MDT

Modbus Data Transceiver

Standard, MAX, and LoRaWAN Systems

Product Overview

The Modbus MDT interfaces to a single Modbus electric meter to provide a direct read of various Modbus registers within the meter. We call this point-to-point Modbus as the MDT does not read multiple meters on a common bus signal. The initial release of our Modbus MDT interfaces to a common set of electric meters used in submetering, auto-detecting the meter it is attached to and and transmitting six pre-definded data points required for submetering the suite or apartment. Other register values can be supported but will require a special order at the time of purchase. All MDTs are powered by two AA field-replaceable Lithium batteries with battery life of up to eight years.

The initially supported meters are the Accurev 1310, Dent PS3, Leviton 4100, and the EZmeter.

The pre-defined data points that are read from these four meters are:
Consumed Energy / System Power / Power Factor / Phase A Power / Phase B Power / Phase C Power

All three radio technologies are supported, Standard, MAX, and LoRaWAN. A 3.3V line power option is also available.

Specifications

Input	• 3 wire Modbus electrical signal from electric or BTU meters
MDT Data Storage	• -Mod MDT: no local storage • -ModT Time-of-Use MDT: Over 2300 data pts. (24+ days @ 15 Min interval)
Data Resolution	• -Mod MDT: 1-hour interval for Standard and MAX, 4 hour interval for LoRaWAN • -ModT Time-of-Use MDT: 15-minute interval, Top of the Hour synchronized*
Radio	902 – 928 MHz; FCC and IC Certified for all modes • Standard: Open field range of one mile* • MAX/LoRaWAN: Open field range approaching 10 miles**
LED	Indicates on/off and RF network connection status. From button press: • Solid Green: good Link Quality • Solid Amber: OK Link Quality • Red or Flashing: poor Link Quality or syncing to Network
Operating Environment	-20 to 145 degrees F, up to 90% RH, non-condensing.
Power	Two replaceable AA Lithium batteries, up to eight years life under normal conditions
Typical Battery Life	6-8 years @ 50 to 90 deg. F, reduced at temperature extremes
Dimensions	4.3" x 2.2" x 1.2"
Warranty	Five years. For more detailed information, please visit our warranty page. Note that the warranty does not cover batteries.

Continual product enhancements may cause specifications to change without notice.
* ToU on LoRaWAN requires a data subscription.
**Actual range may vary depending on installation location and topography

Models

Standard System		
Modbus MDT	TW-160B-Mod	Single meter Modbus input, one-hour interval data, no on-board memory
Modbus, Time-of-Use enabled	TW-160B-ModT	Single meter Modbus input, 15-minute guaranteed[*] Time-of-Use interval data with on-board data memory. Readings are synchronized to the top of the hour for accurate billing.
MAX System		
Modbux MDT	TW-170B-Mod	Single meter Modbus input, one-hour interval data, no on-board memory
Modbus MDT, Time-of-Use enabled	TW-170B-ModT	Single meter Modbus input, 15-minute guaranteed[*] Time-of-Use interval data with on-board data memory. Readings are synchronized to the top of the hour for accurate billing.
LoRaWAN System		
Modbus MDT	TW-180B-Mod	Single meter Modbus input, four hour interval data, no on-board memory
Modbus MDT, Time-of-Use enabled	TW-180B-ModT	Single meter Modbus input, 15-minute guaranteed[*/**] Time-of-Use interval data with on-board data memory. Readings are synchronized to the top of the hour for accurate billing. Requires data subscription with Tehama.

* Adequate Repeater/Gateway coverage is required for guaranteed delivery.
** Extra cloud storage fees may be required
Other combinations and sensor inputs are available by special order. Please contact Tehama for details.

Note Standard, MAX Range & LoRaWAN systems are NOT compatible. MAX MDTs must be used with MAX Repeaters and DCAPs; likewise for Standard. LoRaWAN uses Gateways.

Refer to [AN-119](AN-119) for more information. Also available in the Support/Documents section of our website.

Implementation Details

The Modbus MDT is designed as a point-to-point connection and does not support the bus aspect of Modbus; every meter needs its own MDT. Each meter should be configured to use a baud rate of 19200 and set to port 1. While the MDT can scan for meters on the other 254 ports, the initial setup is accelerated by using Port 1.

The RadioID (aka serial number) of a Modbus MDT will always end in 0, and to support the extra data points, a Modbus MDT will create virtual MDTs by incrementing the last digit of the RadioID. For example, for an MDT labeled with RadioID 7C350C40, these two RadioIDs will appear in our system with the indicated data points:

7C350C40 Sensor1 – Consumed Energy in kWh
7C350C40 Sensor2 – System Power in kW
7C350C40 Sensor3 – Power Factor

7C350C41 Sensor 1 – Phase A Power in kW
7C350C41 Sensor 2 – Phase B Power in kW
7C350C41 Sensor 3 – Phase C Power in kW

The Count factors and Units for each data point will be automatically assigned within our system. Sometimes you can configure this on the meter itself (for example Consumed Energy on the AccurRev 1310), and the MDT will read this setting and transfer this to our system. However a majority of Modbus registers are floating point values and will always have their count factor set to 1 and are displayed with two or three digits to the right of the decimal point.

Other registers might be supported in the future. Please inquire if you have data needs different from the default six data points described here.

