CloudLink 5G Modem User Manual

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Honeywell Process Solutions

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Revision History

Revision	Date	Description
A	April 2024	Initial release of the document for CP R200.2

1 General

This chapter introduces the CloudLink 5G Modem and also talks about the device features.

1.1 Overview

CloudLink 5G Modem is a cellular radio that can be used as a component in Electronic Volume Correctors (EC350), Recorders (ERX350), and in wireless platforms. This can function as a standalone transparent modem. MasterLink application software can be used to configure this modem.

1.2 Modem Characteristics

a. Serial communication through RS232
b. LTE CAT M1 technology
c. IPv4 protocol
d. Operates in TCP Client and Server Modes
e. Firmware Upgrade Over-The-Air (FOTA)
f. External power supply (15V max)
g. Transparent modem
h. Dedicated configuration port
i. eDRX feature (supported with MasterLink R610.1)
j. TLS and TSA feature (Ecrypted sign-on)
k. LTE CAT M1 (NA Region) and NBIoT (Europe Region)
l. Whitelisting for cellular communication
m. Network health check
n. Midnight reset

2 Security Guidelines

This section provides security guidelines for CloudLink 5G Modem.

2.1 Device Security Recommendations

Following are the recommendations to prevent malicious users from accessing the device and its data:

• Install the device where physical access to the device is restricted.

• Avoid using the self-signed certificates, always install the certificates from Honeywell or reputed CA.

• Change the default password on first use, and ensure that user passwords are changed on a regular basis and securely stored.

• Unauthorized people should be kept away from the loading bay area.

• Use an earth connection interlock to prevent loading from starting without the driver physically present.

2.2 Implementing stringent password guidelines

Password attacks of various kinds occur, so the following password management procedure must be followed:

a. Change standard password.

b. Use secure password for CloudLink 5G device.

c. Change password immediately in case someone has tried to attack the system.

> **Note:** A Complex password must:
> -Be at least 8-15 characters in length.
> -Contain both upper and lowercase alphabetic characters. (e.g: A-Z & a-z).
> -Have at least one numerical character. (e.g: 0-9).
> -Have at least one special character. (e.g: ~!@#$%^&*()_+=).

2.3 How to report a security vulnerability

A vulnerability is defined as an error or weakness in the software which can be exploited to adversely affect or reduce the operation or security of the parameterization or device software.

Honeywell reviews all reports about vulnerabilities relating to Honeywell products and services. You can find further information about the Honeywell Security Policy at: https://www.honeywell.com/us/en/product-security.

If you would like to report a possible vulnerability in a Honeywell product, follow the instructions on the Honeywell website at: https://www.honeywell.com/us/en/product-security.

You can find information about current malware threats at: https://process.honeywell.com

OR

Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or our https://process.honeywell.com/us/en/site/elster-instromet/support

2.4 Preventing unauthorized external access using a firewall

To reduce the risk for your network, we recommend that you use a firewall or another mechanism to restrict network traffic between the “external” central billing or control system and the “internal” network of the gas metering systems. Furthermore, CloudLink 5G device should only be installed in the gas metering system, where access control is guaranteed, i.e., protective action is taken to prevent unauthorized persons gaining access to the device.

We also recommend that you only allow protocols and ports which are actually used for data exchange with the external network and that these are added, for example, to the firewall’s whitelist.

3 Safety

This chapter describes the different safety aspects involved with the CloudLink 5G Modem, along with the agency approvals.

3.1 Safety and Hazardous Information

CloudLink 5G Modem complies with the general safety standards and regulations. However, failure to operate as per the safety instructions available in this document may lead to hazards.

Comply with the FCC and IC Rules and Regulations as follows:

a. The integration is limited to fixed or mobile categorized host devices, where a separation distance between the antenna and any person of min. 20cm can be assured during normal operating conditions.

b. This device may not cause harmful interference, and

c. This device must accept any interference received, including interference that may cause undesired operation.

Conditions of Acceptability/ Safe use for Zone 0/ Division 1 version of CloudLink 5G Modem:

a. CloudLink 5G shall be installed in a suitable enclosure that provides an ingress protection appropriate for the environmental conditions/intended application and shall be acceptable to the authority having jurisdiction.

b. The CloudLink 5G does not have any surface that exceeds 135°C at a maximum ambient temperature of +70°C. The service temperature inside the end enclosure shall not exceed the temperature range specified for this component.

c. The SIM connection shall only be used for SIM card. The SIM card may be connected or disconnected in a Hazardous area.

d. J2 shall only be used for a passive antenna with no additional inductance and capacitance. The length of the cable to this antenna shall not exceed 1m. The maximum RF power shall not exceed 3.5W, and the maximum RF energy (Zth) shall not exceed 250µJ when an external antenna is used with CloudLink 5G. Furthermore, the external antenna shall not have another source of power except the CloudLink 5G.

e. P13 shall only be used in a non-hazardous area for factory settings only. Um max ≤ 12V.

f. The CloudLink 5G (51308889-276 and 51308889-476) shall only be powered by an associated apparatus meeting the parameters defined (P1 or P2) OR battery pack 40-6197 for 51308889-276 variant only. The battery pack shall not be replaced in a hazardous area, and be protected from mechanical impact in the end application.

Conditions of Acceptability/ Safe use for Division 2 version of CloudLink 5G Modem:

a. The CloudLink 5G shall only be used in an area of at least pollution degree 2, as defined in CSA C22.2 No/UL 60664-1.

b. The CloudLink 5G shall be installed in a suitable enclosure that provides a minimum ingress protection of IP54 in accordance with CSA C22.2 No/UL 60079-0, unless the CloudLink 5G is afforded an equivalent degree of protection by location.

c. Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value of the source terminals to the equipment.

d. The CloudLink 5G does not have any surface that exceeds 135°C at a maximum ambient temperature of +70°C. The service temperature inside the end enclosure shall not exceed the temperature range specified for this component.

e. The SIM connection shall only be used for SIM card. The SIM card may be connected or disconnected in a Hazardous area.

f. J2 shall only be used for a passive antenna with no additional inductance and capacitance. The length of the cable to this antenna shall not exceed 1m. The maximum RF power shall not exceed 3.5W, and the maximum RF energy (Zth) shall not exceed 250µJ when an external antenna is used with CloudLink 5G. Furthermore, the external antenna shall not have another source of power except the CloudLink 5G.

g. The integration interface (J4 for 51308889-276 and P8 for 51308889-476) shall be mechanically restrained in the assembly/end product according to the manufacturer's specifications per Installation DWG 40-6221.

h. The CloudLink 5G shall only be powered as below based on Model nomenclature:

   i. 5 Vdc – 15 Vdc (51308889-276 and 51308889-476)

   ii. Battery pack 40-6154 (7.2V) for 51308889-276 only

   The battery pack shall not be replaced in a hazardous area, and be protected from mechanical impact in the end application.

