

Eldridge Products, Inc.

*Master-Touch™
and ValuMass™*

Modbus Communications

*INSTRUCTION MANUAL
80202201 (Rev. 2.1)*



Eldridge Products, Inc.
2700 Garden Road, Building A
Monterey, CA 93940

Tel: 800/321-3569
or 831/648-7777
Fax: 831/648-7780
Email: sales@epiflow.com

Table of Contents

Table of Contents	3
Section A Overview	1
RS485 Physical Layer	1
Modbus Address	1
Commands Supported.....	1
Function Code 03 (\$03) Read Holding Registers.....	1
Command String to the field device or EPI Meter	1
Section B Flowmeter Firmware.....	3
Master-Touch™ Firmware 5.x	3
200 *Utility* Submenus	3
Master-Touch™ Firmware 6.x	4
200 *Utility* Submenus	4
ValuMass™ Firmware 1.x	5
200 *Utility* Submenus	5
Section C EPICommunicator™ 2.1x.....	6
Master-Touch™ Firmware 5.x and 6.x	6
ValuMass™ Firmware 1.x	6
EPICommunicator™ Screens.....	7
Master-Touch™ Firmware 5.x.....	7
Menu 210.....	7
Menu 226.....	8
Menu 233.....	8
Master-Touch™ Firmware 6.x.....	9
Menu 210.....	9
Menu 226.....	10
Menu 233.....	10
ValuMass™ Firmware 1.x.....	11
Menu 218.....	11
Menu 226.....	12
Menu 233.....	12
EPICommunicator™ Modbus Module	13
Settings Window / Modbus Comm Port.....	14
Modbus Icon.....	14
Modbus Module.....	14
Modbus Settings	15
Section D Modbus Wiring.....	16

Section A Overview

The intention of this implementation is to communicate the Flow Rate, Flow Total, and Temperature (Temperature not available on all units) using the Modbus protocol on a RS485 physical layer.

This device is a slave device that supports the Modbus RTU protocol. It is assumed that the user has a copy of the Modbus specification or is Modbus literate. It is not the intention of this document to explain the specifics of the protocol. However the document discusses the device's implementation of the specification. This device uses the RS485 physical layer to communicate the protocol.

If any aspect of the implementation does not meet the requirements for your application, please contact the factory regarding upgrading the firmware. Examples of potential upgrades would be a different baud rate, other commands not supported, exception handling, device parameter configuration, etc.

RS485 Physical Layer

The slave device uses a RS485 port with no termination resistors applied on the device. When the device's Modbus address is set by the user, the default port configuration is 19200 baud, 1 start bit, 8 data bits, even Parity, 1 stop bit. The baud and parity values are modifiable after the Modbus address has been set.

Modbus Address

Refer to Section C of this Manual for instructions on how to set the flowmeter's Modbus address. Each time the Modbus Address command is executed the port defaults are programmed.

Commands Supported

The protocol is implemented in RTU mode, not ASCII. This means that each data byte is in Hex format and there is no start of message frame character. Please see the Modbus specification for details. The following is the only supported function code:

Function Code 03 (03) Read Holding Registers

This function code is used to obtain static and dynamic data from the device. The information — flow rate, flow total, etc. — is transmitted in Hex format in two bytes (registers). For example, registers 40001 & 40002 are the flow rate, registers 40003 & 40004 are the flow total, and so on.

The dynamic data available:

40001 - 40002: flow rate (convert Hex to 32 bit IEEE 754 Encoded)

40003 - 40004: flow total (convert Hex to 32 bit IEEE 754 Encoded)

The static data available:

40007 - 40008: serial number (convert Hex to Decimal)

40009 - 40010: flow units (convert Hex to ASCII Encoded)

40011 - 40012: total units (convert Hex to ASCII Encoded)

Command String to the field device or EPI Meter

```
mb_msg[0] = X; // where X is the modbus address
```

```
mb_msg[1] = 3; // value of the command
```

```
mb_msg[2] = 0; // Starting Register Address
```

```
mb_msg[3] = 1; // Starting Register Address
mb_msg[4] = 0; // Ending Register Address
mb_msg[5] = 2; // Ending Register A
calculate_crc (6); // calculate the CRC not including the CRC locations
mb_msg[6] = crc_hi; // store the high byte of the CRC
mb_msg[7] = crc_lo; // store the low byte of the crc
mb_msg[5] indicates the number of Registers to send back
mb_msg[2,3] is the register address to start sending back
```

Address 0 = Starts with Flow Rate

Address 2 = Starts with Total

Address 4 = Starts with Temperature

Address 6 = Starts with Serial Number

Address 8 = Starts with Flow Units

Address 10 = Starts with Total Units

Address 12 = Starts with Max Range

Address 14 = Starts with Full Scale

Each Register requested returns 4 bytes

Example:

Command: 01 03 00 01 10 HH LL // sends all the registers back

Response: 01 03 XX 11 11 22 22 33 33 44 44 55 55 66 66 77 77 88 88 HH LL

where

XX = Byte Count

11 11 = Flow Rate

22 22 = Total

33 33 = Temperature

44 44 = Serial Number

55 55 = Flow Units

66 66 = Total Units

77 77 = Max Range

88 88 = Full Scale

Section B Flowmeter Firmware

Master-Touch™ Firmware 5.x

The Master-Touch™ 5.x firmware is installed on all standard Series 8000MP-8800MP and Series 8000MPNH-8800MPNH flowmeters.

If the Temperature Output option or the 3Txxx option for wide process gas temperatures was requested for your flowmeter, refer to the information for firmware version 6.x.

The submenus for Modbus are shown below. It is assumed that the user has a basic familiarity with the Master-Touch™ firmware, its menu system and the process for data entry. The menuing system is accessed by using the 4-button keypad or a Communicator™ II handheld infrared device.

