Honeywell
THE POWER OF CONNECTED | CNI4

CNI4 Operating and Installation Guide

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1 Introduction

The basic CNI4 assembly includes a LTE supported Cloud Link 4G Modem and a dual-channel pulse data logger. It is designed to support most:

- Commercial & industrial (C&I) applications,
- Smart/automatic meter reading (AMR) analog applications, as well as
- 2G/3G modem-based applications.

The Cloud Link 4G Modem provides cellular communication that wirelessly transfers data originating from the pulse data logger. The CNI4 device is battery-operated (or can be externally powered) and is easy to configure using MasterLink R510+ configuration software over serial, bluetooth and cellular interface.

The accumulated data from the pulse data logger can be periodically reported to Honeywell PowerSpring R110+ Meter Data Management (MDM) system and other third party MDMs. (The CNI4 device must be configured as a Pulse Accumulator device in Honeywell PowerSpring.)

Two independent pulse sources may be connected to the input channels, each having its own 3.5 vdc wetting voltage. As the two channels act as independent accumulators, typical installations might include:

a. One pulse source (pulse transmitter or meter pulse) connected to either Ch1 or Ch2.
b. Two separate pulse sources (pulse transmitters or meter pulses): Ch1 for the first source and Ch2 for the second source.
c. Pulse outputs from one volume corrector connected to both channels, Ch1 for corrected volume pulses and Ch2 for uncorrected volume pulses.

The pulses received at either inputs are assigned a fixed volume through their respective 'Input Pulse Value' selections (item numbers 098 and 912 - refer to Volume related Item Numbers in the Appendix section).

If required, additional pulse scaling (Item numbers 114 and 913 - refer to Volume related Item Numbers in the Appendix section) can be applied to individual channels before the pulses are stored to their respective accumulated totals.

Table 1-1: Quick Reference: Items associated with Accumulated Volumes

	Ch1 Item#	Ch2 Item#
Input Pulse Value	098	912
Input Pulse Scaling	114	913
Accumulated Volume	002	910
Incremental Accumulated Volume	226	911
Accumulated Volume Units	092	458
Accumulated Volume # of Digits	097	097

Additionally, each pulse channel may also be configured to receive a user-specified FixedFactor multiplier. By default, this multiplier is disabled but may be activated by inserting the desired factor into item 044 for Ch1 and item 440 for Ch2. The FixedFactor feature is normally used to adjust the accumulated uncorrected volume for a fixed pressure factor or fixed temperature factor (or both).

The number of digits for Accumulated Volume and FixedFactor Volume can also be assigned for both channels. (item numbers 097, refer to Scaling related Item Numbers in the Appendix section.)

Table 1-2: Quick Reference: Items associated with FixedFactor Volume

	Ch1 Item#	Ch2 Item#
FixedFactor Volume	000	908
Incremental FixedFactor Volume	225	909
FixedFactor Value	044	440
FixedFactor Volume Units	090	457
FixedFactor Volume Digits	096	096

2 Specifications

Pulse Input Circuit

- Full temperature range: -25 °C to +65 °C
- Max wetting current provided = 35 micro-amps
- Max Pulser + Line Resistance = 200 ohms
- Max line length = 300 feet

If you are using Electronic Correctors or Reed Switch (mechanical) as a pulse input source, follow the specifications mentioned in the table below.

Table 2-1: Pulse Input Source Specifications

Specifications	Pulse input type	
	Reed Switch (mechanical)	Electronic Correctors
Firmware Filter	ON	OFF
Min “On” Pulse Width	150 ms	40 ms
Min “Off” Pulse Width	150 ms	60 ms
Max Bounce Time	10 ms	2 ms
Max Frequency	N.A.	10 Hz, 40% duty cycle 5 Hz, > 20% duty cycle
Max Reed Switch Pulse Rate In	20 PPM, 5% duty cycle	600 PPM, 40% duty cycle 300 PPM, 20% duty cycle

Memory

41 Days (If 4 user-specified audit-trail log items are configured for hourly logging)

Power Supply

Battery

- 2 D-cell Lithium disposable battery pack for the Pulse Accumulator
- 2 D-cell Lithium disposable battery pack with super-capacitor for the Cloud Link 4G Modem

External Power Supply

- Pulse Accumulator (5 to 16 V)
- While using external power, the Pulse Accumulator can use a 2 D-cell Lithium disposable battery pack as a backup.

Communications

- Wireless specifications:
  - LTE: Five band, 700 (Bd13)/700 (Bd17)/850 (Bd5)/ AWS (Bd4)/1900MHz (Bd2)
  - UMTS/HSPA+: Triple band, 850 (BdV)/AWS (BdIV)/1900MHz (BdII)
  - GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz

- Bluetooth Low Enenrgy: v.4.0 (2402-2480MHz)

Table 2-2: Modem Receiver Sensitivity

Parameter	Conditions	Min.	Typical	Unit
LTE Connectivity	Band 2, 4, 5, 13 and 17			
Receiver Input Sensitivity@ ARP (ch.bandwidth 5 MHz)	LTE 700 Band 17	-97	-102	dBm
	LTE 700 Band 13	-98	-103	dBm
	LTE 850 Band 5	-98	-104	dBm
	LTE AWS Band 4	-100	-103	dBm
	LTE 1900 Band 2	-98	-103	dBm

- Certified with Verizon and also operates with other major carriers in North America such as AT&T and Rogers.
- Falls back to UMTS/HSPA and GSM/GPRS
- Supports IPV4 communication
- Bluetooth Low Energy interface can be used for wireless configuration

Security

SSL/TLS 1.2

(Transport Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL), both frequently referred to as "SSL", are cryptographic protocols that provide communications security over a computer network.)

Software

- Configuration: MasterLink R510+ (Windows, iOS, Android)
- Data Collection: TDS /PowerSpring R110, Itron MV90 V3.0+

Enclosure

- 20% glass-filled polycarbonate
- Weight: 3.7 lbs
- Wall-mount, meter-mount and pipe-mount

Environmental

- -13 °F to +149 °F (-25 °C to +65 °C)
- Relative Humidity: 0 to 95% non-condensing

Certifications

- Class 1, Division 2, Group D
- PTCRB
- Verizon
- FCC

3 Safety

3.1 Limited Warranty

Honeywell Mercury Instruments, Inc. warrants all instruments covered by this manual to be free from defects in material and workmanship under normal use and service of this product. If returned to our factory, transportation charges prepaid, within 4 years of the original purchase shipment date, Honeywell Mercury Instruments agrees to repair or replace any instrument which its examination reveals to have been defective due to faulty workmanship or material. All obligations or liabilities on Mercury Instruments part is to repair or replace warranty instruments, and does not include any other type of claims or damages, including but not limited to consequential damages following the use or misuse of instruments sold by it.

Honeywell Mercury Instruments reserves the right to, at any time make changes, modification or enhancements to this product without prior notification. This warranty is in lieu of all other warranties, express or implied. No agent is authorized to assume for Mercury Instruments any liability except as set forth above.

3.2 Safety in Hazardous Locations

The Mercury Instruments CNI4 is certified by CSA (CUS) for Class I, Div-2, Group D hazardous locations when installed in accordance with CSA (CUS) control drawing 40-6144 in this manual. Operate the CNI4 device only if the instrument is completely intact. Also, ensure to comply with the applicable laws and regulations, and company policies for the usage of the CNI4 device.

> **Caution: Use only Mercury Instruments manufactured battery packs with part numbers specified on the certification label or control drawing. Use of third-party battery packs voids product warranty, voids hazardous locations Class 1 Div 2 certifications and may impair safety.**

Do not connect 51203165-100 battery pack and external power simultaneously to Cloud Link 4G Modem. Also, do not replace the battery pack in a hazardous location.

> **Warning:** Electrostatic discharge (ESD) can damage CMOS integrated circuits and modules. Observe precautions for handling electrostatic sensitive devices.

Related Item: Installation Drawing

3.3 Security

Using MasterLink R510.1, the CNI4 device can be configured through the following interfaces:

- Serial (using MasterLink desktop application)
- Bluetooth (using MasterLink mobile application)
- Cellular (using MasterLink desktop)

To start using MasterLink Application, Administrator must be registered using the license key provided by Honeywell. MasterLink administrator can create roles with access permissions and assign roles to different users. With this role based access mechanism, a user is restricted to the operations that are associated with assigned role.

A valid user name and password are required to access the MasterLink application, and a valid user ID and access code are required to sign-in to the Cloud Link 4G Modem.

For bluetooth communication with the CNI4, the Cloud Link 4G Modem uses Just Works pairing method. In order to connect a Cloud Link 4G Modem with MasterLink mobile app, you need to perform a bluetooth pairing first. That said, from the security standpoint, it is advised to disable the bluetooth interface and use the serial interface for configuration, to avoid malicious user configuration changes.

Every Cloud Link 4G Modem device has a unique IMEI and RUID numbers. RUIDs are used to identify a device using MasterLink desktop application.

The CNI4 supports white-listing of cellular communications. You can configure up to 10 host IP addresses for the device to allow specific hosts in case of host initiated call outs.

For communication over a cellular interface, the Cloud Link 4G Modem can use SSL/TLS 1.2 certificates for mutual authentication and secure connection. The following certificates can be loaded for secure communication over a cellular interface.

- **Client Certificate** - A client certificate is a type of digital certificate that is used by client systems to make authenticated requests to a remote server.
- **Server Certificate** - Server certificates or SSL certificates are small data files that digitally bind a cryptographic key to an organization's details.
- **Private Key (Encrypted)** - The private key is used to decrypt the information and restore it to its original format so that it can be read.
- **CA Certificate** - A Certification Authority (CA) is a trusted entity that issues electronic documents that verify a digital entity's identity on the Internet.

All files transferred to an Android device for use by MasterLink Software must be deleted after use to ensure that there is no data loss / leak. It is recommended to keep the Android phone or iPhone used for MasterLink Software updated with the security patches released by the respective platforms.

It is also recommended to enable SSL for secure communication with MasterLink Software R510.1.

3.4 Label

Check the material label and serial number label.

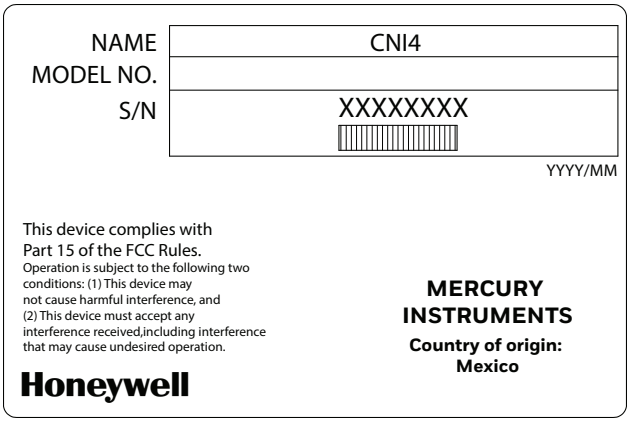


Figure 3-1: Label - Serial Number

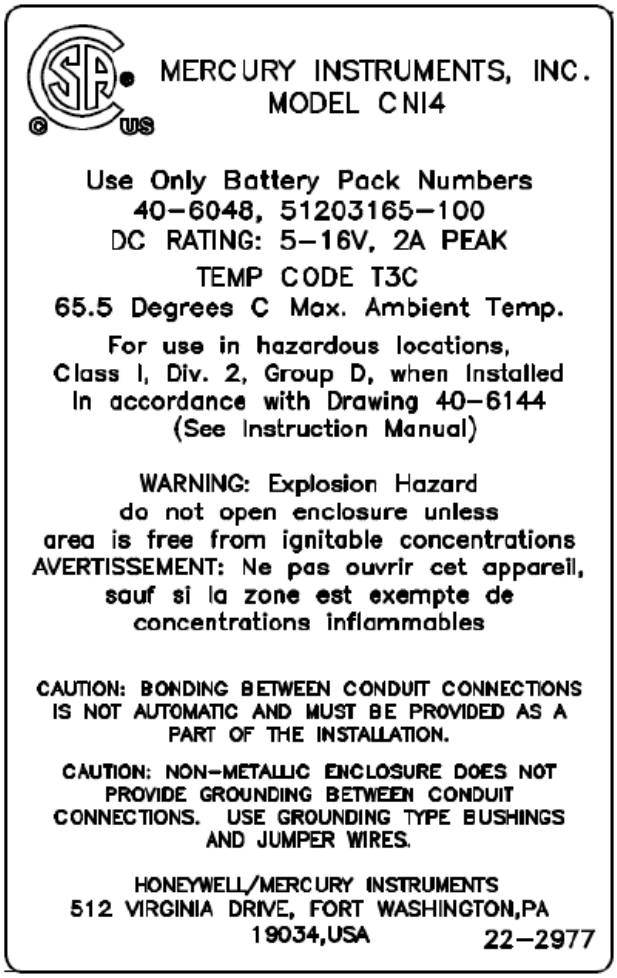


Figure 3-2: Material label

4 Mechanical Assemblies

4.1 Installing the SIM Card

The Cloud Link 4G Modem has a connector that holds the cellular radio Standard SIM card. Cloud Link 4G Modem supports both 1.8V (Class C) and 3.0V (Class B) version SIM cards.

To install the SIM card:

1. Lift the cover on the Cloud Link 4G modem.

2. Slide the white SIM card holder to the right, then lift the left edge.
3. Insert a SIM card into the slot provided and close the card holder.
4. Slide the SIM card holder to the left until it snap locks.
5. Close the cover.

> **Attention:** To avoid damage to the SIM card, ensure that the CNI4 / Cloud Link 4G Modem is powered down before inserting or removing the SIM card.

damage may result to the SIM card.

4.2 Instrument Mounting Options

The instrument mounting options must be clearly specified at the time of order to ensure that everything a field technician needs is available at the time of installation. A CNI4 device can be mounted using one of the following options:

- Wall mount
- Meter mount
- Pipe mount

4.2.1 Wall Mounting

Where a flat wall surface is available, such as on the side of a building or shed, stainless steel “hangers” can be utilized. Illustrated below is the rear view of a CNI4 with associated mounting dimensions (in inches).

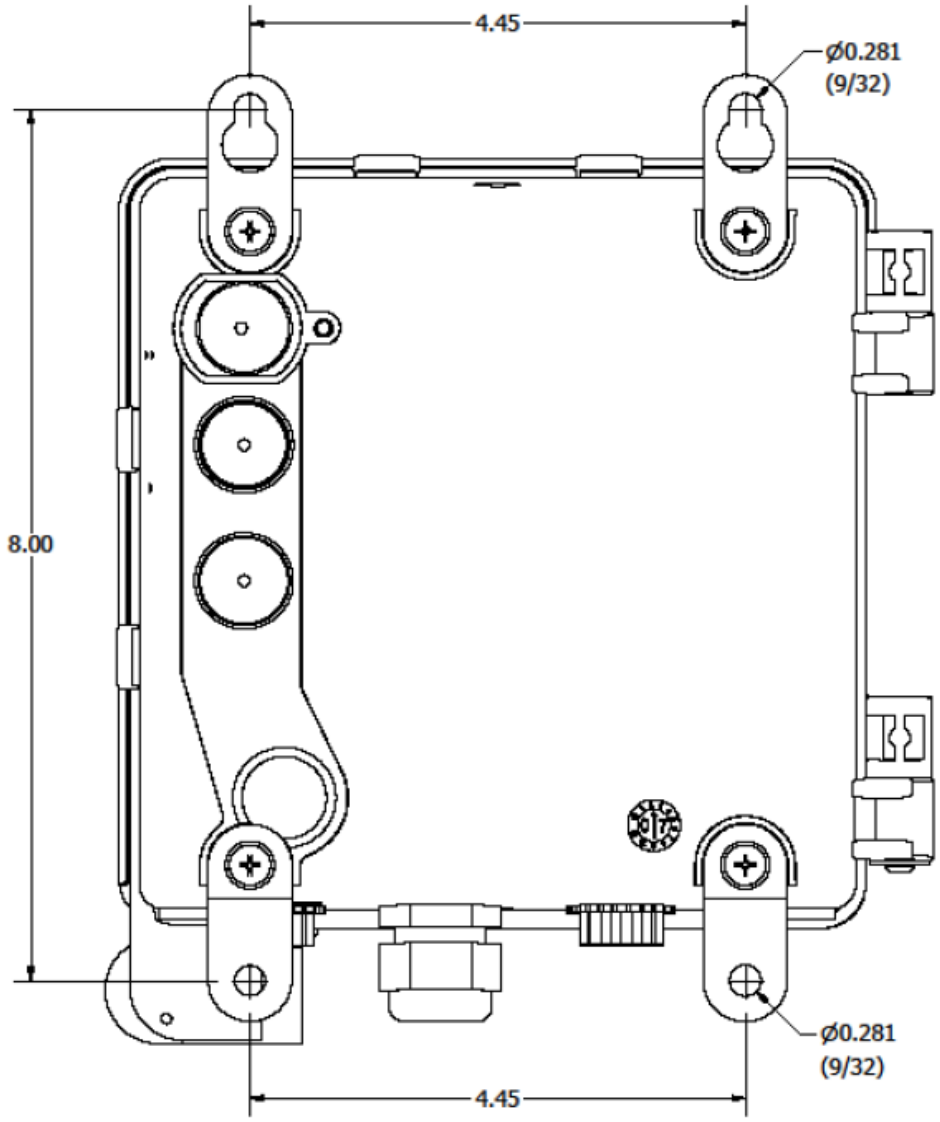


Figure 4-1: Wall Mounting Tabs and Dimensions

Recommended wall and fasteners

Recommended Wall	Brick Wall
Fasteners	Stainless Steel Thread Forming ¼" dia-1.25"length, Screw size 0.25" Min Torque 56 lb.in.

4.2.2 Meter Mounting

The UMB (Universal Mounting Bracket) option is used when the index base has to be mounted directly to a meter. The advantage this option provides is that you can mount the entire instrument without being concerned about routing external meter pulse signal wires. You can mount the UMB index base on rotary, turbine, and diaphragm gas meters that have a rotating instrument drive output. This includes American, Rockwell, Romet, Roots, or Schlumberger meters.

The UMB housing may be rotated about the base plate so that the instrument and index will face in any of four directions. To mount, remove all four screws (provided with the kit) which attach the base plate to the bracket housing. Replace and tighten the four screws after repositioning the UMB housing.

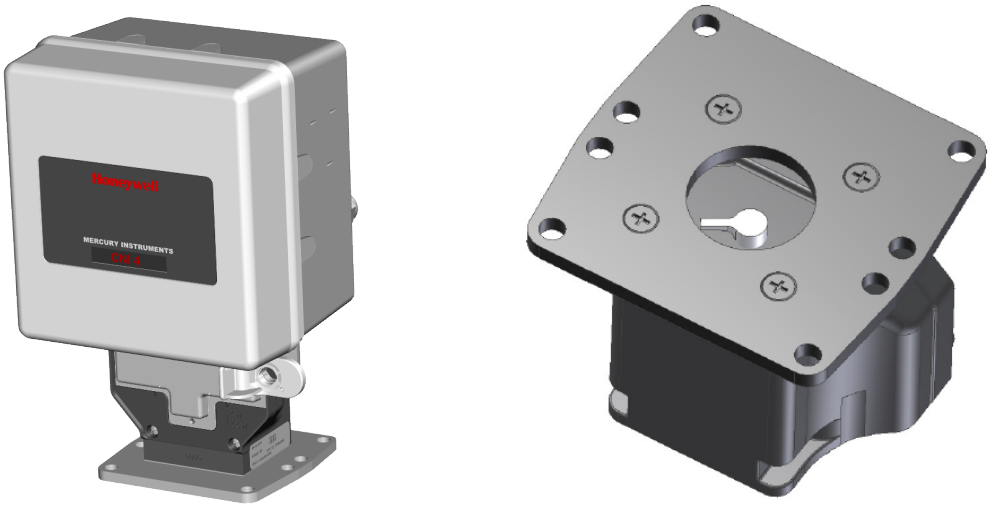


Figure 4-2: CNI4 with Universal Mounting Bracket (UMB)

Reference dimensions for the base plate are shown here. All dimensions are in inches.

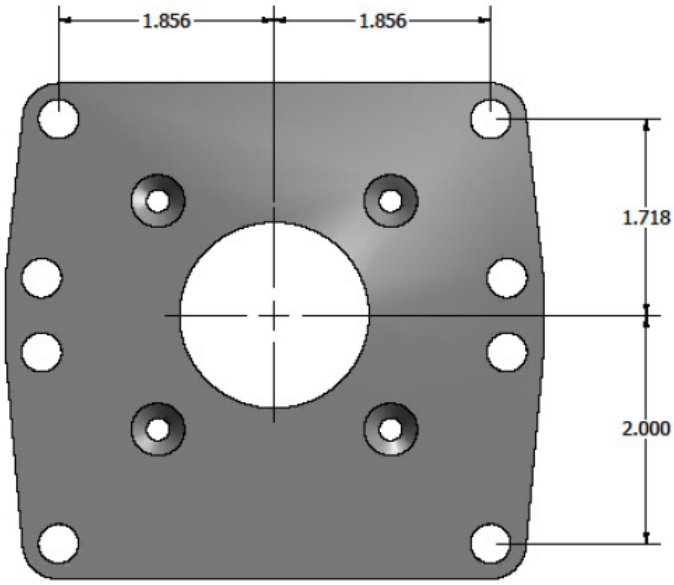


Figure 4-3: Universal Mounting Bracket (UMB) Hole Pattern

4.2.3 Vertical Pipe Mounting

Another mounting option available for the CNI4 is the pipe-mount. In this option, the adaptor will accept a 2 inch diameter galvanized pipe, and is secured in place with a pair of Allen-Head Set Screws.

Figure 4–4: Pipe Mounting using Collar

Shown below is a U-Bolt mounting option. This is optimized for metal pipe with an outside diameter of 2”.

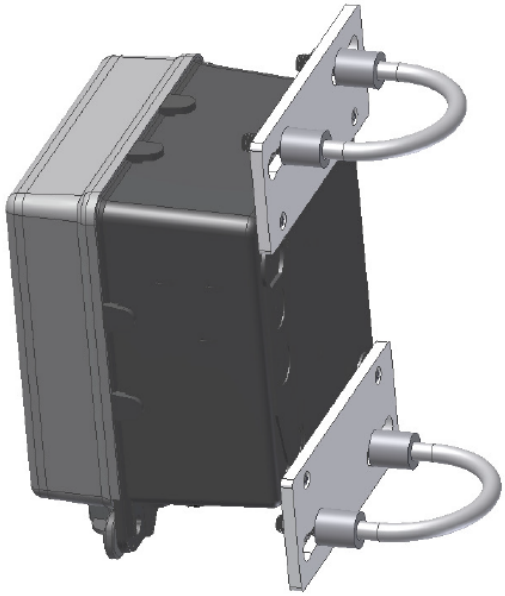


Figure 4–5: Pipe Mounting using U-Bolts

4.3 Call switch

In the CNI4 device, a CALL switch (magnetic reed switch) is located inside the left side of the instrument enclosure, behind the material label. This allows the field technician to initiate a call without the need to open the door of the unit. A hand-held magnetic wand is simply placed against the outside of the enclosure for a few seconds.

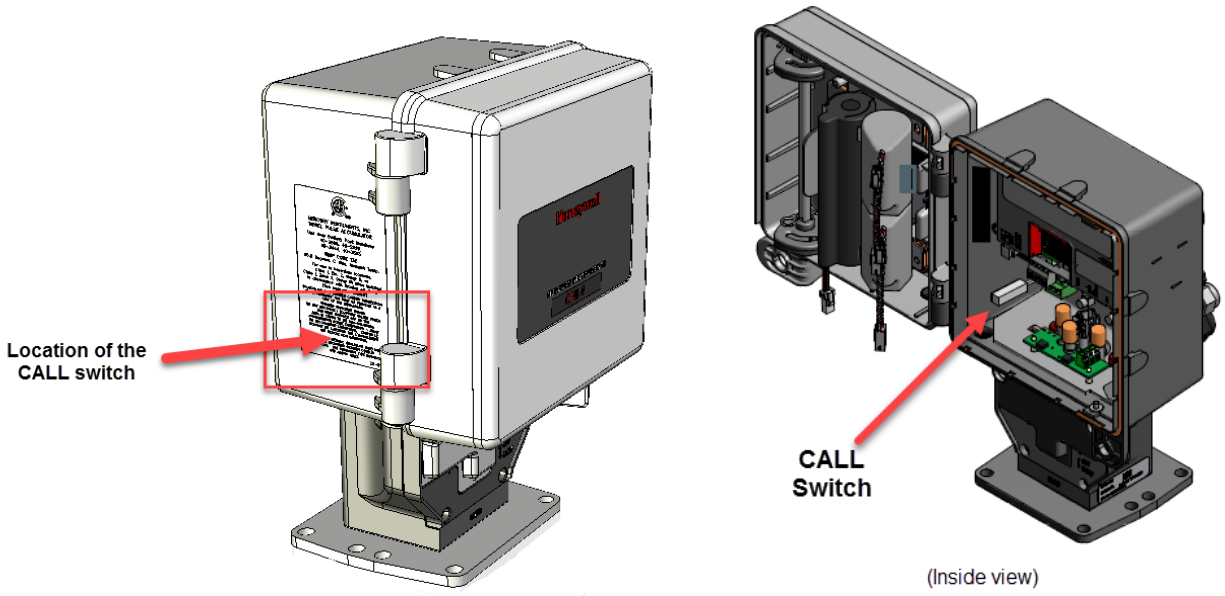


Figure 4-6: CALL switch

4.4 Enclosure Sealing

You need to open and close the device door to configure the CNi4 device. After configuring the CNI4 instrument, close the device lid and lock the door.

