	6 Inferred	Read
8527	Current Prove Point#34 Master Meter LinearFactor	6 Inferred	Read
8529	Current Prove Point#35 Master Meter LinearFactor	6 Inferred	Read
8531	Current Prove Point#36 Master Meter LinearFactor	6 Inferred	Read
8533	Current Prove Point#37 Master Meter LinearFactor	6 Inferred	Read
8535	Current Prove Point#38 Master Meter LinearFactor	6 Inferred	Read
8537	Current Prove Point#39 Master Meter LinearFactor	6 Inferred	Read
8539	Current Prove Point#40 Master Meter LinearFactor	6 Inferred	Read
8541	Current Prove Point#21 Master Meter DP	4 Inferred	Read
8543	Current Prove Point#22 Master Meter DP	4 Inferred	Read
8545	Current Prove Point#23 Master Meter DP	4 Inferred	Read
8547	Current Prove Point#24 Master Meter DP	4 Inferred	Read
8549	Current Prove Point#25 Master Meter DP	4 Inferred	Read
8551	Current Prove Point#26 Master Meter DP	4 Inferred	Read
8553	Current Prove Point#27 Master Meter DP	4 Inferred	Read
8555	Current Prove Point#28 Master Meter DP	4 Inferred	Read
8557	Current Prove Point#29 Master Meter DP	4 Inferred	Read
8559	Current Prove Point#30 Master Meter DP	4 Inferred	Read
8561	Current Prove Point#31 Master Meter DP	4 Inferred	Read
8563	Current Prove Point#32 Master Meter DP	4 Inferred	Read
8565	Current Prove Point#33 Master Meter DP	4 Inferred	Read
8567	Current Prove Point#34 Master Meter DP	4 Inferred	Read
8569	Current Prove Point#35 Master Meter DP	4 Inferred	Read
8571	Current Prove Point#36 Master Meter DP	4 Inferred	Read
8573	Current Prove Point#37 Master Meter DP	4 Inferred	Read
8575	Current Prove Point#38 Master Meter DP	4 Inferred	Read
8577	Current Prove Point#39 Master Meter DP	4 Inferred	Read
8579	Current Prove Point#40 Master Meter DP	4 Inferred	Read
8581	Current Prove Point#21 DP Meter CD	6 Inferred	Read
8583	Current Prove Point#22 DP Meter CD	6 Inferred	Read
8585	Current Prove Point#23 DP Meter CD	6 Inferred	Read
8587	Current Prove Point#24 DP Meter CD	6 Inferred	Read
8589	Current Prove Point#25 DP Meter CD	6 Inferred	Read
8591	Current Prove Point#26 DP Meter CD	6 Inferred	Read
8593	Current Prove Point#27 DP Meter CD	6 Inferred	Read
8595	Current Prove Point#28 DP Meter CD	6 Inferred	Read
8597	Current Prove Point#29 DP Meter CD	6 Inferred	Read
8599	Current Prove Point#30 DP Meter CD	6 Inferred	Read

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
8601	Current Prove Point#31 DP Meter CD	6 Inferred	Read
8603	Current Prove Point#32 DP Meter CD	6 Inferred	Read
8605	Current Prove Point#33 DP Meter CD	6 Inferred	Read
8607	Current Prove Point#34 DP Meter CD	6 Inferred	Read
8609	Current Prove Point#35 DP Meter CD	6 Inferred	Read
8611	Current Prove Point#36 DP Meter CD	6 Inferred	Read
8613	Current Prove Point#37 DP Meter CD	6 Inferred	Read
8615	Current Prove Point#38 DP Meter CD	6 Inferred	Read
8617	Current Prove Point#39 DP Meter CD	6 Inferred	Read
8619	Current Prove Point#40 DP Meter CD	6 Inferred	Read
8621	Current Prove Point#21 DP Meter Actual CD	6 Inferred	Read
8623	Current Prove Point#22 DP Meter Actual CD	6 Inferred	Read
8625	Current Prove Point#23 DP Meter Actual CD	6 Inferred	Read
8627	Current Prove Point#24 DP Meter Actual CD	6 Inferred	Read
8629	Current Prove Point#25 DP Meter Actual CD	6 Inferred	Read
8631	Current Prove Point#26 DP Meter Actual CD	6 Inferred	Read
8633	Current Prove Point#27 DP Meter Actual CD	6 Inferred	Read
8635	Current Prove Point#28 DP Meter Actual CD	6 Inferred	Read
8637	Current Prove Point#29 DP Meter Actual CD	6 Inferred	Read
8639	Current Prove Point#30 DP Meter Actual CD	6 Inferred	Read
8641	Current Prove Point#31 DP Meter Actual CD	6 Inferred	Read
8643	Current Prove Point#32 DP Meter Actual CD	6 Inferred	Read
8645	Current Prove Point#33 DP Meter Actual CD	6 Inferred	Read
8647	Current Prove Point#34 DP Meter Actual CD	6 Inferred	Read
8649	Current Prove Point#35 DP Meter Actual CD	6 Inferred	Read
8651	Current Prove Point#36 DP Meter Actual CD	6 Inferred	Read
8653	Current Prove Point#37 DP Meter Actual CD	6 Inferred	Read
8655	Current Prove Point#38 DP Meter Actual CD	6 Inferred	Read
8657	Current Prove Point#39 DP Meter Actual CD	6 Inferred	Read
8659	Current Prove Point#40 DP Meter Actual CD	6 Inferred	Read
8661	Current Prove Point#21 DP Meter Reynold No	6 Inferred	Read
8663	Current Prove Point#22 DP Meter Reynold No	6 Inferred	Read
8665	Current Prove Point#23 DP Meter Reynold No	6 Inferred	Read
8667	Current Prove Point#24 DP Meter Reynold No	6 Inferred	Read
8669	Current Prove Point#25 DP Meter Reynold No	6 Inferred	Read
8671	Current Prove Point#26 DP Meter Reynold No	6 Inferred	Read
8673	Current Prove Point#27 DP Meter Reynold No	6 Inferred	Read
8675	Current Prove Point#28 DP Meter Reynold No	6 Inferred	Read
8677	Current Prove Point#29 DP Meter Reynold No	6 Inferred	Read
8679	Current Prove Point#30 DP Meter Reynold No	6 Inferred	Read
8681	Current Prove Point#31 DP Meter Reynold No	6 Inferred	Read
8683	Current Prove Point#32 DP Meter Reynold No	6 Inferred	Read
8685	Current Prove Point#33 DP Meter Reynold No	6 Inferred	Read
8687	Current Prove Point#34 DP Meter Reynold No	6 Inferred	Read
8689	Current Prove Point#35 DP Meter Reynold No	6 Inferred	Read
8691	Current Prove Point#36 DP Meter Reynold No	6 Inferred	Read
8693	Current Prove Point#37 DP Meter Reynold No	6 Inferred	Read
8695	Current Prove Point#38 DP Meter Reynold No	6 Inferred	Read
8697	Current Prove Point#39 DP Meter Reynold No	6 Inferred	Read
8699	Current Prove Point#40 DP Meter Reynold No	6 Inferred	Read

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
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**Current Data Area**

9001	Meter#1 Calculation Type	0 Inferred	Read
9003	Configuration Code	0 Inferred	Read

8 BITS	8 BITS	8 BITS	8 BITS
M#2 Gas/Liquid	M#2 Product	M#1 Gas/Liquid	M#1 Product

9005	Alarm Status Flag	0 Inferred	Read
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Position	Description
Bit 7	Meter#2 Flow Rate Low Alarm
Bit 6	Meter#2 Flow Rate High Alarm
Bit 5	Meter#2 Gravity/AGA8 Out of Range
Bit 4	Meter#2 Down
Bit 3	Meter#1 Flow Rate Low Alarm
Bit 2	Meter#1 Flow Rate High Alarm
Bit 1	Meter#1 Gravity/AGA8 Out of Range
Bit 0	Meter#1 Down

9007	Meter#1 Daily Gross Total	*1 or 2 inferred	Read
9009	Meter#1 Daily Net Total	*1 or 2 inferred	Read
9011	Meter#1 Daily Mass Total	*1 or 2 inferred	Read
9013	Meter#1 Daily Energy Total	*1 or 2 inferred	Read
9015	Meter#1 Cum. Gross Total	0 Inferred	Read
9017	Meter#1 Cum. Net Total	0 Inferred	Read
9019	Meter#1 Cum. Mass Total	0 Inferred	Read
9021	Meter#1 Cum. Energy Total	0 Inferred	Read

9023	Meter#1 Gas Data - N2 Percent	4 Inferred	Read
9025	Meter#1 Gas Data - Co2 Percent	4 Inferred	Read
9027	Meter#1 Gas Data - Methane Percent	4 Inferred	Read
9029	Meter#1 Gas Data - Ethane Percent	4 Inferred	Read
9031	Meter#1 Gas Data - Propane Percent	4 Inferred	Read
9033	Meter#1 Gas Data - Water Percent	4 Inferred	Read
9035	Meter#1 Gas Data - H2S Percent	4 Inferred	Read
9037	Meter#1 Gas Data - H2 Percent	4 Inferred	Read
9039	Meter#1 Gas Data - CO Percent	4 Inferred	Read
9041	Meter#1 Gas Data - Oxygen Percent	4 Inferred	Read
9043	Meter#1 Gas Data - I-Butane Percent	4 Inferred	Read
9045	Meter#1 Gas Data - n-Butane Percent	4 Inferred.	Read
9047	Meter#1 Gas Data - I-Pentane Percent	4 Inferred	Read
9049	Meter#1 Gas Data - n-Pentane Percent	4 Inferred	Read
9051	Meter#1 Gas Data - n-Hexane Percent	4 Inferred	Read
9053	Meter#1 Gas Data - n-Heptane Percent	4 Inferred	Read
9055	Meter#1 Gas Data - n-Octane Percent	4 Inferred	Read
9057	Meter#1 Gas Data - n-Nonane Percent	4 Inferred	Read
9059	Meter#1 Gas Data - n-Decane Percent	4 Inferred	Read
9061	Meter#1 Gas Data - Helium Percent	4 Inferred	Read
9063	Meter#1 Gas Data - Argon Percent	4 Inferred	Read

\*Note

**Modbus Address Table – 32 Bits****ADDRESS    DESCRIPTION    DECIMAL READ/WRITE**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

9065	Meter#1 Heating Value	3 Inferred	Read
9067	Meter#1 Gross Flowrate	2 Inferred	Read
9069	Meter#1 Net Flowrate	2 Inferred	Read
9071	Meter#1 Mass Flowrate	2 Inferred	Read
9073	Meter#1 Energy Flowrate	2 Inferred	Read
9075	Meter#1 Product	0 Inferred	Read
9077-9079	Meter#1 Meter ID	8 Chars.	Read
9081	Meter#1 Pipe ID	5 Inferred	Read
9083	Meter#1 Orifice ID	5 Inferred	Read
9085	Frequency #1	0 Inferred	Read
9087	Frequency #2	0 Inferred	Read
9089	Meter#1 K Factor	3 Inferred	Read
9091	Date(mmddyy)	0 Inferred	Read
9093	Time (hhmmss)	0 Inferred	Read
9095	Meter#1DP	4 Inferred	Read
9097	Meter#1 Temperature	2 Inferred	Read
9099	Meter#1 Pressure	2 Inferred	Read
9101	Meter#1 Density	1,3, or 5 Inferred	Read
	US Unit – Gas Application 5 decimal inferred, Liquid Application 3 decimal Inferred		
	Metric Unit – Gas Application 5 decimal inferred, Liquid Application 1 decimal inferred		
9103	Meter#1 Dens.b	1,3, or 6 Inferred	Read
	US Unit – Gas Application 6 decimal inferred, Liquid Application 3 decimal Inferred		
	Metric Unit – Gas Application 6 decimal inferred, Liquid Application 1 decimal inferred		
9105	Meter#1 SG/API	*6 or 1 Inferred	Read
*note: 2049=Meter#1 SG/API Decimal Places, 2050=Meter#2 SG/API Decimal Places			
9107	Meter#1 Y Factor	6 Inferred	Read
9109	Meter#1 K /CD/LMF	6 Inferred	Read
9111	Meter#1 DP EXT	4 Inferred	Read
9113	Meter#1 FPV	6 Inferred	Read
9115	Meter#1 BS&W Percentage	2 Inferred	Read
9117	Meter#2 BS&W Percentage	2 Inferred	Read
9119	Spare		

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL READ/WRITE
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\*\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

9121	Meter#1 Last Month Gross Total	**1 or 2 Inferred	Read
9123	Meter#1 Last Month Net Total	**1 or 2 Inferred	Read
9125	Meter#1 Last Month Mass Total	**1 or 2 Inferred	Read
9127	Meter#1 Last Month Energy Total	**1 or 2 Inferred	Read
9129	Meter#1 Yesterday's Gross Total	**1 or 2 Inferred	Read
9131	Meter#1 Yesterday's Net Total	**1 or 2 Inferred	Read
9133	Meter#1 Yesterday's Mass Total	**1 or 2 Inferred	Read
9135	Meter#1 Yesterday's Energy Total	**1 or 2 Inferred	Read
9137	Meter#1 Last Hour Gross Total	**1 or 2 Inferred	Read
9139	Meter#1 Last Hour Net Total	**1 or 2 Inferred	Read
9141	Meter#1 Last Hour Mass Total	**1 or 2 Inferred	Read
9143	Meter#1 Last Hour Energy Total	**1 or 2 Inferred	Read
9145	Meter#2 Yesterday's Gross Total	**1 or 2 Inferred	Read
9147	Meter#2 Last Month Gross Total	**1 or 2 Inferred	Read
9149	Meter#1 Yesterday Flowing Time	1 Inferred	Read
9151	M#1 Yesterday's Avg SG/API (US)/Density (Metric)	4 or 1 (API)	Read
9153	Meter#1 Yesterday Flow Averaged DP	4 Inferred	Read
9155	Meter#1 Yesterday Flow Averaged Temperature	2 Inferred	Read
9157	Meter#1 Yesterday Flow Averaged Pressure	2 Inferred	Read
9159	Meter#1 Last Hour Flowing Time	1 Inferred	Read
9161	Meter#1 Last Hour Flow Averaged SG/API/Density	4 or 1 (API)	Read
9163	Meter#1 Last Hour Flow Averaged DP	4 Inferred	Read
9165	Meter#1 Last Hour Flow Averaged Temperature	2 Inferred	Read
9167	Meter#1 Last Hour Flow Averaged Pressure	2 Inferred	Read
9169	Meter#2 Last Hour Flowing Time	1 Inferred	Read
9171	Meter#2 Last Hour Flow Averaged SG/API/Density	4 or 1 (API)	Read
9173	Meter#2 Last Hour Flow Averaged DP	4 Inferred	Read
9175	Meter#2 Last Hour Flow Averaged Temperature	2 Inferred	Read
9177	Meter#2 Last Hour Flow Averaged Pressure	2 Inferred	Read
9179	Meter#2 Last Hour Gross Total	2 Inferred	Read
9181	Meter#2 Last Hour Net Total	2 Inferred	Read
9183	Meter#2 Last Hour Mass Total	2 Inferred	Read
9185	Meter#2 Last Hour Energy Total	2 Inferred	Read
9187	Meter#2 Yesterday Flowing Time	1 Inferred	Read
9189	Meter#2 Yesterday Flow Averaged SG/API/Density	4 or 1 (API)	Read
9191	Meter#2 Yesterday Flow Averaged DP	4 Inferred	Read
9193	Meter#2 Yesterday Flow Averaged Temperature	2 Inferred	Read
9195	Meter#2 Yesterday Flow Averaged Pressure	2 Inferred	Read
9197	Meter#1 Yesterday Flow Averaged CTPL	5 Inferred	Read
9199	Meter#2 Yesterday Flow Averaged CTPL	5 Inferred	Read

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
9201	Meter#2 Calculation Type	0 Inferred	Read
9203	Configuration Code	0 Inferred	Read

8 BITS	8 BITS	8 BITS	8 BITS
M#2 Gas/Liquid	M#2 Product	M#1 Gas/Liquid	M#1 Product

9205 Alarm Status 0 Inferred Read

Position	Description
Bit 7	Meter#2 Flow Rate Low Alarm
Bit 6	Meter#2 Flow Rate High Alarm
Bit 5	Meter#2 Gravity/AGA8 Out of Range
Bit 4	Meter#2 Down
Bit 3	Meter#1 Flow Rate Low Alarm
Bit 2	Meter#1 Flow Rate High Alarm
Bit 1	Meter#1 Gravity/AGA8 Out of Range
Bit 0	Meter#1 Down

9207	Meter#2 Daily Gross Total	**1 or 2 inferred	Read
9209	Meter#2 Daily Net Total	**1 or 2 inferred	Read
9211	Meter#2 Daily Mass Total	**1 or 2 inferred	Read
9213	Meter#2 Daily Energy Total	**1 or 2 inferred	Read
9215	Meter#2 Cum. Gross Total	0 Inferred	Read
9217	Meter#2 Cum. Net Total	0 Inferred	Read
9219	Meter#2 Cum. Mass Total	0 Inferred	Read
9221	Meter#2 Cum. Energy Total	0 Inferred	Read
9223	Meter#2 Heating Value	3 Inferred	Read
9225	Meter#2 Gross Flowrate	2 Inferred	Read
9227	Meter#2 Net Flowrate	2 Inferred	Read
9229	Meter#2 Mass Flowrate	2 Inferred	Read
9231	Meter#2 Energy Flowrate	2 Inferred	Read
9233	Meter#2 Product	0 Inferred	Read
9235-9237	Meter#2 Meter ID	8 Chars.	Read
9239	Meter#2 Pipe ID	5 Inferred	Read
9241	Meter#2 Orifice ID	5 Inferred	Read
9243	Meter#2 K Factor	3 Inferred	Read
9245	Meter#2 DP	4 Inferred	Read
9247	Meter#2 Temperature	2 Inferred	Read
9249	Meter#2 Pressure	2 Inferred	Read
9251	Meter#2 Density	5 Inferred	Read
	US Unit – Gas Application 5 decimal inferred, Liquid Application 3 decimal Inferred		
	Metric Unit – Gas Application 5 decimal inferred, Liquid Application 1 decimal inferred		
9253	Meter#2 Dens.b	6 Inferred	Read
	US Unit – Gas Application 6 decimal inferred, Liquid Application 3 decimal Inferred		
	Metric Unit – Gas Application 6 decimal inferred, Liquid Application 1 decimal inferred		
9255	Meter#2 SG/API	*6 or 1 Inferred	Read