3.2 IECEx Schedule of Limitations

For EPL Ga application:

a. CloudLink 5G shall be installed in a suitable enclosure that provides an ingress protection appropriate for the environmental conditions/intended application and shall be acceptable to the authority having jurisdiction.

b. The CloudLink 5G does not have any surface that exceeds 135°C at a maximum ambient temperature of +70°C. The service temperature inside the end enclosure shall not exceed the temperature range specified for this component.

c. The SIM connection shall only be used for SIM card. The SIM card may be connected or disconnected in a Hazardous area.

d. J2 shall only be used for a passive antenna with no additional inductance and capacitance. The length of the cable to this antenna shall not exceed 1 m. The maximum RF power shall not exceed 3.5W, and the maximum RF energy (Zth) shall not exceed 250µJ when an external antenna is used with CloudLink 5G. Furthermore, the external antenna shall not have another

source of power except the CloudLink 5G.

e. P13 shall only be used in a non-hazardous area for factory settings only. Um max ≤ 12V.

f. The CloudLink 5G shall only be powered by an associated apparatus meeting the parameters defined (P1 or P2) OR the following battery packs:

   Nomenclature variants: Allowed battery pack

   i. 51308889-276: Mercury 40-6197 (7.2V)

   ii. 51308889-476: Elster 73021211 (3.9V)

   The battery packs shall not be replaced in a hazardous area, and be protected from mechanical impact in the end application.

For EPL Gc application:

a. The CloudLink 5G shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.

b. The CloudLink 5G shall be installed in a suitable enclosure that provides a minimum ingress protection of IP54 in accordance with IEC 60079-0, unless the equipment is afforded an equivalent degree of protection by location.

c. Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value of the source terminals to the equipment.

d. The CloudLink 5G does not have any surface that exceeds 135°C at a maximum ambient temperature of +70°C. The service temperature inside the end enclosure shall not exceed the temperature range specified for this component.

e. The SIM connection shall only be used for SIM card. The SIM card may be connected or disconnected in a Hazardous area.

f. J2 shall only be used for a passive antenna with no additional inductance and capacitance. The length of the cable to this antenna shall not exceed 1m. The maximum RF power shall not exceed 3.5W, and the maximum RF energy (Zth) shall not exceed 250µJ when an external antenna is used with CloudLink 5G. Furthermore, the external antenna shall not have another source of power except the CloudLink 5G.

g. The integration interface (J4 for 51308889-476 and P8 for 51308889-276) shall be mechanically restrained in the assembly/end product according to the manufacturer's specifications per Installation Drawing 40-6221.

h. The CloudLink 5G shall only be powered as below based on Model nomenclature:

   i. 5 Vdc – 15 Vdc (51308889-276 and 51308889-476)

   ii. Battery pack 40-6154 (7.2V) for 51308889-276 only

   The battery pack shall not be replaced in a hazardous area, and be protected from mechanical impact in the end application.

3.3 Cyber Security Control Measures

The user is recommended to deploy CloudLink 5G and Remote MDM server application under secured VPN network.

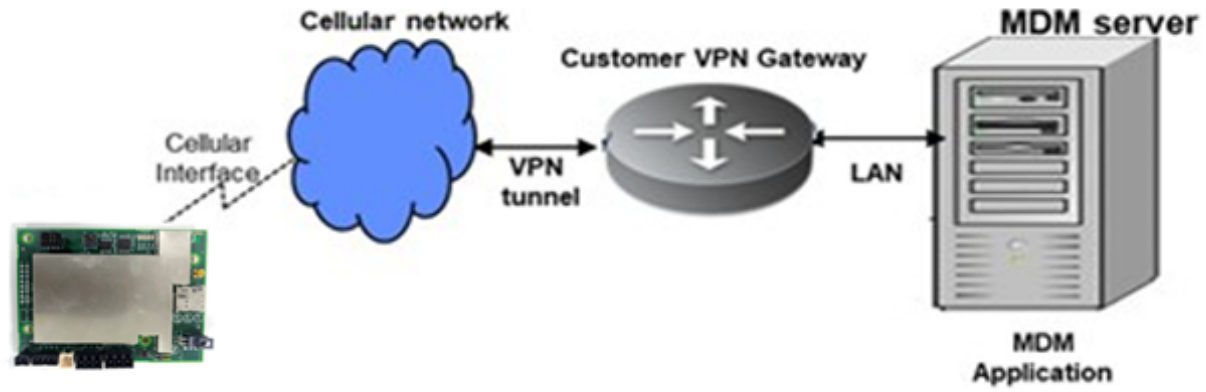


Figure 3.1 - Cyber Security Overview

Conditions to adhere Cyber Security measures:

a. Restrict physical access to the device and other devices in the network.

b. Secure the connection between the Cellular carrier network and end gateway by VPN tunnel.

c. Secure the LAN connecting Customer/User VPN gateway and the MDM server running the MDM application.

d. Use a firewall for the business network to process control/monitor network interface to restrict access from the business network.

e. Use a firewall within local area network connecting VPN Gateway to server hosting MDM application.

f. Close all unused TCP and UDP communication ports on server hosting MDM application Set the minimum level of privilege for all accounts, and enforce a strong password policy. Do not allow the use of unauthorized removable media.

g. Prevent the use of unauthorized laptops on the process control network.

h. Ensure that your virus protection and Microsoft security hot fixes are up to date on all systems.

3.4 Device Security Measures

The CloudLink 5G can be accessed through the following interfaces:

a. Standalone mode (Only CloudLink 5G): Serial RS232 and TCP IP.

b. Integrated mode (CloudLink 5G + 350s): Serial IN3 IrDA.

Sign-In:

a. A valid username and password is required for accessing the CloudLink 5G Modem.

b. Passwords are hashed for encrypted sign-on, and hash pairs embedded in the protocol are used for authentication.

c. The device supports different privilege levels like Read/Write and Read Only.

Whitelist:

a. The CloudLink 5G supports whitelisting for Cellular communication.

b. User can configure up to 10 host IP addresses in case of call outs from remote hosts to the device.

To further enhance device security, a feature to disable device application firmware upgrade using item code i3107 is made available.

Note: Restrict physical access to the device and secure the connection between the carrier network and end gateway by VPN tunnel. Secure the LAN connecting Customer/User VPN gateway and the MDM server running the MDM application.

3.5 Label

The following are the labels of Class I Div 1 and Class I Div 2 that can be found on the corresponding CloudLink 5G Modem.

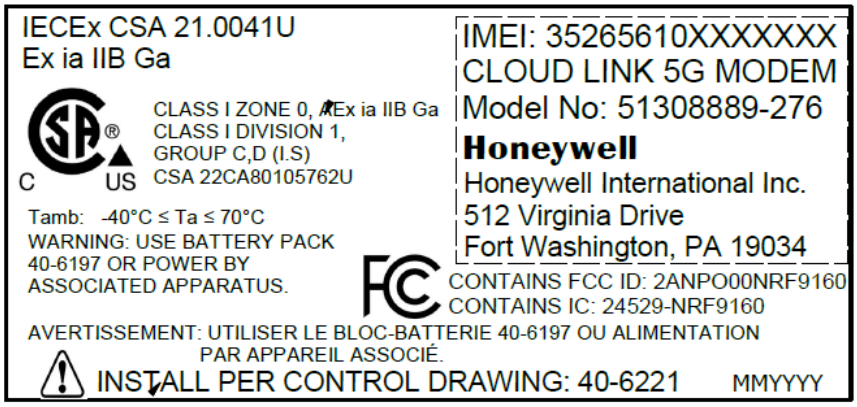


Figure 3.1 - CloudLink 5G Modem Class I Div 1 Label

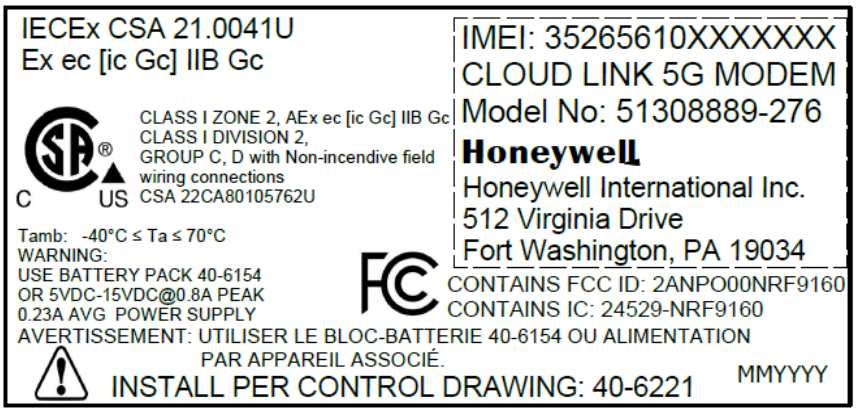


Figure 3.2 - CloudLink 5G Modem Class I Div 2 Label

4 Mechanical Assembly

This chapter describes the mechanical assembly of the different components of a CloudLink 5G Modem.

