Cellular 500G Module Direct Installation Guide

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July 26, 2021

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Contents

New in This Document

Revision	Date	Description
REV 000	July 2021	First date of publication.

1 Important Safety and Compliance Information

This section provides important information for your safety and product compliance.

U.S. and Canadian Patent Numbers

U.S. Patent Numbers

- 4,614,945
- 4,753,169
- 4,768,903
- 4,799,059
- 4,867,700

Canadian Patent Numbers

- 1,254,949
- 1,267,936
- 1,282,118

USA, FCC Part 15 Spectrum Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to provide a separation distance of at least 20 centimeters (7.9 inches) from all persons to be compliant with regulatory RF exposure.

USA, FCC Class B-Part 15

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by

turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for help.

Modifications and Repairs

To ensure system performance, this device and antenna shall not be changed or modified without the express approval of Itron. Per FCC and ISED rules, unapproved modifications or operation beyond or in conflict with these instructions for use could void the user's authority to operate the equipment.

Canada, ISED Spectrum Compliance

Compliance Statement Canada	Déclaration de Conformité
This device complies with Innovation, Science and Economic Development Canada (ISED) license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, (2) this device must accept any interference, including interference that may cause undesired operation of the device.	Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
Under Innovation, Science and Economic Development Canada (ISED) regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.	Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

RF Exposure (FCC/ISED)

This equipment complies with radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement do it être installé et utilisé à distance minimum de 20 cm entre le radiateur et votre corps. Cet émetteur ne doit pas être co-localisées ou opérant en conjonction avec tout autre antenne ou transmetteur.

Transportation Classification

The Federal Aviation Administration prohibits operating transmitters and receivers on all commercial aircraft. When powered, the Itron device is considered an operating transmitter and receiver and cannot be shipped by air. All product returns must be shipped by ground transportation.

Modifications, Repairs, Installation, and Removal

To ensure system performance, this device and antenna shall not be changed or modified without the express approval of Itron. Any unauthorized modification will void the user's authority to operate the equipment.

In the event of malfunction, all repairs should be performed by Itron. It is the responsibility of users requiring service to report the need for service to Itron.

Lithium Battery Safety

Warning! Follow these procedures to avoid injury to avoid injury to yourself or others:

- The lithium battery may cause a fire or chemical burn if it is not disposed of properly.
- Do not recharge, disassemble, heat above 100° Celsius (212° Fahrenheit), crush, expose to water, or incinerate the lithium battery.
- Keep the lithium battery away from children.
- Fire, explosion, and severe burn hazards

Equipment Repairs

Warning! Only authorized Itron personnel should attempt repairs on Itron equipment. Attempts to do so by others might void any maintenance contract with your company. Unauthorized service personnel might also be subject to shock hazard on some Itron equipment if removal of protective covers is attempted.

Intrinsic Safety

Warning! Substitution of components may impair intrinsic safety.

Electrostatic Ignition Hazard

Warning! Verify the area is not hazardous when installing, servicing, cleaning, or touching the Itron device.

Module Cleaning

Warning! Clean only with a damp cloth.

Do Not Drop

Warning! While Itron modules are designed to withstand a drop, dropping the module may damage the device and void the warranty.

2 About the Itron Cellular 500G Module

The Itron Cellular 500G module is a Cellular IoT (CIoT) gas module. It features cellular and RF communication capabilities, delivering flexibility in reading options. It is designed to be read under Itron IoT networks or by legacy ChoiceConnect™ handheld and mobile readers. With new features for Network operation – including firmware download, high flow alarm, sub hourly interval data and the ability to hop to a neighboring module for hard-to-read applications and extended data storage – Itron's Cellular 500G module offers additional value while continuing to offer the highest in reliability, accuracy, battery life, security standards and intrinsic safety that you have come to expect from the industry leader in gas modules.

This guide describes the steps for direct-mount installing the Itron Cellular 500G module.

