SCADAMETRICS®
APPLICATION NOTE

Application Note Siemens.FMT020.1
Version 001
10 March 2025

Connect a Siemens FMT020 to an AMI/AMR System Using the SCADAmetrics Encodalizer™

The **Siemens FMT020** (pictured left, with SCADAmetrics model **MBE Encodalizer™**) is Siemens' newest and most advanced process magnetic flow meter transmitter. It is suitable for a broad range of water and wastewater flow metering applications; and it is usually paired with the FMS500 flow sensor tube, which is available in ½–48 inch diameter sizes.

The FMT020 features traditional 4-20 milliamp and pulse SCADA signals, as well as fieldbus protocols. Like most process magnetic flow meters, the FMT020 does not offer native AMI/AMR-compatibility.

However, today, the latest firmware release for the SCADAmetrics Model MBE Encodalizer™ now adds Neptune and Sensus encoder protocols to this important flow meter, so that it may now be easily integrated into today's modern AMI/AMR systems.

The purpose of this Application Note is to provide technical assistance to the FMT020/FMS500 Flow Meter User who wishes to connect his meter to an AMI/AMR system.

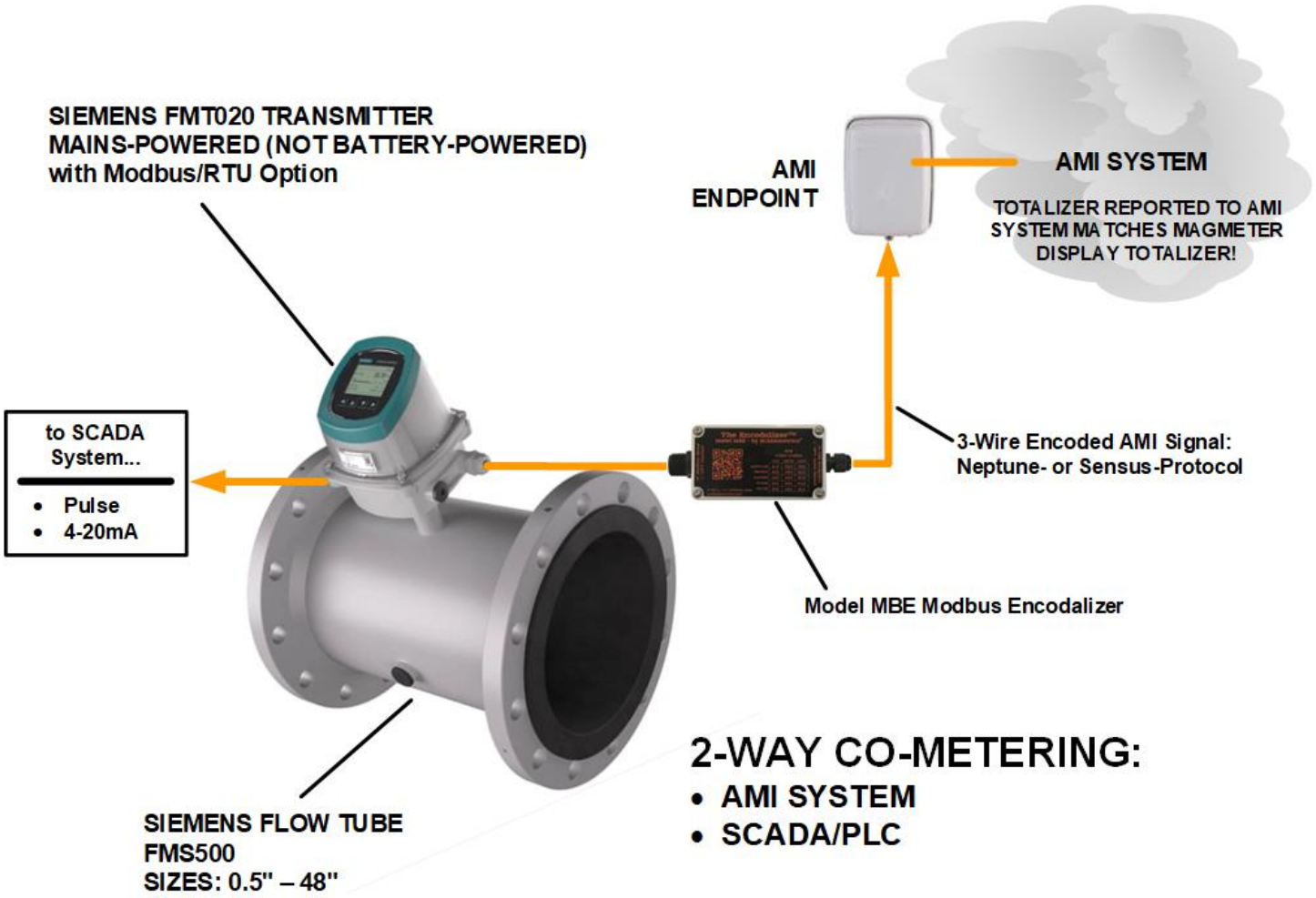
James Mimlitz, SCADAmetrics 'Slim'

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 flow meter using the meter's factory default Modbus/RTU settings. No special setup of the meter should be required beyond normal initialization procedures. When ordering a FMT020, please note that the meter must be outfitted with the Modbus/RTU (RS.485) option, in addition to any other application-specific I/O options. $24V_{DC}$ Mains Power option is also recommended, but not required.