4.1 Device Dimensions

The figure below illustrates the dimensions of a CloudLink 5G Modem device.

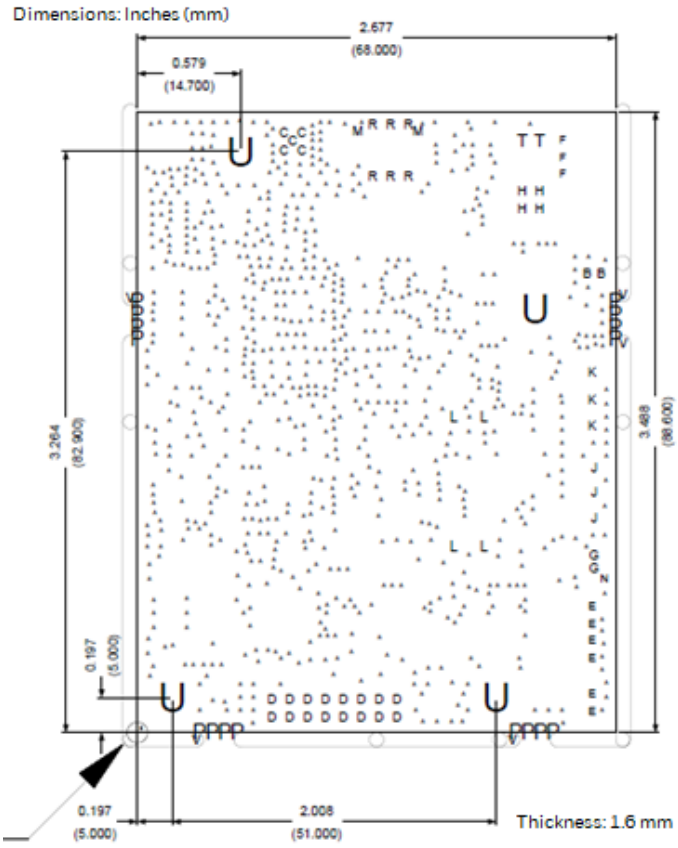


Figure 4.1 – Device Dimensions – Top View

The figures below illustrate the placement of different interfaces available in a CloudLink 5G Modem.

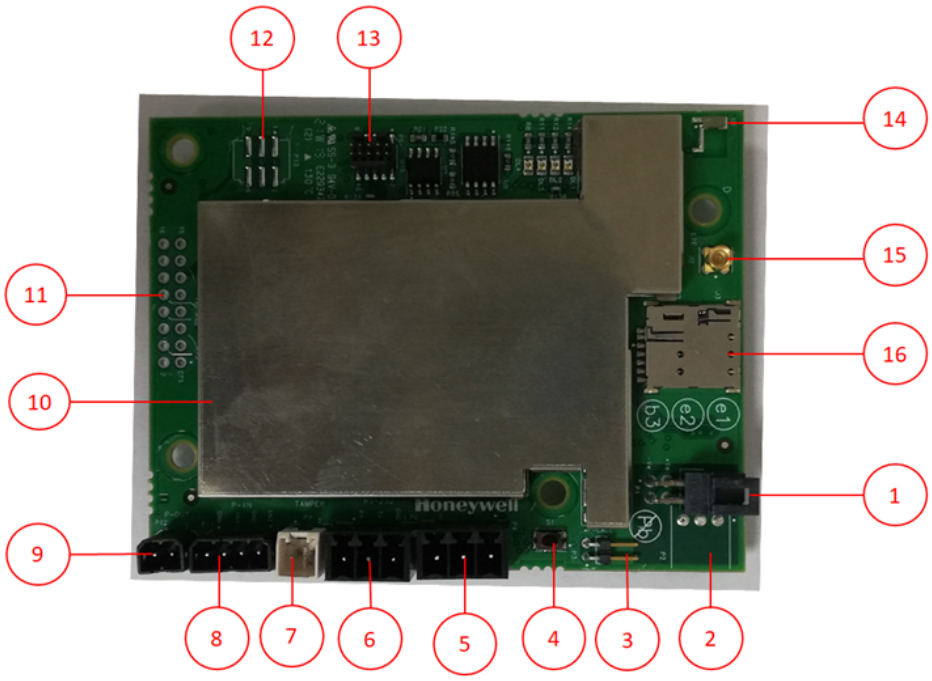


Figure 4.2 - CloudLink 5G Board - Top View

Figure 4.3 - CloudLink 5G Board - Bottom View

1	Mercury Power Connection (P1)	7	Tamper Connection (P9)	13	JTAG Connection (P5)
2	Elster Power Connection (P2)	8	Pulse Input Connection (P11)	14	GPS Antenna
3	Force Call (P3)	9	Pulse Output Connection (P12)	15	LTE Antenna Connection (J2)
4	Factory Restore Switch (S1)	10	Top Shield	16	SIM Holder (J3)

5	Midnight Reset (P4)	11	Elster EVC Connection (P8)	17	Mercury EVC Connection (J4)
6	Configuration Port (P6)	12	Elster Parameterization Connection (P13)		

4.2 Power options

CloudLink 5G supports the following power supply options.

For Zone 0 / DIV 1 use:

1. Lithium Battery Pack (Honeywell Part Number: 40-6197).

For DIV 2 use:

1. Lithium Battery Pack (Honeywell Part Number: 40-6154).
2. For remote power installations connect 5-15V DC to the CloudLink 5G at Power Connector (P1).

Note:

1. Either a battery pack or external power supply can be connected to the CloudLink 5G Modem at a time.
2. Refer to installation drawings for more detailed power options.

4.3 Antenna Options

The Y4HON00A1AA_ANT_X2 flexible ultra wideband antenna is designed to cover all working frequencies in the 698-3000 MHz spectrum. The antenna has a flexible body with excellent efficiencies on all bands, ground independent, with cable and connector for easy installation. Antenna transmits and receives data and can be placed inside EVC enclosure or similar enclosures.