\*Note: 2049=Meter#1 SG/API Decimal Places, 2050=Meter#2 SG/API Decimal Places

**\*\*Note**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
9257	Meter#2 Y Factor	6 Inferred	Read
9259	Meter#2 K /CD/LMF	6 Inferred	Read
9261	Meter#2 DP EXT	4 Inferred	Read
9263	Meter#2 FPV	6 Inferred	Read
9265	Meter#2 CTL	5 Inferred	Read
9267	Meter#2 CPL	5 Inferred	Read
9269	Meter#2 C t,anp	5 Inferred	Read
9271	Meter#2 SG/API at Base	4 or 1 Inferred	Read
9273	Meter #1 CTL	5 Inferred	Read
9275	Meter #1 CPL	5 Inferred	Read
9277	Meter #1 C t,anp	5 Inferred	Read
9279	Meter #1 SG/API at Base	4 or 1 Inferred	Read
9281	Meter#2 Last Month Net Total	**1 or 2 Inferred	Read
9283	Meter#2 Last Month Mass Total	**1 or 2 Inferred	Read
9285	Meter#2 Last Month Energy Total	**1 or 2 Inferred	Read
9287	Meter#2 Yesterday's Net Total	**1 or 2 Inferred	Read
9289	Meter#2 Yesterday's Mass Total	**1 or 2 Inferred	Read
9291	Meter#2 Yesterday's Energy Total	**1 or 2 Inferred	Read
9293	Spare Input #1 Data	2 Inferred	Read
9295	Spare Input #2 Data	2 Inferred	Read
9297	Spare Input #3 Data	2 Inferred	Read
9299	Spare Input #4 Data	2 Inferred	Read
9301	Spare Input #1 Daily Time Averaged Data	2 Inferred	Read
9303	Spare Input #2 Daily Time Averaged Data	2 Inferred	Read
9305	Spare Input #3 Daily Time Averaged Data	2 Inferred	Read
9307	Spare Input #4 Daily Time Averaged Data	2 Inferred	Read
9309	Spare Input #1 Last Day Time Averaged Data	2 Inferred	Read
9311	Spare Input #2 Last Day Time Averaged Data	2 Inferred	Read
9313	Spare Input #3 Last Day Time Averaged Data	2 Inferred	Read
9315	Spare Input #4 Last Day Time Averaged Data	2 Inferred	Read
9317	Auxiliary Meter K Factor	3 Inferred	Read
9319	Auxiliary Meter Frequency	0 Inferred	Read
9321	Auxiliary Meter Flow Rate	3 Inferred	Read
9323	Auxiliary Meter Daily Total	0 Inferred	Read
9325	Auxiliary Meter Cumulative Total	0 Inferred	Read
9327	Auxiliary Meter Month Total	0 Inferred	Read
9329	Yesterday - Auxiliary Meter Daily Total	0 Inferred	Read
9331	Yesterday - Auxiliary Meter Cumulative Total	0 Inferred	Read
9333	Last Month – Auxiliary Meter Month Total	0 Inferred	Read

**\*\*Note**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
9335-9341	Spare		
9343	Meter#2 Gas Data - N2 Percent	4 Inferred	Read
9345	Meter#2 Gas Data - Co2 Percent	4 Inferred	Read
9347	Meter#2 Gas Data - Methane Percent	4 Inferred	Read
9349	Meter#2 Gas Data - Ethane Percent	4 Inferred	Read
9351	Meter#2 Gas Data - Propane Percent	4 Inferred	Read
9353	Meter#2 Gas Data - Water Percent	4 Inferred	Read
9355	Meter#2 Gas Data - H2S Percent	4 Inferred	Read
9357	Meter#2 Gas Data - H2 Percent	4 Inferred	Read
9359	Meter#2 Gas Data - CO Percent	4 Inferred	Read
9361	Meter#2 Gas Data - Oxygen Percent	4 Inferred	Read
9363	Meter#2 Gas Data - I-Butane Percent	4 Inferred	Read
9365	Meter#2 Gas Data - n-Butane Percent	4 Inferred.	Read
9367	Meter#2 Gas Data - I-Pentane Percent	4 Inferred	Read
9369	Meter#2 Gas Data - n-Pentane Percent	4 Inferred	Read
9371	Meter#2 Gas Data - n-Hexane Percent	4 Inferred	Read
9373	Meter#2 Gas Data - n-Heptane Percent	4 Inferred	Read
9375	Meter#2 Gas Data - n-Octane Percent	4 Inferred	Read
9377	Meter#2 Gas Data - n-Nonane Percent	4 Inferred	Read
9379	Meter#2 Gas Data - n-Decane Percent	4 Inferred	Read
9381	Meter#2 Gas Data - Helium Percent	4 Inferred	Read
9383	Meter#2 Gas Data - Argon Percent	4 Inferred	Read

**Tank Gauging Data Area**

9385	Meter#1 Batch Status-0=N/A,1=in Prog,2=Ended	0 Inferred	Read
9387	Meter#1 Start Date	0 Inferred	Read
9389	Meter#1 Start Time	0 Inferred	Read
9391	Meter#1 End Date	0 Inferred	Read
9393	Meter#1 End Time	0 Inferred	Read
9395	Meter#1 Opening Gross Total	2 Inferred	Read
9397	Meter#1 Cumulative Gross Total	2 Inferred	Read
9399	Meter#1 Opening Net Total	2 Inferred	Read
9401	Meter#1 Cumulative Net Total	2 Inferred	Read
9403	Meter#1 Temperature	2 Inferred	Read
9405	Meter#1 Pressure	2 Inferred	Read
9407	Meter#1 API/SG	4 Inferred	Read
9409	Meter#1 Tank Level	2 Inferred	Read
9411	Meter#1 Tank Volume	2 Inferred	Read
9413-9421	Spare		



**Modbus Address Table – 32 Bits**

ADDRESS	DESCRIPTION	DECIMAL	READ/WRITE
<b>Tank Gauging Data Area</b>			
9421	Meter#2 Batch Status-0=N/A,1=in Prog,2=Ended	0 Inferred	Read
9423	Meter#2 Start Date	0 Inferred	Read
9425	Meter#2 Start Time	0 Inferred	Read
9427	Meter#2 End Date	0 Inferred	Read
9429	Meter#2 End Time	0 Inferred	Read
9431	Meter#2 Opening Gross Total	2 Inferred	Read
9433	Meter#2 Cumulative Gross Total	2 Inferred	Read
9435	Meter#2 Opening Net Total	2 Inferred	Read
9437	Meter#2 Cumulative Net Total	2 Inferred	Read
9439	Meter#2 Temperature	2 Inferred	Read
9441	Meter#2 Pressure	2 Inferred	Read
9443	Meter#2 API/SG	4 Inferred	Read
9445	Meter#2 Tank Level	2 Inferred	Read
9447	Meter#2 Tank Volume	2 Inferred	Read
9449-9519	Spare		
9521	Multi.Var DP	4 Inferred	Read
9523	Multi.Var.Pressure	2 Inferred	Read
9525	Multi.Var.Temperature	2 Inferred	Read
9527	Multi.Var.Status (1=OK)	0 Inferred	Read

## Modbus Address Table – Floating Point

7001-7002      Reserved

### AGA 8 GROSS METHOD 1

7003	Metet#1 Mol % of Carbon Dioxide	Read/Write
7004	Metet#1 Mol % of Hydrogen	Read/Write
7005	Metet#1 Mol % of Carbon Monoxide	Read/Write
7006-7019	Spare	

### AGA 8 GROSS METHOD 2

7003	Metet#1 Mol % of Nitrogen	Read/Write
7004	Metet#1 Mol % of Carbon Dioxide	Read/Write
7005	Metet#1 Mol % of Hydrogen	Read/Write
7006	Metet#1 Mol % of Carbon Monoxide	Read/Write
7007-7019	Spare	

### AGA 8 Detail Method

7003	Metet#1 Mol % of Methane	Read/Write
7004	Metet#1 Mol % of Nitrogen	Read/Write
7005	Metet#1 Mol % of Carbon Dioxide	Read/Write
7006	Metet#1 Mol % of Ethane	Read/Write
7007	Metet#1 Mol % of Propane	Read/Write
7008	Metet#1 Mol % of Water	Read/Write
7009	Metet#1 Mol % of Hydrogen Sulfide	Read/Write
7010	Metet#1 Mol % of Hydrogen	Read/Write
7011	Metet#1 Mol % of Carbon Monoxide	Read/Write
7012	Metet#1 Mol % of Oxygen	Read/Write
7013	Metet#1 Mol % of i-Butane	Read/Write
7014	Metet#1 Mol % of n-Butane	Read/Write
7015	Metet#1 Mol % of i-Pentane	Read/Write
7016	Metet#1 Mol % of n-Pentane	Read/Write
7017	Metet#1 Mol % of i-Hexane	Read/Write
7018	Metet#1 Mol % of n-Heptane	Read/Write
7019	Metet#1 Mol % of i-Octane	Read/Write
7020	Metet#1 Mol % of i-Nonane	Read/Write
7021	Metet#1 Mol % of i-Decane	Read/Write
7022	Metet#1 Mol % of Helium	Read/Write
7023	Metet#1 Mol % of Argon	Read/Write
7024	Meter#2 Flow Rate Low Limit	Read/Write
7025	Meter#2 Flow Rate High Limit	Read/Write
7026	Meter#1 Orifice ID	Read/Write
7027	Metet#1 Pipe ID	Read/Write
7028	Meter#1 K Factor	Read/Write
7029	Meter#1 Flow Rate Low Limit	Read/Write
7030	Meter#1 Flow Rate High Limit	Read/Write
7031	Base Temperature	Read/Write
7032	Base Pressure	Read/Write
7033	Atmospheric Pressure	Read/Write
7034	Auxiliary Meter K Factor	Read/Write
7035	Metet#1 Slotted DP Meter–DP/P Limit	Read/Write
7036	Metet#1 Slotted DP Meter–Mass of Air or Cone Meter-Viscosity	Read/Write
7037	Metet#1 Slotted DP Meter–Coefficient A	Read/Write

## **FLOATING POINTS**

7038	Metet#1 Slotted DP Meter–Coefficient B	Read/Write
7039	Metet#1 Slotted DP Meter–Coefficient E	Read/Write
7040	Metet#1 Slotted DP Meter–Coefficient F	Read/Write
7041	Metet#1 FPV Override	Read/Write
7042	Metet#1 Liquid Product SG/API.base	Read/Write
7043	Metet#1 Liquid Product Density .base	Read/Write
7044	Metet#1 Liquid Product Alpha T	Read/Write
7045	Meter#2 Orifice ID	Read/Write
7046	Metet#2 Pipe ID	Read/Write
7047	Meter#2 K Factor	Read/Write
7048	Metet#2 Slotted DP Meter– DP/P Limit	Read/Write
7049	Metet#2 Slotted DP Meter–Mass of Air or Cone Meter-Viscosity	Read/Write
7050	Metet#2 Slotted DP Meter–Coefficient A	Read/Write
7051	Metet#2 Slotted DP Meter–Coefficient B	Read/Write
7052	Metet#2 Slotted DP Meter–Coefficient E	Read/Write
7053	Metet#2 Slotted DP Meter–Coefficient F	Read/Write
7054	Metet#2 FPV Override	Read/Write
7055	Metet#2 Liquid Product SG /API.base	Read/Write
7056	Metet#2 Liquid Product Density.base	Read/Write
7057	Metet#2 Liquid Product Alpha T	Read/Write

## FLOATING POINTS

### AGA 8 GROSS METHOD 1

7058	Metet#2 Mol % of Carbon Dioxide	Read/Write
7059	Metet#2 Mol % of Hydrogen	Read/Write
7060	Metet#2 Mol % of Carbon Monoxide	Read/Write
7061-7078	Spare	

### AGA 8 GROSS METHOD 2

7058	Metet#2 Mol % of Nitrogen	Read/Write
7059	Metet#2 Mol % of Carbon Dioxide	Read/Write
7060	Metet#2 Mol % of Hydrogen	Read/Write
7061	Metet#2 Mol % of Carbon Monoxide	Read/Write
7062-7078	Spare	

### AGA 8 Detail Method

7058	Metet#2 Mol % of Methane	Read/Write
7059	Metet#2 Mol % of Nitrogen	Read/Write
7060	Metet#2 Mol % of Carbon Dioxide	Read/Write
7061	Metet#2 Mol % of Ethane	Read/Write
7062	Metet#2 Mol % of Propane	Read/Write
7063	Metet#2 Mol % of Water	Read/Write
7064	Metet#2 Mol % of Hydrogen Sulfide	Read/Write
7065	Metet#2 Mol % of Hydrogen	Read/Write
7066	Metet#2 Mol % of Carbon Monoxide	Read/Write
7067	Metet#2 Mol % of Oxygen	Read/Write
7068	Metet#2 Mol % of i-Butane	Read/Write
7069	Metet#2 Mol % of n-Butane	Read/Write
7070	Metet#2 Mol % of i-Pentane	Read/Write
7071	Metet#2 Mol % of n-Pentane	Read/Write
7072	Metet#2 Mol % of i-Hexane	Read/Write
7073	Metet#2 Mol % of n-Heptane	Read/Write
7074	Metet#2 Mol % of i-Octane	Read/Write
7075	Metet#2 Mol % of i-Nonane	Read/Write
7076	Metet#2 Mol % of i-Decane	Read/Write
7077	Metet#2 Mol % of Helium	Read/Write
7078	Metet#2 Mol % of Argon	Read/Write

7095	Multivar. DP Reading	Read
7096	Multivar. Pressure Reading	Read
7097	Multivar. Temperature	Read

**FLOATING POINTS**

7901	Analog Output @4mA	Read/Write
7902	Analog Output @20mA	Read/Write
7903	Meter #1 Base Density Override	Read/Write
7904	Meter #1 Flowing Density Override	Read/Write
7905	Meter #2 Base Density Override	Read/Write
7906	Meter #2 Flowing Density Override	Read/Write
7907	Meter #1 Tank ID	Read/Write
7908	Meter #1 Tank Length	Read/Write
7909	Meter #2 Tank ID	Read/Write
7910	Meter #2 Tank Length	Read/Write
7911-7914	Spare	
7915	Analog Output Value	Read
7916	Analog Input #1 mA Value	Read
7917	Analog Input #1 Numerical Value	Read
7918	Analog Input #1 Live Value	Read
7919	Analog Input #2 mA Value	Read
7920	Analog Input #2 Numerical Value	Read
7921	Analog Input #2 Live Value	Read
7922	Analog Input #3 mA Value	Read
7923	Analog Input #3 Live Value	Read
7924	Analog Input #3 Numerical Value	Read
7925	RTD Input Ohm Value	Read
7926	RTD Input Numerical Value	Read
7927	RTD Input Live Value	Read
7928	Enclosure Temperature	Read
7929	Battery Voltage	Read
7930-7947	Reserved	
7948-7950	Spare	
7951	Analog Input #1 4mA	Read/Write
7952	Analog Input #1 20mA	Read/Write
7953	Analog Input #1 Low Limit	Read/Write
7954	Analog Input #1 High Limit	Read/Write
7955	Analog Input #1 Maintenance	Read/Write
7956	Analog Input #2 4mA	Read/Write
7957	Analog Input #2 20mA	Read/Write
7958	Analog Input #2 Low Limit	Read/Write
7959	Analog Input #2 High Limit	Read/Write
7960	Analog Input #2 Maintenance	Read/Write
7961	Analog Input #3 4mA	Read/Write
7962	Analog Input #3 20mA	Read/Write
7963	Analog Input #3 Low Limit	Read/Write
7964	Analog Input #3 High Limit	Read/Write
7965	Analog Input #3 Maintenance	Read/Write
7966	RTD Input Low Limit	Read/Write
7967	RTD Input High Limit	Read/Write
7968	RTD Input Maintenance	Read/Write

## FLOATING POINTS

### Current Data Area

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

**FLOATING POINTS**

7145	Meter#1 Pipe ID	Read
7146	Meter#1 Orifice ID	Read
7147	Meter#1 BS&W Percentage	Read
7148	Meter#1 Daily Flow Time in Minutes	Read
7149	Meter#1 Daily Flow Time in Seconds	Read
7150	Meter#1 Cum. Gross Roll Over Times	Read
7151	Date	Read
7152	Time	Read
7153	Meter#1 Cum. Net Roll Over Times	Read
7154	Meter#1 Cum. Mass Roll Over Times	Read
7155	Meter#1 Cum. Energy Roll Over Times	Read
7156	Meter #1 CTL	Read
7157	Meter #1 CPL	Read
7158	Meter #1 CTL a_int	Read
7159	Meter #1 SG.b	Read
7160	Meter #1 CTPL	Read
7161	Meter #2 Gross Flow Rate	Read
7162	Meter #2 Net Flow Rate	Read
7163	Meter #2 Mass Flow Rate	Read
7164	Meter #2 Energy Flow Rate	Read
7165	Meter #2 Gross Daily Total	Read
7166	Meter #2 Net Daily Total	Read
7167	Meter #2 Mass Daily Total	Read
7168	Meter #2 Energy Daily Total	Read
7169	Meter #2 Gross Cum. Total	Read
7170	Meter #2 Net Cum. Total	Read
7171	Meter #2 Mass Cum. Total	Read
7172	Meter #2 Energy Cum. Total	Read
7173	Meter #2 DP	Read
7174	Meter #2 Temperature	Read
7175	Meter #2 Pressure	Read
7176	Meter #2 Density	Read
7177	Meter #2 Heating Value	Read
7178	Meter #2 Density.b	Read
7179	Meter #2 SG/API	Read
7180	Meter #2 Y	Read
7181	Meter #2 K/CD/LMF	Read
7182	Meter #2 FPV	Read
7183	Meter #2 FA	Read
7184	Meter #2 Daily Flow Time in Minutes	Read
7185	Meter #2 Daily Flow Time in Seconds	Read
7186	Meter #2 Cum. Gross Roll Over Times	Read
7187	Meter #2 Cum. Net Roll Over Times	Read
7188	Meter #2 Cum. Mass Roll Over Times	Read
7189	Meter #2 Cum. Energy Roll Over Times	Read
7190	Meter #2 CTL	Read
7191	Meter #2 CPL	Read
7192	Meter #2 CTL a_int	Read
7193	Meter #2 SG.b	Read
7194	Meter #2 Pipe ID	Read
7195	Meter #2 Orifice ID	Read
7196	Meter #2 BS&W Percentage	Read
7197	Meter #2 CTPL	Read

## FLOATING POINTS

7301	Meter #1 Gas Data – N2 Percent	Read
7302	Meter #1 Gas Data – CO2 Percent	Read
7303	Meter #1 Gas Data – Methane Percent	Read
7304	Meter #1 Gas Data – Ethane Percent	Read
7305	Meter #1 Gas Data – Propane Percent	Read
7306	Meter #1 Gas Data – Water Percent	Read
7307	Meter #1 Gas Data – H2S Percent	Read
7308	Meter #1 Gas Data – H2 Percent	Read
7309	Meter #1 Gas Data – CO Percent	Read
7310	Meter #1 Gas Data – Oxygen Percent	Read
7311	Meter #1 Gas Data – I-Butane Percent	Read
7312	Meter #1 Gas Data – n-Butane Percent	Read
7313	Meter #1 Gas Data – I-Pentane Percent	Read
7314	Meter #1 Gas Data – n-Pentane Percent	Read
7315	Meter #1 Gas Data – n-Hexane Percent	Read
7316	Meter #1 Gas Data – n-Heptane Percent	Read
7317	Meter #1 Gas Data – n-Octane Percent	Read
7318	Meter #1 Gas Data – n-Nonane Percent	Read
7319	Meter #1 Gas Data – n-Decane Percent	Read
7320	Meter #1 Gas Data – Helium Percent	Read
7321	Meter #1 Gas Data – Argon Percent	Read
7322	Prove Cone Master Meter Point 1 Mass Flow Rate	Read
7323	Prove Cone Master Meter Point 2 Mass Flow Rate	Read
7324	Prove Cone Master Meter Point 3 Mass Flow Rate	Read
7325	Prove Cone Master Meter Point 4 Mass Flow Rate	Read
7326	Prove Cone Master Meter Point 5 Mass Flow Rate	Read
7327	Prove Cone Master Meter Point 6 Mass Flow Rate	Read
7328	Prove Cone Master Meter Point 7 Mass Flow Rate	Read
7329	Prove Cone Master Meter Point 8 Mass Flow Rate	Read
7330	Prove Cone Master Meter Point 9 Mass Flow Rate	Read
7331	Meter#1 Tank Level	Read
7332	Meter#1 Tank Volume	Read
7333	Prove Cone Master Meter Point 10 Mass Flow Rate	Read
7334	Prove Cone Master Meter Point 11 Mass Flow Rate	Read
7335	Prove Cone Master Meter Point 12 Mass Flow Rate	Read
7336	Prove Cone Master Meter Point 13 Mass Flow Rate	Read
7337	Prove Cone Master Meter Point 14 Mass Flow Rate	Read
7338	Prove Cone Master Meter Point 15 Mass Flow Rate	Read
7339	Prove Cone Master Meter Point 16 Mass Flow Rate	Read
7340	Prove Cone Master Meter Point 17 Mass Flow Rate	Read
7341	Prove Cone Master Meter Point 18 Mass Flow Rate	Read
7342	Prove Cone Master Meter Point 19 Mass Flow Rate	Read
7343	Prove Cone Master Meter Point 20 Mass Flow Rate	Read
7344	Prove Cone Master Meter Current Mass Flow Rate	Read
7345	Prove Cone DP Meter Current Mass Flow Rate	Read
7346	Prove Cone Density	Read
xxx		
7347	Prove Cone Master Meter Point 4 Mass Flow Rate	Read
7348	Prove Cone Master Meter Point 5 Mass Flow Rate	Read
7349	Prove Cone Master Meter Point 6 Mass Flow Rate	Read