Seal the enclosure either using a conventional lock through the larger hole or by a security wire seal through the smaller hole.

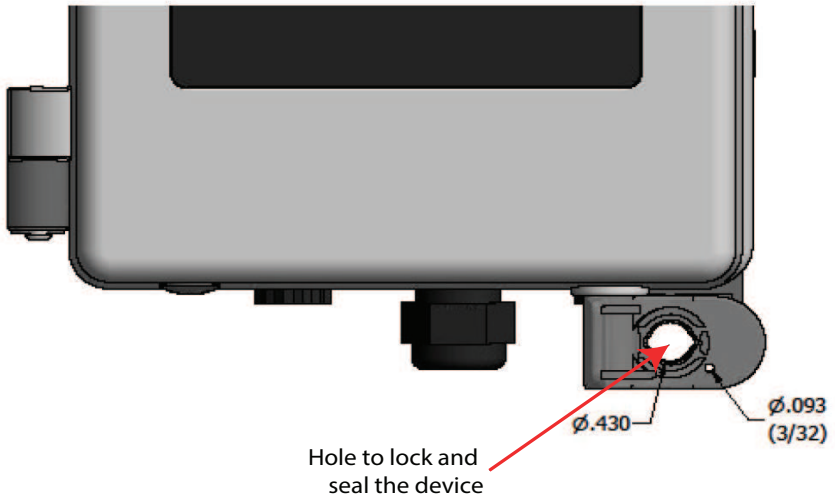
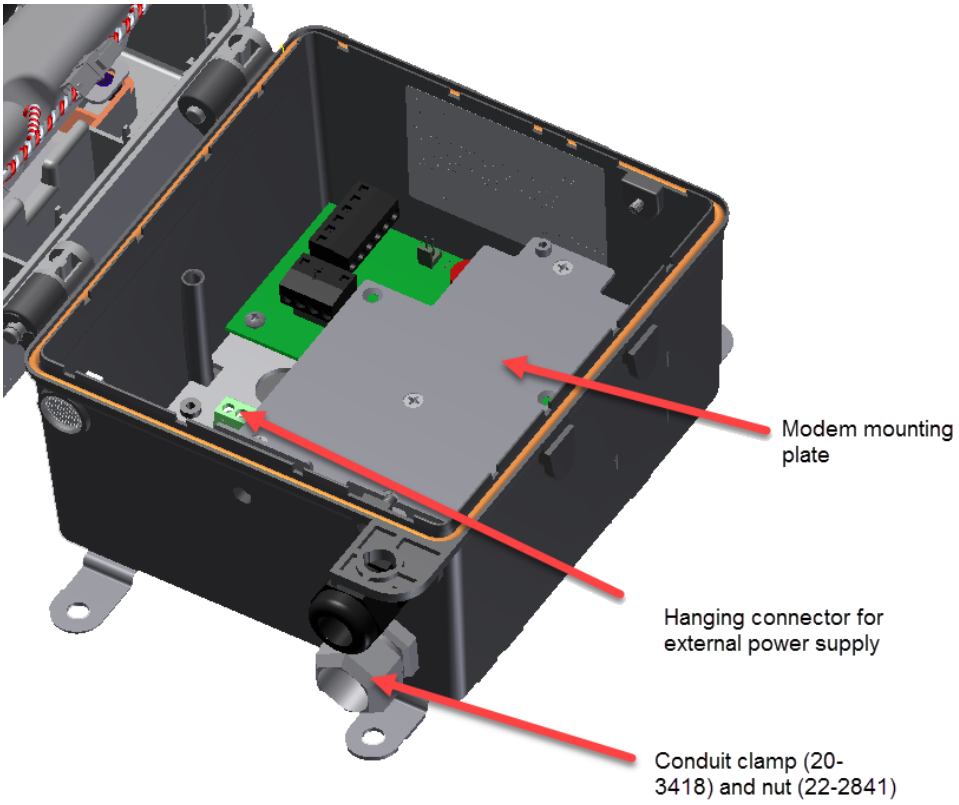


Figure 4-7: Enclosure Sealing Options

4.5 CNI4 device without the modem

If you have ordered a CNI4 device without the Cloud Link 4G modem, the device will be shipped with a modem mounting plate installed (see figure below). This enables you to order a Cloud Link 4G modem at a later time, and retrofit it inside the CNI4 device.



Antenna and terminal block position (external dc power) are same for both meter and wall mount

For Div 2 installation with external power option: The enclosure is supplied with a rigid metal conduit clamp 20-3418 and nut 22-2841

5 Electrical Assemblies

5.1 Internal Battery Power Options

Shown below is the CNI4 device with the Pulse Accumulator and Cloud Link 4G Modem battery packs installed and wired.

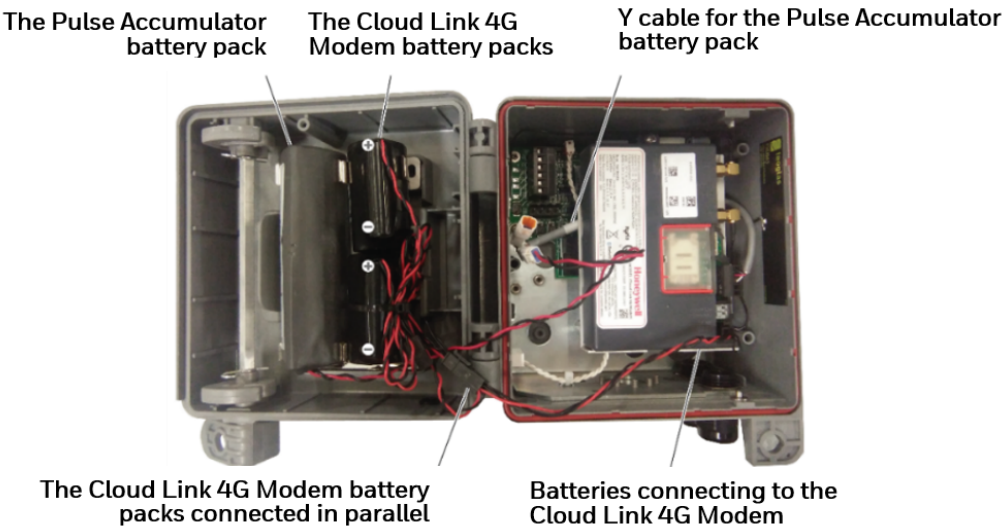
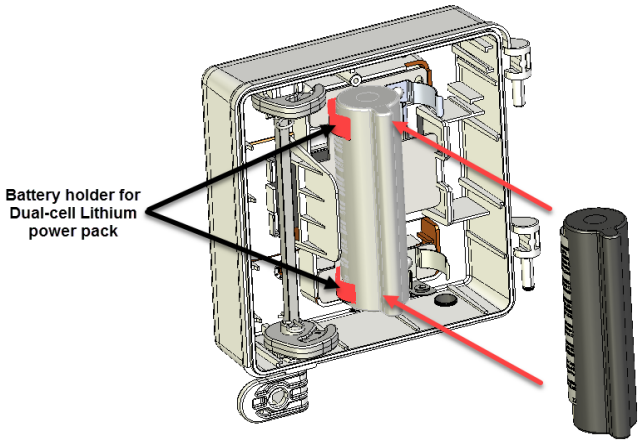


Figure 5-1: Lithium Battery Pack Mounting

Component	Battery pack	Ordering Part Number
Pulse Accumulator	Dual-cell Lithium power pack	40-6048
Cloud Link 4G Modem	Single Lithium D-Cell	51203165-100

To connect the battery pack to the Pulse Accumulator

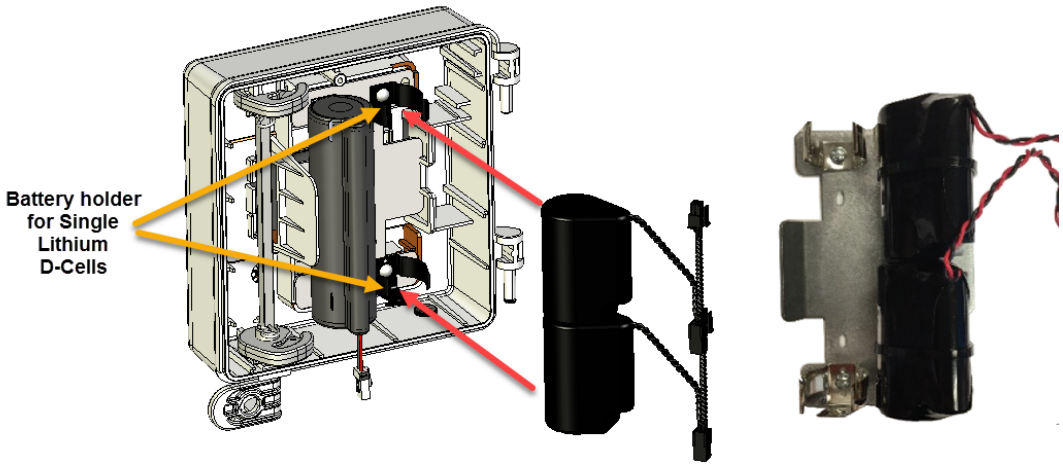
1. Insert the Pulse Accumulator battery pack into the battery holder provided on the enclosure door.



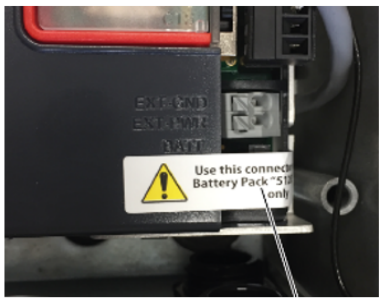
2. Connect the Pulse Accumulator battery pack to the Y cable.
3. Wrap the extra wire using a cable tie.

To connect the battery packs to the Cloud Link 4G Modem

1. Insert the Cloud Link 4G Modem battery pack into the battery holder provided on the enclosure door. You can also connect two battery packs in parallel, and install them in place as shown in the figure below.



2. Tie-wrap the batteries to the metal plate.
3. Connect the female connector from the first battery to the male connector of the second battery.
4. Remove the warning label as shown in the picture, and then remove the dummy battery connector plug on the Cloud Link.



Cloud Link 4G Modem battery connector

5. Attach the connector from the second battery to the Cloud Link battery connector.
6. Wrap the extra wire using a cable tie.

5.1.1 Battery Replacement

Batteries must be replaced in non-hazardous location or after ensuring the area is free from hazardous gases. Before replacing the Pulse Accumulator battery connect the fresh battery to the free-end of the Y-cable to avoid power interruption.

Replacement of internal battery packs is quick and convenient by pressing left-wards on the large plastic tab and pulling the pack out. Take care to not lose grip of the battery pack while disconnecting the power connector from the Pulse Accumulator board.

5.1.2 Extending Battery Life

The CNI4 is designed to provide a long service life when operating from batteries. Total battery life is influenced by two factors in the CNI4 — continuous background current and high current draw during cellular calls. The background current can be minimized to a certain extent by using fewer pulse input connections and using normally-open (Form-A) contacts for pulse and alarm sensing. High current draw depends on the number and duration of cellular calls made. This can be minimized by ensuring the CNI4 has strong cellular reception (which minimizes call retries) and by limiting the number of regular scheduled calls to a practical extent.

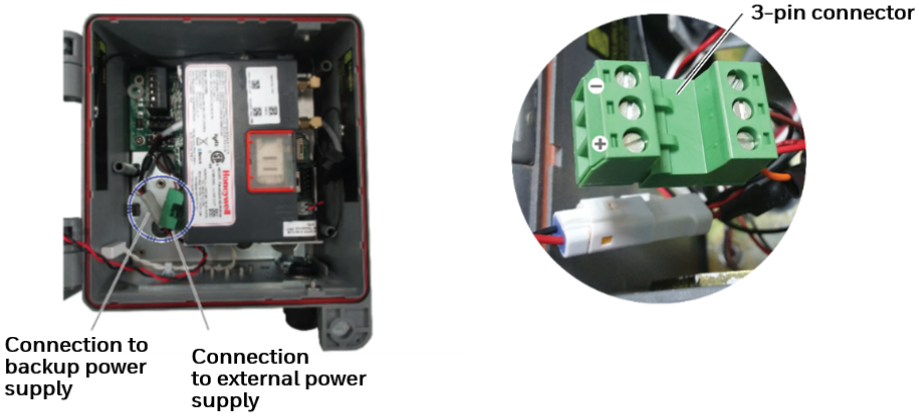
The battery life also depends on bluetooth advertisement interval and so it is recommended to optimize the usage of bluetooth.

5.2 External Power Option

A 3 Pin connector is available on the Y-cable to connect to an external power supply. Where AC power is readily available, as is the case at some sites, use a power adaptor to supply the necessary voltage. The power adaptor is required to be capable of sourcing Class 2 power supply with 2A rated current, 5V to 16V range.

To setup external power supply

1. Remove the housing of the metal conduit and route the power cable through it.
2. Connect the power cable to the 3-Pin power connector on the Pulse Accumulator Board.
3. Connect the other end of the power cable to an external power source (5 to 16 V, 2A peak current).



The output voltage from the power adaptor can be wired to the positive and GND terminals of the 3 pin connector shown above. It may be necessary to check with a voltmeter to determine the positive and GND wires coming from the power adaptor. Polarity of the terminal block connection will be apparent from the wire color — Red is positive and Black is negative.

> **Attention:** In the event of a reverse connection, no harm will be caused to the electronics but the CNI4 will not power as expected.

5.3 Connecting the external pulse inputs

(Applicable for wall-mounted units only)

It is possible to connect a maximum of two external pulse inputs at TB2 (Terminal Block 2) of the Pulse Accumulator.

A 3.5 VDC wetting voltage is provided by each Pulse Accumulator input channel. If the pulse channel is to be wired to an active device, i.e. transistor-type output, be sure to observe polarity.

To connect the external pulse inputs

1. Remove the housing on the cable gland and route the pulse input(s) cable through it.
2. Unplug the male 4-Pin terminal block connector.
3. Connect the external input pulse wires of the cable into the appropriate slot on the 4-Pin terminal block connector.
4. Reconnect the 4-Pin terminal block connector.

5.4 USB-to-serial cable

You can use the MasterLink Software (R510.1 or higher) to configure the Pulse Accumulator and the Cloud Link 4G Modem as two independent sites, using the USB-to-serial cable (40-6147-kit).

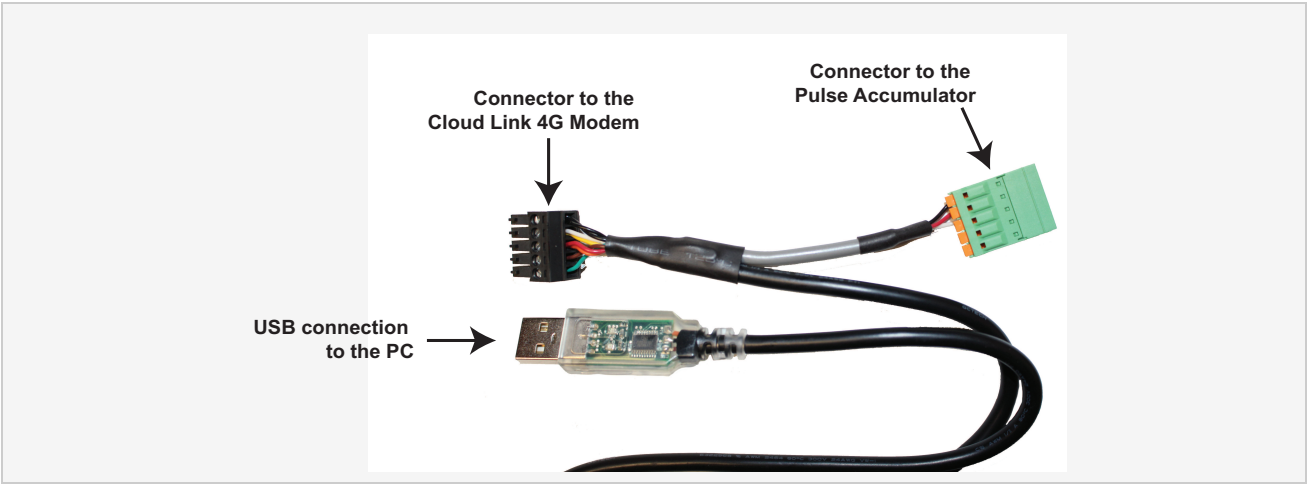
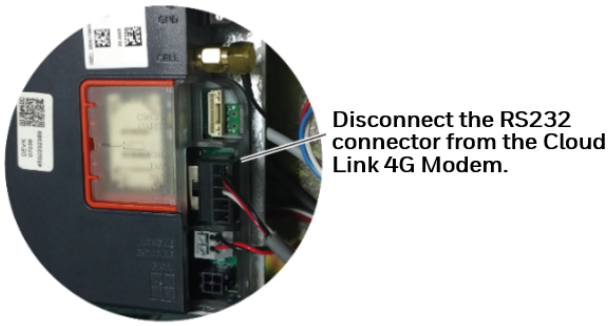


Figure 5-2: The USB-to-serial cable (40-6147-kit)

One end of the cable has a USB connector and the other end includes a male and female connector. The male (black) connector connects to the Cloud Link 4G Modem, and the female (green) connector connects to the Pulse Accumulator.

5.5 Disconnecting the serial interface cable

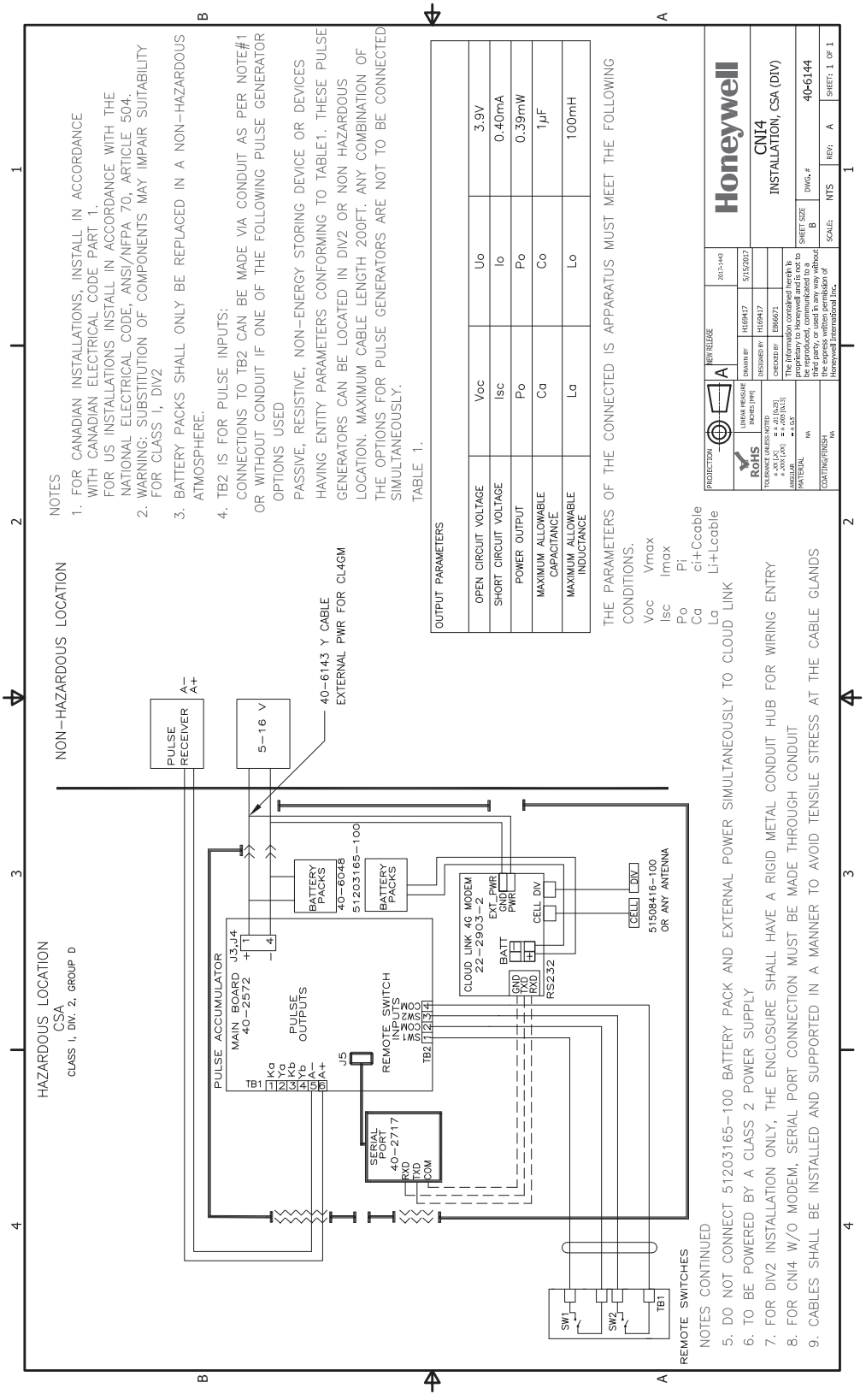
To configure the Cloud Link 4G Modem and the Pulse Accumulator, you need to disconnect the serial cable interface connecting them. To do this, Disconnect the RS 232 connector connected to the Cloud Link 4G modem, and then use the USB-to-serial cable (40-6147-kit) to continue with the configuration process.



Attention: After configuration is complete, remember to resore the original serial interface between the Pulse Accumulator and the Cloud Link 4G Modem.

5.6 Installation Drawing

CNI4 device for Class I Division 2 must be connected to other circuits as per the below installation drawing (40-6144). Substitution of components may impair suitability for use in a hazardous location.



6 Getting Started with a CNI4 device

Follow the steps below to get started with a new CNI4 device:

Step 1: Open the door of the CNI4 and install the SIM Card

Step 2: Power-up the CNI4 – via battery or external power supply

Step 3: Connect the external pulse inputs (applicable for wall-mounted option only)

Step 4: Disconnect the serial cable interfacing the Pulse Accumulator and the Cloud Link 4G Modem

Step 5: Configure the Pulse Accumulator using serial connection

Step 6: Configure the Cloud Link 4G Modem using serial connection

Step 7: Restore the original serial cable connection

Step 8: Close and lock the door

7 Configuration

MasterLink software is used to configure the CNI4 device. MasterLink R510.1 is available as a Windows application and also as an app that can be installed on iOS and Android devices.

CNI4 Configuration scenarios are listed here:

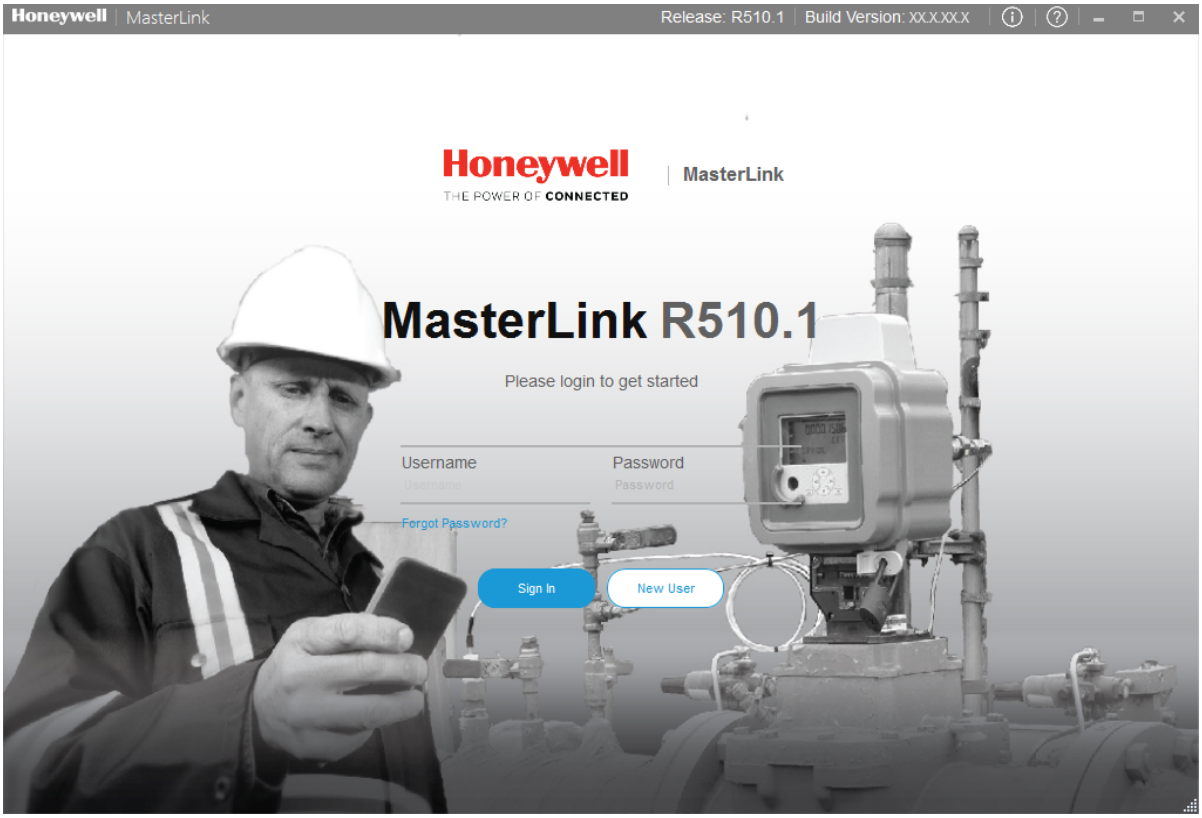
Using the MasterLink Windows application you can:

- Configure the Pulse Accumulator and the Cloud Link 4G Modem as separate sites by connecting to them individually using a serial cable. In this case, both must have the same Site ID.
- Configure the CNI4 device as an integrated device by connecting to it over internet.
- Configure the CNI4 device as a single site, and using the same site you can connect to the Pulse Accumulator / Cloud Link 4G Modem individually through serial communication.