Siemens FMT020 Demo Kit

Siemens FMT020 demo kit generously provided on loan to SCADAmetrics, courtesy of Norm Kramer, Application Engineer | Siemens Industry (Spring House, PA).

Comprehensive Flow Metering: SCADA and AMI



FMT020 / Encodalizer Wiring & Integration:

Encodalizer DIP Switch Settings:

1. Set DIP switches 1-6 per meter type "Siemens FMT020": Fwd (Totalizer 1), Rev (Totalizer 2), or Net (Fwd-Rev)
   Example, Net DIP Switches 2,5,6=ON. DIP Switches 1,3,4=OFF
2. Set DIP switch 8 per desired AMI protocol: Sensus or Neptune: OFF=Sensus, ON=Neptune.
3. FMT020 Modbus/RTU Module (vers January 2025):
   It is required that the FMT020 Display Units be set to match the desired AMI Units.
4. Set DIP switches 11,12 per number of desired AMI digits: 6, 7, 8, or 9.
   If AMI Protocol is set to Neptune, then setting Number of AMI Digits to 6 will force 6-Digit Neptune Protocol.
   Otherwise, Neptune Protocol returns 8 or 6 Digits – depending upon interrogation device protocol.
5. Set DIP switches 13,14,15,16 per desired Totalizer Multiplier (x1, x10, x100, etc…).
   (FOR SIMPLICITY – SEE DIP SWITCH TABLES AT THE END OF THIS DOCUMENT!!)

FMT020 Setup:

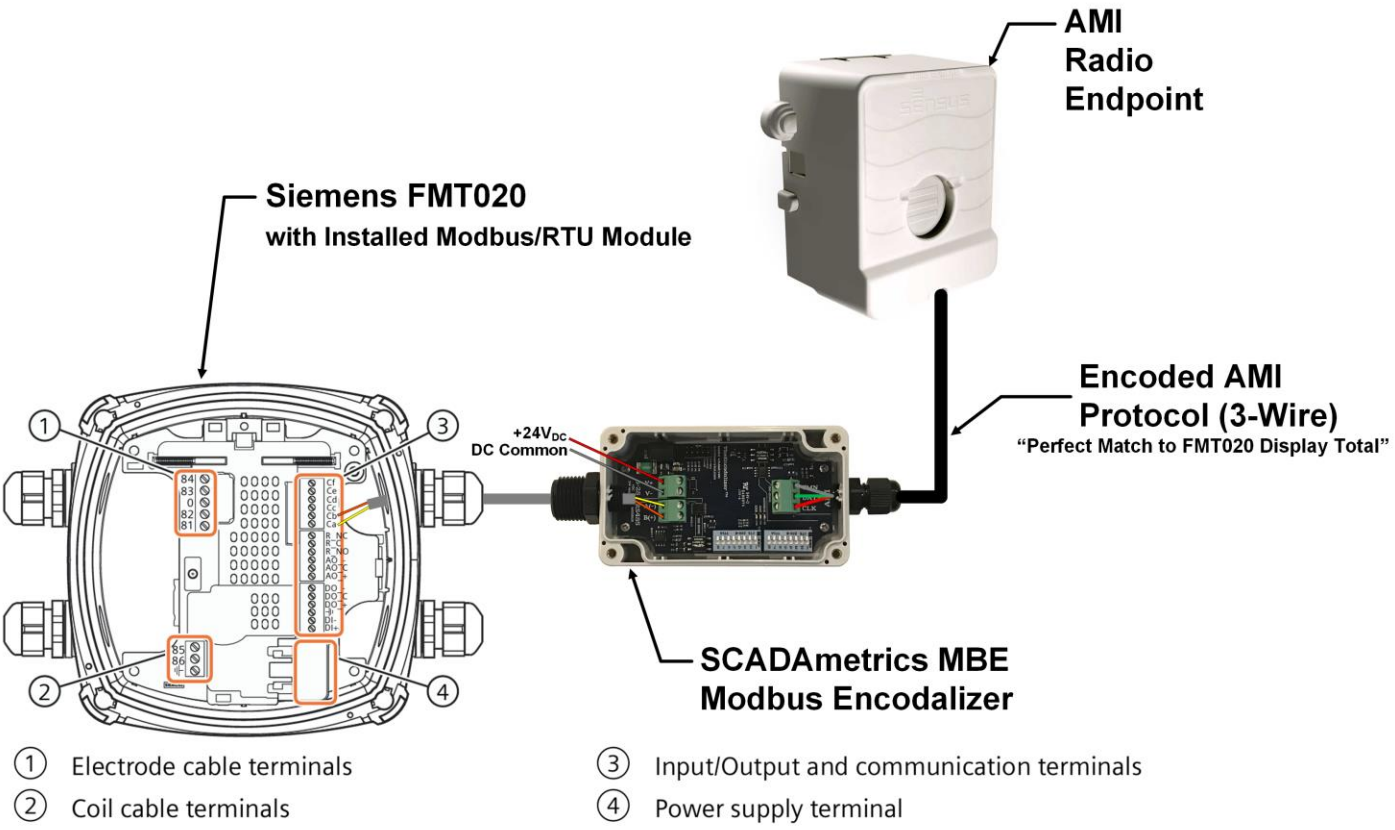
1. Set Display Totalizer Units to Match Desired AMI Totalizer Units:
   - GAL, KGAL, MGAL, FT^3, or M^3, or L
     (Siemens Modbus Module requires the Display Totalizer Units to match the AMI Totalizer Units.)

