# **AN-117:** Encoder Decoder FAQ

We have encountered many questions over the years since we introduced our encoder MDTs. There is some misunderstanding as to how these meters output data and what products like the Tehama Encoder MDT can read from these devices. This app note will cover this and other questions about encoded meters.

### Q: How do I wire the encoded meter to the MDT?

A: Please see our Application Note AN-102-E: Encoder MDT Wiring Guide on the Resources page of the Tehama Wireless website.

### Q: What MDT model will work with which encoded meter?

A: All our MDT products whose part number suffix has an "E" in it will work with both Sensus and Neptune meters. For example, MDT model numbers TW-140B-E, TW-160B-EP, or TW-175B-EE. Almost universally, encoded meters from vendors other than Neptune and some from GWF use the Sensus UI-1203 protocol and are therefore compatible. Note that an early version of our MDT with model number TW-140B-N will only work with Neptune meters.

Our recently introduced TW-160B-G and TW-170B-G AllRead Encoder MDTs are designed to read GWF Unico2coder® MP water meters. This modified M-bus interface transfers data about the meter's unit of measure (gallons, cubic feet, etc.), the count factor, and the hot or cold designation of the meter, in addition to the meter read and the serial number. This greatly simplifies the MDT setup and guarantees an error-free commissioning process.

### Q: How do I determine the Count Factor for an encoded meter?

A: The count factor might be printed on the meter's register face (x10 or x100). For many mechanical meters it can be determined by the number of fixed zeros to the right of the moving dials. For other registers there may be a graphic that indicates only the top X digits that are available to the reading device. Electronic meters with LCD displays can vary. Neptune for example can only provide the upper six digits regardless of actual display width, so the remaining digits should be treated like fixed zeros. On the other hand, a Kamstrup meter will provide every digit shown on the display. It is best to consult with the meter manufacturer.

### Q: How do the encoded meter and the MDT communicate?

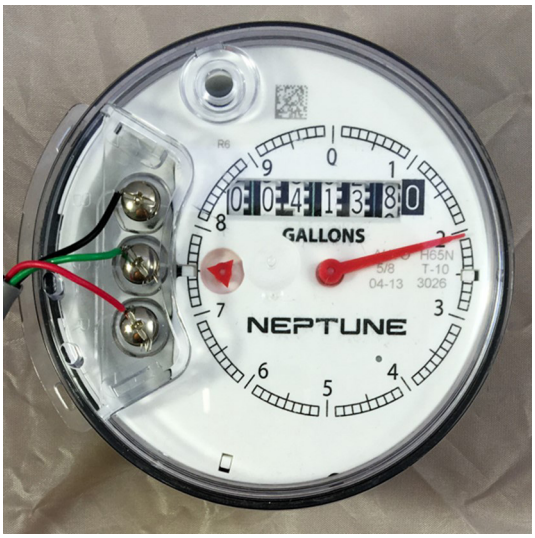
A: The interface between encoded meters and the MDT is based on a digital handshake between the devices. The MDT is the reader and sends a query command to the meter which will respond with the current reading as displayed on the meter face along with the serial number of the meter. This data is in a specific format (i.e. Sensus UI-1203 or Neptune formats) and the MDT will interpret the response from either format and transmit the reading value. For our GWF AllRead compatible MDTs, the information about the meter's units of measure, count factor, and Hot/Cold meter type is also read by the MDT.

### Q: Will an Encoded meter turn on an MDT, like Pulse meters do?

A: Yes. An MDT that is in the Off state will still wake up once every 24 hours to check if it is connected to a meter. If it receives a valid response from a meter, the MDT will turn on and begin to transmit reads.

### Q: What's the resolution on a Neptune ProRead Mechanical meter?

A: On 1 inch and smaller meters there are six moving dials plus a fixed (painted) 0 for the single gallon position, so the count factor is 10. On 1.5 and 2 inch meters there are six moving dials and two fixed (painted) 0's for the 1 and 10 gallon positions, so the count factor is 100.

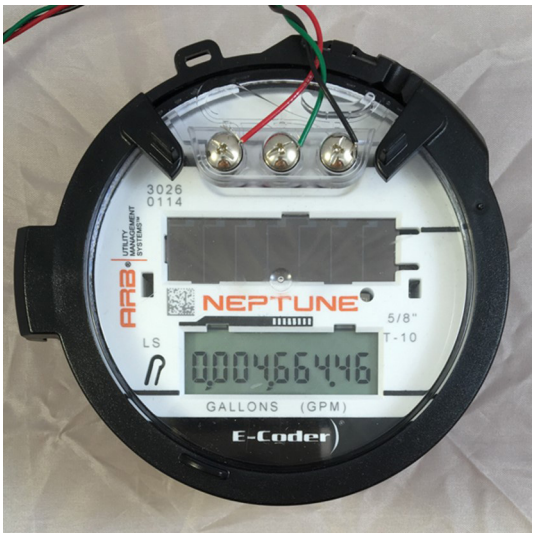



**However,** Neptune further reduces the effective count factor by only reporting a 0 or a 5 for the lowest moving dial. *While the count factor is still 10 for this meter (because of the one fixed zero), any reader such as our MDT will only detect a change in reading every 50 gallons. For the larger meters with two fixed zeros the MDT can only detect a change every 500 gallons (and the count factor is 100).*

For the register shown above, the moving dials show 4138. Apply a 10X count factor to the 4138 to get 41,380 gallons. However, the MDT will report 41350. Why? Because of the 50-gallon resolution available to the MDT. Once the register shows 41400, the MDT will report 41400.