Using the MasterLink mobile app, you can connect to the CNI4 device over Bluetooth, and configure it as an integrated device.

7.1 Getting started with MasterLink

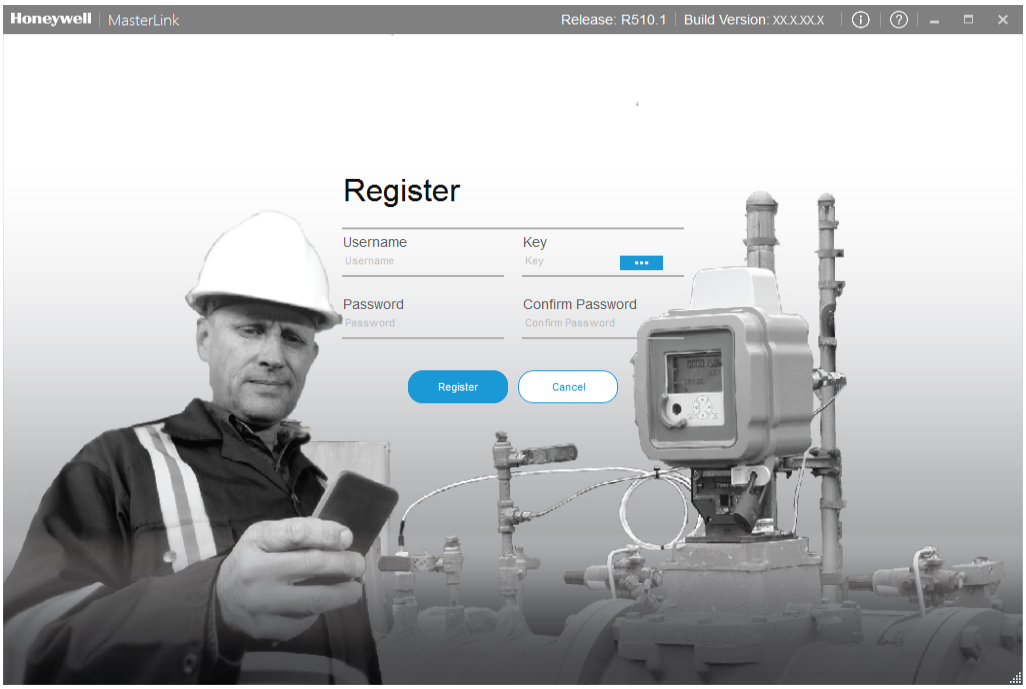
On launching the MasterLink, you will see a screen to log on.



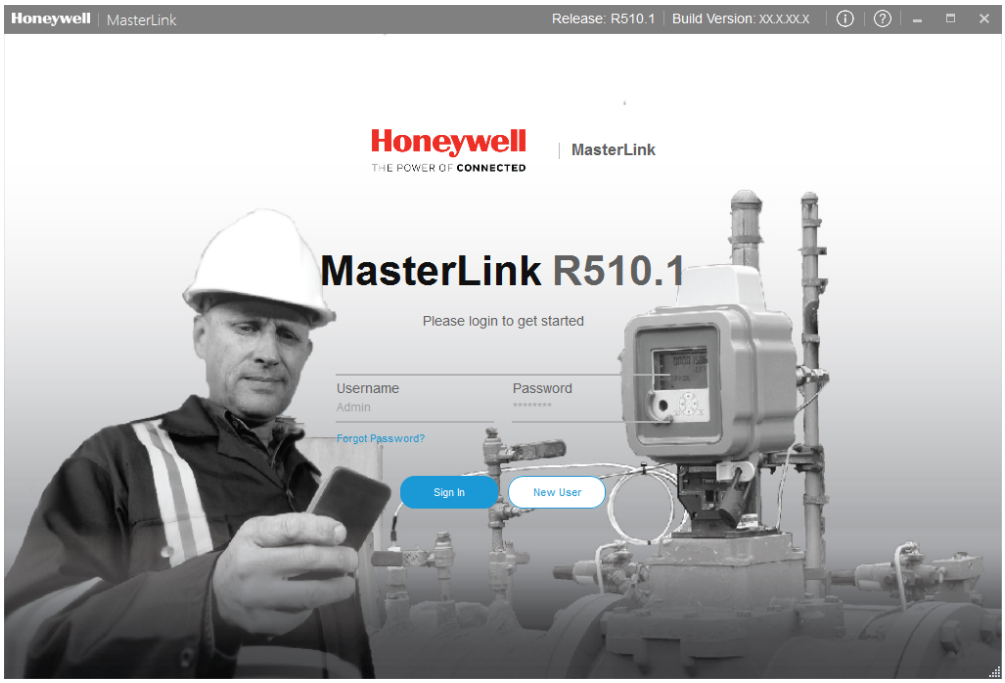
To start using MasterLink Application, Administrator must be registered using the license key provided by Honeywell. After the site administrator is registered, they can create new users using Security feature.

For individual user, the generated license key must be emailed to them by the administrator allowing them to register and start using MasterLink.

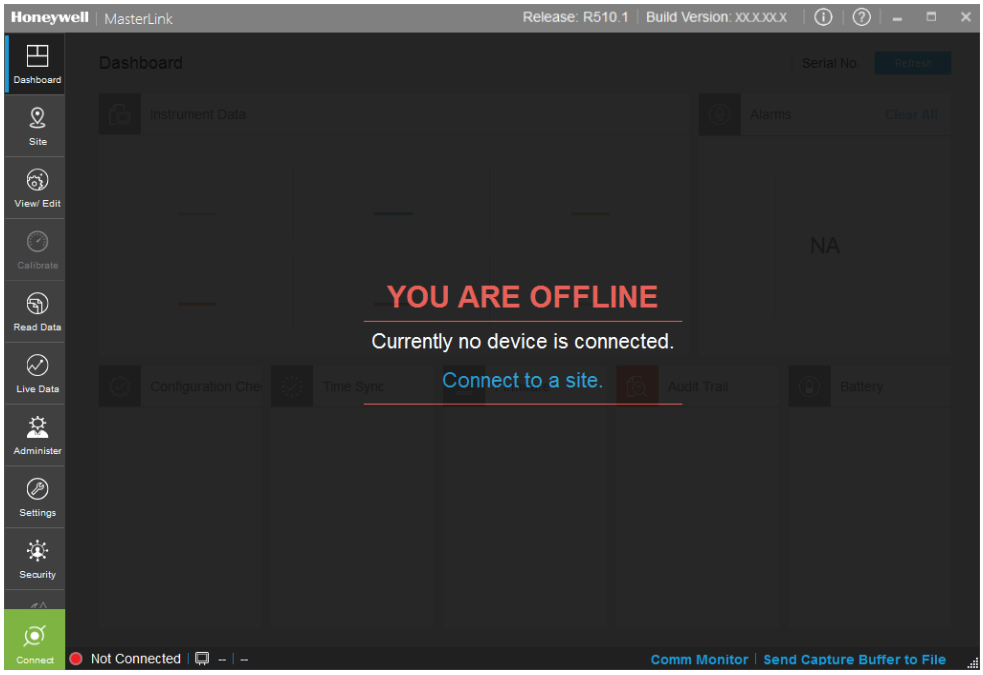
For a first time user, click **New User** and register. Enter the log-in details, browse and select the license key, and then click **Register**. The user-name you enter while registering must match with the user name used while creating the license key.



The Login screen appears. Log in with your credentials. Click **Sign In**.



The following screen is displayed.

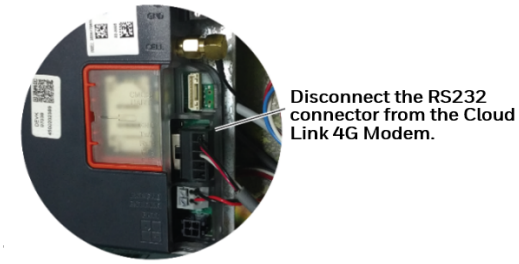


Download a copy of the MasterLink Guide for more information on using Honeywell MasterLink.

7.2 Configuring a Pulse Accumulator using serial connection

To configure the Pulse Accumulator using serial connection:

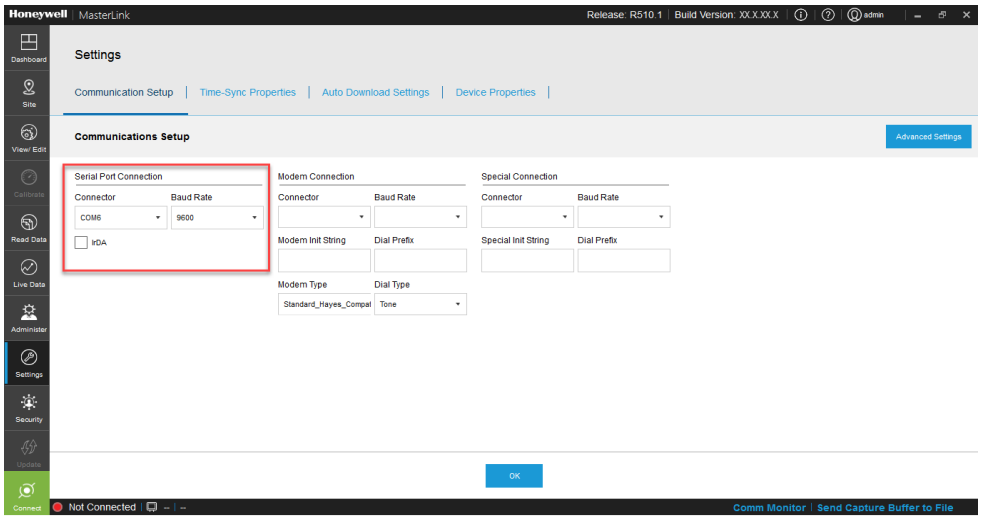
1. Disconnect the serial cable interface connecting the Pulse Accumulator and the Cloud Link 4G Modem.



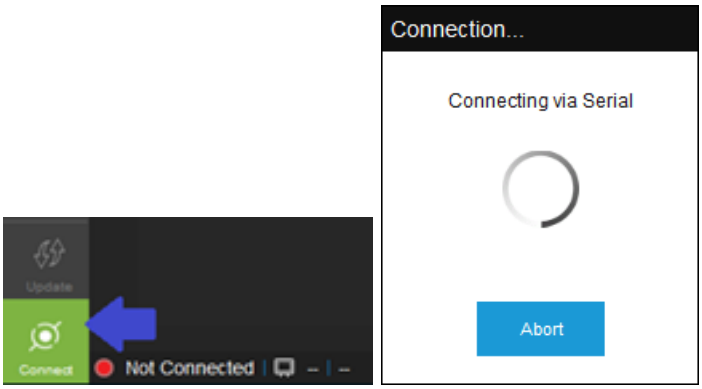
2. Insert the female connector of the Pulse Accumulator into the male connector of the USB-to-serial cable (40-6147-kit).

3. Connect the USB end of the serial cable to a PC running the MasterLink R510.xx desktop application.
4. Launch and login to the MasterLink R510.xx desktop application.
5. Navigate to the **Settings** menu. In the 'Communications Setup' tab, select the **Serial Port Connector** and the **Baud Rate** (default value = 9600) and Click **OK**.

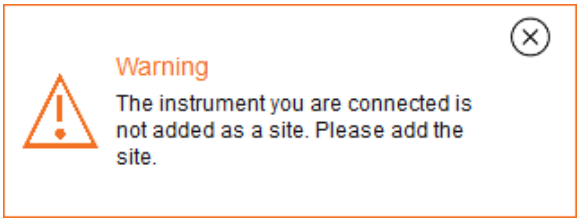
> **Note:** If multiple serial port connectors are detected, then ensure that you select the correct port using the **Connector** drop-down. Also, ensure that you set the baud rate to match the baud rate of the connected instrument.



6. Click **Connect**. MasterLink starts connecting to the Pulse Accumulator.

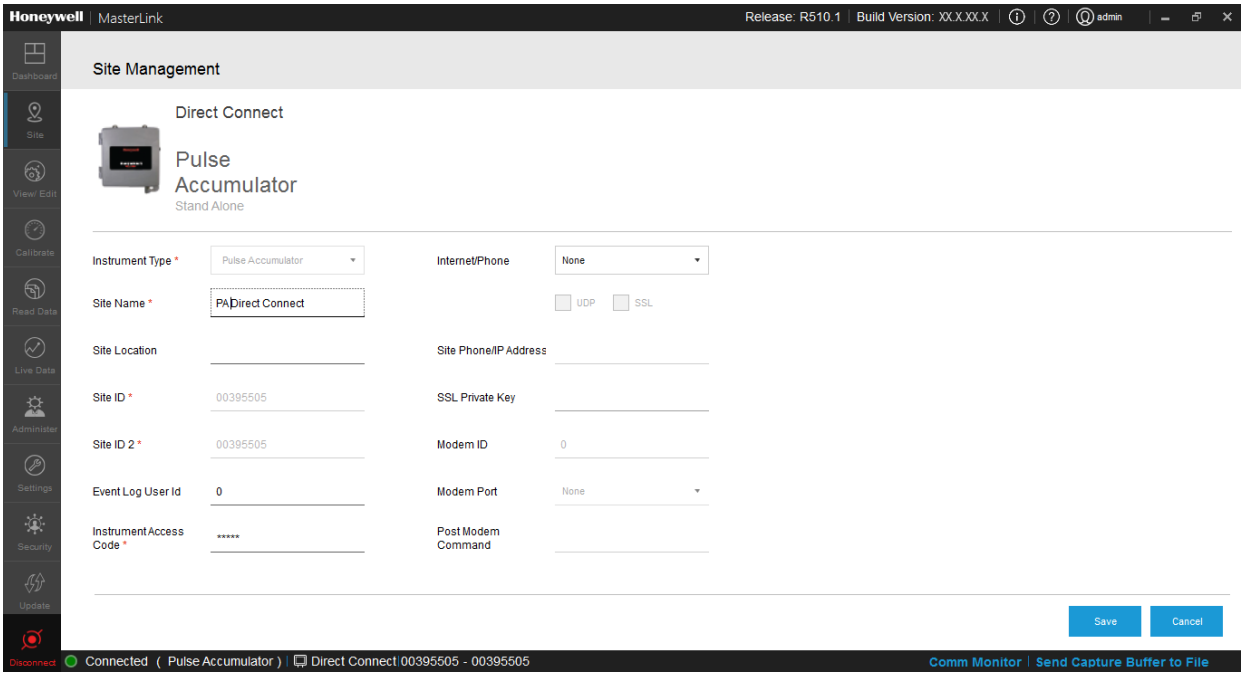


When connecting to the Pulse Accumulator for the first time, as the site is not already added to MasterLink, you will see the following warning message asking you to add the site to MasterLink.



This warning is not displayed, if the site is already added to MasterLink.

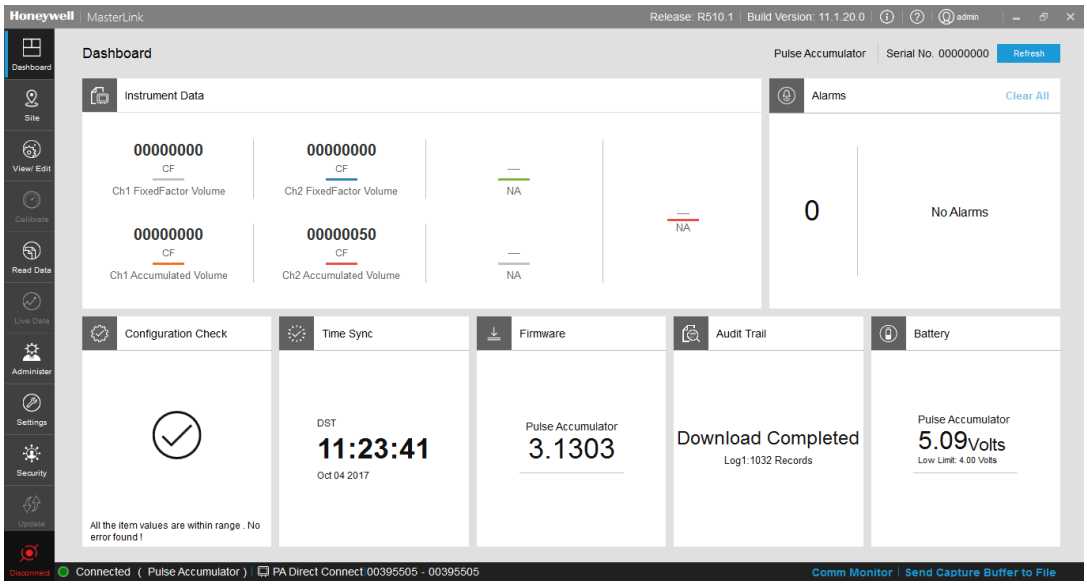
7. Close the warning message. The following screen appears.



8. Edit the **Site Name**.

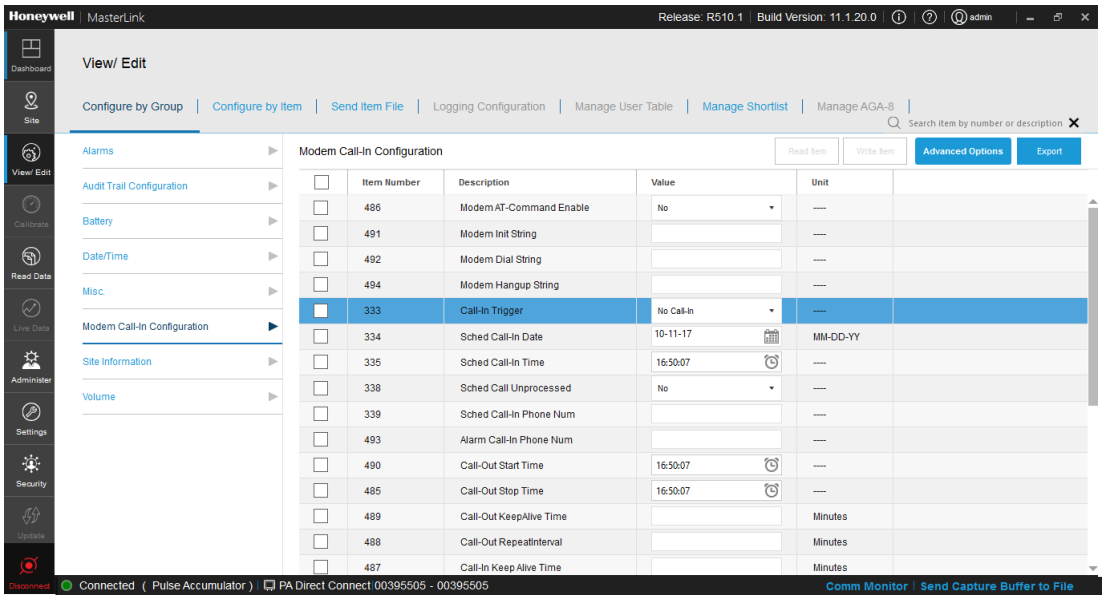
   Click **Save** to continue.

The instrument dashboard appears. Also, the site is added to the list of sites on the site management screen.



Note: Before making any changes to the connected instrument, ensure that you wait till the dashboard data is completely loaded.

9. Click the center of the **Time Sync** widget and perform a time synchronization between the Pulse Accumulator and the PC by clicking **Sync**. You need to perform a time sync if you see a difference in the instrument time and the host (PC) time. Otherwise you can skip this step.
10. Navigate to **View/Edit > Configure by Group > Site Information** and change the Site ID to the value required by MDM software.
11. Navigate to **View/Edit > Configure by Group > Modem Call-in Configuration**.

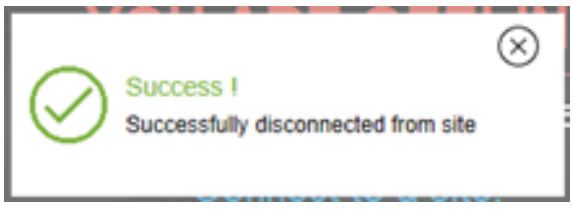


Select the check-box next to an Item number, enter a value in the text box provided and then click on **Write Item** button to write the value against the item in the connected instrument/device. You can search for a specific item number and can also modify multiple Item Numbers at once. You can also use the **Read Item** button (enabled only when an item is selected) to read the currently configured value of the item numbers.

Set the following parameters:

Item No.	Description	Recommended Value
333	Call-in Trigger	3 = Alarm & Scheduled Call-in
449	Switch Filtering	1 = Filter Both Channels
486	Modem AT-Command Enable	1-Yes
334	Scheduled Call-In Date	Set to the desired Call-In Date
335	Scheduled Call-In Time	Set to the desired Call-In Time
336	Call-In Retry By	Instrument
339	Scheduled Call-In Phone number	<IP>/<Port>Example: 192.168.1.1/50467
485	Call-Out Stop Time	00:00:00
490	Call-Out Start Time	00:00:00
493	Alarm Call-In Phone number	<IP>/<Port> Example: 192.168.1.1/50467
495	Modem Retry Interval A	5 minutes
496	Modem Retry Interval B	1440 minutes
497	Modem Retry A Count	3

12. Click **Disconnect** to disconnect MasterLink from the Pulse Accumulator. On successful disconnection from the Pulse Accumulator, a status message is displayed. Close the pop-up to acknowledge the message.



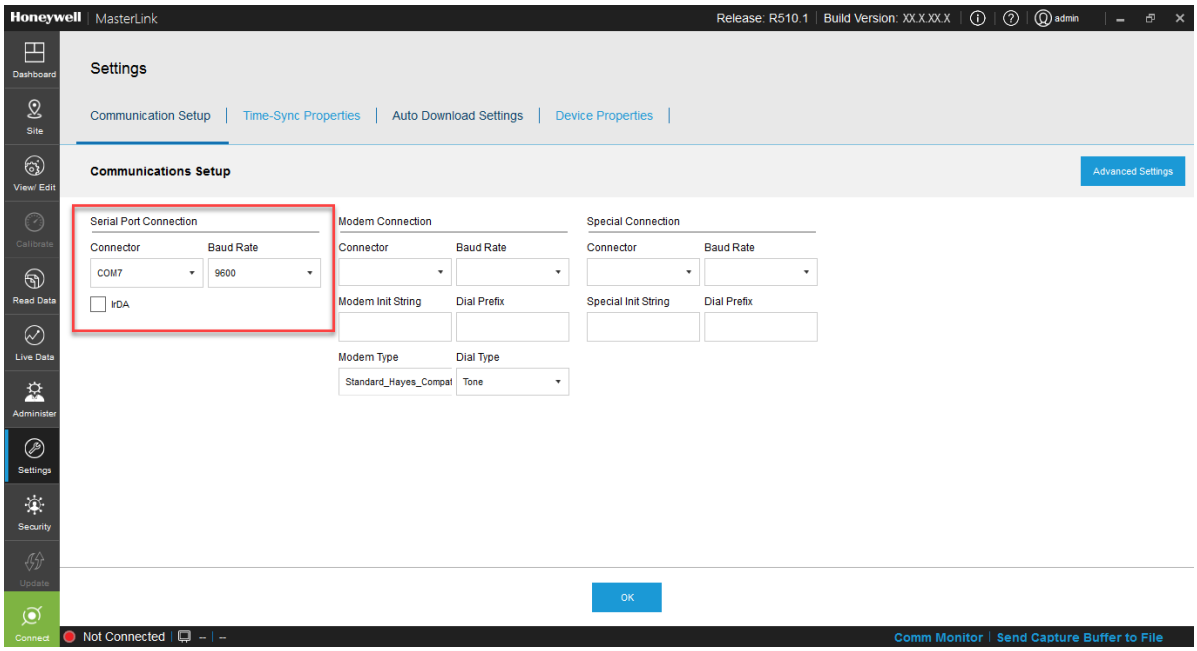
7.3 Configuring a Cloud Link 4G Modem using serial connection

To configure the Cloud Link 4G Modem using serial connection:

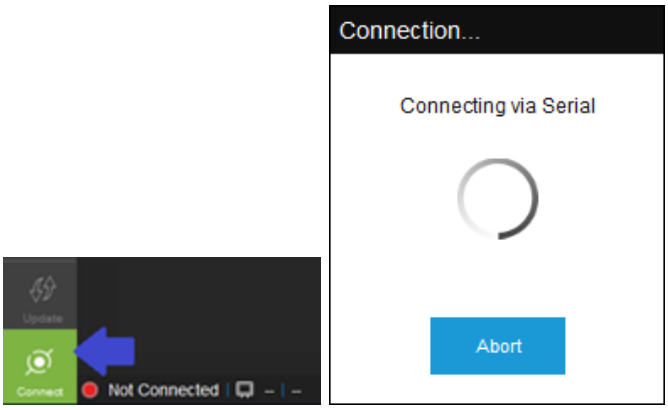
1. Disconnect the male connector of the USB to serial cable that was previously connected to the Pulse Accumulator.
2. Insert the male connector, so far unused, of the USB-to-serial cable into the female RS232 connector slot on the Cloud Link.

3. Connect the USB end of the serial cable to a PC running the MasterLink R510.xx desktop application.
4. Launch and login to the MasterLink R510.xx desktop application.
5. Navigate to the **Settings** menu. In the Communications Setup tab, select the **Serial Port Connector** and the **Baud Rate** (default value = 9600) and Click **OK**.

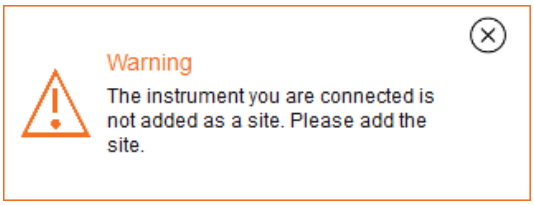
> **Note:** If multiple serial port connectors are detected, then ensure that you select the correct port using the **Connector** drop-down. Also, ensure that you set the baud rate to match the baud rate of the connected instrument.