**FLOATING POINTS**

7350	Prove Cone Master Meter Point 7 Mass Flow Rate	Read
7351	Prove Cone Master Meter Point 8 Mass Flow Rate	Read
7352	Prove Cone Master Meter Point 9 Mass Flow Rate	Read
xxx		
7331	Meter#1 Tank Level	Read
7332	Meter#1 Tank Volume	Read
Xxxx		
7359	Prove Cone DP Meter Point 1 Mass Flow Rate	Read
7360	Prove Cone DP Meter Point 2 Mass Flow Rate	Read
7361	Prove Cone DP Meter Point 3 Mass Flow Rate	Read
7362	Prove Cone DP Meter Point 4 Mass Flow Rate	Read
7363	Prove Cone DP Meter Point 5 Mass Flow Rate	Read
7364	Prove Cone DP Meter Point 6 Mass Flow Rate	Read
7365	Prove Cone DP Meter Point 7 Mass Flow Rate	Read
7366	Prove Cone DP Meter Point 8 Mass Flow Rate	Read
7367	Prove Cone DP Meter Point 9 Mass Flow Rate	Read
7368	Prove Cone DP Meter Point 10 Mass Flow Rate	Read
7369	Prove Cone DP Meter Point 11 Mass Flow Rate	Read
7370	Prove Cone DP Meter Point 12 Mass Flow Rate	Read
7371	Prove Cone DP Meter Point 13 Mass Flow Rate	Read
7372	Prove Cone DP Meter Point 14 Mass Flow Rate	Read
7373	Prove Cone DP Meter Point 15 Mass Flow Rate	Read
7374	Prove Cone DP Meter Point 16 Mass Flow Rate	Read
7375	Prove Cone DP Meter Point 17 Mass Flow Rate	Read
7376	Prove Cone DP Meter Point 18 Mass Flow Rate	Read
7377	Prove Cone DP Meter Point 19 Mass Flow Rate	Read
7378	Prove Cone DP Meter Point 20 Mass Flow Rate	Read
7481	Auxiliary Meter K Factor	Read
7482	Auxiliary Meter Frequency	Read
7483	Auxiliary Meter Flow Rate	Read
7484	Auxiliary Meter Daily Total	Read
7485	Auxiliary Meter Month Total	Read
7486	Auxiliary Meter Cumulative Total	Read
7487	Auxiliary Meter Day Total – Roll Over Number	Read
7488	Auxiliary Meter Month Total – Roll Over Number	Read
7489	Auxiliary Meter Cum. Total – Roll Over Number	Read
7490	Spare Input #1 Data	Read
7491	Spare Input #2 Data	Read
7492	Spare Input #3 Data	Read
7493	Spare Input #4 Data	Read
7494	Spare Input #1 Daily Averaged Data	Read
7495	Spare Input #2 Daily Averaged Data	Read
7496	Spare Input #3 Daily Averaged Data	Read
7497	Spare Input #4 Daily Averaged Data	Read
7602	Prove Cone Master Meter Point 21 Mass Flow Rate	Read
7603	Prove Cone Master Meter Point 22 Mass Flow Rate	Read
7604	Prove Cone Master Meter Point 23 Mass Flow Rate	Read
7605	Prove Cone Master Meter Point 24 Mass Flow Rate	Read

**FLOATING POINTS**

7606	Prove Cone Master Meter Point 25 Mass Flow Rate	Read
7607	Prove Cone Master Meter Point 26 Mass Flow Rate	Read
7608	Prove Cone Master Meter Point 27 Mass Flow Rate	Read
7609	Prove Cone Master Meter Point 28 Mass Flow Rate	Read
7610	Prove Cone Master Meter Point 29 Mass Flow Rate	Read
7611	Prove Cone Master Meter Point 30 Mass Flow Rate	Read
7612	Prove Cone Master Meter Point 31 Mass Flow Rate	Read
7613	Prove Cone Master Meter Point 32 Mass Flow Rate	Read
7614	Prove Cone Master Meter Point 33 Mass Flow Rate	Read
7615	Prove Cone Master Meter Point 34 Mass Flow Rate	Read
7616	Prove Cone Master Meter Point 35 Mass Flow Rate	Read
7617	Prove Cone Master Meter Point 36 Mass Flow Rate	Read
7618	Prove Cone Master Meter Point 37 Mass Flow Rate	Read
7619	Prove Cone Master Meter Point 38 Mass Flow Rate	Read
7620	Prove Cone Master Meter Point 39 Mass Flow Rate	Read
7621	Prove Cone Master Meter Point 40 Mass Flow Rate	Read
7622	Prove Cone DP Meter Point 21 Mass Flow Rate	Read
7623	Prove Cone DP Meter Point 22 Mass Flow Rate	Read
7624	Prove Cone DP Meter Point 23 Mass Flow Rate	Read
7624	Prove Cone DP Meter Point 24 Mass Flow Rate	Read
7626	Prove Cone DP Meter Point 25 Mass Flow Rate	Read
7627	Prove Cone DP Meter Point 26 Mass Flow Rate	Read
7628	Prove Cone DP Meter Point 27 Mass Flow Rate	Read
7629	Prove Cone DP Meter Point 28 Mass Flow Rate	Read
7630	Prove Cone DP Meter Point 29 Mass Flow Rate	Read
7631	Prove Cone DP Meter Point 30 Mass Flow Rate	Read
7632	Prove Cone DP Meter Point 31 Mass Flow Rate	Read
7633	Prove Cone DP Meter Point 32 Mass Flow Rate	Read
7634	Prove Cone DP Meter Point 33 Mass Flow Rate	Read
7635	Prove Cone DP Meter Point 34 Mass Flow Rate	Read
7636	Prove Cone DP Meter Point 35 Mass Flow Rate	Read
7637	Prove Cone DP Meter Point 36 Mass Flow Rate	Read
7638	Prove Cone DP Meter Point 37 Mass Flow Rate	Read
7339	Prove Cone DP Meter Point 38 Mass Flow Rate	Read
7640	Prove Cone DP Meter Point 39 Mass Flow Rate	Read
7641	Prove Cone DP Meter Point 40 Mass Flow Rate	Read

## FLOATING POINTS

### Current Month Data Area

7730	Meter#1 Flow Time in Seconds	Read
7731	Meter#1 Flow Time in Minutes	Read
7732	Meter#1 Gross Total	Read
7733	Meter#1 Net Total	Read
7734	Meter#1 Mass Total	Read
7735	Meter#1 Energy Total	Read
7736	Spare	
7737	Roll Over Number – Meter#1 Gross Total	Read
7738	Roll Over Number – Meter#1 Net Total	Read
7739	Roll Over Number – Meter#1 Mass Total	Read
7740	Roll Over Number – Meter#1 Energy Total	Read
7741	Spare	
7744	Meter#2 Flow Time in Seconds	Read
7745	Meter#2 Flow Time in Minutes	Read
7746	Meter#2 Gross Total	Read
7747	Meter#2 Net Total	Read
7748	Meter#2 Mass Total	Read
7749	Meter#2 Energy Total	Read
7750	Auxiliary Meter Gross Total	Read
7751	Roll Over Number – Meter#2 Gross Total	Read
7752	Roll Over Number – Meter#2 Net Total	Read
7753	Roll Over Number – Meter#2 Mass Total	Read
7754	Roll Over Number – Meter#2 Energy Total	Read
7755	Roll Over Number – Auxiliary Meter Gross Total	Read

(Month total roll over at 99999999. Use the following method to get correct value in floating point,

$$\text{Total (Double)} = \text{Roll Over Number} \times 9999999 + \text{Total}$$

## FLOATING POINTS

### Last Month Data Area

7728	Meter#1 Flow Time in Seconds	Read
7729	Meter#1 Flow Time in Minutes	Read
7268	Meter#1 Gross Total	Read
7269	Meter#1 Net Total	Read
7270	Meter#1 Mass Total	Read
7271	Meter#1 Energy Total	Read
7742	Meter#2 Flow Time in Seconds	Read
7743	Meter#2 Flow Time in Minutes	Read
7467	Meter#2 Gross Total	Read
7468	Meter#2 Net Total	Read
7469	Meter#2 Mass Total	Read
7470	Meter#2 Energy Total	Read
7471	Auxiliary Meter Gross Total	Read
7472	Auxiliary Meter Gross Total – Roll Over Number	Read
7287	Roll Over Number – Meter#1 Gross Total	Read
7288	Roll Over Number – Meter#1 Net Total	Read
7289	Roll Over Number – Meter#1 Mass Total	Read
7290	Roll Over Number – Meter#1 Energy Total	Read
7291	Roll Over Number – Meter#2 Gross Total	Read
7292	Roll Over Number – Meter#2 Net Total	Read
7293	Roll Over Number – Meter#2 Mass Total	Read
7294	Roll Over Number – Meter#2 Energy Total	Read
7262	Program Variable #1	Read
7263	Program Variable #2	Read
7264	Program Variable #3	Read
7265	Program Variable #4	Read
7266	Program Variable #5	Read

(Month total roll over at 999999999. Use the following method to get correct value in floating point,

$$\text{Total (Double)} = \text{Roll Over Number} \times 9999999 + \text{Total}$$

## **FLOATING POINTS**

### **Last Hour Data Area**

7272	Meter #1 Gross Total	Read
7273	Meter #1 Net Total	Read
7274	Meter #1 Mass Total	Read
7275	Meter #1 Energy Total	Read
7282	Meter #1 Flowing Time	Read
7283	Meter #1 Average SG/API	Read
7284	Meter #1 Average DP	Read
7285	Meter #1 Average Temperature	Read
7286	Meter #1 Average Pressure	Read
7295	Meter #2 Gross Total	Read
7296	Meter #2 Net Total	Read
7297	Meter #2 Mass Total	Read
7298	Meter #2 Energy Total	Read
7701	Meter #2 Flowing Time	Read
7702	Meter #2 Average SG/API	Read
7703	Meter #2 Average DP	Read
7704	Meter #2 Average Temperature	Read
7705	Meter #2 Average Pressure	Read
7756	Program Variable #1	Read
7757	Program Variable #2	Read
7758	Program Variable #3	Read
7759	Program Variable #4	Read
7760	Program Variable #5	Read

## **FLOATING POINTS**

### **Yesterday's Data Area**

7257	Meter #1 Flowing Time in Minutes (One Decimal Resolution)	Read
7258	Meter #1 Average SG/API	Read
7259	Meter #1 Average DP	Read
7260	Meter #1 Average Temperature	Read
7261	Meter #1 Average Pressure	Read
7276	Meter #1 Gross Total	Read
7277	Meter #1 Net Total	Read
7278	Meter #1 Mass Total	Read
7279	Meter #1 Energy Total	Read
7706	Meter #2 Flowing Time in Minutes (One Decimal Resolution)	Read
7707	Meter #2 Average SG/API	Read
7708	Meter #2 Average DP	Read
7709	Meter #2 Average Temperature	Read
7710	Meter #2 Average Pressure	Read
7460	Meter #2 Gross Total	Read
7461	Meter #2 Net Total	Read
7462	Meter #2 Mass Total	Read
7463	Meter #2 Energy Total	Read
7473	Auxiliary Meter Gross Total	Read
7474	Auxiliary Meter Gross Cumulative Total	Read
7475	Auxiliary Meter Gross Total – Roll Over Number	Read
7476	Auxiliary Meter Gross Cumulative Total – Roll Over Number	Read
7477	Spare Input #1 Time Averaged Data	Read
7478	Spare Input #2 Time Averaged Data	Read
7479	Spare Input #3 Time Averaged Data	Read
7480	Spare Input #4 Time Averaged Data	Read
7724	Meter#1 Flowing Time in Minutes (Floating)	Read
7725	Meter#1 Flowing Time in Seconds	Read
7726	Meter#2 Flowing Time in Minutes (Floating)	Read
7727	Meter#2 Flowing Time in Seconds	Read
7761	Program Variable #1	Read
7762	Program Variable #2	Read
7763	Program Variable #3	Read
7764	Program Variable #4	Read
7765	Program Variable #5	Read

## FLOATING POINTS

### Previous Daily/Month Data Area

**Set Last Daily Report Request (3026) (1=Latest,35=Oldest)**

**Set Last Monthly Report Request (3027) to 1=Latest,2=Oldest**

(3026-3027,16bits Integer,Write only)

7201	Date	Read
7202	Time	Read
7203	Meter#1 Flow Time (Hour)	Read
7204	Meter#1 Average DP	Read
7205	Meter#1 Average Pressure	Read
7206	Meter#1 Average Temperature	Read
7207	Meter#1 Average DP/EXT	Read
7208	Meter#1 Gross Total	Read
7209	Meter#1 Net Total	Read
7210	Meter#1 Mass Total	Read
7211	Meter#1 Energy Total	Read
7212	Meter#1 Average Heating Value	Read
7213	Meter#1 Average SG	Read
7214	Meter#1 Average N2 Percent	Read
7215	Meter#1 Average CO2 Percent	Read
7216	Meter#1 Average Methane Percent	Read
7217	Meter#1 Average Ethane Percent	Read
7218	Meter#1 Average Propane Percent	Read
7219	Meter#1 Average Water Percent	Read
7220	Meter#1 Average H2S Percent	Read
7221	Meter#1 Average H2 Percent	Read
7222	Meter#1 Average CO Percent	Read
7223	Meter#1 Average Oxygen Percent	Read
7224	Meter#1 Average I-Butane Percent	Read
7225	Meter#1 Average n-Butane Percent	Read
7226	Meter#1 Average I-Pentane Percent	Read
7227	Meter#1 Average n-Pentane Percent	Read
7228	Meter#1 Average n-Hexane Percent	Read
7229	Meter#1 Average n-Heptane Percent	Read
7230	Meter#1 Average n-Octane Percent	Read
7231	Meter#1 Average n-Nonane Percent	Read
7232	Meter#1 Average n-Decane Percent	Read
7233	Meter#1 Average Helium Percent	Read
7234	Meter#1 Average Argon Percent	Read
7235	Meter#1 Average Density	Read
7236	Meter#1 Average Base Density	Read
7237	Meter#1 Average BS&W Percentage	Read
7238	Meter#1 Average CTPL	Read
7239-7261	Reserved	
7262	Program Variable #1	Read
7263	Program Variable #2	Read
7264	Program Variable #3	Read
7265	Program Variable #4	Read
7266	Program Variable #5	Read
7401-7402	Reserved	
7403	Meter#2 Flow Time (Hour)	Read
7404	Meter#2 Average DP	Read

**FLOATING POINTS**

7405	Meter#2 Average Pressure	Read
7406	Meter#2 Average Temperature	Read
7407	Meter#2 Average DP	Read
7408	Meter#2 Average DP/EXT	Read
7409	Meter#2 Gross Total	Read
7410	Meter#2 Net Total	Read
7411	Meter#2 Mass Total	Read
7412	Meter#2 Energy Total	Read
7413	Meter#2 Average Heating Value	Read
7414	Meter#2 Average SG	Read
7415	Meter#2 Average N2 Percent	Read
7416	Meter#2 Average CO2 Percent	Read
7417	Meter#2 Average Methane Percent	Read
7418	Meter#2 Average Ethane Percent	Read
7419	Meter#2 Average Propane Percent	Read
7420	Meter#2 Average Water Percent	Read
7421	Meter#2 Average H2S Percent	Read
7422	Meter#2 Average CO Percent	Read
7423	Meter#2 Average Oxygen Percent	Read
7424	Meter#2 Average I-Butane Percent	Read
7425	Meter#2 Average n-Butane Percent	Read
7426	Meter#2 Average I-Pentane Percent	Read
7427	Meter#2 Average n-Pentane Percent	Read
7428	Meter#2 Average n-Hexane Percent	Read
7429	Meter#2 Average n-Heptane Percent	Read
7430	Meter#2 Average n-Octane Percent	Read
7431	Meter#2 Average n-Nonane Percent	Read
7432	Meter#2 Average n-Decane Percent	Read
7433	Meter#2 Average Helium Percent	Read
7434	Meter#2 Average Argon Percent	Read
7435	Meter#2 Average Density	Read
7436	Meter#2 Average Base Density	Read
7437	Average Spare Data #1	Read
7438	Average Spare Data #2	Read
7439	Average Spare Data #3	Read
7440	Average Spare Data #4	Read
7441	Auxiliary Meter Daily or Monthly Total	Read
7442	Auxiliary Meter Cumulative Total	Read
7443	Auxiliary Meter Daily/Monthly Total – Roll Over No.	Read
7444	Auxiliary Meter Cumulative Total – Roll Over No.	Read
7445	Meter #2 Average BS&W Percentage	Read
7446	Meter #2 Average CTPL	Read



## FLOATING POINTS

### Previous Hourly Data Area

#### **3029                      Last Hourly Report Request(1=Latest,750=Oldest)**

(3029,16bits Integer,Write only)

7240	Meter#1 User Defined Variable#3	Read
7241	Date	Read
7242	Time	Read
7243	Meter#1 Flow Time	Read
7244	Meter#1 User Defined Variable#1	Read
7245	Meter#1 Average Temperature	Read
7246	Meter#1 Average Pressure	Read
7247	Meter#1 User Defined Variable#2	Read
7248	Meter#1 Hourly Gross	Read
7249	Meter#1 Hourly Net	Read
7250	Meter#1 Hourly Mass	Read
7251	Meter#1 Hourly Energy	Read
7252	Program Variable #1	Read
7253	Program Variable #2	Read
7254	Program Variable #3	Read
7255	Program Variable #4	Read
7256	Program Variable #5	Read
7450	Meter #2 User Defined Variable#3	Read
7451	Meter #2 Flow Time	Read
7452	Meter #2 User Defined Variable#1	Read
7453	Meter #2 Average Temperature	Read
7454	Meter #2 Average Pressure	Read
7455	Meter #2 User Defined Variable#2	Read
7456	Meter #2 Hourly Gross	Read
7457	Meter #2 Hourly Net	Read
7458	Meter #2 Hourly Mass	Read
7459	Meter #2 Hourly Energy	Read

## FLOATING POINTS

**Hourly and Daily archive flow data 701, 702, 703, 704 are fixed length arrays. The data field is used to address an individual record**

One Modbus register (7098 –floating point) is used to indicate the current *daily record pointer numbers*. This pointer identifies the current record which data was last logged. The EPLUS-GL can store up to 32 day's data. The daily pointer will be 1 through 32. The pointer will roll over at 32 to 1.