200 *Utility* Submenus

210-Modbus Addr	This menu item is used to set the Modbus address for the flowmeter. The value can be 1 to 127.
226-Set RS485 Baud	This menu item adjusts the baud rate of the RS485 port. 0 = Factory Default (19200) 1 = 9600 2 = 14400 3 = 19200 4 = 28800 5 = 33400 6 = 56000 7 = 57600 8 = 115200
233-SetRS485Parity	This menu item adjusts the parity of the RS485 port. 0 = 1 8 NONE 1 1 = 1 8 EVEN 1 (Factory Default) 2 = 1 8 ODD 1 3 = 1 8 NONE 2

Although the Modbus communications can be set up using the firmware menuing system, it is strongly recommended that you use our free EPICommunicator™ v2.1x software for this process.

Master-Touch™ Firmware 6.x

The Master-Touch™ 6.x firmware is installed on all Series 9100MP-9800MP and Series 9100MPNH-9800MPNH Flow Averaging Tube (FAT™) flowmeters.

The submenus for Modbus are shown below. It is assumed that the user has a basic familiarity with the Master-Touch™ firmware, its menu system and the process for data entry. The menuing system is accessed by using the 4-button keypad or a Communicator™ II handheld infrared device.

200 *Utility* Submenus

210-Modbus Addr	This menu item is used to set the Modbus address for the flowmeter. The value can be 1 to 127.
-----------------	--

226-SetRS485Baud	This menu item adjusts the baud rate of the RS485 port. 0 = Factory Default (19200) 1 = 9600 2 = 14400 3 = 19200 4 = 28800 5 = 33400 6 = 56000 7 = 57600 8 = 115200
------------------	--

233-SetRS485Parity	This menu item adjusts the parity of the RS485 port. 0 = 1 8 NONE 1 1 = 1 8 EVEN 1 (Factory Default) 2 = 1 8 ODD 1 3 = 1 8 NONE 2
--------------------	---

Although the Modbus communications can be set up using the firmware menuing system, it is strongly recommended that you use our free EPICommunicator™ v2.1x software for this process.

ValuMass™ Firmware 1.x

The ValuMass™ 1.x firmware is installed on all Series 500 and 540 flowmeters.

The submenus for Modbus are shown below. It is assumed that the user has a basic familiarity with the ValuMass™ firmware, its menu system and the process for data entry. The menuing system is accessed by using a Communicator™ II handheld infrared device.

200 *Utility* Submenus

218-Modbus Addr	This menu item is used to set the Modbus address for the flowmeter. The value can be 1 to 127.
226-SetRS485Baud	This menu item adjusts the baud rate of the RS485 port. 0 = Factory Default (19200) 1 = 9600 2 = 14400 3 = 19200 4 = 28800 5 = 33400 6 = 56000 7 = 57600 8 = 115200
233-SetRS485Parity	This menu item adjusts the parity of the RS485 port. 0 = 1 8 NONE 1 1 = 1 8 EVEN 1 (Factory Default) 2 = 1 8 ODD 1 3 = 1 8 NONE 2

Although the Modbus communications can be set up using the firmware menuing system, it is strongly recommended that you use our free EPICommunicator™ v2.1x software for this process.

Section C EPICommunicator™ 2.1x

EPICommunicator™ 2.1x (EPICom) software is compatible with Master-Touch™ firmware versions 5.x and 6.x and with ValuMass firmware version 1.x. It includes the Modbus menu selections and a separate Modbus Module for communication with as many as eight (8) flowmeters. It is assumed that the user has a basic familiarity with the EPICom software, its menu system and the process for data entry.

To prepare for this process, check the RS232 and Modbus Comm Port numbers to which the flowmeter is connected by viewing Hardware Manager on your PC and make note of these ports. You must also know the Parity values required by your system or network. Please refer to Section B of this Manual for the menu descriptions.

Master-Touch™ Firmware 5.x and 6.x

Use the following directions to set up Master-Touch™ Firmware 5.x and 6.x for Modbus communications.

- Launch EPICom version 2.1x
- Confirm the RS232 Comm Port connection settings for the flowmeter in the View/Settings menu
- Click on the Terminal Mode icon in the EPICom tool bar to connect to the flowmeter
- After the start up screen appears, hold down the period (.) key until 100 Menus screen appears
- Type in "9001" at the prompt and press the Enter key to unlock the microprocessor settings
- Type in "210" at the prompt and press the Enter key to go to [Menu 210](#)
- Type in a value from 1 to 127 at prompt and press the Enter key

NOTE: This sets the Modbus Address to 1–127. This address must be unique for each flowmeter on the same network.

- Type in "226" at the prompt and press the Enter key to go to [Menu 226](#)
- Type in a number between 1 and 8, corresponding to the desired Baud rate, and press the Enter key
- Type in "233" at the prompt and press the Enter key to go to [Menu 233](#)
- Type in a number between 1 and 4, corresponding to the desired Parity setting, and press the Enter key
- Type in "500" and press the Enter key to return the flowmeter to Run Mode

The flowmeter is now ready to communicate via RS485 Modbus RTU. Please refer to the instructions for your Modbus system or network for further directions.

ValuMass™ Firmware 1.x

Use the following directions to set up ValuMass Firmware 1.x for Modbus communications.

- Launch EPICom version 2.1x
- Confirm the RS232 Comm Port connection settings for the flowmeter in the View/Settings menu
- Click on the Terminal Mode icon in the EPICom tool bar to connect to the flowmeter
- After the start up screen appears, hold down the period (.) key until 100 Menus screen appears
- Type in "9001" at the prompt and press the Enter key to unlock the microprocessor settings
- Type in "218" at the prompt and press the Enter key to go to [Menu 218](#)
- Type in a value from 1 to 127 at prompt and press the Enter key

NOTE: This sets the Modbus Address to 1–127. This address must be unique for each flowmeter on the same network.