MDT Configuration

All MDTs come with a pre-set configuration; there are no settings to change on the MDT itself. Settings such as count factor or Units are read from the meter and sent to our system.

New MDTs are shipped from the factory in a powered-off state. They can be powered on using a hidden button under the Tehama Wireless logo. The LED lights up when the button is pressed for visible feedback.

Turn ON or Off:

- Press & hold button until LED blips off (roughly 3 seconds), then release.

- A pulse input will also turn on an MDT.
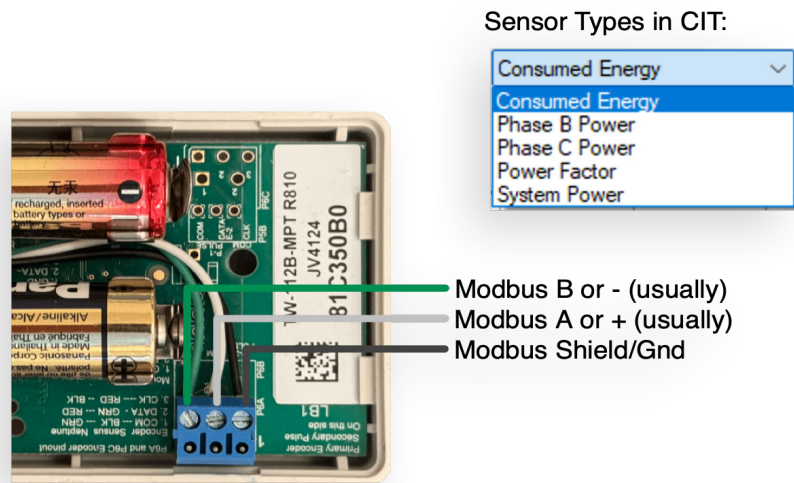
Power-up LED Flashing at a 1 second rate:

- Indicates MDT / Repeater is listening for a DCAP, Gateway, or Repeater.

- Once a beacon is heard, the flashing rate will double in speed.

- Once a Connection is established, the LED stays solid for 10 seconds.

- If the attempt to connect to all beacons fails, LED flashing stops after 60 seconds.

Check the status of an MDT or Repeater by tapping the button:

- Unit is OFF if you see 2 flashes after the button is released.

- Unit is Asleep (On but out of range) if you see 1 flash only. The button press will wake up the unit to try to re-connect to Network. Finding an MDT in the sleep state is usually an indication of poor placement or inadequate Repeater coverage.

- Unit is Connected and operating normally if the LED stays on for 10 seconds.

- Green indicates a robust radio link, Orange an OK link, and Red a poor link.

Wiring Guide

TW-160/170/180B-Mod Single meter Modbus MDT

Sensor Types in CIT:

Consumed Energy
- Consumed Energy
- Phase B Power
- Phase C Power
- Power Factor
- System Power

Modbus B or - (usually)
Modbus A or + (usually)
Modbus Shield/Gnd

Modbus wiring designation on various meters is unfortunately *not* consistent! Some meters indicate A and B, whereas others might only have + and -. Yet others combine them: A(-) and B(+) and some are A(+) and B(-)!

Refere to this table for the currently supported Meters.

MDT Pin	AccuRev	Dent	Leviton 4000	EZMeter
1	S	SH	S	IGND
2	A	B(+)	+	RX-(A)
3	B	A(-)	-	TX+(B)

Recommended System Installation Steps

First power up the DCAP or primary Gateway. Next power up Repeaters or other Gateways in appropriate locations around the property. For Repeaters, start with units closer to the DCAP and use the Repeater LED feedback indication to verify the range is acceptable. At first, just the minimum numbers of repeaters need be placed; however, it is necessary that they be within range (solid 10 second LED "flash" when button pushed) for the backbone to be reliable. Repeater to Repeater (or DCAP) range in open field scenarios is measured in miles for our MAX system, however building construction materials, terrain, and poor location choices can reduce this down to hundreds of feet. Gateways communicate directly with the Internet via Cellular but can use wired Ethernet if available across the property.

Once the initial Repeater placement is complete, the MDT placement phase begins. Again, the LED feedback can be used to verify that MDTs are communicating with the network. Additional Repeaters/Gateways can be placed in areas where MDTs are unable to connect to the backbone. MDT to Repeater (or DCAP) range in open field scenarios approaches 10 miles for MAX and LoRaWAN, and over a mile for Standard. Again building construction materials, terrain, and poor location choices can reduce this down to hundreds of feet or less.

The CIT software can also be used in the placement phase to provide more detailed information such as Link Quality and Signal Strength readings generated by MDT and Repeaters.

> **Warning:** All radio devices should be placed at least 8 inches (20 cm) away from people in order to minimize RF exposure.

Mounting Guidelines

Units should never be placed directly on a metal surface or within a metal enclosure. Mounting on a metal surface will significantly affect the radio performance of the device, be it an MDT or a Repeater.

Recommended placement

- Mount on nearby wall away from meter and copper /metal piping or conduit.
- RF performance is best when mounted on wallboard.
- Use keyhole shape to mount on screw in wall.
- Designed for #6 Drywall screw.
- Separate case to tighten screw if desired.
- Note Antenna Pattern shown on the right.
- Radio signal slightly attenuated along the long axis of the MDT case.