



# 600/700 Series Foundation Fieldbus

## Instruction Manual

Foundation Fieldbus Interface Specification for Models: 640S, 760S, 780S, and 780S UHP

Thermal Mass Flow Meters



Part Number: IM600/700-FF, Rev. V1.1  
December 2013



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# Warnings and Cautions



**Warning!** Agency approval for hazardous location installations varies between flow meter models. Consult the flow meter nameplate for specific flow meter approvals before any hazardous location installation.

**Warning!** Hot tapping must be performed by a trained professional. U.S. regulations often require a hot tap permit. The manufacturer of the hot tap equipment and/or the contractor performing the hot tap is responsible for providing proof of such a permit.

**Warning!** All wiring procedures must be performed with the power off.

**Warning!** To avoid potential electric shock, follow National Electric Code safety practices or your local code when wiring this unit to a power source and to peripheral devices. Failure to do so could result in injury or death. All AC power connections must be in accordance with published CE directives.

**Warning!** Do not power the flow meter with the sensor remote (if applicable) wires disconnected. This could cause over-heating of the sensors and/or damage to the electronics.

**Warning!** Before attempting any flow meter repair, verify that the line is de-pressurized.

**Warning!** Always remove main power before disassembling any part of the mass flow meter.



**Caution!** Before making adjustments to the device, verify the flow meter is not actively monitoring or reporting to any master control system. Adjustments to the electronics will cause direct changes to flow control settings.

**Caution!** All flow meter connections, isolation valves and fittings for hot tapping must have the same or higher pressure rating as the main pipeline.

**Caution!** Changing the length of cables or interchanging sensors or sensor wiring will affect the accuracy of the flow meter. You cannot add or subtract wire length without returning the meter to the factory for re-calibration.

**Caution!** When using toxic or corrosive gases, purge the line with inert gas for a minimum of four hours at full gas flow before installing the meter.

**Caution!** The AC wire insulation temperature rating must meet or exceed 80°C (176°F).

**Caution!** Printed circuit boards are sensitive to electrostatic discharge. To avoid damaging the board, follow these precautions to minimize the risk of damage:

- before handling the assembly, discharge your body by touching a grounded, metal object
- handle all cards by their edges unless otherwise required
- when possible, use grounded electrostatic discharge wrist straps when handling sensitive components

## **Note and Safety Information**

We use caution and warning statements throughout this book to draw your attention to important information.



### **Warning!**

This statement appears with information that is important to protect people and equipment from damage. Pay very close attention to all warnings that apply to your application.



### **Caution!**

This statement appears with information that is important for protecting your equipment and performance. Read and follow all cautions that apply to your application.

## **Receipt of System Components**

When receiving a Sierra mass flow meter, carefully check the outside packing carton for damage incurred in shipment. If the carton is damaged, notify the local carrier and submit a report to the factory or distributor. Remove the packing slip and check that all ordered components are present. Make sure any spare parts or accessories are not discarded with the packing material. Do not return any equipment to the factory without first contacting Sierra Customer Service.

## **Technical Assistance**

If you encounter a problem with your flow meter, review the configuration information for each step of the installation, operation, and setup procedures. Verify that your settings and adjustments are consistent with factory recommendations. Installation and troubleshooting information can be found in the [SteelMass™ 640S](#), [FlatTrak™ 780S](#) (includes 760S), or [780S UHP](#) product manual.

If the problem persists after following the troubleshooting procedures outlined in the 640S or 780S product manuals, contact Sierra Instruments by fax or by E-mail (see inside front cover). For urgent phone support you may call (800) 866-0200 or (831) 373-0200 between 8:00 a.m. and 5:00 p.m. PST. In Europe, contact Sierra Instruments Europe at +31 20 6145810. In the Asia-Pacific region, contact Sierra Instruments Asia at +86-21-58798521. When contacting Technical Support, make sure to include this information:

- The flow range, serial number, and Sierra order number (all marked on the meter nameplate)
- The software version (visible at start up)
- The problem you are encountering and any corrective action taken
- Application information (gas, pressure, temperature and piping)

configuration)

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# Chapter 1: Introduction

This manual will explain how to add a Sierra flow meter equipped with Foundation Fieldbus to your network. The Foundation Fieldbus interface allows access to all relevant data available in the flow meter.

This manual is intended to document the configuration of the Sierra Instruments' 600/700 Series thermal flow meters with the Foundation Fieldbus Communication Interface to your network. It assumes the reader already has a working knowledge of Foundation Fieldbus. For specific operations of the Sierra Instruments' 600/700 Series thermal flow meters, consult the [SteelMass™ 640S](#), [FlatTrak™ 780S](#) (includes 760S), or [780S UHP](#) product instruction manuals.

For detailed information about Foundation Fieldbus go to: <http://www.fieldbus.org/>

The Sierra Instruments' 600/700 Series mass flow meters can be ordered with the optional Foundation Fieldbus (FF-BUS) Communication interface for use on a Foundation Fieldbus H1 network. This Interface complies with the new ITK version 6.