2. Do NOT Modify FMT020 Modbus/RTU Default Settings.
   (Device ID: 1, Baud: 19200, Stop Bits: 1, Parity: Even)

FMT020 and Encodalizer Wiring Procedures:

1. Connect chassis Ground wire to FMT020 grounding lug. Connect Power (Preferably $24V_{DC}$) to FMT020.
   The FMT020 bootup process completes in approximately 5 seconds.
2. The MBE Encodalizer features a ½" NPT(male) fitting, and the FMT020 features four (4) M20 (female) receptacles. Therefore, the MBE may be mated directly to the FMT020 housing with a M20 - ½" NPT adapter, such as Part# **M20NPT1/2** by Jacob GmbH.
3. Connect Encodalizer Modbus Terminals to FMT020 Modbus Terminals. Note that the Siemens FMT020 User Manual is incorrect, and that the RS.485 terminal polarities are flipped as follows:
   - Encodalizer.Term.(A–) ➔ FMT020.Term.Ca(B+)
   - Encodalizer.Term.(B+) ➔ FMT020.Term.Cb(A–)
   - FMT020 Terminals **Cc** and **Cd** should be left unconnected.
4. A 120 ohm termination resistor across the RS.485 terminals of the FMT020 is not required.
5. Connect DC Power to MBE Encodalizer ($8\text{-}28V_{DC}$).
6. The Encodalizer LED should NEVER blink RED. Red blinks denote a Configuration Error and/or Read Error.
7. If SCADA connection is required, then connect SCADA System to the Encoded Output of the MBE Encodalizer, or to the discrete output(s) of the FMT020: 4-20mA and/or Pulse

FMT020 and Encodalizer Wiring Diagram:



Connecting AMI Endpoint:

Function	Sensus Color Also: Badger, Metron-Farnier, Master Meter, Kamstrup, Mueller, Zenner, RG3, Diehl, Fenix, Next, Nicor Cable	Neptune Color	Itron ERT Color
CLK	Red	Black	Black
DATA	Green|White	Red	Red
CMN	Black	Green	White|Shield

Testing:

If you experience any problems, use of a SCADAmetrics model TMD TheMeterDisplay™ is highly recommended. The TMD can be used to display the AMI totalizer reading and/or AMI Serial Number:

Connections:

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

SIEMENS FMT020

RECOMMENDED DIP SWITCHES 1 – 7

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

RECOMMENDED DIP SWITCHES 8 – 16

GALLONS – Set FMT020 Totalizer/Display to US Gallons
FT^3 – Set FMT020 Totalizer/Display to FT^3
M^3 – Set FMT020 Totalizer/Display to M^3

AMI RESOLUTION	Sensus 6	Sensus 7	Sensus 8	Sensus 9	Neptune ECODER	Neptune PROREAD
USG x0.001 FT^3 x0.001 M^3 x0.001	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12= DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12=ON DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13= DipSw.14=ON DipSw.15=ON DipSw.16=
USG x0.01 FT^3 x0.01 M^3 x0.01	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12= DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13=ON DipSw.14= DipSw.15=ON DipSw.16=
USG x0.1 FT^3 x0.1 M^3 x0.1	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12= DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8= DipSw.9= DipSw.10=ON DipSw.11=ON DipSw.12=ON DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10=ON DipSw.11= DipSw.12= DipSw.13= DipSw.14= DipSw.15=ON DipSw.16=
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=
USG x10 FT^3 x10 M^3 x10	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12= DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13=ON DipSw.14= DipSw.15= DipSw.16=
USG x100 FT^3 x100 M^3 x100	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13= DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12= DipSw.13= DipSw.14= ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12=ON DipSw.13= DipSw.14= ON DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13= DipSw.14= ON DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13= DipSw.14= ON DipSw.15= DipSw.16=
USG x1000 FT^3 x1000 M^3 x1000	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12= DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8= DipSw.9= DipSw.10= DipSw.11=ON DipSw.12=ON DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12=ON DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=	DipSw.8=ON DipSw.9= DipSw.10= DipSw.11= DipSw.12= DipSw.13=ON DipSw.14=ON DipSw.15= DipSw.16=