Transmission Modes

This section describes the various modes available for the Cellular 500G modules.

> **Note:** An FCC license is not required to read the modules.

The module supports 5, 15, 30, or 60-minute intervals and provides storage and reporting for up to 62 days of 15-minute interval data and associated event data, or 8 months of hourly interval data.

> **Note:** Interval data options are dependent on the module's firmware version.

The module is designed to transmit 3 times a day with a 20-year battery life.

Mobile High Power Mode

The module transmits a high-powered RF message every 60 seconds. In Mobile High-Power Mode, the expected battery life is 20 years.

Mobile and Handheld Mode

The module transmits a medium-powered RF message every 15 seconds. In Mobile and Handheld Mode, the expected battery life is 20 years.

(Optional) Hard-to-Read Mode

The module transmits a high-powered RF message every 30 seconds. In Hard to Read Mode, the expected battery life decreases to 15 years in this mode. The hard to read mobile mode should only be used for exceptionally hard-to-read applications (such as meters installed on rooftops or in sub-basements).

Module High Flow Event

> **Note:** High Flow event functionality is dependent on the Cellular 500G module firmware version.

High Flow is a configurable event/alarm that can alert a utility of an excessive flow of gas to avoid potential hazardous events. The High Flow threshold can be configured using FDM Tools.

Gas Day Take

> **Note:** Gas Day Take functionality is dependent on the module firmware version. For more information, see Device Firmware Functionality on page 13.

Gas Day Take (GDT) is critical to many natural gas utilities. GDT allows utilities to manage deregulated gas purchases. While daily GDT reads can be used for various operations within the utility, the primary time constrained business operation is to daily balance deregulated (transport) customers. GDT requires GDT data from a percentage (typically a maximum of 10%) of the utility's customers at 9:00 a.m. Central Clock Time.

All collected data must be prepared and presented to deregulated marketers and customers by 11:00 a.m. CCT to support the gas utility's deregulated tariff. If a deregulated marketer of customer under or over-burns what they nominated for a given day, they may pay a daily penalty. Customers require the previous day's GDT data to make adjustments to their next day nomination to avoid penalties.

Local Auditing

> **Note:** Local auditing functionality is dependent on the module's firmware version. For more information, see Device Firmware Functionality on page 13.

The 500G module supports local data auditing of installation programming. Local auditing features the listed characteristics.

- Supports writing data (in both manufacturing and by FDM) to the module to support future installation programming auditing.
- Reading the auditing data is supported locally.
- Auditing parameters include FDM User ID, number of dials, meter drive rate, unit of measure, ERT count rate, rollover, and PComp.
- Timestamping of auditing parameters.
- Log access via COSEM only.

Low Battery Event/Alarm

> **Note:** For 500G modules, low-battery functionality is dependent on the module's firmware version. For more information, see Device Firmware Functionality on page 13.

The 500G modules' low-battery events are flagged when the device reaches a 10% of battery life remaining state. The event triggers an alarm configurable for asynchronous delivery to the head end system.

Itron Security Manager

System security, provided by Itron Security Manager (ISM), applies to the RF communications between the collection device and the Cellular 500G module.

There are two fundamental security processes used in the Itron Security Manager to ensure system communication confidentiality and validity.

- **Authentication**. Authentication is the process of confirming that an artifact is genuine or valid. Authentication in the module is the process of verifying a request is from a valid source and in its original form.
- **Encryption**. Encryption is the process of transforming information to make it unreadable to anyone who does not have a valid security key. There are two types of encryption, symmetric and asymmetric. Symmetric encryption uses a shared key to decrypt or encrypt information. Asymmetric encryption uses a private key to encrypt and a public key to decrypt. Data transmissions over the network are protected using AES-256 encryption.

The 500G module supports the security model found in the GenX solution for both reading and programming. If the modules are shipped without security enabled (ready to secure), the utility can—at a later date—configure the modules for ISM enhanced security.