6. Click **Connect**. MasterLink starts connecting to the Cloud Link 4G Modem.

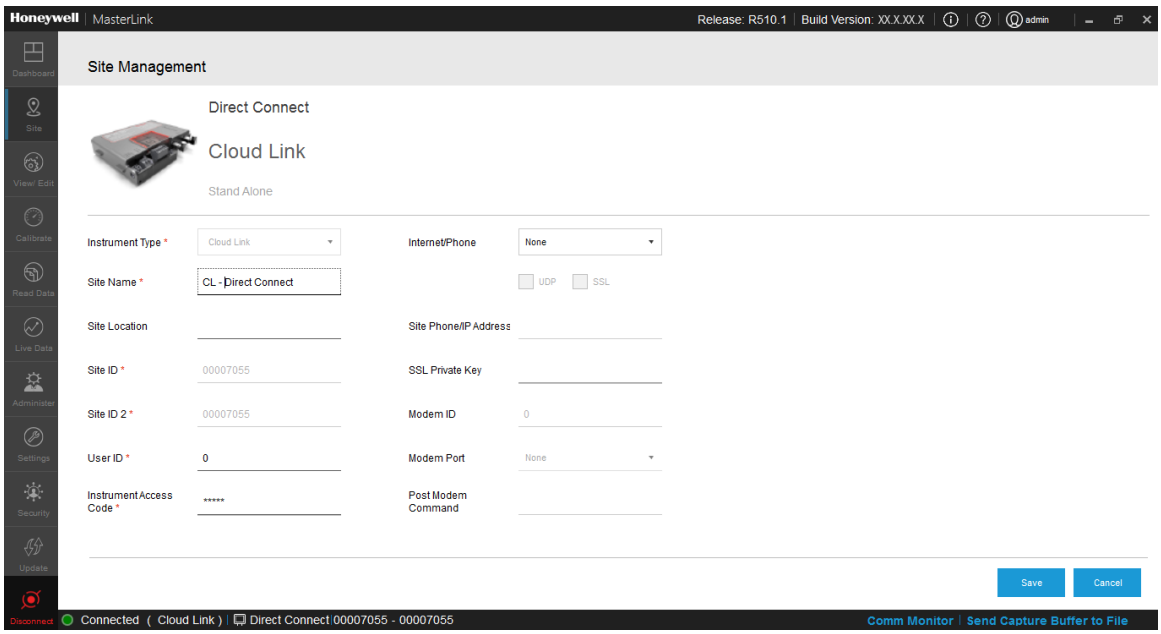


When connecting to the Cloud Link 4G Modem for the first time, as the site is not already added to MasterLink, the following warning message appears asking you to add the site to MasterLink.



This warning is not displayed, if the site is already added to MasterLink.

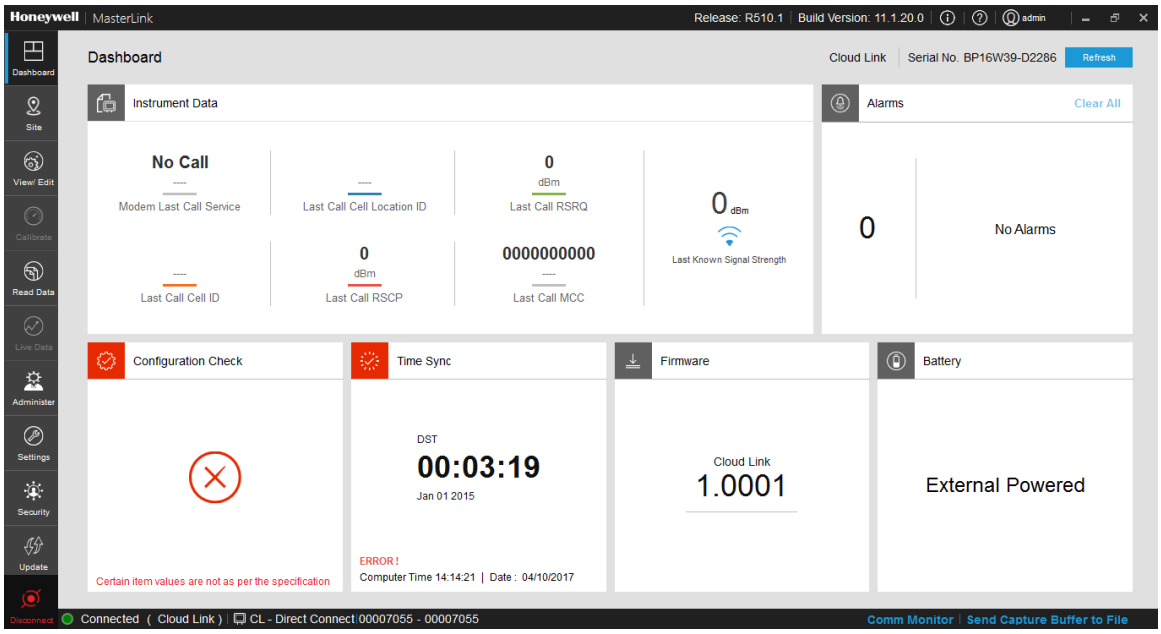
7. Close the warning message. The following screen appears.



8. Edit the **Site Name**.

Click **Save** to continue.

The instrument dashboard appears. The site is added to the list of sites on the Site Management screen.



Note: Before making any changes to the connected instrument, ensure that you wait till the dashboard data is completely loaded.

9. Wait for the dashboard to load. Click the center of the **Time Sync** widget and perform a time synchronization between the Cloud Link 4G modem and the PC by clicking **Sync**. You need to perform a time sync if you see a difference in the instrument time and the host (PC) time. Otherwise you can skip this step.

10. Navigate to **View/Edit > Configure by Group > Radio Configuration.**

    Select the check-box next to an Item number, enter a value in the text box provided and then click on **Write Item** button to write the value against the item in the connected instrument/device. You can search for a specific item number and can also modify multiple Item Numbers at once. You can also use the **Read Item** button (enabled only when an item is selected) to read the currently configured value of the item numbers.

    Set the following parameters:

Item No.	Description	Verizon	Non-Verizon
3071	Verizon enable	1 = Enable	0 = Disable
3016	Fetch Radio Parameters	1 = Set	1 = Set
3021	ModemIPType	0 = IPv4	0 = IPv4
3022	Packet Service Connection	ATD*99***3#	ATD*99#

Item No.	Description	Verizon	Non-Verizon
	Command		
3064	Manual APN Enable	1 = Enable	1 = Enable
3023	APN Name	Provided By Verizon	Example for AT&T: 12221.mcs

Note: To make an internet connection, The Cloud Link 4G modem requires an Internet APN (access point name) from the cellular service provider. In order to connect to the Internet, the provider has its own computer equipment called a “gateway” server. The server will usually have an APN in the form of a domain name, such as “myserviceprovider.com” or a generic name such as “proxy”. Contact your service provider for this information.

11. To enable MiWireless mode, Cloud Link must be externally powered and modem session timeout must be configured to 180 seconds.

Item No.	Description	Recommended Value
3142	MiWireless Enable	1 = Enable
3028	Cellular session timeout	180 seconds

Attention: Restart the Cloud Link 4G modem after changing the 'Cellular session timeout'.

12. Disconnect MasterLink.
13. Power cycle the Cloud Link 4G Modem.

7.4 Configuring an integrated CNI4 device using serial connection

Before configuring an integrated CNI4 site in MasterLink, ensure that you are aware of the Site ID of Pulse Accumulator and RUID of Cloud Link 4G modem, and they **must** be the same.

If..	Then..
You know the Site ID of Pulse Accumulator and RUID of Cloud Link 4G modem	Continue with the procedure mentioned below, and configure the CNI4 device as an integrated site in MasterLink.
You do not know the Site ID or RUID	Connect to Cloud Link 4G Modem, and Pulse Accumulator individually over serial, and then make a note of the Site ID and the RUID before configuring the CNI4 device as an integrated site.

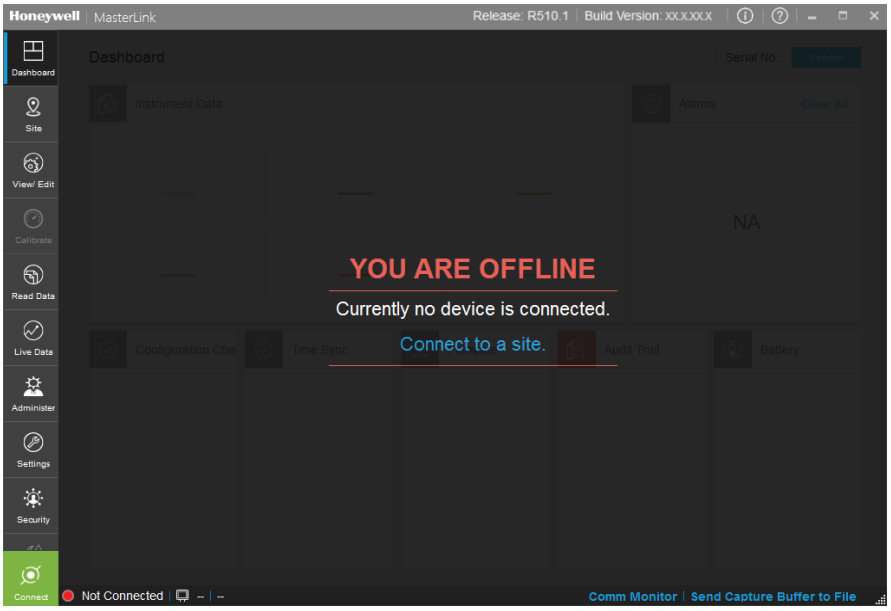
Warning: If you have configured the Pulse Accumulator and the Cloud Link 4G Modem as separate standalone sites in MasterLink, ensure that you delete those sites before adding a new CNI4 site as an integrated device.

To configure a CNI4 device using serial connection:

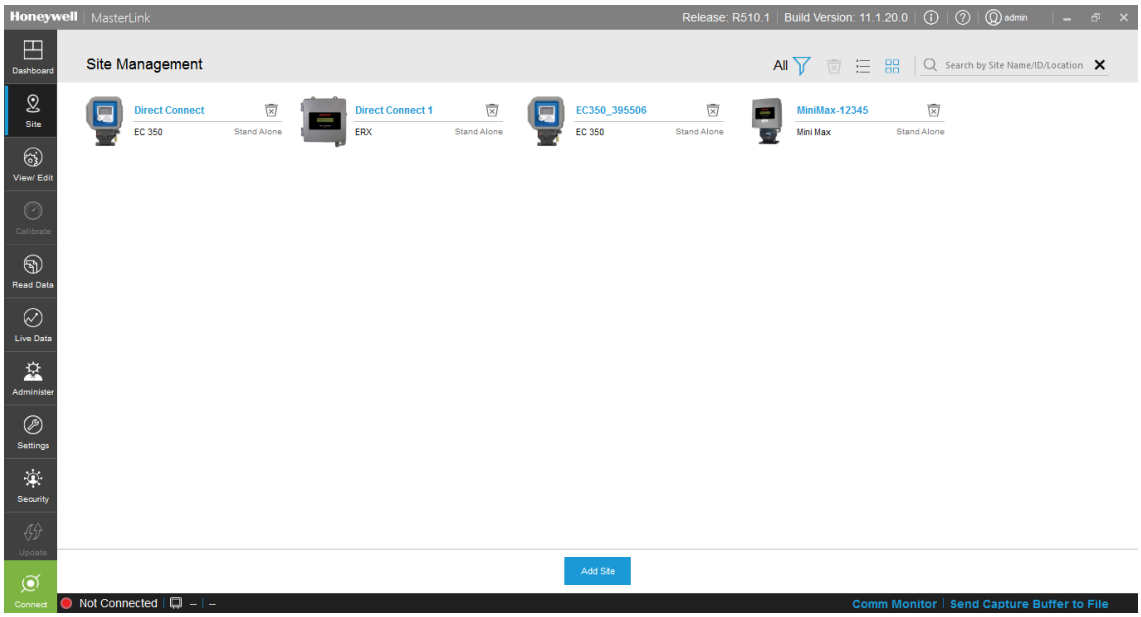
1. Ensure that the USB-to-serial cable is connected to one of the components (Cloud Link 4G Modem OR Pulse Accumulator) inside the CNI4 device and a computer running MasterLink software.

   Attention: Do not connect and use both the black and green connectors at the same time. Only one connector (either black OR green) can be used at any given point of time. If you are using the black connector to connect to the Cloud Link 4G Modem, ensure that the female (green) connector is disconnected. If you are using the green connector to connect to the Pulse Accumulator, ensure that the male (black) connector is disconnected.

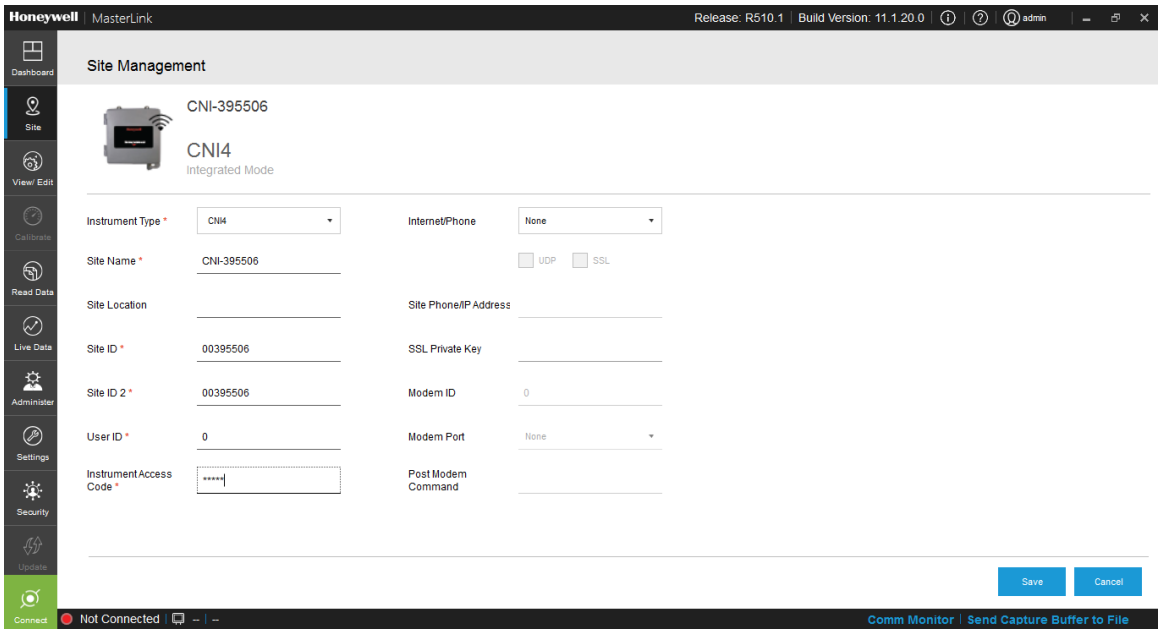
2. Launch and login to the MasterLink R510.xx desktop application.



3. Select the **Site** menu, and on the 'Site Management' screen, click **Add Site**.



The following screen appears.



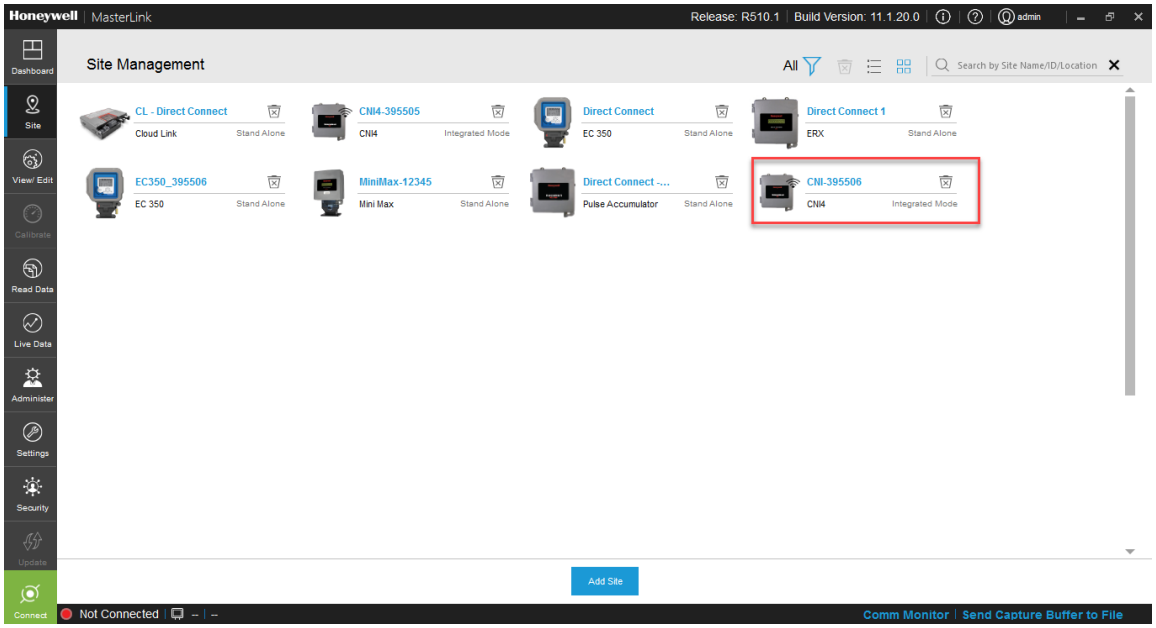
4. Configure the following site properties:

   - **Site Name:** The name of the connected site.
   - **Site Location:** The location where the instrument is installed.
   - **Site ID:** The first eight digits of the user assigned, site identification number. The entry is limited to only characters: 0-9, therefore characters "." and "-" are not valid.
   - **Site ID 2:** The second set of eight digit, site identification numbers.

- **User ID:** User ID used to log-in to the device. Valid User IDs are 0 through 99 (decimal numeric).
- **Instrument Access code**: Passcode used to log-in to the device. Valid passcodes are 00000 through 99999 (decimal numeric). The Passcode must be 5 digits in length.
- **Internet/Phone**: None. Not applicable as the device is being configured to connect over serial.
- Other fields displayed on the screen can be left blank.

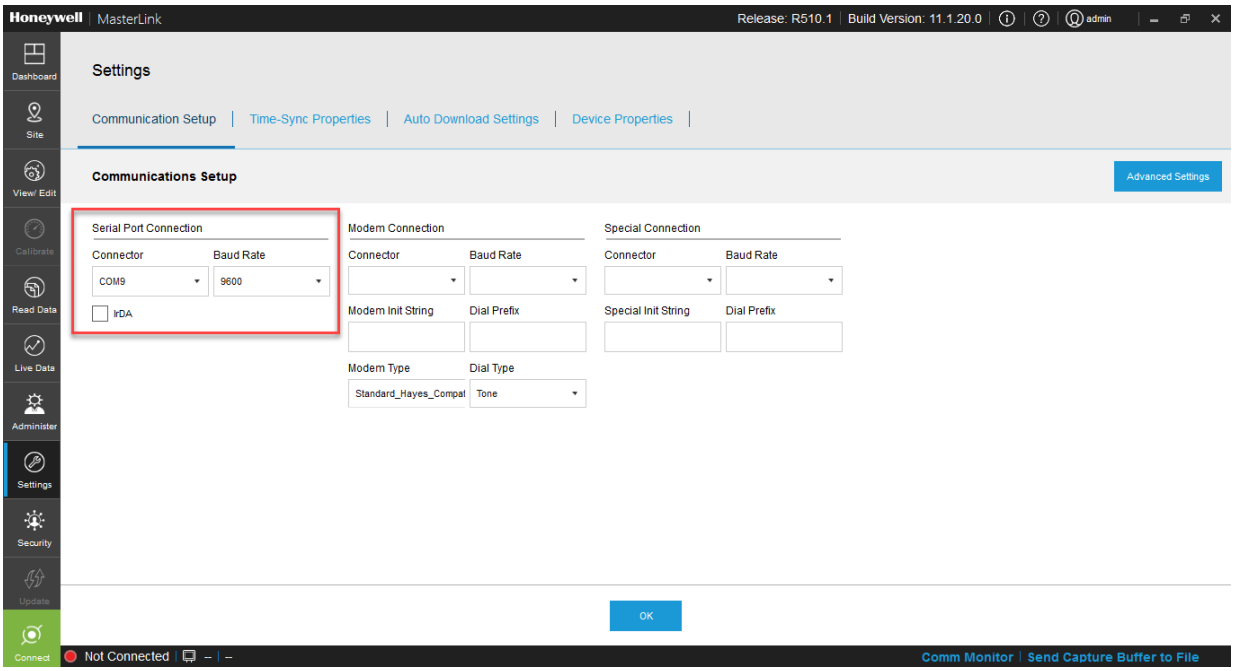
Click **Save** to continue.

The site is added to the list of sites on the Site Management screen.

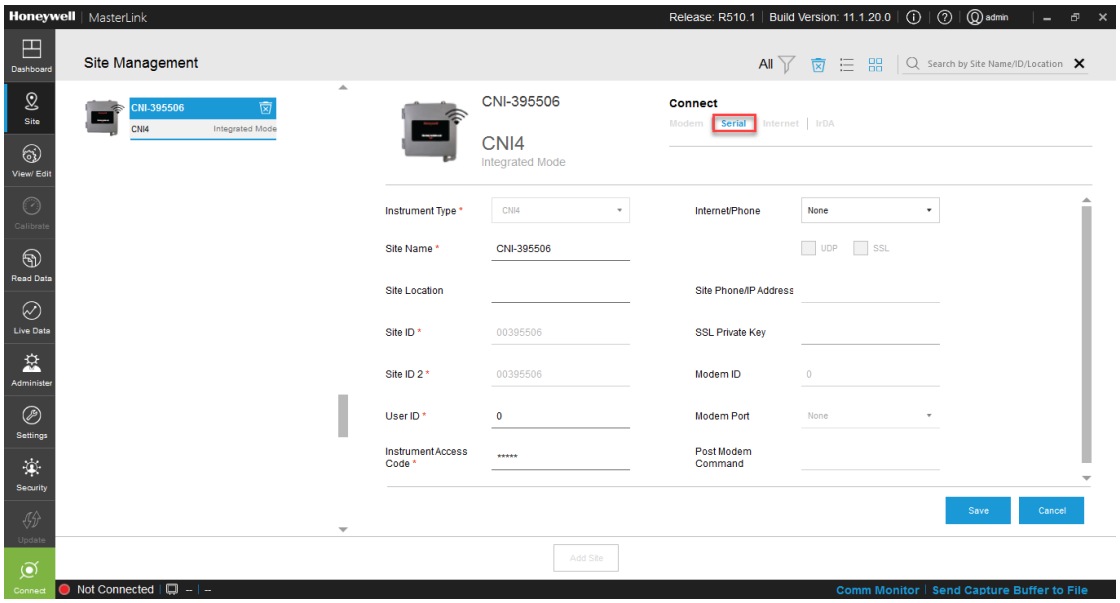


5. Navigate to the **Settings** menu. In the 'Communications Setup' tab, select the **Serial Port Connector** and the **Baud Rate** (default value = 9600) and Click **OK**.

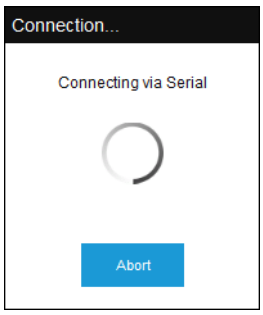
> **Note:** Note: If multiple serial port connectors are detected, then ensure that you select the correct port using the Connector drop-down. Also, ensure that you set the baud rate to match the baud rate of the connected instrument.



6. Access the **Site** menu, and from the **Site Management** screen, click and select the newly added CNI4 site, and then click on the **Serial** link.



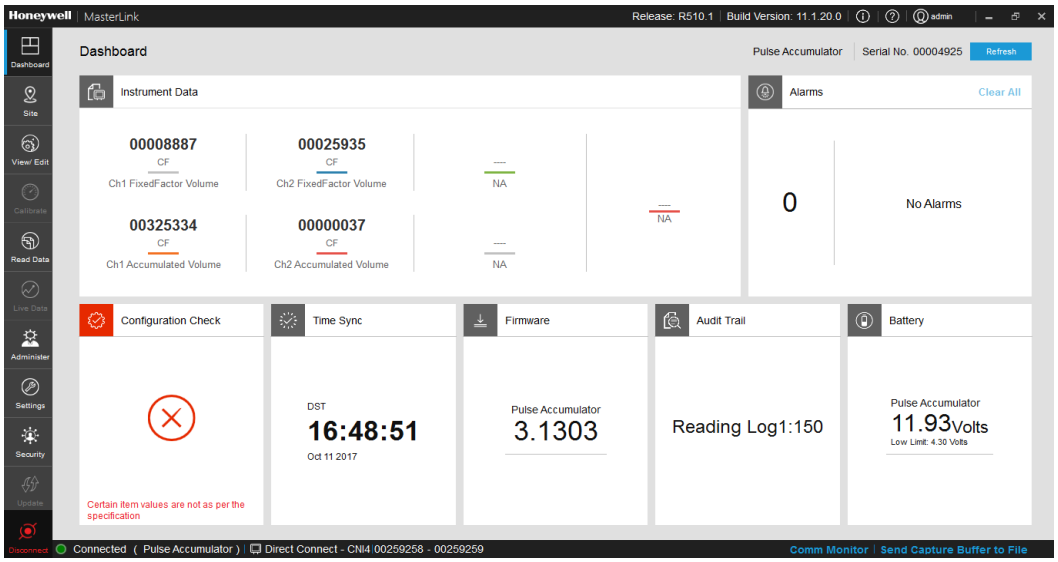
MasterLink starts connecting to the CNI4 device over serial interface.