Read Archive Record Query Message – Read archive registers 701 record number 10

### RTU MODE –

ADDR	FUNC CODE	STARTING POINT		# OF POINTS		CRC CHECK	
		HI	LO	HI	LO		
01	03	02	BD	00	0A	54	51

### Response

ADDR	FUNC CODE	BYTE COUNTS	DATA ...(Repeat n Times)		CRC CHECK	
			HI	LO		
01	03	58	00	01..		

### Daily Archive 701:Meter#1,702:Meter#2- Previous Daily Data

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

## **FLOATING POINTS**

### **Daily Archive 703:Meter#1,705:Meter#2- Previous Daily Data Area**

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

One Modbus register (7099 –floating point) is used to indicate the current *hourly record pointer numbers*. This pointer identifies the current record which data was last logged. The EPLUS-GL can store up to 770 hour's data. The hourly pointer will be 1 through 770. (The pointer will roll over at 770 to 1).

### **Hourly Archive 704:Meter#1, 706:Meter#2 - Previous Hourly Data Area**

Date  
Time  
Flow Time (Min.)  
Average Pressure  
Average Temperature  
Gross Total  
Net Total  
Mass Total  
Energy Total  
User Defined Variable#1  
User Defined Variable#2

## FLOATING POINTS

### Programmable Floating Point Variable

7791-7798	Program Display Variables	Read/Write
7801-7830	Scratch Pad Variables – Floating Point	Read/Write

7975	Hour Program Variable #1	Read/Write
7976	Hour Program Variable #2	Read/Write
7977	Hour Program Variable #3	Read/Write
7978	Hour Program Variable #4	Read/Write
7979	Hour Program Variable #5	Read/Write

**7975-7779** – 5 Variables will be reset at the end of hour.

7980	Day Program Variable #1	Read/Write
7981	Day Program Variable #2	Read/Write
7982	Day Program Variable #3	Read/Write
7983	Day Program Variable #4	Read/Write
7984	Day Program Variable #5	Read/Write

**7980-7984** – 5 Variables will be reset at the end of day.

7985	Month Program Variable #1	Read/Write
7986	Month Program Variable #2	Read/Write
7988	Month Program Variable #3	Read/Write
7988	Month Program Variable #4	Read/Write
7989	Month Program Variable #5	Read/Write

**7985-7989** – 5 Variables will be reset at the end of Month.

**7756-7760** – Last Hour Program Variables (Read Only)

**7761-7765** – Yesterday Program Variables (Read Only)

**7766-7770** – Last Month Program Variables (Read Only)

**Previous Hourly Data Area – Prog.Var**

**3029** Last Hourly Report Request (1=Latest,840=Oldest)

(3029,16bits Integer,Write only)

7252	Program Variable #1	Read
7253	Program Variable #2	Read
7254	Program Variable #3	Read
7255	Program Variable #4	Read
7256	Program Variable #5	Read

**Previous Daily/Month Data Area – Prog.Var**

**3026** Last Daily Report Request (1=Latest,35=Oldest)

**3027** Set Last Monthly Report Request (1=Latest,2=Oldest)

(3026-3027,16bits Integer,Write only)

7262	Program Variable #1	Read
7263	Program Variable #2	Read
7264	Program Variable #3	Read
7265	Program Variable #4	Read
7266	Program Variable #5	Read

## Alarms, Audit Trail, and Calibration Data

### Alarms and Status Codes

Set last alarm status request (3030) to 1.

(3030, 16bits, Integer, Write only)

4001-4003 ((2x16 bits Integer, Write only)

4001 last alarm date mmddyy

4003 last alarm time hhmmss

4005 last alarm flag -  $\text{Idx}1000000 + \text{CODE} \times 10000 + \text{ACODE} \times 100 + \text{STATUS}$

### Last Alarm Flag

ID	CODE	ACODE	STATUS
----	------	-------	--------

#### ID

0	Analog Output	18	Calibration Mode
		20	Multi.Var. DP
		21	Multi.Var. Pressurer
		22	Multi.Var. Temperature
		23	Analog Input #1
		24	Analog Input #2
		25	Analog Input #3
11	Meter #1	26	RTD Input
12	Meter #2	27	Battery Voltage

#### CODE (Only For ID=Meter)

1	Net Flowrate (Gross –AGA7)		
2	Density Out of Range	7	Down
		8	Start

#### ACODE

N/A

#### STATUS

0	ID = 0	OVERRANGE OK	1	ID=18	Calib.Mode
	ID=18	OFF		ID=Others	HI
	ID=Others	OK	2	LO	
Others	Not Used		5	OVERRANGE	

Example: Last Alarm Flag – (Hex:A8EA33, Decimal:11070003)

ID= 11, CODE=7,ACODE=0,STATUS=3 -> METER DOWN

### **Previous Audit Data Area**

Set last audit data request (3031) to 1.

(3031, 16bits Integer, Write only)

(8101-8109, 2x16 bits Integer, Write only)

8101 Last Audit Date mmdyy

8103 Last Audit Time hhmmss

8105 Old Value (Decimal Inferred in the 4<sup>th</sup> byte of 8109)

8107 New Value (Decimal Inferred in the 4<sup>th</sup> byte of 8109)

8109 Code Flag-Given in four hexadecimal bytes (no,audit code,dec)

### **Code Flag**

	No.	Audit Code	Old/New Value Decimal Inferred
--	-----	------------	--------------------------------

#### **NO.**

The following table is only for audit code is less than 200

Value 0 : this field is not used.

1	Meter #1
2	Meter #2
3	Analog Input #1
4	Analog Input #2
5	Analog Input #3
6	RTD Input

211	Multi.Var.DP
212	Multi.Var.Pressure
213	Multi.Var.Temperature

#### **Audit Codes**

1	DP Cut Off
2	Spare
3	Spare
4	Flowing Density Override
5	Base Density Override
6	Pipe ID
7	Orifice ID
8	Temperature Override
9	Pressure Override
10	Spare
11	Base SG
12	Ratio of Heat
13	Viscosity
14	Pipe Thermal Expansion E-6
15	Orifice Thermal Expansion E-6
16	Reference Temperature of Pipe
17	Reference Temperature of Orifice
18	MOL% of Methane (aga8d) CO2 (AGA8 Gross Method 1) Nitrogen(AGA8 Gross Method 2)
19	Hydrogen(AGA8 Gross Method 1) CO2 (AGA8 Gross Method 2) Nitrogen(AGA8 Detail Method)
20	CO (AGA8 Gross Method 1) Hydrogen(AGA8 Gross Method 2) CO2 (AGA8 Detail Method)
21	CO (AGA8 Gross Method 2) Ethane (AGA8 Detail Method)

142	Flow Rate Threshold #1
143	Flow Rate Threshold #2
144	Flow Rate Threshold #3
145	Flow Rate Threshold #4
146	Linearization Factor #1
147	Linearization Factor #2
148	Linearization Factor #3
149	Linearization Factor #4
150	
151	
152	
153	Flow Rate Display
154	Calculation Type
155	Y Factor Select
156	
157	
158	
159	
161	Day Start Hour

22	Propane (AGA8 Detail Method)
23	Water (AGA8 Detail Method)
24	H2S (AGA8 Detail Method)
25	Hydrogen (AGA8 Detail Method)
26	CO (AGA8 Detail Method)
27	Oxygen (AGA8 Detail Method)
28	i-Butane (AGA8 Detail Method)
29	n-Butane (AGA8 Detail Method)
58	Density Correction Factor
60	Base Temperature
61	Base Pressure
62	Atmospheric Pressure
63	Pulse Output #1 Volume
64	Pulse Output #2 Volume
65	Mol % of I-Pentane
66	Mol % of n-Pentane
67	Mol % of n-Hexane
68	Mol % of n-Heptane
69	Mol % of n-Octane
70	Mol % of n-Nonane
71	Mol % of n-Decane
72	Mol % of Helium
73	Mol % of Argon
131	Fail Code
132	Analog Output @4mA
133	Analog Output @20mA
134	@4mA
135	@20mA
136	Maintenance
137	Maintenance
138	Override
139	Spare
140	Spare

162	
163	
164	Product
165	History Monthly Report Var#1
166	History Monthly Report Var#2
167	History Daily Report Var#1
168	History Daily Report Var#2
170	Gas or Liquid
171	Pressure Unit
173	Flow Unit
180	***SEE NOTE (next page)
181	Flow Cut Off Hertz
182	K Factor
183	Meter Factor
184	Spare
185	Spare
186	Spare
187	Spare

**Example:** Density Correction Factor change from 1.00000 to 1.10000

- 8101            Last Audit Date mmddyy**  
00 00 C8 C8 (Hex), 051400 (Decimal) – May 14, 2000
- 8103            Last Audit Time hhmmss**  
00 03 0d 40 (Hex), 200000(Decimal) – 8 PM
- 8105            Old Value (Decimal Inferred in the 4<sup>th</sup> byte of 8109)**  
00 01 86 a0 (Hex) 100000 (Decimal)  
4<sup>th</sup> byte of 8513 = 5 (Decimal Places)  
result = 1.00000
- 8107            New Vaule(Decimal Inferred in the 4<sup>th</sup> byte of 8109)**  
00 01 ad b0 (Hex) 110000 (Decimal)  
4<sup>th</sup> byte of 8513 = 5 (Decimal Places)  
Rslt = 1.10000
- 8109            Code Flag**  
00 26 3a 05 in Hex  
**2<sup>nd</sup> Byte** – 26 (Hex) 38 (Decimal) Meter Density,  
**3<sup>rd</sup> Byte** – **Audit Code** – 3A(Hex) 58 (Decimal) – Density Correction Factor  
**4<sup>th</sup> Byte** – **Decimal Places** – 05 (Hex) – 5 Decimal Places

**NOTE:**

*When Audit Code = 180, then the following Modbus Addresses store the parameters indicated.*

- 8101    System Start Date*
- 8103    System Start Time*
- 8105    System Failed Date*
- 8107    System Failed Time*
- 8109    Not Used*



**Previous Calibration/Verification Data Area**

**3020**            **Last Calib./Verification Rpt Req.(1=Latest,20=Oldest) 0 InferredRead/Write**  
 8251            Last Calibration/Verification Date mmddyy  
 8253            Last Calibration/Verification Time hhmmss  
 8255            As Found / Verification Point (Decimal Inferred in the 4<sup>th</sup> byte of 8259)  
 8257            As Left (Decimal Inferred in the 4<sup>th</sup> byte of 8259)  
 8259            Code Flag-Given in four hexadecimal bytes (no,code,dec)

**Code Flag**

	ID	Code	Value Decimal Inferred
--	----	------	------------------------

**ID**

1	DP
2	Pressure
3	Temperature
4	Analog Input #1
5	Analog Input #2
6	Analog Input #3
7	RTD Input

**Code**

0	Calibration
1	Verification

**Decimal Inferred**

4	4 Decimal Inferred
2	2 Decimal Inferred

**Current Alarm Status**

4 Bytes in Hex - FF FF FF FF

**Meter#1 Modbus Address 9533**The Current Alarm Status is a 4-byte string that resides at **Modbus address 9533**.

1 <sup>st</sup> byte	2 <sup>nd</sup> byte	3 <sup>rd</sup> byte	4 <sup>th</sup> byte	
01	00	00	00	Meter#1 Down
02	00	00	00	Meter#1 Density Out of Range
04	00	00	00	Meter#1 Net Flowrate High(Gross Flowrate High if AGA7 is selected)
08	00	00	00	Meter#1 Net Flowrate Low (Gross Flowrate Low if AGA7 is selected)
10	00	00	00	Meter#2 Down
20	00	00	00	Meter#2 Density Out of Range
40	00	00	00	Meter#2 Net Flowrate High(Gross Flowrate High if AGA7 is selected)
80	00	00	00	Meter#2 Net Flowrate Low (Gross Flowrate Low if AGA7 is selected)

**Other Alarms (Modbus Address 9531)**

4 Bytes in Hex - FF FF FF FF

01	00	00	00	Multi.Var.DP High
02	00	00	00	Multi.Var.DP Low
04	00	00	00	Multi.Var.Pressure High
08	00	00	00	Multi.Var.Pressure Low
10	00	00	00	Multi.Var.Temperature High
20	00	00	00	Multi.Var.Temperature Low
40	00	00	00	Analog Output Overrange
80	00	00	00	Battery Voltage Low
00	01	00	00	Analog Input #1 High
00	02	00	00	Analog Input #1 Low
00	04	00	00	Analog Input #2 High
00	08	00	00	Analog Input #2 Low
00	10	00	00	Analog Input #3 High
00	20	00	00	Analog Input #3 Low
00	40	00	00	RTD Input High
00	80	00	00	RTD Input Low
00	00	01	00	Calibration Mode ON

## Data Packet

### Previous Hourly Data Packet (101-268)

Hourly archive flow data 101, 102, .. 268 are fixed length arrays. The data field is used to address an 5 hours individual group record.(101=Latest, 268=Oldest)

#### RTU MODE -

ADDR	FUNC CODE	ARCHIVE NUMBER		METER NUMBER		CRC CHECK	
		HI	LO	HI	LO		
01	03	00	65	00	01	94	15

#### Response

ADDR	FUNC CODE	BYTE COUNTS	DATA ...(Repeat n Times)		CRC CHECK	
			HI	LO		
01	03	F0	00	01..		

#### Response Data Message

DESCRIPTION	DECIMAL	HOURL
Date (24 Bits)/ Hour (8 Bits)	0 Inferred	First Hour
Alarm Status	0 Inferred	First Hour
Flowing Time	1 Inferred	First Hour
Gross Total	*1 or 2 Inferred	First Hour
Net Total	*1 or 2 Inferred	First Hour
Mass Total	*1 or 2 Inferred	First Hour
Energy Total	*1 or 2 Inferred	First Hour
Temperature	1 Inferred	First Hour
Pressure	1 Inferred	First Hour
User Defined Variable#1	4 Inferred	First Hour
User Defined Variable#2	4 Inferred	First Hour
User Defined Variable#3	6 Inferred or 1 Inferred(API)	First Hour
Date (24 Bits)/ Hour (8 Bits)	0 Inferred	Second Hour
Alarm Status	0 Inferred	Second Hour
Flowing Time	1 Inferred	Second Hour
Gross Total	*1 or 2 Inferred	Second Hour
Net Total	*1 or 2 Inferred	Second Hour
Mass Total	*1 or 2 Inferred	Second Hour
Energy Total	*1 or 2 Inferred	Second Hour
Temperature	1 Inferred	Second Hour
Pressure	1 Inferred	Second Hour
User Defined Variable#1	4 Inferred	Second Hour
User Defined Variable#2	4 Inferred	Second Hour
User Defined Variable#3	6 Inferred or 1 Inferred (API)	Second Hour

\*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

## Data Packet

DESCRIPTION	DECIMAL	HOURL
Date (24 Bits)/ Hour (8 Bits)	0 Inferred	Third Hour
Alarm Status	0 Inferred	Third Hour
Flowing Time	1 Inferred	Third Hour
Gross Total	*1 or 2 Inferred	Third Hour
Net Total	*1 or 2 Inferred	Third Hour
Mass Total	*1 or 2 Inferred	Third Hour
Energy Total	*1 or 2 Inferred	Third Hour
Temperature	1 Inferred	Third Hour
Pressure	1 Inferred	Third Hour
User Defined Variable#1	4 Inferred	Third Hour
User Defined Variable#2	4 Inferred	Third Hour
User Defined Variable#3	6 Inferred or 1 Inferred (API)	Third Hour
Date (24 Bits)/ Hour (8 Bits)	0 Inferred	Fourth Hour
Alarm Status	0 Inferred	Fourth Hour
Flowing Time	1 Inferred	Fourth Hour
Gross Total	*1 or 2 Inferred	Fourth Hour
Net Total	*1 or 2 Inferred	Fourth Hour
Mass Total	*1 or 2 Inferred	Fourth Hour
Energy Total	*1 or 2 Inferred	Fourth Hour
Temperature	1 Inferred	Fourth Hour
Pressure	1 Inferred	Fourth Hour
User Defined Variable#1	4 Inferred	Fourth Hour
User Defined Variable#2	4 Inferred	Fourth Hour
User Defined Variable#3	6 Inferred or 1 Inferred (API)	Fourth Hour
Date (24 Bits)/ Hour (8 Bits)	0 Inferred	Fifth Hour
Alarm Status	0 Inferred	Fifth Hour
Flowing Time	1 Inferred	Fifth Hour
Gross Total	*1 or 2 Inferred	Fifth Hour
Net Total	*1 or 2 Inferred	Fifth Hour
Mass Total	*1 or 2 Inferred	Fifth Hour
Energy Total	*1 or 2 Inferred	Fifth Hour
Temperature	1 Inferred	Fifth Hour
Pressure	1 Inferred	Fifth Hour
User Defined Variable#1	4 Inferred	Fifth Hour
User Defined Variable#2	4 Inferred	Fifth Hour
User Defined Variable#3	6 Inferred or 1 Inferred (API)	Fifth Hour

**\*Note**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

## Data Packet

\*Note: Alarm Status

<b>Bit 0</b>	0 – Meter #1 Live DP 1 – Meter #1 DP maintenance value.
<b>Bit 1</b>	0 – Meter #1 Live Pressure 1 – Meter #1 Pressure maintenance or override value
<b>Bit 2</b>	0 – Meter #1 Live Temperature 1 – Meter #1 Temperature maintenance or override value
<b>Bit 3</b>	0 – Meter #1 Live BS&W 1 – Meter #1 BS&W maintenance or override value
<b>Bit 4</b>	0 – Meter #2 Live DP 1 – Meter #2 DP maintenance value.
<b>Bit 5</b>	0 – Meter #2 Live Pressure 1 – Meter #2 Pressure maintenance or override value
<b>Bit 6</b>	0 – Meter #2 Live Temperature 1 – Meter #2 Temperature maintenance or override value
<b>Bit 7</b>	0 – Meter #2 Live BS&W 1 – Meter #2 BS&W maintenance or override value

### Previous Hourly Data Packet

Number	Hour
101	1-5
102	6-10
103	11-15
104	16-20
105	21-25
106	26-30
107	31-35
108	36-40
109	41-45
110	46-50
111	51-55
112	56-60
113	61-65
114	66-70
115	71-75
116	76-80
117	81-85
118	86-90
119	91-95
120	96-100
121	101-105
122	106-110
123	111-115
124	116-120
125	121-125
126	126-130
127	131-135
128	136-140
129	141-145
130	146-150

Number	Hour
131	151-155
132	156-160
133	161-165
134	166-170
135	171-175
136	176-180
137	181-185
138	186-190
139	191-195
140	196-200
141	201-205
142	206-210
143	211-215
144	216-220
145	221-225
146	226-230
147	231-235
148	236-240
149	241-245
150	246-250
151	251-255
152	256-260
153	261-265
154	266-270
155	271-275
156	276-280
157	281-285
158	286-290
159	291-295
160	296-300

Number	Hour
161	301-305
162	306-310
163	311-315
164	316-320
165	321-325
166	326-330
167	331-335
168	336-340
169	341-345
170	346-350
171	351-355
172	356-360
173	361-365
174	366-370
175	371-375
176	376-380
177	381-385
178	386-390
179	391-395
180	396-400
181	401-405
182	406-410
183	411-415
184	416-420
185	421-425
186	426-430
187	431-435
188	436-440
189	441-445
190	446-450

## ***Data Packet***

Number	Hour
191	451-455
192	456-460
193	461-465
194	466-470
195	471-475
196	476-480
197	481-485
198	486-490
199	491-495
200	496-500
201	501-505
202	506-510
203	511-515
204	516-520
205	521-525
206	526-530
207	531-535
208	536-540
209	541-545
210	546-550
211	551-555
212	556-560
213	561-565
214	566-570
215	571-575
216	576-580
217	581-585
218	586-590
219	591-595
220	596-600

Number	Hour
221	601-605
222	606-610
223	611-615
224	616-620
225	621-625
226	626-630
227	631-635
228	636-640
229	641-645
230	646-650
231	651-655
232	656-660
233	661-665
234	666-670
235	671-675
236	676-680
237	681-685
238	686-690
239	691-695
240	696-700
241	701-705
242	706-710
243	711-715
244	716-720
245	721-725
246	726-730
247	731-735
248	736-740
249	741-745
250	746-750

## Data Packet

### **Previous Daily Data Packet (601- Meter#1, 602-Meter#2)**

**Daily archive flow data 601 is a fixed length array. The data field is used to address an 1day (24 hours) individual group record.(1=Latest, 35=Oldest)**

### **RTU MODE -**

ADDR	FUNC CODE	ARCHIVE NUMBER		DATA FIELD		CRC CHECK	
		HI	LO	HI	LO		
01	03	02	59	00	01		

### **Response**

ADDR	FUNC CODE	BYTE COUNTS	DATA ...(Repeat n Times)		CRC CHECK	
			HI	LO		
01	03	F7	00	01..		