> **Important!** Modules ordered pre-programmed with security injected and specified as Zero Touch Deployment require that the installer rotates the wriggler five (5) times to activate the module if the module is installed in a location with little or no gas flow.

Functional Specifications

Functional specification	Description
Power source	Single "D" cell lithium batteries
Tamper detection	Tilt and cut cable
Regulatory and Standards	FCC compliance: Part 15.247, 15.249 (programming), 15.109 FCC ID: EWQ500GAC: for American/Rockwell Gas meters

Functional specification	Description
	■ The Cellular modem is a Sierra Wireless HL7800 module. – FCC ID: NLNHL78 ISED compliance: RSS-247, RSS-210 (programming), ICES 003 IC: 864D-500GAC: American/Rockwell ■ The Cellular modem is a Sierra Wireless HL7800 module. – IC: 2417C-HL78 Measurement Canada: Pending
Intrinsically safe per	Telemetering Equipment for use in Hazardous Locations, for Cl I, Div 1, Gp D for Haz Loc, Temp Code T1, -40°C ≤ Ta ≤ +70°C.
Operational	All Cellular 500G modules operate pursuant to FCC, ISED cellular licensing, and 3GPP defined, regulated cellular standards and networks. Frequency: 3GPP Band 4 (744-787 MHz) / Band 13 (1710-2155 MHz) for cellular operation; 902 to 928 MHz and 2400-2483.5 MHz ISM bands for RF operation Program frequency: 908 MHz
Product identification	Numeric and bar coded ERT type and serial number
Construction materials	Gray polycarbonate housing and back plate with encapsulated electronics

Operational Specifications

Operational specifications	Description
Operating temperatures	-22° to 158° F (-30° to +70° C)
Operating humidity	5 to 95 percent relative humidity
Data integrity	Verified in every data message

Device Firmware Functionality

This section lists the module device firmware information and lists functionality by version.

Part number	Global software release (GSR) version	FDM check endpoint firmware version	Firmware functionality
FMW-7200-001 (Direct mount)	5.4	6.1.0	■ Support for American/Elster Residential meters ■ Support for Rockwell/Sensus Residential meters ■ GSR 5.4 functionality ■ Network/Mobile topology ■ 5, 15, 30-minute interval data ■ High flow alarm ■ Low battery alarm ■ Gas Day Take ■ Local auditing for dial and drive rate

Related Documents

- *500G Module Remote Installation Guide*
- *Field Deployment Manager Field Representative Guide*
- *Field Deployment Manager Tools Configuration Guide*
- *Field Deployment Manager Tools Mobile Application Guide*

3 Module Programming

> **Caution:** You must program the module before use.

Programming Itron modules requires an understanding of:

- Your meter's drive rate and the number of dials
  - The drive rate and number of dials is important for programming the module to count correctly and roll over to zero at the correct time. For example, a four-dial, 2 cubic-feet meter configuration will count two cubic-feet for each rotation and roll over to zero after 999**9**.99 where the **ones place** is equivalent to 100 cubic-feet.
- How your system interprets the meter reading
  - Some systems modify the consumption reading with the collection software. Other times, the billing system is used to make modifications. If modifications are made in both systems, issues may cause consumption reading errors.

Program the 500G cellular module using an approved programming device loaded with Field Deployment Manager (FDM) software version 4.4 or later.

To enable enhanced security and for more complete programming information, see the *Field Deployment Manager Tools Mobile Application Guide*.

> **Important!** Modules ordered pre-programmed with security injected and specified as Zero Touch Deployment require the installer to rotate the wriggler five (5) times to activate the module if installing in a location with little or no gas flow.