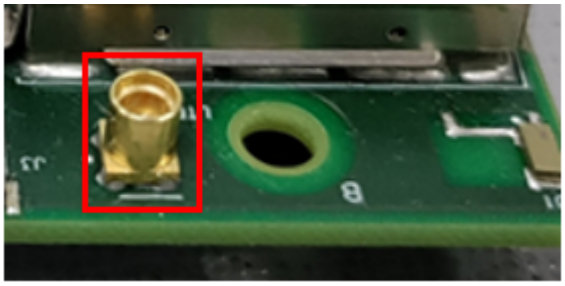


Figure 4.1 - Antenna Location

Signal Quality – Reference Signal Received Quality (RSRQ):

Technology	Range Description	Ranges (dB)	
		Start	End
LTE	Good Range	-10	-1
	Fair Range	-15	-10
	Poor Range	-20	-15

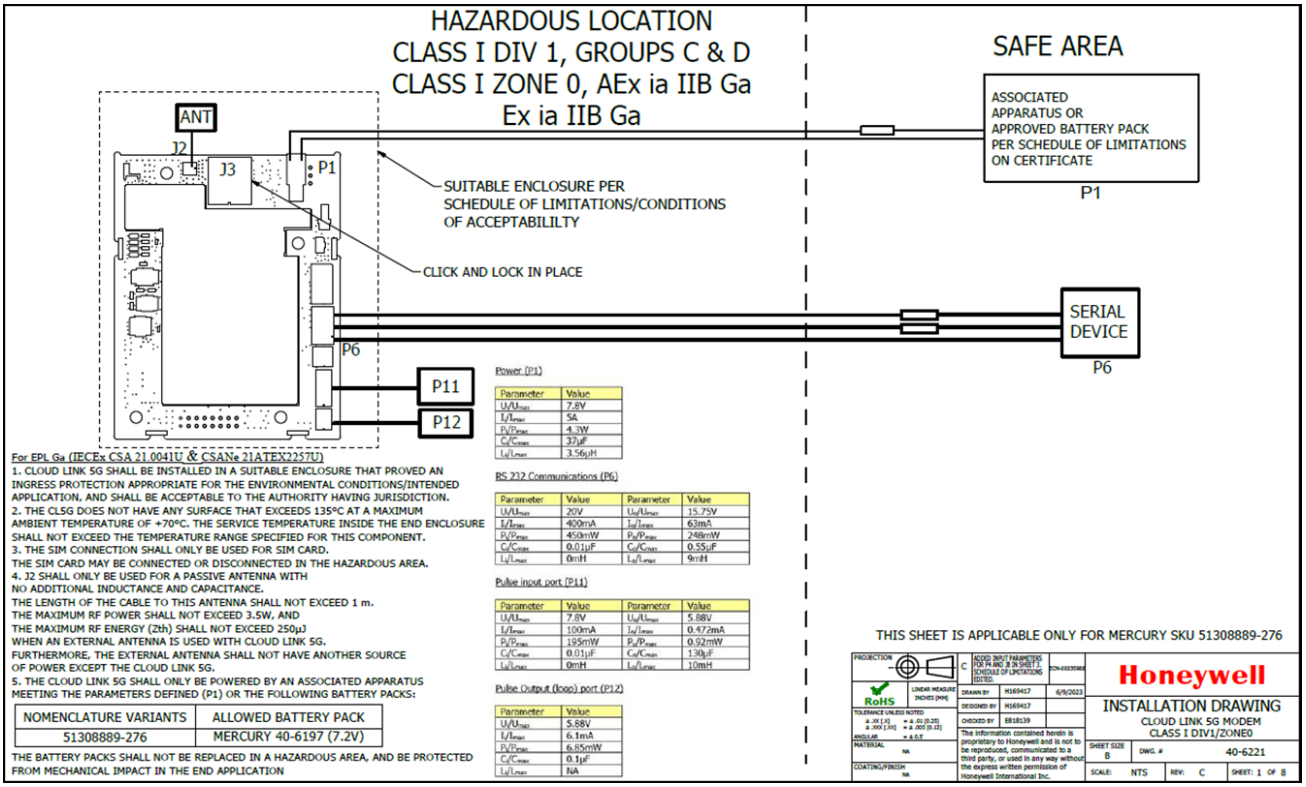
The CloudLink 5G supports following bands:

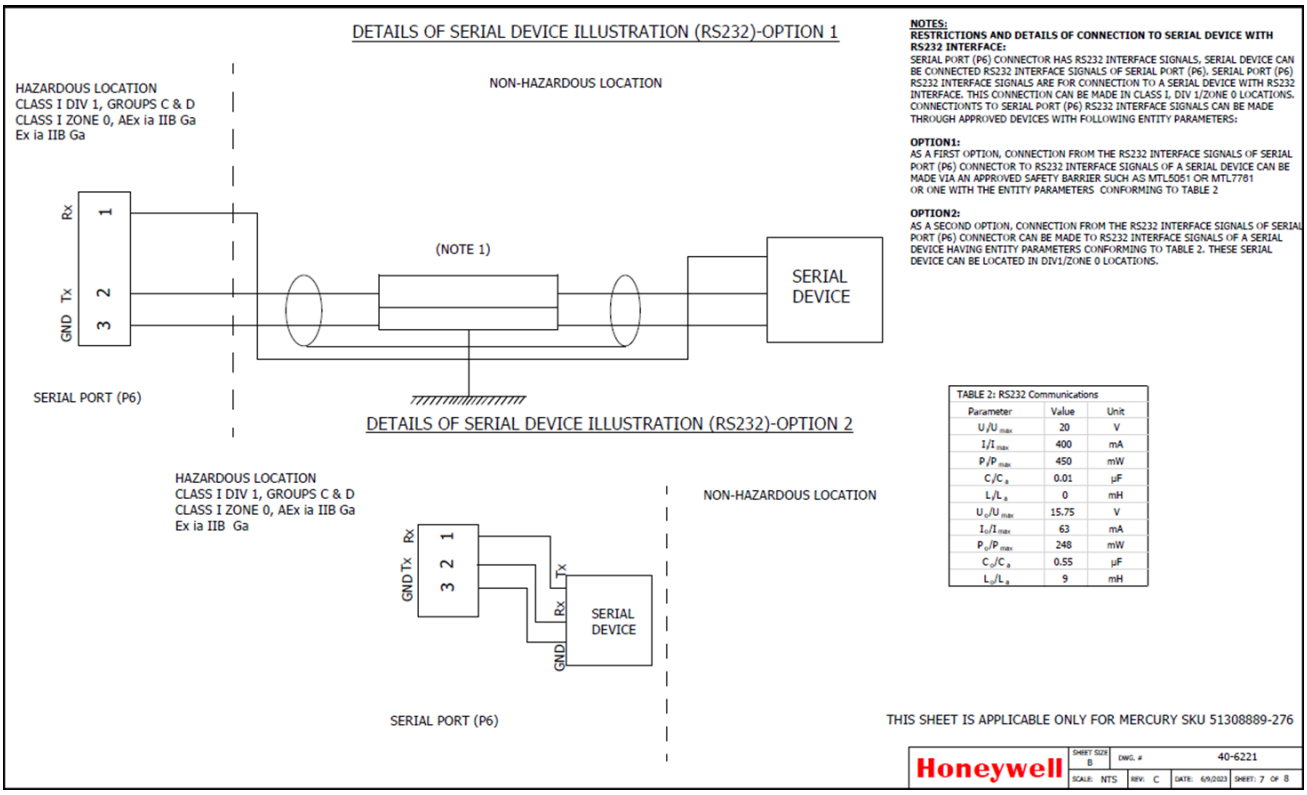
Category	Bands
Cat-M1	B1, B2, B3, B4, B5, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B66
Cat-NB1	B1, B2, B3, B4, B5, B8, B12, B13, B17, B19, B20, B25, B26, B28, B66

Attention: Antennas must be placed away from metallic parts like Batteries, Pressure Transducers, and Grounding plates.