### **Response Data Message**

DESCRIPTION
Date and Day Start Hour (4 Bytes)
1 <sup>st</sup> Hour Variable #1 (4 Bytes)
1 <sup>st</sup> Hour Variable #2 (4 Bytes)
1 <sup>st</sup> Hour Variable #3 (2 Bytes)
2 <sup>nd</sup> Hour Variable #1 (4 Bytes)
2 <sup>nd</sup> Hour Variable #2 (4 Bytes)
2 <sup>nd</sup> Hour Variable #3 (2 Bytes)
3 <sup>rd</sup> Hour Variable #1 (4 Bytes)
3 <sup>rd</sup> Hour Variable #2 (4 Bytes)
3 <sup>rd</sup> Hour Variable #3 (2 Bytes)
4 <sup>th</sup> Hour Variable #1 (4 Bytes)
4 <sup>th</sup> Hour Variable #2 (4 Bytes)
4 <sup>th</sup> Hour Variable #3 (2 Bytes)
5 <sup>th</sup> Hour Variable #1 (4 Bytes)
5 <sup>th</sup> Hour Variable #2 (4 Bytes)
5 <sup>th</sup> Hour Variable #3 (2 Bytes)
...
...
...
24 <sup>th</sup> Hour Variable #1 (4 Bytes)
24 <sup>th</sup> Hour Variable #2 (4 Bytes)
24 <sup>th</sup> Hour Variable #3 (2 Bytes)

## Data Packet

### Description of Daily Data Packet

#### *Date and Day Start Hour (32 Bits)*

24 Bits	8 Bits
Date (MM/DD/YY)	Day Start Hour

#### *Variable#1 (32 Bits)*

8 Bits	16 Bits	8 Bits
Flow Time in Hour (2 Decimal Inferred)	VAR#1 (1 Decimal Inferred)	DP (1 <sup>st</sup> Part)

#### *Variable#2 (32 Bits)*

4 Bits (2 <sup>nd</sup> Part DP)	12 Bits	12 Bits	4 Bits
DP (1 Decimal Inferred)	Temperature (1 Decimal)	Pressure (0 Decimal)	VAR#2 (1 <sup>st</sup> Part)

#### *Variable#3 (16 Bits)*

16 Bits (2 <sup>nd</sup> Part VAR#2)
VAR#2

### Report Format Selection

Meter Number	Variable #1	Variable #2
1	2669	2670
2	2671	2672

Selection	VAR#1	Decimal Inferred
0	Gross Total	1
1	Net Total	1
2	Mass Total	1
3	Energy Total	1

Selection	VAR#2	Decimal Inferred
0	Gross Total	1
1	Net Total	1
2	Mass Total	1
3	Energy Total	1
4	DP/EXT	4



## Data Packet

### Previous Month Data Packet (411,421)

Monthly archive flow data 411- 421 are fixed length arrays. The data field is used to address month configuration and month totals record.(411=Lastest, 421=Oldest)

#### RTU MODE -

ADDR	FUNC CODE	ARCHIVE NUMBER		METER NUMBER		CRC CHECK	
		HI	LO	HI	LO		
01	03	01	9b	00	01		

#### Response

ADDR	FUNC CODE	BYTE COUNTS	DATA ...(Repeat n Times)		CRC CHECK	
			HI	LO		
01	03	E4	00	01..		

DESCRIPTION	DECIMAL
Meter#1 Base SG (GAS)	6 Inferred
Meter#1 N2	4 Inferred
Meter#1 CO2	4 Inferred
Meter#1 Heating Value (GAS)	3 Inferred
Meter#1 Pipe ID	4 Inferred
Meter#1 Orifice ID	4 Inferred
Base Temperature	2 Inferred
Base Pressure...	4 Inferred
Atmospheric Pressure...	4 Inferred
Meter#1 DP Cut Of (Gas) / Flow Cut Off (Liquid)	4 Inferred
Flowing Time	1 Inferred
Month Total – VAR#1	*1 or 2 Inferred
Month Total – VAR#2	*1 or 2 Inferred
Month Averaged Temperature	2 Inferred
Month Average Pressure	2 Inferred
Month Average DP	4 Inferred
Month Average DP/EXT	4 Inferred
Configuration Flag	0 Inferred
Date	0 Inferred
Month	0 Inferred
Year	0 Inferred
Reserved	0 Inferred

#### \*Note

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

## Data Packet

### **Previous Month Data Packet (412-414,422-424)**

**Monthly archive flow data 412-414, .422-424 are fixed length arrays. The data field is used to address an 8 days individual group record.**

Number	Day
412	1-8
413	9-16
414	17-24

Number	Day
422	1-8
423	9-16
424	17-24

DESCRIPTION	DECIMAL	Days
Index	0 Inferred	
Flowing Time	1 Inferred	First Day
VAR#1	*1 or 2 Inferred	First Day
VAR#2	*1 or 2 Inferred	First Day
Temperature	2 Inferred	First Day
Pressure	2 Inferred	First Day
DP	4 Inferred	First Day
DP/EXT	4 Inferred	First Day
...	...	...
...	...	...
...	...	...
Flowing Time	1 Inferred	Eighth Day
VAR#1	*1 or 2 Inferred	Eighth Day
VAR#2	*1 or 2 Inferred	Eighth Day
Temperature	2 Inferred	Eighth Day
Pressure	2 Inferred	Eighth Day
DP	4 Inferred	Eighth Day
DP/EXT	4 Inferred	Eighth Day

### **VAR#1 and VAR #2 Modbus Register**

Meter Number	Variable #1	Variable #2
1	2665	2666
2	2667	2668

Selection	VAR#1	Decimal Inferred
0	Gross Total	*1 or 2
1	Net Total	*1 or 2
2	Mass Total	*1 or 2
3	Energy Total	*1 or 2

#### **\*Note**

Firmware version 9.00.21 or older: 1 decimal inferred

Firmware version 9.00.22 or newer: 2 decimal inferred

## Data Packet

### Previous Month Data Packet (415, 425)

Monthly archive flow data 415, .425 are fixed length arrays. The data field is used to address an 7 days individual group record

Number	Day
415	25-31

Number	Day
425	25-31

### RTU MODE -

ADDR	FUNC CODE	ARCHIVE NUMBER		METER NUMBER		CRC CHECK	
		HI	LO	HI	LO		
01	03	01	9f	00	01		

### Response


ADDR	FUNC CODE	BYTE COUNTS	DATA ...(Repeat n Times)		CRC CHECK	
			HI	LO		
01	03	C8	00	01..		


# CHAPTER 5: 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).


 B. DIVISION 2 WIRING METHOD.


6. CLASS II INSTALLATIONS MUST USE A CSA APPROVED DUST-IGNITIONPROOF 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.

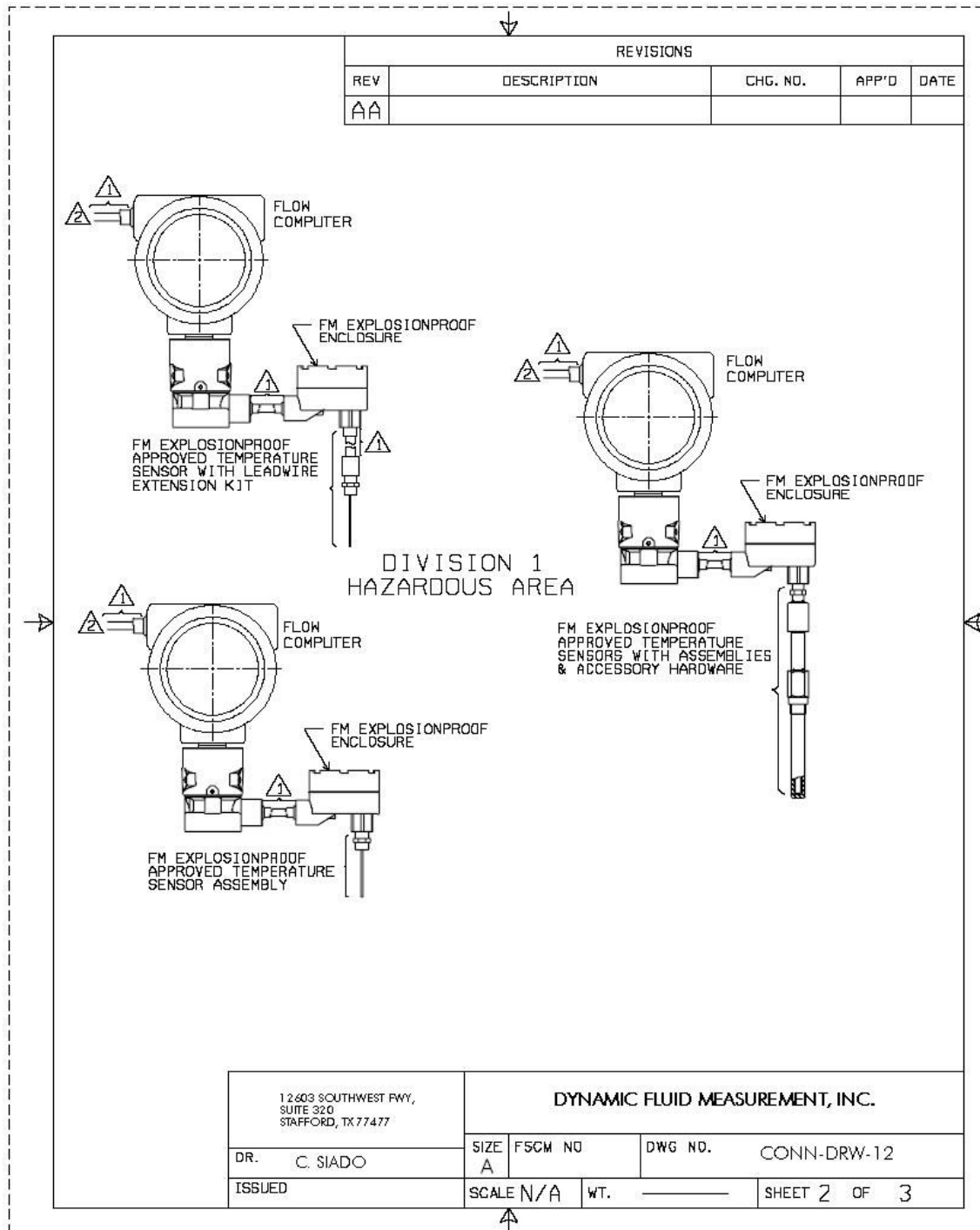
3. ALL CONDUITS THREADS TO BE ASSEMBLED WITH FIVE FULL THREADS MINIMUM.

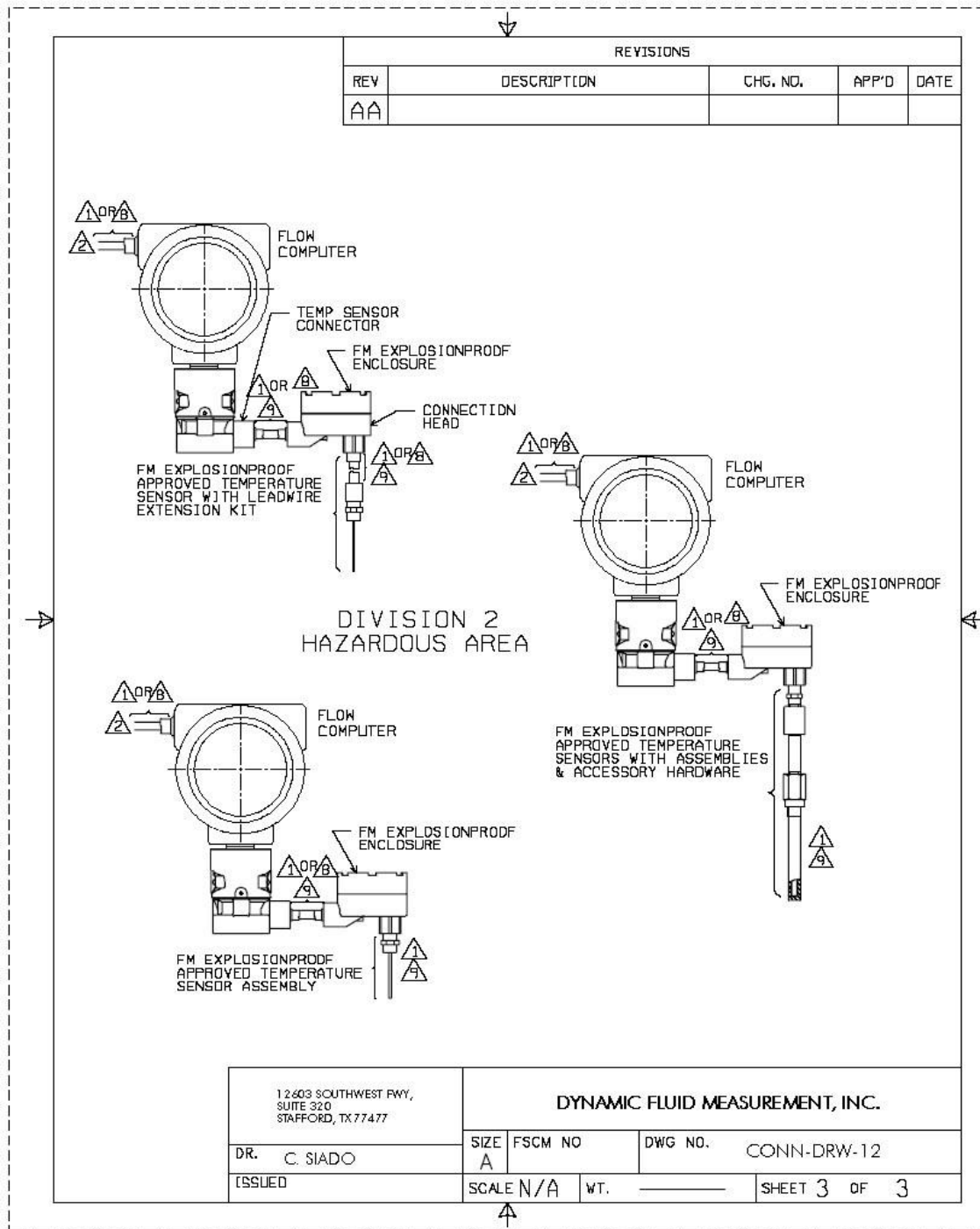
 2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250VAC.

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

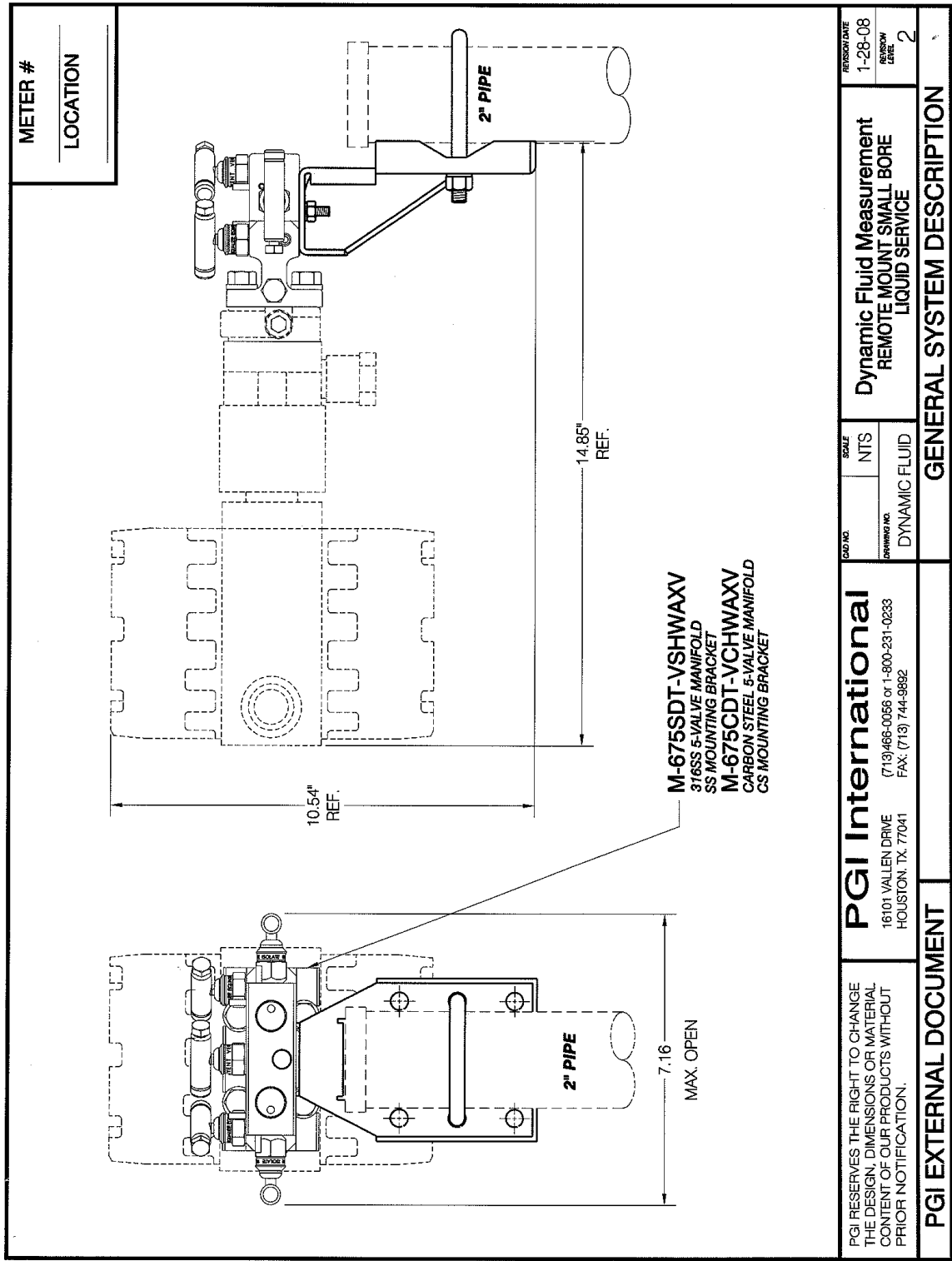
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES (mm). REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125	CONTRACT NO.	DYNAMIC FLUID MEASUREMENT, INC.		12603 SOUTHWEST HWY., SUITE 320 STAFFORD, TX 77477	
	DR. C. SIADO	TITLE MODEL MICROMV AND ECHART EXPLOSIONPROOF INSTALLATION DRAWING, FACTORY MUTUAL			
	CHK'D				
	APP'D. S. HALILAH	SIZE A	FSCM NO	DWG NO. CONN-DRW-12	
-TOLERANCE- .X = .1 (2.5) .XX = .02 (0.5) .XXX = .010 (0.25) FRACTIONS = 1/32 ANGLES = 2°	APP'D. GOVT.	SCALE	WT.	SHEET 1 OF 3	