Standard Configuration

Gas modules are capable of configurations that reduce battery life. Standard battery life is based on the following configuration:

- Hourly interval data
- Interrogations of 3 times per day
- 60-second receiver wakeup
- Five firmware downloads over the life of the module
- Network management and security overhead set to default timing
- RF at capacity (2,000 maximum per cell)
- Average of one two-way command/response per week

Programming the Direct Mount Module

Program the meter drive rate into the module using a compatible programming device.

1. Verify that you have the correct programming for your application: Mobile High-Power Mode, Mobile/Handheld Mode, or Hard-to-read Mobile/Handheld Mode.
2. For all programming and **Check Endpoint** operations using a handheld computer, hold the handheld as close to vertical as possible. For best success, keep the handheld within six feet of the target module.
3. Programming parameters are based on the configuration file loaded into the programming device.
4. **Read** or **Check** the module using a compatible reading device.
   - If the read result is higher than the number programmed in step 2, the module is counting correctly.
   - If the read result is not higher than the number programmed in step 2, replace the module.

Itron Programs and Software Variables

This section defines and clarifies possible system variables you may encounter in programming modules.

Field Deployment Manager (FDM)

The following tables illustrate various FDM programming configurations and the endpoint response to each setting.

	1,000,000,000,000 CF	100,000,000,000 CF	10,000,000,000 CF	1,000,000,000 CF	100,000,000 CF	10,000,000 CF	1,000,000 CF	100,000 CF	10,000 CF	1,000 CF	100 CF	10 CF	1 CF
3 Dial, 1 cubic foot													1
3 Dial, 2 cubic feet													2
4 Dial, 1 cubic foot													1
4 Dial, 2 cubic feet													2
4 Dial, 5 cubic feet													5
4 Dial, 10 cubic feet												1	
5 Dial, 1 cubic foot													1
5 Dial, 2 cubic feet													2
5 Dial, 5 cubic feet													5
5 Dial, 10 cubic feet												1	
5 Dial, 20 cubic feet												2	
5 Dial, 25 cubic feet												2	5
5 Dial, 40 cubic feet												4	
5 Dial, 50 cubic feet												5	
5 Dial, 100 cubic feet											1		
5 Dial, 500 cubic feet											5		
5 Dial, 1000 cubic feet										1			
6 Dial, 5 cubic feet													5
6 Dial, 10 cubic feet												1	
6 Dial, 20 cubic feet												2	
6 Dial, 50 cubic feet (CCF)												5	
6 Dial, 50 cubic feet (MCF)												5	
6 Dial, 100 cubic feet (CCF)											1		
6 Dial, 100 cubic feet (MCF)											1		
6 Dial, 500 cubic feet (CCF)											5		
6 Dial, 500 cubic feet (MCF)											5		
6 Dial, 1000 cubic feet (CCF)										1			
6 Dial, 1000 cubic feet (MCF)										1			
6 Dial, 10000 cubic feet									1				
7 Dial, 100 cubic feet (CCF)											1		
7 Dial, 100 cubic feet (MCF)											1		
7 Dial, 1000 cubic feet (CCF)										1			
7 Dial, 1000 cubic feet (MCF)										1			

Numbers represent the place and value that will increment per count/pulse

Entered in initial index read

Entered in initial index read but will not increment

Not entered in initial index read but passed on in reading

Not entered in initial index read and will not increment; will always read 0

Internal, incrementing digits not visible or transmitted

Not in SCM or SCM Plus but read out in NIM. Rolls over after 32 bits 4,294,967,295

				100,000,000 M³	10,000,000 M³	1,000,000 M³	100,000 M³	10,000 M³	1,000 M³	100 M³	10 M³	M³	0.1 M³	0.01 M³
5 Dial, 0.05 cubic meter														5
6 Dial, 0.10 cubic meter													1	
6 Dial, 1 cubic meter												1		
6 Dial, 10 cubic meters											1			
6 Dial, 100 cubic meters										1				
7 Dial, 10 cubic meters											1			
7 Dial, 100 cubic meters										1				

Programming Example

Endpoint programmed for 6 dial, 1000 cubic feet CCF.

