Connect an ABB ProcessMaster Magnetic Flow Meter to an AMI/AMR System Using the SCADAmetrics MBE Encodalizer™

ABB (Stockholm, Sweden) is a global technology leader with over 140 years of history in electrification and automation.

The **ProcessMaster** (pictured left) is one of ABB's flagship, closed-pipe electromagnetic flow meters – aka "mag meter". Mag meters are based upon the principle of measuring fluid flow as proportional to voltage induced across the liquid by its flow through a magnetic field. Read more here.

Mag meters have no moving parts, and also have no protrusions into the flow tube – thereby lending themselves as suitable for both water and wastewater applications.

The **ProcessMaster** is available with SCADA connectivity, which includes a pulse (totalizing) output, a 4-20mA (flow) output, HART, Profibus, and Modbus/RTU (RS.485) industrial protocol.

Today, the latest release of the **SCADAmetrics Model MBE Modbus Encodalizer** now adds UI.1203 (Sensus) protocol and Neptune ECODER.PLUS protocol to this important flow meter, so that it may now be easily integrated into modern potable water AMI/AMR systems.

The purpose of this Application Note is to provide technical assistance to the **ProcessMaster** User who wishes to connect his meter to an AMI system.

This Application Note assumes that the ProcessMaster is outfitted with the optional Modbus/RTU communication card installed into Transmitter **Option Card Slot #1**.

ABB P/N: 3KQZ400028U0100
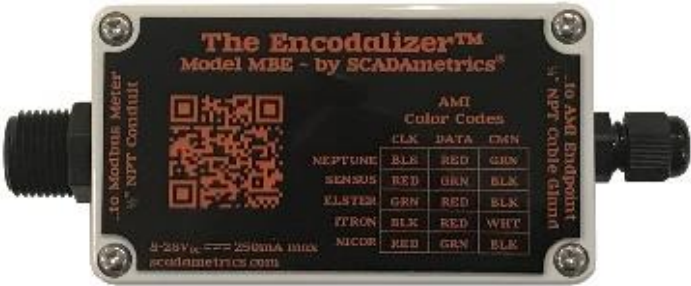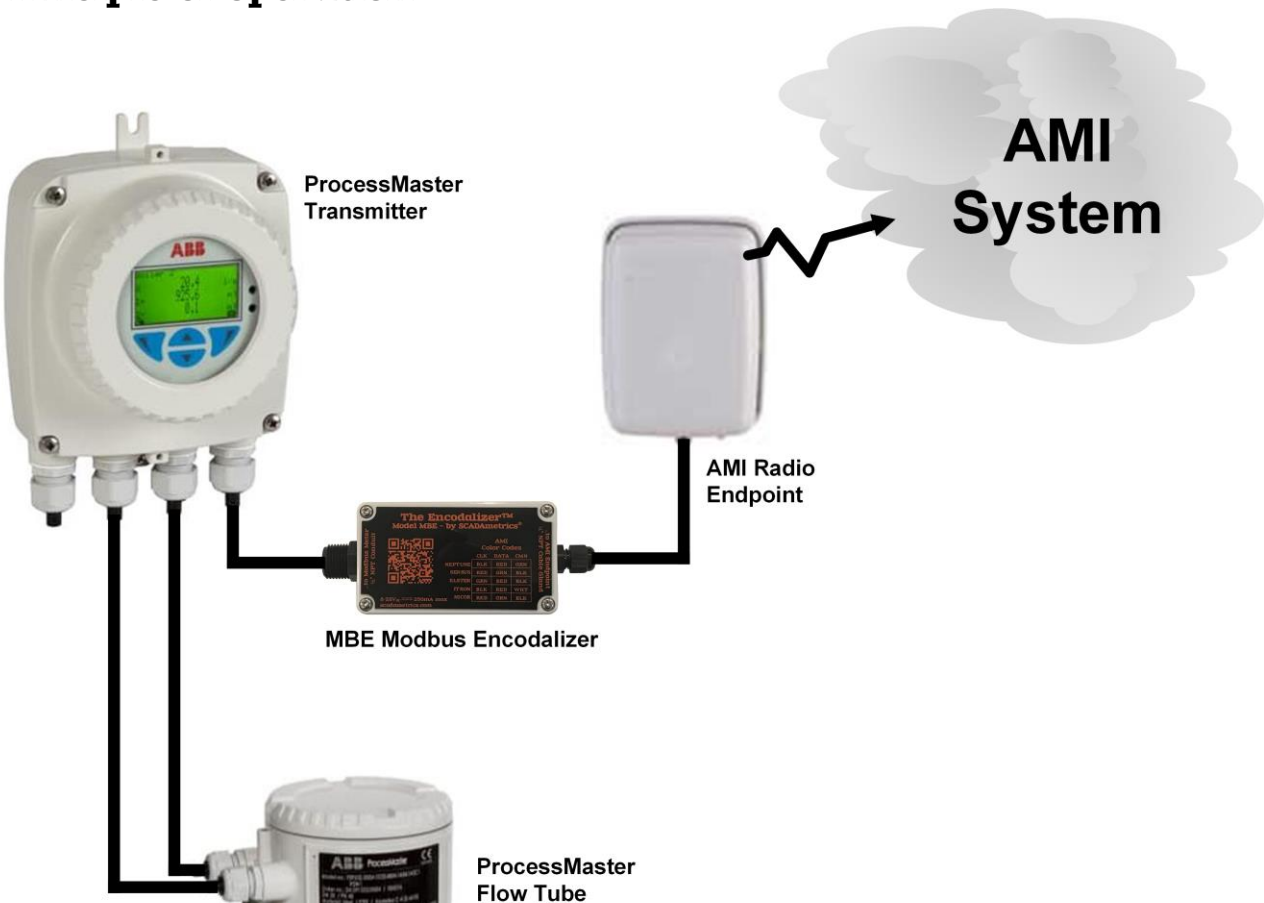**Modbus/RTU Communication Card**