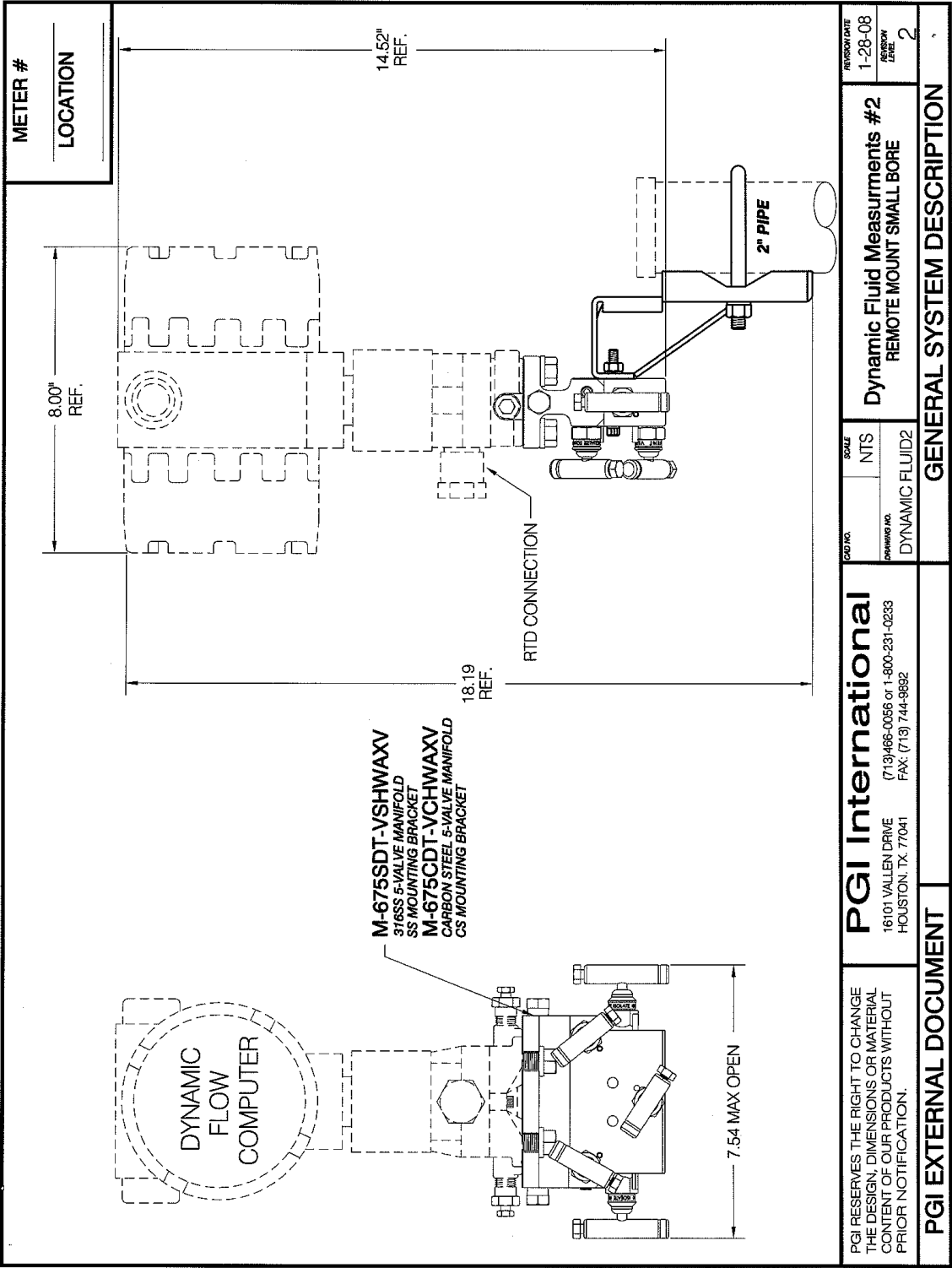
DO NOT SCALE PRINT



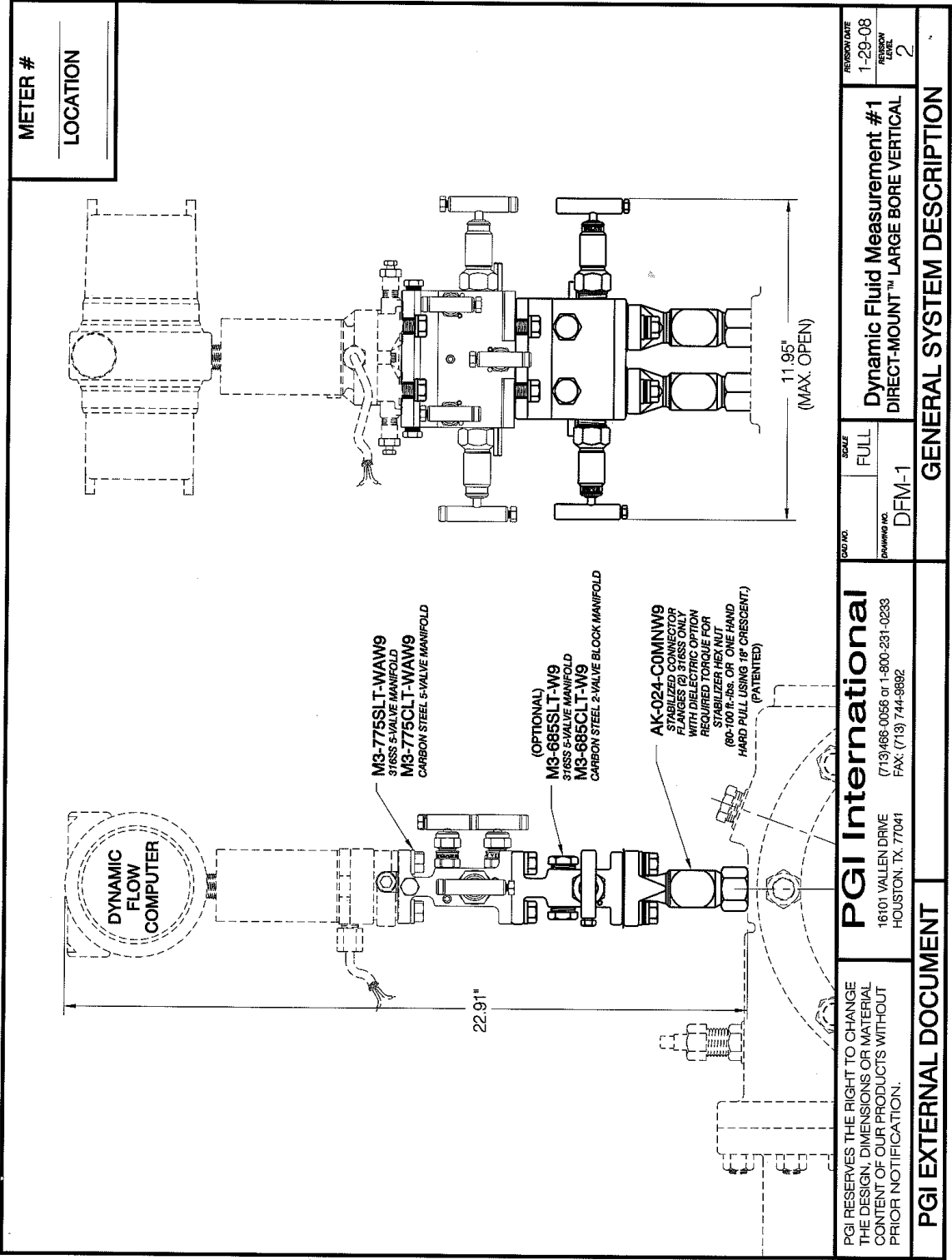


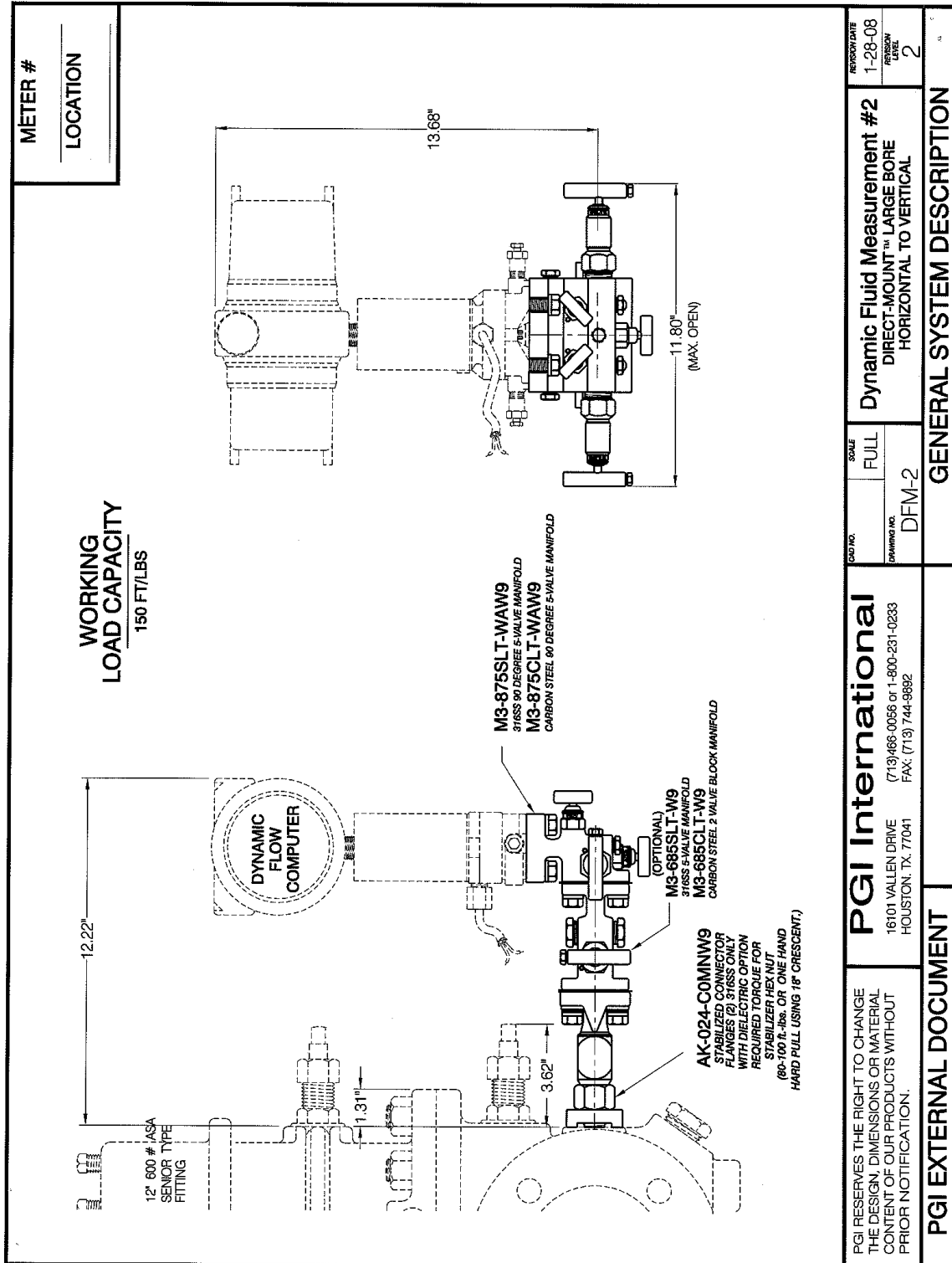
Manifold Installation Drawings











# Appendix A: Radio Board Manual

## *Introduction*

Our Radio Interface board with battery charger was designed after careful listening to our customers in all sectors of the oil and gas industry. It was built to address the different wireless connection 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 this interface board, with all its multiple wireless modules has delivered and met the design intentions.

The product combines the following features:

- ◆ **Simple and Reliable**
- ◆ **Flexible and able to use either 900Mhz, 2.4Ghz, GSM, CDMA and WiFi Modules**
- ◆ **Easy to understand and configure**
- ◆ **Rugged and designed to industrial specifications**
- ◆ **Economical to install and maintain**

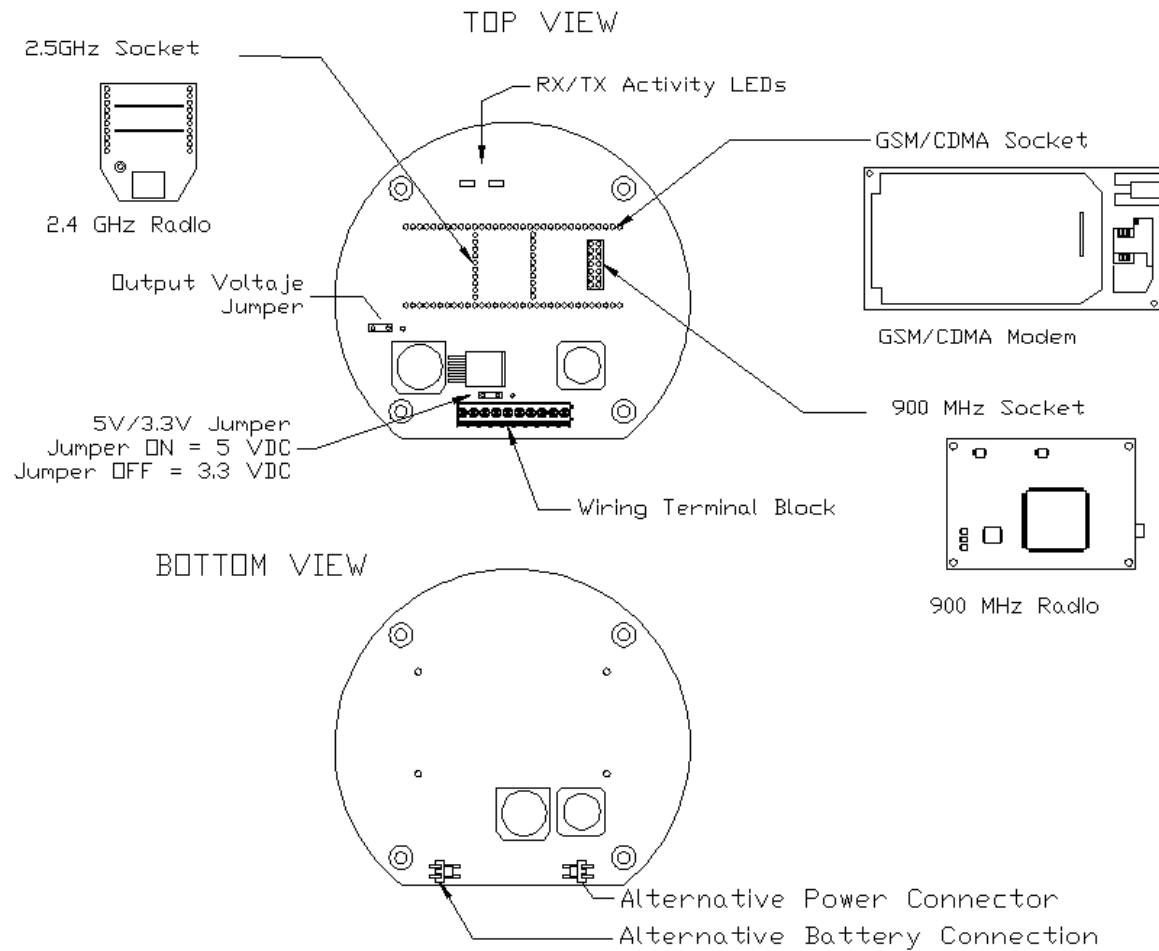
We hope that your experience with our products will be a simple pleasant experience, not intimidating in any way.

The Radio interface board can handle three different socket modules.

- A 900 MHz radio module for long distance radio links.
- A 2.4 GHz radio module ideal for short range radio links.
- A socket modem that can be either GSM or CDMA. Ideal to access remote locations using existing cellular network infrastructure. The modem can be also Wi-Fi which can take advantage of existing wireless networks.

In addition the board provides power to external devices which allow the user to connect other radios. It also has a shutdown input to turn the radio On/Off to improve power management on top of the smart battery charger included on the board to extend the life of the battery pack and take advantage of the power coming from external supplies.

## Overview

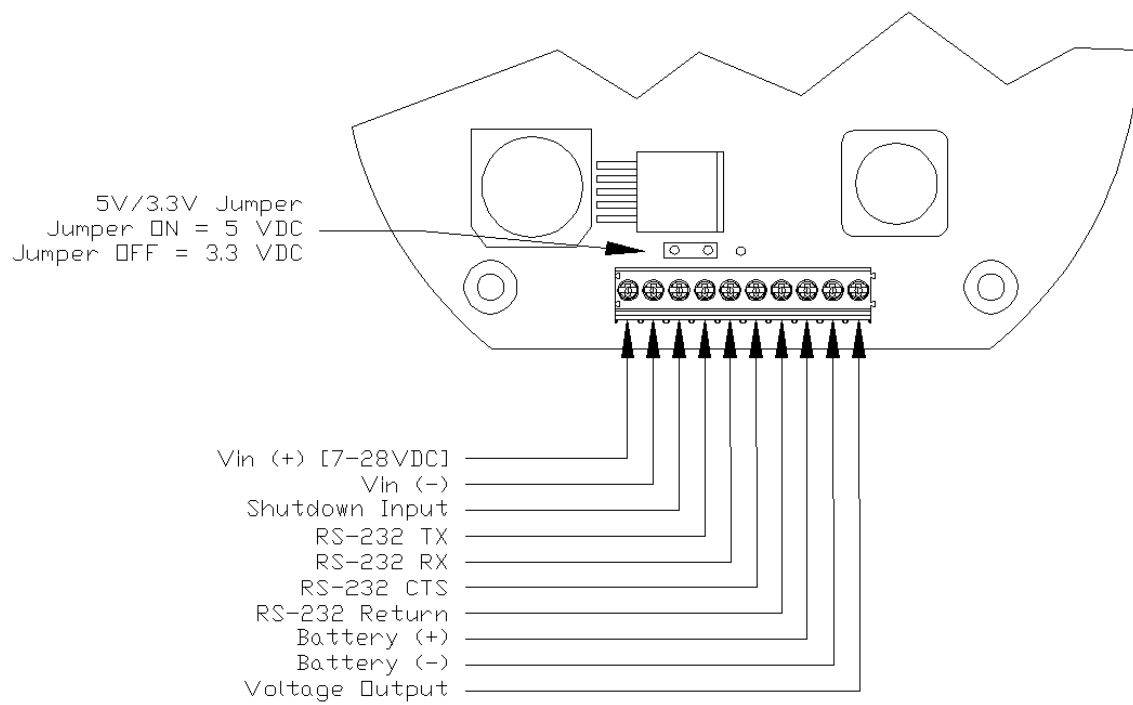


## Technical Data

<b>CHARGER</b>	
VOLTAGE INPUT	7-28 VDC
DROPOUT VOLTAGE	0.5 VOLTS
PROTECTION	Automatic Disconnect below -20°C
OUTPUT	Up to 4A
TARGET CHARGE	12.6V
<b>GSM/CDMA MODULE</b>	
POWER SUPPLY	5 VDC
MAX. CURRENT CONSUMPTION	770 mA
SERIAL INTERFACE	TTL
<b>900 MHZ RADIO MODULE</b>	
POWER SUPPLY	3 VDC to 5.25 VDC
MAX. CURRENT COMSUMPTION	900 mA
SERIAL INTERFACE	TTL
<b>2.4GHZ RADIO MODULE</b>	
POWER SUPPLY	3.3 VDC
MAX. CURRENT COMSUMPTION	215 mA
SERIAL INTERFACE	TTL
<b>OTHER I/O</b>	
SERIAL INTEFACE	RS-232 INTERFACE
POWER OUTPUT	3.3V, 5V or POWER SUPPLY
SHUT DOWN (POWER SAVE)	OPEN COLLECTOR RADIO SHUT DOWN INPUT AND RTS/CTS SHUT DOWN INPUT.