1. Enter the initial index read. For this example, the initial read is 123456 where 6 = 600 cubic feet. After the initial programming, an endpoint read will result in a reading of 1234560 where the least significant digit is in 10's of cubic feet. Since counting is with a drive rate of 1000 cubic feet and the reading is transmitted in 10's of cubic feet, the last two digits of the reading will not change.
2. Program the endpoint to 123456.
3. Read the endpoint. The result should be 1234560 with the zero added to put the reading in 10's of cubic feet.
4. Add one count. The result should be 12346**60**. Notice that the last two digits of **60** do not change.

	1,000,000,000 CF	100,000,000 CF	10,000,000 CF	1,000,000 CF	100,000 CF	10,000 CF	1,000 CF	100 CF	10 CF
6 Dial, 1000 cubic feet (CCF)							1		

Mercury X-Blank Options

Endpoints (modules) can be programmed with one of the Mercury X-Blank options. There are 1, 2, 3, and 4 blank option available. Blank options are set up as a *what-you-see-is-what-you-get* (WYSIWYG) configuration. The values are not set in cubic feet or cubic meter standards. The Mercury X-Blank options are used in configurations where the system receives pulses from a corrector or instrument that can change pulse values and has configurable display digits. The Mercury-X Blank options allow users to program the endpoint to match the configuration of the corrector or instrument.

Check Endpoint Functions

The FDM Check Endpoint function triggers users to input the number of dials and drive rate if a Check Endpoint is requested for an endpoint programmed for 5, 6, or 7-dial meter configurations. The request to input the dial and drive rate information happens only if the system has more than one option using the same count rate and rollover variable enabled in their FDM business unit.

> **Note:** Itron recommends that users only enable the configurations used by your business unit. Having only one meter configuration option enabled (with the endpoint variable being checked in the FDM business unit) eliminates the need to enter the number of dials.

Field Collection System (FCS) (Mobile Mode Only)

In FCS, a Read Type Code can be assigned to a meter session. The Read Type Code in conjunction with the Endpoint Type is used to determine how the endpoint reading is formatted using the Endpoint Translation table in FCS. The Endpoint Translation table is a configurable table that is used to determine the truncation factor and multiplier for each reading. A default Endpoint Translation is defined for each type of endpoint supported by FCS (ReadType of 00 for each EndpointType). If the default Endpoint Translation is not formatting the read correctly, an additional Endpoint Translation can be defined to properly format the read.

Since the Endpoint Translation Code is based on the Read Type Code and the Endpoint Type, changing from a 40-series endpoint to a 100-series endpoint can cause the reading to be truncated differently. If you are having issues with your reading after a change out, check your Read Type Codes and Endpoint Translation Codes.

OpenWay Operation Center (OWOC)

The OpenWay Operation Center (OWOC) collects the raw reading and passes it on without making any formatting changes.

4 Specific Meter Manufacturer Installation

This chapter provides module installation instructions for the compatible meter types. See each section for a listing of those meters.

> **Important!** Modules ordered pre-programmed with security injected and specified as Zero Touch Deployment require that the installer rotate the wriggler five (5) times to activate the module if installing in a location with little or no gas flow.

Elster American Installation

Table 1 Residential direct-mount Cellular 500G Module

This section provides instructions to install the residential modules on the following compatible Elster American meters. Some meter manufacturers provide mounting kits and installation procedures for their meters. If the Elster American meter to the module installation instructions are not available, follow the installation procedures in this section.