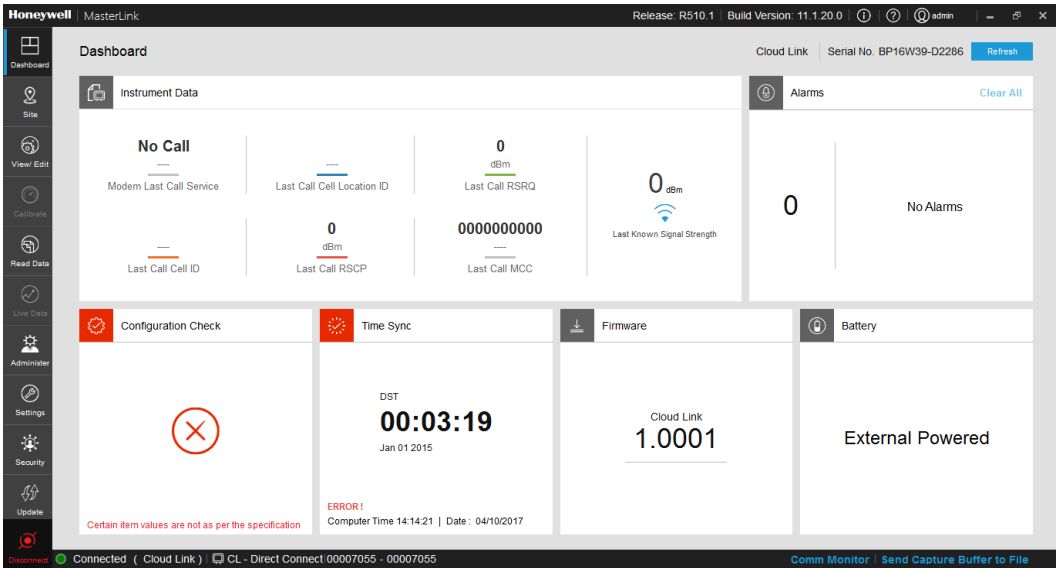
While using the USB-to-serial cable	IF..	MasterLink recognizes the connected CNI4 device as..
The USB end of the connector is connected to a computer running MasterLink	Male (black) connector is connected to Cloud Link 4G Modem	Cloud Link 4G Modem
	OR	
	Female (green) connector is connected to the Pulse Accumulator	Pulse Accumulator

The instrument dashboard appears.

If the Female (green) connector is connected to the Pulse Accumulator, MasterLink recognizes the connected CNI4 device as Pulse Accumulator.

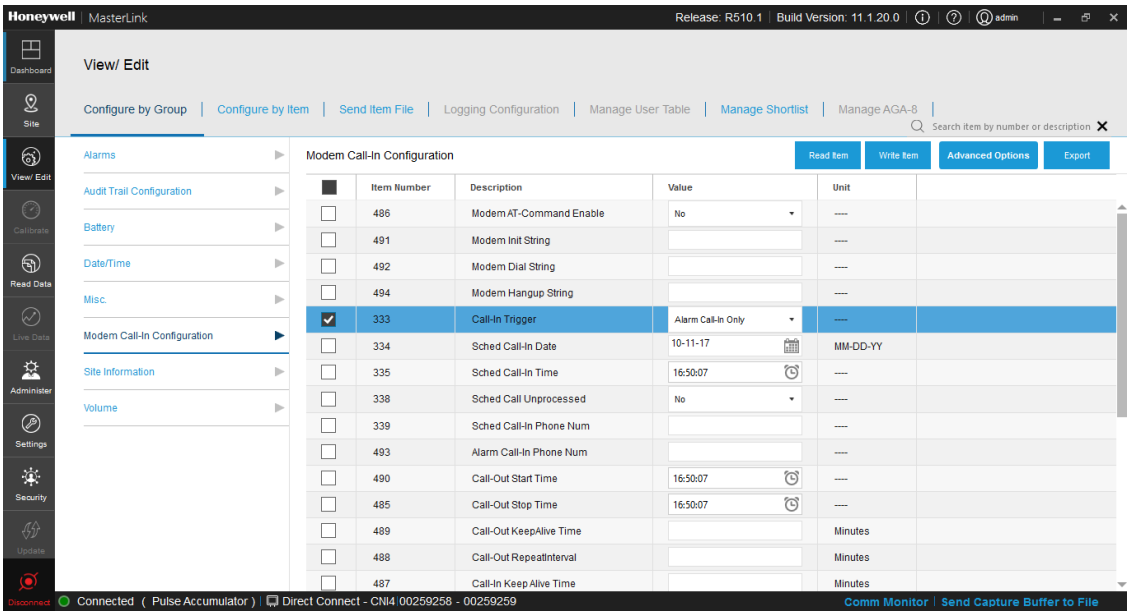


If the Male (black) connector is connected to Cloud Link 4G Modem, MasterLink recognizes the connected CNI4 device as Cloud Link 4G Modem.



Note: Before making any changes to the connected instrument, ensure that you wait till the dashboard data is completely loaded.

7. In the View/Edit menu, use the 'Configure by Group' tab to modify the Item Numbers. Select the check-box next to an Item number, enter a value in the text box provided and then click on **Write Item** button to write the value against the item in the connected instrument/device. You can also use the **Read Item** button (enabled only when an item is selected) to read the currently configured value of the item numbers.

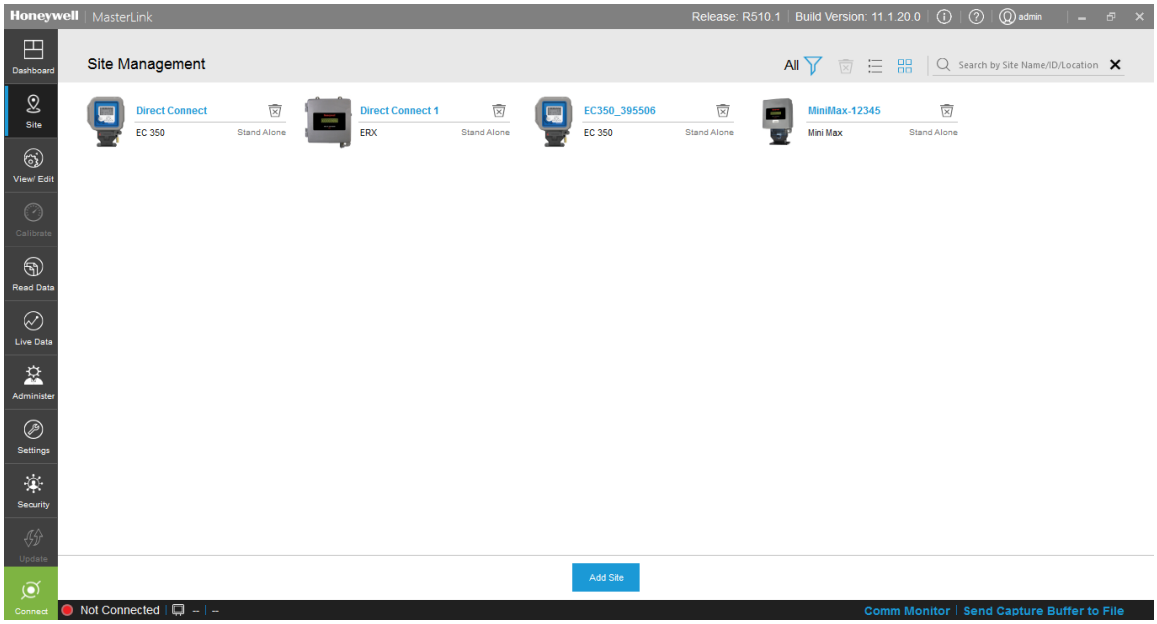


7.5 Connecting to an integrated CNI4 device over internet

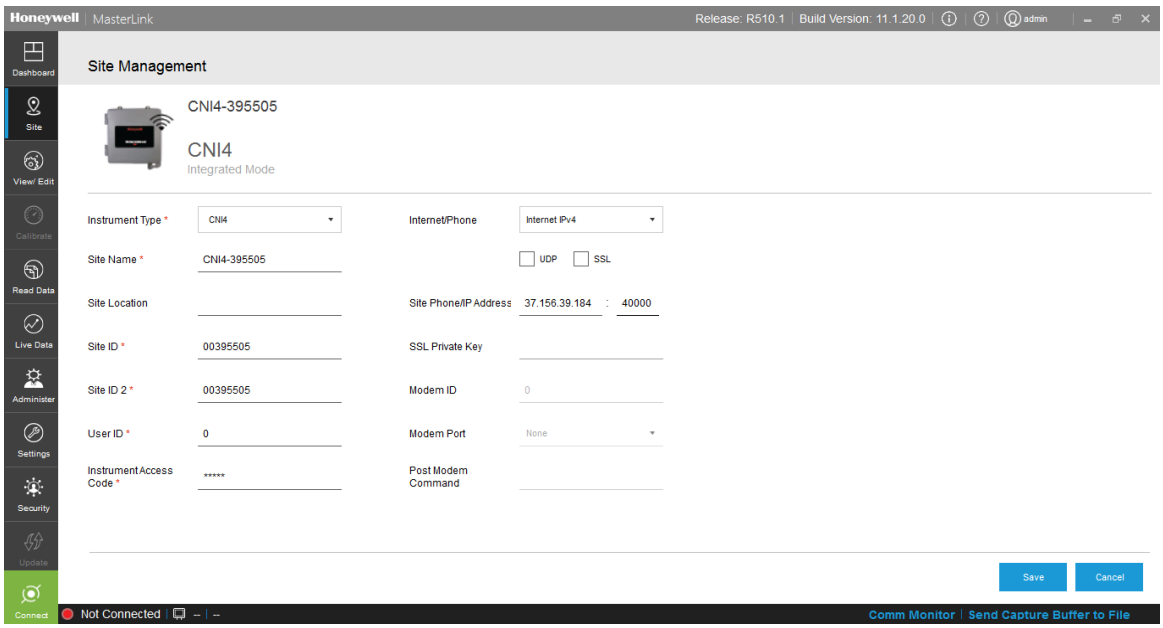
Attention: Before connecting to an integrated CNI4 device over internet, ensure that the Cloud Link 4G Modem is in MiWireless mode and is externally powered. Also ensure that the modem is connected to the cellular network and the modem is assigned a static IP.

To configure and connect to a CNI4 device over the internet:

1. On the Site Management screen, click **Add Site**.



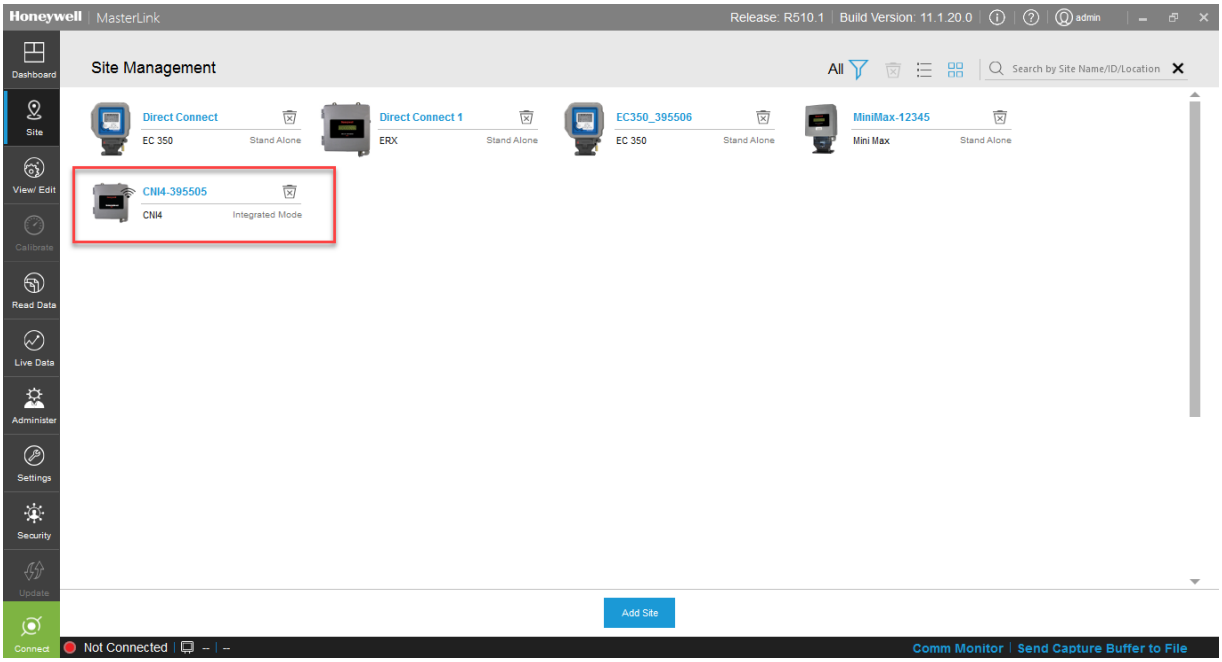
The following screen appears.



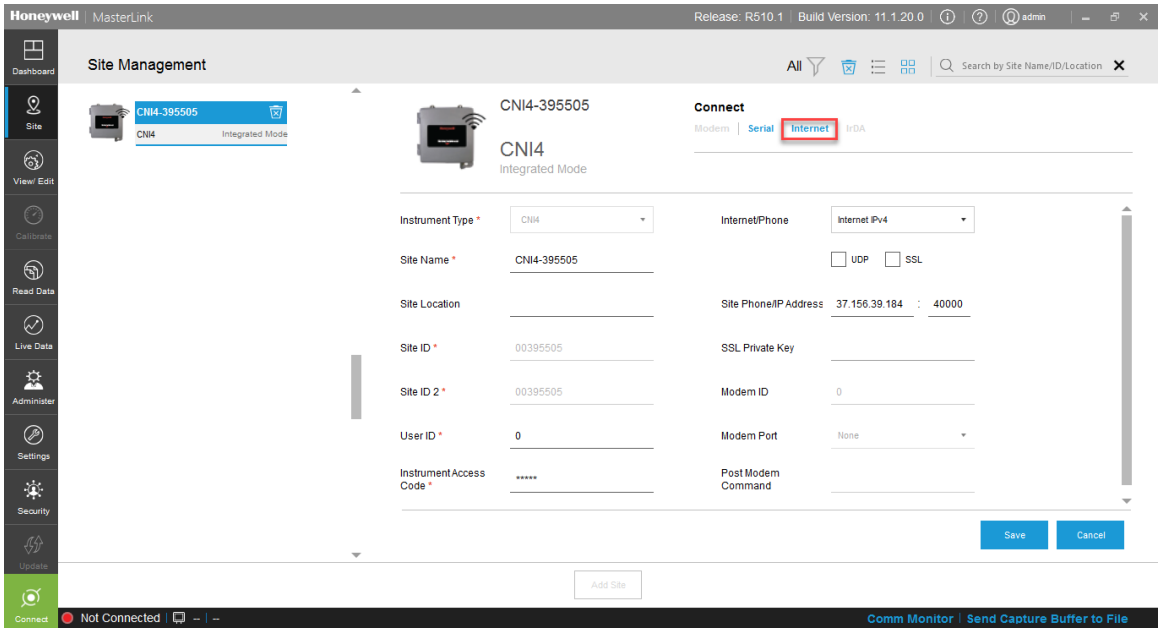
2. Configure the CNI4's site properties.

   - **Site Name:** The name of the connected site.
   - **Site Location:** The location where the instrument is installed.
   - **Site ID:** The first eight digits of the user assigned, site identification number. The entry is limited to only characters: 0-9, therefore characters "." and "-" are not valid.
   - **Site ID 2:** The second set of eight digit, site identification numbers.
   - **User ID:** User ID used to log-in to the device. Valid User IDs are 0 through 99 (decimal numeric).
   - **Instrument Access code**: Passcode used to log-in to the device. Valid passcodes are 00000 through 99999 (decimal numeric). The Passcode must be 5 digits in length.
   - **Internet/Phone**: Internet IPv4 (because the device is being configured to connect over the internet).
   - **Site Phone/IP address**: The static IP and port number used to connect to the device. [Use the port number configured for Cloud Link 'Server mode IP port number' = 3111, refer Modem Item Numbers under Appendex section.]
   - Other fields displayed on the screen can be left blank.

Click **Save** to continue. The site is added to the list of sites on the Site Management screen.

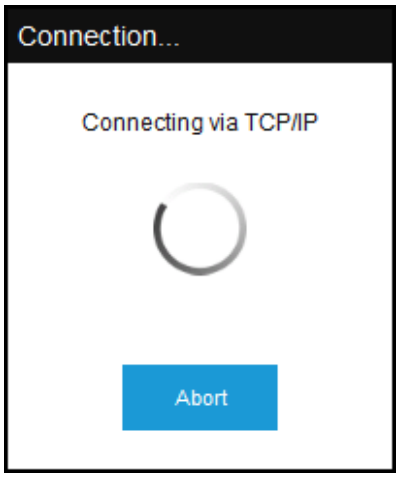


3. Select the CNI4 site. The following screen appears.

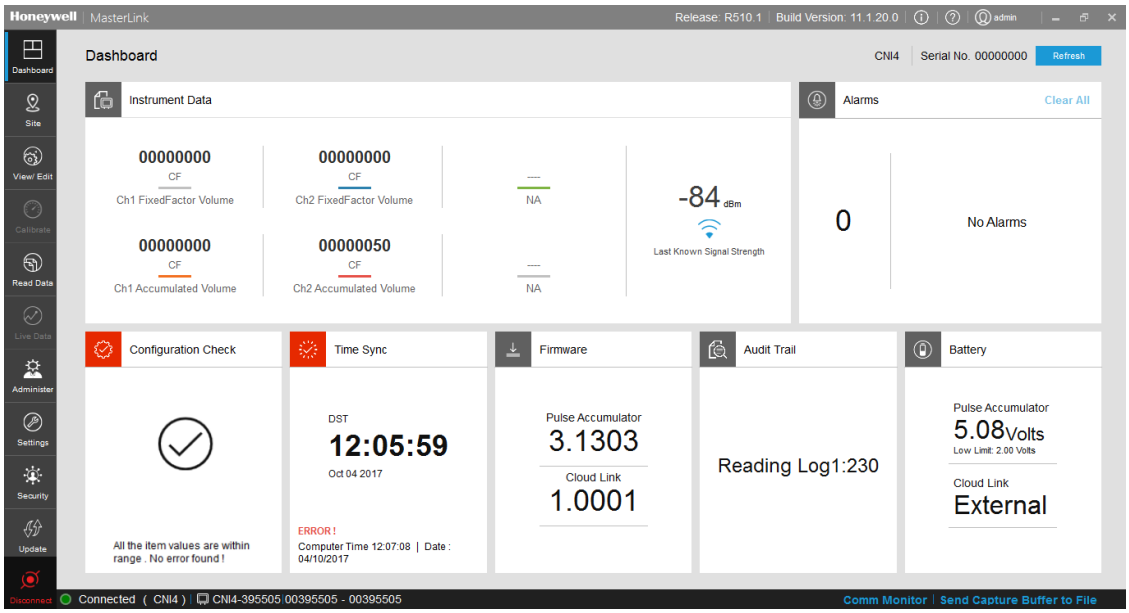


4. Click on **Internet**.

   MasterLink starts connecting to the CNI4 device over the air using TCP/IP.



After the CNI4 device is connected, the device dashboard appears.:



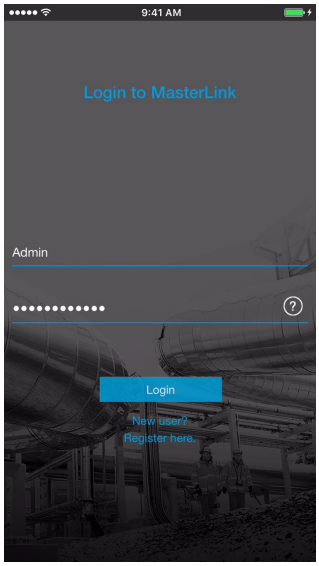
Note: Before making any changes to the connected instrument, ensure that you wait till the dashboard data is completely loaded.

5. In the View/Edit menu, use the 'Configure by Group' tab to modify the Item Numbers. Select the check-box next to an Item number, enter a value in the text box provided and then click on **Write Item** button to send the value to the connect site. You can also use the **Read Item** button to read the currently configured value of the item numbers.

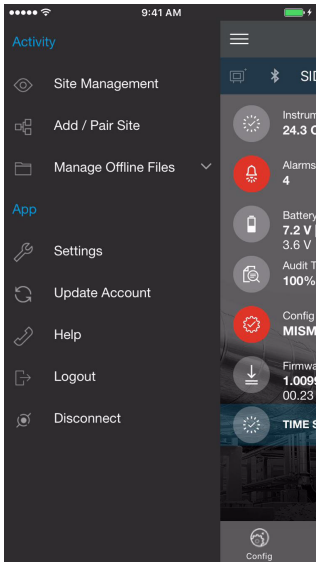
7.6 Adding a CNI4 site in MasterLink mobile application

Note: Before adding the CNI4 device in MasterLink Mobile App, ensure that you are aware of the Remote Unit ID (RUID) of the Cloud Link 4G Modem. Each CNI4 device has a unique six-digit ID number that is assigned to it prior to shipment. If the RUID is not specified at the time of shipment, then the CNI4 device is shipped with an RUID that is the last six digits of the serial number located on the front label of the Cloud Link 4G Modem. This RUID is used to identify the CNI4 device while adding a site in the MasterLink Mobile App.

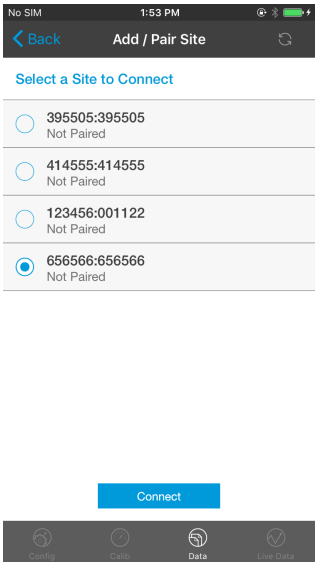
To add a CNI4 site in the MasterLink mobile application:



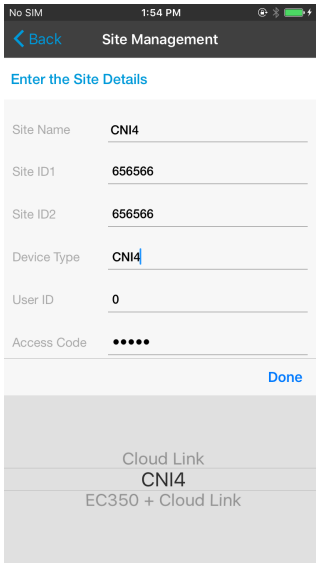
1. Login to the MasterLink app

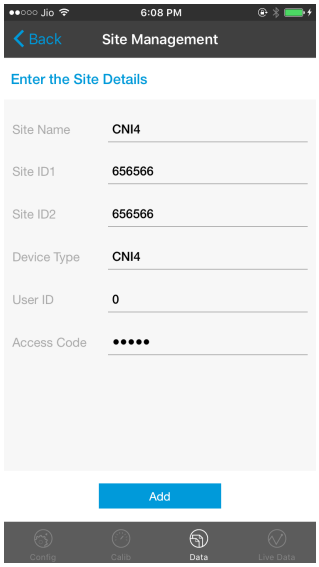


2. Tap **Add / Pair Site**

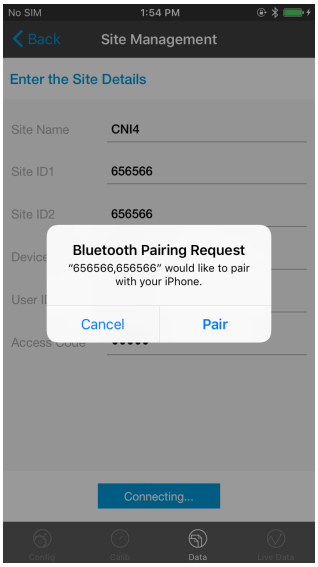


3. Use the RUID of Cloud Link to identify and connect to the site.

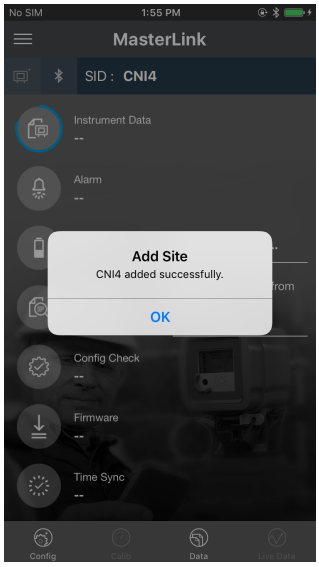




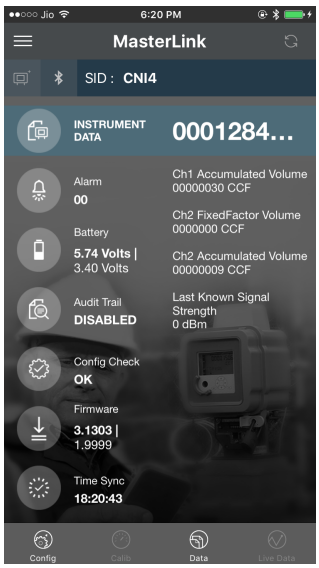
3. On the Site Management Screen, enter the site details, and tap **Add**.