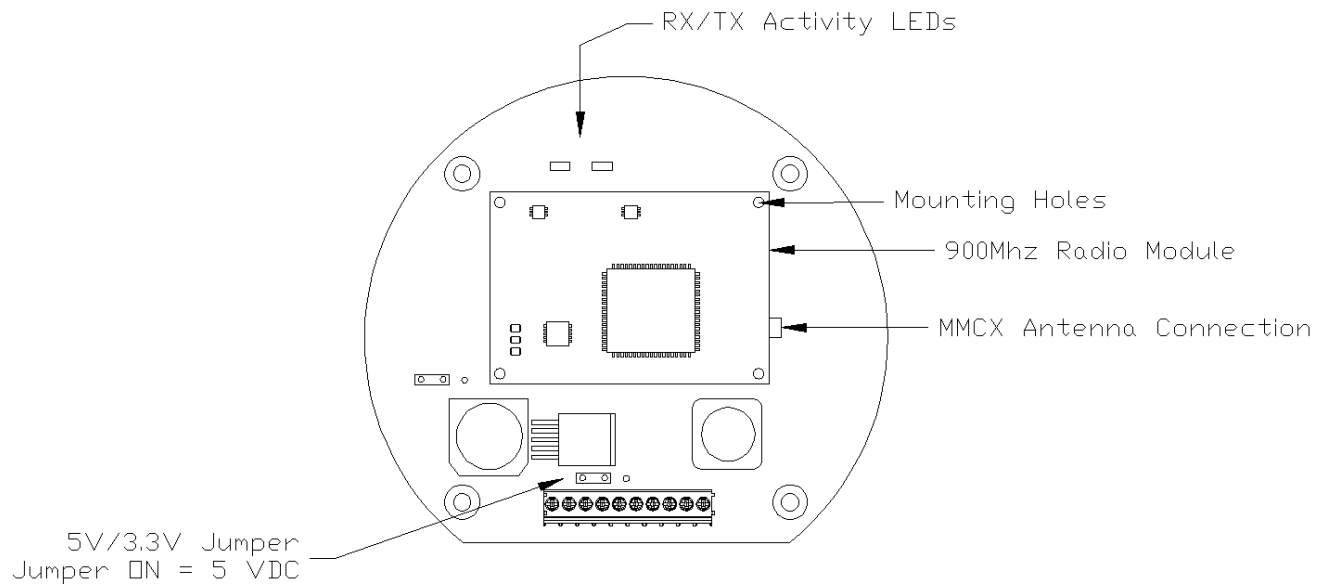
## ***Getting acquainted with the wiring:***

### **Wiring Terminal Block**



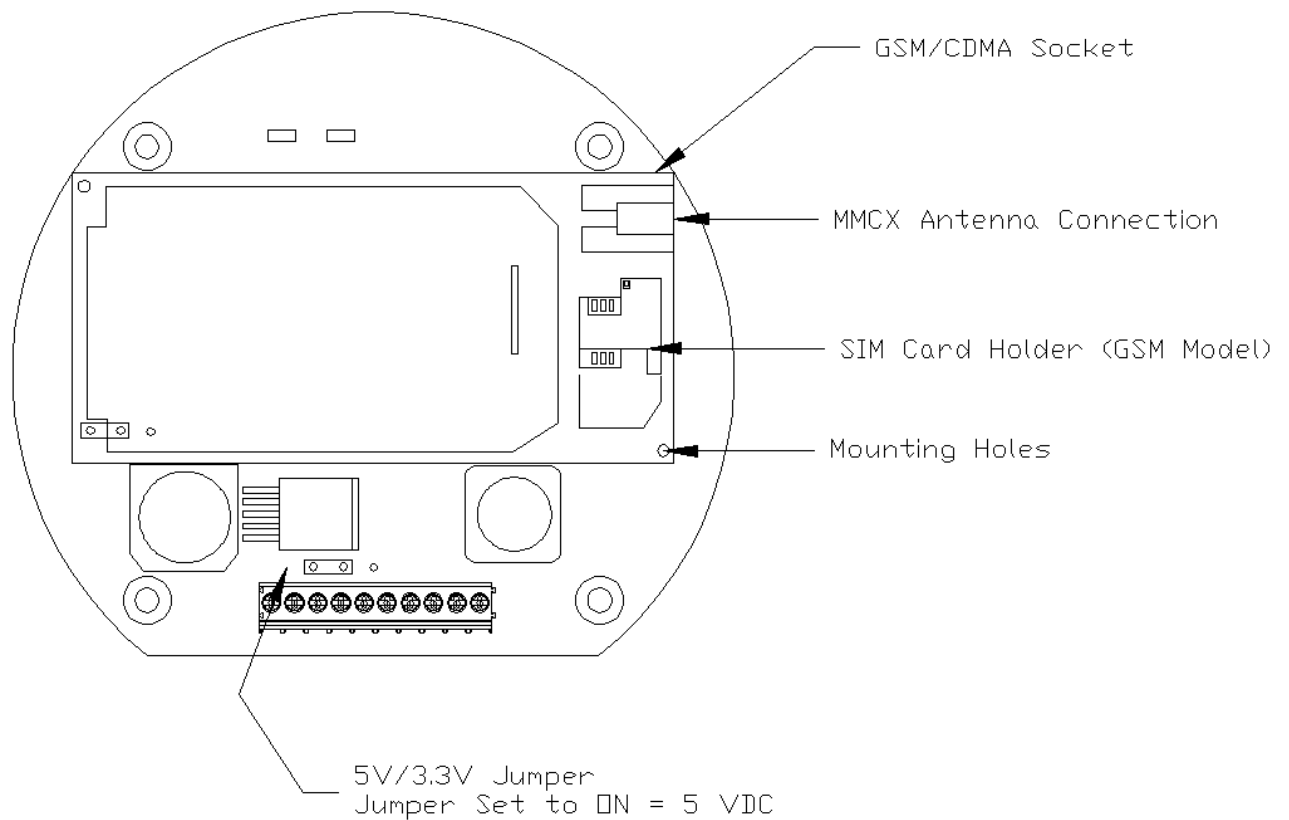
### **Installation of 900 Mhz Module**

- Remove power from the interface board
- Mount stand-offs for radio module
- Mount 900 MHz Radio on the top side of the board on socket U8B
- Fasten module to stand-offs using 440 nuts.
- Place Link on jumper JP1 to provide 5V to the module.
- Connect MMCX coaxial cable for antenna.



## Installation of Socket Modem Module

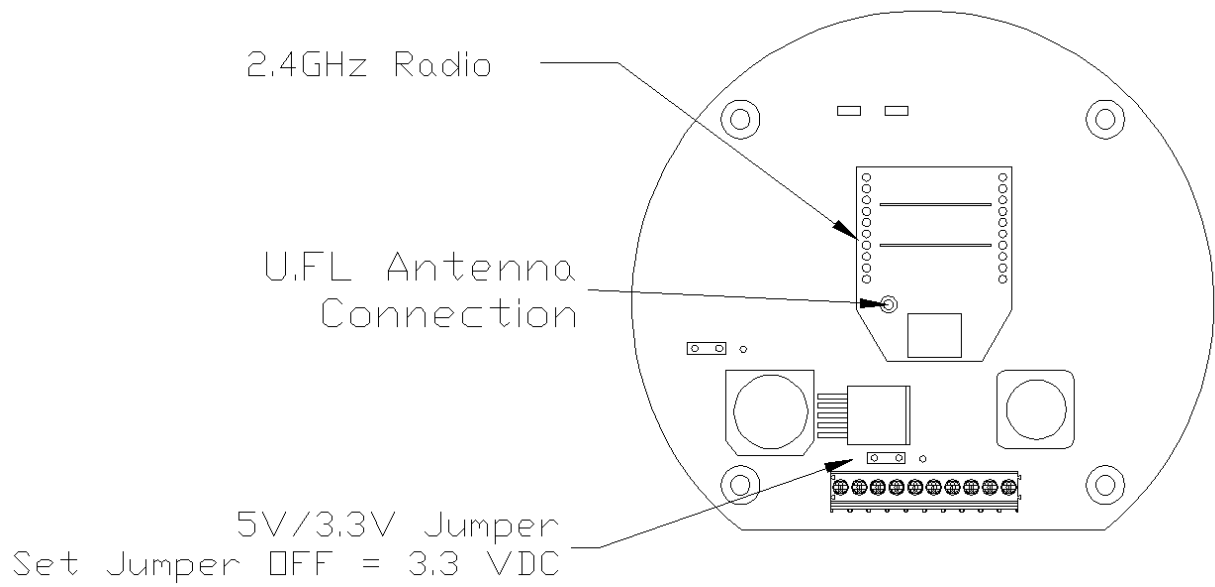
- Remove power from the interface board
- Mount stand-offs for radio module
- Mount GSM/CDMA Modem on the top side of the board on socket U8A
- Fasten module to stand-offs using 440 nuts.
- Place Link on jumper JP1 to provide 5V to the module.
- Connect MMCX coaxial cable for antenna.





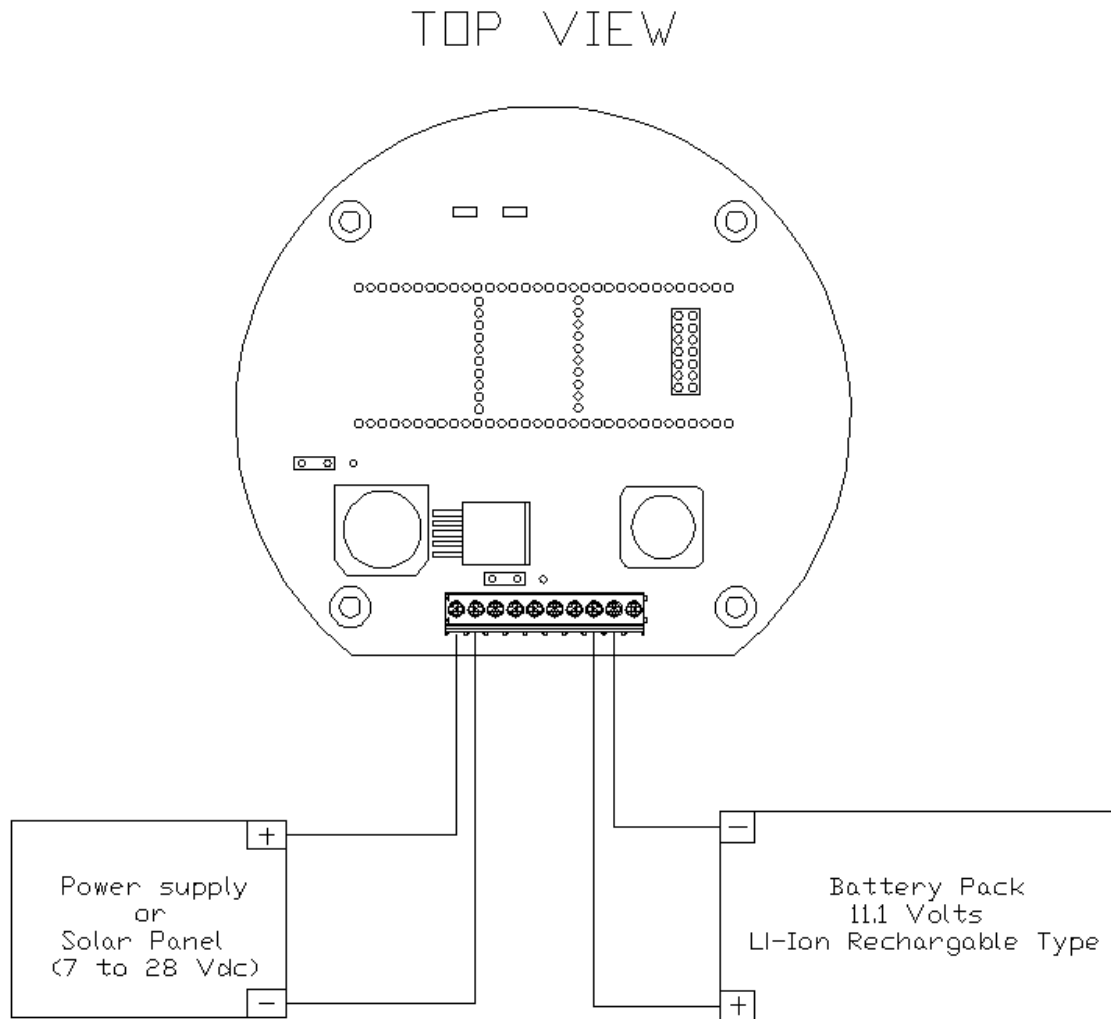
## Installation of 2.4 Ghz Module

- Remove power from the interface board
- Mount 2.4GHz Radio on the top side of the board on socket U8C
- Remove Link on jumper JP1 to provide 3.3V to the module.
- Connect U.FL coaxial cable for antenna.



## **Wiring of Power System**

- Power to the unit can be wired either through the 10-pin terminal block or the power and battery plugs located on the back of the board.



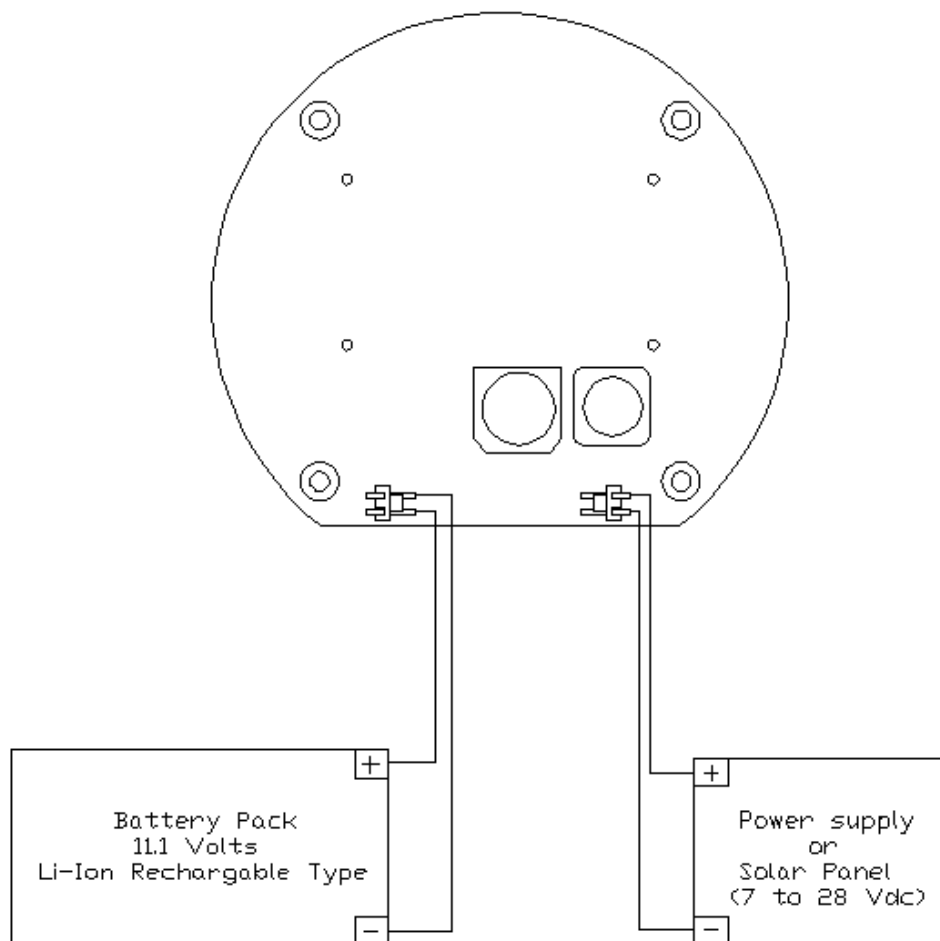
### **Warning**



- Verify Voltage and current ratings before powering the unit.
- Follow all Hazardous Environment guidelines before connecting a live power supply.

## BOTTOM VIEW

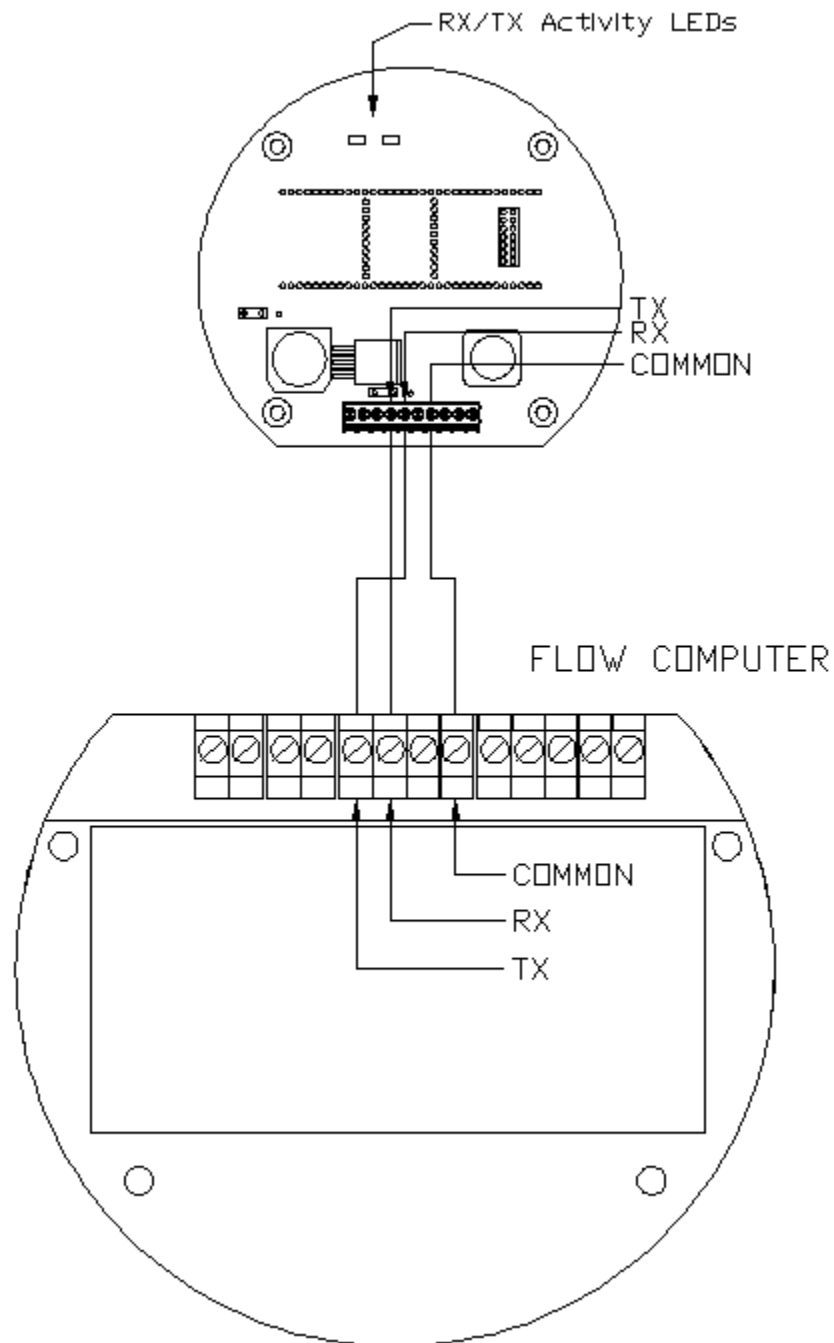
## ALTERNATIVE WIRING USING BOTTOM PLUGS

**Warning**

- Verify Voltage and current ratings before powering the unit.
- Follow all Hazardous Environment guidelines before connecting a live power supply.