The operational convenience of the **MBE Encodalizer** is based upon the principle that the User sets the Meter Type (Make & Model) via Encodalizer DIP switches, connects the Encodalizer to the meter via Modbus/RTU (2-Wire RS.485), and the Encodalizer interacts with the target meter using the meter's factory default Modbus/RTU settings.

Therefore, minimal setup of the **ProcessMaster** is required. All ProcessMaster factory defaults are used, including baud (9600), data bits (8), parity (odd), stop bits (1). The only settings that must be VERIFIED using the ProcessMaster's integral Display & Menu are the following: Modbus Device ID = "1" , IEEE Word Ordering = "Big-Endian".

James Mimlitz, SCADAmetrics – 'Slim'

Principle of Operation

ProcessMaster
Transmitter

AMI
System

AMI Radio
Endpoint

MBE Modbus Encodalizer

ProcessMaster
Flow Tube

AMI Color Codes	CLK	DATA	CMN
NEPTUNE	BLK	RED	GRN
SENSUS	RED	GRN	BLK
ELSTER	GRN	RED	BLK
ITRON	BLK	RED	WHT
NICOR	RED	GRN	BLK

8-28V = 250mA max
scadametrics.com

**Model MBE Modbus Encodalizer™
By SCADAmetrics**

Encodalizer DIP Switch Settings:

1. Set DIP Switches 1-6 Per Desired Data Type:

    - **"ProcessMaster <u>Forward</u> Total":**
      (DIP Switches **4=ON**. DIP Switches 1,2,3,5,6=OFF)

    - **"ProcessMaster <u>Reverse</u> Total":**
      (DIP Switches **1,4=ON**. DIP Switches 2,3,5,6=OFF)

    - **"ProcessMaster <u>Net</u> Total (Forward – Reverse)":**
      (DIP Switches **2,4=ON**. DIP Switches 1,3,5,6=OFF)

2. Set DIP Switches 7,8 = OFF,OFF.

3. Set DIP Switches 9,10 = OFF,OFF.

4. Set DIP Switches 11,12 per the Desired Number of Encoded Digits. For example, if 8 encoded digits are desired, then set 11,12 = OFF,**ON**.

