GE
Measurement & Control

Flow

Communications Options

User's Guide

imagination at work

916-115 Rev. D
January 2014

GE
Measurement & Control

Communications Options

User's Guide

916-115 Rev. D
January 2014

www.ge-mcs.com

[no content intended for this page]

Information Paragraphs

- Note paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.
- Important paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.
- Caution! paragraphs provide information that alerts the operator to a hazardous situation that can cause damage to property or equipment.
- Warning! paragraphs provide information that alerts the operator to a hazardous situation that can cause injury to personnel. Cautionary information is also included, when applicable.

Safety Issues

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.

WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Purpose for User's Guide

This guide is a separate document that is meant to complement product manuals for various GE Measurement & Control ultrasonic flowmeters that have digital communications options. Due to the varied nature of digital I/O on GE Measurement & Control ultrasonic flowmeters, this separate guide provides more detailed information around setup, programming, verification, and trouble-shooting of digital communications options. In particular, this guide addresses digital communications options for the following instruments:

- DF868 Liquid Ultrasonic Flowmeters
- Gx868 Gas Ultrasonic Flowmeters (GC868, GF868, GS868, GM868)
- XMT868 & XMT868i Liquid Ultrasonic Flowmeters
- XGx868 & XGx868i Gas Ultrasonic Flowmeters (XGS868, XGM868, XGS868i, XGM868i)

Note: This guide supersedes previously published information on digital communications for GE Sensing ultrasonic flowmeters published in various instrument manuals.

To find the communications options available for your instrument, see the specifications section of your user's manual or product datasheet, or contact GE.

Chapter 9. BACNet/IP (BACNet Over Ethernet)

Chapter 1. Modbus Communications

1.1 Introduction

Your flowmeter hardware and software (GC3E.MBS) have been modified to provide improved MODBUS communications. The MODBUS option card provides an RS485 interface with a host system, while the main circuit board continues to support RS232 communications for use with a PC running PanaView™ software.

Note: PanaView™ does not support Modbus.

To properly set up the instrument, use this addendum along with the standard flowmeter *User's Manual*. This document shows how to install the MODBUS option card and how to program the modified flowmeter to access this special feature.

When equipped with the optional MODBUS output card, the flow transmitter can send flow data and diagnostic information to a flow computer (or SCADA) serially, using a Gould-type RTU protocol. In this case, only the MODBUS function command, 3 (read multiple registers), 6 (write multiple registers) is valid. The format for the data exchange is as follows:

- The **send** command (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><First Register MSB>
  <First Register LSB><Register Count MSB>
  <Register Count LSB><CRC Low><CRC High>[time delimiter]
- The response (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><Byte count><Data.....>
  <CRC Low><CRC High>[time delimiter]

The format for the returned data types is as follows:

- Integer (16 bit Integer) <MSB><LSB>
  1 Register - 16 bit integer
- Integer (32 bit IntegerI) <MSB><LSB><LSB><LSB>
  2 Registers - 32 bit long integer
- Floating Point (FP) <EXP><MAN><MAN><MAN>
  2 Registers - 32 bit IEEE floating point number

1.2 Installing the MODBUS Option Card

IMPORTANT: The installation information presented here supersedes the information in the standard flowmeter User's Manual.

The modified flowmeter uses the RS485 standard for MODBUS communications. This standard allows up to 32 nodes (drivers and receivers) on one multidrop network, at distances up to 4,000 ft (1,200 m). To connect the instrument(s) to the host system, GE Sensing recommends using a 24-gauge (24 AWG) twisted-pair cable with a characteristic impedance of 120 ohms and a 120-ohm termination at each end of the communications line.

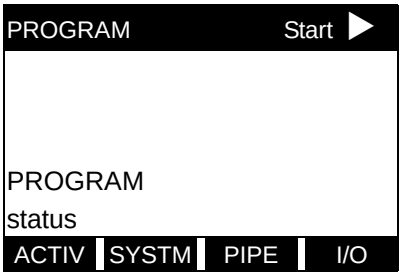
The MODBUS option card must be plugged into either slot 5 or slot 6 of the flowmeter. On the option card, pin 1 is the [TMT-] inverting or negative connection and pin 2 is the [TMT+] non-inverting or positive connection. To link the flowmeter to the control system, connect the two wires of the twisted-pair cable from these terminals to the corresponding terminals at the control system.

Note: If two MODBUS option cards are installed in the flowmeter, only the card in slot 5 is activated.

1.3 Setting Up MODBUS Communications

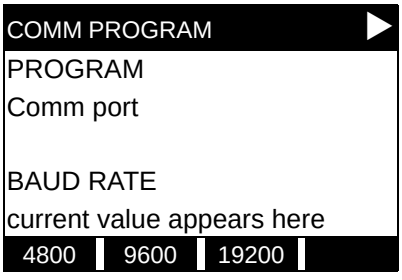
To set up MODBUS communications, enter the *User Program* as described in your *Programming Manual*. Then, refer to the *menu map* in Figure 1 on page 17 and complete the following steps:

Note: Any time the following settings are changed, the flowmeter must be rebooted to load the new settings into the option card.



Press the [∅] key and then the [F3] key to select the *COMM* submenu. (On a two-channel flowmeter, pressing the [∅] key and the [F3] key accesses the *GLOBL* menu. Then press [F4] to select the *COMM* submenu.)

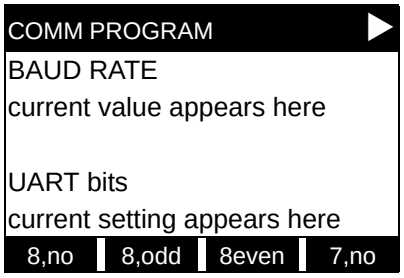
IMPORTANT: The serial port settings of the flowmeter must match those of the MODBUS control system.



[This baud rate applies only to the RS232 serial port.] Press the [∅] until the desired RS232 baud rate appears on the option bar and press the appropriate [Fx] function key to select it.

The available RS232 baud rates are 300, 600, 1200, 2400, 4800, 9600, and 19200.

1.3 Setting Up MODBUS Communications (cont.)

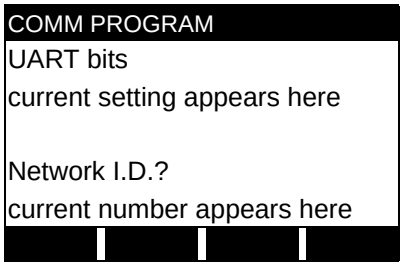


[The UART bits setting applies only to the RS232 serial port.] Press the [∅] until the desired RS232 UART bits setting appears on the option bar and then press the appropriate [Fx] function key to select it.

See Table 1 for a description of the options available at the above prompt.

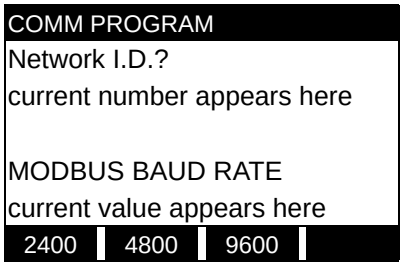
Table 1: UART Bits Options

Option Bar	# Data Bits	# Stop Bits	Parity
8,no	8	0	None
8,odd	8	0	Odd
8even	8	0	Even
7,odd	7	1	Odd
7even	7	1	Even

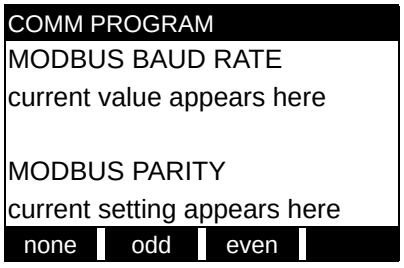


[The Network ID number is used by the IDM software only.] Enter a Network ID number between 1 and 254 and then press [ENT]. The default ID number is 1.

Note: If more than one meter is connected to a network, each meter must have a unique Network I.D.

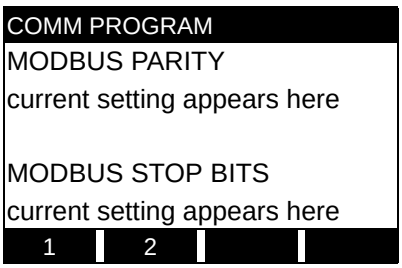


Press the appropriate [Fx] function key to select [2400], [4800], or [9600] for the MODBUS baud rate.

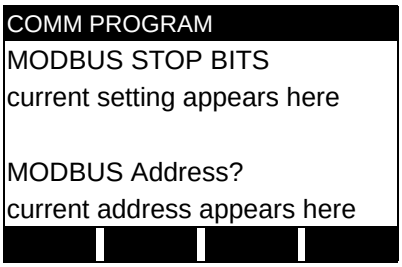


Press the appropriate [Fx] function key to select [NONE], [ODD], or [EVEN] for the MODBUS parity setting.

1.3 Setting Up MODBUS Communications (cont.)



Press the appropriate [Fx] function key to select [1] or [2] for the MODBUS stop bits setting.



Enter a MODBUS Address number between 1 and 247. Then, press [ENT].

Press [EXIT] until you return to RUN mode and the screen resumes the display of data measurements. Then reboot the meter to load the new settings into memory.

1.4 MODBUS Register Map

To request specific parameters from the flowmeter using MODBUS, the control system must enter the appropriate register number. Only registers 1 through 90 are available for MODBUS communications, while registers 508 through 512 are used by the flowmeter to store the MODBUS parameters. For details, see:

Table 2 on page 5 for a 1-Channel gas flowmeter (GC868, GF868, GM868, GN868, GS868, XGM868, XGS868)
Table 3 on page 6 for a 2-Channel gas flowmeter (GC868, GF868, GM868, GN868, GS868, XGM868, XGS868)
Table 4 on page 9 for a 1-Channel liquid flowmeter (DF868, XMT868i)
Table 5 on page 11 for a 2-Channel liquid flowmeter (DF868, XMT868i)
Table 6 on page 14 for a Sentinel flowmeter.

Refer to Notes on page 8, page 13, or page 16 for information about the numerical references.

Note: Depending on the type of flowmeter being programmed, some MODBUS register numbers may have zero readings. If this is the case, those register types are not available for that flowmeter.

Note: If you request Ch2 or AVE data from a 1-Channel meter, the values will all be zero.

Table 2: MODBUS Registers for a 1-Channel Gas Flowmeter

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
1	[1]"Clear Ch1 Totalizers"	--	2 (16 bit signed int)
2	Not Used	--	2 (16 bit signed int)
3, 4**	Velocity	2	4 (32 bit Long Integer)
5, 6*	[2]Act Volumetric	--	4 (IEEE 32 bit Float)
7, 8*	[2]Std Volumetric	--	4 (IEEE 32 bit Float)
9, 10**	[3]Fwd Totals	Register 13	4 (32 bit Long Integer)
11, 12**	[3]Rev Totals	Register 13	4 (32 bit Long Integer)
13	#Tot Digits	0	2
14, 15*	[2]Mass Flow	--	4 (IEEE 32 bit Float)
16, 17**	[4]Fwd Mass Totals	Register 20	4 (32 bit Long Integer)
18, 19**	[4]Rev Mass Totals	Register 20	4 (32 bit Long Integer)
20	#MT DIGITS (Mass Tot Digits)	0	2
21, 22**	Timer	2	4 (32 bit Long Integer)
23	[9]Error Code	0	2
24, 25**	Sound Speed	3	4 (32 bit Long Integer)
26, 27**	[10]Density	4	4 (32 bit Long Integer)
28, 29**	Signal Strength Upstream	1	4 (32 bit Long Integer)
30, 31**	Signal Strength Downstream	1	4 (32 bit Long Integer)
32, 33**	Temperature	2	4 (32 bit Long Integer)
34, 35**	Pressure	3	4 (32 bit Long Integer)
92, 93 (36, 37)*	Signal Quality Up	--	4 (IEEE 32 bit Float)
94, 95 (38, 39)*	Signal Quality Down	--	4 (IEEE 32 bit Float)
96, 97 (40, 41)*	Amp Discriminator Up	--	4 (IEEE 32 bit Float)
98, 99 (42, 43)*	Amp Discriminator Down	--	4 (IEEE 32 bit Float)
100, 101 (44, 45)*	SNR Up	--	4 (IEEE 32 bit Float)
102, 103 (46, 47)*	SNR Down	--	4 (IEEE 32 bit Float)
508	[6]MODBUS baud rate	0	2
509	[7]MODBUS parity	0	2
510	[8]MODBUS stop bits	0	2
511	MODBUS meter addr	0	2
512	RESERVED	---	---

*The complete floating point value is constructed by combining readings from the first register with a second register. An eight Hex digits number will represent the IEEE-754 hexadecimal floating point value. 32-bit Hexadecimal Representation To Decimal Floating-Point conversion can be performed if needed.

Example: Reg 14 reading is 44d7, Reg 15 reading is 4000, Mass Flow is 44d74000, which corresponds to 1722.

**The complete Long integer value is constructed by combining readings from the first register with the second register. Eight Hex digits will represent the Long integer value.

Example: Reg 24 is 0019, Reg 25 is ED30, Hexadecimal Sound Speed is 0019ED30, which is converted to 1699120 decimal. Taking into account that Sound Speed has 3 decimal places (from the map), it corresponds to a value of 1699.120.

Table 3: MODBUS Registers for a 2-Channel Gas Flowmeter

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
1	[1]"Clear Ch1 Totalizers"	--	2 (16 bit signed int)
2	[1]"Clear Ch2 Totalizers"	--	2 (16 bit signed int)
3, 4**	Ch1 Velocity	2	4 (32 bit Long Integer)
5, 6*	[2]Ch1 Act Volumetric	--	4 (IEEE 32 bit Float)
7, 8*	[2]Ch1 Std Volumetric	--	4 (IEEE 32 bit Float)
9, 10**	[3]Ch1 Fwd Totals	Register 13	4 (32 bit Long Integer)
11, 12**	[3]Ch1 Rev Totals	Register 13	4 (32 bit Long Integer)
13	Ch1 #Tot Digits	0	2
14, 15*	[2]Ch1 Mass Flow	--	4 (IEEE 32 bit Float)
16, 17**	[4]Ch1 Fwd Mass Totals	Register 20	4 (32 bit Long Integer)
18, 19**	[4]Ch1 Rev Mass Totals	Register 20	4 (32 bit Long Integer)
20	Ch1 #MT DIGITS (Mass Tot Digits)	0	2
21, 22**	Ch1 Timer	2	4 (32 bit Long Integer)
23	[9]Ch1 Error Code	0	2
24, 25**	Ch1 Sound Speed	3	4 (32 bit Long Integer)
26, 27**	[10]Ch1 Density	4	4 (32 bit Long Integer)
28, 29**	Ch1 Sig Strength Upstream	1	4 (32 bit Long Integer)
30, 31**	Ch1 Sig Strength Downstream	1	4 (32 bit Long Integer)
32, 33**	Ch1 Temperature	2	4 (32 bit Long Integer)
34, 35**	Ch1 Pressure	3	4 (32 bit Long Integer)
36, 37**	Ch2 Velocity	2	4 (32 bit Long Integer)
38, 39*	Ch2 Act Volumetric	--	4 (IEEE 32 bit Float)
40, 41*	Ch2 Std Volumetric	--	4 (IEEE 32 bit Float)
42, 43**	Ch2 Fwd Totals	Register 46	4 (32 bit Long Integer)
44, 45**	Ch2 Rev Totals	Register 46	4 (32 bit Long Integer)
46	Ch2 #Tot Digits	0	2
47, 48*	Ch2 Mass Flow	--	4 (IEEE 32 bit Float)
49, 50**	Ch2 Fwd Mass Totals	Register 53	4 (32 bit Long Integer)
51, 52**	Ch2 Rev Mass Totals	Register 53	4 (32 bit Long Integer)
53	Ch2 #Mass Tot Digits	0	2
54, 55**	Ch2 Timer	2	4 (32 bit Long Integer)
56	[9]Ch2 Error Code	0	2
57, 58**	Ch2 Sound Speed	3	4 (32 bit Long Integer)
59, 60**	[10]Ch2 Density	4	4 (32 bit Long Integer)
61, 62**	Ch2 Sig Strength Upstream	1	4 (32 bit Long Integer)
63, 64**	Ch2 Sig Strength Downstream	1	4 (32 bit Long Integer)
65, 66**	Ch2 Temperature	2	4 (32 bit Long Integer)
67, 68**	Ch2 Pressure	3	4 (32 bit Long Integer)

Table 3: MODBUS Registers for a 2-Channel Gas Flowmeter (cont.)

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
69, 70**	Avg Velocity	2	4 (32 bit Long Integer)
71, 72*	Avg Act Volumetric	--	4 (IEEE 32 bit Float)
73, 74*	Avg Std Volumetric	--	4 (IEEE 32 bit Float)
75, 76**	Avg Fwd Totals	Register 79	4 (32 bit Long Integer)
77, 78**	Avg Rev Totals	Register 79	4 (32 bit Long Integer)
79	Avg #Tot Digits	0	2
80, 81*	Avg Mass Flow	--	4 (IEEE 32 bit Float)
82, 83**	Avg Fwd Mass Totals	Register 86	4 (32 bit Long Integer)
84, 85**	Avg Rev Mass Totals	Register 86	4 (32 bit Long Integer)
86	Avg #Mass Tot Digits	0	2
87, 88**	Avg Timer	2	4 (32 bit Long Integer)
89	[5]Avg Error Code	0	2
90, 91**	Avg Sound Speed	3	4 (32 bit Long Integer)
92, 93*	CH1 Signal Quality Up	--	4 (IEEE 32 bit Float)
94, 95*	CH1 Signal Quality Down	--	4 (IEEE 32 bit Float)
96, 97*	CH1 Amp Discriminator Up	--	4 (IEEE 32 bit Float)
98, 99*	CH1 Amp Discriminator Down	--	4 (IEEE 32 bit Float)
100, 101*	CH1 SNR Up	--	4 (IEEE 32 bit Float)
102, 103*	CH1 SNR Down	--	4 (IEEE 32 bit Float)
104, 105*	CH2 Signal Quality Up	--	4 (IEEE 32 bit Float)
106, 107*	CH2 Signal Quality Down	--	4 (IEEE 32 bit Float)
108, 109*	CH2 Amp Discriminator Up	--	4 (IEEE 32 bit Float)
110, 111*	CH2 Amp Discriminator Down	--	4 (IEEE 32 bit Float)
112, 113*	CH2 SNR Up	--	4 (IEEE 32 bit Float)
114, 115*	CH2 SNR Down	--	4 (IEEE 32 bit Float)
508	[6]MODBUS baud rate	0	2
509	[7]MODBUS parity	0	2
510	[8]MODBUS stop bits	0	2
511	MODBUS meter addr	0	2
512	RESERVED	---	---

*The complete floating point value is constructed by combining readings from the first register with a second register. An eight Hex digits number will represent the IEEE-754 hexadecimal floating point value. 32-bit Hexadecimal Representation To Decimal Floating-Point conversion can be performed if needed.

Example: Reg 14 reading is 44d7, Reg 15 reading is 4000, Mass Flow is 44d74000, which corresponds to 1722.

**The complete Long integer value is constructed by combining readings from the first register with the second register. Eight Hex digits will represent the Long integer value.

Example: Reg 24 is 0019, Reg 25 is ED30, Hexadecimal Sound Speed is 0019ED30, which is converted to 1699120 decimal. Taking into account that Sound Speed has 3 decimal places (from the map), it corresponds to a value of 1699.120.

1.4.1 Notes for a Gas Flowmeter:

1. **Clear Totalizers:**
   Write 1 to Reg 1 to clear Channel 1 totalizers.
   Write 1 to Reg 2 to clear Channel 2 totalizers.
2. **Values in these registers are floating point numbers and require no scaling. The number of decimal digits is set in meter programming.**
3. **Require scaling by value in register 13.**
4. **Require scaling by value in register 20.**
5. **AVG Error Code:**
   0=Both Ch1 and Ch2 are in error.
   1=Ch1 only is in error
   2=Ch2 only is in error
   3=Both channels are error free
6. **MODBUS baud rate:**
   5 = 2400, 6 = 4800, 7 = 9600
7. **MODBUS parity:**
   0 = none, 1 = odd, 2 = even
8. **MODBUS stop bits:**
   1 = 1 stop bit, 2 = 2 stop bits
9. **Error Code:**
   Highest single number, or combination of error numbers, listed without an “E”. Error codes should be explained in the user’s manual or guide.

IMPORTANT: If the unit is reading over range, an error condition will occur and output 20mA *(for a 0-20mA range) or* 21.10mA *(for a 4-20mA range).*

10. **Descriptions:**
    For the GF868, register numbers 26, 27 and 59, 60 have the description Molecular Weight.
    For the GN868, register numbers 26, 27 and 59, 60 have the description Fpv.

Table 4: MODBUS Registers for a 1-Channel Liquid Flowmeter

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
1	[1]Clear Totalizers		2 (16 bit signed int)
2, 3**	Velocity	2	4 (32 bit Long Integer)
4, 5*	Volumetric	--	4 (IEEE 32 bit Float)
6, 7**	+Totals	Register 10	4 (32 bit Long Integer)
8, 9**	–Totals	Register 10	4 (32 bit Long Integer)
10	#T Digits	0	2 (16 bit signed int)
11, 12**	Totalizer Time	2	4 (32 bit Long Integer)
13	[2]Error Value	0	2 (16 bit signed int)
14, 15**	SSUP	1	4 (32 bit Long Integer)
16, 17**	SSDN	1	4 (32 bit Long Integer)
18, 19**	SNDSP	0	4 (32 bit Long Integer)
56, 57*	Power	--	4 (IEEE 32 bit Float)
58, 59**	+Energy	Register 62	4 (32 bit Long Integer)
60, 61**	–Energy	Register 62	4 (32 bit Long Integer)
62	# Energy Digits	0	2 (16 bit signed int)
63, 64**	TempS	2	4 (32 bit Long Integer)
65, 66**	TempR	2	4 (32 bit Long Integer)
67, 68**	TS-TR	2	4 (32 bit Long Integer)
69, 70**	DELTH	2	4 (32 bit Long Integer)
86, 87*	[5]Slot 1 Input A		4 (IEEE 32 bit Float)
88, 89*	[5]Slot 1 Input B		4 (IEEE 32 bit Float)
90, 91*	Slot 2 Input A		4 (IEEE 32 bit Float)
92, 93*	Slot 2 Input B		4 (IEEE 32 bit Float)
94, 95*	Slot 3 Input A		4 (IEEE 32 bit Float)
96, 97*	Slot 3 Input B		4 (IEEE 32 bit Float)
98, 99*	Slot 4 Input A		4 (IEEE 32 bit Float)
100, 101*	Slot 4 Input B		4 (IEEE 32 bit Float)
102, 103*	Slot 5 Input A		4 (IEEE 32 bit Float)
104, 105*	Slot 5 Input B		4 (IEEE 32 bit Float)
106, 107*	Slot 6 Input A		4 (IEEE 32 bit Float)
108, 109*	Slot 6 Input B		4 (IEEE 32 bit Float)
508	[6]MODBUS baud rate	0	2 (16 bit signed int)
509	[7]MODBUS parity	0	2 (16 bit signed int)
510	[8]MODBUS stop bits	0	2 (16 bit signed int)
511	MODBUS meter address	0	2 (16 bit signed int)
512	RESERVED	--	--

Table 4: MODBUS Registers for a 1-Channel Liquid Flowmeter (cont.)

*The complete floating point value is constructed by combining readings from the first register with a second register. An eight Hex digits number will represent the IEEE-754 hexadecimal floating point value. 32-bit Hexadecimal Representation To Decimal Floating-Point conversion can be performed if needed.

Example: Reg 4 reading is 44d7, Reg 5 reading is 4000, Volumetric is 44d74000, which corresponds to 1722.

**The complete Long integer value is constructed by combining readings from the first register with the second register. Eight Hex digits will represent the Long integer value.

Example: Reg 2 is 0019, Reg 3 is ED30, Hexadecimal Velocity is 0019ED30, which corresponds to 1699120 decimal. Taking into account that Velocity has 2 decimal places (from the map), it corresponds to a value of 16991.20.

Table 5: MODBUS Registers for a 2-Channel Liquid Flowmeter

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
1	[1]Clear Totalizers		2 (16 bit signed int)
2, 3**	CH 1 Velocity	2	4 (32 bit Long Integer)
4, 5*	CH 1 Volumetric	--	4 (IEEE 32 bit Float)
6, 7**	CH 1 +Totals	Register 10	4 (32 bit Long Integer)
8, 9**	CH 1 -Totals	Register 10	4 (32 bit Long Integer)
10	CH 1 #T Digits	0	2 (16 bit signed int)
11, 12**	CH 1 Totalizer Time	2	4 (32 bit Long Integer)
13	[2]CH 1 Error Value	0	2 (16 bit signed int)
14, 15**	CH 1 SSUP	1	4 (32 bit Long Integer)
16, 17**	CH 1 SSDN	1	4 (32 bit Long Integer)
18, 19**	CH 1 SNDSP	0	4 (32 bit Long Integer)
20, 21**	CH 2 Velocity	2	4 (32 bit Long Integer)
22, 23*	CH 2 Volumetric	--	4 (IEEE 32 bit Float)
24, 25**	CH 2 + Totals	Register 28	4 (32 bit Long Integer)
26, 27**	CH 2 - Totals	Register 28	4 (32 bit Long Integer)
28	CH 2 # T Digits	0	2 (16 bit signed int)
29, 30**	CH 2 Totalizer Time	2	4 (32 bit Long Integer)
31	[2]CH 2 Error Value	0	2 (16 bit signed int)
32, 33**	CH 2 SSUP	1	4 (32 bit Long Integer)
34, 35**	CH 2 SSDN	1	4 (32 bit Long Integer)
36, 37**	CH 2 SNDSP	0	4 (32 bit Long Integer)
38, 39**	[3]AVG Velocity	2	4 (32 bit Long Integer)
40, 41*	[3]AVG Volumetric	--	4 (IEEE 32 bit Float)
42, 43**	[3]AVG + Totals	Register 46	4 (32 bit Long Integer)
44, 45**	[3]AVG - Totals	Register 46	4 (32 bit Long Integer)
46	AVG #T Digits	0	2 (16 bit signed int)
47, 48**	[3]AVG Totalizer Time	2	4 (32 bit Long Integer)
49	[4]AVG Error Value	0	2 (16 bit signed int)
50, 51**	[3]AVG SSUP	1	4 (32 bit Long Integer)
52, 53**	[3]AVG SSDN	1	4 (32 bit Long Integer)
54, 55**	[3]AVG SNDSP	0	4 (32 bit Long Integer)
56, 57*	CH 1 Power	--	4 (IEEE 32 bit Float)
58, 59**	CH 1 +Energy	Register 62	4 (32 bit Long Integer)
60, 61**	CH 1 -Energy	Register 62	4 (32 bit Long Integer)
62	CH 1 # Energy Digits	0	2 (16 bit signed int)
63, 64**	CH 1 TempS	2	4 (32 bit Long Integer)
65, 66**	CH 1 TempR	2	4 (32 bit Long Integer)
67, 68**	CH 1 TS-TR	2	4 (32 bit Long Integer)

Table 5: MODBUS Registers for a 2-Channel Liquid Flowmeter (cont.)