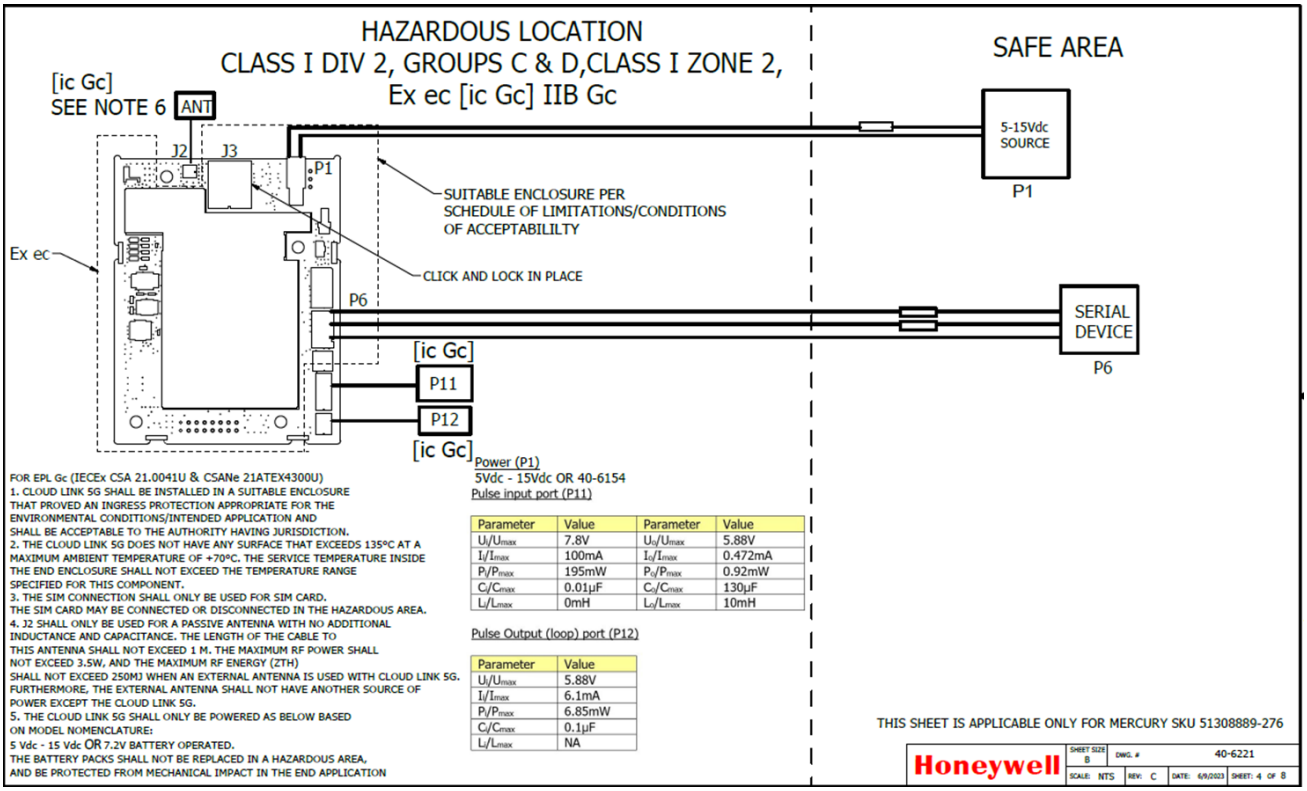
4.4 Installation Drawings

4.4.1 Zone 0, Div 1





4.4.2 Zone 2, Div 2



4.5 Field Installation

4.5.1 Retrofit details

The CloudLink 5G Modem can be retrofitted easily by following the below steps:

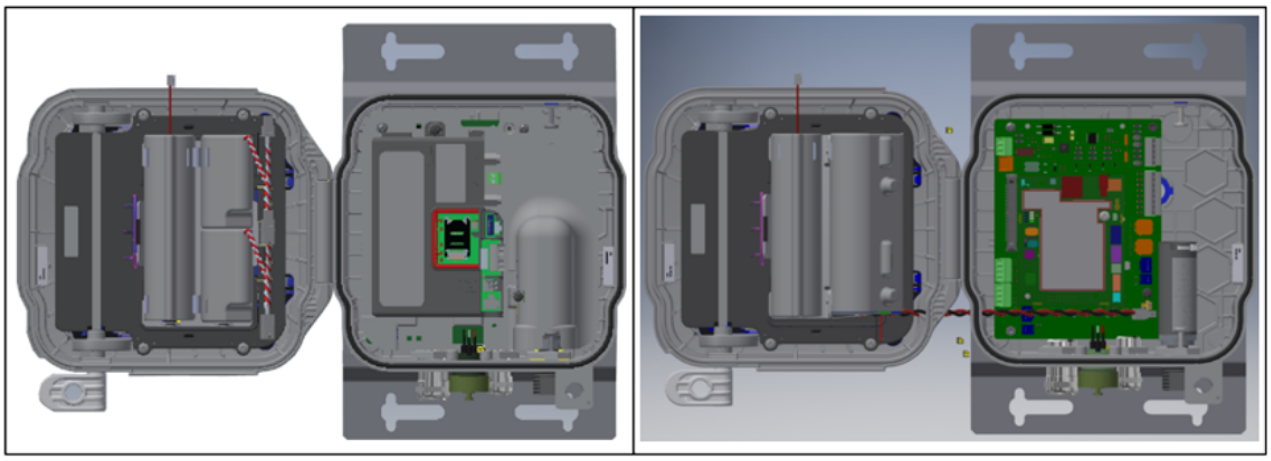
STEPS:

a. Unscrew the CloudLink 4G M1 Modem.

b. Slide the CloudLink 5G Modem into the same slot.

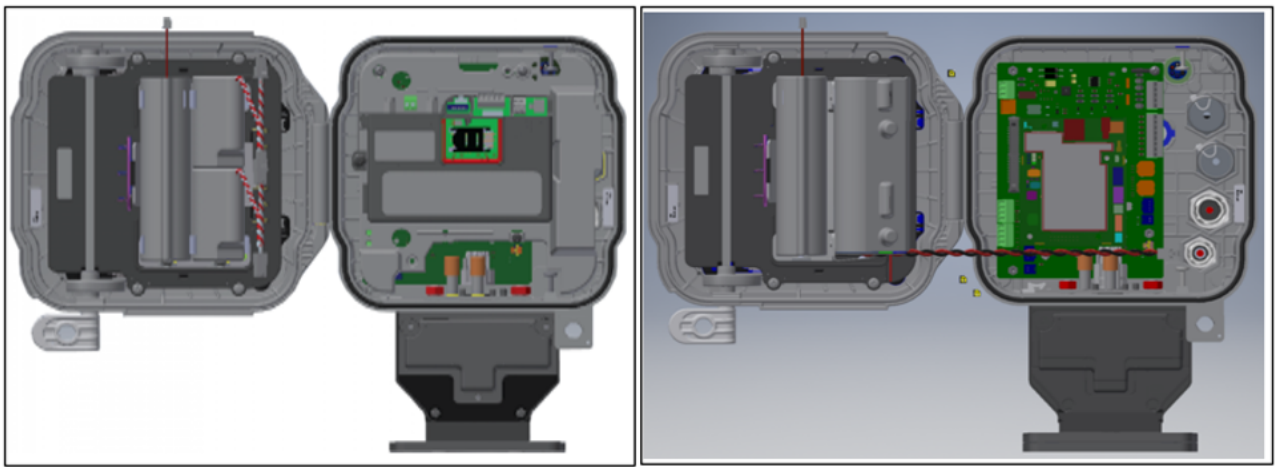
c. Position the mounting tabs properly and torque the screw.

d. Connect the cables (Refer 22-3012 and 22-3013 for Meter and Remote Mounts respectively).