FF-BUS differs from other digital communication protocols, it is designed for process control rather than just transfer of data between a device and a central controller. It supports peer-to-peer communication and allows for functional blocks to operate independently between themselves without main controller intervention.

Foundation Fieldbus H1 networks are connected using a shielded twisted wire pairs. For more information about FF-BUS H1 wiring see: <http://www.fieldbus.org/images/stories/enduserresources/technicalreferences/documents/wiringinstallationguide.pdf>

## Chapter 2 – Connecting the 600/700 Series to Your FF-BUS Network

The 600/700 Series meter uses 18-30 VDC at 625 mA. Due to the current needed, the meter cannot be powered off the H1 network. The 24 VDC power is connected to terminals 1 and 2. The Foundation Fieldbus H1 network connections are labeled as FF-1 and FF-2.

This is on the 2 position terminal block on the upper left shown below in Figure 1. These are not polarity dependent. If you are using multiple shield grounds, use the grounding screw shown in Figure 1.

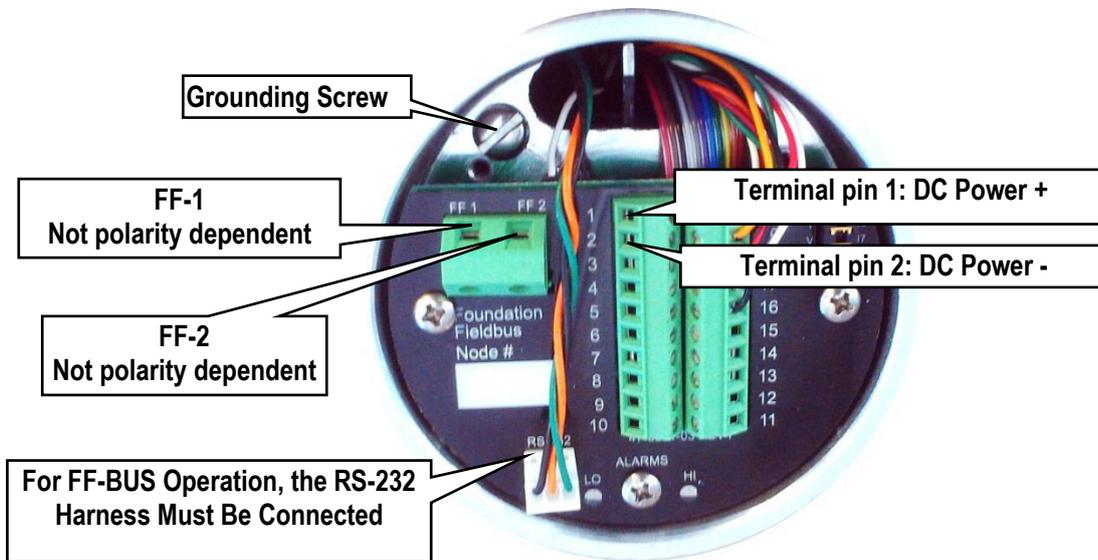


Figure 1: Basic Meter Connections

## Chapter 3 - Definitions

**DD:** Device Description files are necessary to configure your FF-BUS host software. The DD files explain the specific configuration and features to your host network so it understands how to use the device.

**Resource Block (RS):** This function block contains basic information about the FF-BUS interface.

**Transducer Block (TB):** This block makes the connection to the meter and presents the process variables to the lower blocks. Most of the configuration setup is done in this block.

**AI (Analog Input) Block:** Although this is actually digital process data coming from the instrument (output), it is still referred to as an AI Block. This FF-BUS interface has four analog input blocks: AI1, AI2, AI3, and AI4.

**AO (Analog Output) Block:** Although this is a digital command being sent to the instrument (input), it is still referred to as an AO Block. The 600/700 Series FF-BUS interface has one, labeled AO.

**Modbus:** Modbus is another digital communication protocol and is only relevant here because the Sierra FF-BUS interface uses Modbus as an intermediary between the meter and the FF-BUS interface. For special configuration, the user will only need a rudimentary knowledge of Modbus.

**MODBUS\_REG\_SETUP\_1 to 4:** This is where AI1,2,3,4 and AO are configured as PV1,2,3,4, and Final Value. These are 32 bit registers that can be configured multiple data types in various Byte order.

**MODBUS\_REGS\_1 to 4:** There are four groups of ten Modbus R/W registers that can be used for static variables such as serial number, calibration date, total reset, and meter full scale. These only have limited use, and may not be able to be seen with all FF-BUS devices.

**32 bit float:** Also known as Real or IEEE-754 single precision. The 32 bit float is a common data encoding scheme that provides 1 bit for the sign, 8 bits for an exponent, and 23 bits of significant numbers. In Modbus the Byte order is normally 1-0,3-2, however FF-BUS interface allows it to be changed if needed.