MODBUS Reg #	Description	Scaling (decimal places)	Size in Bytes
69, 70**	CH 1 DELTH	2	4 (32 bit Long Integer)
71, 72*	CH 2 Power	--	4 (IEEE 32 bit Float)
73, 74**	CH 2 +Energy	Register 77	4 (32 bit Long Integer)
75, 76**	CH 2 -Energy	Register 77	4 (32 bit Long Integer)
77	CH 2 # Energy Digits	0	2 (16 bit signed int)
78, 79**	CH 2 TempS	2	4 (32 bit Long Integer)
80, 81**	CH 2 TempR	2	4 (32 bit Long Integer)
82, 83**	CH 2 TS-TR	2	4 (32 bit Long Integer)
84, 85**	CH 2 DELTH	2	4 (32 bit Long Integer)
86, 87*	[5]Slot 1 Input A		4 (IEEE 32 bit Float)
88, 89*	[5]Slot 1 Input B		4 (IEEE 32 bit Float)
90, 91*	Slot 2 Input A		4 (IEEE 32 bit Float)
92, 93*	Slot 2 Input B		4 (IEEE 32 bit Float)
94, 95*	Slot 3 Input A		4 (IEEE 32 bit Float)
96, 97*	Slot 3 Input B		4 (IEEE 32 bit Float)
98, 99*	Slot 4 Input A		4 (IEEE 32 bit Float)
100, 101*	Slot 4 Input B		4 (IEEE 32 bit Float)
102, 103*	Slot 5 Input A		4 (IEEE 32 bit Float)
104, 105*	Slot 5 Input B		4 (IEEE 32 bit Float)
106, 107*	Slot 6 Input A		4 (IEEE 32 bit Float)
108, 109*	Slot 6 Input B		4 (IEEE 32 bit Float)
508	[6]MODBUS baud rate	0	2 (16 bit signed int)
509	[7]MODBUS parity	0	2 (16 bit signed int)
510	[8]MODBUS stop bits	0	2 (16 bit signed int)
511	MODBUS meter addr	0	2 (16 bit signed int)
512	RESERVED	--	--

*The complete floating point value is constructed by combining readings from the first register with a second register. An eight Hex digits number will represent the IEEE-754 hexadecimal floating point value. 32-bit Hexadecimal Representation To Decimal Floating-Point conversion can be performed if needed.

Example: Reg 4 reading is 44d7, Reg 5 reading is 4000, Volumetric is 44d74000, which corresponds to 1722.

**The complete Long integer value is constructed by combining readings from the first register with the second register. Eight Hex digits will represent the Long integer value.

Example: Reg 2 is 0019, Reg 3 is ED30, Hexadecimal Velocity is 0019ED30, which is converted to 1699120 decimal. Taking into account that Velocity has 2 decimal places (from the map), it corresponds to a value of 16991.20.

1.4.2 Notes for a Liquid Flowmeter:

1. **Clear Totalizers:** Write 1 to Reg 1 to clear Channel 1 and Channel 2 totalizers.
2. **Error Value:** see table in DF868 manual for error codes
3. **Average:**
   average of channel 1 and channel 2 if both channels out of error,
   channel 1 value if channel 2 is in error,
   channel 2 value if channel 1 is in error,
   zero if both channels are in error.
4. **Average Error Status:**
   0 = both in error
   1 = chan 2 in error,
   2 = chan 1 in error,
   3 = both ok
5. **MODBUS baud rate:**
   5 = 2400, 6 = 4800, 7 = 9600
6. **MODBUS parity:**
   0 = none, 1 = odd, 2 = even
7. **MODBUS stop bits:**
   1 = 1 stop bit, 2 = 2 stop bits
8. **General:**
   Registers are written if corresponding functions are actuated by the user. Registers for unactuated functions are initialized to zero at startup.
9. **Error Code:**
   Highest number (single or combination of errors) listed, without an “E”. Error codes should be explained in the user’s manual.

Table 6: MODBUS Registers for a Sentinel Flowmeter

MODBUS Reg #	Description	Default	Unit	Refresh	Size in Bytes
1, 2*	Actual Volumetric Flow	0	am^3/hr	1s	4 (IEEE 32 bit Float)
3, 4*	Soundspeed	0	m/s	1s	4 (IEEE 32 bit Float)
5	Measurement Status	0		1s	2 (16 bit Int)
6, 7*	Area Average Velocity	0	m/s	1s	4 (IEEE 32 bit Float)
8, 9*	Normal Volumetric Flow	0	sm^3/hr	1s	4 (IEEE 32 bit Float)
10, 11, 12, 13**	Actual Volume Forward Total	0	am^3	2s	8 (64 bit double precision)
14, 15, 16, 17**	Actual Volume Reverse Total	0	am^3	2s	8 (64 bit double precision)
18, 19, 20, 21**	Normal Volume Forward Total	0	sm^3	2s	8 (64 bit double precision)
22, 23, 24, 25**	Normal Volume Reverse Total	0	sm^3	2s	8 (64 bit double precision)
26, 27*	Mass Flow	0	kg/hr	2s*	4 (IEEE 32 bit Float)
28, 29*	Forward Mass Total	0	kg	2s*	4 (IEEE 32 bit Float)
30, 31*	Reverse Mass Total	0	kg	2s*	4 (IEEE 32 bit Float)
32, 33*	Energy Flow	0	J/hr	5s*	4 (IEEE 32 bit Float)
34, 35*	Forward Energy Total	0	J	5s*	4 (IEEE 32 bit Float)
36, 37*	Reverse Energy Total	0	J	5s*	4 (IEEE 32 bit Float)
38, 39*	Pressure	10^5	Pa	10s/Fixed	4 (IEEE 32 bit Float)
40, 41*	Temperature	20	C	10s/Fixed	4 (IEEE 32 bit Float)
42	Super Compressibility Factor x 1000	1000		10s/Fixed	2 (16 bit Int)
43	Density x 1000	1000	lb/ft^3	10s/Fixed	2 (16 bit Int)
44	Kinematic Viscosity x 10^8	1000	m^2/s	10s/Fixed*	2 (16 bit Int)
45	Heating Value	25000	kJ/m^3	10s/Fixed*	2 (16 bit Int)
46	Path A Velocity	0	m/s x 1000	10s	2 (16 bit Int)
47	Path A Sound Speed	0	m/s x 10	10s	2 (16 bit Int)
48	Path A % Readings in Error	0		10s	2 (16 bit Int)
49	Path A Last Error	0		10s*	2 (16 bit Int)
50	Path B Velocity	0	m/s x 1000	10s	2 (16 bit Int)
51	Path B Sound Speed	0	m/s x 10	10s	2 (16 bit Int)
52	Path B % Readings in Error	0		10s	2 (16 bit Int)
53	Path B Last Error	0		10s*	2 (16 bit Int)
54	Path C Velocity	0	m/s x 1000	10s	2 (16 bit Int)
55	Path C Sound Speed	0	m/s x 10	10s	2 (16 bit Int)
56	Path C % Readings in Error	0		10s	2 (16 bit Int)
57	Path C Last Error	0		10s*	2 (16 bit Int)
58	Path D Velocity	0	m/s x 1000	10s	2 (16 bit Int)
59	Path D Sound Speed	0	m/s x 10	10s	2 (16 bit Int)
60	Path D % Readings in Error	0		10s	2 (16 bit Int)
61	Path D Last Error	0		10s*	2 (16 bit Int)
62	Path E Velocity	0	m/s x 1000	10s	2 (16 bit Int)
63	Path E Sound Speed	0	m/s x 10	10s	2 (16 bit Int)

Table 6: MODBUS Registers for a Sentinel Flowmeter (cont.)

MODBUS Reg #	Description	Default	Unit	Refresh	Size in Bytes
64	Path E % Readings in Error	0		10s	2 (16 bit Int)
65	Path E Last Error	0		10s*	2 (16 bit Int)
66	Path F Velocity	0	m/s x 1000	10s	2 (16 bit Int)
67	Path F Sound Speed	0	m/s x 10	10s	2 (16 bit Int)
68	Path F % Readings in Error	0		10s	2 (16 bit Int)
69	Path F Last Error	0		10s*	2 (16 bit Int)
70	Internal Update Rate	10	Hz	On Init.	2 (16 bit Int)
71	Sound Speed Low Limit	300	m/s	On Init.	2 (16 bit Int)
72	Sound Speed High Limit	500	m/s	On Init.	2 (16 bit Int)
73	Velocity High Limit	40	m/s	On Init.	2 (16 bit Int)
74	Velocity Low Limit	–40	m/s	On Init.	2 (16 bit Int)
75	Signal Strength High Limit	100	dB	On Init.	2 (16 bit Int)
76	Signal Strength Low Limit	20	dB	On Init.	2 (16 bit Int)
77	Amplitude High Limit	95		On Init.	2 (16 bit Int)
78	Amplitude Low Limit	35		On Init.	2 (16 bit Int)
79	Number in Average	32		On Init.	2 (16 bit Int)
80	Software Version	(2 ASCII)		On Init.	2 (16 bit Int)
81	Checksum			On Init.	2 (16 bit Int)
82	Number of Paths	4		On Init.	2 (16 bit Int)
83	Modbus Address	32		On Init.	2 (16 bit Int)

*The complete floating point value is constructed by combining readings from the first register with a second register. An eight Hex digits number will represent the IEEE-754 hexadecimal floating point value. 32-bit Hexadecimal Representation To Decimal Floating-Point conversion can be performed if needed.

Example: Reg 1 reading is 44d7, Reg 2 reading is 4000, Actual Volumetric Flow is 44d74000, which corresponds to 1722.

**The complete double precision floating point value is constructed by combining readings from all four registers according to IEEE-754 for double precision.

1.4.3 Notes for a Sentinel Flowmeter

The Sentinel Flowmeter, when equipped with the optional Modbus output card, can transmit flow data and diagnostic information to a flow computer or SCADA, serially, using a Gould-type RTU protocol. For security and audit-trail purposes, the unit must be programmed through the PanaView interface. This means that only the Modbus function command 3 (read multiple registers), is valid.

Communication parameters: 9600, n, 8, 1

The format for the data exchange is as follows:

- The ***send*** command (initiated by host flow computer or controller) is of the form:

<time delimiter> <Addr> <3> <First Register MSB>
<First Register LSB> <Register Count MSB>
<Register Count LSB> <CRC Low> <CRC High> <time delimiter>

- The ***response*** (initiated by host flow computer or controller) is of the form:

[time delimiter] <Addr> <3> <Byte count> < Data …… >
<CRC Low> <CRC High> <time delimiter>

Table 6 on page 14 is the data map for the IGM878 and Sentinel. The refresh rate indicates how often the central controller updates the memory map, available using the ModBus port. The most time-critical information is stored at the top of the register. This limits how deep the user has to go into the resister stack to gather the real-time information. All values are IEEE format MSB first (big-endian).

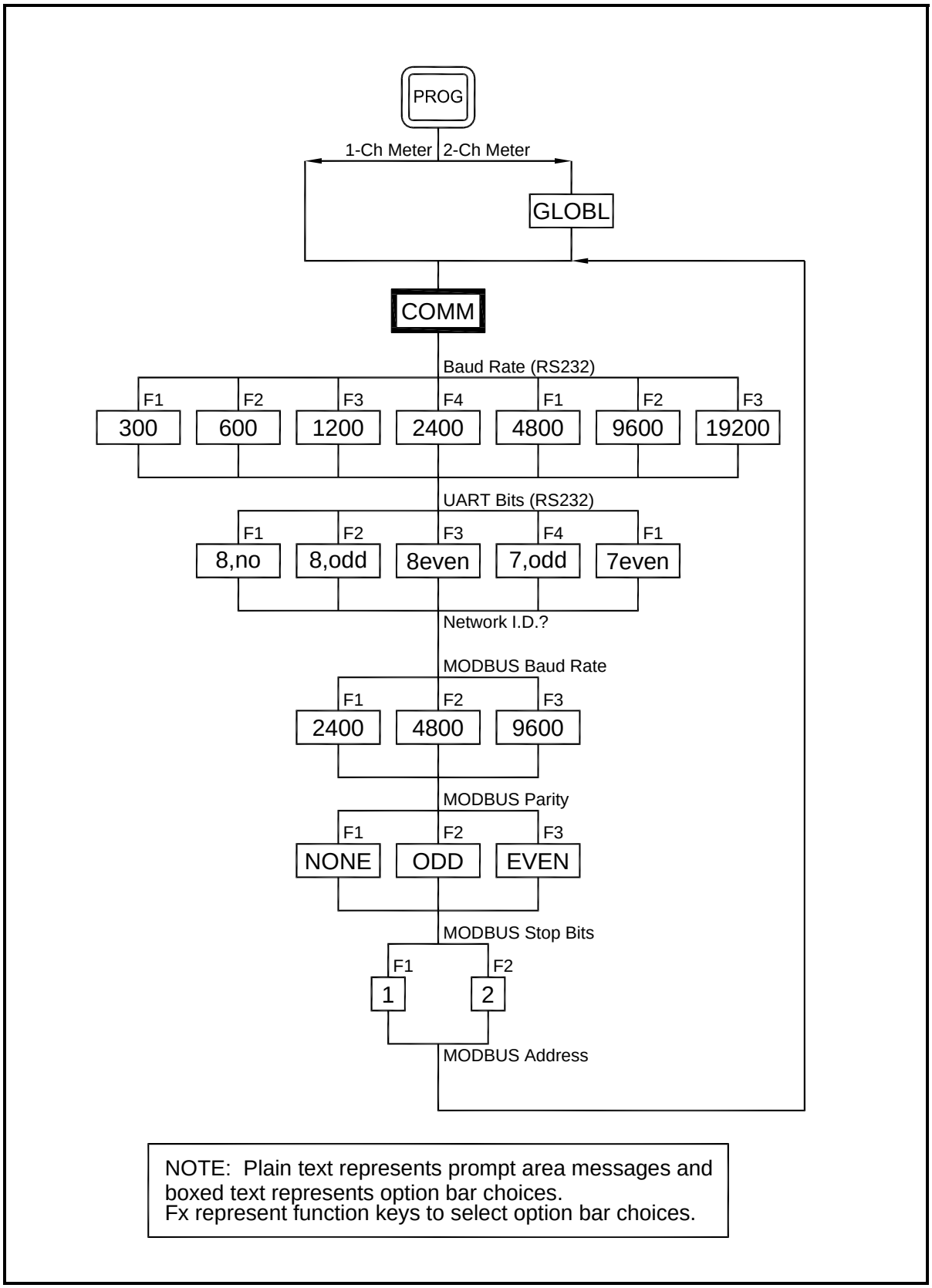


Figure 1: MODBUS Menu Map

1.5 Swapping the Floating Point

To represent a correct floating point value, you may need to swap the reading from two registers. Some applications allow you to swap the registers. Some do not.

When using the Modscan32 utility in order to monitor register values, you need to select 03: HOLDING REGISTER (see Figure 2), select the corresponding communications parameters in the menu item Connection-Connect, and hit OK to make a connection.

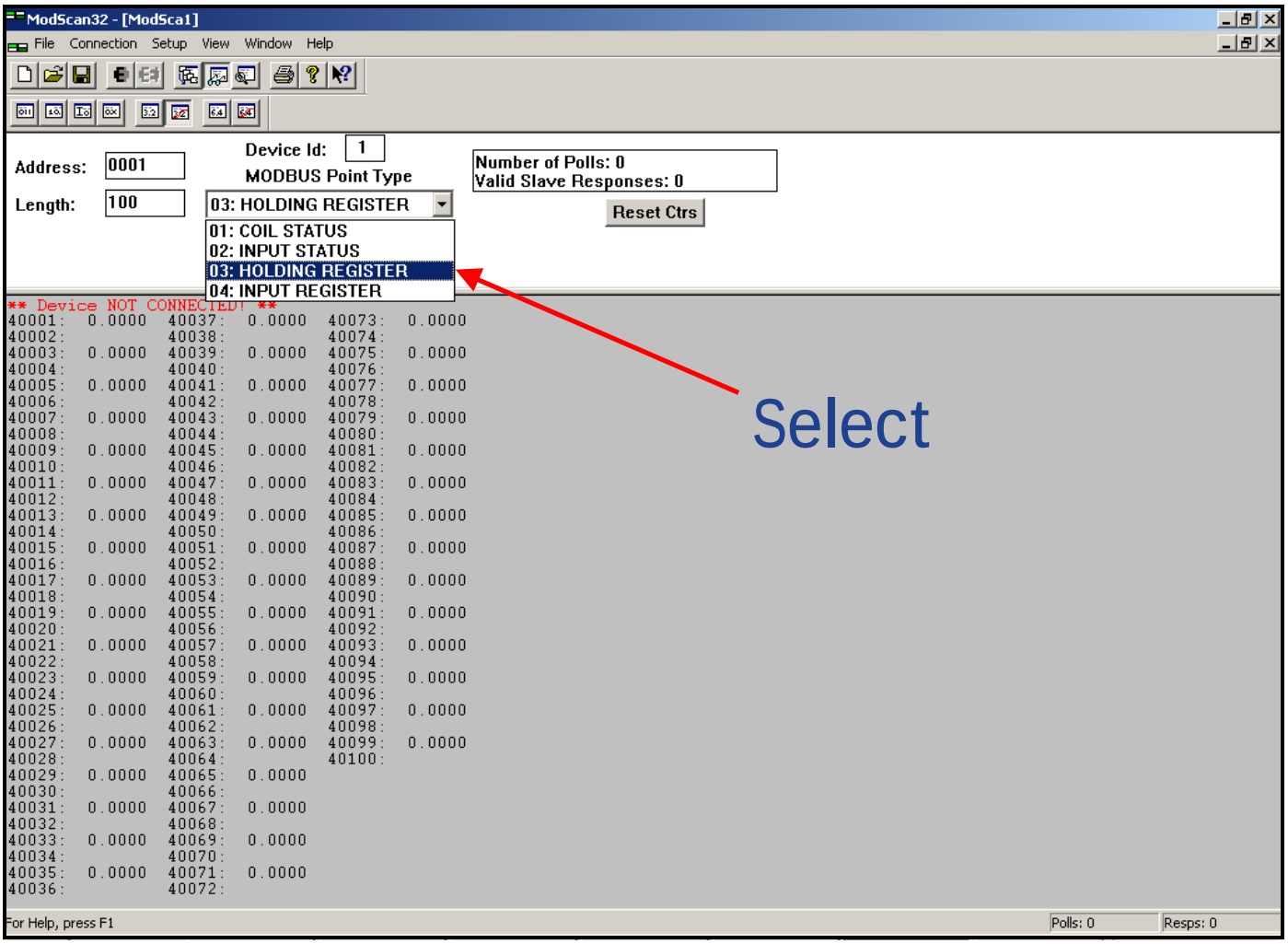


Figure 2: Selecting the Holding Register

1.5 Swapping the Floating Point (cont.)

To see all the register readings in Hexadecimal form, select Menu-Setup-Display Options-Hex (see Figure 3).

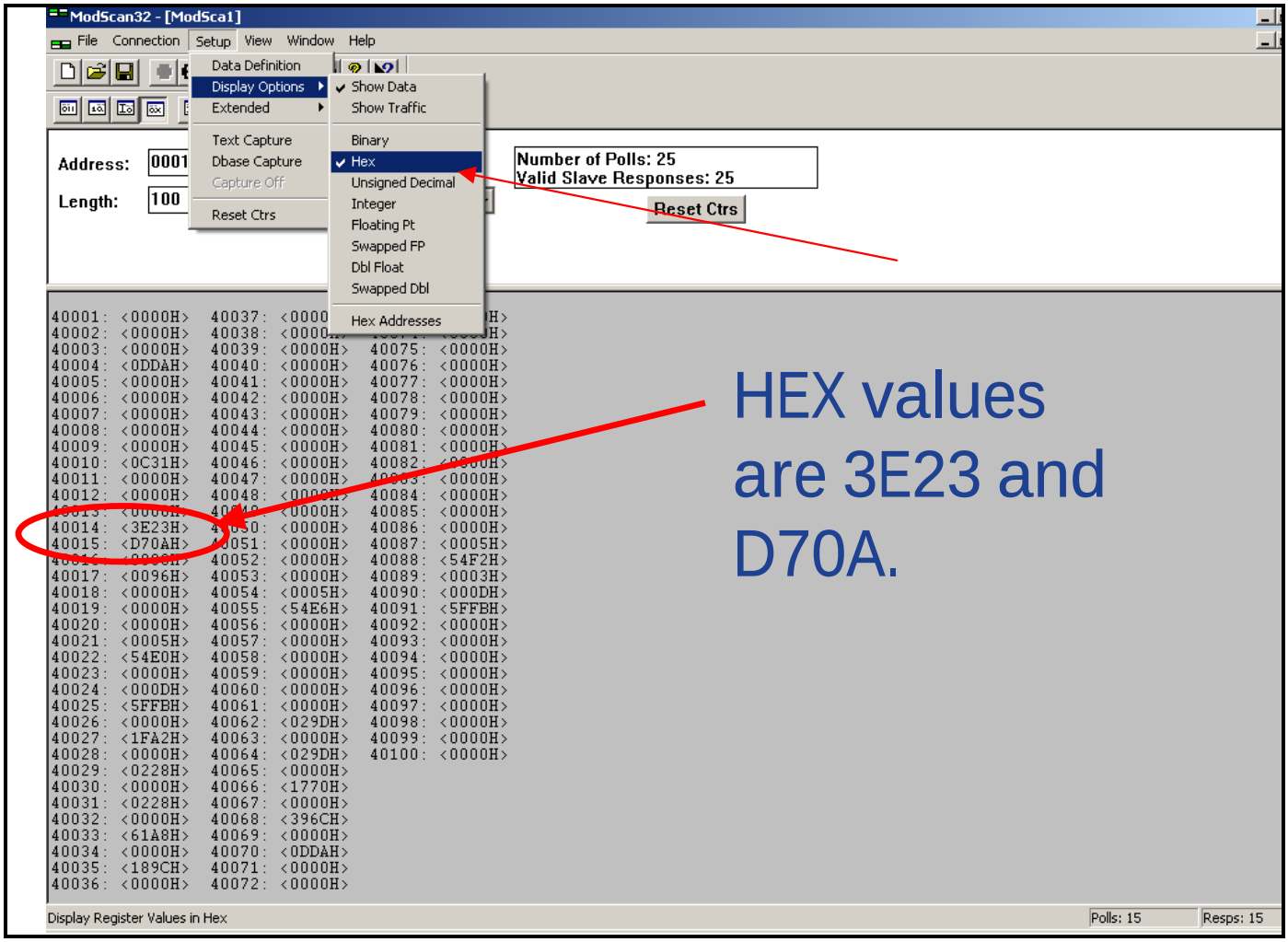


Figure 3: Finding the Hex Values

1.5 Swapping Floating Point (cont.)

To monitor the floating point variable, enter the first register of the variable in the Address (see Figure 6), and set the Length to "2".

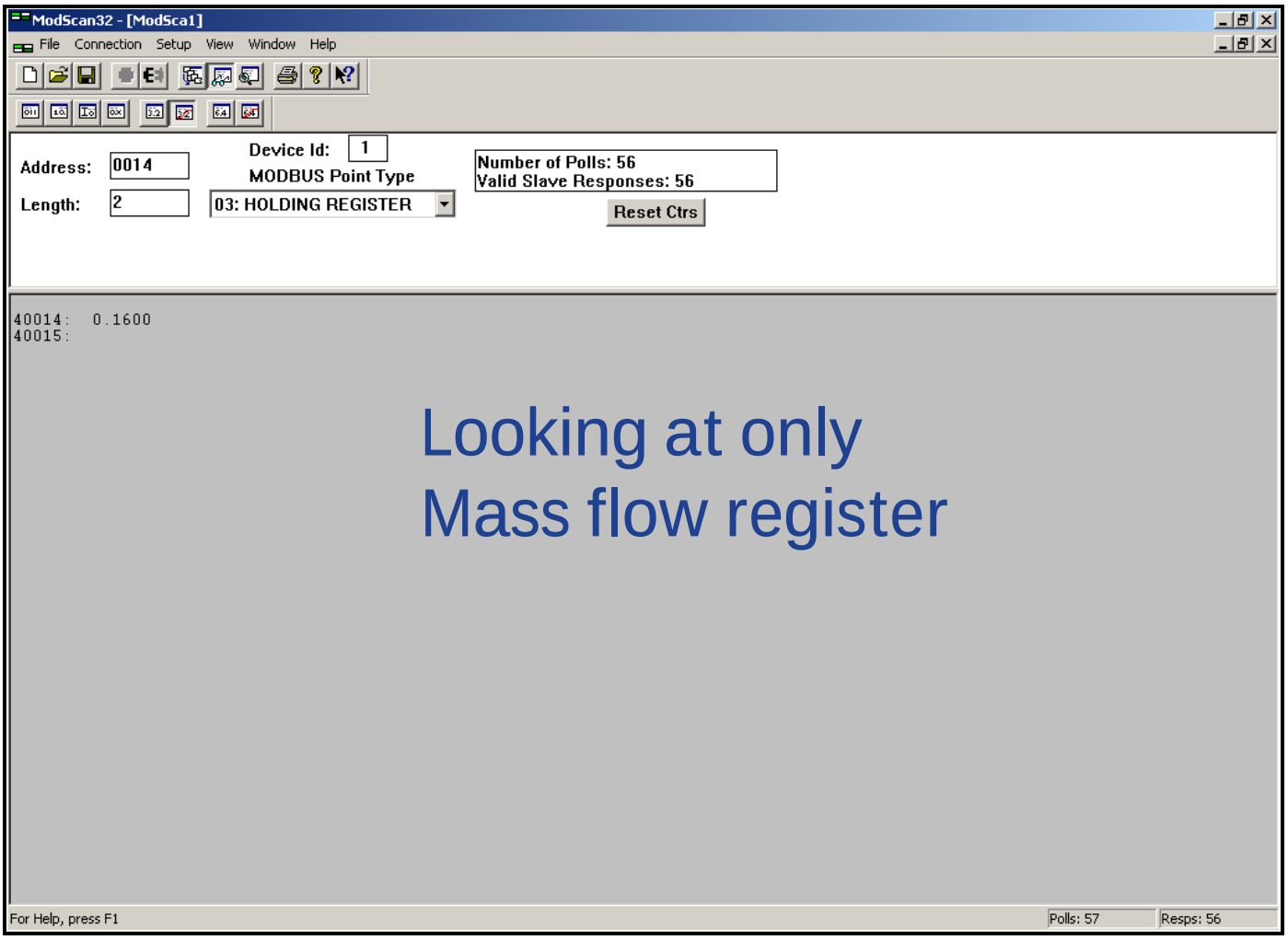


Figure 4: The Mass Flow Register

1.5 Swapping the Floating Point (cont.)

Then select Menu-Setup-Display Options-Swapped FP (see Figure 5). Modscan32 will swap the register and display the floating point variable correctly.

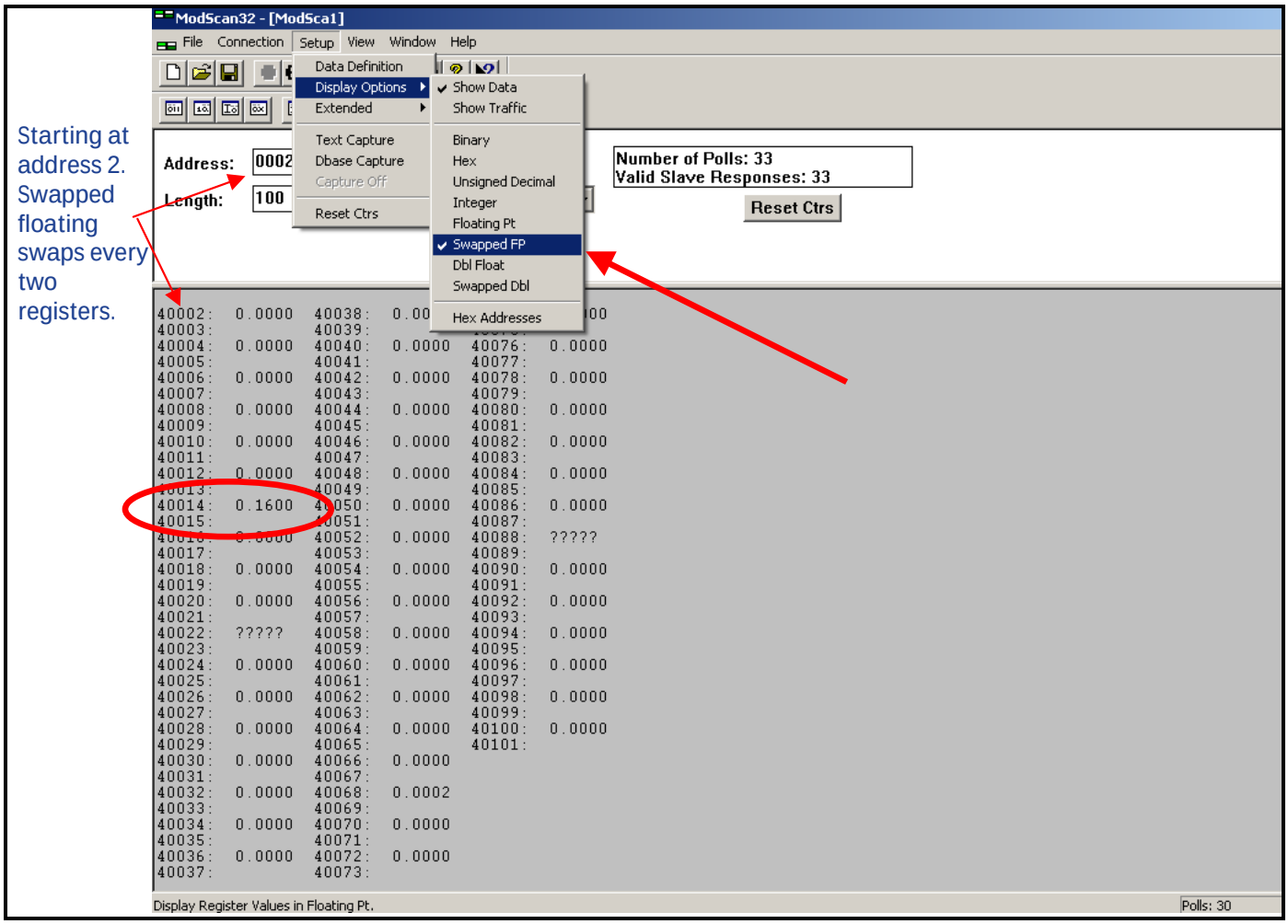


Figure 5: Swapped Floating Point

1.5 Swapping the Floating Point (cont.)

Web utilities can also be used to convert hexadecimal register readings into floating point values (see Figure 6).