- Type in “226” at the prompt and press the Enter key to go to [Menu 226](#)
- Type in a number between 1 and 8, corresponding to the desired Baud rate, and press the Enter key
- Type in “233” at the prompt and press the Enter key to go to [Menu 233](#)
- Type in a number between 1 and 4, corresponding to the desired Parity setting, and press the Enter key
- Type in “500” and press the Enter key to return the flowmeter to Run Mode

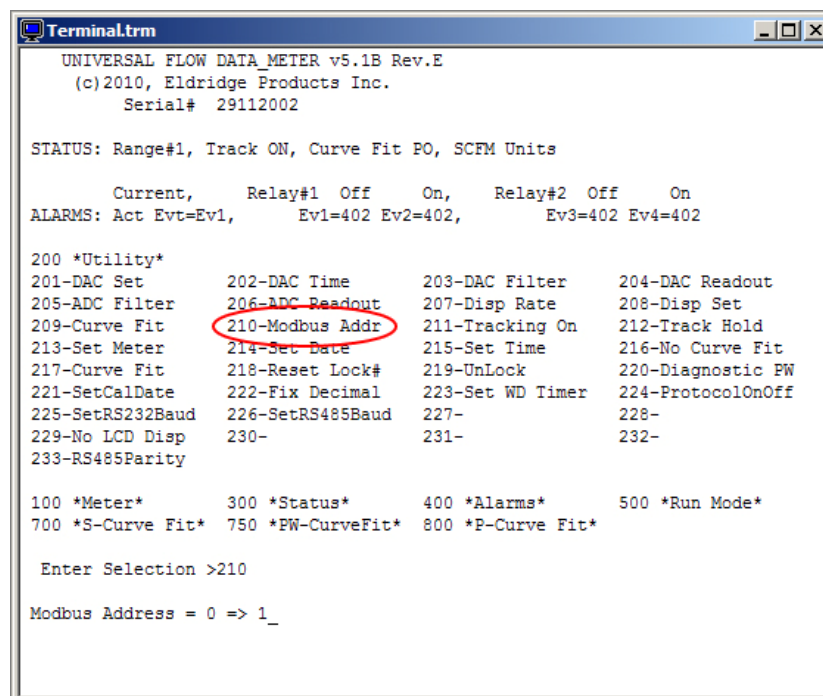
The flowmeter is now ready to communicate via RS485 Modbus RTU. Please refer to the instructions for your Modbus system or network for further directions.

EPICommunicator™ Screens

Master-Touch™ Firmware 5.x

The following are the EPICom screens that you will see when setting up the Modbus communications for Firmware 5.x installed on most Series 8000MP-8800MP and Series 8000MPNH-8800MPNH flowmeters:

Menu 210



```

Terminal.trm
UNIVERSAL FLOW DATA METER v5.1B Rev.E
(c)2010, Eldridge Products Inc.
Serial# 29112002

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201-DAC Set 202-DAC Time 203-DAC Filter 204-DAC Readout
205-ADC Filter 206-ADC Readout 207-Disp Rate 208-Disp Set
209-Curve Fit 210-Modbus Addr 211-Tracking On 212-Track Hold
213-Set Meter 214-Set Date 215-Set Time 216-No Curve Fit
217-Curve Fit 218-Reset Lock# 219-UnLock 220-Diagnostic PW
221-SetCalDate 222-Fix Decimal 223-Set WD Timer 224-ProtocolOnOff
225-SetRS232Baud 226-SetRS485Baud 227- 228-
229-No LCD Disp 230- 231- 232-
233-RS485Parity

100 *Meter* 300 *Status* 400 *Alarms* 500 *Run Mode*
700 *S-Curve Fit* 750 *PW-CurveFit* 800 *P-Curve Fit*

Enter Selection >210

Modbus Address = 0 => 1_

```

Menu 226

```

Terminal.trm
UNIVERSAL FLOW DATA METER v5.1B Rev.E
(c)2010, Eldridge Products Inc.
Serial# 29112002

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201-DAC Set 202-DAC Time 203-DAC Filter 204-DAC Readout
205-ADC Filter 206-ADC Readout 207-Disp Rate 208-Disp Set
209-Curve Fit 210-Modbus Addr 211-Tracking On 212-Track Hold
213-Set Meter 214-Set Date 215-Set Time 216-No Curve Fit
217-Curve Fit 218-Reset Lock# 219-UnLock 220-Diagnostic PW
221-SetCalDate 222-Fix Decimal 223-Set WD Timer 224-ProtocolOnOff
225-SetRS232Baud 226-SetRS485Baud 227- 228-
229-No LCD Disp 230- 231- 232-
233-RS485Parity

100 *Meter* 300 *Status* 400 *Alarms* 500 *Run Mode*
700 *S-Curve Fit* 750 *PW-CurveFit* 800 *P-Curve Fit*

Enter Selection >226

Set RS485 Baud = 3 => 3
    
```