**16 bit short integer:** This is a 16 bit number ranging from 0-65,535 ( $2^{16}$ ). The Byte order is 0,1.

**32 bit long integer:** This combines two 16 bit Modbus registers to make a number as high as 4,294,967,296 ( $2^{32}$ ). The Byte order is 1-0,3-2. The FF-BUS will see this as one 32 bit integer.

**String (Character):** A 16 bit Modbus register would contain 2 ASCII characters (8 bits each) in 0-1 Byte order. So 0x 41 42 would equal "A B".

## Chapter 4 – Foundation Fieldbus Interface Configurations

Both 640S and 780S FF-BUS interfaces uses a Modbus to FF-BUS translator board inside the flowmeter. This allows the user to configure variables accessible to our Modbus interface. For the most part, the Modbus to FF-BUS translation is invisible to the end user unless they want to reconfigure the Transducer Block (TB) to access other Modbus variables.

### AI/AO Blocks:

The Foundation Fieldbus Transducer Block (SIERRA\_TB) provides four analog inputs (AI1 through AI4) and one analog output (AO). These are all configurable as 16 or 32 bit integer or Float data types. We have pre-configured these blocks as shown below in Table 1. However, the user can reconfigure them as needed.

AI/AO Blocks	Primary Value	Channel	Data Type	Analog Signal
AI1	PV1	1	32 bit Float	Flow Rate
AI2	PV2	2	32 bit unsigned integer	Total
AI3	PV3	3	*	*
AI4	PV4	4	*	*
AO	Final Value	5	*	*

\*Unassigned, open for customer configuration.

Table 1: Factory AI/AO Blocks

### MODBUS\_REGS\_ (1 through 4):

The Transducer Block also has four groups of Modbus registers that can be used for static setup inputs and outputs for variables such as factory full scale, K-Factor, or resetting the totalizer. This data is not cyclic as it only updates occasionally, and might not be accessible to all devices on the fieldbus. These variables are limited to an unsigned short integer, Byte order 0-1. There are four groups of ten. Each group can only be configured in consecutive Modbus address order.

To use these groups, a starting registers number (MODBUS\_REG\_START\_ADDRESS) and the number of registers after (NUM\_OF\_MODBUS\_REG) is needed. These have been pre-configured as shown below in Table 2. However, the user can reconfigure them as needed.

Variable	MODBUS_REGS Group	REG_START ADDRESS	NUM_OF_REGS
User full scale	1	4	4
Factory full scale			
K-Factor			
Total reset			
Calibration Date, Low word	2	8	5
Calibration Date, High word			
Flow unit - char 1,2			
Flow unit - char 3,4			
Flow unit - char 5,6			
Totalizer unit- char 1,2	3	13	7
Totalizer unit- char 3,4			

Serial number – char 1,2			
Serial number – char 3,4			
Serial number – char 5,6			
Serial number – char 7,8			
Serial number – char 9,10			
Decimal Point	4	26	1

*Table 2: Factory Static MODBUS Registers*

# Chapter 5 – Configuring the FF-BUS Using NI-FBUS Configurator

The National Instruments F-BUS Configurator software is widely used for testing and configuration of FF-BUS devices. Consult your NI-FBUS Configurator manual for more information on this NI software (included in NI-FBUS help on the software).

Before starting the NI-FBUS Configurator, you must import the DD using the NI-FBUS Interface Configurator Utility. The DD files are available can be downloaded from our web site at: [http://www.sierrainstruments.com/userfiles/file/dd\\_files.zip](http://www.sierrainstruments.com/userfiles/file/dd_files.zip)

## Getting Started Configuring FF-Bus Using NI-FBUS Configurator

1. Start the NI-FBUS COM manager then start the NI-FBUS Configurator.
2. When NI-FBUS Configurator starts, choose the FF-BUS interface used.
3. If the 640S or 780S is connected correctly, SIERRA\_DEVICE should appear on your screen as shown below.
4. The node address (factory set) is set to 247. We suggest it be changed to suit the FF-BUS application.  
Change the Tag names as needed.
5. Make configuration changes as needed.