Device fitted with CloudLink 4G M1 Modem | Device fitted with CloudLink 5G Modem

Figure 4.1 - CloudLink Retrofit with EC350 (Remote Mount)



Device fitted with CloudLink 4G M1 Modem | Device fitted with CloudLink 5G Modem

Figure 4.2 - CloudLink Retrofit with EC350 (Meter Mount)

5 Specifications

This section provides specifications related to the CloudLink 5G Modem.

5.1 Environmental

Operating Temperature (Remote Div 1 and Div 2 Reference): -40 °C to +70 °C (-40 °F to +158 °F).

6 Electrical Assembly

This chapter describes assembly of the different electrical components of a CloudLink 5G Modem.

6.1 Power Supply

CloudLink 5G Modem supports external power supply and battery connection that connects the device to Lithium battery pack with a voltage rating of 7.2V (±5%).

a. Humidity: Max 95% rH, non-condensing

b. Peak current during transmission: 0.8A @ 5V

c. Duty cycle (GSM) during communication: 0.577ms every 4.6ms

d. Operating voltage (external power supply): 5V to 15V

e. Dynamic Response and Low Ripple

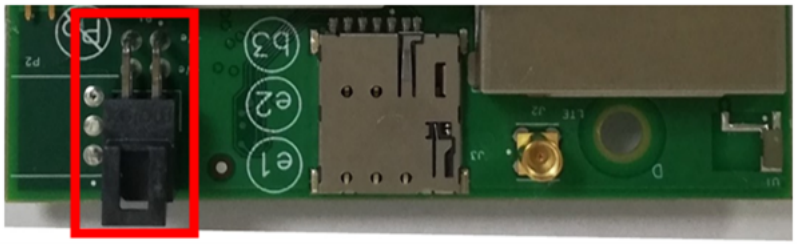


Figure 6.1 – Power Port for External Power Supply/ Battery Pack

The power port on the CloudLink 5G is common for both external power supply and battery connection. So, either you can connect the external power supply or battery pack to the power port at a time.

	Battery Source	External Power Supply Source
Voltage Range	6V to 7.5V	5V to 15V DC
Type	Lithium Battery Pack	External Power supply
Pin Description	1. COMMON: Negative (-) terminal/ Return of the external supply. 2. EXT-PWR: Positive (+) terminal of the external supply.	
Recommended Battery	Part numbers: 40-6154 (Zone 2), 40-6197 (Zone 0)	
Recommended Battery Terminal Connector	HPN: 50161138-001 MPN: 105314-1304 MFGR: MOLEX LLC Description: Conn Header R/A 4POS 2.5mm	

6.2 Serial Communication – RS232

CloudLink 5G as a transparent cellular modem supports traditional RS232 interface.

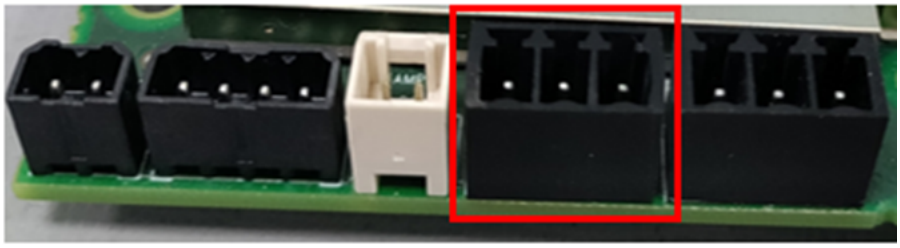


Figure 6.1 – Serial Communication Connector – RS232

Pin#	Name	Description	I/O	Voltage Levels
1	RS232 Rx	RS232 Mode: Receiver Line	1	+/- 10V (max)
2	RS232 Tx	RS232 Mode: Transmit Line	0	+/- 3.7V (Min) +/- 4V (Typ)
3	GND	GND		GND

Note: Configuration must be done using serial communication (RS232 interface) through the corresponding configuration port (P6). The maximum baud rate for RS232 interface is 115200 bps.

Warning: Older RS232 standards have a voltage level of +/- 18V. Using this voltage level can damage the CloudLink 5G Modem.

Recommended Serial Communication Connector Specs:

a. MPN: 39501-1003

b. MFR: Molex Inc

c. Description: Term Block HDR 3POS Vert 3.5 mm, RS232 Connector - P6

6.3 Antenna Interface

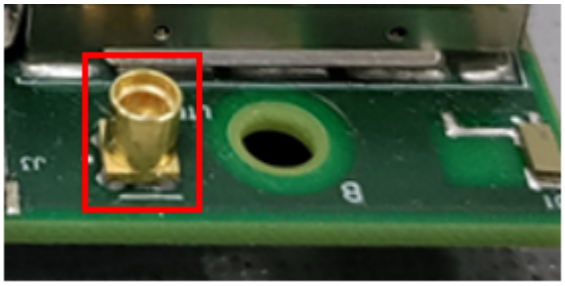


Figure 6.1 - Antenna Location

Connector Specifications:

HPN: 51506947-303

MPN: 73415-1472

MFGR: MOLEX LLC

Description: CONN MMCX JACK STR 50 OHM PCB

Recommended Antenna Specifications:

HPN: 50182208-001

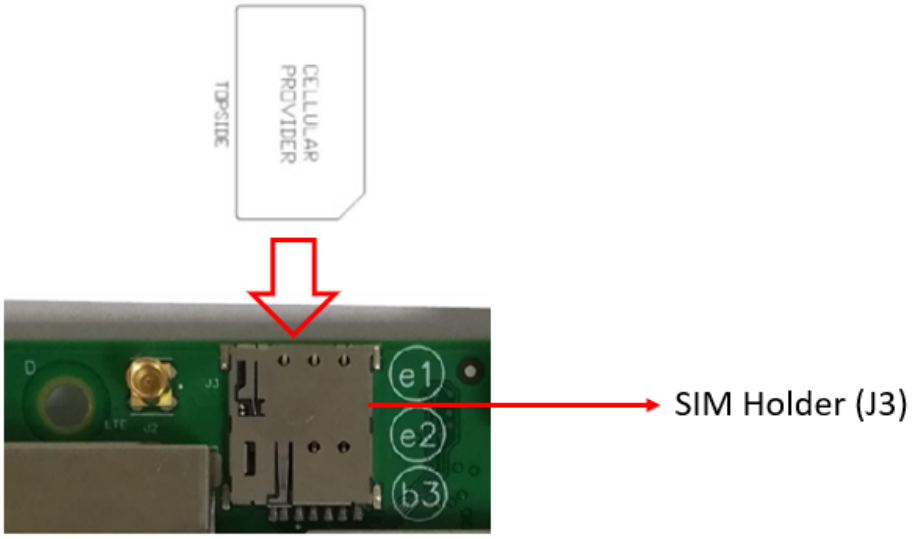
MPN: Y4HON00A1AA_ANT_X2

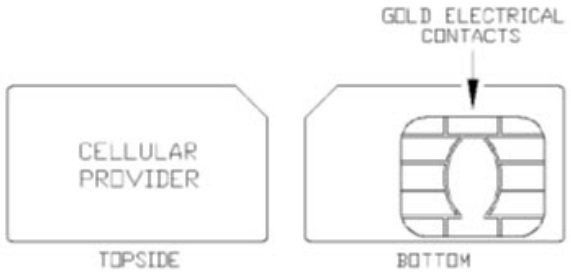
Description: RF LTE Antenna (698-3000 MHz spectrum)

6.4 SIM Card

The SIM Holder (J3) on CloudLink 5G Modem holds the cellular radio Nano SIM card. CloudLink 5G Modem supports 1.8V (Class C) version SIM cards.