This explains why in CIT-generated graphs of some Neptune meter data, you will always see the value jump by 50 or 500 gallons (assuming you have applied the proper count factor in the CIT).

### Q: What's the resolution on the newer Neptune E-coder and ProCoder meters?




A: The picture here shows a 5/8" E-Coder registers with nine digits total, two digits of which are to the right of the decimal (1/100 of a gallon resolution). Early on Neptune still restricted the encoder output to the upper six digits. Around year 2020 they allowed 3rd party vendors like Tehama to read eight digits.

MDTs with Firmware Revision prior to 2.11F can only read six digits. From the image above, the older MDTs will only report 466. Therefore, the Count Factor needs to be 10 to get 4,660 gallons when displayed in the CIT or a daily report.

MDTs with Firmware Revision 2.11F and later can read eight digits. Again, using this image, the newer MDTs will report 46644, so applying a Count Factor of 0.1 will yield the correct reading of 4664.4 Gallons. A small number of 1st Generation MDTs can also read all eight dials; the Firmware version for these is 1.14G.


The Neptune ProCoder register pictured above is Neptune's updated mechanical register that displays 8 moving dials. The decimal point is painted between the 7th and 8th dial. Therefore the Count Factor should be set to 0.1 for newer MDTs and to 10 for older MDTs that read only six dials.

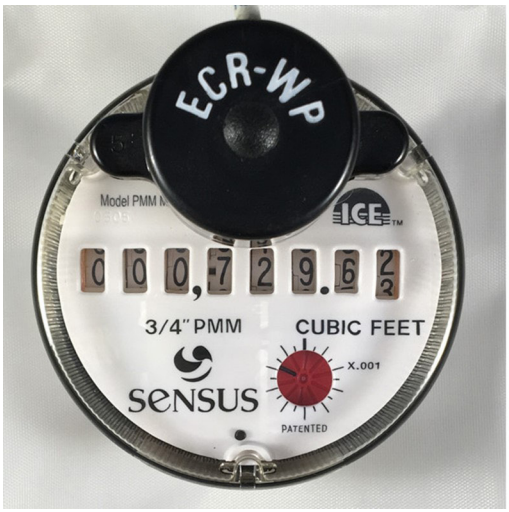
For both ProCoder and E-Coder meters, On 1.5 and 2 inch sized meters the decimal moves one digit to the right, so the Count factors will be 100 for older MDTs and 1 for newer MDTs.

### Q: What is the resolution on newer electronic encoded registers?

A: Newer solid-state meters, easily identifiable with an LCD display and often a solar panel, generally provide better resolutions compared to the mechanical meters. Often every digit is available on the AMR output and the MDT can read them. However, some meters still limit the output and use bars over the digits which are available. In these two examples, the meter on the left will only output the upper four digits (for a count factor of 1000), while the one on the right will output 8 digits and a count factor of 0.001 m3.


### Q: What's the resolution on a Sensus mechanical meter?

A: This depends on how the meter was manufactured or programmed at the factory. Some Sensus meters have dials going down to the 1/100 of a unit (gallon or cubic feet) but it may only supply some of the dials through the electronic interface.





The meter above has eight rotating dials. However, the factory sticker shown on the right says only 4 digits are available to an external reader. Therefore the MDT will report the value of 7. Apply a 100X count factor to get 700 cubic feet, even though the register shows 729.62 cubic feet. Once the register shows 800.00, the MDT will report 8 (or 800 with the 100X count factor applied).

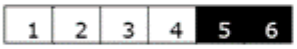
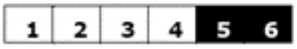
Note the serial number printed on the label. That is the serial number that is transmitted by MDTs manufactured after July 2015. Not all registers have the serial number printed on them or available through the interface.

### Q: How do the encoded meters generate the reads data?

A: For mechanical meters there is either a magnetic or optical mechanism that interprets the physical dial position. Here is a YouTube video that demonstrates the optical solution. The MDT (or touchpad reader) energizes the circuit in the meter, which in turn sends the reads data to the reader. To simplify the circuit, the meter manufacturers often don't output the value of every spinning dial, or sometimes they reduce the resolution of the rightmost spinning dial. Note that a higher resolution sweep hand is never available to an external reader as it is usually associated with the rightmost fixed zero(s).

### Q: How do I read the register on the meter face?

A: Please consult with the meter manufacture on how to read their specific meter. In general, here are a couple examples to help illustrate:

| Register or Totalizer shows: | Readings (Gallons) |
|---|---|
|   Gallons | 1,234,560 |
|   Gallons X 100 | 123,456 x 100 or 12,345,600 |
|   X 100 Gallons | 123,456 x 100 or 12,345,600 |