Note: How to construct an 8-digit hexadecimal value from two registers is explained at the bottom of the Modbus Register *tables, Table 2 on page 5 for 1-Channel flowmeters and Table 3 on page 6 for 2-Channel flowmeters.*

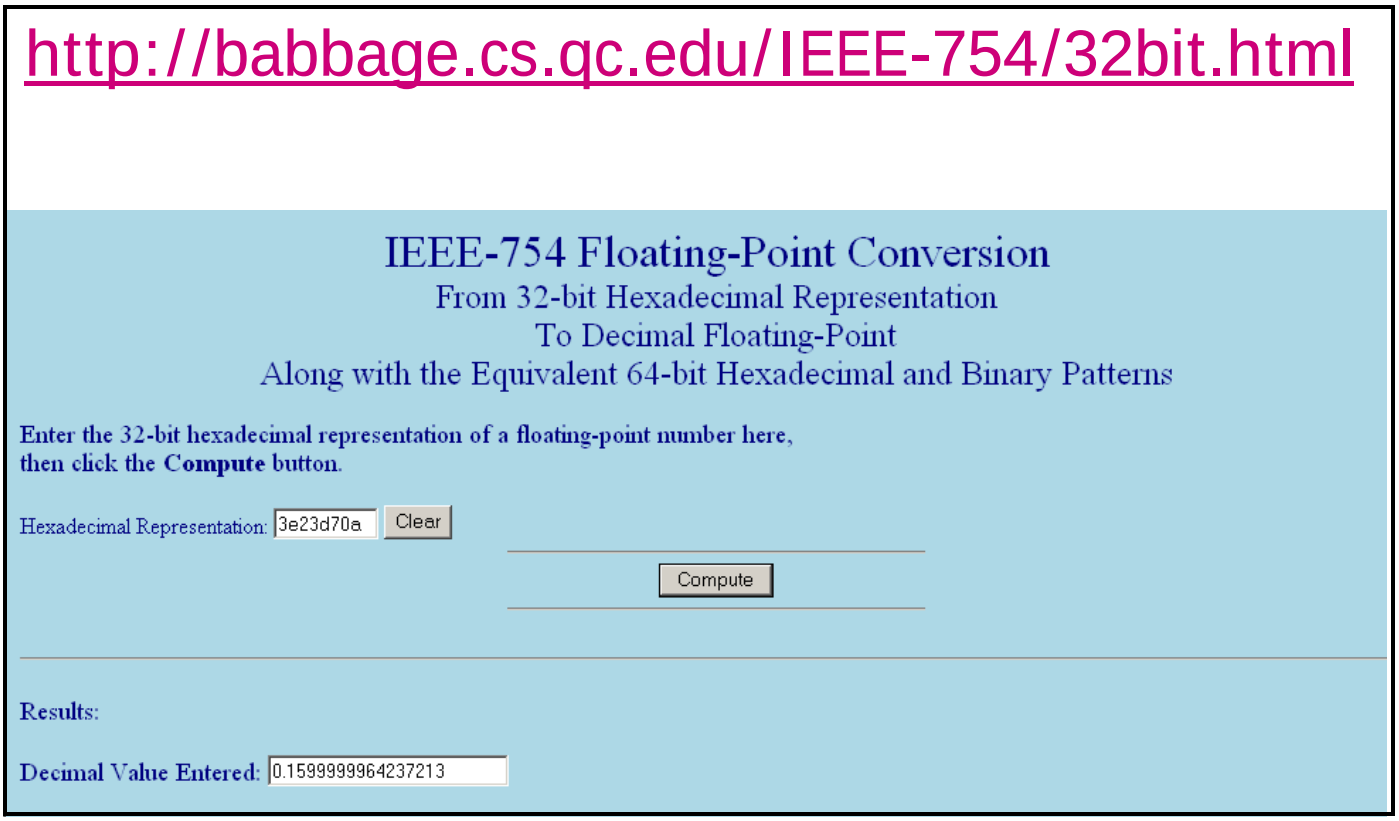


Figure 6: Converting Hexadecimal Register Readings into Floating Point Values

Chapter 2. Modbus Over Ethernet Communications 1

IMPORTANT: These setup instructions apply only when using option card 703-1476-05, rev. A, *or option card* 703-1477-03, rev. C *and* lower.

2.1 Introduction

This document provides instructions for setting up a flowmeter equipped with *Modbus Over Ethernet* (Modbus/TCP) communications. To apply these procedures, the flowmeter must have the option card installed. The option card, based on the features that were ordered, will have many components. (See the examples in Figure 7 and Figure 8).

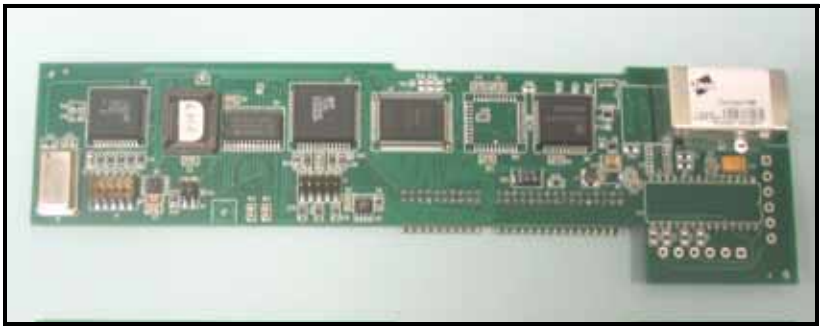


Figure 7: DF/GX Ethernet Option Card

Figure 8: XMT Ethernet Option Card

Note: To install an option card, consult the user's manual(s) which apply to your instrument.

2.2 Setup

The default IP address in setting up the Ethernet option card is Dynamic (DHCP). If it has to be changed to a static IP address, the instrument must first be connected to the DHCP network.

Note: The following are setup procedure examples.

2.2.1 Finding the Assigned IP Address

Example:
Find the IP address of a module with Media Access Control (MAC) address 00409d25da0b.

1. Open a DOS command prompt. Go to the directory containing the executable *ruiping.exe.*
2. Type `ruiping -e` and hit Enter.

Note: Once the module containing the MAC address has been found, it will be displayed along with the assigned IP address (see Figure 9). In this example the assigned address is 3.112.161.79.

3. Stop the process by hitting the Esc key.

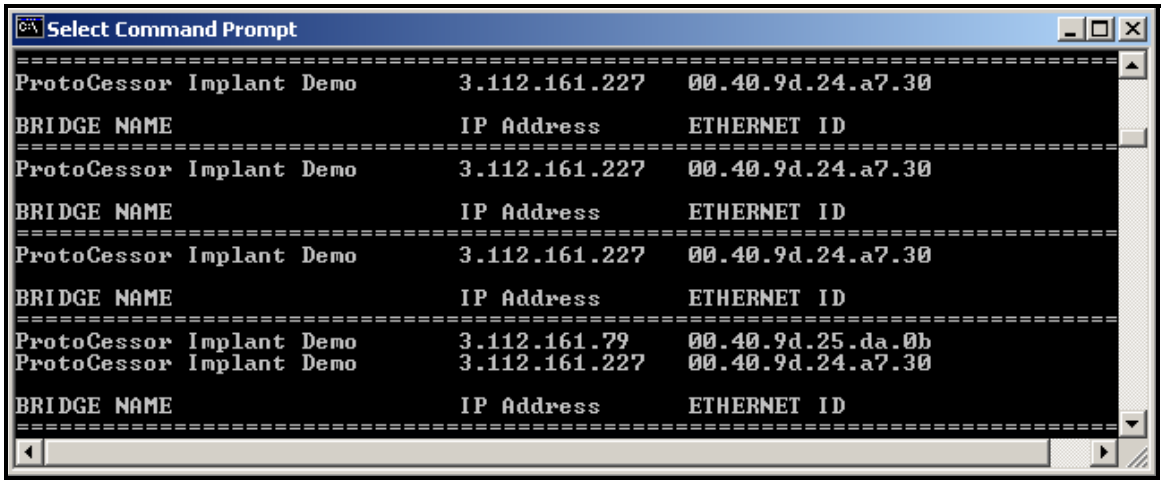


Figure 9: Finding the Assigned IP Address

2.2.2 Changing the Password

Example:
Change the Password for the module with IP address 3.112.161.79 (see Figure 10).

1. Open a DOS command prompt.
2. Type `telnet 3.112.161.79 10000` and hit Enter.
3. Enter the current Login and Password. The factory defaults are *root* and *Netsilicon*.

Note: The Login and Password are case sensitive.

4. Enter Selection number 2.
5. Enter the current Password and the new Password when prompted.

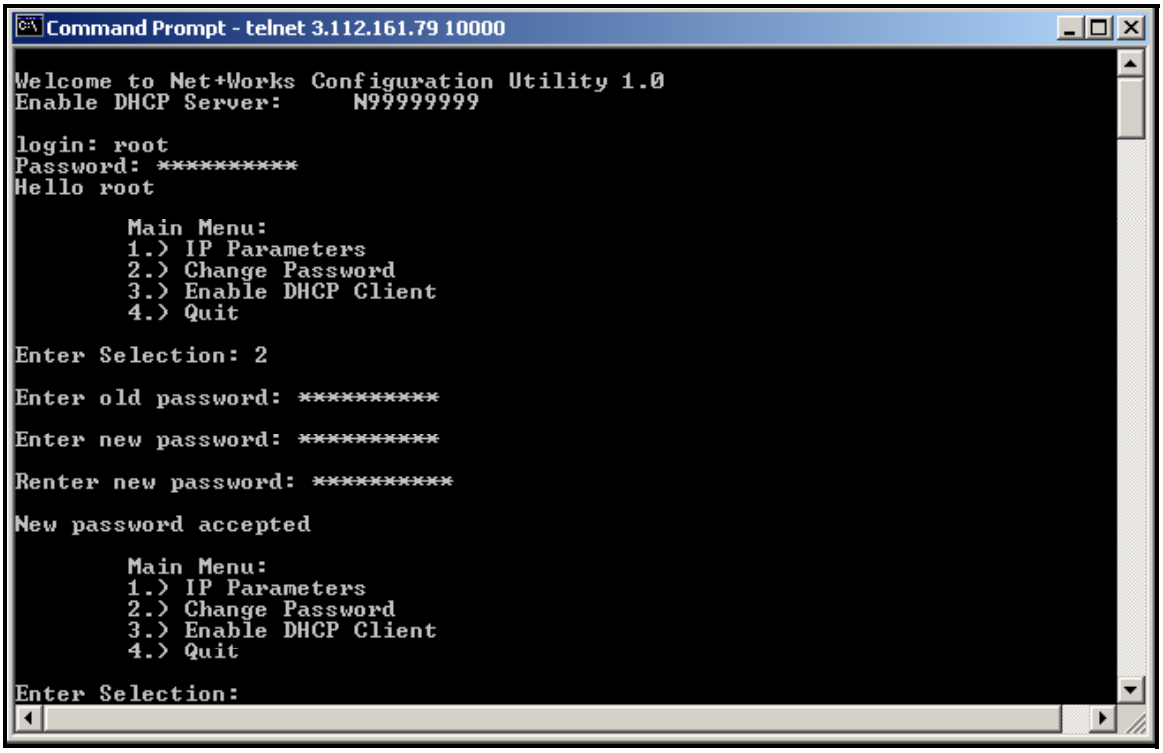


Figure 10: Changing the Password

2.2.3 Changing IP Parameters

Example:
Change the DHCP-assigned IP address to static address 192.168.2.225 and disable DHCP for the module with IP-assigned address 3.112.161.79 (see Figure 11 on page 27 and Figure 12 on page 28).

1. Open a DOS command prompt.

2. Type `telnet 3.112.161.79 10000` and hit Enter.

3. Enter the current Login and Password.

Note: The Login and Password are case sensitive.

4. From the Main Menu select *1. IP Parameters*.

5. From the IP Parameters menu select *1. IP Address*.

6. Enter the new static IP address `192.168.2.225`.

Note: If necessary, change the Subnet Main and a default Gateway by entering 2 and 3 in the IP parameters menu.

7. Select 4 to return to the Main Menu.

8. From the Main Menu select 3. *Enable DHCP Client.*

9. Enter 2 to disable the DHCP. Once the update has taken place, the new IP address will be shown.

10. Select 4. *Main Menu* and Quit.

11. Cycle the power on the unit.

2.2.3 Changing IP Parameters (cont.)

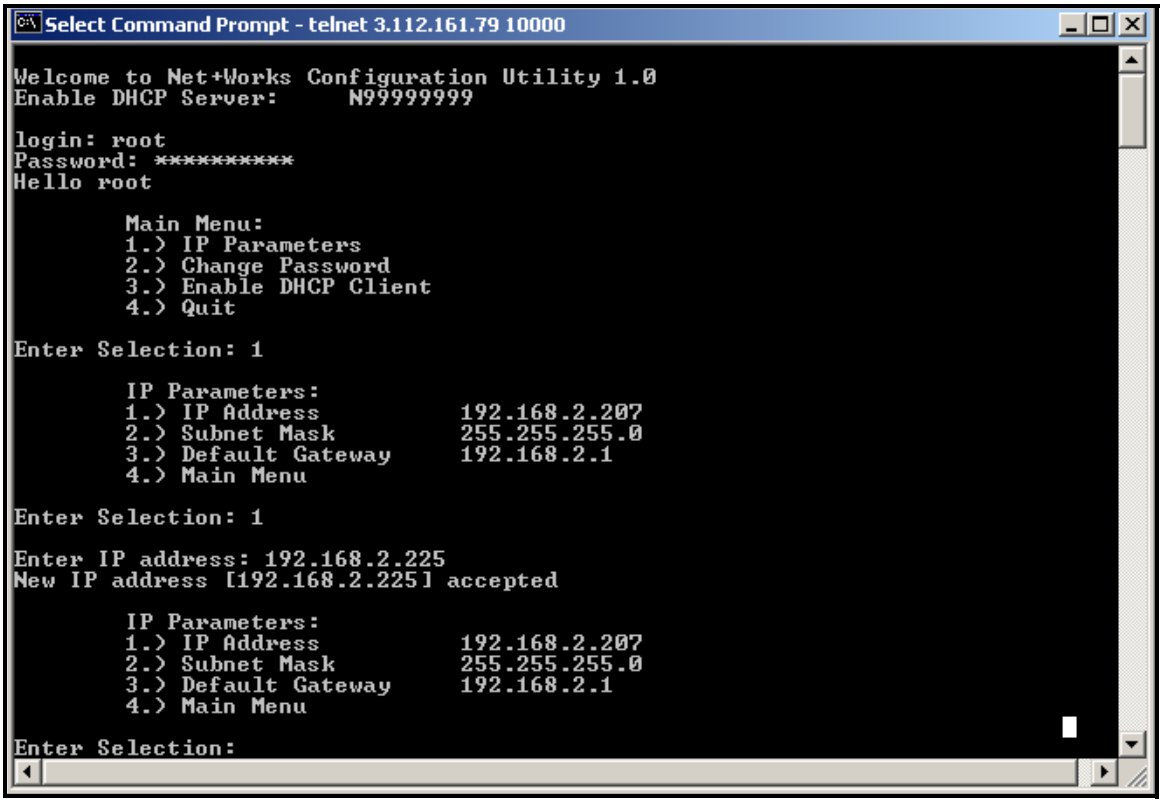


Figure 11: Changing IP Parameters - 1

2.2.3 Changing IP Parameters (cont.)

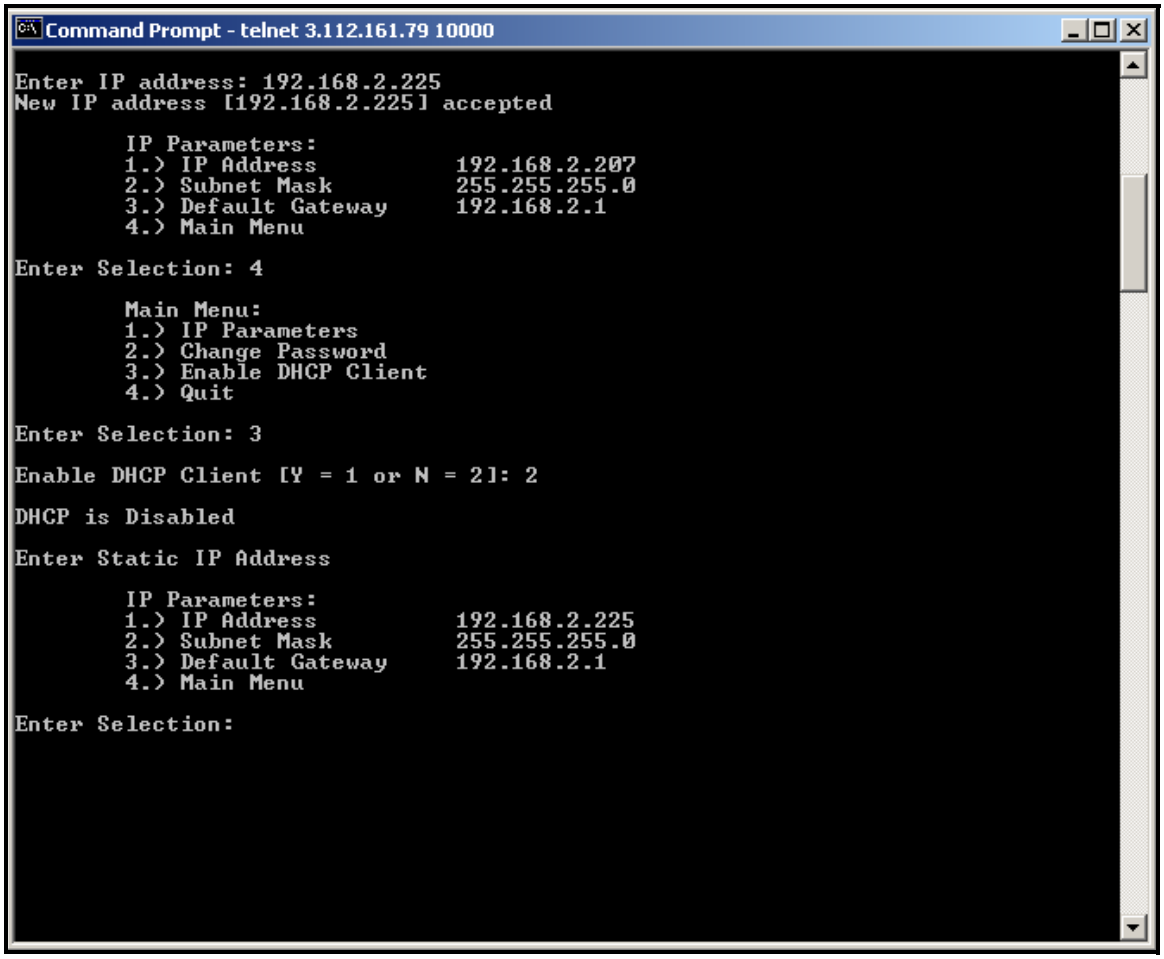


Figure 12: Changing IP Parameters - 2

Chapter 3. Modbus Over Ethernet Communications 2

IMPORTANT: ***These setup instructions apply only when using option card*** 703-1476-05, rev. B ***and*** higher***, or option card*** 703-1477-03, rev. D ***and*** higher**.**

3.1 Introduction

This document provides instructions for setting up a flowmeter equipped with *Modbus Over Ethernet* (Modbus/TCP) communications. To apply these procedures, the flowmeter must have the option card installed. See the option card examples in Figure 13 and Figure 14.

Note: *To install an option card, consult the user's manual(s) which apply to your instrument.*

Figure 13: DF Modbus Over Ethernet Option Card

Figure 14: XMT Modbus Over Ethernet Option Card

3.2 Setup

The *Digi Device Discovery Program* is required to set up Ethernet parameters. To download the program, proceed with the following steps:

3.2.1 Downloading the Digi Device Discovery Program

1. Go to www.digi.com on the internet.

2. Move the cursor to the SUPPORT button and select *Diagnostics, Utilities and MIBs* from the menu.

3. Open the Select Your Product for Support menu and select *Digi Connect ME*. Then click on Submit.

4. From the OS Specific Diagnostics, Utilities and MIBs menu select *Microsoft Windows NT 4.0, 2000* or *XP*. Then, under the window, select *Device Discovery Utility for Windows*, and the File Download window appears.

5. Select Save this file to a disk, click on OK, and save the file to your computer.

6. Install the program from the downloaded file.

3.2.2 Module LED Behaviors

- Yellow ON: a link has been detected
- Yellow OFF: no link has been detected

3.2.3 Default Parameters

- Baud Rate: 9600 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None
- TCP/UDP Port: 502

IMPORTANT: The option card is shipped with DHCP (not static) IP addressing which may not work in your LAN network. If your network requires static IP, you must follow the procedure on page 4. Otherwise, this card will not be operational.

3.2.4 Finding the Assigned IP Address

Note: The following are setup procedure examples.

Example:
Find the IP address of the module with Media Access Control (MAC) address 00409d24ded5.

1. Run the *Digi Device Discovery Program* (see Figure 15).

Note: To access the Digi Device Discovery Program, *see page 30.*

Note: The MAC address of all found units and the assigned IP address will be displayed. In this example the assigned address is 3.112.162.129.

Note: Refresh the display to find the MAC address of all units.

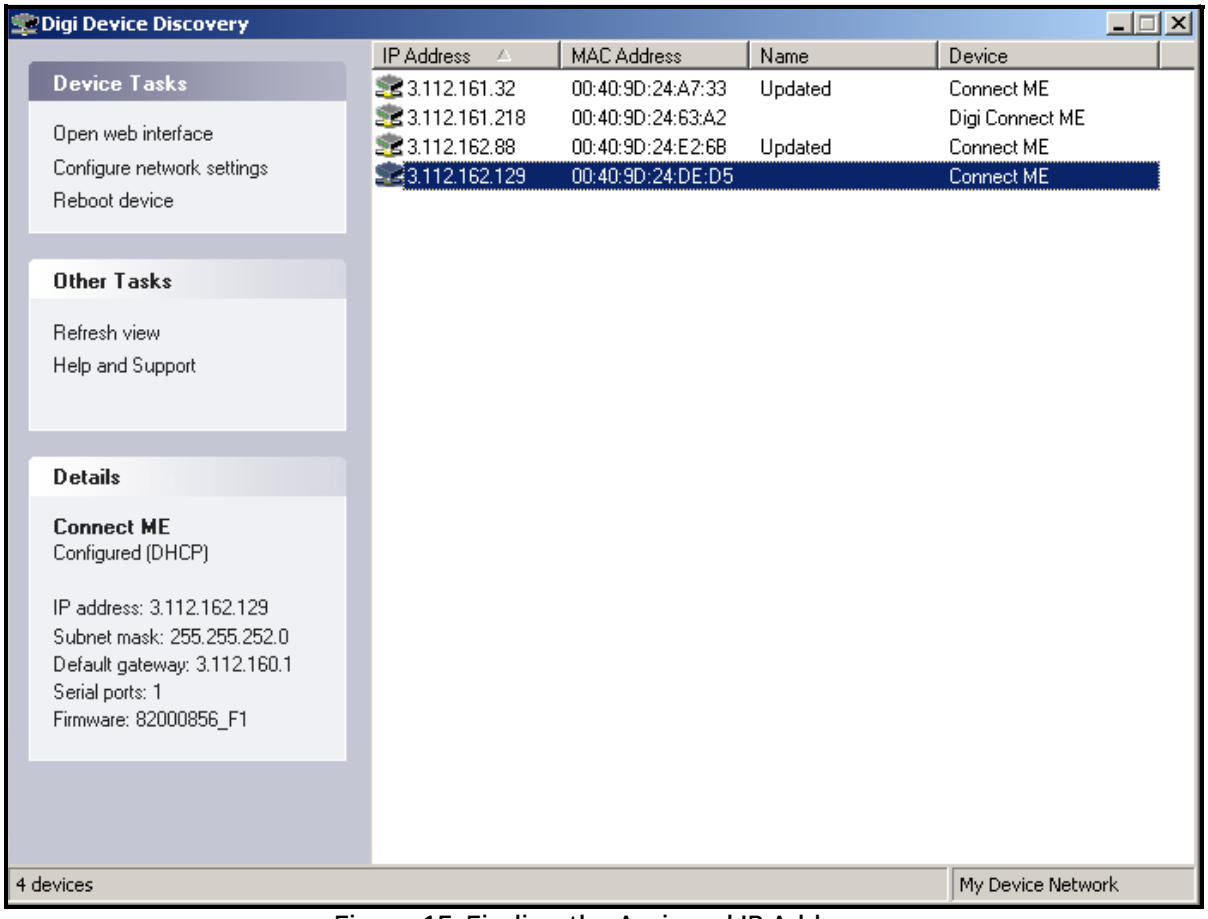


Figure 15: Finding the Assigned IP Address

3.2.5 Changing IP Parameters

Example: (to change the dynamic DHCP IP address to static).
Change the DHCP-assigned IP address to static address 192.168.2.207 and disable DHCP for the unit with IP assigned

address 3.112.162.129 (see Figure 16).

1. Plug the option card into the DHCP network. The DHCP network server has to assign an IP address to this card.
2. Under Device Task at Digi Device Discovery Program (page 31), highlight the corresponding device and select *Open web interface*.
3. Enter Username and Password. Factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

4. Click on Login.
5. Select *Configuration* / *Network*.
6. Select *Use the following IP address:* and enter IP address `192.168.2.207`.
7. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to complete.