Meter model	Meter notes	Itron part number	Gas module notes
 **W75AL Aluminum case**		ECG-7200-001	
AC-175 Aluminum case			
AL-175 Aluminum case			
ALC-175 Aluminum case			
AT-175 Aluminum case			
AT-210 Aluminum case			
AL-225, Canada only Aluminum case			
5B-225 Aluminum case			Must cut 1/16" off the end of the module wriggler drive post which will make the module incompatible with other 2-ft. drive meters.
AC-250 Aluminum case			
AL-250 Aluminum case			
AM-250 Aluminum case			
AR-250 Aluminum case		ECG-7200-001	
AT-250 Aluminum case			
AL-310 Aluminum case			
AL-350 Aluminum case			
AL-425 Aluminum case			
AC-630 Aluminum case			
AC-800 Aluminum case			

Installation Overview

Installing the direct mount module to an Elster American meter involves four tasks.

1. Removing the index cover and preparing the meter for installation.
   - Preparing the meter requires:
     - A flat-head screwdriver
     - A scraping tool
2. Assembling the index and module.
3. Programming the module. See Module Programming on page 15 for programming instructions and items needed to program the module.
4. Connecting the module to the meter. Connecting the module to the meter may require the following materials:
   - A compatible index
   - Small and medium flat-blade or Phillips screwdrivers
   - Side-cutting pliers or wire snips
   - *(Optional)* meter seals, wire seal, and seal press
   - 11/32-inch nut driver or other blunt tool
   - Replacement screws (for replacement screw information, see Installation Requirements on page 1.

Module configuration with the meter is dependent on your system application. See the Elster American meter configuration information.

Sensus Meter Installation

This section provides the information to install the module on a Sensus meter. These instructions apply to 11-tooth, 16-tooth, and 18-tooth residential Sensus gas modules.

> **Note:** Sensus meters are also known as Invensys, Equimeter, or Rockwell. For these instructions, all meter types are referred to as Sensus meters.

Figure 1 Sensus residential Cellular 500G module

Sensus 11-tooth

Sensus 16-tooth

Sensus 18-tooth

The listed Sensus meters are compatible with the gas modules.

Meter model			Gas module notes
S-110	11-tooth	ECG-7200-002	24 and 30-tooth gears are not compatible
T-110			
S-120			
T-120			
R-175			
R-200			
RT-200			
S-200			
RC-225			
RT-225			
RC-230			
RT-230			
250			
Cubix250			
MR-7 (Cubix250 Metric)			
 **R-275**			
RT-275			
S-275			
310			
R-315			

Meter model			Gas module notes
RCM-230 (RC-230 Metric)	16-tooth	ECG-7200-003	24 and 30-tooth gears are not compatible
MR-8 (R-275 Metric)			
MR-5 (S275 Metric)			
MR-9 (R-315 Metric)			
MR-12 (415 Metric)			
RT-100	18-tooth	ECG-7200-004	24 and 30-tooth gears are not compatible
S-175			
S-190			
RT-360			
 **415**	18-tooth. Older meters may have module-to-meter mounting hole variations that make them incompatible.	ECG-7200-004	24 and 30-tooth gears are not compatible

Installation Overview

Installing the 500G direct mount module to a Sensus meter involves four tasks.

1. Removing the index cover and preparing the meter for installation.
   - Preparing the meter requires:
     - A flat-head screwdriver
     - A scraping tool
2. Assembling the index and module.
3. Programming the module. See Module Programming on page 15 for programming instructions and items needed to program the module.
4. Connecting the module to the meter. Connecting the module to the meter may require the following materials:
   - A compatible index
   - Small and medium flat-blade or Phillips screwdrivers