5. Set DIP Switches 13,14,15,16 according to the desired totalizer multiplier.

    Example 1: The ProcessMaster Totalizer Screen Displays 925,402.44
    Desired AMI Reading: 00925402
    Set Multiplier DIP Switches to x1
    (13,14,15,16 = OFF,OFF,OFF,OFF)

    Example 2: The ProcessMaster Totalizer Screen Displays 925,402.44
    Desired AMI Reading: 00092540
    Set Multiplier DIP Switches to x10
    (13,14,15,16 = **ON**,OFF,OFF,OFF)

    Example 3: The ProcessMaster Totalizer Screen Displays 925,402.44
    Desired AMI Reading: 09254024
    Set Multiplier DIP Switches to x0.1
    (13,14,15,16 = OFF,OFF,**ON**,OFF)

ProcessMaster Communication Settings:

It is vitally important that the User ensure that the ProcessMaster communication factory defaults are pre-set as expected. Communication settings may be observed and modified (if necessary) through the ProcessMaster Display and Keypad Menu. The main communication parameters to watch are the following:

- **Communication Protocol = "Modbus"**
- **Modbus Device ID = "1"**
- **IEEE Word Ordering = "Big-Endian"**
- **Baud = "9600"**
- **Data Bits = "8"**
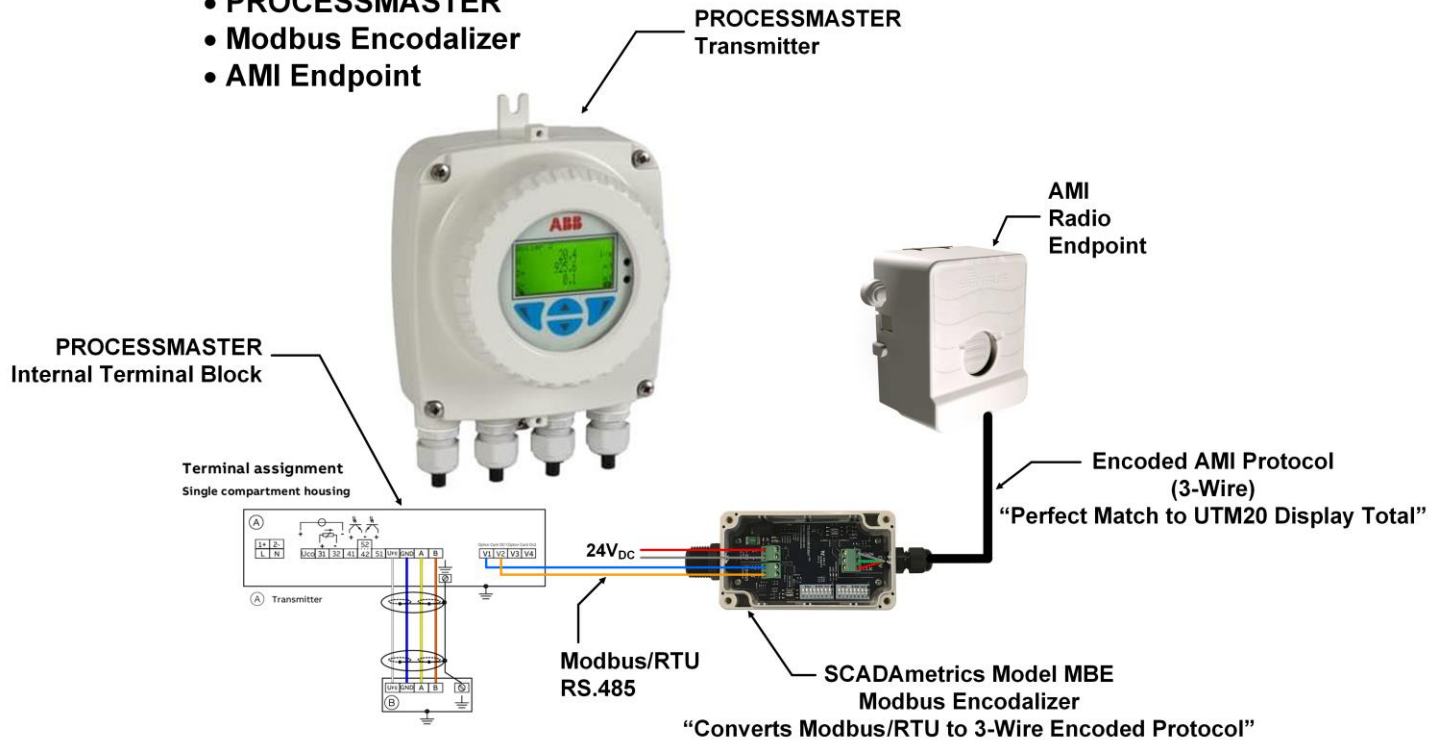- **Parity = "Odd"**
- **Stop Bits = "1"**