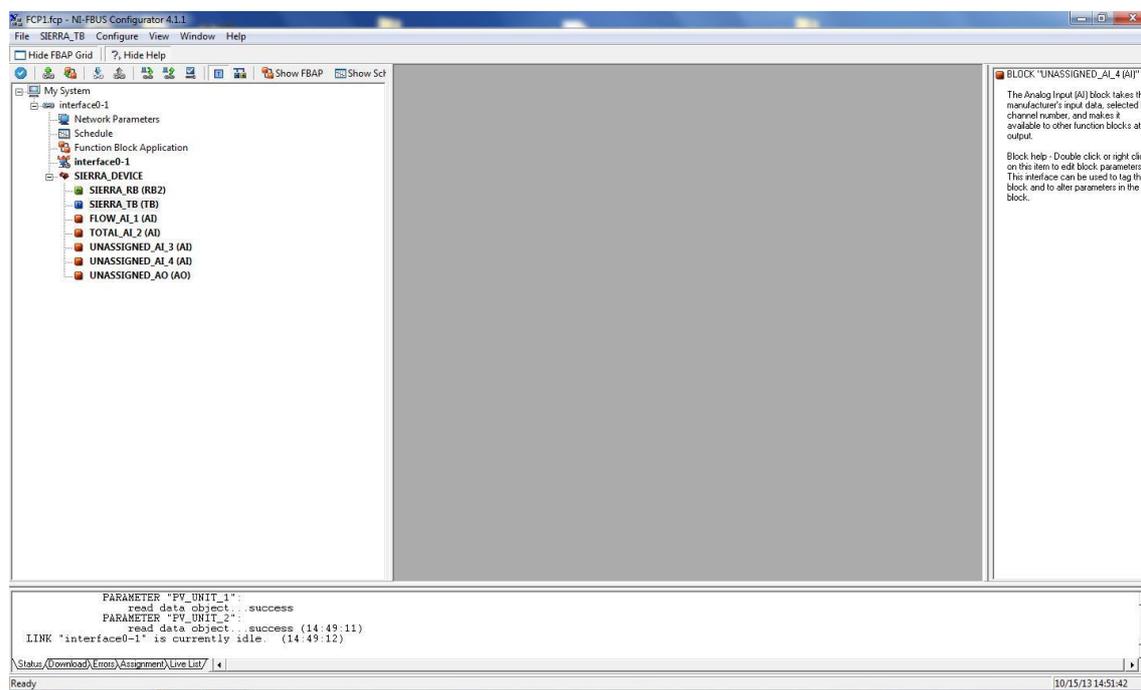


Figure 2: NI Screen After SIERRA\_DEVICE Is Found

## Configuration

Most of the configuration will be in the Transducer Block (SIERRA\_TB) under the “Others” tab (see the screen shots below). In order to write any changes, the Block Mode must be set to OOS (out of service). Make your changes and click “Write Changes.” Once the yellow highlights disappear, click Auto mode. The configuration below was already done at the factory.

The screenshot shows the configuration interface for the SIERRA\_TB block. The 'Others' tab is selected. The 'Block Mode' is set to 'OOS'. The 'Modic Updates' are set to 2 seconds. The 'Write Changes' button is highlighted.

Parameter	Value	Type & Extensions	Help
MODBUS_REG_SETUP_1			Modbus register setup for Modbus device 1
*MODBUS_ADDRESS	1	016	Modbus instrument address
PV_REG_FUNCTION_CODE	3-PV Read function code 3	000	Modbus function code for the dynamic variable registers
*PV_REG_ADDRESS	0	016	Primary variable Modbus register address
*PV_TYPE_BYTEORDER	2-Float(2 two bytes registers), Byte order 1-0-3-2	000	Gives the choice of data type and byte ordering
PV_SCALING_FACTOR	1	016	Scaling factor
*MODBUS_REGS_START_A4		016	The start address for the Modbus setup registers
*MODBUS_REGS_BYTE_OR1-Byte order 0-1		000	Gives the choice of the Modbus setup registers ordering
*NUM_OF_MODBUS_REGS	4	016	Numbers of consecutive Modbus setup registers
MODBUS_DEV_STATUS_BY0		016	The start address for the Modbus setup registers
MODBUS_DEV_STATUS_BY0-Status byte not used		000	Chooses the device status byte from bit positions 7-0(default) or 15-8
MODBUS_REG_SETUP_2			Modbus register setup for Modbus device 2
*MODBUS_ADDRESS	1	016	Modbus instrument address
PV_REG_FUNCTION_CODE	3-PV Read function code 3	000	Modbus function code for the dynamic variable registers
*PV_REG_ADDRESS	2	016	Primary variable Modbus register address
*PV_TYPE_BYTEORDER	14-Unsigned long integer, Byte order 1-0-3-2	000	Gives the choice of data type and byte ordering
PV_SCALING_FACTOR	1	016	Scaling factor
*MODBUS_REGS_START_A8		016	The start address for the Modbus setup registers
*MODBUS_REGS_BYTE_OR1-Byte order 0-1		000	Gives the choice of the Modbus setup registers ordering
*NUM_OF_MODBUS_REGS	5	016	Numbers of consecutive Modbus setup registers
MODBUS_DEV_STATUS_BY0		016	The start address for the Modbus setup registers
MODBUS_DEV_STATUS_BY0-Status byte not used		000	Chooses the device status byte from bit positions 7-0(default) or 15-8
MODBUS_REG_SETUP_3			Modbus register setup for Modbus device 3
*MODBUS_ADDRESS	1	016	Modbus instrument address
PV_REG_FUNCTION_CODE	3-PV Read function code 3	000	Modbus function code for the dynamic variable registers
*PV_REG_ADDRESS	0	016	Primary variable Modbus register address
*PV_TYPE_BYTEORDER	2-Float(2 two bytes registers), Byte order 1-0-3-2	000	Gives the choice of data type and byte ordering
PV_SCALING_FACTOR	1	016	Scaling factor
*MODBUS_REGS_START_A13		016	The start address for the Modbus setup registers
*MODBUS_REGS_BYTE_OR1-Byte order 0-1		000	Gives the choice of the Modbus setup registers ordering
*NUM_OF_MODBUS_REGS	7	016	Numbers of consecutive Modbus setup registers
MODBUS_DEV_STATUS_BY0		016	The start address for the Modbus setup registers
MODBUS_DEV_STATUS_BY0-Status byte not used		000	Chooses the device status byte from bit positions 7-0(default) or 15-8
MODBUS_REG_SETUP_4			Modbus register setup for Modbus device 4
*MODBUS_ADDRESS	1	016	Modbus instrument address
PV_REG_FUNCTION_CODE	3-PV Read function code 3	000	Modbus function code for the dynamic variable registers
*PV_REG_ADDRESS	0	016	Primary variable Modbus register address
*PV_TYPE_BYTEORDER	1-Float(2 two bytes registers), Byte order 3-2-1-0	000	Gives the choice of data type and byte ordering
PV_SCALING_FACTOR	1	016	Scaling factor
*MODBUS_REGS_START_A26		016	The start address for the Modbus setup registers
*MODBUS_REGS_BYTE_OR1-Byte order 0-1		000	Gives the choice of the Modbus setup registers ordering
*NUM_OF_MODBUS_REGS	1	016	Numbers of consecutive Modbus setup registers
MODBUS_DEV_STATUS_BY0		016	The start address for the Modbus setup registers
MODBUS_DEV_STATUS_BY0-Status byte not used		000	Chooses the device status byte from bit positions 7-0(default) or 15-8
MODBUS_FINAL_VALUE_AD			Modbus register setup for Modbus device 4