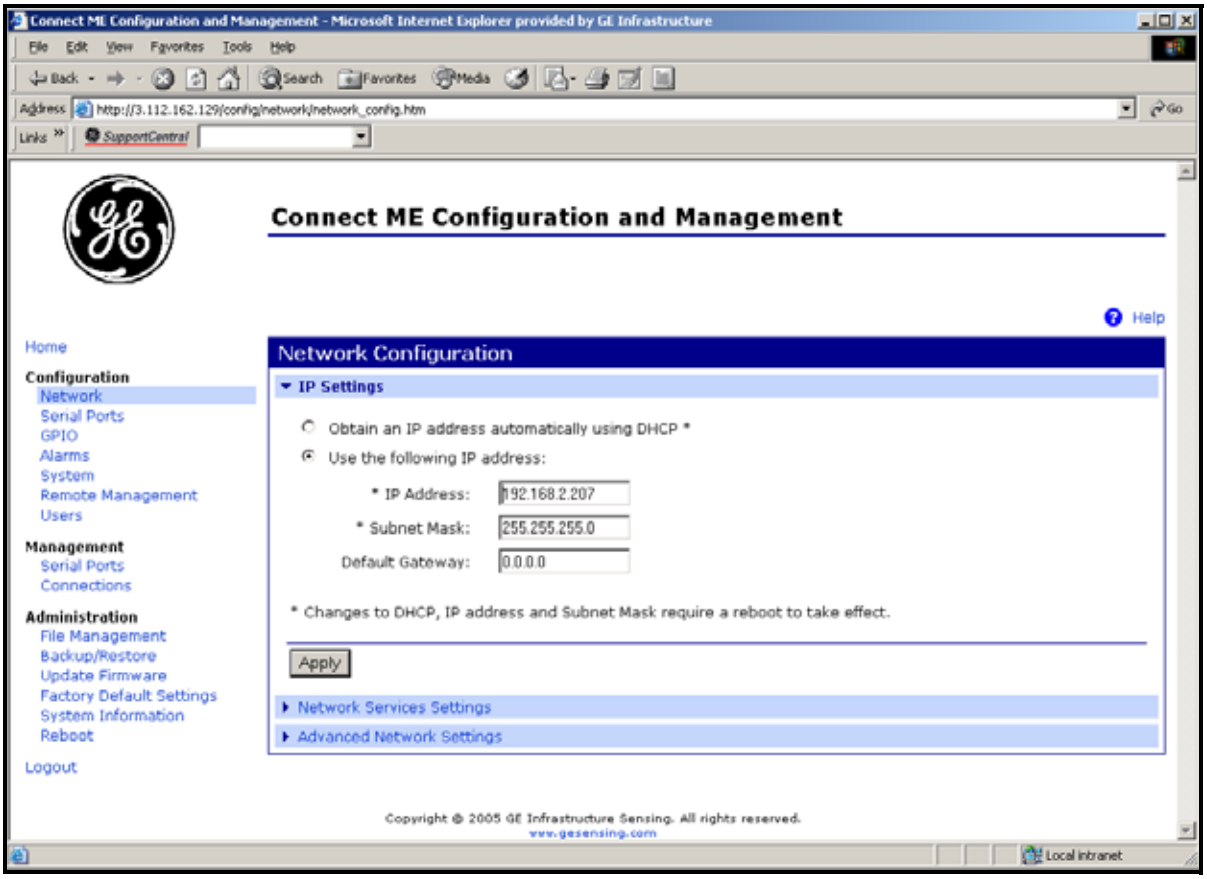


Figure 16: Changing IP Parameters

3.2.6 Changing Modbus/TCP Network Parameters

1. Select Configuration → Serial Ports → Port 1 → Modbus/TCP Network Setting

2. Accept incoming Modbus/TCP connection: TCP Port: XXX
3. Accept incoming Modbus/TCP in UDP/IP: UDP Port: XXX
4. → Apply

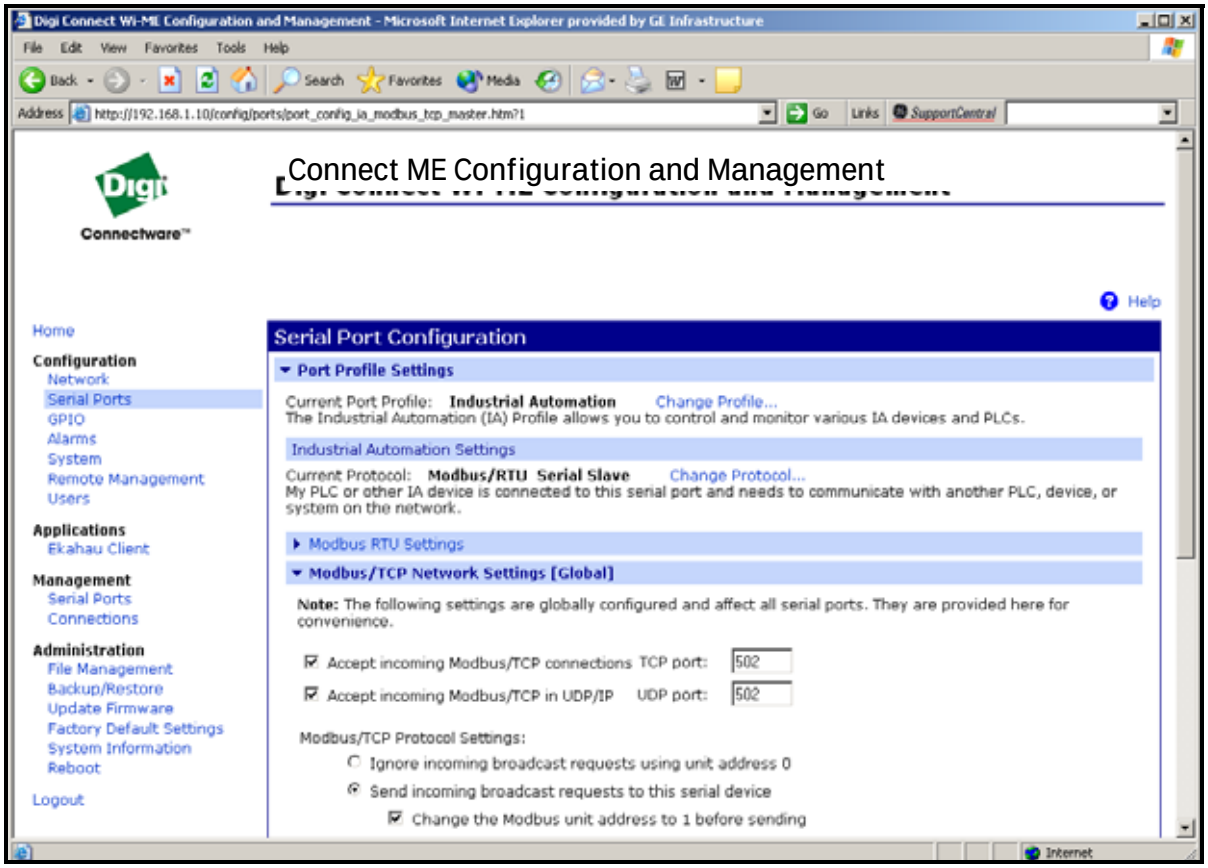


Figure 17: Changing Modbus/TCP Port

3.2.7 Changing User's Information

To change the user name and/or password:

1. Under Device Task select *Open web interface*.
2. Enter the Username and Password. The factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

3. Click on Login. Figure 18 appears.
4. Select *Configuration* / *Users*.
5. Click on New.... Figure 19 on page 35 appears.

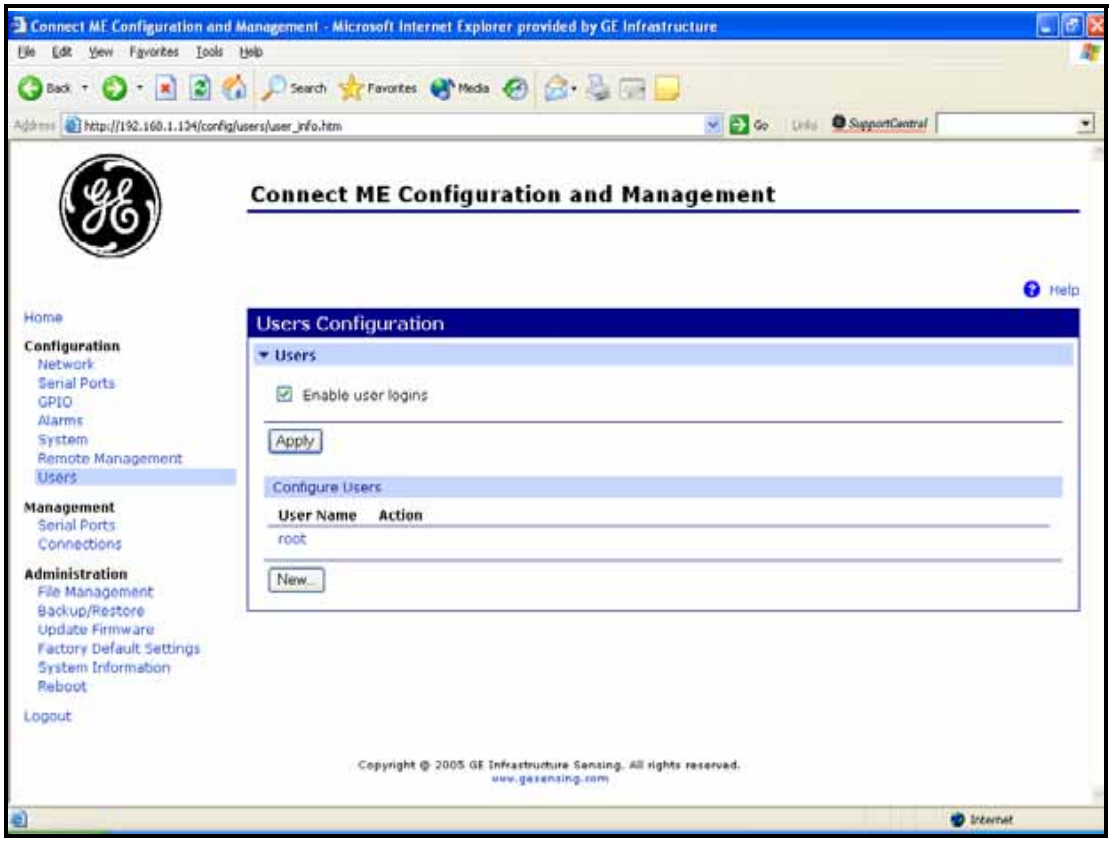


Figure 18: User's Configuration Menu

3.2.7 Changing User's Information (cont.)

6. To change the User Name, click in the box, delete the current name, and type in the new name.

7. To create a New Password, click in the box, delete the current password, and type in the new password.

8. To Confirm the new Password, click in the box, delete the current password and type in the new password.

Note: For the password to be changed, the New Password and Confirm Password must be identical.

9. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to be completed.

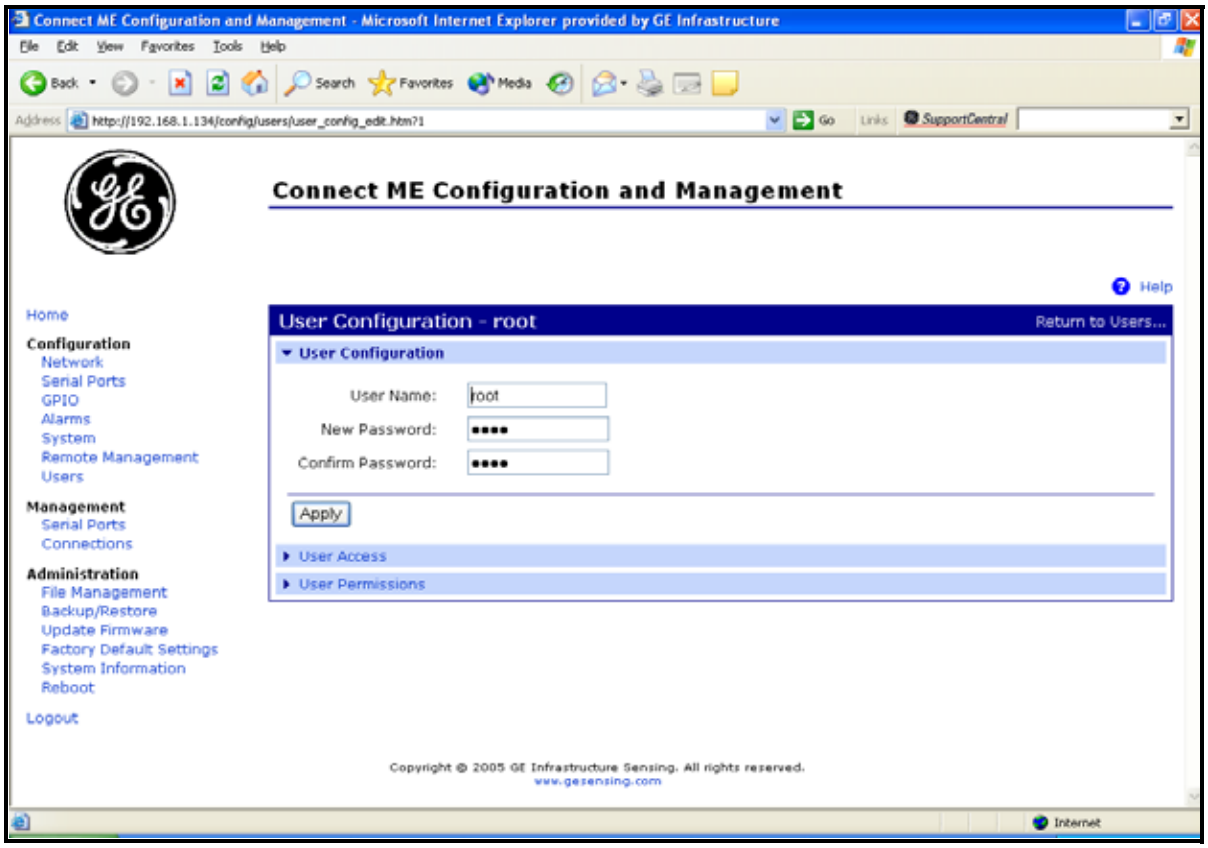


Figure 19: Changing the User Name and/or Password

[no content intended for this page]

Chapter 4. Ethernet Only Communications

4.1 Introduction

This document provides instructions for setting up a flowmeter equipped with *Ethernet Only* communications. To apply these procedures, the flowmeter must have the option card installed. See the option card examples in Figure 20 and Figure 21.

Note: *To install an option card, consult the user's manual(s) which apply to your instrument.*

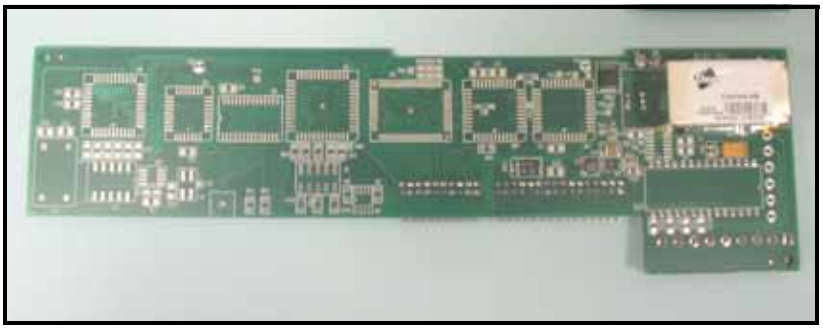


Figure 20: DF/GX Ethernet Only Option Card

Figure 21: XMT Ethernet Only Option Card

4.2 Setup

The *Digi Device Discovery Program* is required to set up Ethernet parameters for the *Ethernet Only* board. To download the program, proceed with the following steps:

4.2.1 Downloading the Digi Device Discovery Program

1. Go to www.digi.com on the internet.

2. Move the cursor to the SUPPORT button and select *Diagnostics, Utilities and MIBs* from the menu.

3. Open the Select Your Product for Support menu and select *Digi Connect ME*. Then click on Submit.

4. From the OS Specific Diagnostics, Utilities and MIBs menu select *Microsoft Windows NT 4.0, 2000* or *XP*. Then, under the window, select *Device Discovery Utility for Windows*, and the File Download window appears.

5. Select Save this file to a disk, click on OK, and save the file to your computer.

6. Install the program from the downloaded file.

4.2.2 Module LED Behaviors

- Yellow ON: a link has been detected
- Yellow OFF: no link has been detected

4.2.3 Default Parameters

- Baud Rate: 9600 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

4.2.4 Finding the Assigned IP Address

Note: The following are setup procedure examples.

Example:
Find the IP address of the module with Media Access Control (MAC) address 00409d24ded5.

1. Run the *Digi Device Discovery Program* (see Figure 22).

Note: To access the Digi Device Discovery Program, *refer to page 38.*

Note: The MAC address of all found units and the assigned IP address will be displayed. In this example the assigned address is 3.112.162.129.

Note: Refresh the display to find the MAC address of all units.

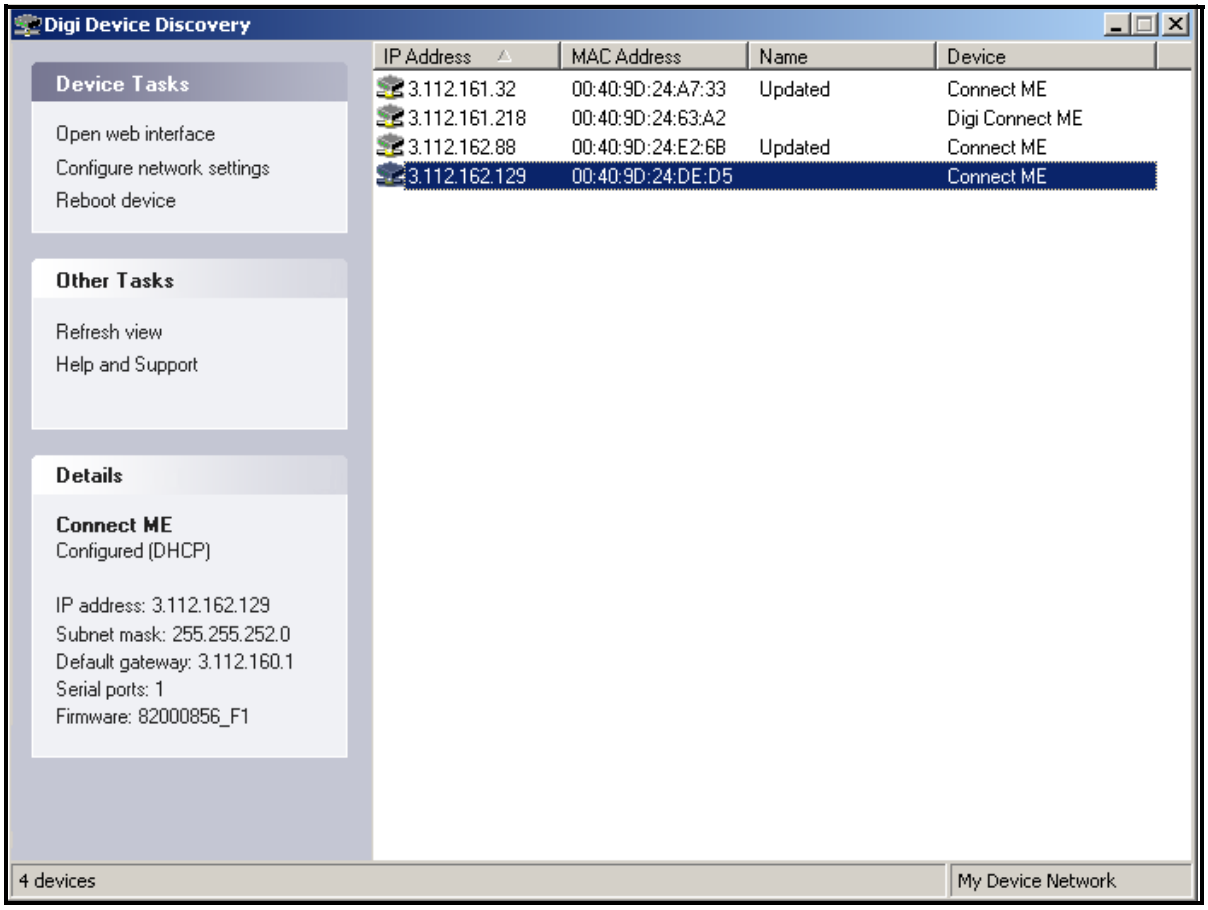


Figure 22: Finding the Assigned IP Address

4.2.5 Changing IP Parameters

Example:
Change the DHCP-assigned IP address to static address 192.168.2.207 and disable DHCP for the unit with IP assigned address 3.112.162.129 (see Figure 23).

1. Under Device Task select *Open web interface*.
2. Enter the Username and Password. The factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

3. Click on Login.
4. Select *Configuration* / *Network*.
5. Select *Use the following IP address:* and enter IP address `192.168.2.207`.
6. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to complete.

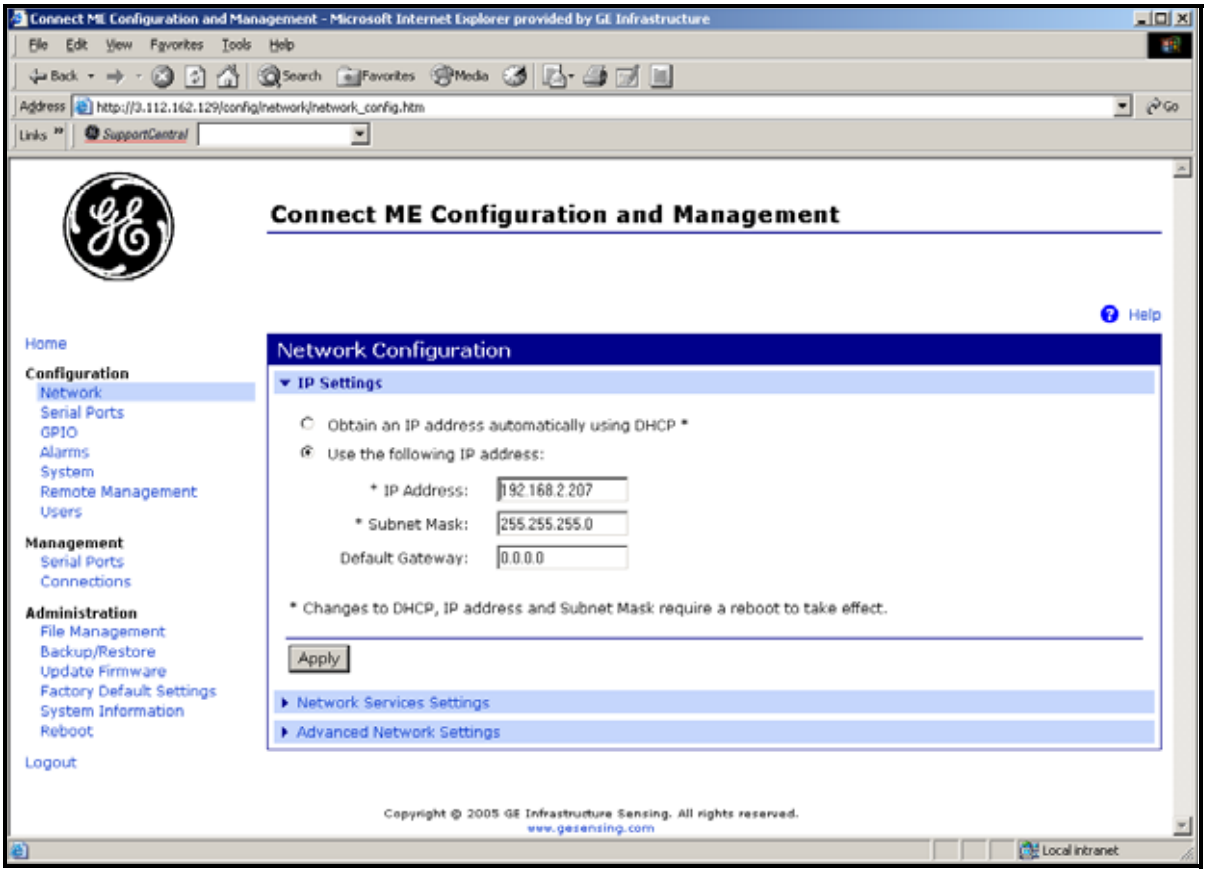


Figure 23: Changing IP Parameters

4.2.6 Changing User's Information

To change the user name and/or password:

1. Under Device Task select *Open web interface*.
2. Enter the Username and Password. The factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

3. Click on Login. Figure 24 appears.
4. Select *Configuration* / *Users*.
5. Click on New.... Figure 25 on page 42 appears.

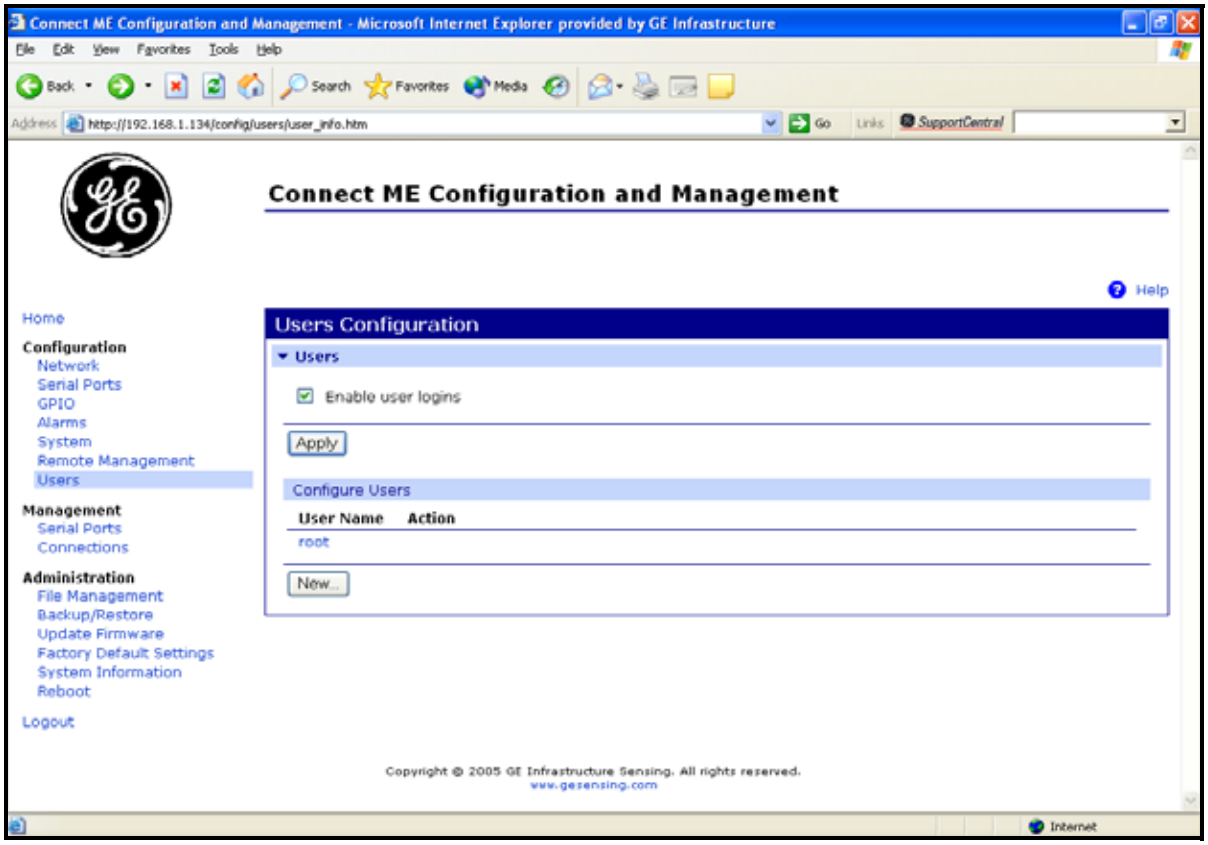


Figure 24: User's Configuration Menu

4.2.6 Changing User's Information (cont.)

6. To change the User Name, click in the box, delete the current name, and type in the new name.

7. To create a New Password, click in the box, delete the current password, and type in the new password.

8. To Confirm the new Password, click in the box, delete the current password and type in the new password.

Note: For the password to be changed, the New Password and Confirm Password must be identical.

9. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to be completed.