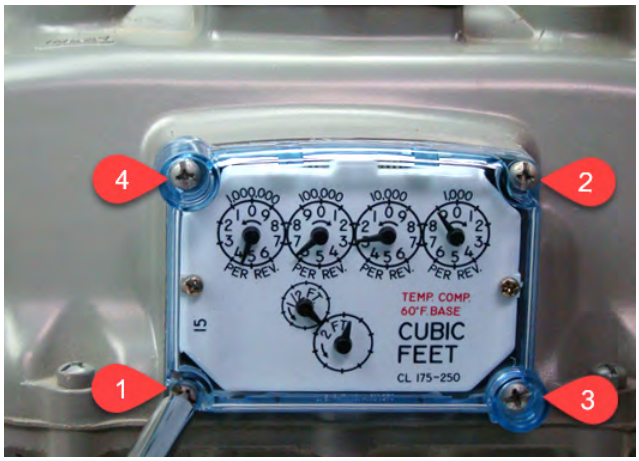
- Side-cutting pliers or wire snips
- (Optional) meter seals, wire seal, and seal press
- 11/32-inch nut driver or other blunt tool
- Replacement screws (for replacement screw information, see Installation Requirements on page 1)

Module configuration with the meter is dependent on your system application. See Sensus meter documentation for more information.

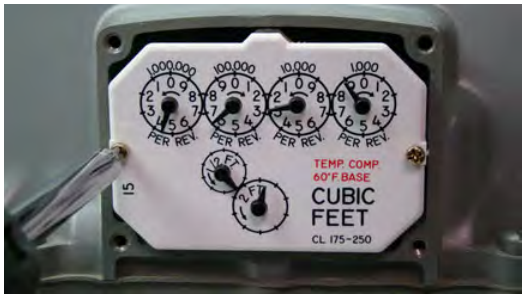
Residential Meter Mechanical Installation

This section describes the module mechanical installation on the residential Sensus meter.

1. Remove the four index cover screws and the index cover from the Sensus meter. Alternate screw removal following the numbered pattern as shown in the illustration.



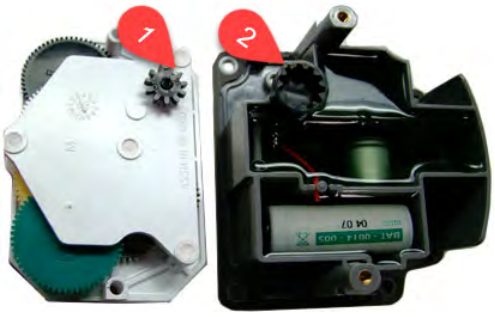
2. Examine the index cover screws. If they are 5/8-inch long and not corroded, keep them to attach the module assembly. If the screws are not the correct length or if the screws are corroded, discard them.
3. Remove one index mounting screw completely. Hold one hand under the index to catch the screw. While removing the other mounting screw, pull the index away from the meter to keep the index backplate against the back of the screw. Remove the screw completely after the index is free of the meter.



4. Set the index aside where it will not be damaged or fill with dirt, rain, or snow. You will mount the index on the module later in this procedure.
5. Verify that the index mounting screws not corroded. If the screws are the not corroded, retain for later use. If you discard the original screws, use the correct replacement screws. For screw replacement information, see Installation Requirements on page 1.
6. Remove the old gasket, gasket residue, and dirt from the meter (if applicable). The meter face must be free of gasket residue or dirt before you install the module.

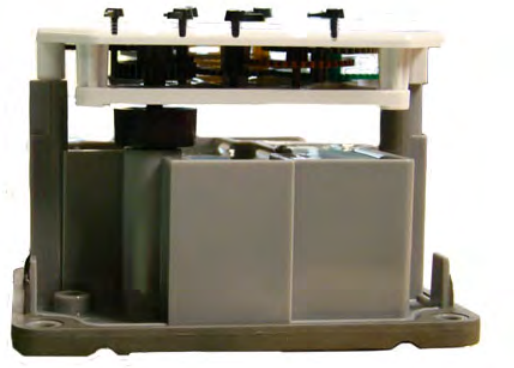
7. Separate the module housing from the clear cover by pulling the cover straight out from the housing. Set the module cover aside where it will not be damaged or fill with rain, dirt, or snow. You will replace the cover later in this installation procedure.

8. Place the index drive gear (1) in the shaft gear cup (2) of the module. The example shows an 11-tooth drive gear. Your index may be a 16- or 18-tooth gear. Use the appropriate module for your specific meter.