Figure 3: Screen Before Writing Changes

After completing the configuration, you should be able to read the variables being returned from your flow meter on the same SIERRA\_TB block on the “Others” tab. Flow (PV\_1) and Total (PV\_2) are shown below. (See Figure 4) If you scroll down further, you will also see the static MODBUS\_REGS\_ values being read from the meter. (See Figure 5)

Parameter	Value	Type & Extensions	Help
PV_1	1238	FF	Primary value 1 A numerical quantity entered by a user or calculated by the algorithm.
VALUE			
STATUS			
QUALITY	Good_NonCascade NonSpecific NotLimited	FF FF FF	QUALITY SUBSTATUS LIMITS
PV_2	100	FF	Primary value 2 A numerical quantity entered by a user or calculated by the algorithm.
VALUE			
STATUS			
QUALITY	Good_NonCascade NonSpecific NotLimited	FF FF FF	QUALITY SUBSTATUS LIMITS

Figure 4: Screen Showing PV1 and PV2 Values From Meter

Parameter	Value	Type & Extensions	Help
MODBUS_REGS_1			Modbus setup registers for Modbus device 1
REGISTER_1	15000		Modbus writable register 1
REGISTER_2	18750		Modbus writable register 2
REGISTER_3	1000	W16	Modbus writable register 3
REGISTER_4	1	W16	Modbus writable register 4
REGISTER_5	0	W16	Modbus writable register 5
REGISTER_6	0	W16	Modbus writable register 6
REGISTER_7	0	W16	Modbus writable register 7
REGISTER_8	0	W16	Modbus writable register 8
REGISTER_9	0	W16	Modbus writable register 9
REGISTER_10	0	W16	Modbus writable register 10
MODBUS_REGS_2			Modbus setup registers for Modbus device 2
REGISTER_1	17705	W16	Modbus writable register 1
REGISTER_2	64	W16	Modbus writable register 2
REGISTER_3	21315	W16	Modbus writable register 3
REGISTER_4	17992	W16	Modbus writable register 4
REGISTER_5	8224	W16	Modbus writable register 5
REGISTER_6	0	W16	Modbus writable register 6
REGISTER_7	0	W16	Modbus writable register 7
REGISTER_8	0	W16	Modbus writable register 8
REGISTER_9	0	W16	Modbus writable register 9
REGISTER_10	0	W16	Modbus writable register 10
MODBUS_REGS_3			Modbus setup registers for Modbus device 3
REGISTER_1	21315	W16	Modbus writable register 1
REGISTER_2	17952	W16	Modbus writable register 2
REGISTER_3	21326	W16	Modbus writable register 3
REGISTER_4	14897	W16	Modbus writable register 4
REGISTER_5	12850	W16	Modbus writable register 5
REGISTER_6	13879	W16	Modbus writable register 6
REGISTER_7	13600	W16	Modbus writable register 7
REGISTER_8	0	W16	Modbus writable register 8
REGISTER_9	0	W16	Modbus writable register 9
REGISTER_10	0	W16	Modbus writable register 10
MODBUS_REGS_4			Modbus setup registers for Modbus device 4
REGISTER_1	0	W16	Modbus writable register 1
REGISTER_2	0	W16	Modbus writable register 2
REGISTER_3	0	W16	Modbus writable register 3
REGISTER_4	0	W16	Modbus writable register 4
REGISTER_5	0	W16	Modbus writable register 5
REGISTER_6	0	W16	Modbus writable register 6
REGISTER_7	0	W16	Modbus writable register 7
REGISTER_8	0	W16	Modbus writable register 8
REGISTER_9	0	W16	Modbus writable register 9
REGISTER_10	0	W16	Modbus writable register 10