ProcessMaster and Encodalizer Wiring:

See the Wiring Detail, as illustrated on the following page.

1. Install ABB ProcessMaster MagMeter, per ABB Instruction Manual.
2. Connect Encodalizer Modbus Terminals to ProcessMaster Modbus/RTU Terminals:

   - MBE.A(-) to PROCESSMASTER.OPTION.CARD.V1
   - MBE.B(+) to PROCESSMASTER.OPTION.CARD.V2

3. Connect Mains Power to the ProcessMaster.
4. The ProcessMaster bootup process completes after a few seconds.
5. Connect DC Power to MBE Encodalizer (24V_{DC} or 12V_{DC}).
6. The Encodalizer LED should NOT blink RED. Red Blinks Denote a Configuration and/or Read Error.

Wiring Detail:

- **PROCESSMASTER**
- **Modbus Encodalizer**
- **AMI Endpoint**

PROCESSMASTER Transmitter

AMI Radio Endpoint

PROCESSMASTER Internal Terminal Block

Terminal assignment
Single compartment housing

24V_DC

Encoded AMI Protocol (3-Wire)
"Perfect Match to UTM20 Display Total"

Modbus/RTU RS.485

SCADAmetrics Model MBE Modbus Encodalizer
"Converts Modbus/RTU to 3-Wire Encoded Protocol"

Testing:

The Meter Display™
Model TMD - by SCADAmetrics

Total (gal)
1,234,568.5

Press to Read

Made in USA   Patent Pending   NTEP CC 20-024
3V dc 500mA max CR123A   scadametrics.com

If you experience any problems, use of a SCADAmetrics model TMD TheMeterDisplay™ is highly recommended. When the TMD is operated in DEBUG mode (dip switch #10 = ON), the raw Sensus Protocol ASCII data can be observed on the LCD display.

Connections:

TMD.Terminal.1   to →   Encodalizer.Terminal.CLK
TMD.Terminal.2   to →   Encodalizer.Terminal.DATA
TMD.Terminal.3   to →   Encodalizer.Terminal.CMN

RECOMMENDED DIP SWITCHES 1 - 7

Forward Total	Reverse Total	Net (Fwd-Rev) Total
DipSw.1= DipSw.2= DipSw.3= DipSw.4=ON DipSw.5= DipSw.6= DipSw.7=	DipSw.1=ON DipSw.2=ON DipSw.3= DipSw.4=ON DipSw.5= DipSw.6= DipSw.7=	DipSw.1= DipSw.2=ON DipSw.3= DipSw.4=ON DipSw.5= DipSw.6= DipSw.7=

RECOMMENDED DIP SWITCHES 8 - 16

GALLONS – Set ProcessMaster Totalizer/Display to US Gallons
FT^3 – Set ProcessMaster Totalizer/Display to FT^3
M^3 – Set ProcessMaster Totalizer/Display to M^3

AMI RESOLUTION	Sensus 6	Sensus 7	Sensus 8	Sensus 9	Neptune ECODER	Neptune PROREAD
USG x1 FT^3 x1 M^3 x1	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13= DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12= DipSw.13= DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12=ON DipSw.13= DipSw.14= DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13= DipSw.14= DipSw.15= DipSw.16=
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