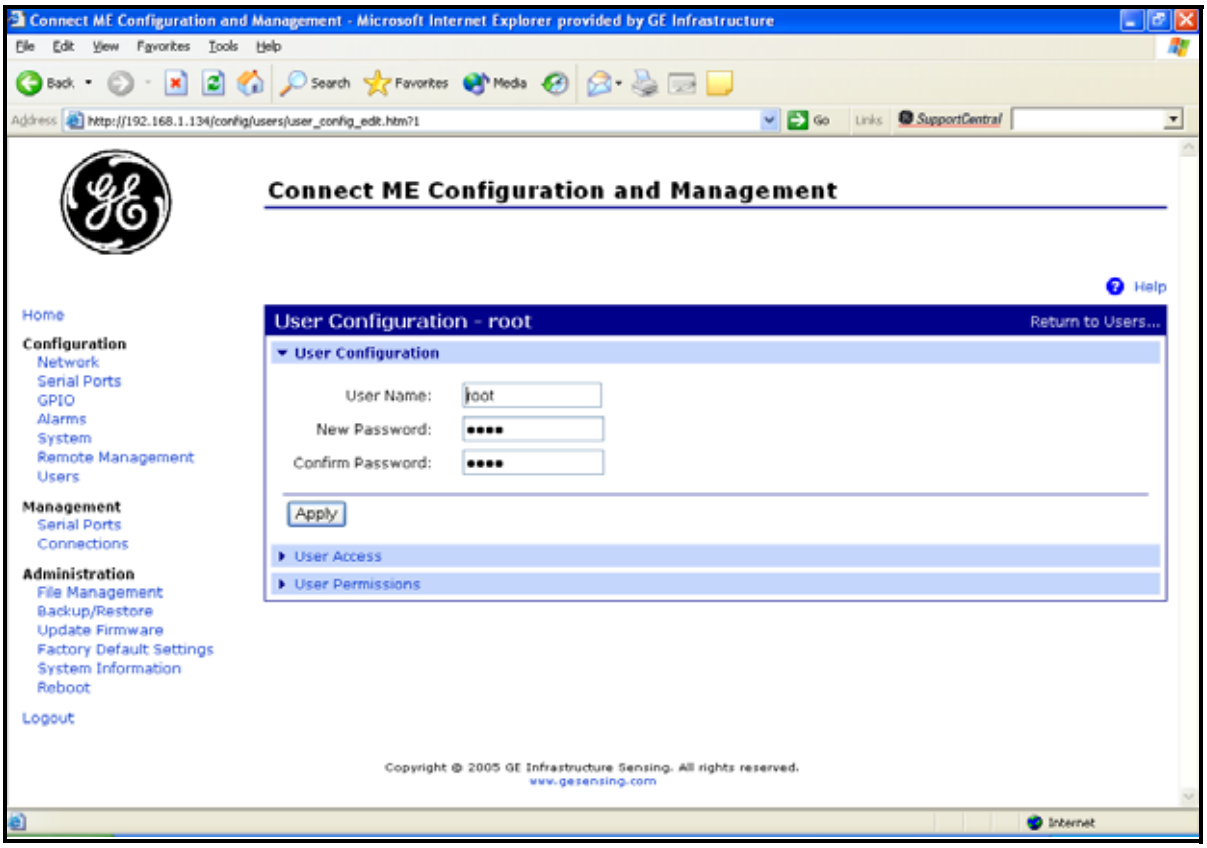


Figure 25: Changing the User Name and/or Password

Chapter 5. Modbus Over WI-FI Communications

5.1 Introduction

This document provides instructions for setting up a flowmeter equipped with *Modbus Over WI-FI* communications. To apply these procedures, the flowmeter must have the option card installed (see the example in Figure 26) and connected to a WI-FI antenna.

Note: *To install an option card, consult the user's manual(s) which apply to your instrument.*

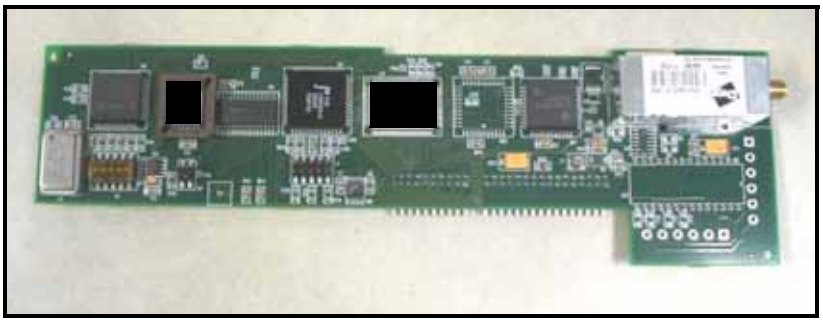


Figure 26: Modbus Over WI-FI Option Card

5.2 WI-FI Components

The WI-FI antenna should be mounted on top of the flowmeter enclosure (see Figure 27) and connected to the *Modbus Over WI-FI* option card as shown in Figure 28 and Figure 29 on page 44.

Figure 27: WI-FI Antenna

5.2 WI-FI Components (cont.)

Figure 28: WI-FI Cable Antenna Connection

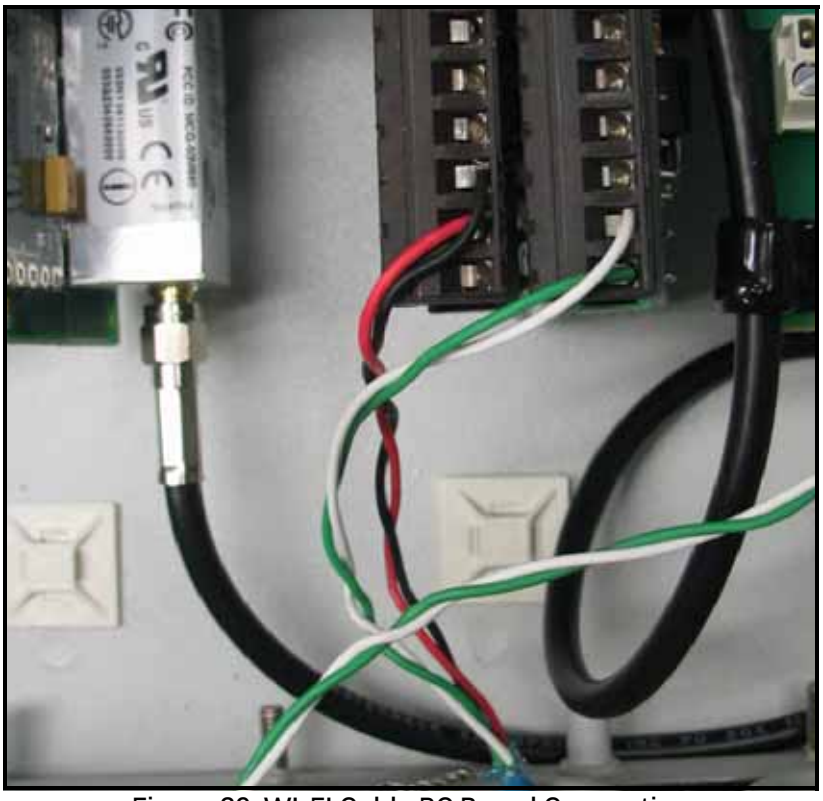


Figure 29: WI-FI Cable PC Board Connection

5.3 Setup

The default IP address in setting up the Modbus Over WI-FI option card is Dynamic (DHCP). If it has to be changed to a static IP address, the instrument must first be linked to the DHCP network.

Note: The following are setup procedure examples.

The *Digi Device Discovery Program* is required to set up WI-FI parameters. To download the program, proceed with the following steps:

5.3.1 Downloading the Digi Device Discovery Program

1. Go to www.digi.com on the internet.
2. Move the cursor to the SUPPORT button and select *Diagnostics, Utilities and MIBs* from the menu.
3. Open the Select Your Product for Support menu and select *Digi Connect ME*. Then click on Submit.
4. From the OS Specific Diagnostics, Utilities and MIBs menu select *Microsoft Windows NT 4.0, 2000* or *XP*. Then, under the window, select *Device Discovery Utility for Windows*, and the File Download window appears.
5. Select Save this file to a disk, click on OK, and save the file to your computer.
6. Install the program from the downloaded file.

5.3.2 Module LED Behaviors

- Yellow ON**:** Associated with Access Point
- Yellow Blinking Slowly: Ad hoc mode
- Yellow Blinking Quickly: Scanning for a network

5.3.3 Default Parameters

- Baud Rate: 9600 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None
- TCP/UDP Port: 502

IMPORTANT: This Modbus over WI-FI option card is shipped with DHCP IP addressing, and all the security options disabled. If your wireless LAN has any security set, it should be disabled to have this card join your wireless network. A solid yellow LED on the card indicates the card is joined to the wireless network.

5.3.4 Finding the Assigned IP Address

Note: The following are setup procedure examples.

Example:
Find the IP address of the module with Media Access Control (MAC) address 00409d24ded5.

1. Run the *Digi Device Discovery Program* (see Figure 30).

Note: To access the Digi Device Discovery Program, *see page 45.*

Note: The MAC address of all found units and the assigned IP address will be displayed. In this example the assigned address is 3.112.162.129.

Note: Refresh the display to find the MAC address of all units.

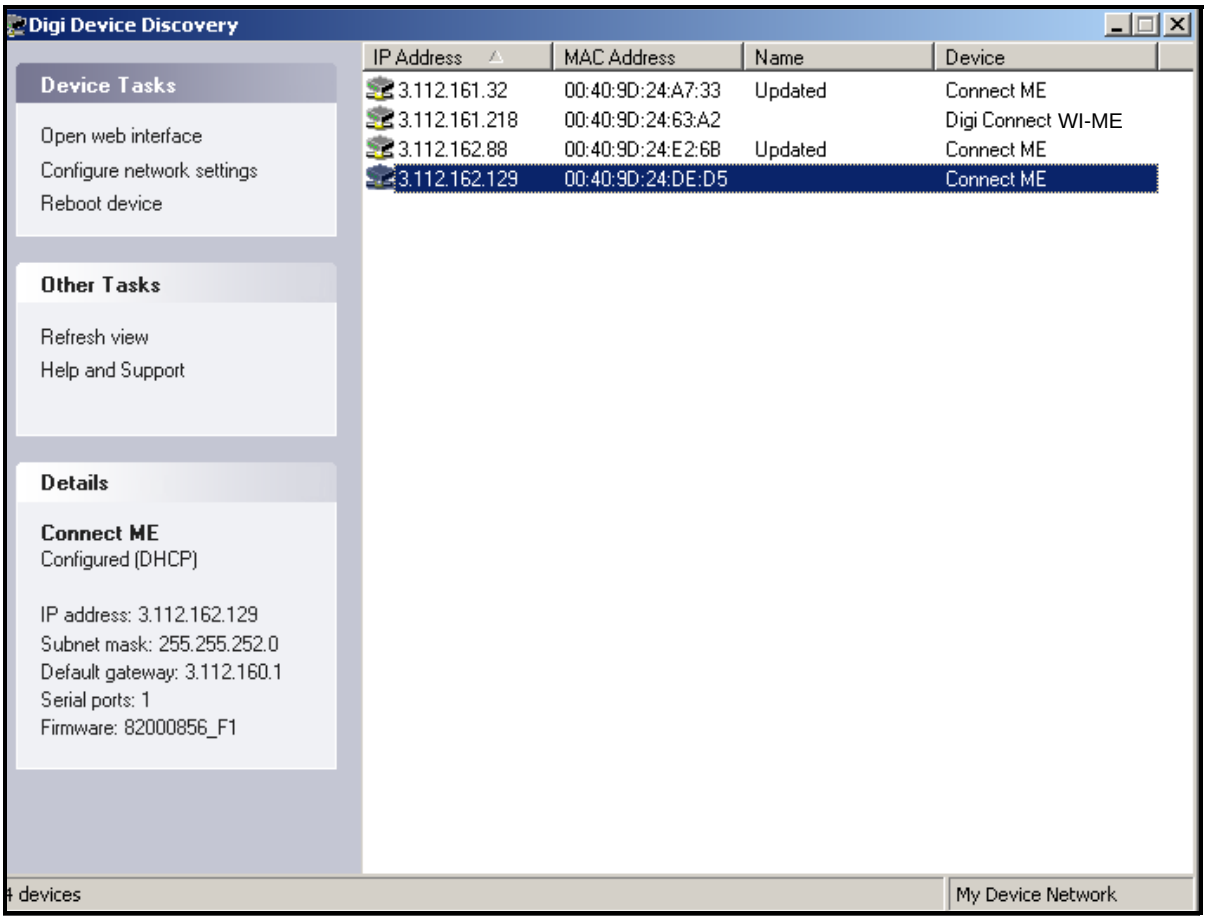


Figure 30: Finding the Assigned IP Address

5.3.5 Changing IP Parameters

Example:
Change the DHCP-assigned IP address to static address 192.168.2.207 and disable DHCP for the unit with IP assigned address 3.112.162.129 (see Figure 31).

1. Have your option card joined to the wireless network.
2. Under Device Task select *Open web interface*.
3. Enter Username and Password. Factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

4. Click on Login.
5. Select *Configuration* / *Network*.
6. Select *Use the following IP address:* and enter IP address `192.168.2.207`.
7. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to be completed.

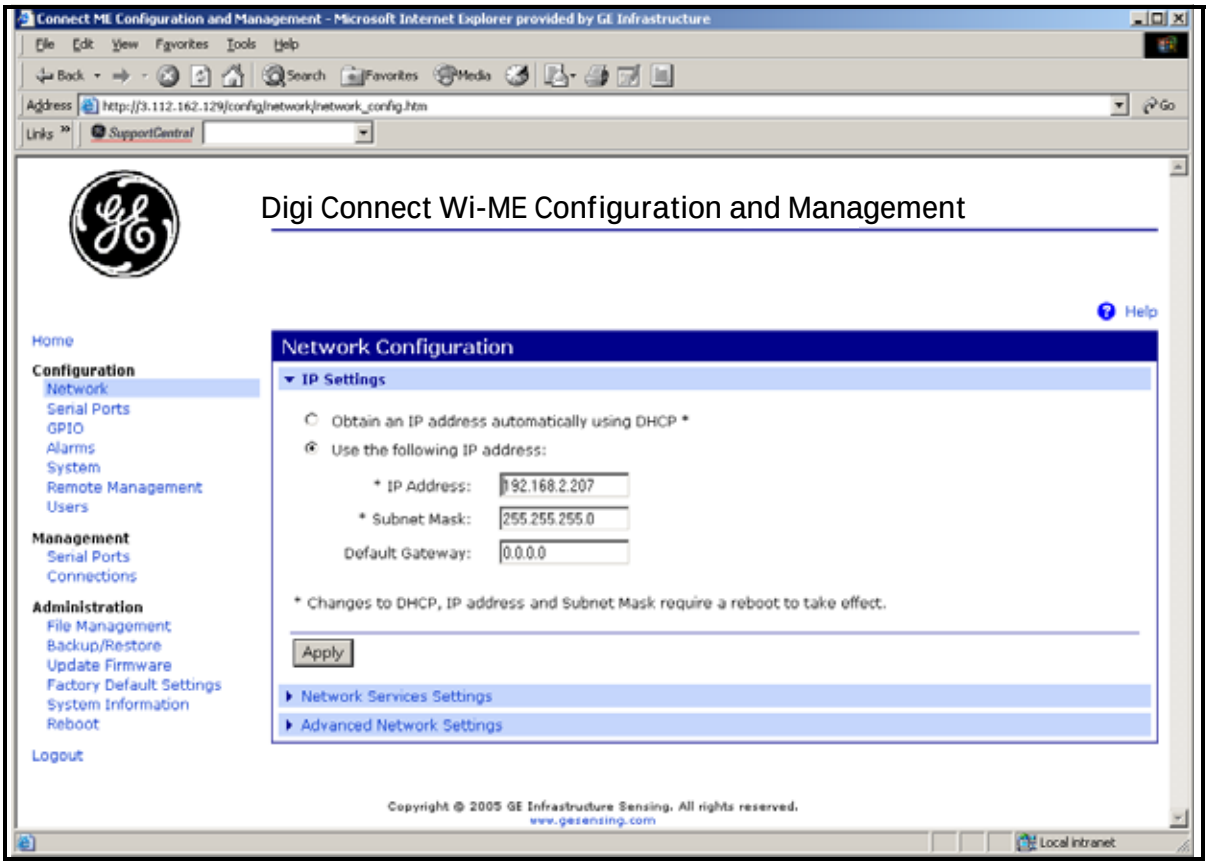


Figure 31: Changing IP Parameters

5.3.6 Changing Modbus/TCP Network Parameters

1. Select Configuration → Serial Ports → Port 1 → Modbus/TCP Network Setting
2. Accept incoming Modbus/TCP connection: TCP Port: XXX
3. Accept incoming Modbus/TCP in UDP/IP: UDP Port: XXX
4. → Apply

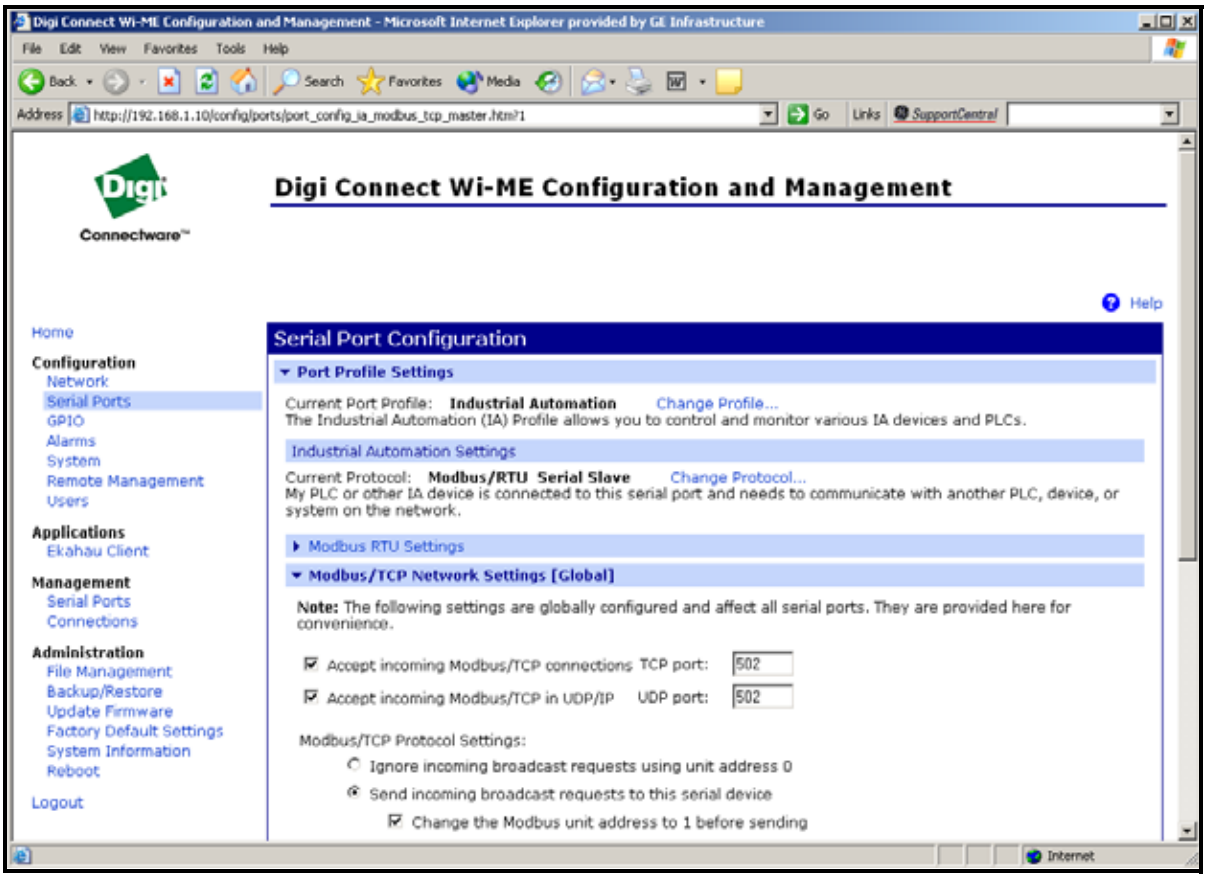


Figure 32: Changing Modbus/TCP Port

5.3.7 Changing User's Information

To change the user name and/or password:

1. Under Device Task select *Open web interface*.
2. Enter the Username and Password. The factory defaults are *root* and *dbps*.

Note: The username and password are case sensitive.

3. Click on Login. Figure 33 appears.
4. Select *Configuration* / *Users*.
5. Click on New.... Figure 34 on page 50 appears.

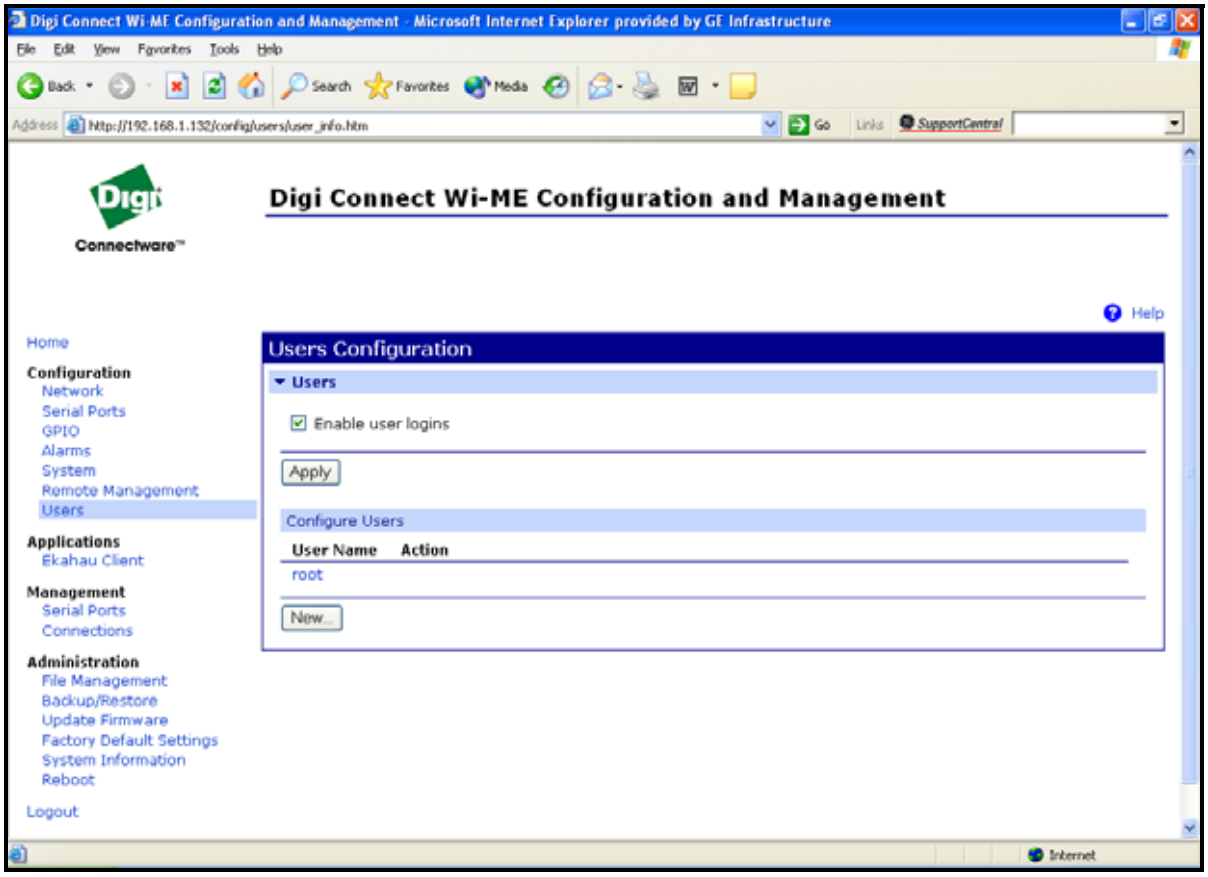


Figure 33: User's Configuration Menu

5.3.7 Changing User's Information (cont.)

6. To change the User Name, click in the box, delete the current name, and type in the new name.

7. To create a New Password, click in the box, delete the current password, and type in the new password.

8. To Confirm the new Password, click in the box, delete the current password and type in the new password.

Note: For the password to be changed, the New Password and Confirm Password must be identical.

9. Click on Apply.

Note: Changes will require a reboot to take effect.

Select *Administration / Reboot*, then wait for the reboot to be completed.

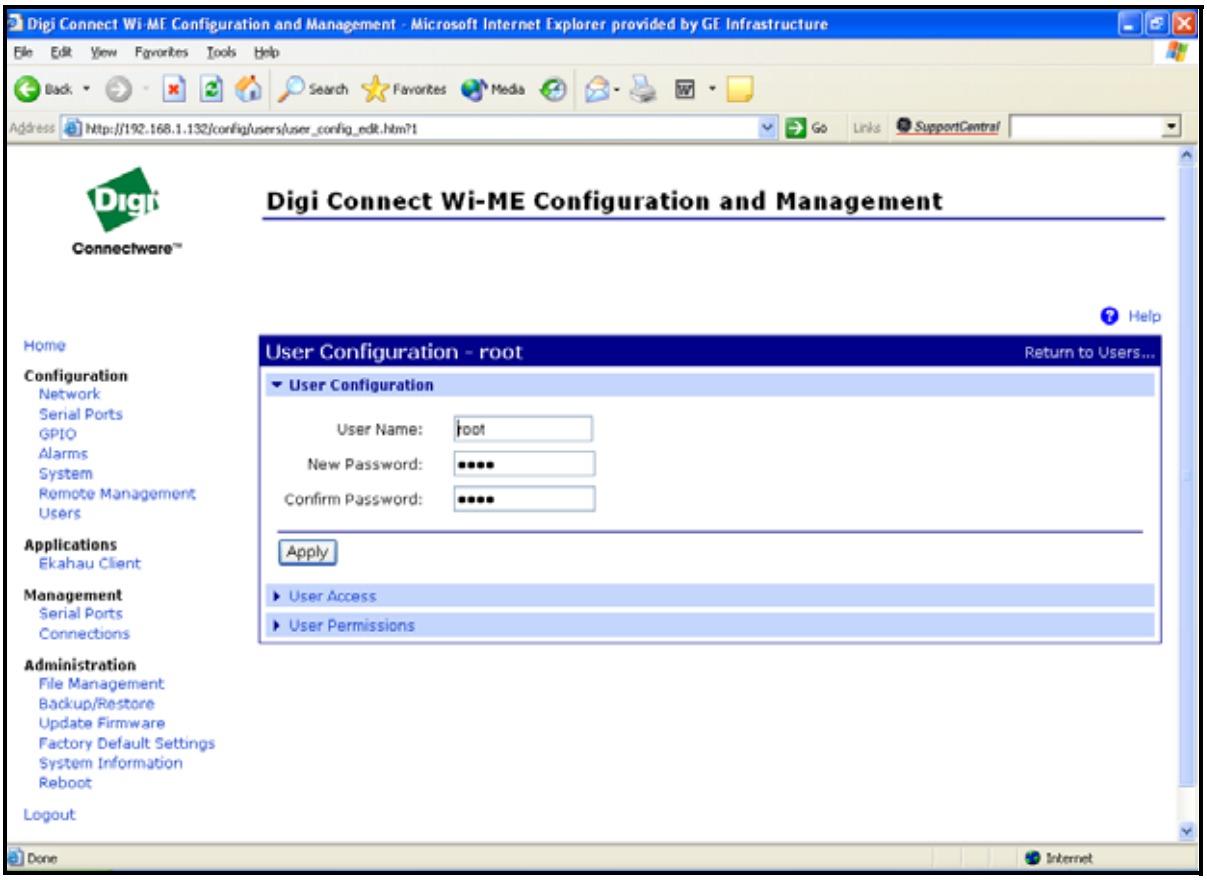


Figure 34: Changing the User Name and/or Password

5.4 Tips for Improving Wireless Data Communications

Figure 35: Installation Site

A suitable installation site should locate the antenna in a transmission path as unobstructed as possible; in the direction of the associated router.

When a wireless transducer is linked to a router, a yellow LED on the WI-FI option board remains on. Received Signal Strength Indication (RSSI) is an important indicator of wireless link quality. The higher the RSSI, the stronger the performance a wireless system can provide. Signal Strength is calculated by a wireless transceiver and can be viewed on Administration-System Information - WI-FI LAN - Active Settings of the device home page (see Figure 36 on page 51).

If constant interference is present in a particular frequency zone, it might be necessary to change the operational channel in the WI-FI network. If interference problems persist, try reducing the length of data streams by reading less registers in one request. Groups of short data streams have a better chance of getting through in the presence of interference than do long streams.