Figure 5: Screen Showing Modbus Static Values From Meter

You may also set the engineering units used by your meter in the NI-FBUS Configurator so they can be read by the FF-BUS under PV\_UNIT\_1,2,3,4 and FINAL\_VALUE\_AO\_UNIT. (See Figure 5)

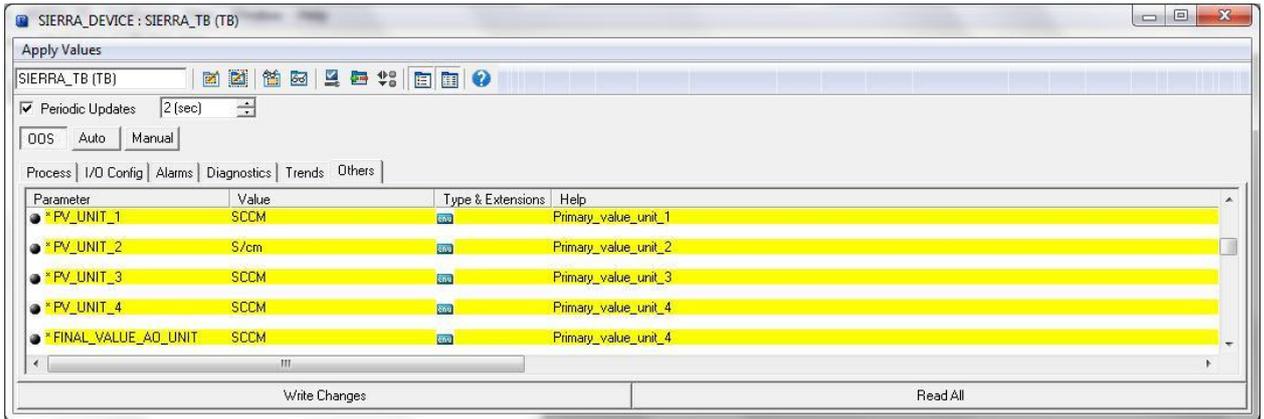


Figure 6: TB Block Engineering Unit Setup

## MODBUS\_COM\_SETUP

The Modbus com settings are needed for the communication connection between the Modbus and the FF-BUS boards inside the meter. The Modbus Instrument Address **must** always be set to 1. The MODBUS\_COM\_SETUP **must** always set as shown below:

BaudRate: 9600 Baud  
 Stop\_Bits: 1  
 Parity: None  
 CRC\_ORDER: Normal

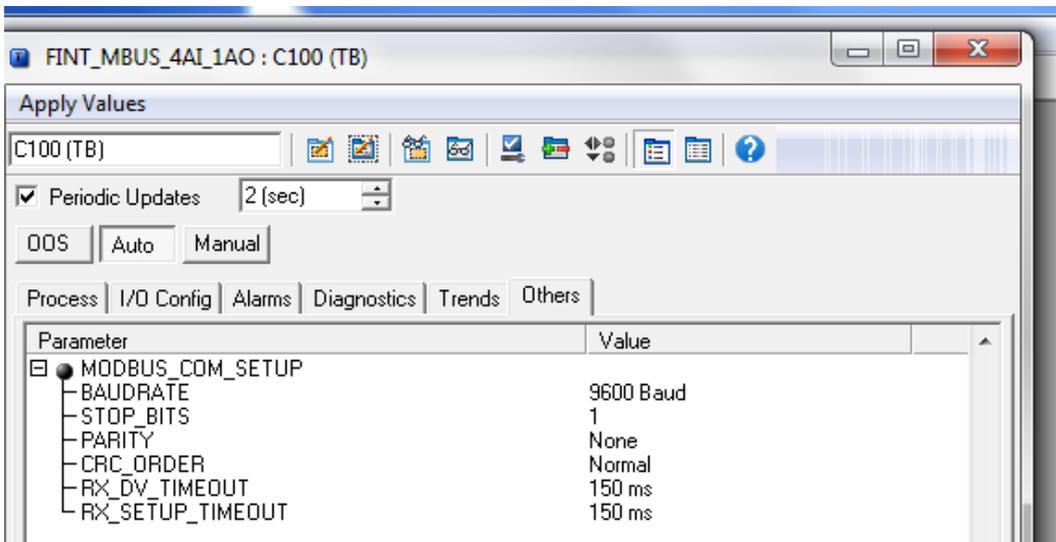


Figure 7: Screen Showing MODBUS\_COM\_SETUP

## Chapter 6 – Available Modbus Registers

Although most users will be satisfied using the default configuration, other Modbus registers can be configured for Foundation Fieldbus access. Below (Table 3) is a list of all available Modbus registers. These would need to be configured in the transducer block.