Menu 233

```

Terminal.trm
UNIVERSAL FLOW DATA METER v5.1B Rev.E
(c)2010, Eldridge Products Inc.
Serial# 29112002

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201-DAC Set 202-DAC Time 203-DAC Filter 204-DAC Readout
205-ADC Filter 206-ADC Readout 207-Disp Rate 208-Disp Set
209-Curve Fit 210-Modbus Addr 211-Tracking On 212-Track Hold
213-Set Meter 214-Set Date 215-Set Time 216-No Curve Fit
217-Curve Fit 218-Reset Lock# 219-UnLock 220-Diagnostic PW
221-SetCalDate 222-Fix Decimal 223-Set WD Timer 224-ProtocolOnOff
225-SetRS232Baud 226-SetRS485Baud 227- 228-
229-No LCD Disp 230- 231- 232-
233-RS485Parity

100 *Meter* 300 *Status* 400 *Alarms* 500 *Run Mode*
700 *S-Curve Fit* 750 *PW-CurveFit* 800 *P-Curve Fit*

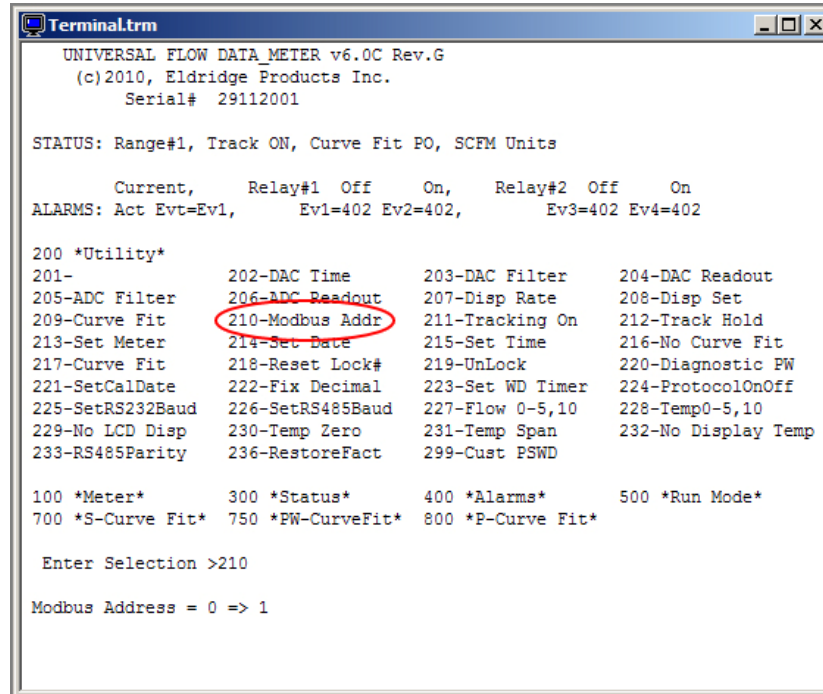
Enter Selection >233

SetRS485Parity = 0 => 2
    
```

Master-Touch™ Firmware 6.x

The following are the EPICom screens that you will see when setting up the Modbus communications for Firmware 5.x installed on most Series 9100MP-9800MP and Series 9100MPNH-9800MPNH Flow Averaging Tube (FAT™) flowmeters:

Menu 210



```
Terminal.trm
UNIVERSAL FLOW DATA METER v6.0C Rev.G
(c)2010, Eldridge Products Inc.
Serial# 29112001

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201-
205-ADC Filter
209-Curve Fit
213-Set Meter
217-Curve Fit
221-SetCalDate
225-SetRS232Baud
229-No LCD Disp
233-RS485Parity

202-DAC Time
206-ADC Readout
210-Modbus Addr
214-Set Date
218-Reset Lock#
222-Fix Decimal
226-SetRS485Baud
230-Temp Zero
236-RestoreFact

203-DAC Filter
207-Disp Rate
211-Tracking On
215-Set Time
219-UnLock
223-Set WD Timer
227-Flow 0-5,10
231-Temp Span
299-Cust PSWD

204-DAC Readout
208-Disp Set
212-Track Hold
216-No Curve Fit
220-Diagnostic PW
224-ProtocolOnOff
228-Temp0-5,10
232-No Display Temp

100 *Meter*
700 *S-Curve Fit*

300 *Status*
750 *PW-CurveFit*

400 *Alarms*
800 *P-Curve Fit*

500 *Run Mode*

Enter Selection >210

Modbus Address = 0 => 1
```

Menu 226

```

Terminal.trm
UNIVERSAL FLOW DATA METER v6.0C Rev.G
(c)2010, Eldridge Products Inc.
Serial# 29112001

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201- 202-DAC Time 203-DAC Filter 204-DAC Readout
205-ADC Filter 206-ADC Readout 207-Disp Rate 208-Disp Set
209-Curve Fit 210-Modbus Addr 211-Tracking On 212-Track Hold
213-Set Meter 214-Set Date 215-Set Time 216-No Curve Fit
217-Curve Fit 218-Reset Lock# 219-UnLock 220-Diagnostic PW
221-SetCalDate 222-Fix Decimal 223-Set WD Timer 224-ProtocolOnOff
225-SetRS232Baud 226-SetRS485Baud 227-Flow 0-5,10 228-Temp0-5,10
229-No LCD Disp 230-Temp Zero 231-Temp Span 232-No Display Temp
233-RS485Parity 236-RestoreFact 299-Cust PSWD

100 *Meter* 300 *Status* 400 *Alarms* 500 *Run Mode*
700 *S-Curve Fit* 750 *PW-CurveFit* 800 *P-Curve Fit*

Enter Selection >226

Set RS485 Baud = 3 => 3_
    
```