4. When you see the Bluetooth pairing request, tap **Pair**.



5. After the CNI4 site is added, tap **OK**.

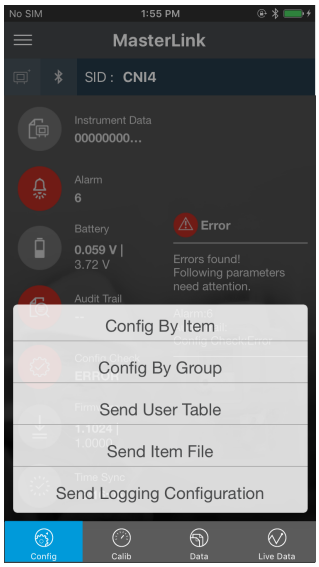


6. The site dashboard appears and displays the instrument data.

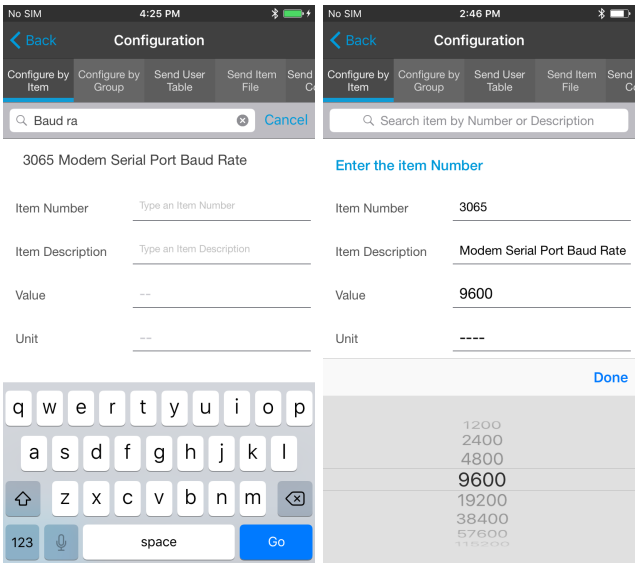
Note: Before making any changes to the connected instrument, ensure that you wait till the dashboard data is completely loaded.

7.6.1 Configuring items in the MasterLink mobile application

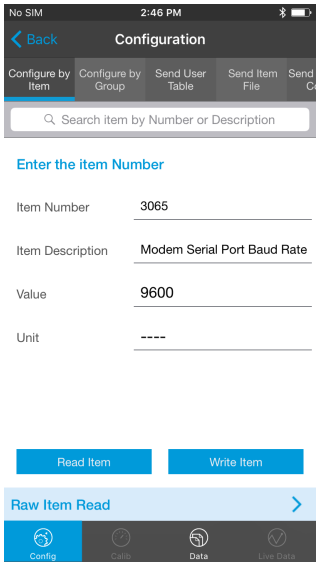
To modify the item numbers in MasterLink mobile application:



1. Tap **Config > Config by Item / Config by Group**



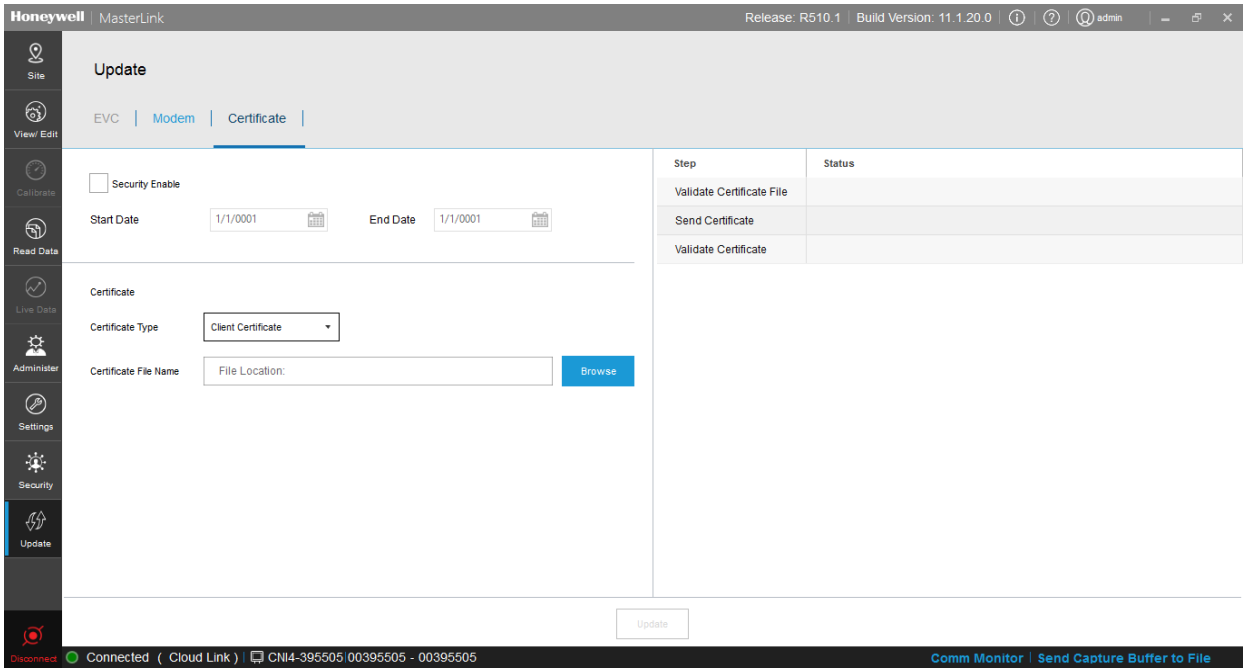
2. Configure item parameters



3. Select **Write** Item

7.7 Uploading Certificates

Data Exchange over Cellular Network between MasterLink and Cloud Link 4G Modem can be protected using TLS 1.2 enabled communication. The certificates needed for enabling this communication can be loaded to Cloud Link 4G Modem by using MasterLink R510.1.



To enable SSL communication, make sure the Security Enable check box under Certificate tab is checked. Then upload a valid security certificate to the MasterLink Software Application R510.1 and host. These certificates can either be self-signed or signed by a third-party.

> **Attention:** Enabling SSL on the Cloud Link 4G Modem must be followed by enabling SSL on host. If the remote host does not support SSL, the Cloud Link 4G Modem requires forced defaults after the certificates are loaded.

To load security certificates:

1. In the 'Update' menu, select the 'Certificate' tab.
2. Select the Certificate Type from the drop-down. **Browse** and select a certificate file.
3. Click **Update** to send the certificate to the instrument.
4. Finally click **Enable Security**.

> **Note:** It is mandatory to load security certificates to Cloud Link using serial interface. You can renew certificates using any of the supported interfaces.

Steps to prepare Cloud Link 4G Modem to use certificates:

Attention: Honeywell recommends users to use certificates provided by a valid Certificate Authority for this purpose. It is also recommend to use different certificates for different Cloud Link 4G Modems deployed in the field.

1. Enable SSL in Cloud Link 4G Modem (Item Number: 3017).
2. Configure SSL private key in Cloud Link 4G Modem (Item Number: 3086).
3. Then upload a valid security certificate to Cloud Link 4G Modem using MasterLink Software Application R510.1. Loading certificates to Cloud Link 4G Modem must proceed in the following order:
    a. Key Certificate
    b. Client Certificate
    c. Server Certificate
    d. CA certificate.
4. Restart Cloud Link 4G Modem.
5. Perform a Time Sync after restarting Cloud Link 4G Modem.
6. Edit the site by selecting Internet/Phone as Pv4 and checking the SSL option. IP Address and Port Number can vary based on the customer's network settings.
7. Configure SSL Private Key. This key should match the one configured in Cloud Link 4G Modem (Item Number: 3086)
8. Configure **IP Address** and **Port Number**.
9. Click **Save.**
10. Click on the **Internet** link to connect to the Cloud Link 4G modem over the internet.

Note: Place the certificates (CA, Client, Server and Private Key file) in the location C:\ProgramData\Honeywell\MasterLink\Certificates.
Certificate names must match the following naming conventions:

CA Certificate: SiteId1_SiteId2_ca.pem

Client Certificate: SiteId1_SiteId2_clientcertificate.pem

Server Certificate: SiteId1_SiteId2_servercertificate.pem

Private Key file: SiteId1_ SiteId2_keyfile.pfx

Private key file: SiteId1_ SiteId2_keyfile.pem

Also the Site ID must be of 8 characters in length (prefix zeros if the configured site ID is less than 8 characters.).

7.8 Firmware Upgrade

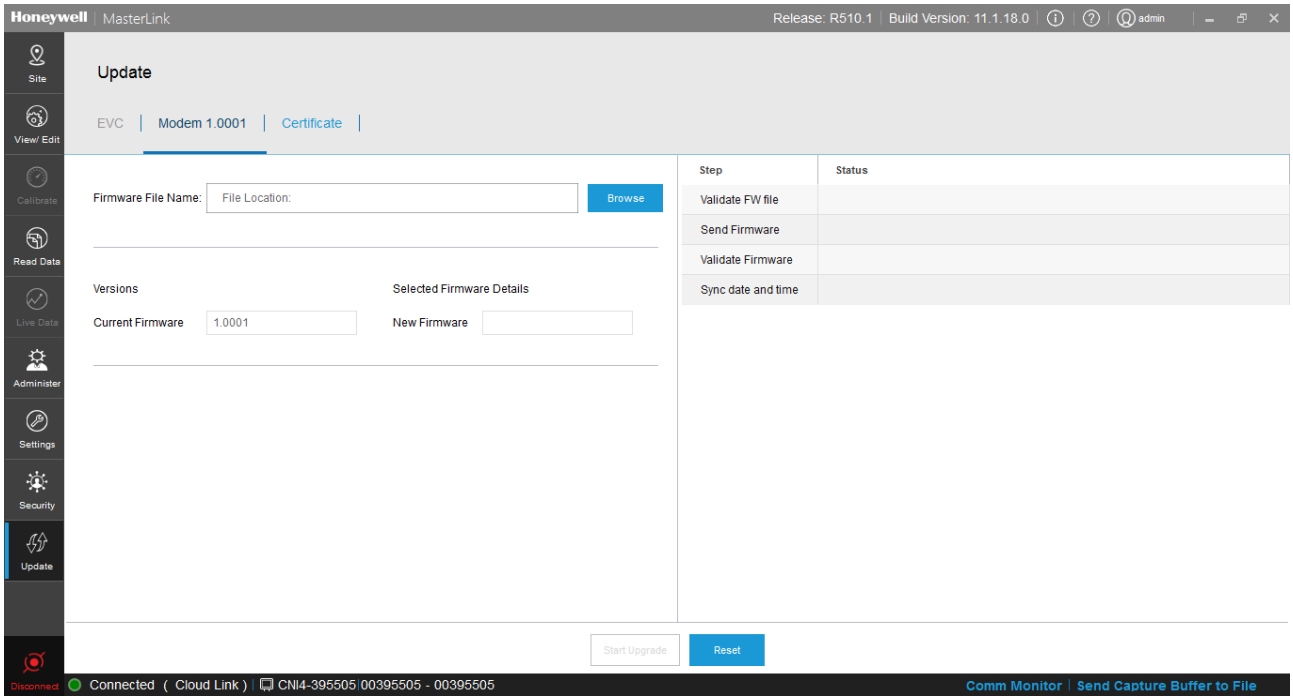
You can use the MasterLink 510.1 software to upgrade the Cloud Link 4G Modem firmware.

	Firmware upgrade over..		
	Serial	OTA	Bluetooth
MasterLink Desktop Application	✓	✓	
MasterLink Mobile Application			✓

7.8.1 Firmware Upgrade using MasterLink

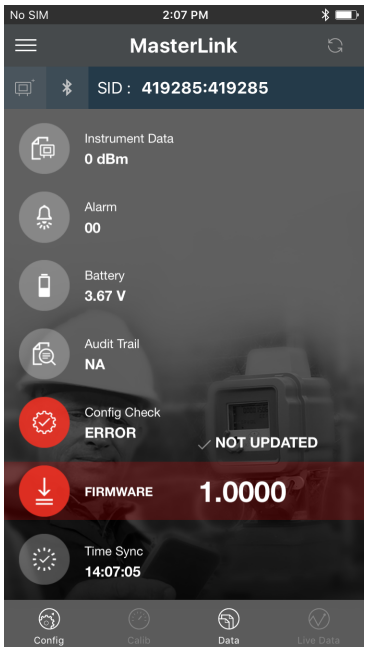
When you are connected to the CNI4 device, you will see two tabs enabled in the 'Update' screen.

Use the Modem tab to upgrade the modem firmware. Click **Browse** to select the firmware file. The **Start Upgrade** button will be enabled. Now click the **Start Upgrade** button to start the Cloud Link 4G Modem firmware upgrade.

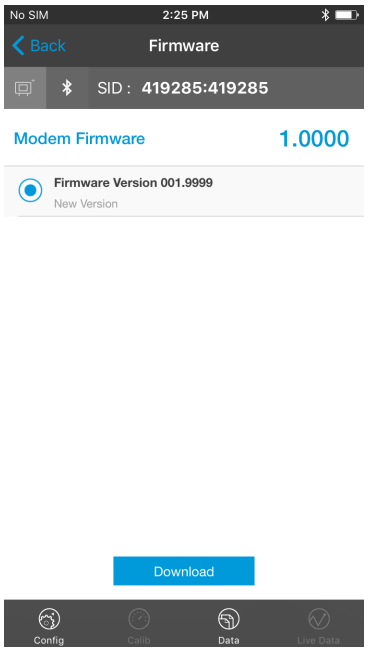


7.8.2 Firmware Upgrade over bluetooth

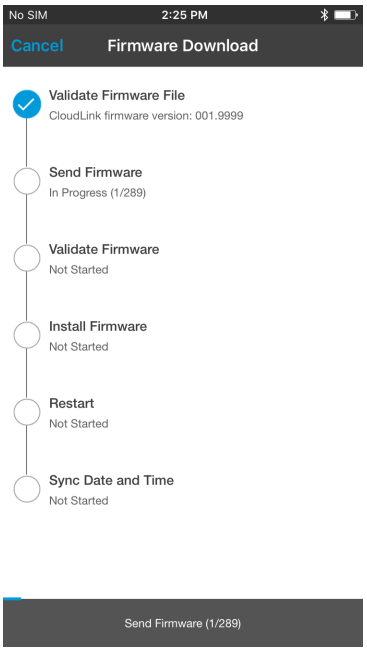
To perform an OTA updrade of Cloud Link 4G Modem firmware:



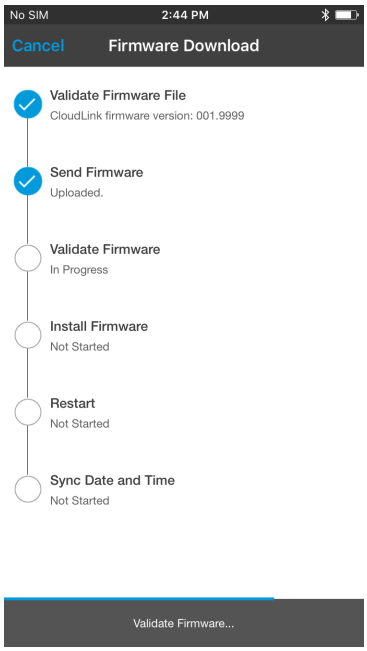
1. Tap Firmware



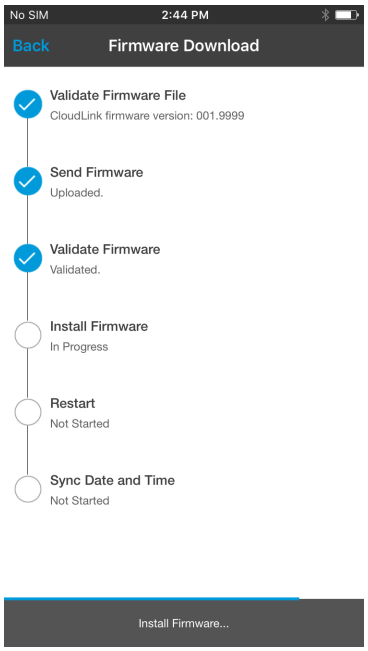
2. Select Firmware and tap Download



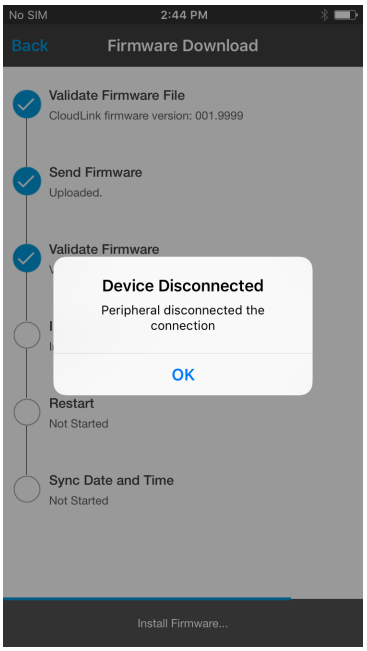
3. Firmware Validation



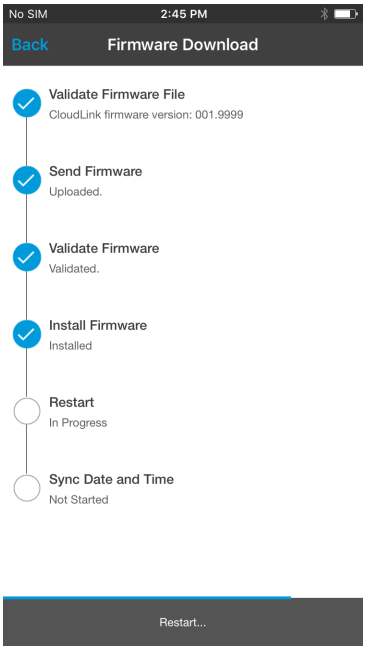
4. Send firmware to device



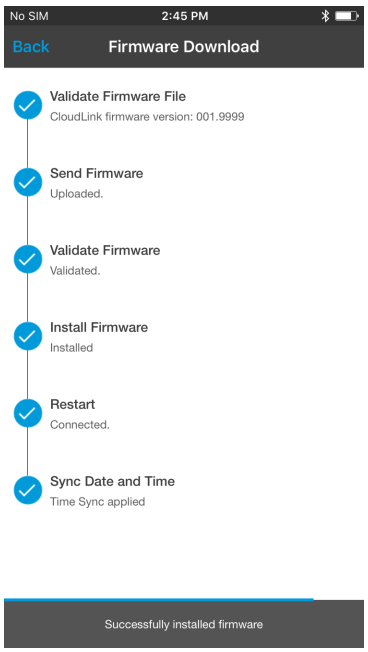
5. Validation



6. Device restarts



7. Installation in progress



8. Firmware update completed

8 Troubleshooting

Connect the CNI4 device to MasterLink, and download diagnostic logs to troubleshoot the following issues:

Error Codes	Error Description	Troubleshooting Recommendations
150	Firmware upgrade image is not valid	Firmware binary may be corrupted. Check for the right firmware from the release package
153	Firmware upgrade packet sequence mismatch	Re-initiate firmware upgrade using MasterLink. Upgrade will resume from where it stopped
154	Firmware upgrade fail due to invalid packet size	Check the max packet size in MasterLink
155	Firmware upgrade fail due to flash write error	Retry firmware upgrade. If problem persists, replace the hardware
156	Firmware upgrade fail due to flash read error	Retry firmware upgrade. If problem persists, replace the hardware
157	Firmware upgrade sequence number out of range	Re-initiate firmware upgrade using MasterLink. Upgrade resumes from where it stopped
158	Firmware upgrade fail due to low battery	Wait (1-4 hrs) for the Super capacitor to recharge. After that, retry the firmware upgrade.
159	Firmware upgrade fail due to image checksum error	Firmware binary may be corrupted. Check for the right firmware from the release package
160	Firmware upgrade fail due to data packet checksum error	Re-initiate firmware upgrade using MasterLink. Upgrade will resume from where it stopped
162	No Diagnostic records found	Perform a Time Sync before pulling Logs
164	Microprocessor Watchdog Reset occurred	If problem persists, replace the hardware
172	External OTA flash segment erase fail	In case of multiple occurrences, perform a reset. If problem still persists, replace the hardware.
174	OTA flash write failure	If problem persists, replace the hardware
175	Data flash read failure	In case of multiple occurrences, perform a reset. If problem still persists, replace the hardware.
176	OTA flash read failure	Retry firmware upgrade. If problem persists, replace the hardware
177	Configuration data checksum error	In case of multiple occurrences, perform a reset. If problem still persists, replace the hardware.
180	Client certificate key is invalid	Client certificate is not valid or corrupted. Reload valid client certificate key.
181	Server certificate key is invalid	Server certificate is not valid or corrupted. Reload valid server certificate key.
184	Client certificate expired	Send certificates for renewal

Error Codes	Error Description	Troubleshooting Recommendations
185	Server certificate expired	Send certificates for renewal
186	CA certificate expired	Send certificates for renewal
193	Modem not responding	In case of multiple occurrences, replace the hardware.
195	Radio on Initialization Fail??	In case of multiple occurrences, replace the hardware.
196	PPP connection fail	Check for correct APN, supercap voltage Item#3014(>3.2), and Signal Strength
197	TCP/IP socket connection fail	Check PowerSpring and port numbers
200	Modem dial fail	Check packet service command, supercap voltage Item#3014(>3.2), and Signal Strength
201	BLE Abrupt Connection Failure	Super capacitor voltage is low for bluetooth to connect. Wait for 1-4hrs for the supercap to charge
202	BLE pairing fail	Retry pairing from MasterLink app or Switch Off and switch On Bluetooth on mobile.
203	User table checksum error	In case of multiple occurrences, perform a reset. If problem still persists, replace the hardware.
205	BLE out of bonds	Write Item# 3082 = 1 to unpair bonds
208	SRAM configuration checksum mismatch	In case of multiple occurrences, perform a reset. If problem still persists, replace the hardware.

9 Appendix

9.1 Item Code Types

There are two basic item code types used in the CNI4 — Direct-read and Configuration. Direct-read items are mainly used to store information or to accumulate readings. Except during the initial installation, these items are normally just read periodically to obtain the accumulated information. However, if needed, these values may be changed by directly typing in new information from the keyboard. Configuration items are used to configure the CNI4 device.

9.1.1 Volume Items

Ch Item #	Item Name	Description
002 910	Ch1 Accumulated Volume Ch2 Accumulated Volume	Totalized Accumulated Volume based on the volume signal connected to its input. The totalized value is scaled to the volume unit selected at item 092 for Ch1 and item 458 for Ch2. The number of digits is defined by item 097 for both.
226 911	Ch1 Inc Accumulated Volume Ch2 Inc Accumulated Volume	The Incremental Accumulated Volumes are the same as Accumulated Volume (items 002 and 910) but is initialized (re zeroed) at the beginning of every Log Interval, (Hourly or Daily) as defined by item 202. If the CNI4 is accessed via a serial connection, this item will display the current value for that point in time.
098 912	Ch1 Input Pulse Value Ch2 Input Pulse Value Select: 0 - 1 CF 1 - 5 CF 2 - 10 CF (Default) 3 - 100 CF 4 - 1000 CF 5 - .1m3 6 - 1 m3 7 - 10 m3 8 - 100 m3 9 - 1000 m3 10 - 10000 CF 12 - 50 CF 13 - 500 CF	Use codes (0-13) to select the value for each pulse received at Ch1 or Ch2 inputs. This selection must agree with the gas meter drive rate or meter pulse value when connected to a meter. When connected to a volume corrector, the value must agree with the value assigned to the corrector's output pulse.
114 913	Ch1 Input Pulse Scaling Ch2 Input Pulse Scaling Default = 1.0000	Additional scaling for item 098 and 912 (Input Pulse Value), if required. Usually needed when the volume input is a value other than 0.1, 1, 5, 10, 100, or 1000.
000 908	000 - Ch1 FixedFactor Volume 098 - Ch2 FixedFactor Volume	Totalized Accumulated Volume for Ch1 and Ch2, multiplied by a user-assigned scaling factor provided by item 044 for Ch1 and item 440 for Ch2. The totalized value is then scaled to the volume unit selected at item 090 for Ch1 and item 457 for Ch2. The number of digits is defined by

Ch Item #	Item Name	Description
		item 096 for both.
225 909	Ch1 Inc FixedFactor Volume Ch2 Inc FixedFactor Volume	The Incremental FixedFactor Volumes are the same as FixedFactor Volume (item 000 and 908) but are initialized (re-zeroed) at the beginning of every Log Interval (Hourly or Daily) as defined by item 202. If the CNI4 is accessed via a serial connection, this item will display the current value for that point in time.
044 440	Ch1 FixedFactor Value Ch2 FixedFactor Value Default = 0.0000	User-assigned scaling factor to be applied to the FixedFactor Volumes for Ch1 and Ch2. The FixedFactor scaling is normally used to adjust the accumulated volume for a fixed pressure factor, a fixed temperature factor, or both. The scaling factors default to a value of zero, which forces the FixedFactor Volumes to remain at zero when the fixed factor feature is not used.
092 090	Ch1 Accumulated Vol Units Ch1 FixedFactor Vol Units Select: 0 - CU FT 1 - CU FT x 10 2 - CRUFT x 100 3 - CF 4 - CF x 10 5 - CF x 100 6 - CF x 1000 7 - CCF (Default) 8 - MCF 9 - m3 x 0.1 10 - m3 11 - m3 x 10 12 - m3 x 100 13 - m3 x 1000 14 - CF x 10,000 15 - THERMS 16 - DKTHERMS 17 - MJOULES 18 - GJOULES19 - KILOCAL 19 - kWh 20 - CF x 100,000	Codes (0-20) for item 092 (Accumulated Vol Units) and item 090 (FixedFactor Vol Units) that selects the volume units of measure.
097 096	Ch1 & Ch2 Accumulated Vol Digits Ch1 & Ch2 FixedFactor Vol Digits Select: 0 - 8 DIGITS, Example: 12345678 1 - 7 DIGITS, Example: 2345678 2 - 6 DIGITS, Example: 345678 3 - 5 DIGITS, Example: 45678 4 - 4 DIGITS, Example:5678	Codes (0-4) for items 097 (Accumulated Vol digits) and 096 (FixedFactor Vol Digits) that selects the number of digits when displaying either type of volume reading.