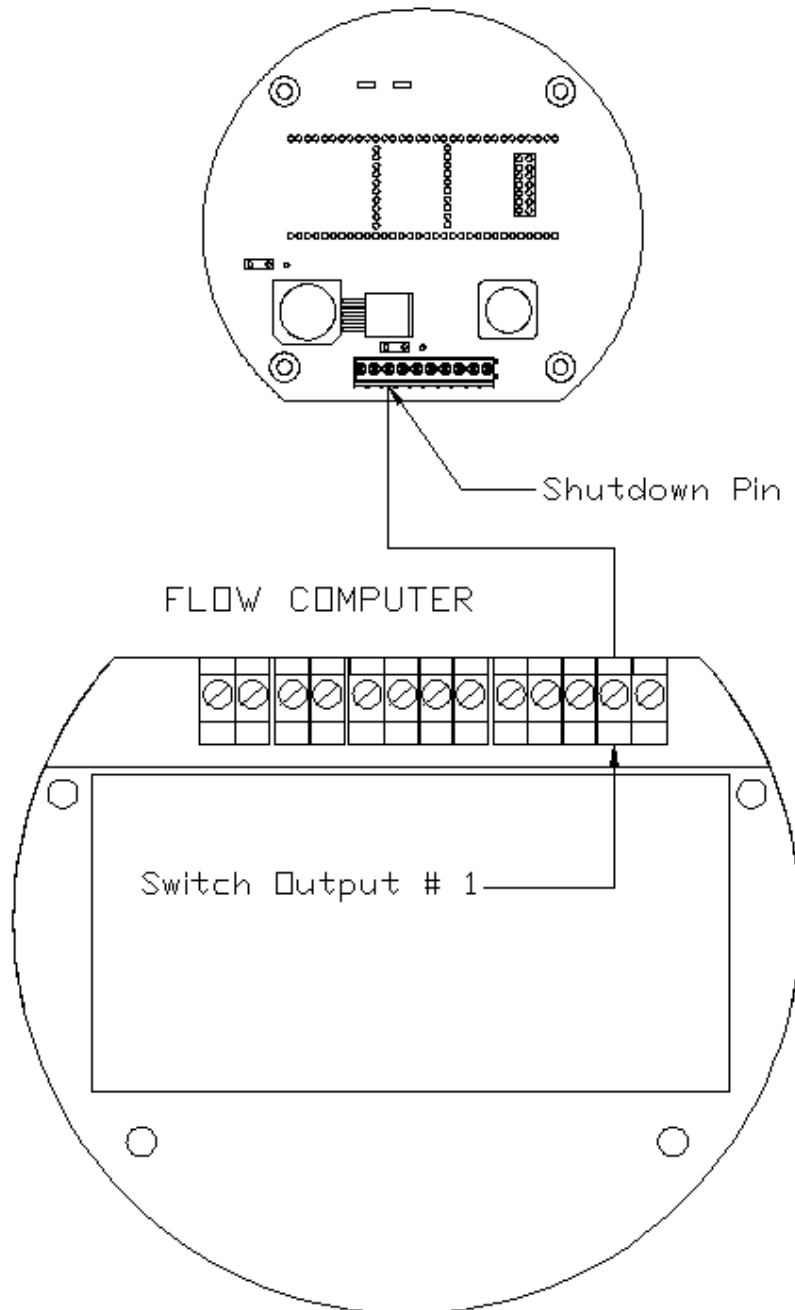
### **Wiring of RS-232 Interface**

- Wire TX Terminal in the flow computer to RX terminal on Radio board (Pin 5).
- Wire RX terminal in the flow computer to TX terminal on Radio board (Pin 4).
- Wire RS-232 Common or Return from flow computer to radio board (Pin 7).
- You can use the RX/TD LEDs to monitor port activity.
- The picture below shows an EChart flow computer pin location as example.



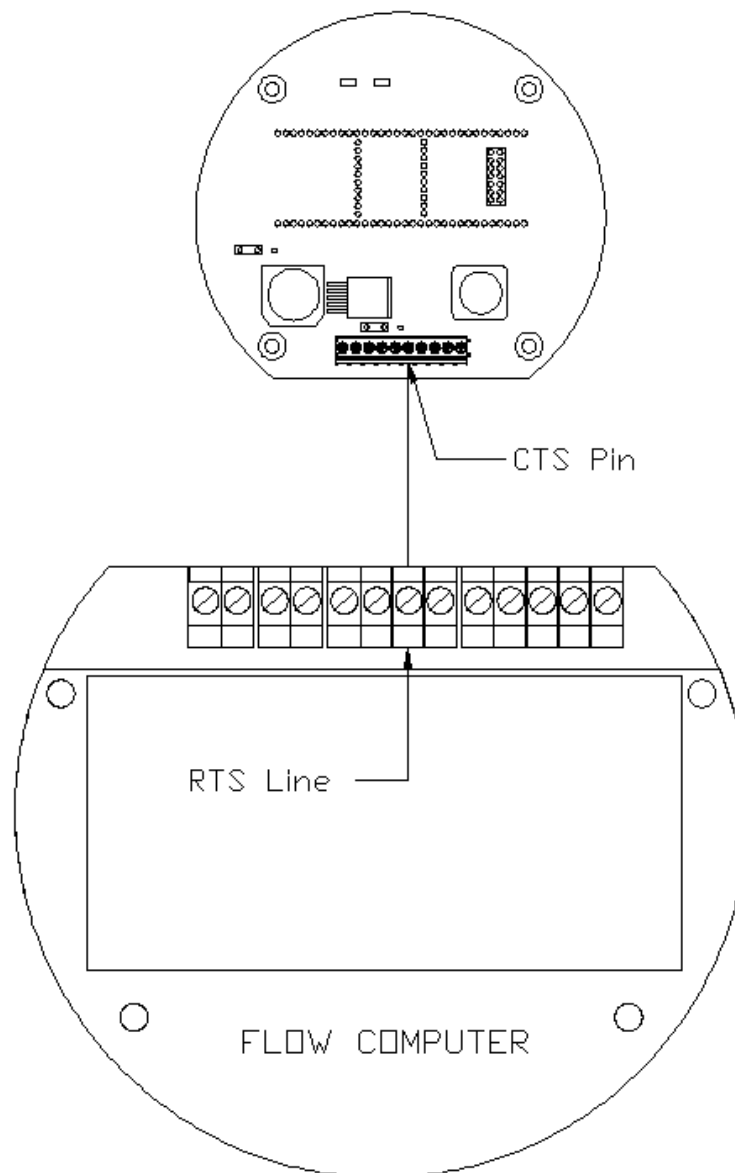
### **Wiring of Shutdown Input**

- If the shutdown pin is not wired the radio is always ON.
- Because the Radio board and the flow computer share the same electrical ground only one wire is needed. In the event each device uses different power supplies then the ground of both devices must be tied together.
- The picture below shows an EChart flow computer using Switch Output 1 for shutdown but any switch output can be used.
- Remember to configure the switch output to manage the power on the radio board.



### **Wiring of RTS/CTS Input**

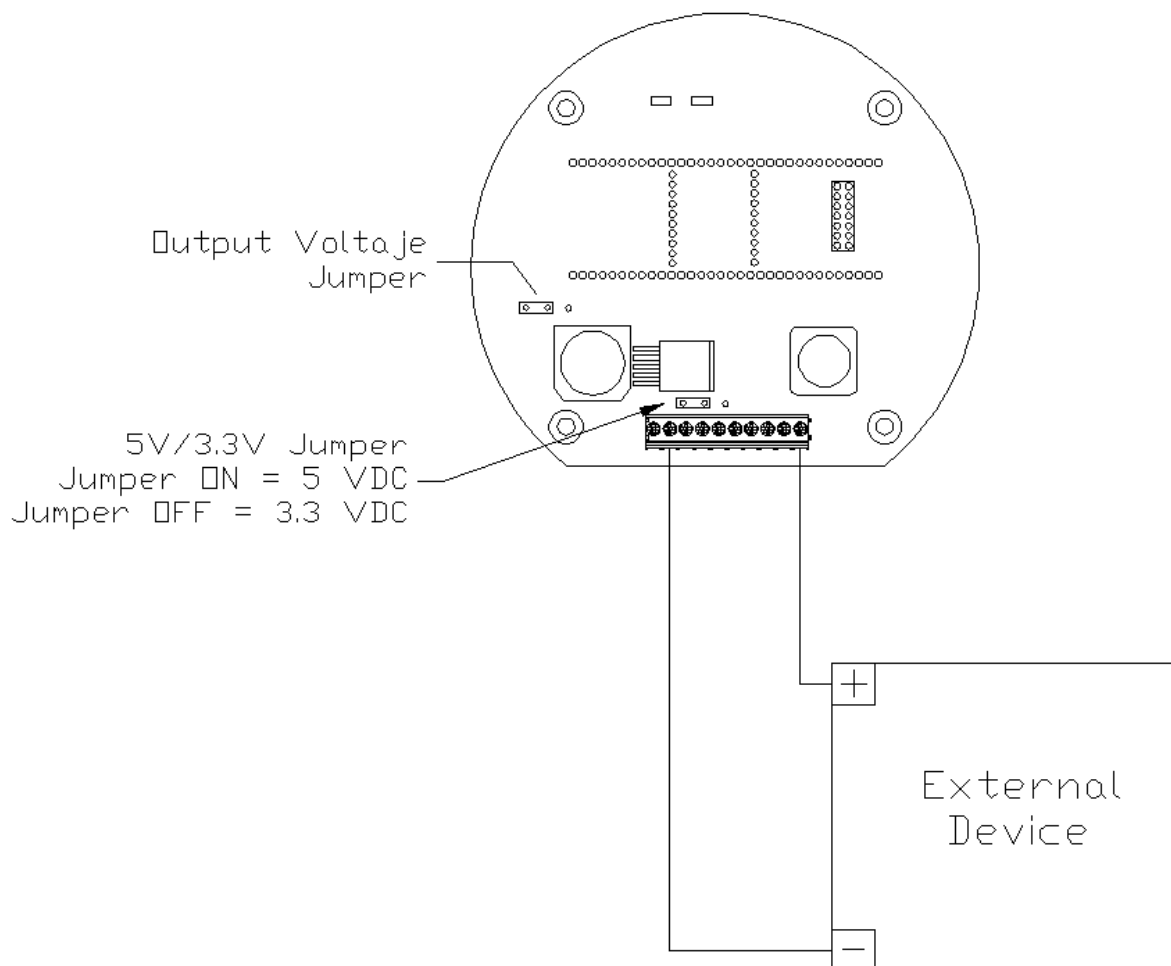
- The CTS pin allows us to optimize power consumption of the radio module using the RS-232 RTS Hardware handshake line.
- For optimal power saving use the Shutdown pin shown above, for power radio power saving only use the CTS option.
- If the CTS pin (Pin 6) is not wired the radio is always ON.
- Because the Radio board and the flow computer share the same electrical ground only one wire is needed. In the event each device uses different power supplies then the ground of both devices must be tied together.
- The picture below shows an EChart flow computer as an example but any model can be used.
- Remember to configure the RTS line output to manage the power on the radio board.



### Wiring of Voltage Output

- Remove power from the interface board
- In the event none of the three radio modules fits the application, the interface board can still be used to power an external radio and turn it ON/OFF via the shutdown pin.
- Wire terminal 10 to the positive terminal on the external device.
- Wire terminal 2 to the negative terminal on the external device.
- Configure the jumper for the desired voltage output:

Jumper	Output	
JP2 with Link on pins 1 & 2	Supply voltage (whatever is applied to terminals 1 & 2)	
JP2 with Link on pins 2 & 3	With Jumper JP1 OFF	3.3 VDC
	With Jumper JP1 ON	5 VDC



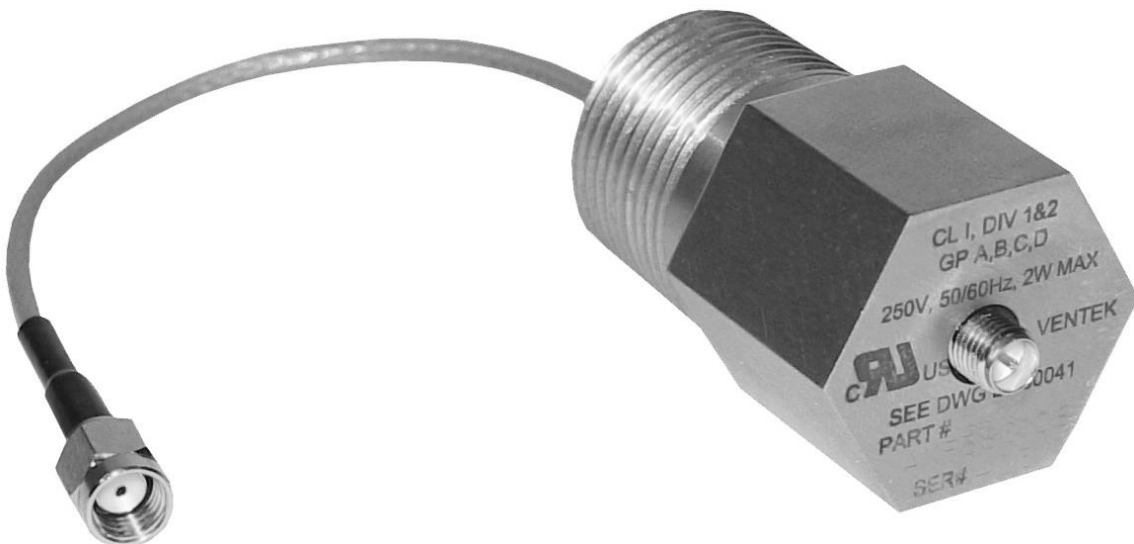
## ***Explosion Proof External Antenna Connection***

Since the radio is enclosed by an explosion proof metal housing using an internal antenna would yield a very short range thus an external antenna is required. In order to fit an external antenna to an internal radio an approved explosion proof connection must be made and that is the purpose of the explosion proof coaxial coupler.

### **Explosion Proof Antenna Coupler Specifications**

<b>General</b>	
Approximate weight	0.5 lb (0.23 kg)
Housing material	300 Series Stainless Steel
Ambient Temperature Range	-40°C to +85°C (subject to end product evaluation)
<b>Certification</b>	
CUR; USR (UL) Recognized Component	Rating: Class I, Div. 1, Group A, B, C, D File #: E219089
<b>Maximum Fault Voltage</b>	250 VDC, 250 VAC 50-60 Hz
<b>Maximum Antenna Power Output</b>	2 Watts or 33 dB (subject to end product evaluation)
<b>Electrical</b>	
Maximum Capacitance	5.64 nF
Frequency Range	260 to 2483 MHz
Impedance	50 Ohms
<b>Approximate Signal Attenuation</b>	
@ 425 MHz	0.6 dB
@ 915 MHz	2.2 dB
@ 2.4 GHz	2.6 dB

### **Coupler Drawing**

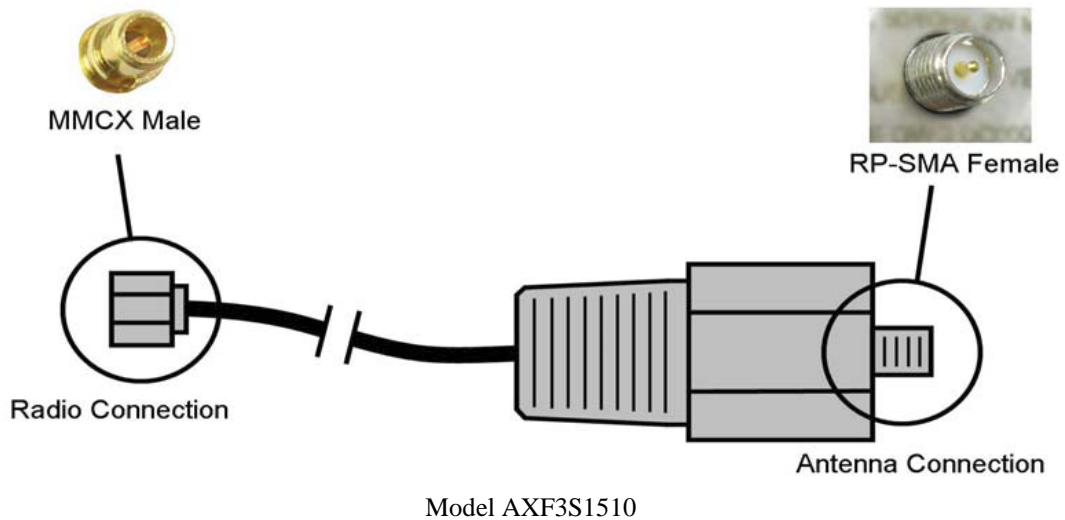


### **Part Numbers**

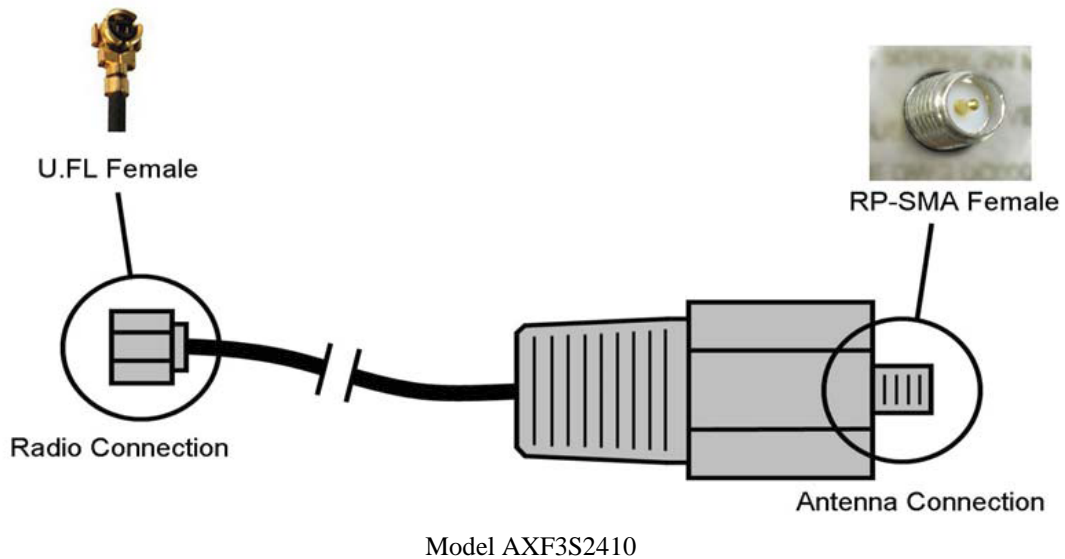
There are two models to fit our radio options:

**Model AXF3S1510:** Has a MMCX male radio connection to be used with our Socket Modem and our 900 MHz radio option.





**Model AXF3S2410:** Has a U.FL female radio connection to be used with our 2.4GHz radio option.



**NOTE:** Both models have a female RP-SMA connector for an external antenna.

## Appendix B: Battery and Solar Panel Wiring

### *Battery Wiring and Connection*

There is no need for an external diode. The Solar Panel connects directly to the terminal 1 & 2 on the terminal block like a regular power supply.