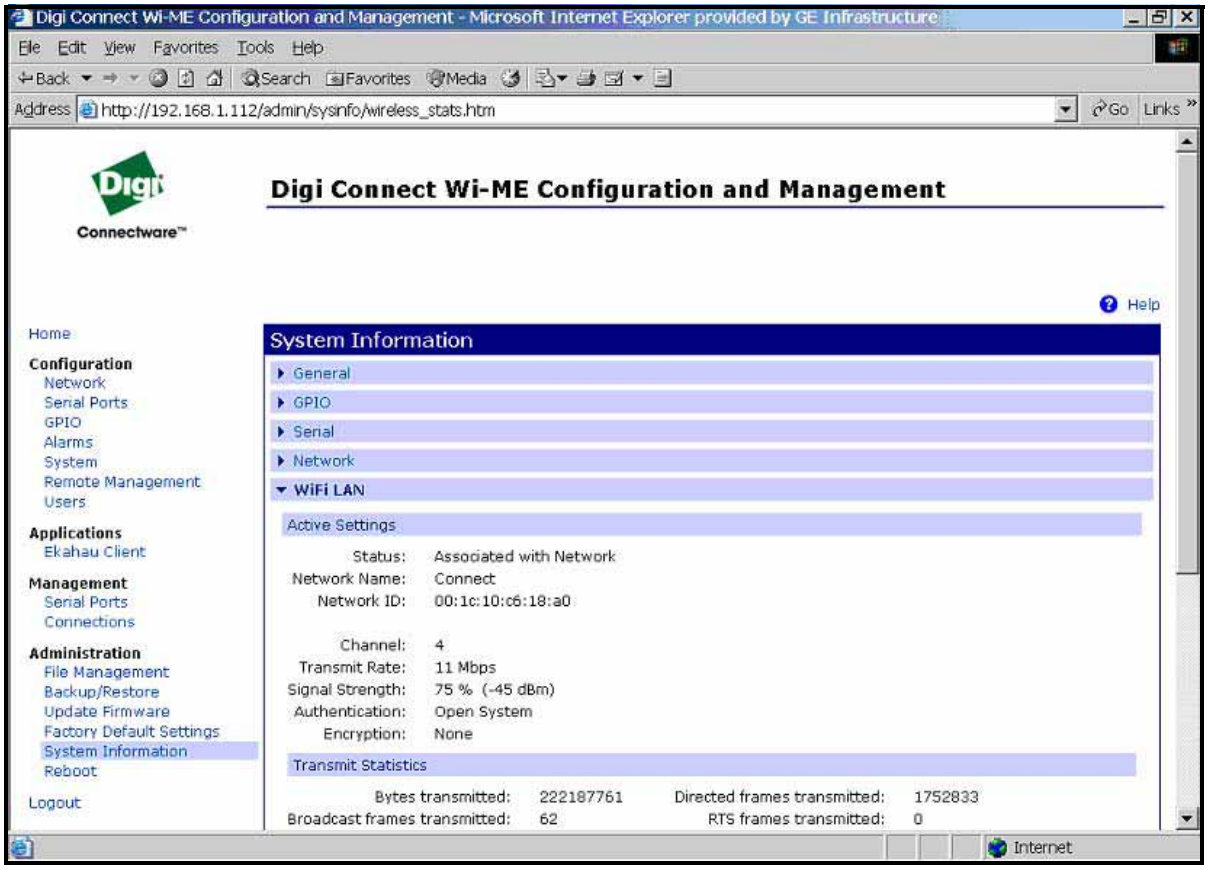


Figure 36: System Information Menu - WI-FI Lan

[no content intended for this page]

Chapter 6. WI-FI Only Communications

6.1 Introduction

This document provides instructions for setting up a flowmeter equipped with *WI-FI Only* communications. To apply these procedures, the flowmeter must have the option card installed (see the example in Figure 37) and connected to a WI-FI antenna.

Note: *To install an option card, consult the user's manual(s) which apply to your instrument.*

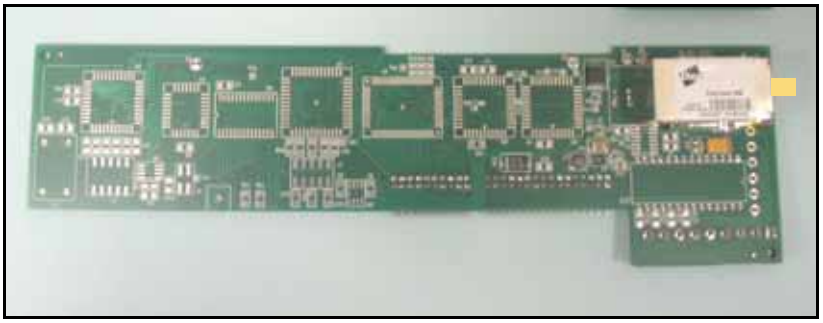


Figure 37: WI-FI Only Option Card

6.2 WI-FI Components

The WI-FI antenna should be mounted on top of the flowmeter enclosure (see Figure 38) and connected to the *WI-FI Only* option card as shown in Figure 39 and Figure 40 on page 54.

Figure 38: WI-FI Antenna

6.2 WI-FI Components (cont.)

Figure 39: WI-FI Cable Antenna Connection

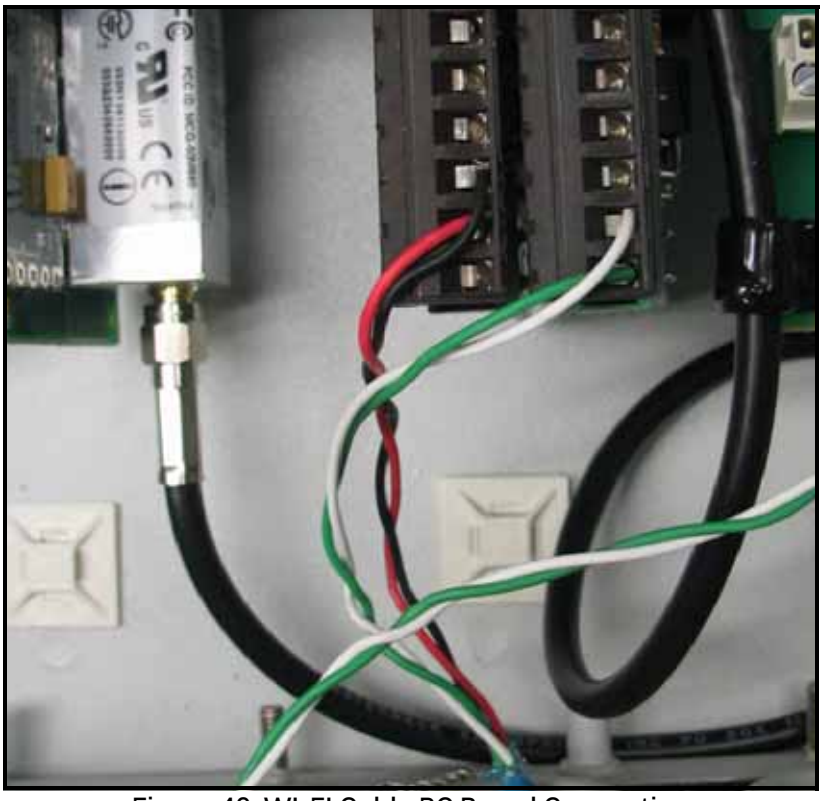


Figure 40: WI-FI Cable PC Board Connection

6.3 Setup

The default IP address in setting up the WI-FI Only option card is Dynamic (DHCP). If it has to be changed to a static IP address, the instrument must first be wirelessly linked to the DHCP network. You may need a WI-FI router in order to activate that.

Note: *The following are setup procedure examples.*

The *Digi Device Discovery Program* is required to change communications parameters if needed. To download the program, proceed with the following steps:

6.3.1 Downloading the Digi Device Discovery Program

1. Go to www.digi.com on the internet.

2. Move the cursor to the SUPPORT button and select *Diagnostics, Utilities and MIBs* from the menu.

3. Open the Select Your Product for Support menu and select *Digi Connect ME*. Then click on Submit.

4. From the OS Specific Diagnostics, Utilities and MIBs menu select *Microsoft Windows NT 4.0, 2000* or *XP*. Then, under the window, select *Device Discovery Utility for Windows*, and the File Download window appears.

5. Select Save this file to a disk, click on OK, and save the file to your computer.

6. Install the program from the downloaded file.

6.3.2 Module LED Behaviors

- Yellow ON**:** Associated with Access Point
- Yellow Blinking Slowly: Ad hoc mode
- Yellow Blinking Quickly: Scanning for a network

6.3.3 Default Parameters

- Baud Rate: 9600 bps
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

IMPORTANT: *This WI-FI Only option card is shipped with DHCP IP addressing, and all the security options disabled. If your wireless LAN has any security set, it should be disabled to have this card join your wireless network. A solid yellow LED on the card indicates the card is joined to the wireless network.*

6.3.4 Finding the Assigned IP Address

Note: *The following are setup procedure examples.*

Example:
Find the IP address of the module with Media Access Control (MAC) address 00409d24ded5.

1. Run the *Digi Device Discovery Program* (see Figure 41).

Note: *To access the* Digi Device Discovery Program, *see page 55.*

Note: *The MAC address of all found units and the assigned IP address will be displayed. In this example the assigned address is 3.112.162.129.*

Note: *Refresh the display to find the MAC address of all units.*

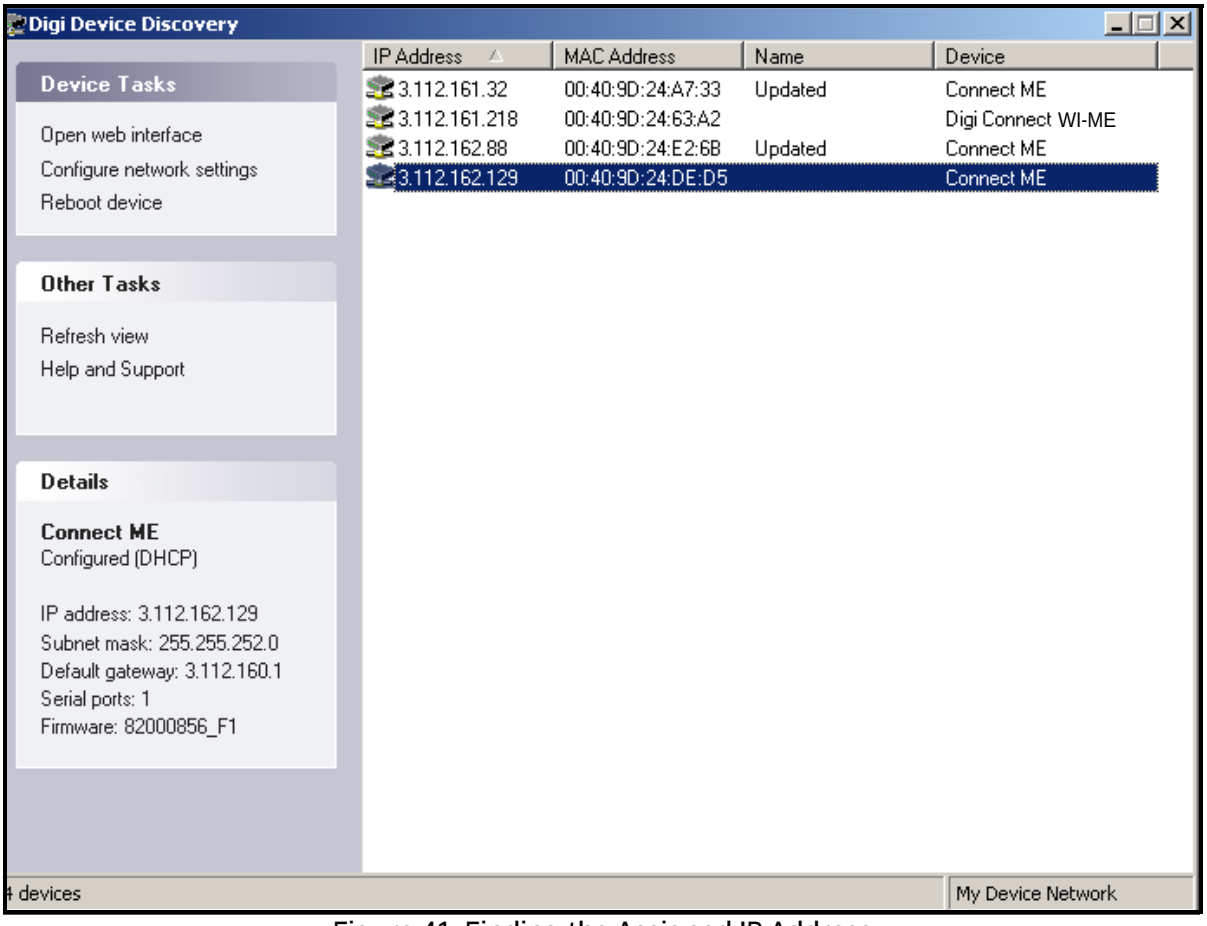


Figure 41: Finding the Assigned IP Address

6.3.5 Changing IP Parameters

Example:
Change the DHCP-assigned IP address to static address 192.168.2.207 and disable DHCP for the unit with IP assigned address 3.112.162.129 (see Figure 42).

1. Have your option card joined to the wireless network.
2. Under Device Task select *Open web interface*.
3. Enter Username and Password. Factory defaults are *root* and *dbps*.

Note: *The username and password are case sensitive.*

4. Click on Login.
5. Select *Configuration* / *Network.*
6. Select *Use the following IP address:* and enter IP address `192.168.2.207`.
7. Click on Apply.

Note: *Changes will require a reboot to take effect.*

Select *Administration / Reboot*, then wait for the reboot to be completed.

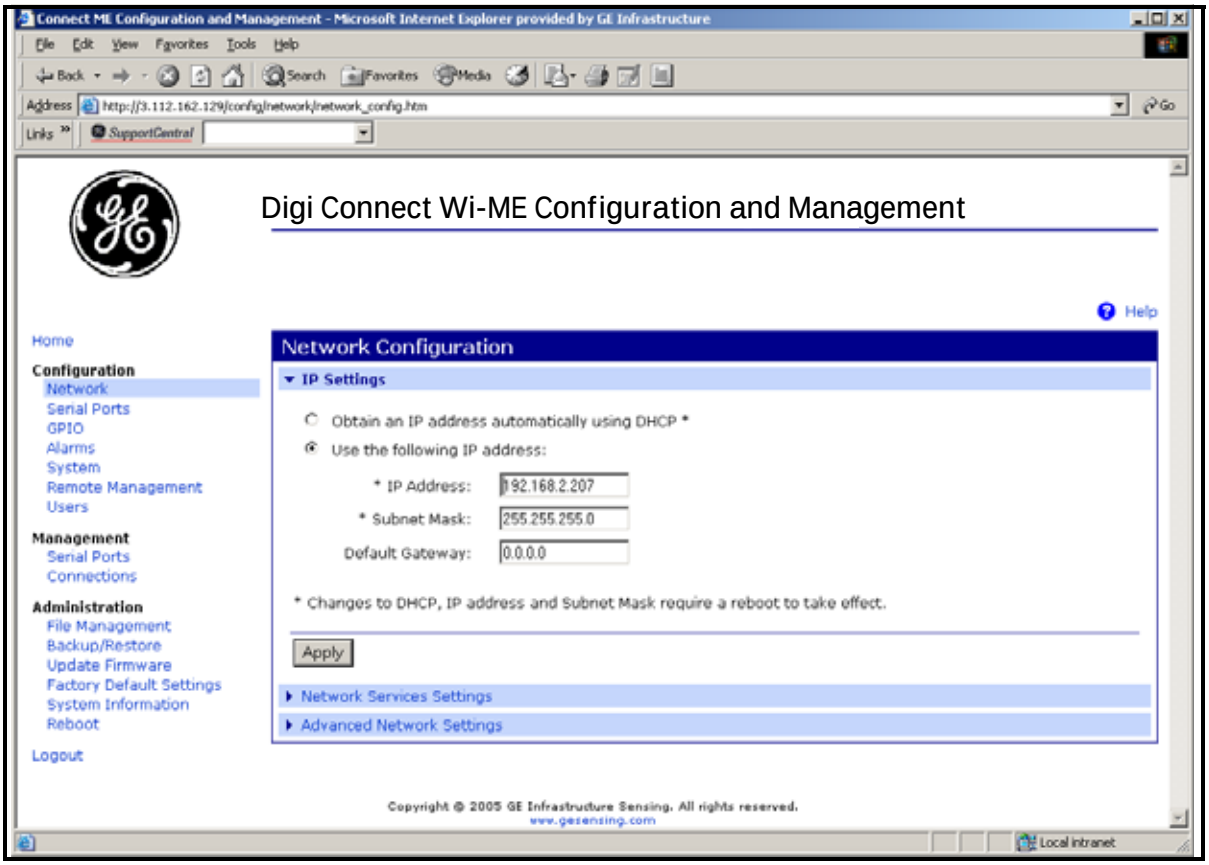


Figure 42: Changing IP Parameters

6.3.6 Changing User's Information

To change the user name and/or password:

1. Under Device Task select *Open web interface*.
2. Enter the Username and Password. The factory defaults are *root* and *dbps*.

Note: *The username and password are case sensitive.*

3. Click on Login. Figure 43 appears.
4. Select *Configuration* / *Users*.
5. Click on New.... Figure 44 on page 59 appears.

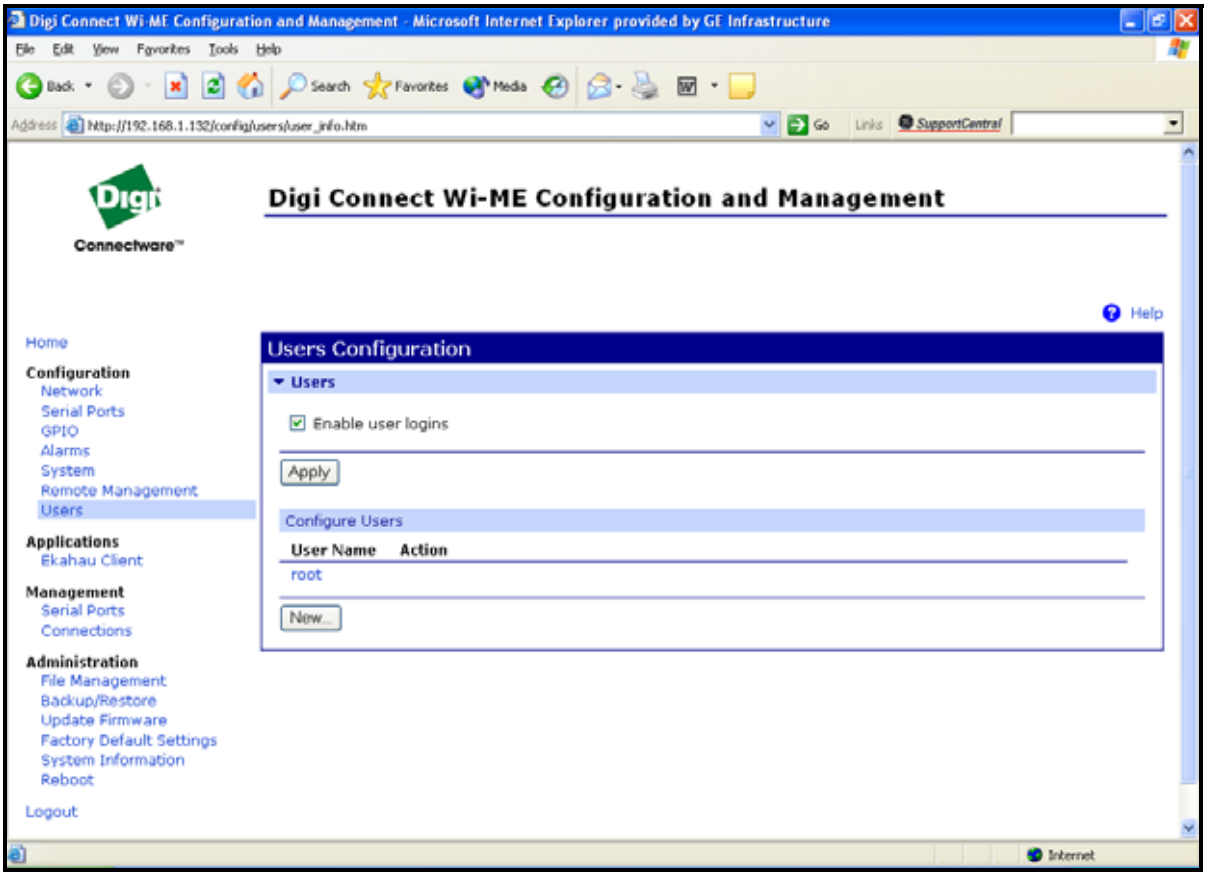


Figure 43: User's Configuration Menu

6.3.6 Changing User's Information (cont.)

6. To change the User Name, click in the box, delete the current name, and type in the new name.

7. To create a New Password, click in the box, delete the current password, and type in the new password.

8. To Confirm the new Password, click in the box, delete the current password and type in the new password.

Note: *For the password to be changed, the New Password and Confirm Password must be identical.*

9. Click on Apply.

Note: *Changes will require a reboot to take effect.*

Select *Administration / Reboot*, then wait for the reboot to be completed.

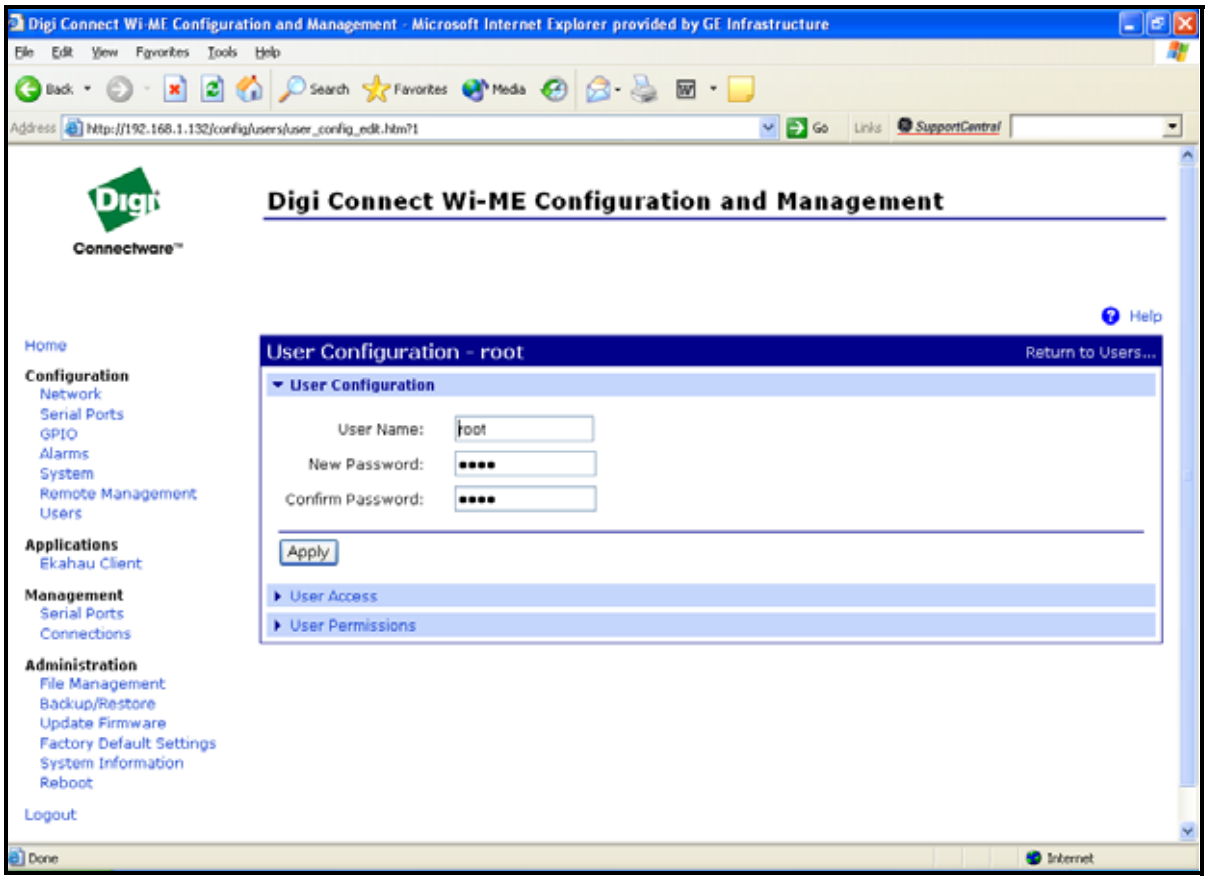


Figure 44: Changing the User Name and/or Password

6.4 Tips for Improving Wireless Data Communications

Figure 45: Installation Site

A suitable installation site should locate the antenna in a transmission path as unobstructed as possible; in the direction of the associated router.

When a wireless transducer is linked to a router, a yellow LED on the WI-FI option board remains on. Received Signal Strength Indication (RSSI) is an important indicator of wireless link quality. The higher the RSSI, the stronger the performance a wireless system can provide. Signal Strength is calculated by a wireless transceiver and can be viewed on Administration-System Information - WI-FI LAN - Active Settings of the device home page (see Figure 46).

If constant interference is present in a particular frequency zone, it might be necessary to change the operational channel in the WI-FI network. If interference problems persist, try reducing the length of data streams. Groups of short data streams have a better chance of getting through in the presence of interference than do long streams.

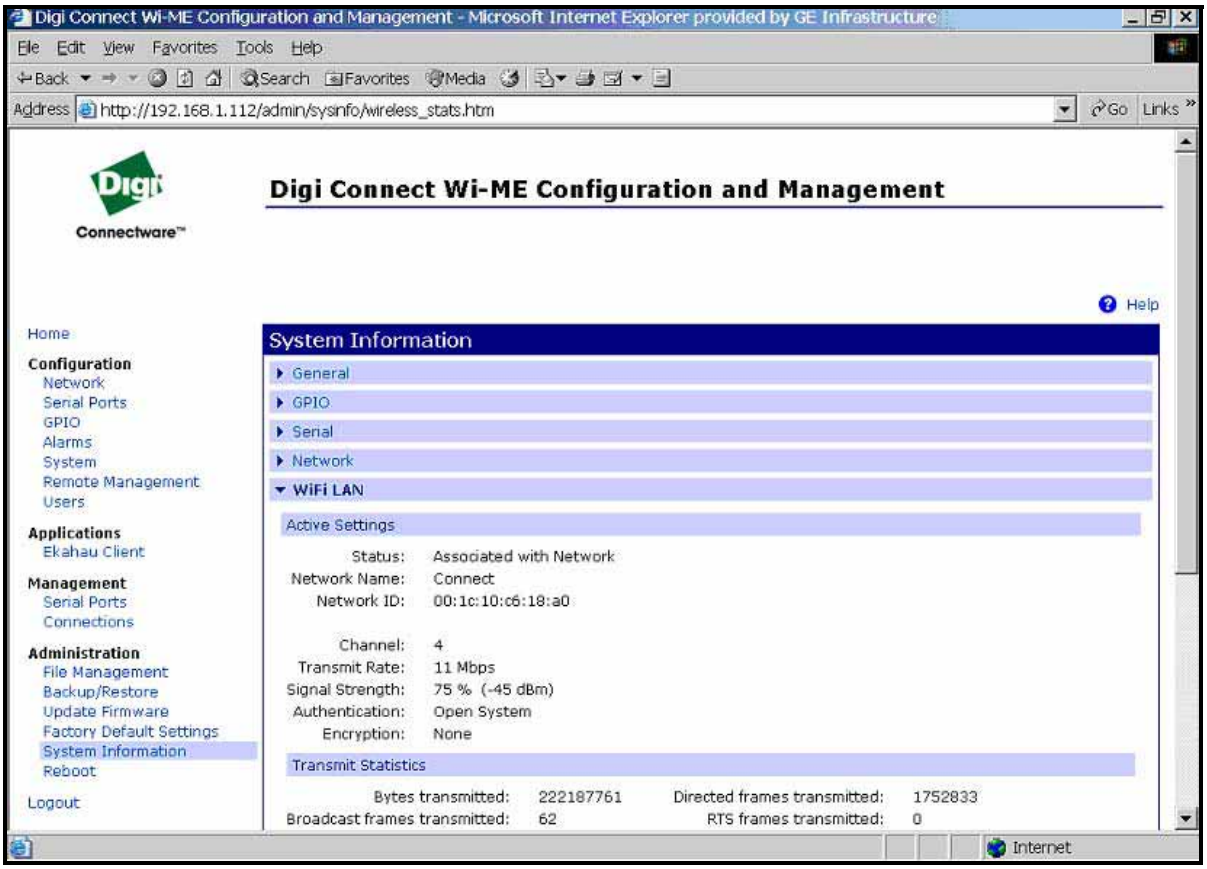


Figure 46: System Information Menu - WI-FI Lan

Chapter 7. Foundation Fieldbus Communications

7.1 Optional Measurements

Foundation Fieldbus provides a means of communicating with the flowmeter. The patent numbers which apply are 5,909,363 and 6,424,872.