Register	Description	Read Write	Data type
0	Actual flow - high word	R	32 bit Float
1	Actual flow - low word		
2	Totalizer - high word	R	Unsigned long integer
3	Totalizer - low word		
4	User full scale	R/W	Unsigned short integer
5	Factory full scale	R	Unsigned short integer
6	K-Factor	R/W	Unsigned short integer
7	Total reset	R/W	Unsigned short integer
8	Calibration date - high word	R	Unsigned long integer
9	Calibration date- low word	R	
10	Flow unit - char 1,2	R	Unsigned short integer, 2 Char ASCII String
11	Flow unit - char 3,4	R	Unsigned short integer, 2 Char ASCII String
12	Flow unit - char 5,6	R	Unsigned short integer, 2 Char ASCII String
13	Totalizer unit- char 1,2	R	Unsigned short integer, 2 Char ASCII String
14	Totalizer unit- char 3,4	R	Unsigned short integer, 2 Char ASCII String
15	Serial number – char 1,2	R	Unsigned short integer, 2 Char ASCII String
16	Serial number – char 3,4	R	Unsigned short integer, 2 Char ASCII String
17	Serial number – char 5,6	R	Unsigned short integer, 2 Char ASCII String
18	Serial number – char 7,8	R	Unsigned short integer, 2 Char ASCII String
19	Serial number – char 9,10	R	Unsigned short integer, 2 Char ASCII String
20	Serial number – char 11,12	R	Unsigned short integer, 2 Char ASCII String
26	Decimal point – flow/totalizer	R	Unsigned short integer
31	Total in 32 bit float - Lo word	R	32 bit Float
32	Total in 32 bit float - Hi word		

Table 3: All Available Modbus Registers

## Chapter 7 – Modbus Register Explained

Each 16 bit register holds a specific type of data. Sometimes more registers are required to obtain the desired information.

### **0-1 : Actual Flow**

The actual flow as displayed on the LCD of the meter (if available). The flow is in a Float format, Byte order 1-0-3-2 (IEEE-754 encoded). We have pre-configured it to AI1, PV1, and Channel 1.

### **2-3 : Totalizer Value**

The totalizer value as displayed on the LCD of the 640S (if available). Use data type 32 bit long integer. This has been pre-configured to AI2, PV2, and Channel 2. This returns the cumulative total. This would provide a maximum number of  $2^{32}$ . However, the maximum count in the 640S is only  $10^8$ . The decimal point, if used is stored in a separate register, number 26.

### **4 : User Full Scale**

This is a R/W word that contains the full scale of the instrument as set by the user. This only affects the 4-20 mA. output, which would not be relevant for FF-BUS. Use data type 16 bit short integer, Byte order 1,0. This register would work in one of the 40 Modbus registers.

### **5 : Factory Full Scale**

This is a read only word that contains the full scale of the unit as set by the manufacturer. This would be the full scale flow available to FF-BUS. Use data type 16 bit short integer, Byte order 1,0. This register would work in one of the 40 Modbus registers.

### **6 : K-Factor**

This is a calibration adjustment factor at the meter level. The K-Factor normally ships set to 1000 (1.000 the 3 decimals are always included). Use data type 16 bit short integer, Byte order 1,0. This register would work in one of the 40 Modbus registers.

### **7 : Reset Total**

Reading this address will return fixed data value of 1. Writing a 1 resets the total to zero in the meter. Use data type 16 bit short integer, Byte order 1,0. This register would work in one of the 40 Modbus registers, or could also be used in AO if needed.

### **8-9 : Calibration Date**

The returned data contains the calibration date of the unit. Use data type unsigned 32 bit long integer, Byte order 1-0,3-2. Example: ox 008D2CAB = dec 9252003 = 9/25/2013. You could either use one of the AI analog inputs or treat it as two 16 bit unsigned integers in 2 of the 40 Modbus registers.

### **10-12 : Flow Unit**

Each 16 bit register contains two 8 bit ASCII characters of the flow unit. The returned word is encoded in ASCII. You could read this value by using three of the 40 Modbus registers. However, we recommend just using the FF-BUS PV\_UNITS instead.

### **13-14 : Totalizer Unit**

Each 16 bit register contains two 8 bit ASCII characters of the flow unit. The returned word is encoded in ASCII. You could read this value by using 3 of the 40 Modbus registers. However we recommend just using the FF-BUS PV\_UNITS instead.

### **15-20 : Serial Number**

Each 16 bit register contains two 8 bit ASCII characters of the serial number. The returned word is encoded in ASCII. You could read the 12 character value by using six of the 40 Modbus registers. The serial number is twelve characters long, and always starts with “SN;,” or 53 4E 3A in Hex.