Insert a SIM card in the slot provided and make sure SIM card touches the SIM card pads.





Typical SIM Card

Attention: The SIM card may be connected or disconnected only in a non-hazardous area or when the modem has been de-energized.

Note: Honeywell has qualified CloudLink 5G with Verizon's CAT M1 network. However, the CloudLink 5G is also compatible with other network carriers like AT&T and T-Mobile.

6.5 LED Indicators

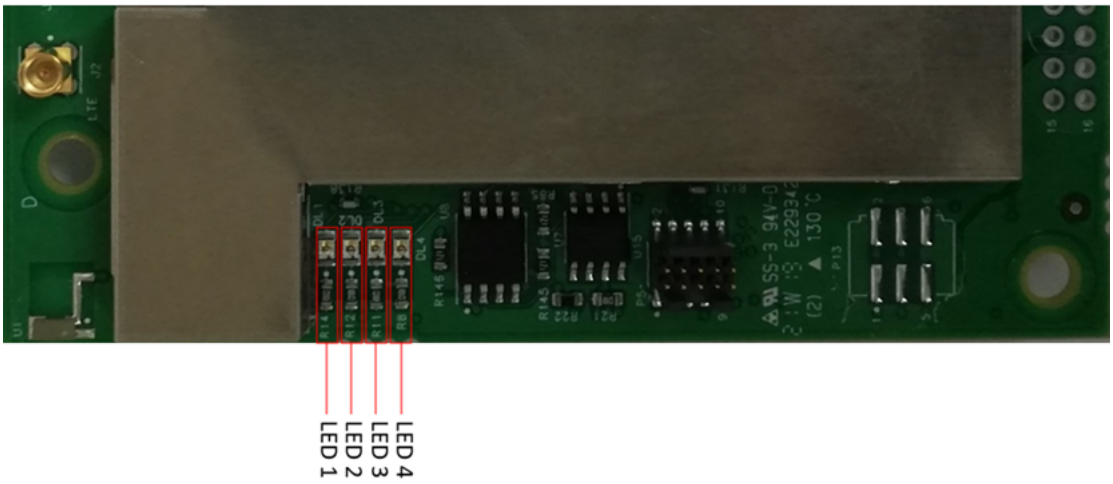


Figure 6.1 – LED Indicators

Item code i3018 is used to enable/disable LED display through MasterLink desktop application.

Item Code	Value	Description
i3018	Enable	Enable LED functionality (LED will function as described in below table).
i3018	Disable	Disable LED functionality (All LEDs will be OFF).

LED	Color Codes	Symbol	Description	State	Detail Description
1	Green 		Power Indication and Network Connectivity Status	OFF	Sleep or power off.
				Blink	Trying to connect (cellular).
				ON	Connected to network (cellular).
2	Green 		Data Connection	OFF	Not data flow to cellular host.
				Blink	Data flow between host and device over cellular interface, no fixed blink rate.
3	Green 		Network Connectivity and Signal Strength	OFF	Not connected to network.

LED	Color Codes	Symbol	Description	State	Detail Description
				Blink*	Connected to network. *Denotes: a. No Signal - Blinks at 800ms b. Poor RSSI – Blinks at 500ms c. Fair RSRQ - Blinks at 150ms d. Good RSRQ - Blinks at 50ms
4	Red 		Diagnostics and Connectivity	Red	Red LED denotes for diagnostic error codes and MI session connection status. Example: Low Battery Voltage (Error Code 13): 1 Red blink, followed by 5 seconds pause, and then followed by 3 Red blinks.

Note:

1. During booting, all LEDs blink thrice (i.e., LEDs 1-3: Blinks green thrice, LED 4: Blinks red thrice) simultaneously.
2. During factory reset, all LEDs blink serially thrice (i.e., First: LED 1 blinks green > Second: LED 2 blinks green > Third: LED 3 blinks green > Fourth: LED 4 blinks red, and this sequence repeats three times).

LED Error Codes:

Error code Description	Bit Number	Corresponding Decimal Value	Displayed error code on LEDs
Self test failure	0	0	11
Radio module failure	1	1	12
Low battery voltage	2	2	13
SIM card error	3	4	21
Data connection failure	4	8	22
Radio module echo failure	5	16	23
Call disconnected abruptly	6	32	31

Error code Description	Bit Number	Corresponding Decimal Value	Displayed error code on LEDs
Network registration fail	7	64	32
Alarm call voltage low	8	128	33

Example 1:

Instance: SIM Card Error

Modem displays Error Code 21 : 2 Red blinks, followed by 5 seconds pause, and then followed by 1 Red blink.

Item 3160 value will display '0000000004' in MasterLink desktop application.

Example 2:

Instance : Self test failure

Modem displays Error Code 11 : 1 Red blink, followed by 5 seconds pause, and then followed by 1 Red blink.

Item 3160 value will display '0000000000' in MasterLink desktop application.

7 Firmware Upgrade Over-The-Air (FOTA)

This chapter describes the configurations required to perform the Firmware Upgrade Over-The-Air (FOTA).

7.1 Steps to Upgrade Firmware

Figure 7.1 - Firmware Upgrade Over-The-Air (FOTA)

Follow the below instructions to perform Firmware Upgrade Over-The-Air (FOTA):

1. Configure the below item values to initiate the FOTA:

Item Number	Item Description	Example
3180	CloudLink FOTA	Enable
3179	CloudLink On Demand FOTA	Enable
3227	Cellular FOTA HTTP Host Name	http://192.168.0.XXXX:portnumber
3230	Last Application FW Updated Date Over FOTA	MM-DD-YY
3232	FOTA Path for Application Version File	FOTA/AppVersion.txt

2. Using the MasterLink application, FOTA upgrade process can be done in the following two ways:
    a. Case Scenario 1: (Default 30-day period)
        i. Enable i3180 Value.
        ii. Give the HTTP host name in item number i3227. For example "http://192.168.0.100:4403/", where 192.168.0.100 is the HTTP server IP address and 4403 is the HTTP port number.

        > **Note:** The IP address varies with user-to-user.

        iii. Write the latest Application FW version number in the AppVersion.txt file and place it in the HTTP server.
        iv. Initiate a call from the device (EC350).

v. The FOTA process will commence (at default time - 30 days).

vi. Wait for 5 minutes for the radio firmware upgrade to complete.

b. Case Scenario 2: (Quick or Immediate)

i. Enable i3142 Value (Continuous Server Mode)

ii. Enable i3180 Value (to initiate FOTA).

iii. Enable i3179 Value (Quick or immediate FOTA).

iv. Give the HTTP host name in item number i3227. For example, "http://192.168.0.100:4403/", where 192.168.0.100 is the HTTP server IP address and 4403 is the HTTP port number.

v. Write the latest Application FW version number in the AppVersion.txt file and place it in the HTTP server.

vi. Wait for 5 minutes for the radio firmware upgrade to complete.