Menu 233

```

Terminal.trm
UNIVERSAL FLOW DATA METER v6.0C Rev.G
(c)2010, Eldridge Products Inc.
Serial# 29112001

STATUS: Range#1, Track ON, Curve Fit PO, SCFM Units

Current, Relay#1 Off On, Relay#2 Off On
ALARMS: Act Evt=Ev1, Ev1=402 Ev2=402, Ev3=402 Ev4=402

200 *Utility*
201- 202-DAC Time 203-DAC Filter 204-DAC Readout
205-ADC Filter 206-ADC Readout 207-Disp Rate 208-Disp Set
209-Curve Fit 210-Modbus Addr 211-Tracking On 212-Track Hold
213-Set Meter 214-Set Date 215-Set Time 216-No Curve Fit
217-Curve Fit 218-Reset Lock# 219-UnLock 220-Diagnostic PW
221-SetCalDate 222-Fix Decimal 223-Set WD Timer 224-ProtocolOnOff
225-SetRS232Baud 226-SetRS485Baud 227-Flow 0-5,10 228-Temp0-5,10
229-No LCD Disp 230-Temp Zero 231-Temp Span 232-No Display Temp
233-RS485Parity 236-RestoreFact 299-Cust PSWD

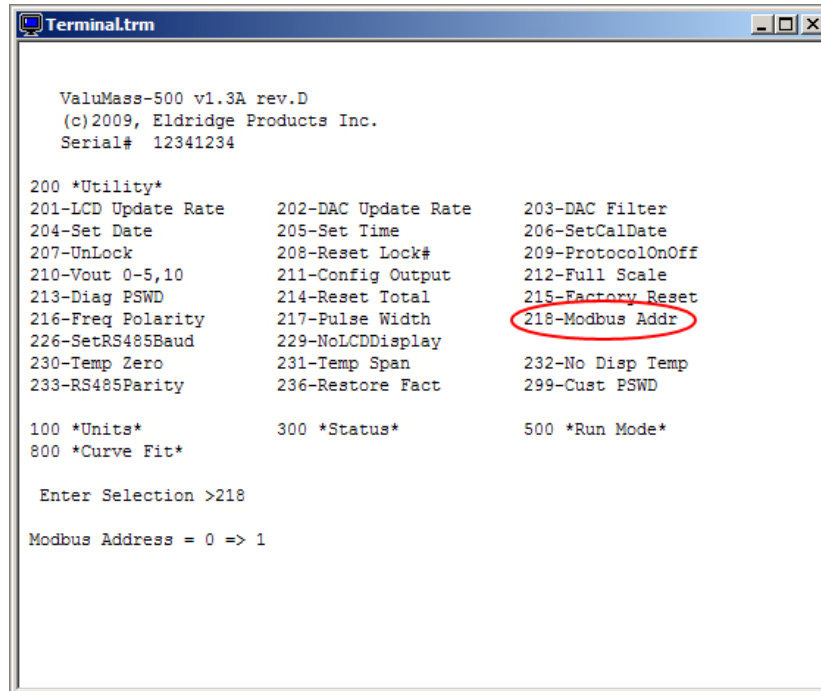
100 *Meter* 300 *Status* 400 *Alarms* 500 *Run Mode*
700 *S-Curve Fit* 750 *PW-CurveFit* 800 *P-Curve Fit*

Enter Selection >233

RS485Parity = 0 => 1
    
```

ValuMass™ Firmware 1.x

The following are the EPICom screens that you will see when setting up the Modbus communications for Firmware 1.x installed on ValuMass flowmeters:

Menu 218

```
Terminal.trm

ValuMass-500 v1.3A rev.D
(c)2009, Eldridge Products Inc.
Serial# 12341234

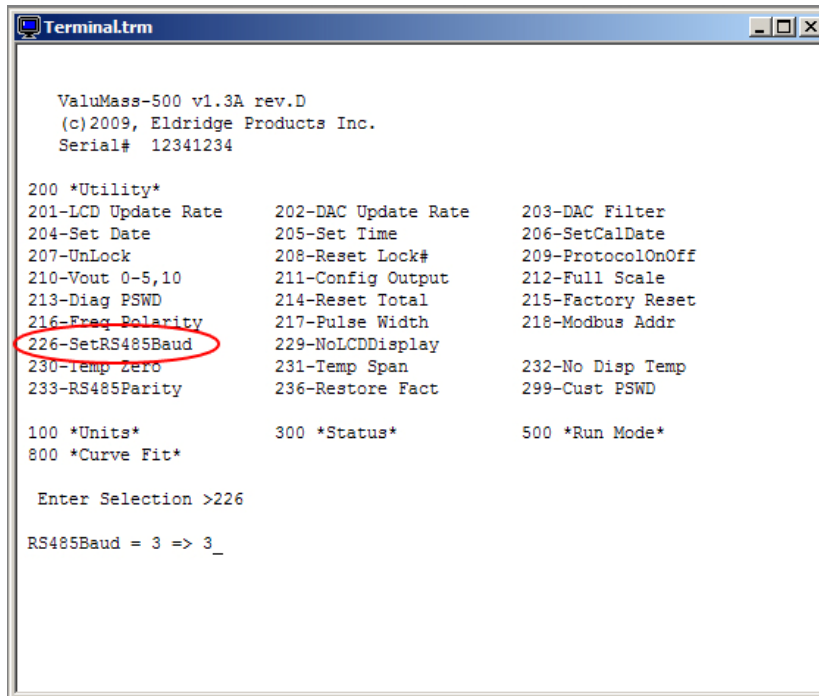
200 *Utility*
201-LCD Update Rate      202-DAC Update Rate      203-DAC Filter
204-Set Date             205-Set Time             206-SetCalDate
207-UnLock              208-Reset Lock#         209-ProtocolOnOff
210-Vout 0-5,10         211-Config Output       212-Full Scale
213-Diag PSWD           214-Reset Total         215-Factory Reset
216-Freq Polarity       217-Pulse Width         218-Modbus Addr
226-SetRS485Baud        229-NoLCDDisplay        232-No Disp Temp
230-Temp Zero           231-Temp Span           236-Restore Fact
233-RS485Parity         236-Restore Fact        299-Cust PSWD

100 *Units*              300 *Status*            500 *Run Mode*
800 *Curve Fit*

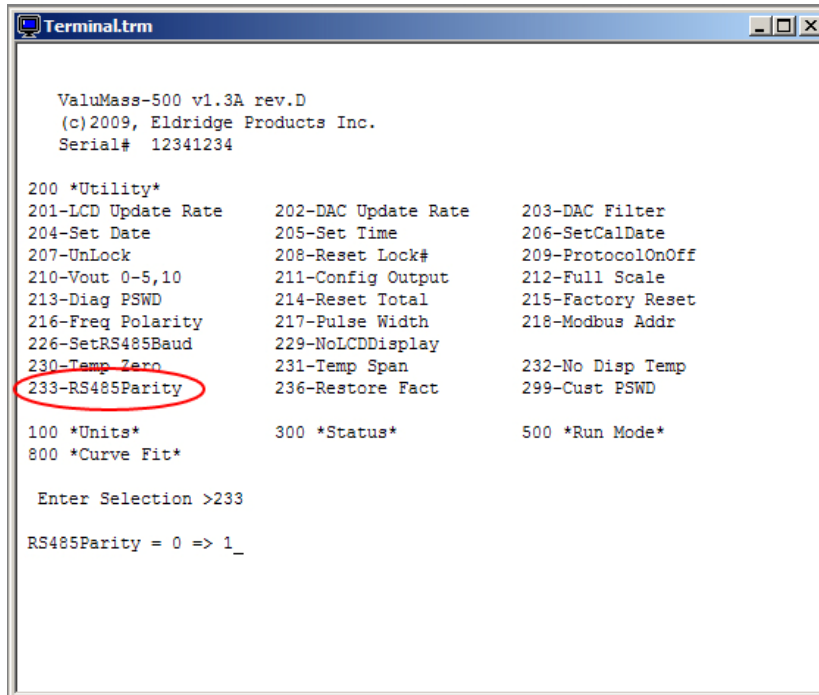
Enter Selection >218

Modbus Address = 0 => 1
```