This Foundation Fieldbus device supports 2 Analog Input (AI) blocks, which can be configured to supply the following measurements on the network (see Table 7).

Table 7: Available Measurements for the DF868

Channel 1	Units	Channel 2	Units	Average	Units
Ch1 Velocity	ft/s or m/s*	Ch2 Velocity	ft/s or m/s*	Avg Velocity	ft/s or m/s*
Ch1 Act Volumetric	VOL_U	Ch2 Act Volumetric	VOL_U	Avg Act Volumetric	VOL_U
Ch1 Std Volumetric	VOL_U	Ch2 Std Volumetric	VOL_U	Avg Std Volumetric	VOL_U
Ch1 Fwd Totals	TOT_U	Ch2 Fwd Totals	TOT_U	Avg Fwd Totals	TOT_U
Ch1 Rev Totals	TOT_U	Ch2 Rev Totals	TOT_U	Avg Rev Totals	TOT_U
Ch1 #Tot Digits**	none	Ch2 #Tot Digits**	none	Avg #Tot Digits	none
Ch1 Mass Flow	MASS_U	Ch2 Mass Flow	MASS_U	Avg Mass Flow	MASS_U
Ch1 Fwd Mass Totals	MTOT_U	Ch2 Fwd Mass Totals	MTOT_U	Avg Fwd Mass Totals	MTOT_U
Ch1 Rev Mass Totals	MTOT_U	Ch2 Rev Mass Totals	MTOT_U	Avg Rev Mass Totals	MTOT_U
Ch1 #Mass Tot Digits	none	Ch2 #Mass Tot Digits	none	Avg #Mass Tot Digits	none
Ch1 Timer	sec	Ch2 Timer	sec	Avg Timer	sec
Ch1 Error Code	none	Ch2 Error Code	none	Avg Error Code	none
Ch1 SSUP	none	Ch2 SSUP	none	Avg SSUP	none
Ch1 SSDN	none	Ch2 SSDN	none	Avg SSDN	none
Ch1 Sound Speed	ft/s or m/s*	Ch2 Sound Speed	ft/s or m/s*	Avg Sound Speed	ft/s or m/s*
Ch1 Density***	see note	Ch2 Density***	see note		
Ch1 Temperature	Deg F or C*	Ch2 Temperature	Deg F or C*		
Ch1 Pressure	PRESS_U	Ch2 Pressure	PRESS_U		

*Metric or English units are determined by the setup of the flowmeter.

**Totalizer digits are available for informational purposes only. Respective totals are automatically scaled by the Tot Digits value selected in the flowmeter setup.

***If the meter is outputting Mole Weight, the unit is “mw”, otherwise it is the programmed pressure unit.

VOL_U, TOT_U, MASS_U, MTOT_U and PRESS_U are determined by the units chosen for these measurements in the flowmeter setup. See the instrument User's Manual for the setup of these parameters.

7.2 Configuration Utility Setup

The following is an example setup using National Instruments Configuration Utility v3.1.

Figure 47 shows the Configuration Utility with a flowmeter on the network (GE Flow-XMT).

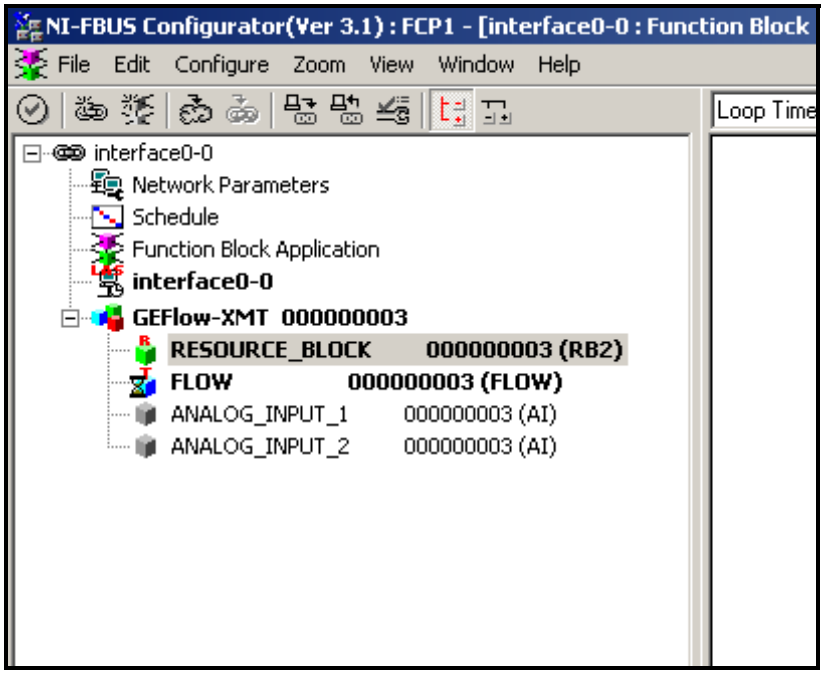


Figure 47: Configuration Utility Setup Example

Note: *The following procedures assume that the device has been placed in the OOS (out-of-service) mode before executing.*

7.3 Selecting the Desired Measurements

To set the measurement unit for each AI:

1. Double click on the FLOW Transducer Block (in the tree under GEFlow-XMT).
2. Select the Others tab and open the drop down list for the PRIMARY_SELECTOR and SECONDARY_SELECTOR (refer to Figure 48 on page 63).
3. Choose the unit from the list (see Figure 48 on page 63).

This unit will correspond to the unit that is available in the AI block for network connection. The PRIMARY_SELECTOR unit will correspond to ANALOG_INPUT_1 and the SECONDARY_SELECTOR will correspond to ANALOG_INPUT_2.

7.3 Selecting the Desired Measurements (cont.)

4. After the desired measurements have been selected for the PRIMARY and SECONDARY SELECTOR, choose the unit system (UNIT_SELECTOR above the PRIMARY_SELECTOR) that has been programmed in the flowmeter (English or SI).

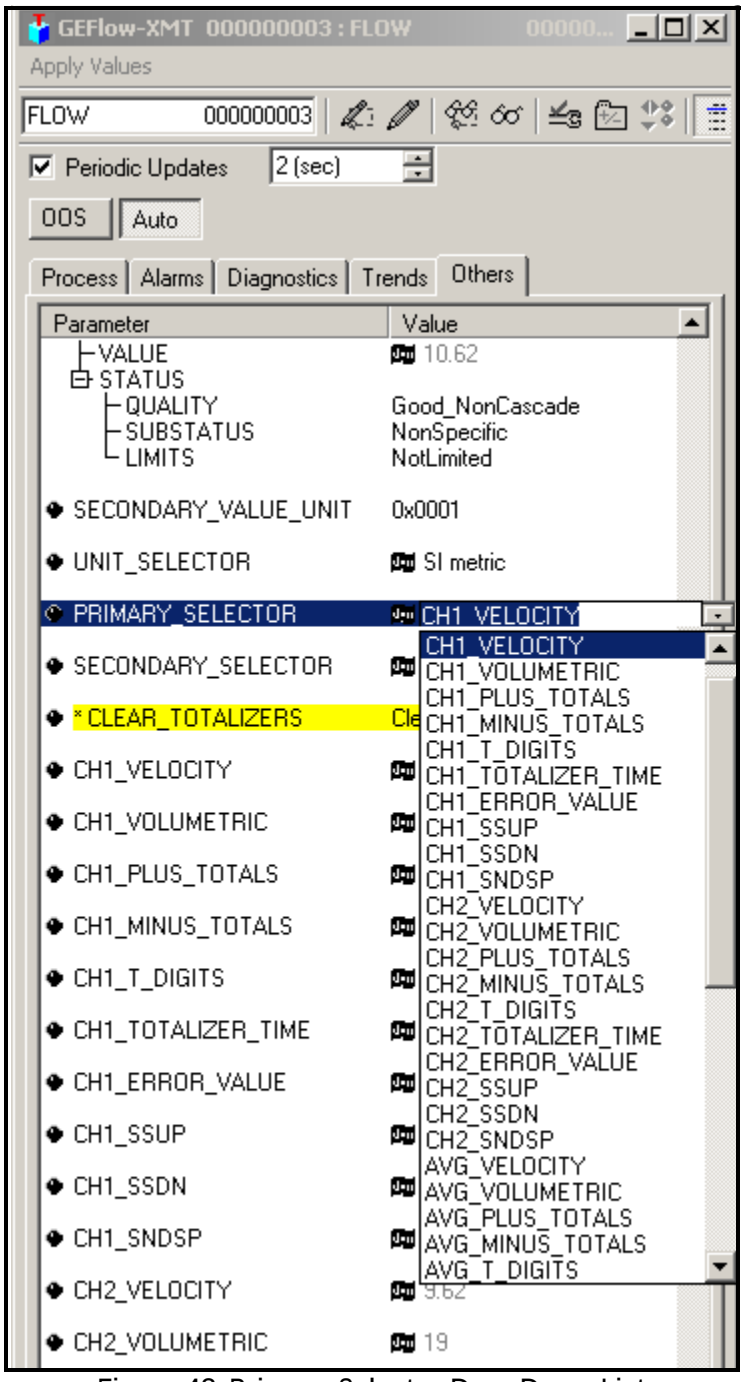


Figure 48: Primary Selector Drop Down List

7.4 Selecting Units for AI Blocks

To select the units for the individual AI blocks:

1. Double click on the AI block for which you wish to set the units (ANALOG_INPUT_1 or ANALOG_INPUT_2 in the tree under GEFlow-XMT; see Figure 47 on page 62).
2. Select the Scaling tab and set the unit for the measurement based on the flowmeter settings.

For example, if the flowmeter was set to use the metric unit system and the PRIMARY_SELECTOR was set to use VELOCITY you would choose m/s for the unit as shown in Figure 49.

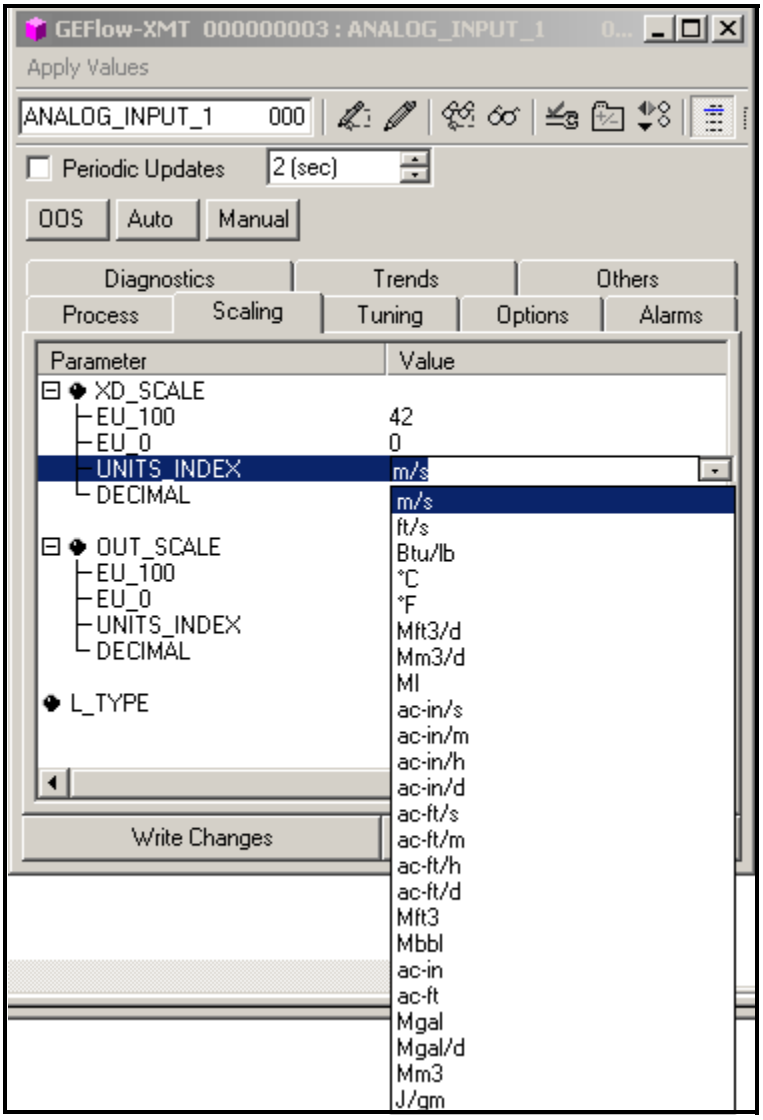


Figure 49: Units Index Drop Down List

7.5 Resetting Instrument Totalizers

To reset the instrument totalizers:

1. Double click on the FLOW transducer block (in the tree under GEFlow-XMT; see Figure 47 on page 62).
2. Select the Others tab and scroll down to the CLEAR_TOTALIZERS listing.
3. Select Clear from the drop down list box (see Figure 50).
4. After the totals have been reset, select Normal from the drop down list box to resume total accumulation.

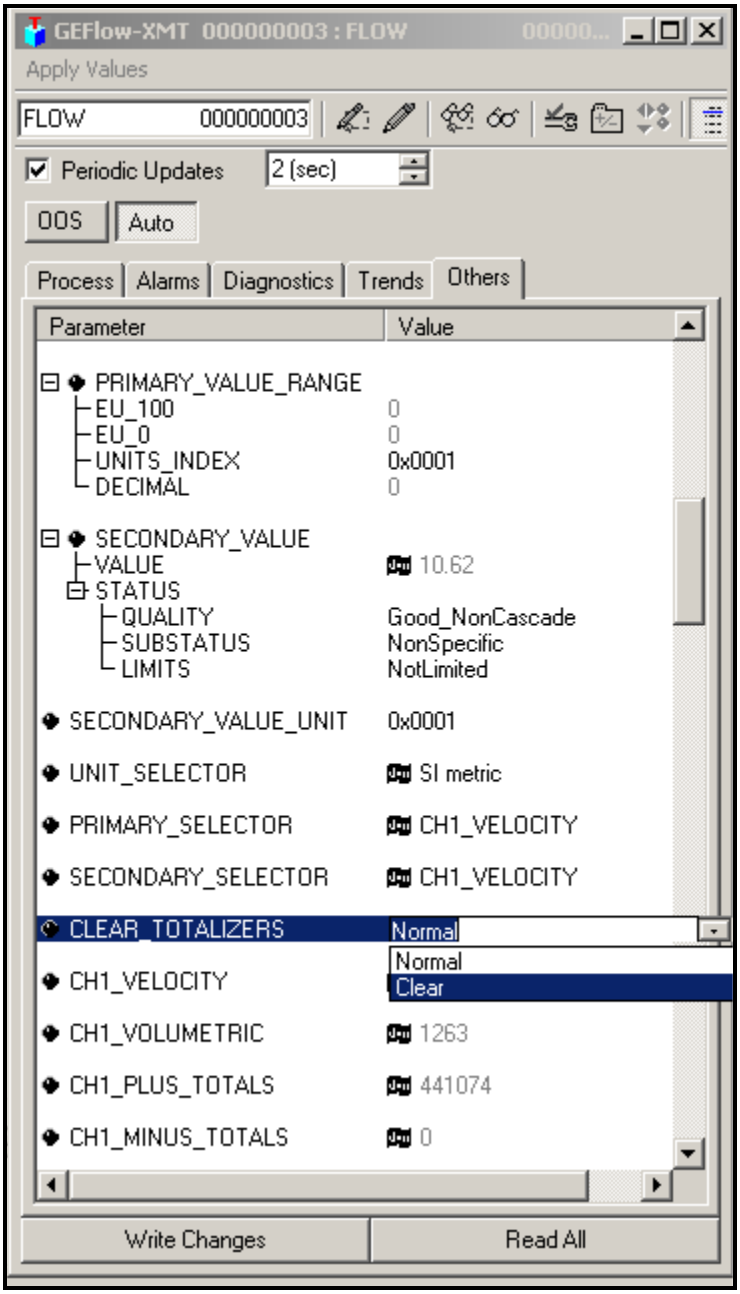


Figure 50: Clear Totalizers Drop Down List

7.6 Function Block Application

Figure 51 is an example setup using the Function Block Application editor. The flowmeter AI blocks, along with the AO and PID of another device on the network, are displayed. We have connected the AI_1 OUT of the flowmeter to the CAS IN of the AO block. We have also connected the AI_2 OUT of the flowmeter to the CAS IN of the PID block.

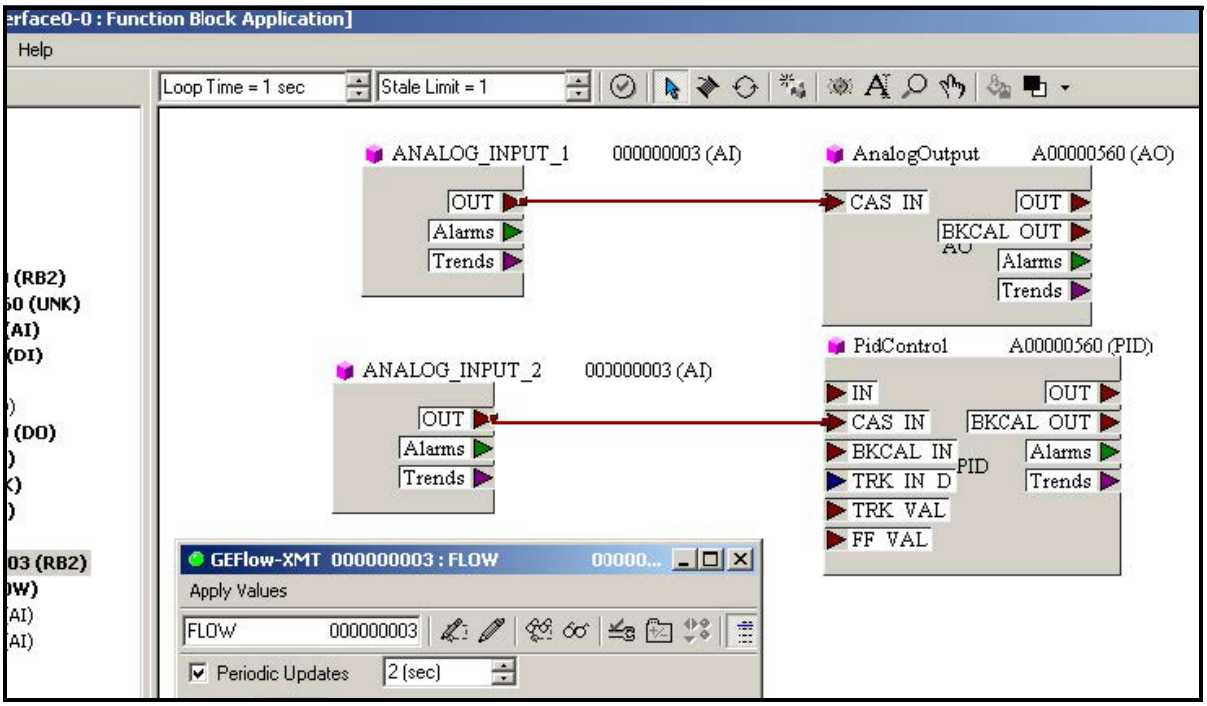


Figure 51: Function Block Application

Chapter 8. HART Communications

8.1 Introduction

GE Panametrics GF868, XGM868, XGS868 and XMT868 ultrasonic flowmeters may be modified to permit two-way communication with a HART communication device. This requires the installation of a HART option card in the flowmeter. The option card generates a 4-20 mA analog output signal that can be read by the HART device. Proceed to the appropriate section for detailed instructions on installing and using the HART option card.

8.2 Installing the HART Option Card

To install a HART option card in your flowmeter, complete the following steps:

WARNING! This procedure should be performed only by qualified service personnel.

1. Disconnect the main power from the flowmeter.

WARNING! Failure to disconnect the power before proceeding may result in serious injury.

2. Refer to your *User's Manual* for step-by-step instructions, and install the HART option card in Slot 6 for a GF868 flowmeter or in Slot 2 for an XGM868, XGS868 or XMT868 flowmeter.

IMPORTANT: If a MODBUS *option card is installed in Slot 5 of a GF868 flowmeter, the* HART *option card in Slot 6 will be ignored.*

3. Interconnect the HART option card and the HART device as shown in Figure 52.

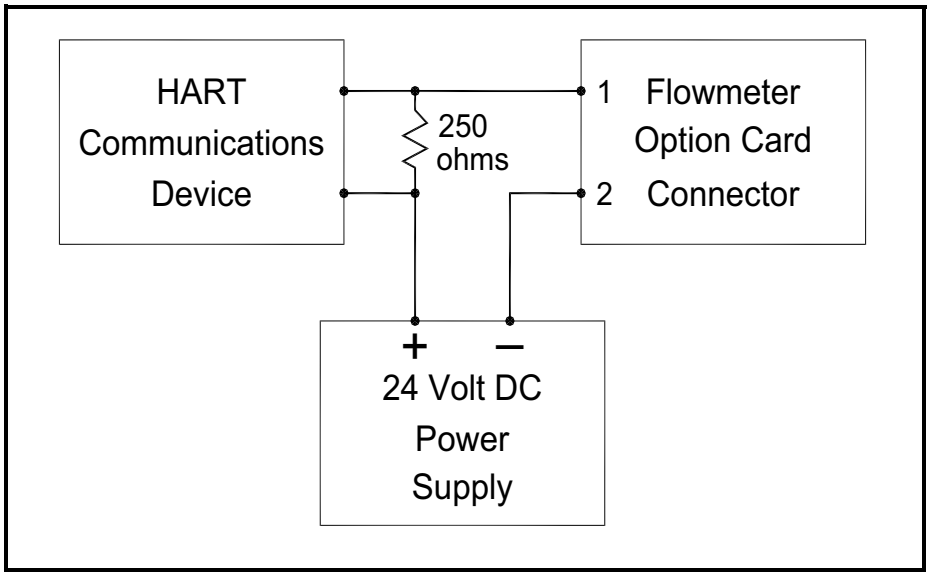


Figure 52: Option Card Wiring

For a GF868 flowmeter, the option card connector is mounted on the card, and the HART device leads should go to pins 1 and 2 of this connector. As for other option cards installed in the same meter as the HART option card, the HART device will not recognize any option card installed in Slots 3-5 and it will only recognize option cards installed in Slots 1-2 if they are Analog Input, Analog Output, or RTD option cards.

8.2 Installing the HART Option Card (cont.)

Note: For XGM868i, XGS868i and XMT868i flow meters the HART device connections are found on the PCB output for HART card installed in Slot 2. Note the polarity of signals (pin 1 HART+, pin2 HART- on Figure 53 below.

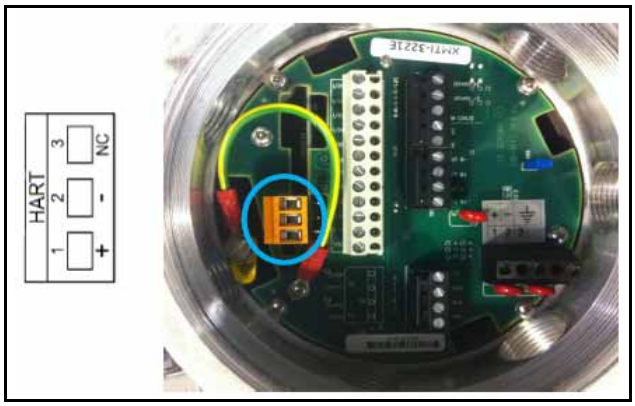


Figure 53: PCB Output for HART Card

8.3 Flowmeter Software Setup

GE Panametrics flowmeters that are shipped with a factory-installed HART option card require no special setup procedures by the user. The meter automatically configures itself for HART communication on startup. However, for field-installation of a HART option card, the card must be configured in the factory test menu before it will be recognized by the meter. Thereafter, the initialization will be automatic on startup. Contact the factory for specific instructions.

In addition to setting up the HART option card so that it is recognized by the meter, the analog output of the option card may be configured using any of the following methods (if available):

- the flowmeter keypad
- Instrument Data Manager (IDM™) software
- PanaView™ graphical user interface software
- the HART device

To configure your HART option card analog output using any of the first three methods, follow the instructions in the appropriate *User's Manual*. During configuration, the choice of parameter must be limited to those listed in Table 8 on page 69. To use the HART device for configuration of the analog output, refer to the instructions that came with that device.

Note: Because HART communication is unreliable at analog outputs below 4 mA, the flowmeter automatically changes a HART option card analog output configuration of 0-20 mA *or* OFF *to a* 4-20 mA *configuration upon startup. Check to make sure that the analog output configuration is set to 4-20mA. If for some reason, it has not been automatically changed, set it to 4-20mA from the front panel.*

8.3 Flowmeter Software Setup (cont.)

Some flowmeter parameters can only be read by the HART device during startup. Therefore, it is recommended that both the flowmeter and the HART device be rebooted after any reprogramming of the HART option card analog output. Failure to do so may result in erroneous information or a communication failure between the flowmeter and the HART device.

Table 8: Valid HART Parameters and Units

Parameter	English Units	Metric Units
Velocity	ft/sec	m/s
Volumetric (liquid)	gal/s, gal/m, gal/h, mgal/day, cuf/s, cuf/m, cuf/h, mcf/day, bbls/s, bbl/m, bbl/h, mbl/d, acre-inch/day	l/s, l/m, l/h, ml/d, cum/s, cum/m, cum/h, mcm/d, bbl/s, bbl/m, bbl/h, mbl/d
Volumetric (gas)	acf/m, acf/h, scf/m, scf/h	acm/h, scm/h, scm/d
+Tot, -Tot (liquid)	gal, cuf,bbl, acre-in, acre-ft	liter, cum, bbl
+Tot, -Tot (gas)	acf, scf	acm, scm
Mass Flow	lb/s, lb/m, lb/h, mlb/d, ton/m, ton/h, mton/d	kg/s, kg/h, mkg/d, tne/m, tne/h, tne/d
+Mass, -Mass	lb, ton	kg, tne
Power	kbtu/h, kw	mcal/h, kw
+Energy, -Energy	btu, kw-hr	mcal, kw-hr
Temperature	°F	°C
Pressure	psia	bar, bara
Mol Weight	none	none
NOTE: “acf” is reported as “normal cubic feet” in HART. Also, “Mega” units (i.e. mgal/day, mcf/day, etc.) are reported as standard units x 10^6 in HART. For example, 1 mgal is 1x10^6 gal in HART.		

8.4 Using the HART Interface

The HART communications option card installed in GE Panametrics flowmeters has been successfully tested with the **Rosemount 275 Hand-Held Communicator** and the **Rosemount AMS Computer-Based Communications Software**. Although some flowmeter functions may be performed using the HART device, many other functions (i.e. data logging, site file uploading, site file downloading, printing, etc.) must still be programmed by the methods described in the flowmeter *User’s Manual*. This is because the HART protocol was developed for use with simple transmitters and it cannot handle the multitude of sophisticated functions built into the GE Panametrics flowmeters.

8.4.1 Unit Types

Due to limitations of the HART protocol, only those unit types listed in Table 8 are acceptable. If a meter parameter is set to any other measurement units, the HART device displays an *“Unknown Enumerator, Can not resolve”* error message and may terminate communications entirely. In some cases, both the Hart device and the flowmeter may have to be rebooted to clear the error. To address this potential problem, the flowmeter has been programmed to force all measurement units to HART compliant units if a HART option card is detected upon startup.