Items-90, 92, 457 and 458 are used in conjunction with other Item Codes to convert raw pulse counts to a more meaningful value. The value of the Item Code translates to a multiplier “VUm[Item]”. Example: If Item-457 is set for a value of 2 (CF x 100), then Vum[457] = 100.0.

VALUE	DESCRIPTION	MULTIPLIER (Vum[Item])
0 or 3	Cubic feet (CF)	1.0
1 or 4	Cubic feet (CF) X 10	10.0
2, 5 or 7	Cubic feet (CF) X 100	100.0
6 or 8	Cubic feet (CF) X 1000	1000.0
9	Cubic meters x 0.1	3.531467
10	Cubic meters	35.31467
11	Cubic meters x 10	353.1467
12	Cubic meters x 100	3531.467
13	Cubic meters x 1000	35314.67
14	Cubic meters x 10000	353146.7
15	Therms	100000.0
16	Dekatherms	1000000.0
17	Mega Joules	35314.67
18	Giga Joules	35314670.0
19	Kilo Calories	35.31467
20	Kilo Watt Hours	35314.67
21	Cubic feet (CF) X 100000	100000.0

Items associated with Accumulated Volumes:

Description	Ch1 Item#	Ch2 Item#
Input Pulse Value	098	912
Input Pulse Scaling (this feature is normally not needed)	114	913
Accumulated Volume	002	910
Incremental Accumulated Volume	226	911
Accumulated Volume Units	092	458
Accumulated Volume # of Digits	097	

9.1.2 Site Information Items

Ch Item #	Item Name	Description
200	Site ID Number Part 1 Default = 00000000	The first eight digits of the user assigned site identification number. The entry is limited to characters 0-9 only. "." and "-" are not valid. Note: All instruments downloaded using Mercury Instruments Window-based software must be configured for unique Site ID Numbers at Items 200 and 201.
201	Site ID Number Part 2 Default = 00000000	The second set of eight digits of the site identification number. These eight digits are combined with the eight from item 200 to create a 16-digit identification number.
62	Instrument S/N Default = 00000000	Factory assigned Instrument Serial Number. Example: 09901234.x9901234 - disregard the leading zerox99xxxxx - 2 digit year of manufacturexxx01234 - 5 digit sequence number during year of manufacture
122	Firmware Version	A read-only version number indicating the instrument's operating firmware. The number reported is automatically updated when a different firmware file is up loaded into the instrument's FLASH memory.
126	Instrument Baud Rate Select: 0 - 9600 - Default 1 - 4800 2 - 2400 3 - 1200 4 - Not Used 5 - Not Used 6 -19200 7 - 38400 8 - AutoBaud	Codes (0-8) to select the instrument's Baud Rate for serial communications. When a Cloud Link 4G Modem is installed, leave the selection set to 2400. For other communication devices, set the baud rate to match the baud rate of the connected device. Avoid using Autobaud unless local connections are the only types of serial connections to be used. When Autobaud is used, the instrument will automatically match the baud rate of the connected computer, otherwise the computer's baud rate must be set to match that of the instrument.
127	Instrument Type	A read-only numeric code assigned to all Mercury Instruments products used to identify the particular type of instrument CNI4 = 8
170	Protocol Code A Select: 0 – Send Time-out Errors (Default) 1 – Do not send Time-out Errors	Codes (0-1) to select if specific Time-out error codes are transmitted while attempting a serial link Sign-on. When this item is set to "0", (which is the recommended setting for most applications) all instrument error codes are transmitted. When set to "1", the CNI4 will not send Time-out errors during serial communications. The selection of "1" is provided as a convenience for some 3rd party communication interfaces.
171	Time-out Delay 1 Default = 20	The time (in seconds) the CNI4 waits for the host device to send protocol character "ENQ" (Ctrl-E) following the

Ch Item #	Item Name	Description
		"EOT" (Ctrl-D) during instrument Sign-on. If the "ENQ" is not received in the specified time, an error "21" (Time-out error) is transmitted from the CNI4. This item is usually set to 7-seconds but when a Cloud Link 4G Modem is installed, the value must be set to at least 20-seconds. Range: 7 to 60,
172	Time-out Delay 2 Default = 20 seconds	The time (in seconds) the CNI4 waits for the "SN" protocol com- mand (Sign-on) following the receipt of the "ENQ" before issuing an error "21" (Time-out error). This item is usually set to 7-seconds but when a Cloud Link 4G Modem is installed, the value must be set to at least 20-seconds. Range: 7 to 60.
118	Reference Number 1 Default = 00000000	No specific function for this item other than to store a numeric value, for any reason. Examples of stored numbers: phone #, meter #, installation date, map coordinates, elevation, etc.
119	Reference Number 2 Default = 00000000	Second location for a stored number. Same purpose as item 118 above.
449	Switch Filtering Select: 0 - Filter Neither Channel 1 - Filter Both Channels Default 2 - Filter Channel 1 only 3 - Filter Channel 2 only	Codes (0-3) to indicate whether the input switch filtering algorithm is enabled for either or both input channels. In general, switch filtering should be "On" when the input channel is wired to a mechanical-type switch (such as a reed switch) or "Off" if the input channel is wired to an electronic pulse output (such as the corrected volume pulses from an electronic volume corrector). Use Raw Item Access to change the selection for the codes listed below.

9.1.3 Battery Items

Ch Item #	Item Name	Description
48	Battery Voltage Reading	Battery voltage reading, measured at last wake-up
49	Battery Low Volt Limit Default = 4.30	Low voltage limit for main battery, initiates a low voltage battery alarm (Item 099) if the value a item 048 drops below this limit.
50	Shutdown Voltage Limit Default = 4.00	The voltage level at which the unit goes into Shutdown, meaning no more pulses will be accepted until the battery is replaced.

9.1.4 Date and Time Items

Ch Item #	Item Name	Description
202	Log Interval Select: 60 (minutes) Default 24 (hours)	User selected time period that determines how often a Time-related, 4-item audit trail record is placed in audit trail memory. The four audit trail items are selected at items 258 - 261.
203	Time	Real Time Clock that displays hours, minutes, and seconds in

Ch Item #	Item Name	Description
	Default = 12:00:00	24-hour “military” format, i.e., 14:30:02 would be two seconds past 2:30 PM. When entering or changing the time, leading zeros are required where applicable.
204	Date Default = 01-01-99, Format: MM-DD-YY	A numeric field indicating the calendar date provided by the on-board real-time clock. The format of the Date is determined by the selection at item 262 and may be displayed as MM-DD-YY, DD-MM-YY, or YY-MM-DD. The Date automatically tracks the days in the month, including leap year. When configuring this item, leading zeros are required where applicable. This Date and Time (from Item 203) are used to time-stamp the records in Audit Trail memory.
205	Gas Day Start Time Default = 09 00 00	User selectable time to indicate the beginning of the GAS DAY, which by definition for other items, is the time of day when daily computations are re-zeroed to begin the next day’s computations. Note: The time entered should only contain zeros for minutes and seconds.
262	Date Format Select : 0 - MM-DD-YY Default 1 - DD-MM-YY 2 – YY-MM-DD	Codes (0-2) to select the format in which the Date is entered and displayed at item 204. The format for all date-related items will also be governed by this item

9.1.5 Audit Trial Configuration Items

Ch Item #	Item Name	Description
450	Memory Capacity	A read-only value indicating audit trail memory capacity, expressed in days or months, based on the maximum number of audit trail records at item 481.
481	Audit Trail Max Records	A read-only value indicating the maximum number of audit trail records available for this particular product
258	Audit Trail Data Item 1 of 10 Default: 002 (Ch1Accumulated Volume)	The first of ten user selectable Audit Trail Report Items that can be configured for Audit Trail logging. To use these ten items, insert the desired item code number into any of the report locations (258 - 261 and 229 - 234). The value “255” at any of these Report Items will cause that position to be ‘blank’.
259	Audit Trail Data Item 2 of 10 Default: 226 (Ch1 Inc. Accumulated Volume)	
260	Audit Trail Data Item 3 of 10 Default: 910 (Ch2Accumulated Volume)	

Ch Item #	Item Name	Description
261	Audit Trail Data Item 4 of 10 Default: 911 (Ch2 Inc. Accumulated Volume)	
229	Audit Trail Data Item 5 of 10 Default: 255 (blank)	
230	Audit Trail Data Item 6 of 10 Default: 255 (blank)	
231	Audit Trail Data Item 7 of 10 Default: 255 (blank)	
232	Audit Trail Data Item 8 of 10 Default: 255 (blank)	
233	Audit Trail Data Item 9 of 10 Default: 255 (blank)	
234	Audit Trail Data Item 10 of 10 Default: 255 (blank)	

9.1.6 Alarm Items

Ch Item #	Item Name	Description
099	Battery Low Volt Alarm Default = 00000000	This item indicates if a low voltage alarm for the main battery was generated. During a wake-cycle, if the measurement for item 048 (Battery Voltage Reading) is a value less than the value at item 049 (Battery Low Volt Limit), an alarm is initiated and is indicated by placing “11111111” at this item. “00000000” indicates there is no Battery Low Volt Alarm. The alarm indication cannot be cleared until the batteries are replaced or the voltage becomes greater than item 049..
108	Alarm Output Default = 00000000	This item displays “11111111” to indicate that a Battery Low Volt Alarm has become active, and that an alarm pulse was transmitted out the Alarm Channel. “00000000” at item 108 indicates there are no active alarms.
462	Battery Low Alarm Time Default = 00 00 00	The time during the day (on the date indicated at item 463) the Battery Low Volt Alarm occurred.
463	Battery Low Alarm Date Default = 01-01-04	The date a Battery Low Volt Alarm (item 099) first occurred. After the battery pack is replaced, items 462 and 463 should be manually changed back to their default values so that the next battery alarm will be easily recognized
484	Alarm Channel Control Select: 0 - Alarm Pulse	Selection that determines the function of the main board’s Alarm Channel output, i.e., terminals A+ & A- at TB1. The traditional function is to output a 50 mSec Form-A alarm pulse, used for remote notification. The alternative function is to

Ch Item #	Item Name	Description
	Output (Default) 1 - Modem Power Control	provide a Form-A control signal to activate DC power to an external, battery-operated device, such as a cellular or external modem. When configured for Power Control, use items 485 & 487 - 490 to define how and when power is to be applied to the external device.
493	Alarm Call-In Phone Number User supplied phone number to be dialed on all Alarm calls-in	

9.1.7 Call-in and Call-out

The CNI4 can receive host-initiated calls (Call-out) or provide instrument-initiated calls (Call-in). Call-in type calls can be the result of an instrument Alarm, a Scheduled call, or by 'Forcing-a-call' by swiping a magnet next to the reed switch (figure below). The 'Force-a-call' function can only be used if item 333 (Call-In Trigger) is set to Alarm Call-in. If instrument-initiated calls fail to connect to a host system, primary and secondary call-in retries are activated in an effort to complete the call-in process.

Caution: The CNI4 can receive Call-outs by configuring the Cloud Link 4G Modem to function in MiWireless mode, and in this scenario the Cloud Link 4G Modem must be connected to external power source.

Ch Item #	Item Name	Description
333	Call-In Trigger Select: 0 - No Call-in 1 - Alarm Call-in Only 2 - Scheduled Call-in Only - Default 3 - Alarm & Scheduled Call-in	Codes (0-3) to select the activity that will cause the instrument to make a call into a host system.
334	Scheduled Call-In Date Default = 01-01-04	Date of the next scheduled call-in. When used, this parameter is normally incremented to the next calendar date by the host data collection computer so that a future call-in will occur.
335	Scheduled Call-In Time Default = 12 00 00	Time of the next scheduled call-in. When used, this parameter is normally set once and then reused for the next day's call-in. However, the data collection computer might make slight adjustments to optimize call throughput if scheduling a large number of units.
336	Call-In Retry By: Select: 0 = Host - Default 1 = Alarm: Host / Scheduled:	Codes (0-3) to select the retry strategy that is to be implemented by the instrument based on the following guidelines; Host: Host is responsible for retrying failed call-ins

Ch Item #	Item Name	Description
	Instrument 2 = Alarm: Instrument / Scheduled: Host 3 = Instrument (Most Preferred)	after the initial hand shake. If a call-in fails, the instrument is responsible for retrying only until it receives the “+-+clralms” string from the host. Thereafter the instrument will not retry if the call is dropped. (It expects the host to do so.) Instrument: Instrument is responsible for retrying failed call-ins. For alarm call-ins, the call is considered successful when a sign-off command is received at the instrument. For scheduled call-ins, the call is only considered successful if the host writes a ‘0’ to item 338 (Scheduled Call-in Occurred). Until that happens, the instrument will call back after a dropped call, or even after a sign-off command.
338	Scheduled Call-In Occurred Codes: 0 = No, call-in has not occurred - Default 1 = Yes, call-in has occurred	Status of scheduled call-in activity. “1” (Yes) indicates call-in activity has occurred. “0” (No) indicates call-in activity has not occurred from the point in time this item was last reset. Following the successful transfer of data, this item is intended to be reset to “0” by the data collection computer just prior to instrument sign-off. Also see item 336.
339	Scheduled Call-In Phone Number	User supplied phone number the instrument will call when the Scheduled Call-in feature is enabled via items 333 and 486. The time of the scheduled call is deter- mined by items 334 and 335.
490	Call-out Start Time Default = 00 00 00	Parameter used to set the time of day to start the call-out cycle when using modem power control.
485	Call Out Stop Time Default = 00 00 00	User supplied time during the calendar day that Modem Power Control (enabled via item 484) will end. Also see item 490 for Start Time.
487	Call-in Keep Alive Time Default = 15 minutes	User selectable parameter to set the amount of time (in minutes) to leave the communication system (i.e. modem) powered up after an Alarm or Scheduled call-in. The purpose of this feature is to allow for a follow-up call to retrieve additional information (such as audit trail data) if needed.
488	Call-out Repeat Interval Default = 0	User selectable parameter to set the amount of time (in minutes) to wait until repeating the Call-out Window set by the Call-out Keep Alive Time (Item 489). Note: When used, the value set in Item 488 must be greater than the value set in Item 489, otherwise the power control feature is disabled.
489	Call-out Keep Alive Time Default = 0	User selectable parameter to set the amount of time (in minutes) that power is be applied to an external modem, starting at the time-of-day set

Ch Item #	Item Name	Description
		into item 490 (Call-out Start Time). Note: Set items 488 and 489 to “0” (default) to disable Call-out power control. Call-in power control (item 487) will still provide modem power for scheduled and alarm calls-in
486	Modem AT-Command Enable Select: 0 - No (Call-in via Alarm Pulse. Wires from TB1 A- & A+ must be connected to a compatible modem, eg. MI Modem or ECI-2) 1 - Yes (Default) (Call-in via AT-commands @ J5 using CMOS or RS-232 serial communications)	Codes (0-1) to select the method of instrument call-in.
491	Modem Init String Default = ATE0Q0V0X4 Where:AT = Attention (required for each modem command string) E0 = Echo Off Q0 = Result Codes Enabled V0 = Verbose Mode Off (i.e. use number codes, not text) X4 = Modem waits for dial tone before dialing or sends No Dial tone code if not detected within 5-seconds or sends Busy code on busy signal	Character string used to initialize the instrument modem at the beginning of each AT-type call-in. The default string is for use with Mercury Instruments ’Cloud Link 4G Modem. Other brands or types of modems may require a different init string.
492	Modem Dial String Default = ATDT Where: DT = Dial the phone number using Tones, not pulses (DP)	Dial Telephone Number modifier
494	Modem Hang-up Default = ATH Where: H (or H0) causes the modem to hang up	String Switch Hook Control
495	Modem Retry Interval A Default = 5	The amount of time (in minutes) to wait before attempting a retry, following a failed Scheduled or Alarm call-in. Often referred to as the primary retry interval.
496	Modem Retry Interval B Default = 1440 (i.e., 24 hours)	The amount of time (in minutes) to wait before attempting a retry, following the last failed primary retry call. Often referred to as the secondary retry interval.

Ch Item #	Item Name	Description
497	Modem Retry A Count Default =3	Following a failed Scheduled or Alarm call-in, the maximum number of Interval A (primary) retry attempts,

9.1.8 Scaling Factor Item Codes

The “Scaling Factor” is a multiplier, pulse scaling can be applied using their respective Input Pulse Scaling items (if needed) before the pulses are stored (added) to their respective accumulated totals This affects how the recorded pulse counts are reported to the host system.

Ch1 versus Ch2 volumes units can be independently scaled.

Items-114 and 913 are used in conjunction with other Item Codes to convert the raw pulse counts to some other more meaningful value. The value of the Item Code translates to a multiplier “SFm[Item]”, which is any value between 0.0 and 200.0. Example: If Item-913 is set for a value of 2.3 then SFm [913] = 2.3.

Example: Assume the most recent interval count is 29 pulses and the total count so far is 10332.

Table 9-1: Examples of Using the Scaling Factor

Scaling Factor	Reported Interval Reading	Reported Total
1	29	10332
0.5	14 (see Note-1)	5166
2	58	20664
0.1	2 (see Note-1)	1033 (see Note-1)
2500	??? (see Note-2)	25830000

9.1.9 Modem Item Codes

Item #	Item Name	Item Description	Possible Values
3002	Cloud Link 4G Modem Serial Number	Cloud Link 4G Modem Serial Number	19 character string
3003	Cloud Link 4G Modem Manufacturing Date	Cloud Link 4G Modem Manufacturing data	19 character string, DD:MM:YYYY.
3004	Radio IMEI number	Radio identification number	19 character string
3005	Change Battery	Tells Cloud Link we have inserted a new battery. Resets the "available % battery life" (3011) calculation and updates Battery type (3007)	0 - Clear, 1 - Set.
3006	Modem Advance Low Battery Indication	Advance Low Battery Indication (in days): Maximum allowed is 180 days and Min allowed is 7	Min = 7Days Max = 180 Days

Item #	Item Name	Item Description	Possible Values
3007	Modem Power Source Type	Automatically detected by cloudlink and updated when 3005 is resetted	0 - Single Battery Pack, 1 - Dual Battery Pack, 2 - Quad Battery Pack, 3 - One Battery With SuperCap, 4 - External Supply With Single Battery Pack, 5 - External Supply With Dual Battery Pack, 6 - External Supply, 7 - No Supply.
3008	Battery Charge Capacity	Battery Charge Capacity: is based on battery type (0 if external Power Supply is used)	Floating Point value (in Milli Coloumbs)
3009	Super Cap Low voltage to drop the call	Super cap voltage reading. If event occurs, it will be logged in the diagnostics.	Floating Point value, Min = 2 V Max = 4 V
3011	Available % battery life	Percentage battery life	Min = 0 % Max = 100 %
3012	Super Cap Charge Availability (in sec)	Super cap voltage in seconds. Before calling the EC350 will read this parameter and decide whether it can make a call or not.	Floating Point value (in Sec)
3014	Modem Internal Voltage	Internal Voltage supply to the modem. Should be in the x-xV range	Floating Point value (In Volts)
3016	Fetch radio parameters	Forces a read of the SIM card details upon modem power up (reads SIM#, Radio carrier, Radio software version, radio hardware version).	0 - Clear, 1 - Set.
3017	SSL enable / Disable	0 - Disable, 1 - Enable	0 - Disable, 1 - Enable.
3021	Modem IP Type	TCP/IP configuration to be used	0 - IPV4, 1 - IPV6, 2 - IPV4V6.
3022	Packet Service Connection Command	This command initiates a packet (internet) connection This can be different for different cellular providers, but generally the universally-accepted string is"ATD*99#"	49 character string
3023	Access Point Name	This is the name of the gateway to the service provider's internet service. Examples: m2m@T-Mobile.com or isp.singular	49 character string
3024	PAP / CHAP Enable	Password Authentication protocol or Challenge/Handshake Authentication Protocol. Additional security settings for the cellular connection.	0 - None, 1 - PAP, 2 - CHAP.
3025	PAP / CHAP User Nam		29 character string
3026	PAP / CHAP Pass Word		29 character string

Item #	Item Name	Item Description	Possible Values
3028	Cellular Session Timeout	Timeout after which a session between Cloud Link and PowerSpring or Masterlink (...) is closed (in case of inactivity). **Note:** Restart the Cloud Link 4G modem after changing the 'Cellular session timeout'.	16 bit integer Min = 1 Sec Max = 65535 Sec
3029	SIM Card Number		String
3031	Carrier Name	Mobile Carrier name (verizon, AT&T, ...)	String
3033	Source Port Starting Number	When establishing a client connection (Cloud Link calling a server), it must assign itself a port number which will be reported to the host server. If the Source Port Ending Number is the same, then the customer wishes to use the same source port number for each call. If the Source Port Ending Number is greater, then the customer wishes to use a range of port numbers. The first call will use the Source Port Starting Number. For each subsequent call, the source port number will be incremented until it is greater than the Source Port Ending Number. Once greater, the sequence will start over with the Source Port Starting Number. Example-1: Source Port range = 50000 - 50010 1st Call uses 50000 2nd Call uses 50001 11th Call uses 50010 12th Call uses 50000 and so on	16 bit integer Min = 1024 Max = 65535
3034	Source Port Ending Number		16 bit integer Min = 1024 Max = 65535
3037	Primary Destination IP Address (Client Mode)	Primary IP address of the Host Server which Cloud Link can call upon emergency (magnet swap). This function is enabled by item 3106 'Modem Call On Magnetic Switch Enable'.	39 character string (Min 12 characters)
3038	Primary Destination Port Number (Client Mode).	Primary port of the Host Server which Cloud Link can call upon emergency (magnet swap). This function is enabled by item 3106 'Modem Call On Magnetic Switch Enable'.	16 bit integer Min = 1024 Max = 65535
3039	Alternate Destination IP Address (Client Mode)	Alternate IP address of the Host Server which Cloud Link can call upon emergency (magnet swap). This function is enabled by item 3106 'Modem Call On Magnetic Switch Enable'.	39 character string (Min 12 characters)
3040	Alternate Destination Port Number (Client Mode)	Alternate port of the Host Server which Cloud Link can call upon emergency (magnet swap). This function is enabled by item 3106 'Modem Call On Magnetic Switch Enable'.	16 bit integer Min = 1024 Max = 65535
3044	Server Mode Friends (White) List Enable	If enabled, Cloud Link will accept only connections (Call Out) from the IP addresses configured in items 3045-3054.	0 - Disable, 1 - Enable.
3045-3054	Server Mode Friends (White) List(10 IP	Server White list IP addresses 1 - 10	String

Item #	Item Name	Item Description	Possible Values
	address)		
3055	Device Wakeup time	Modem sleep timeout after an AT command is received. Example with 3055 set to 15s. If EC350 sends and ATDT command to Cloud Link, Cloud Link will go back to sleep 15s later if no other command is received.	16 bit integer Min = 1 Sec Max = 180 Sec
3057	MasterLink session timeout	MasterLink session timeout for both Cloud Link 4G Modem & EVC connection	16 bit integer Min = 60 Sec Max = 960 Sec
3058	Last call / Known Signal Strength	RSSI - Received Signal Strength Indicator. Last call known signal strength on a 2G network. Excellent : -50dBm ð -70dBm Good : - 70dBm ð -85dBm Fair : -85dBm ð -100dBm Poor : -100dBm ð -120dBm	Float (in dBm)
3059	Last Known Source IP Address	Last call IP address	String
3060	Last Known Source Port	Last call IP Port	32 bit integer
3062	Modem Firmware Version		String
3063	Radio Modem model		String
3064	Modem Manual APN Enable	Typically select manual APN if a private static APN is assigned to your SIM card.	0 - Disable, 1 - Enable.
3065	RS-232 / RS-485 Serial Port Baud Rate		0 - 1200, 1 - 2400, 2 - 4800, 3 - 9600, 4 - 19200, 5 - 38400, 6 - 57600, 7 - 115200.
3067	RS-232 Serial Port Flow Control		0 - Disable, 1 - Enable.
3070	Include Baud in CONNECT Message	Check in CNI2 manual	0 - Disable, 1 - Enable.
3071	Modem Verizon Enable	Select 'Enable' if operating on the Verizon network. 'Disable' if not. Changes to this parameter require 3016 (fetch parameters) to be set and Cloud Link to be rebooted.	0 - Disable, 1 - Enable.
3072	Use Non-Verbose (Numeric) Response Codes	Check in CNI2 manual	0 - Disable, 1 - Enable.
3073	Serial Port Delay Before Sending Packet	During a Call-In sequence, the modem acquires the data and will wait for a xx mSec gap before sending the data to PowerSpring.	16 bit integer Min = 10 mSec Max = 10000 mSec
3075	RS-485 enable	Defines the RS-232 or RS-485 operation of the serial port. This setting has to match the Hardware Switch.	0 - Disable, 1 - Enable.