Menu 226



Menu 233



EPICommunicator™ Modbus Module

Use the following directions to set up the flowmeter to communicate with the Modbus Module:

- Go to the View Icon on EPICom tool bar
- Confirm the Modbus Comm Port connection settings for the flowmeter in the View/Settings menu
- Select the **Modbus Comm Port** Tab
- Select the same Comm Port as the USB Serial Port noted in Device Manager
- Select the Baud rate that matches the set up in the flowmeter (the Factory Default is 19200)
- Select the Parity setting that matches the set up in the flowmeter (the Factory Default is 1 8 EVEN 1)
- Exit Settings window
- Click on the **Modbus icon** to launch the EPI Modbus module

The selected Comm port # and baud rate are shown in the Modbus Module; confirm that the Modbus Address in the top left field is the same address that you set in Menu 210 of Firmware 5.x and 6.x, or in Menu 218 of Firmware 1.x.

NOTE: If this is not correct then redo the settings instructions

The flowmeter should be displaying flow rate and totalizer

NOTE: If this “times out”, there is a problem with your RS485 connection.

Then enter “2” in the Update Every Seconds Field, select the radial button, and then press the CMD 3 button

The CMD 3 button will change to a STOP Button

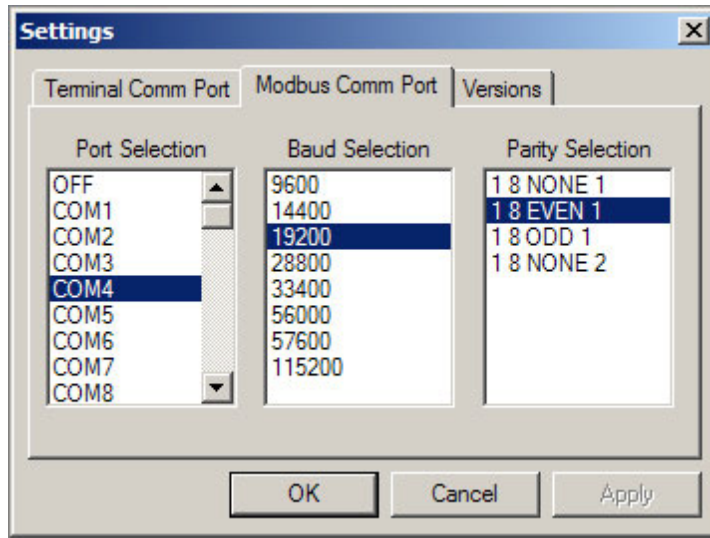
In the Top Left Box you will see the Flow Rate and Total the same as the flow rate and total on the terminal screen

To end the real-time communication, press the Stop button

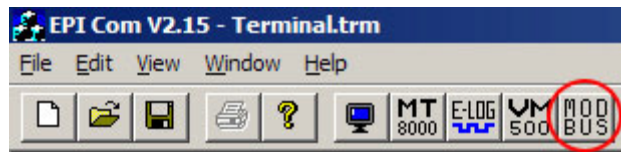
You can repeat this procedure to connect to as many as eight EPI flowmeters.

Always use the top left Modbus window as the first flowmeter. If this window is left blank, the Modbus Module will not communicate with any of the other connected flowmeters.