8.4.2 HART Functions

After HART communications has been properly set up, the following flowmeter functions may be accessed using the HART device:

- static temperature and static pressure

Note: To view the static temperature or pressure for a channel using the HART device, the fixed value for that parameter must be assigned to that channel at the flowmeter. See your User's Manual *for instructions.*

- tracking windows (XMT868 only)
- minimum and maximum soundspeed (XMT868 only)
- 2-path error handling
- velocity averaging response time
- static density
- error handling
- mA error level (if selected)
- clear totals

Note: Refer to your User's Manual *for a complete description of each of the above functions.*

When information is viewed through the HART device, the input variable always appears as either *Channel 1 Temperature* or *Channel 1 Pressure*. Although these inputs are not necessarily assigned to Channel 1, the HART protocol labels all inputs as channel-specific. For example, a Slot 1 analog input that is programmed at the meter as a temperature input assigned to Channel 1, Channel 2, Both, or Neither is always reported by the HART device as a *Channel 1* Temperature input.

Note: Inputs cannot be assigned using the HART device. Also, any input assigned as "Special" *is always reported as a Channel 1 Temperature input by the HART device*

In addition to the functions listed on the previous page, the following procedures may be performed through the HART device:

- calibration and setup of the HART option card analog output
- calibration and some programming of analog inputs, analog outputs, and RTD inputs on option cards installed in Slots 0 (all), 1 (all), and 2 (GF868 only)
- viewing some of the flowmeter's diagnostic parameters

8.5 List of Programmable Variables

For convenient reference, all of the programmable variables for the four flowmeter models are listed in Table 9 on page 71.

Table 9: Programmable Variables

Description	Format*	R/W/B*	XMT868	XGS868	XGM868	GF868
Channel Process Variables						
Ch1, Ch2, or Ave vel	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave vol	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave mdot	f.p.	R	Y	Y	if mass	Y
Ch1, Ch2, or Ave power	f.p.	R	if energy	N	N	N
Ch1, Ch2, or Ave Temper	f.p.	R	N	Y	Y	Y
Ch1, Ch2, or Ave Pressure	f.p.	R	N	Y	Y	Y
Ch1, Ch2, or Ave Mw	f.p.	R	N	N	N	Y
Ch1, Ch2, or Ave +tot	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave -tot	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave +mass	f.p.	R	Y	Y	if mass	Y
Ch1, Ch2, or Ave -mass	f.p.	R	Y	Y	if mass	Y
Ch1, Ch2, or Ave +energy	f.p.	R	if energy	N	N	N
Ch1, Ch2, or Ave -energy	f.p.	R	if energy	N	N	N
Ch1 or Ch2 Ssup	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 ssDO	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave tUP	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave tDO	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave deltaT	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 peak%	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave DeltaT(s)	f.p.	R	N	if meas	if meas	if meas
Ch1, Ch2, or Ave DeltaT(M)	f.p.	R	N	if meas	if meas	if meas
Ch1 or Ch2 qUP	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 qDOWN	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 ampUP	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 ampDOWN	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 peak#UP	f.p.	R	Y	Y	Y	Y
Ch1 or Ch2 peak#DOWN	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave t.S	f.p.	R	if energy	N	N	N
Ch1, Ch2, or Ave t.R	f.p.	R	if energy	N	N	N
Ch1, Ch2, or Ave t.S-t.R	f.p.	R	if energy	N	N	N
Ch1 or Ch2 inco1	f.p.	R	if transfl.	N	N	N
Ch1 or Ch2 onco2	f.p.	R	if transfl.	N	N	N
Ch1 or Ch2 Rpowr	f.p.	R	if transfl.	N	N	N
Ch1 or Ch2 Rqual	f.p.	R	if transfl.	N	N	N
Ch1 or Ch2 Repp	f.p.	R	if transfl.	N	N	N
Ch1, Ch2, or Ave c3	f.p.	R	Y	Y	Y	Y
Ch1, Ch2, or Ave Temp_super	f.p.	R	N	Y	N	N
Ch1, Ch2, or Ave Rho	f.p.	R	N	Y	N	N
Ch1 or Ch2 Err code	int	R	Y	Y	Y	Y
Ch1 or Ch2 re#	f.p.	R	Y	N	N	N

Table 9: Programmable Variables (cont.)

Description	Format*	R/W/B*	XMT868	XGS868	XGM868	GF868
Global Meter Information						
MeterType (Model)	int	R	Y	Y	Y	Y
#Channels	int	R	Y	N	N	N
2-Path?	int	B	Y	N	N	N
Resp_time	int	B	Y	Y	Y	Y
Static Density?	int	B	Y	Y	Y	Y
Static Density Value	f.p.	B	Y	Y	Y	Y
Error Mode	int	B	Y	Y	Y	Y
Aout Error Level	f.p.	B	Y	Y	Y	Y
Meter Units (Eng. or Metric)	uchar	B	Y	Y	Y	Y
EnergyMeter?	uchar	R	Y	N	N	N
Clear-totals?	int	W	Y	Y	Y	Y
CH1 Information						
Ch1 Fixed Temp	f.p.	B	N	Y	Y	Y
Ch1 Fixed Press	f.p.	B	N	Y	Y	Y
Ch1 Tracking?	int	B	Y	N	N	
Ch1 Min Sound Spd	f.p.	B	Y	N	N	N
Ch1 Max Sound Spd	f.p.	B	Y	N	N	N
CH2 Information (if applicable)						
Ch2 Fixed Temp	f.p.	B	N	Y	Y	Y
Ch2 Fixed Press	f.p.	B	N	Y	Y	Y
Ch2 Tracking?	int	B	Y	N	N	
Ch2 Min Sound Spd	f.p.	B	Y	N	N	N
Ch2 Max Sound Spd	f.p.	B	Y	N	N	N
Slot Information						
Slot 0 A or B Device	uchar	R	Y	Y	Y	Y
Slot 0 A or B Type	uchar	B	Y	Y	Y	Y
Slot 0 A or B Chan	uchar	B	if 2-Ch	if 2-Ch	if 2-Ch	if 2-Ch
Slot Information (cont.)						
Slot 0 A or B Variable	uchar	B	Y	Y	Y	Y
Slot 0 A or B Units	uchar	R	Y	Y	Y	Y
Slot 0 A or B Zero	f.p.	B	Y	Y	Y	Y
Slot 0 A or B Span	f.p.	B	Y	Y	Y	Y
Slot 1 or 2 Active	int	R	Y	Y	Y	Y
Slot 1 or 2 A, B, C, or D Device	uchar	R	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Type	uchar	B	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Chan	uchar	B	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Variable	uchar	B	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Units	uchar	R	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Zero	f.p.	B	if active	if active	if active	if active
Slot 1 or 2 A, B, C, or D Span	f.p.	B	if active	if active	if active	if active

Table 9: Programmable Variables (cont.)

Description	Format*	R/W/B*	XMT868	XGS868	XGM868	GF868
HART Variables						
Universal Rev	uchar	R	Y	Y	Y	Y
Software Rev	uchar	R	Y	Y	Y	Y
Transmitter Rev	uchar	R	Y	Y	Y	Y
Hardware Rev	uchar	R	Y	Y	Y	Y
Device ID	uchar	R	Y	Y	Y	Y
PollAddress	uchar	B	Y	Y	Y	Y
Message	uchar24	B	Y	Y	Y	Y
Tag	uchar6	B	Y	Y	Y	Y
Descriptor	uchar12	B	Y	Y	Y	Y
Date	uchar3	B	Y	Y	Y	Y
Final Assy No	uchar3	B	Y	Y	Y	Y
Derial No.	uchar3	R	Y	Y	Y	Y
Pvt. Label Dist	uchar	R	Y	Y	Y	Y
Pri Var Code	uchar	R	Y	Y	Y	Y
Alarm Select	f.p.	B	Y	Y	Y	Y
Write Protect Code	uchar	B	Y	Y	Y	Y
Config Chgd Flag	uchar	B	Y	Y	Y	Y
Response Preambles	uchar	B	Y	Y	Y	Y
HART Device	uchar	R	Y	Y	Y	Y
HART Type	uchar	B	Y	Y	Y	Y
HART Channel	uchar	B	Y	Y	Y	Y
HART Variable	uchar	B	Y	Y	Y	Y
HART Units	uchar	R	Y	Y	Y	Y
HART Zero	f.p.	B	Y	Y	Y	Y
HART Span	f.p.	B	Y	Y	Y	Y

*** Format** - f.p. = IEEE floating point, int = integer, uchar = unsigned character ucharX = X bytes of unsigned characters. **R/W/B** - R = read only, W = write only, B = read or write using HART

[no content intended for this page]

Chapter 9. BACNet/IP (BACNet Over Ethernet)

9.1 Introduction

This chapter provides instructions for setting up a flowmeter equipped with *BACNet Over Ethernet* communications. To apply these procedures, the flowmeter must have the option card installed. The option card, based on the features that were ordered, will have many components (see Figure 54 and Figure 55).

Note: To install an option card, consult the user's manual(s) which apply to your instrument.

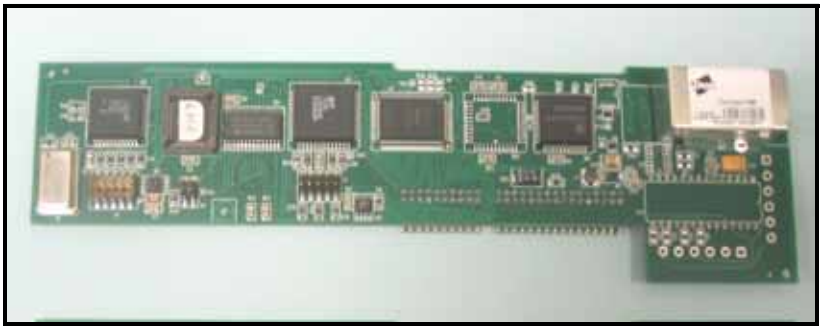


Figure 54: DF/GX BACNet/IP Option Card

Figure 55: XMT BACNet/IP Option Card

9.2 Setup

Using an Ethernet Crossover Cable, connect the flowmeter to a computer as shown in Figure 56. You must set up the computer's IP parameters according to Figure 56.

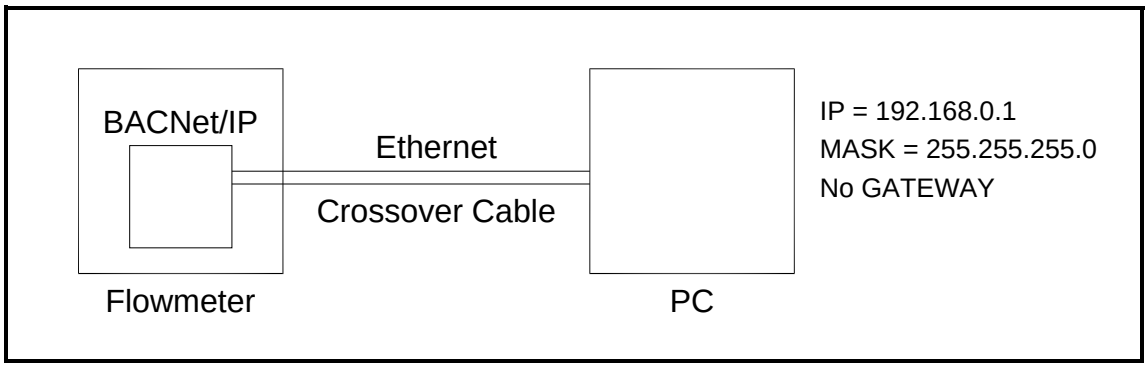


Figure 56: Computer Cable Connection

To set up the BACNet/IP parameters, enter "192.168.0.100" (the default static IP of the board) on your internet browser, and a screen similar to Figure 57 on page 77 appears.

9.2 Setup (cont.)

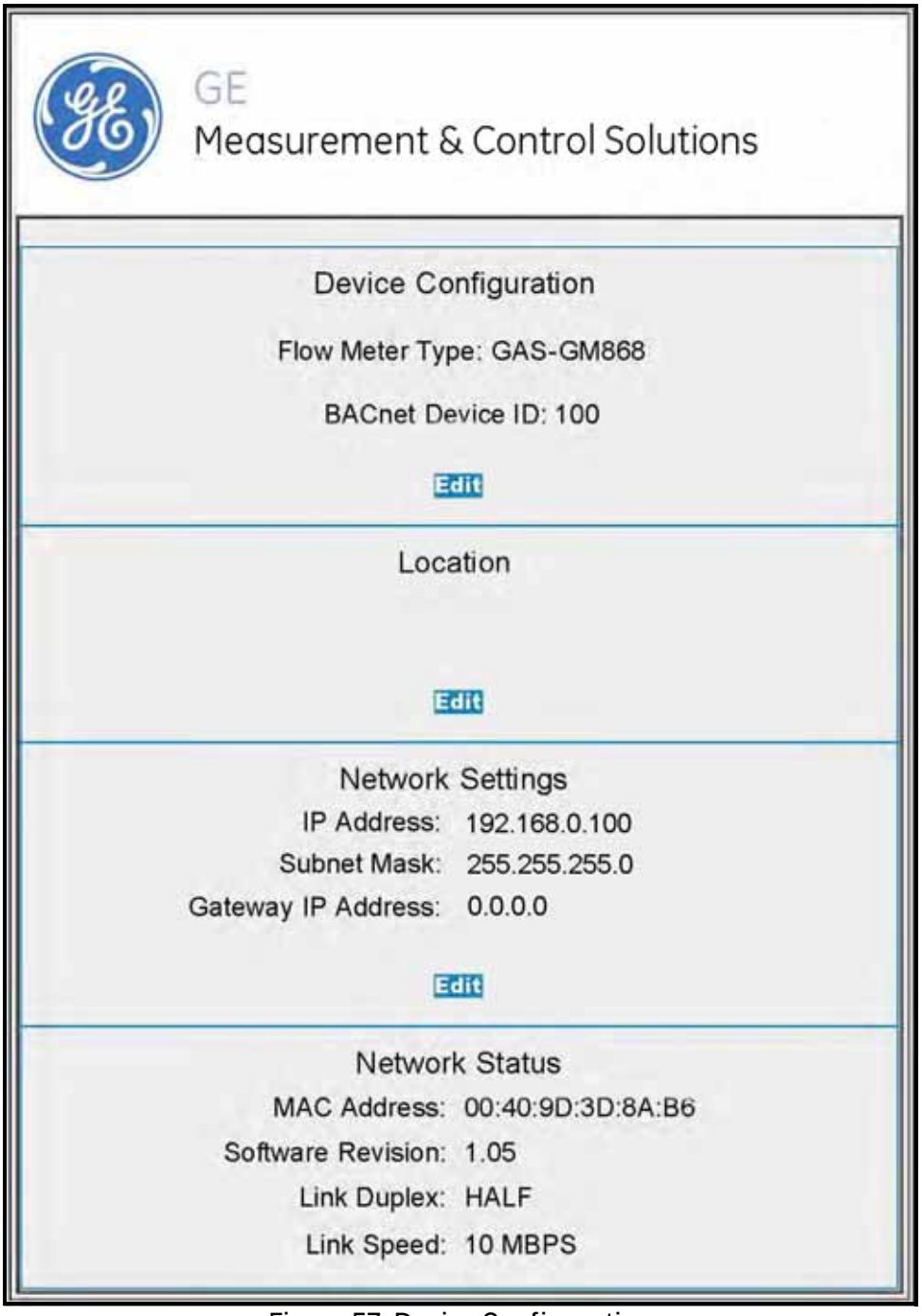


Figure 57: Device Configuration

9.2 Setup (cont.)

To change the BACNet Device ID (see Figure 57), under Device Configuration, click on Edit and a screen similar to Figure 58 appears. Enter the flow meter type and/or the device ID and click on “Save Settings” to save the change or “Cancel Changes” to return to the previous value. Click on Main Page to return to the main page.

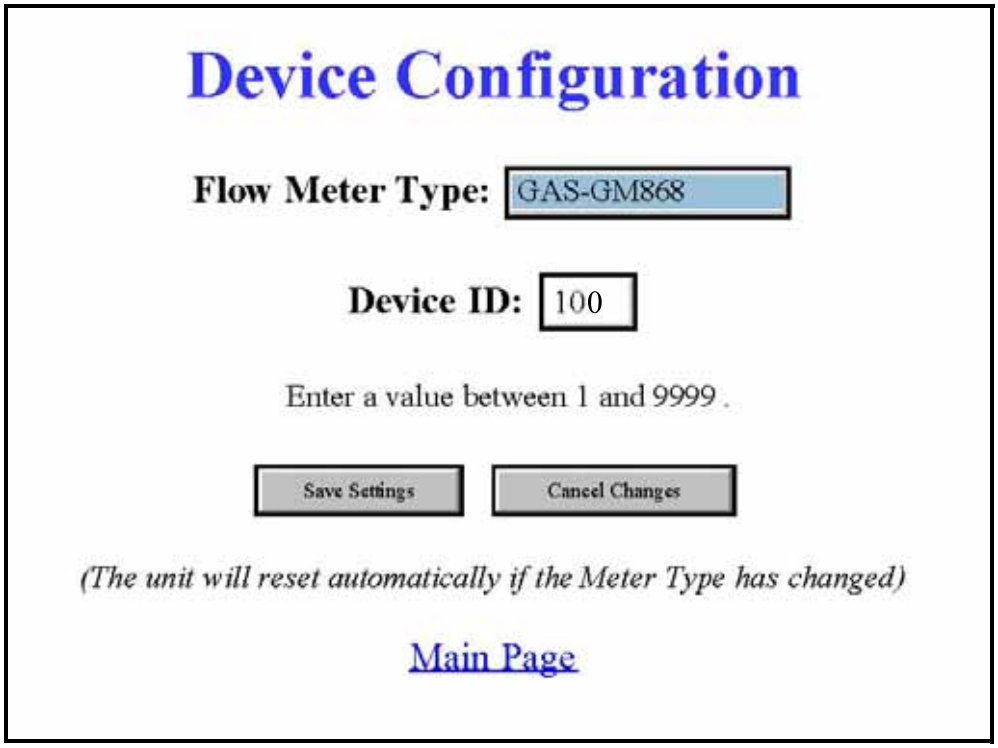


Figure 58: Device Configuration

9.2 Setup (cont.)

To change the IP address, under Network Settings, click on Edit and a screen similar to the following appears. Enter the new address and click on “Save Settings” to save the change, or “Cancel Changes” to return to the previous setting. You must type the new IP in the browser to return to the main page.

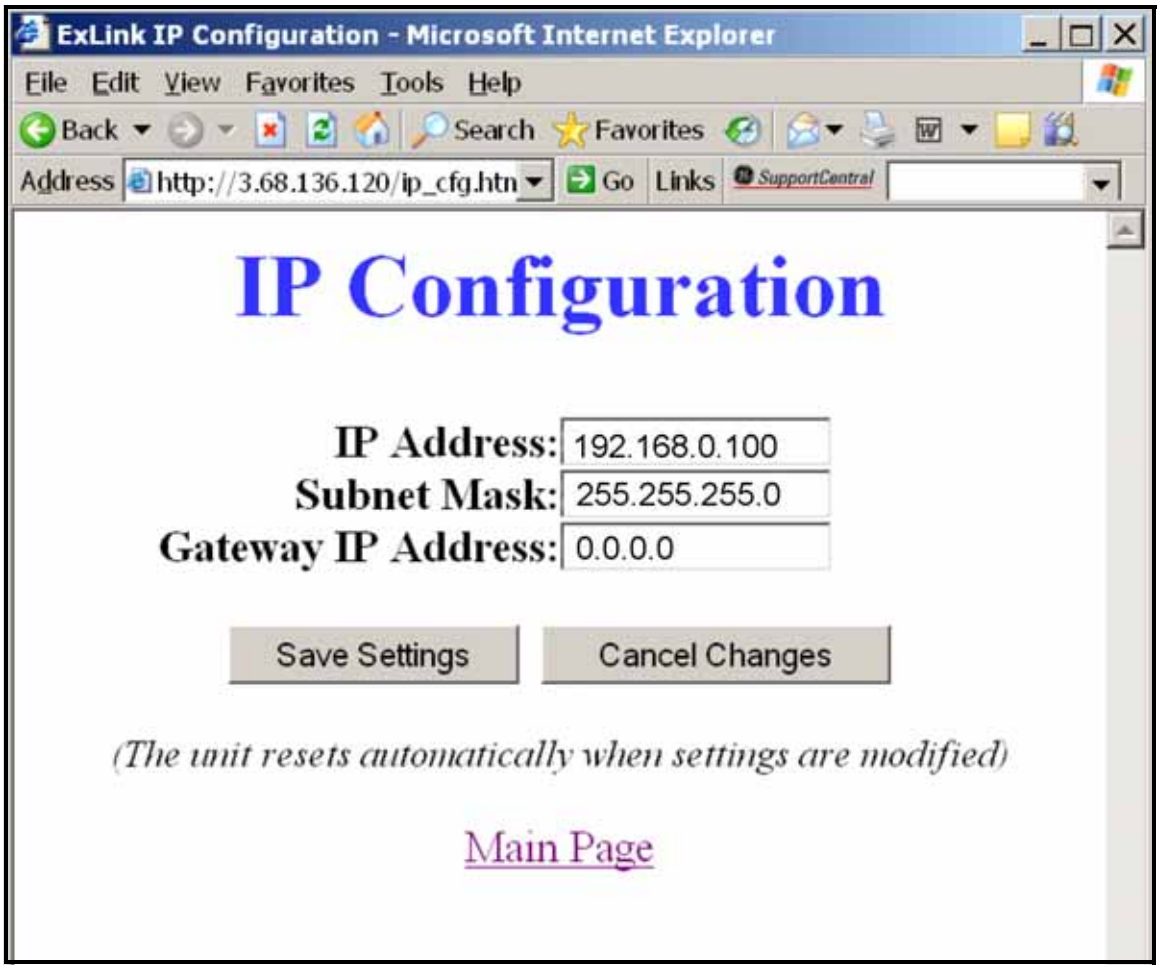
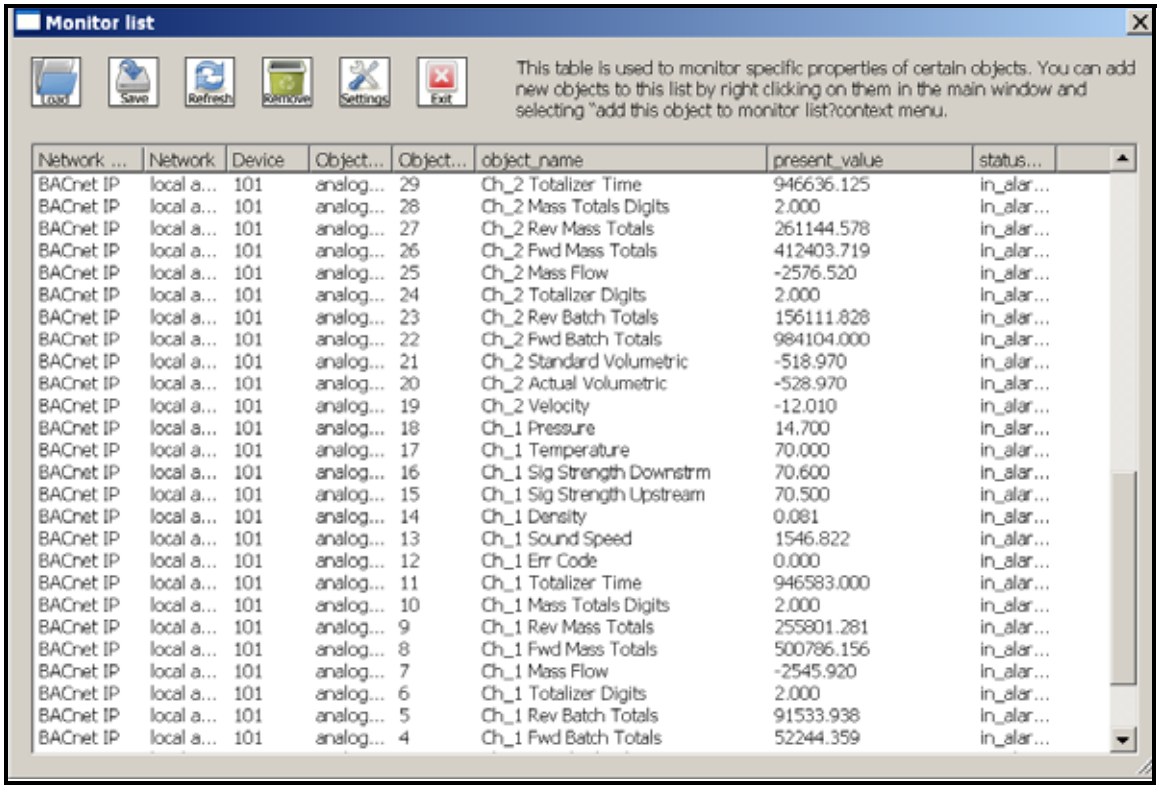


Figure 59: IP Configuration

9.3 Adding Information to the Monitor List

To test connectivity and view data, use any BACNet monitoring software.

The table shown in Figure 60 is used to monitor specific properties of certain objects on the CAS BACNet Explorer. To add new objects to this list, right click on the BACNet device in the main window and select “add this device’s object to monitor list” context menu.



Network ...	Network	Device	Object...	Object...	object_name	present_value	status...
BACnet IP	local a...	101	analog...	29	Ch_2 Totalizer Time	946636.125	in_alar...
BACnet IP	local a...	101	analog...	28	Ch_2 Mass Totals Digits	2.000	in_alar...
BACnet IP	local a...	101	analog...	27	Ch_2 Rev Mass Totals	261144.578	in_alar...
BACnet IP	local a...	101	analog...	26	Ch_2 Fwd Mass Totals	412403.719	in_alar...
BACnet IP	local a...	101	analog...	25	Ch_2 Mass Flow	-2576.520	in_alar...
BACnet IP	local a...	101	analog...	24	Ch_2 Totalizer Digits	2.000	in_alar...
BACnet IP	local a...	101	analog...	23	Ch_2 Rev Batch Totals	156111.828	in_alar...
BACnet IP	local a...	101	analog...	22	Ch_2 Fwd Batch Totals	984104.000	in_alar...
BACnet IP	local a...	101	analog...	21	Ch_2 Standard Volumetric	-518.970	in_alar...
BACnet IP	local a...	101	analog...	20	Ch_2 Actual Volumetric	-528.970	in_alar...
BACnet IP	local a...	101	analog...	19	Ch_2 Velocity	-12.010	in_alar...
BACnet IP	local a...	101	analog...	18	Ch_1 Pressure	14.700	in_alar...
BACnet IP	local a...	101	analog...	17	Ch_1 Temperature	70.000	in_alar...
BACnet IP	local a...	101	analog...	16	Ch_1 Sig Strength Downstrm	70.600	in_alar...
BACnet IP	local a...	101	analog...	15	Ch_1 Sig Strength Upstream	70.500	in_alar...
BACnet IP	local a...	101	analog...	14	Ch_1 Density	0.081	in_alar...
BACnet IP	local a...	101	analog...	13	Ch_1 Sound Speed	1546.822	in_alar...
BACnet IP	local a...	101	analog...	12	Ch_1 Err Code	0.000	in_alar...
BACnet IP	local a...	101	analog...	11	Ch_1 Totalizer Time	946583.000	in_alar...
BACnet IP	local a...	101	analog...	10	Ch_1 Mass Totals Digits	2.000	in_alar...
BACnet IP	local a...	101	analog...	9	Ch_1 Rev Mass Totals	255801.281	in_alar...
BACnet IP	local a...	101	analog...	8	Ch_1 Fwd Mass Totals	500786.156	in_alar...
BACnet IP	local a...	101	analog...	7	Ch_1 Mass Flow	-2545.920	in_alar...
BACnet IP	local a...	101	analog...	6	Ch_1 Totalizer Digits	2.000	in_alar...
BACnet IP	local a...	101	analog...	5	Ch_1 Rev Batch Totals	91533.938	in_alar...
BACnet IP	local a...	101	analog...	4	Ch_1 Fwd Batch Totals	52244.359	in_alar...

Figure 60: Monitor List Context Menu

Warranty

Each instrument manufactured by GE Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

[no content intended for this page]

Customer Support Centers

U.S.A.

The Boston Center
1100 Technology Park Drive
Billerica, MA 01821
U.S.A.
Tel: 800 833 9438 (toll-free)
978 437 1000
E-mail: sensing@ge.com

Ireland

Sensing House
Shannon Free Zone East
Shannon, County Clare
Ireland
Tel: +353 61 61470291
E-mail: gesensingsnnservices@ge.com

www.ge-mcs.com