> **Warning!** Indexes have varying drive mechanism styles. Failure to align the module shaft with the index drive post can cause binding and lead to poor registration or meter failure. To verify proper engagement of the index to the module shaft, spin the wriggler one clockwise rotation, then one-counterclockwise rotation. Do not spin the shaft more than one complete rotation. The shaft should spin freely, with little or no resistance.

9. After the index drive gear is aligned and inserted into the shaft gear cup, the mounting holes will line up.

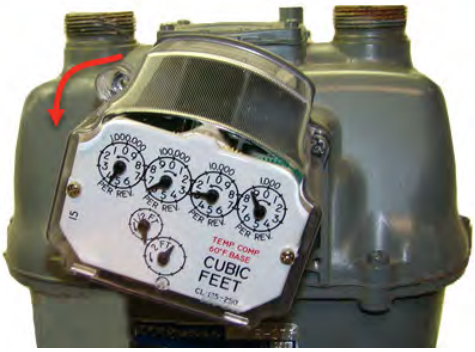


10. Using the original index mounting screw or a replacement screw (if necessary), place one 6 - 32 x 5/8-inch screw into the index right mounting screw hole.
11. Attach the screw to the module housing right-index mounting post just enough to hold the screw and the right end of the index in place.
12. Install and tighten the left index mounting screw.

13. Tighten the right index mounting screw completely. Install and tighten both index mounting screws evenly.

14. Slide the module cover over the index and housing. Verify that the cover is installed correctly. The module label should be clearly visible and easily read.

15. After the module programming is complete, attach the module assembly to the Sensus meter. For programming information, see Programming the Direct Mount Module on page 16.
16. Place the module assembly against the front of the meter at angle.



Warning! Failure to correctly align the meter drive gears and module drive gears can cause binding and lead to poor registration or meter failure. If there is a gap between the module gasket and the meter, it may be the that drive gears of the module assembly's wriggler are not correctly aligned with the meter drive gears. Remove the module assembly and repeat the alignment procedure. You must engage the module wriggler with the meter drive gears.

17. Install and tighten the module-to-meter mounting screws in an alternating pattern. Use the original mounting screws if they were the correct size and not corroded. If you discarded the original screws, use the correct replacement screws.

    Caution: As the module assembly is secured into its final position on the meter, shifting may occur due to existing tolerances within the mounting screw holes. To ensure full module wriggler gear to meter gear engagement, push the module to the right while tightening the screws in the following pattern.

    a. Align the top right mounting screw hole on the meter with the top right screw hole on the module.

    b. Insert the top right cover mounting screw and tighten the screw enough to hold the module assembly in place. Do not completely tighten the screw.

    c. Rotate the module assembly counterclockwise until the remaining three module screw holes line up with the holes in the meter.

18. Install the remaining three mounting screws and tighten them as described here and shown in the illustration.

    Important! Meter manufacturers: torque the mounting screws 15 to 20 inch-pounds.

    1. Insert lower left mounting screw (2) and tighten to snug position.
    2. Tighten upper right mounting screw (1,3) to snug position.
    3. Insert upper left mounting screw (4) and tighten to snug position.
    4. Insert lower right mounting screw (5) and tighten to snug position.

5. Tighten each mounting screw evenly.

19. Place a new tamper seal over the two screws with tamper seal cups. Press the new tamper seals into place using an 11/32-inch nut driver (or similar blunt tool).

20. Complete any necessary paperwork and properly dispose excess installation materials and scrap from the customer premises.

This completes installation of the module installation on the Sensus meter.

Programming and Requirements Notes

Caution: You must program the module before use. For programming information, see Programming the Direct Mount Module on page 16.

The module is programmed based on the meter's drive rate. Take note of the index drive rate shown on a lower dial on the index. Sensus meter index drive rates are typically 2-cubic feet.