Item #	Item Name	Item Description	Possible Values
3076	BLE MAC Address		String
3078	Advertisement interval(in msec)	How often Cloud Link broadcast its ID.	16 bit integer Min = 320 mSec Max = 10000 mSec
3079	BLE Module Status	Shows if a device is connected to Cloud Link over the BLE link.	0 - Disconnected, 1 - Connected.
3080	BLE firmware version		String
3081	BLE stack version		String
3082	BLE forget all bonds	Cloud Link remembers up to 8 devices that have paired with it. Once this limit is reached no new device can be connected. This parameter has to be Enabled to clear the list of paired devices and be able to pair a new device. This parameter can be changed either using an already paired smartphone or by going into level 2 "FORGET DEV" menu.	0 - Disable, 1 - Enable.
3084	BLE Last RSSI		Floating point value(in dBm)
3085	BLE Security type	There are 2 types of connection : "Just Works" and "Passkey Entry". With Just Works, any device can connect to the modem over BLE, no passkey is required. If "Passkey entry" is selected, when trying to connect, a passkey has to be entered on the smartphone to be able to pair. This passkey can be found on the EC350 in Level 2, "BT PAIRING" menu. The passkey must be entered within 40 seconds. The passkey is valid for 40 seconds after which it expires. If the passkey expires, you need to obtain a new passkey, and start all over. Passkey entry bluetooth pairing works only when the Cloud Link 4G Modem is used in integrated mode.	1 - Just Works, 2 - Passkey Entry. Passkey entiry is not applicable for CNI4.
3086-3093	Modem SSL Security Passphrase	When SSL secure connection is used, a password has to be entered on both ends (Cloud Link and MasterLink) so that the communication can be established. This passphrase is used to encrypt the security certificate.	String
3095	Remote Unit ID (RUID)	Used for BLE idvertisment and identification of Cloud Link (Standalone) in MasterLink.	String, 6 characters
3096	Running / Existing Firmware Version	Cloud Link 4G Modem firmware revision	String
3097	Running Firmware CRC checksum	Cloud Link 4G Modem firmware checksum	String
3098	Down Loading Firmware Version	Firmware version being downloaded to the Cloud Link.	String
3099	Firmware upgrade max packet size	Maximum packet size used during firmware upgrade. When doing a Firmware upgrade over the	0 - 256 Bytes, 1 - 512 Bytes, 2 - 1024 Bytes.

Item #	Item Name	Item Description	Possible Values
		cellular network, if the Maximum Transmission Unit (MTU) of the network is lower than the configured packet size, the packet size should be decreased to be smaller than the MTU. On an LTE network the MTU is typically 1200 bytes.	
3100	Firmware image max size allowed		32 bit Integer (in Bytes)
3101	Coordinated Universal Time (UTC)	When the Cloud Link 4G Modem receives a time and date, it is relative to Coordinated Universal Time (UTC), which is essentially the same thing as Greenwich Mean Time (GMT).	32 bit Integer Min = 0 Sec Max = 4294967295 Sec
3102	Date format type		0 - MMDDYY, 1 - DDMMYY, 2 - YYMMDD.
3103	Cloud Link 4G Modem Bootloader version		String
3104	Cloud Link 4G Modem Bootloader CRC		32 bit Integer
3105	Modem Call On Low Battery Enable	Whenever selected, Cloud Link will call the IP addresses defined in 3037-3040 on Low battery conditions (requires PowerSpring)	0 - Disable, 1 - Enable.
3106	Modem Call On Magnetic Switch Enable	Whenever selected, Cloud Link will call the IP addresses defined in 3037-3040 when the switch magnet is activated (requires PowerSpring)	0 - Disable, 1 - Enable.
3108	Modem Date		
3109	Modem Time		InHH MM SS
3110	Server mode IP address	Used when CLoudLink is in integrated mode. This parameter needs to be configured by the user so that Cloud Link knows its IP address (Call Out mode)	39 character string (Min 12 characters)
3111	Server mode IP port number	Used when CLoudLink is in integrated mode. This parameter needs to be configured by the user so that Cloud Link knows which port to listen on (Call Out mode). This port shall be configured in MasterLink or PowerSpring for example.	16 bit integer Min = 1024 Max = 65535
3112	BLE connection interval	Advertisement interval max : data value in mSec	16 bit integer Min = 8 mSec Max = 4000 mSec
3113	Pulse count	Cloud Link 4G Modem has a feature to count the raw pulses coming from an input switch. This adds the advantage of getting redundant counts along with the counts from the actual meter measured by the external EVC. To use this functionality, you need to enable and configure this feature (Item 3136). If you want to start from a specific value, to	16 bit integer Min = 1 Max = 99999999

Item #	Item Name	Item Description	Possible Values
		be able to write to that parameter, first disable the count feature (item 3136), then write item 3113, then enable the pulse count feature (item 3136).	
3114	Cloud Link 4G Modem board temperature	Modem Board Temperature (units are defined in item 3140)	Float
3118	Cloud Link 4G Modem Reset counter	This items keeps track of how many times the modem has been rebooted.	Usigned integer 32 bits
3120	Low Battery Alarm Event	The battery alarm depends on the number of days (defined in 3006) before the battery is expected to die. If 3105 is set, this will generate a call to PowerSpring. This alarm will be active and can be acknowledge by clearing this alarm.	0 - Not Active, 1 - Active.
3121	Modem Magnetic Alarm	Whenever Magent is swiped on the magnetic reed switch, this alarm will be active and can be acknowledge by clearing this alarm. If 3106 is set, this will generate a call to PowerSpring.	0 - Not Active, 1 - Active.
3122	BLE transmit power	BLE transmit power	16 bit integer Min = 0 Max = 9
3123	BLE enable	If Disabled, this item will turn off the BLE module completely.	0 - Disable, 1 - Enable.
3124	Last call Cellular service	Last call Cellular service	0 - 2G, 1 - 3G, 2 - 4G, 3 - No Call.
3125	Last call cellid	Last call Cellular ID Global cellular identification number-Region specific.	String
3126	Last call Location ID	Last call location identifier. Set of Cell Towers Identification ID in 4G	String
3127	Last call RSCP	RSCP - Receive Signal Coded Power. Signal Strength, used on 3G networks. Excellent : -50dBm ð -70dBm Good : - 70dBm ð -85dBm Fair : -85dBm ð -100dBm Poor : -100dBm ð -120dBm	Floating point Value (in dBm)
3128	Last call RSRQ	RSRQ - Reference Signal Receive Quality. Quality of the signal received on a 4G network.	Floating point Value (in dBm)
3129	Last call MCC	MCC - Mobile Country Code. Allows Country identification.	Usigned integer 32 bits
3130	Last call MNC	MNC - Mobile Network Code. Cellular Operator Identification.	Usigned integer 32 bits
3131	Last call Physical cell id	Actual Tower Identification number	String
3132	Last call Cellular RSRP	RSRP - Reference Signal Receive Power Signal Strength on 4G networks. Excellent : -70dBm ð -90dBm Good : - 90dBm ð -105dBm Fair : -105dBm ð -120dBm Poor : -120dBm ð -150dBm	Floating point Value (in dBm)
3133	Last call Cellular	TAC - TowerArea Code Set of Cell Towers	String

Item #	Item Name	Item Description	Possible Values
	TAC	Identification ID in 2G or 3G.	
3134	Last call duration	Lats successful call duration	Usigned integer 32 bits (in Sec)
3135	Last call status	Last call status	0 - No Call, 1 - Call in Init, 2 - Dialing, 3 - Dial Failed, 4 - Connected, 5 - Failed Due to No Response, 6- PPP Failed, 7 - TCP Conn Failed, 8 - Low Super Cap, 9 - Invalid IP Configuration, 10 - Success.
3136	Pulse count enable	Enables the Cloud Link 4G Modem pulse Counting input. See Item 3113.	0 - Disable, 1 - Enable.
3137	Modem Restore/Reset/Clear logs	This item can be used to clear some logs or do a firmware reset on Cloud Link. Writing to this parameter is instantaneous and does not require disconnecting from the instrument. 1 'Restore Defaults-Device Config' - Similar to a factory default done by shortening the pins. 7 'Restore Defaults-Security Config' - Clears the SSL certificate, issue time, expiry time,... 8 'Restore Defaults-Battery Config' - Clears battery configuration : battery type, battery change, ... 9 'Modem Reset' - Firmware reset. 10 'BLE Module Reset' 11 'Restore Defaults-Internal Config'	0 - None, 1 - Restore Defaults-Device Config, 2 - Clear Event Logs, 3 - Clear Alarm Logs, 4 - Clear Diagnostic Logs, 5 - Clear Cellular Logs, 6 - Clear All Logs, 7 - Restore Defaults-Security Config, 8 - Restore Defaults-Battery Config, 9 - Modem Reset, 10 - BLE Module Reset, 11 - Restore Defaults-Internal Config.
3138	Modem server timeout	Used when connecting to third party EVCs which do not support Call Out start and end time. This parameter can be used defines how long Cloud Link will remain in server mode.	Unsigned Integer 32 bits Min = 60 Sec Max = 4294967295 Sec
3139	Remote Unit ID 2 (RUID)		String, 6 characters
3140	Temperature units	Units used when displaying the modem board temperature (item 3114).	0 - Degree Celcius, 1 - Farenheit, 2 - Rankine, 3 - Kelvin.
3141	BLE number of bonds	Number of devices which have paired with Cloud Link. See item 3082.	Unsigned Integer 8 bits
3142	MIWireless Enable	0 = for 350 or integrated mode(default), 1 = MiWireless. In MiWireless mode, the modem will directly connect to the cellular network when the power is applied. In EC350 or integrated mode, once the power is applied to the modem, it will	0 - Disable, 1 - Enable.

Item #	Item Name	Item Description	Possible Values
		remain in a dormant state until the corrector send an AT command to instruct the mode to wake up and join the network. (When this item number is changed, the instrument must be restarted)	
3143	BLE start time	To save battery life, the BLE connection can be completely turned OFF (item 3123) or turned ON during a specific part of the day. By default, the BLE is ON between 6AM and 6PM. If you want to permanently enable BLE, set Start time = 00 00 00 and stop time = 23 59 00.	Time in HH MM SS
3144	BLE stop time		Time in HH MM SS
3145	BLE Passkey	If Passkey security is selected for BLE (see item 3085), this item will contain the passkey generated by the modem.	String
3146	External Supply Voltage	If the power source type is external (item 3007), then this item will contain the supply voltage.	Floating point value (in Volts)
3147	Alarm Call Retries	Number of times Cloud Link will try to contact the primary destination IP address (item 3037) before switching to the secondary (item 3039). The same number of retries will happen on the secondary. If it fails the modem will go to sleep.	Unsigned Integer 8 bits Min = 0 Max = 2
3148	Cloud Link 4G Modem model number	Defined by factory.	String
3149	PWA serial number	PWA serial number	String
3150	PWA revision number	PWA revision number	String

9.2 CNI4 Index Base

When the UMB index mount option is included with the instrument, a rotating magnet and two or three magnetic sensor switches will be present inside the enclosure as seen below. For convenience, wires from the sensor switches are prewired from the factory to the pulse counting input terminal block. In the unlikely event that one of the two reed switches fails, the redundant input channel will continue to register accurate counts.

The illustration below shows the CNI4 with the rotary magnet and magnetic sensor switches. For the sake of clarity, this illustration does not show the routing of wires from the sensor switches.

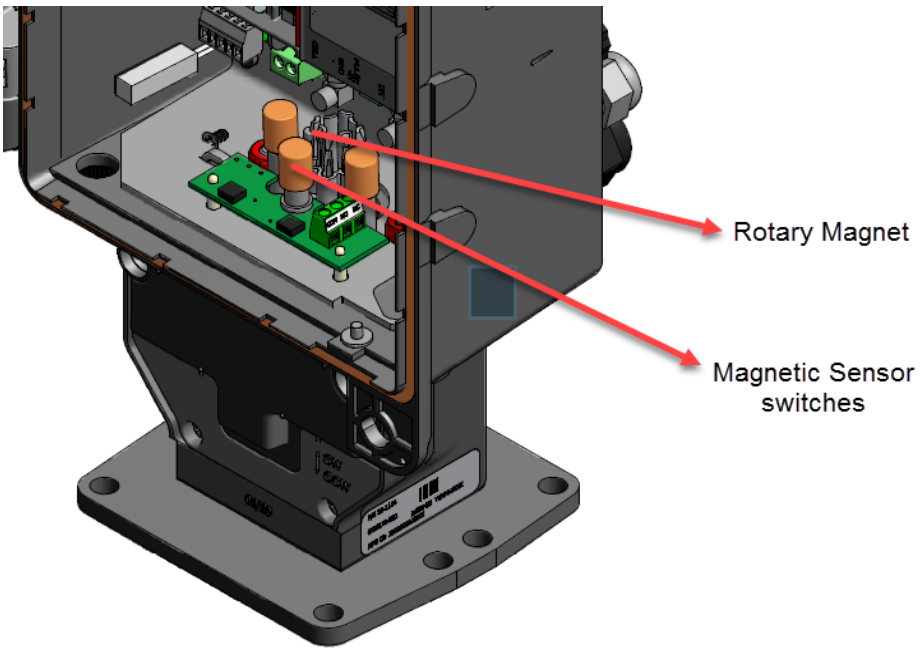


Figure 9-2: Index Base with Magnetic Switches

Another option is the Uncorrected Pulse Output board, as seen below. This provides an additional dry-signal pulse output that allows for connection to an external pulse counting instrument.

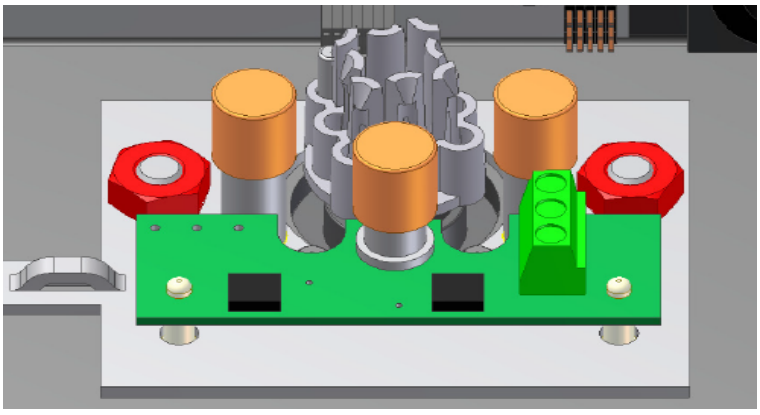


Figure 9-3: Pulse Output Board

Illustrated below is the UMB index without the front covers or enclosure housing. To change the direction of rotation, first remove the odometer. This is accomplished by removing the screw on the top left corner after which the odometer can be pulled out straight.

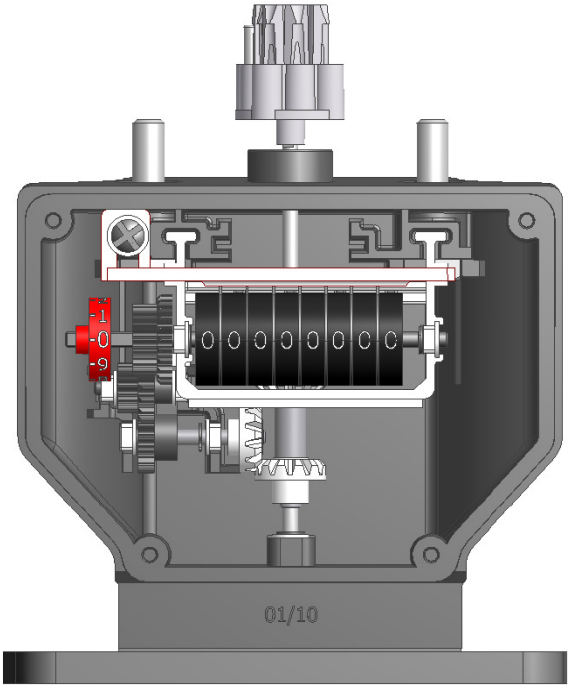


Figure 9-4: Internal View of the Index Base

A small Allen wrench tool is included with the index. Loosen the set screws on the top and bottom miter gears and swap the gear that engages. Shift the gear set upwards for meters with CW rotation and down for meters with CCW rotation. See the gear detail drawing below. After the gears are securely set, check for good gear engagement that is neither too loose (causing gear skipping) or too tight (causing gear binding). Then reinstall the odometer.

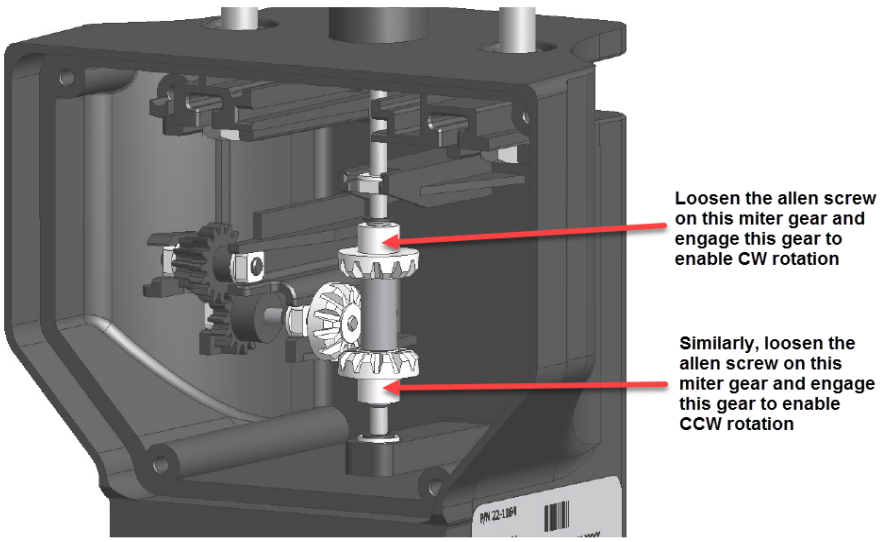
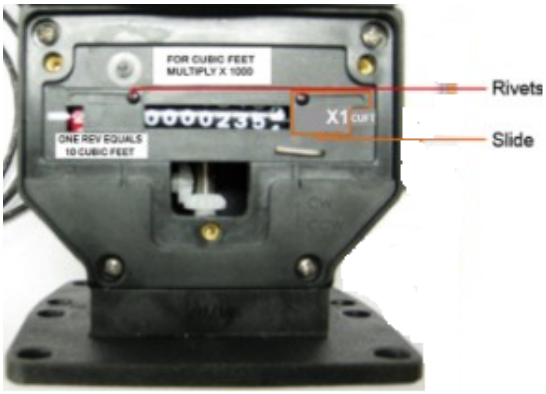


Figure 9-5: Rotation Gears within the Index Base

Note that it is also possible to change the number of digits visible on the mechanical odometer using the horizontal sliding “windows”. Up to three digits from the right side and/or up to three digits from the left side can be masked-off.



9.3 Connecting to cellular networks

9.3.1 Connecting to AT&T network

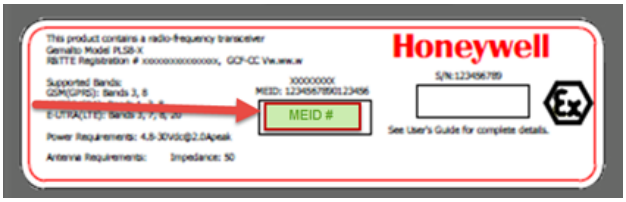
AT&T Wireless uses 3 main types of IP addresses:

1. **Public Static IP addresses**. These IP addresses normally connect to an APN like: 12221.mcs or to an APN provided by AT&T. The area code of the phone number must match the APN you are using.
2. **Private Static IP addresses**. These IP addresses can use the same APN as the public static IP addresses or a dedicated IP provided by AT&T.
3. **Private Dynamic IP addresses**. This is typically what is used in mobile phones.

To obtain the APN:

1. Contact AT&T support
2. Authorize your account by providing either:
    - Phone number associated to the Sim
    - IMEID of the Sim card. It is written on the Sim card.

3. Request the following details from AT&T support
    - IP Address of the Sim card.
    - APN Associated to Sim card.
4. Ask AT&T to verify the MEID with which the Cloud Link device is registered on the network. You can find the Cloud Link MEID on the Honeywell label.



9.3.2 Connecting to Verizon network

Verizon Wireless uses 3 main types of IP addresses:

1. **Public Static IP addresses**. These IP addresses normally connect to one of the following APNs: ne01.VZWSTATIC, mw01.VZWSTATIC, we01.VZWSTATIC or so01.VZWSTATIC. The area code of the phone number must match the APN (ne, mw, we or so).
2. **Private Static IP addresses**. These IP addresses can use the same APN as the public static IP addresses or a dedicated IP provided by Verizon.
3. **Private Dynamic IP addresses**, Verizon typically uses VZWINTERNET as an APN. This is typically used in mobile phones.

To obtain the APN:

1. Contact Verizon support
2. Authorize your account by providing either:
    - Phone number associated to the Sim
    - IMEID of the Sim card. It is written on the Sim card.

3. Request the following details from Verizon support
    - IP Address of the Sim card.
    - APN Associated to Sim card.
4. Ask Verizon to verify the MEID with which the Cloud Link device is registered on the network. You can find the Cloud Link MEID on the Honeywell label.

10 Glossary

2

2G/3G/4G

A mobile communications standard

A

Accumulated Volume

Totalized Accumulated Volume based on the volume signal connected to its input.

Activity Log

This function is used to quickly view the Activity Log on screen. Please note that this log is different from the Event Log because this log mainly focuses on software activity (and some firmware activity) where the Event Log function records activity that is directly linked to and maintained within the instrument.

Alarm Log

The alarm log contains descriptions of all significant problems detected by the system

APN

Access Point Name (APN) is the name of a gateway between a mobile network and host system. The cellular device requesting a data connection must be configured with an APN to communicate with the carrier. Based on the APN used, the mobile carrier assigns an IP address to the device. Device IP addresss assigned from carrier are categorized into two types i.e. Dynamic and static IP address. Type of IP address assigned to the device depends on the APN configured to the device. For static IP address,a special SIM cards need to be procured from the carrier with agreed dataplan. Carriers support two types of network toplogy - public and private network. If the data collection system and the cellular devices are to be deployed in private network, the sevice provider can implement a network which connects to private network without disturbing existing network topology. In this deployement special SIM cards are required which are configured with a private APN provided by the carrier.

Audit Trail

You can use the 'Audit Trail' tab to view and download Audit Trial data from the instrument. The term "Audit Trail" has different meanings in MasterLink Software Application that depend on the type of connected instrument.

B

Baud rate

The baud rate is the rate at which information is transferred in a communication channel. In the serial port context, "9600 baud" means that the serial port is capable of transferring a maximum of 9600 bits per second.

C

CA Certificate

A Certification Authority (CA) is a trusted entity that issues electronic documents that verify a digital entity's identity on the Internet.

Client Certificate

A client certificate is a type of digital certificate that is used by client systems to make authenticated requests to a remote server.

D

Diagnostic log report

Displays log files containing messages that record all types of events, including startup and shutdown information, errors, warning messages, and access information

F

Firmware

Permanent software programmed into a read-only memory.

FixedFactor Value

The FixedFactor scaling is normally used to adjust the accumulated volume for a

fixed pressure factor, a fixed temperature factor or both.

I

Incremental Accumulated Volumes

The Incremental Accumulated Volumes are the same as Accumulated Volume (items 002 and 910) but is initialized (rezeroed) at the beginning of every Log Interval, (Hourly or Daily) as definded by item 202. If the Pulse Accumulator is accessed via a serial connection, this item will display the current value for that point in time.

Item Codes

An “Item Code” is a 3-digit number that describes the information to be written to or read from a Mercury device.

Item File

An Item File stores the connected site instrument’s item values in a file.

L

LTE

In telecommunication, Long-Term Evolution (LTE) is a standard for high-speed wireless communication for mobile devices and data terminals, based on the GSM/EDGE and UMTS/HSPA technologies.

M

MDM

Meter data management (MDM) refers to software that performs long-term data storage and management for the vast quantities of data delivered by smart metering systems.

MEID

MEID stands for Mobile Equipment Identifier and is a unique identifier for a mobile device. MEID is a form of ESN (Electronic Serial Number).

Metrological items

A “Metrological” item is any item that affects the accuracy of the pulse-count readings.

O

OTA

Over-the-air

P

Passkey

A Passkey contains encrypted information of user name and privileges. For a user to be effected in other MasterLink instances a Passkey needs to be generated by the Administrator and sent to the user.

Private Key

The private key is used to decrypt the information and restore it to its original format so that it can be read.

R

Reed Switch

The reed switch is an electrical switch operated by an applied magnetic field.

RS-232/RS-485

In telecommunications, RS-232/RS-485 is a standard for serial communication transmission of data.

S

Serial port

Port of your system to which the device is connected

Server Certificate

Server certificates or SSL certificates are small data files that digitally bind a cryptographic key to an organization's details.

Site

A 'Site' refers to a connected field instrument/device.

SSL

SSL (Secure Sockets Layer) is the standard security technology for

establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and integral.

T

Time Sync

The Time Sync function is used to synchronize instrument time with host time.

TLS

Transport Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL), both frequently referred to as "SSL", are cryptographic protocols that provide communications security over a computer network.

U

UMB

Universal Mounting Bracket

USB

Universal Serial Bus (USB) is an industry standard that defines cables, connectors and communications protocols for connection, communication, and power supply between computers and devices.

User IDs and Passcodes

User IDs and Passcodes are used to login to an instrument. When creating a user account, assign User ID, and a Passcode, and assign a role to the new user. Valid User IDs are 0 through 99 (decimal numeric). Valid passcodes are 00000 through 99999 (decimal numeric). The Passcode must be 5 digits in length.

W

Wetting current

Wetting current is the minimum electric current needing to flow through a contact to break through the surface film resistance. The film of oxidation occurs often in areas with high humidity. Providing a sufficient amount of wetting current is a crucial step in designing systems that use delicate switches with small contact pressure as sensor inputs. Failing to do this might result in switches remaining electrically "open" when pressed, due to contact oxidation.

Wriggler mechanism

A wriggler device is provided for a gas meter endpoint or gas meter index as an interface with a gas meter drive mechanism.