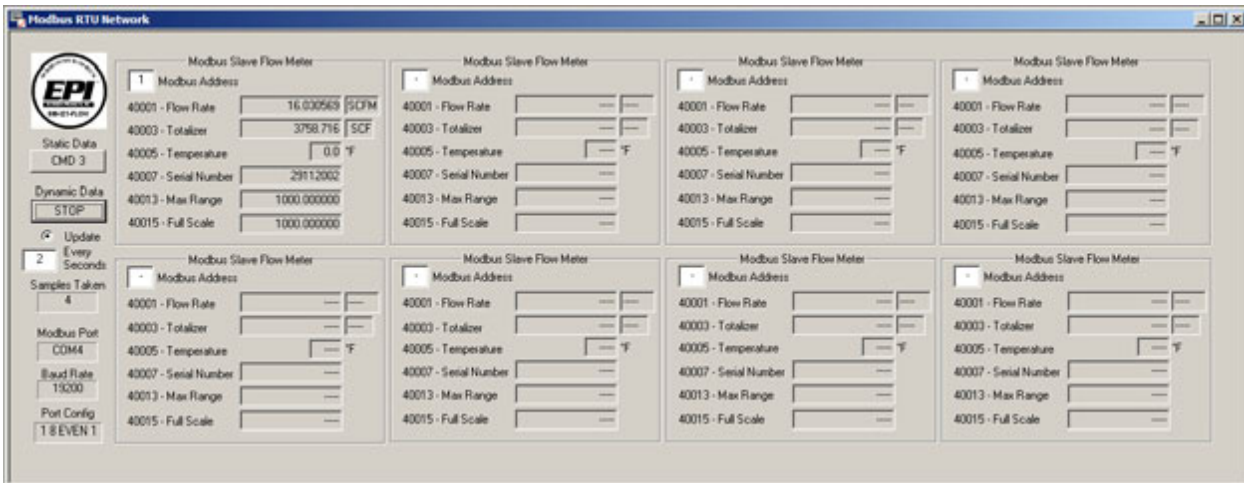
Settings Window / Modbus Comm Port



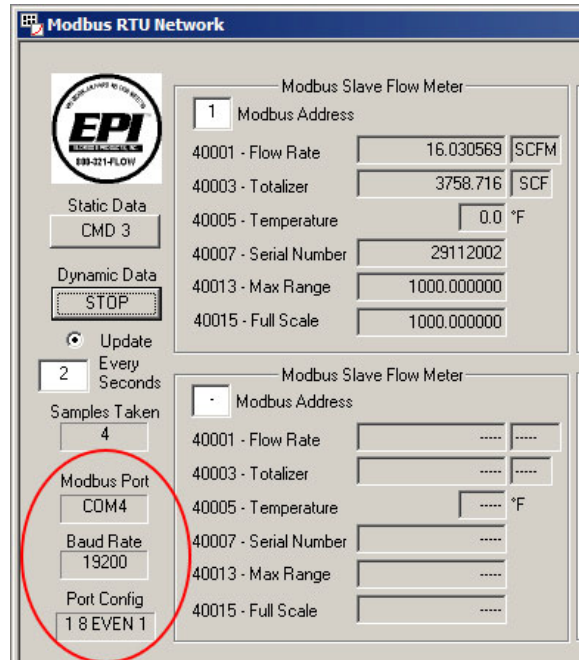
Modbus Icon



Modbus Module

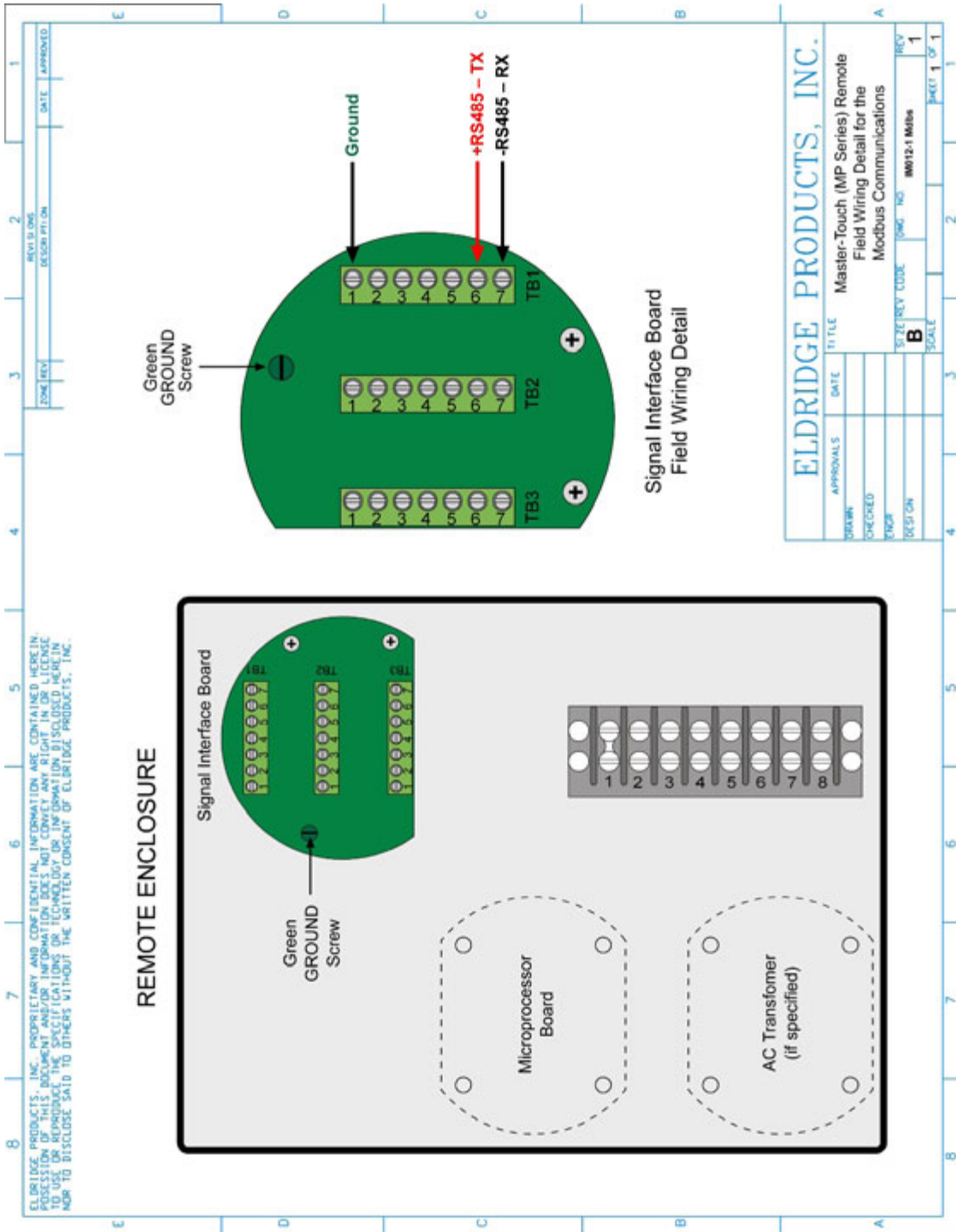


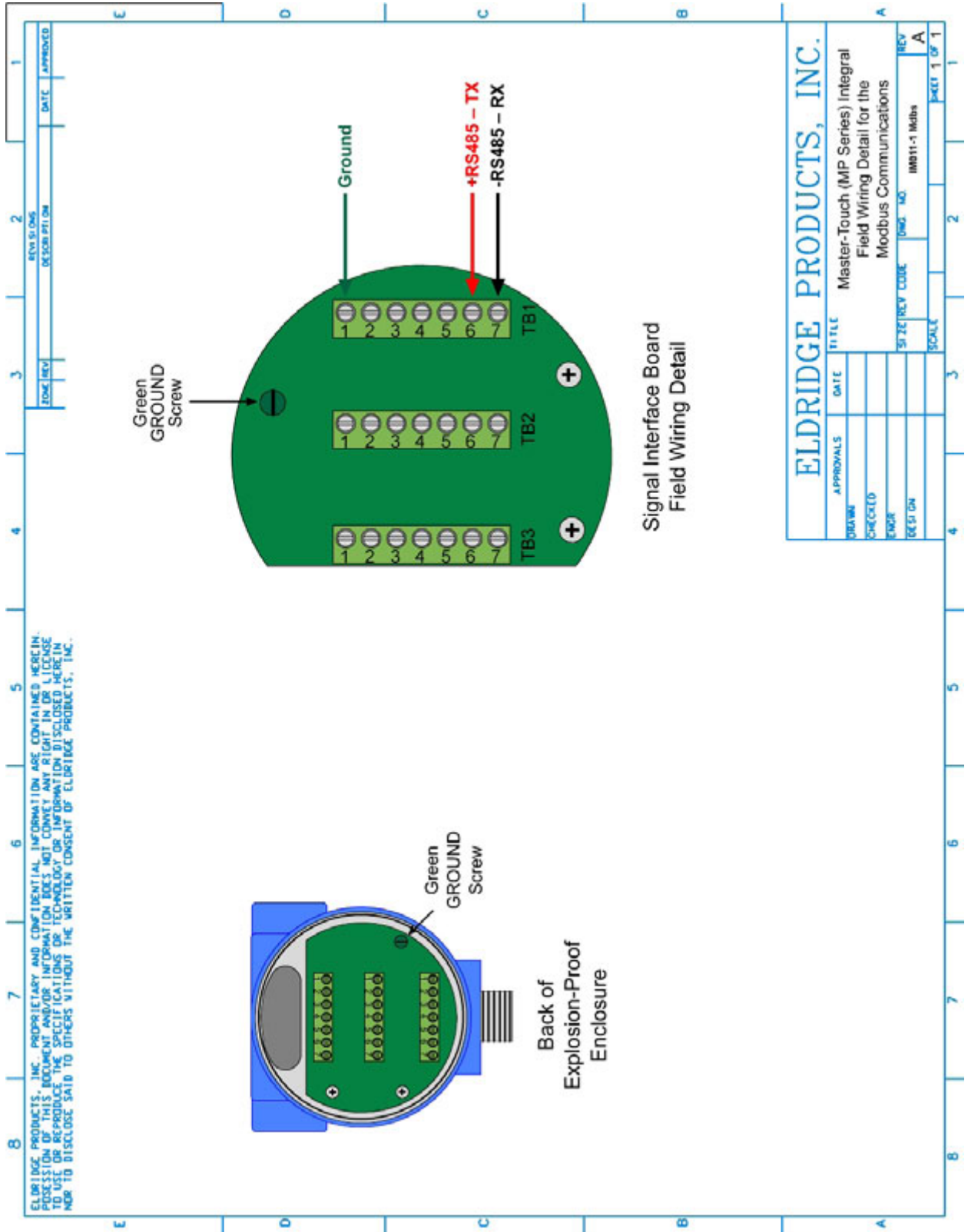
Modbus Settings



Section D Modbus Wiring

The following drawing show the wiring details for Modbus connections.





REV	DATE	APPROVED

ELDRIDGE PRODUCTS, INC.	
APPROVALS	TITLE
DATE	Master-Touch (MP Series) Integral
CHECKED	Field Wiring Detail for the
ENGINEER	Modbus Communications
DESIGN	SIZE/REV CODE
	IMB11-1 Modbus
	SCALE
	SHEET 1 OF 1

ELDRIDGE PRODUCTS, INC. PROPRIETARY AND CONFIDENTIAL INFORMATION ARE CONTAINED HEREIN. POSSESSION OF THIS DOCUMENT AND/OR INFORMATION DOES NOT CONVEY ANY RIGHT IN OR LICENSE TO USE OR REPRODUCE THE SPECIFICATIONS OR TECHNOLOGY OR INFORMATION DISCLOSED HEREIN NOR TO DISCLOSE SAID TO OTHERS WITHOUT THE WRITTEN CONSENT OF ELDRIDGE PRODUCTS, INC.