### **26 : Decimal Point Of The Flow/Totalizer**

This register indicates the location of the decimal point in the actual flow/totalizer.

Returned: 2 Bytes (high Byte = flow, low Byte = totalizer)

Example: 0x0201 = decimal point for Flow = 0x02, decimal point total = 0x01

<b>Data</b>	<b>Decimal Point</b>	<b>Divide by</b>
0	00000000	0
1	0000000.0	10
2	000000.00	100
3	00000.000	1000

*Table 4: Decimal Point Examples*

### **31-32 : Alternate Totalizer**

Some devices can't use 32 bit long integers so an alternate totalizer has been added in the 32 bit float data type also. This data type includes the decimal point. However, it will switch to scientific notation when the count gets above 8388608.

## Chapter 8 – Communication Diagnostic LEDs

When powered, one of the Meter to Modbus LEDs will be flashing Green indicating that the meter is communicating with the Modbus board. The other LED will blink Red each time the Foundation Fieldbus Board polls the Modbus board.

Every time a message is passed between the Foundation Fieldbus board and the Modbus board the FF\_BUS to MODBUS\_COM LED will blink yellow.

When the Foundation Fieldbus Board is connected to the H1 network the Fieldbus COM LED will blink green.

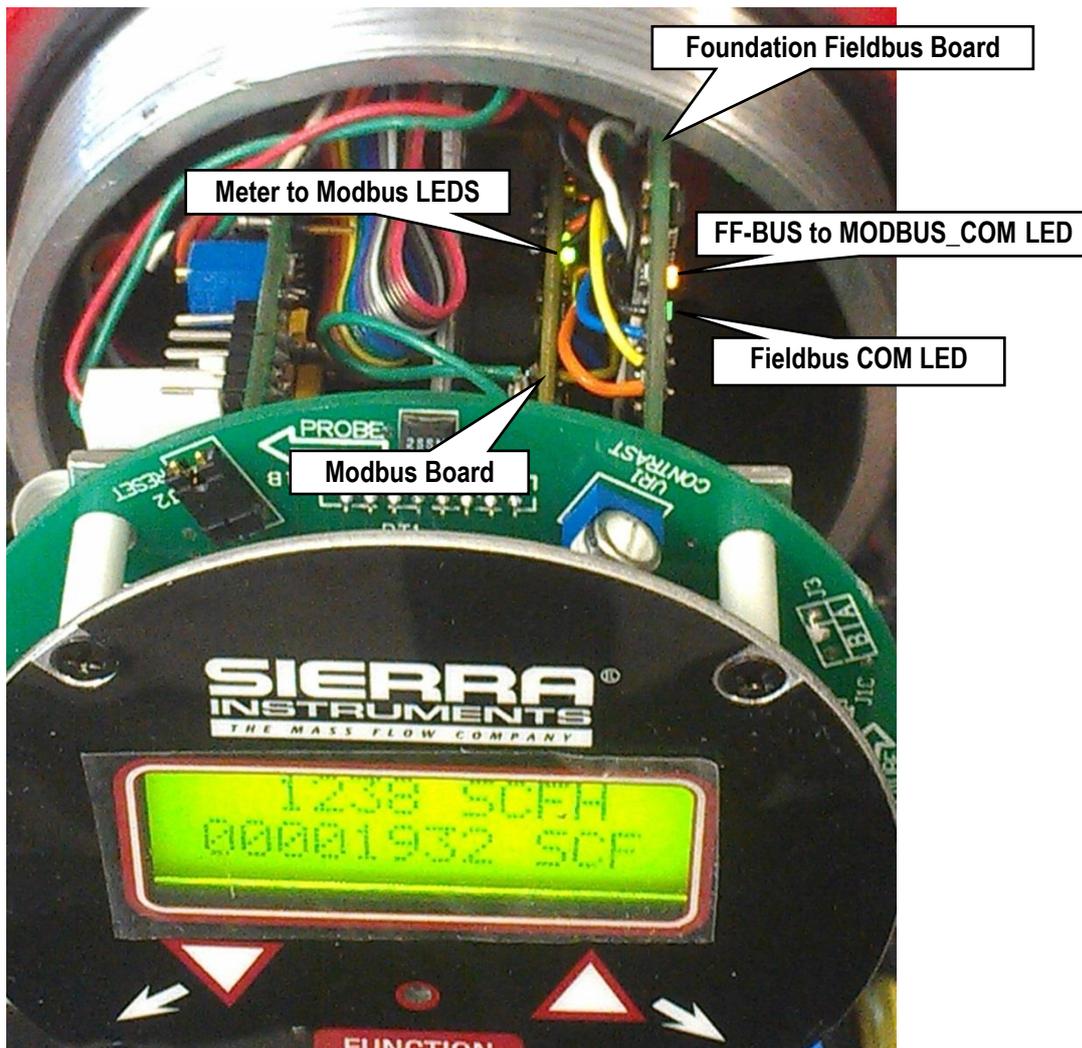


Figure 8: Diagnostic LED locations