You can check the current firmware version of the FOTA in the MasterLink application using item number i3096.

8 Configuring CloudLink 5G Modem

This chapter describes the configuration of a CloudLink 5G Modem device using the MasterLink desktop application.

MasterLink desktop application is a configuration and diagnostic software designed for Electronic Volume Corrector EC350 and CloudLink 5G Modem. The primary purpose is to configure, calibrate, deploy, and download data from EC350 and CloudLink 5G through MasterLink application.

When you connect a CloudLink 5G Modem device to MasterLink, you can configure it as:

a. CloudLink 5G modem, or

b. EC350/ERX350 + CloudLink 5G Modem as an Integrated device.

To learn more about MasterLink, EC350/ERX350, or CloudLink 5G Modem, refer to their respective user guides available on the Honeywell Process Website.

Product Name	Documentation Link
Honeywell MasterLink Software	MasterLink User Guide
Honeywell EC350	EC350 User's Guide
Honeywell ERX350	ERX350 User's Guide
CloudLink 5G Modem	CloudLink 5G Modem User Guide

8.1 Operating Modes

The CloudLink 5G Modem has 2 operating modes:

1. Normal mode: Also known as power saving mode where the modem connects to remote host based on configured call profile in the integrated instrument/EVC. Else the device sleeps saving power, recommended for battery powered application (i3142 is disabled).
2. Continuous Server mode: Where the modem is always connected to network and waiting for a remote host to dial out, recommended for non-battery powered application (i3142 is enabled)

8.2 Deployment Scenarios

The CloudLink 5G Modem can be deployed in the following two ways:

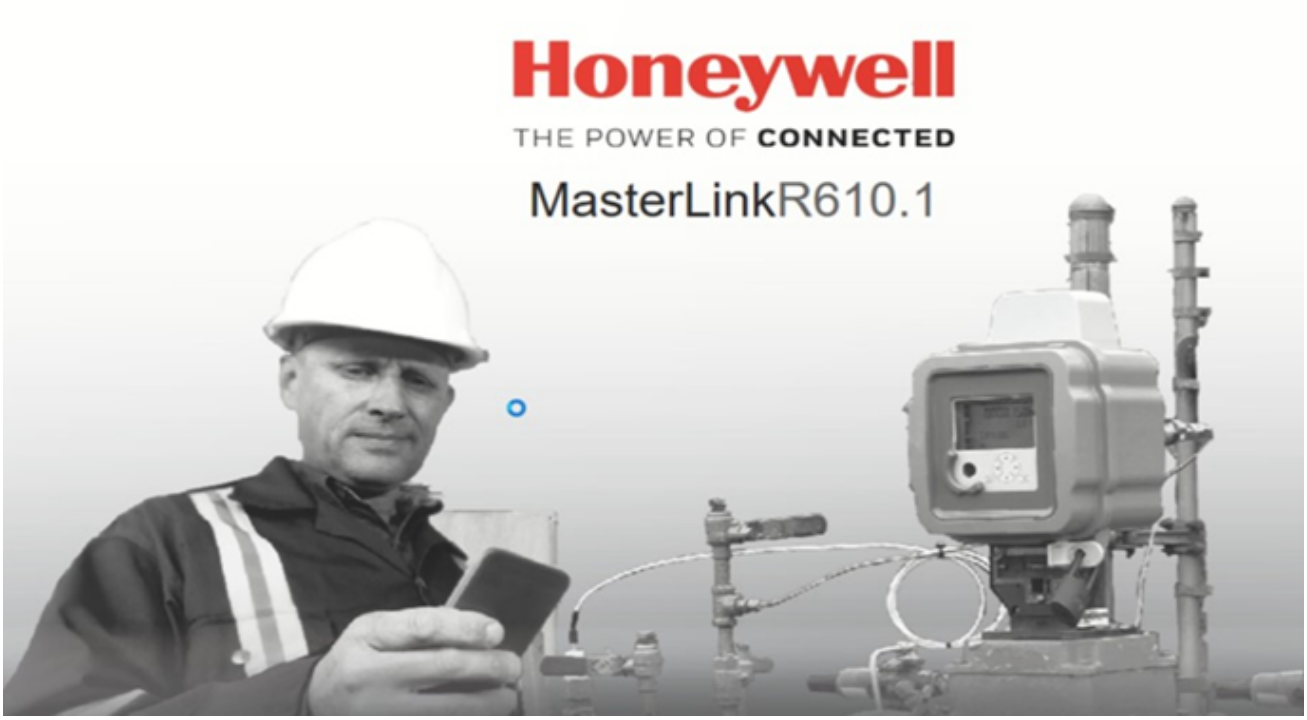
1. Standalone mode: Where the modem functions as an independent device.
2. Integrated mode: Where the modem is connected and used with an instrument/EVC device connected over board-to-board connector using UART and RS232 serial communication.

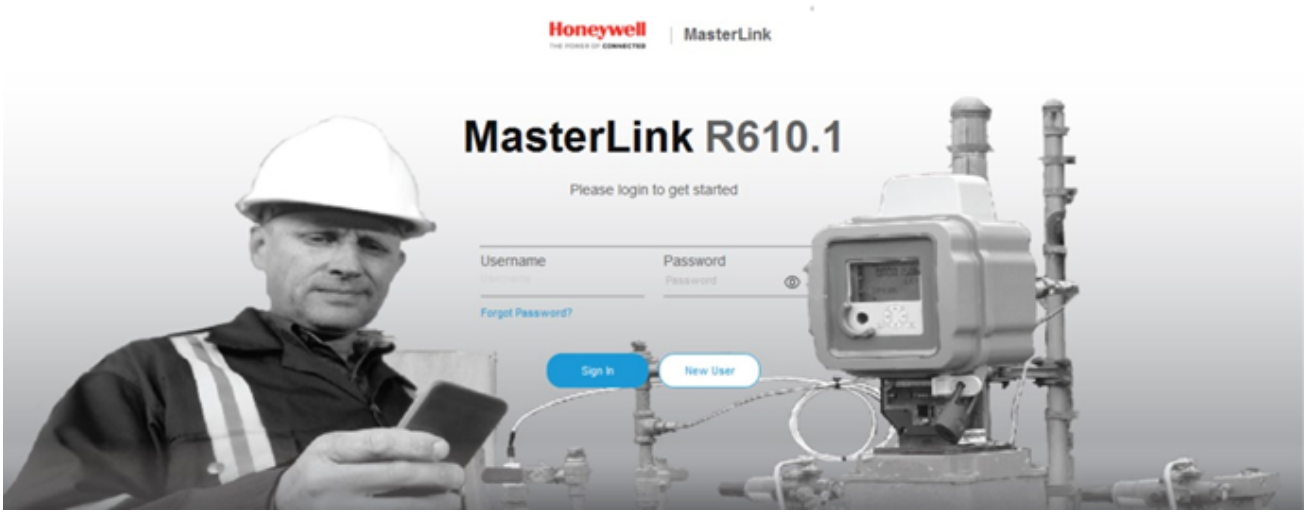
Note: The screenshots provided throughout the manual are just for reference.

8.3 Getting started with MasterLink desktop Application

For more information on installing and getting started with the MasterLink desktop application refer to MasterLink desktop application help from the Honeywell Process Website (https://www.-process.honeywell.com).

On launching the MasterLink, a splash screen appears and then you will see a screen to log on.





8.3.1 Login and Registration

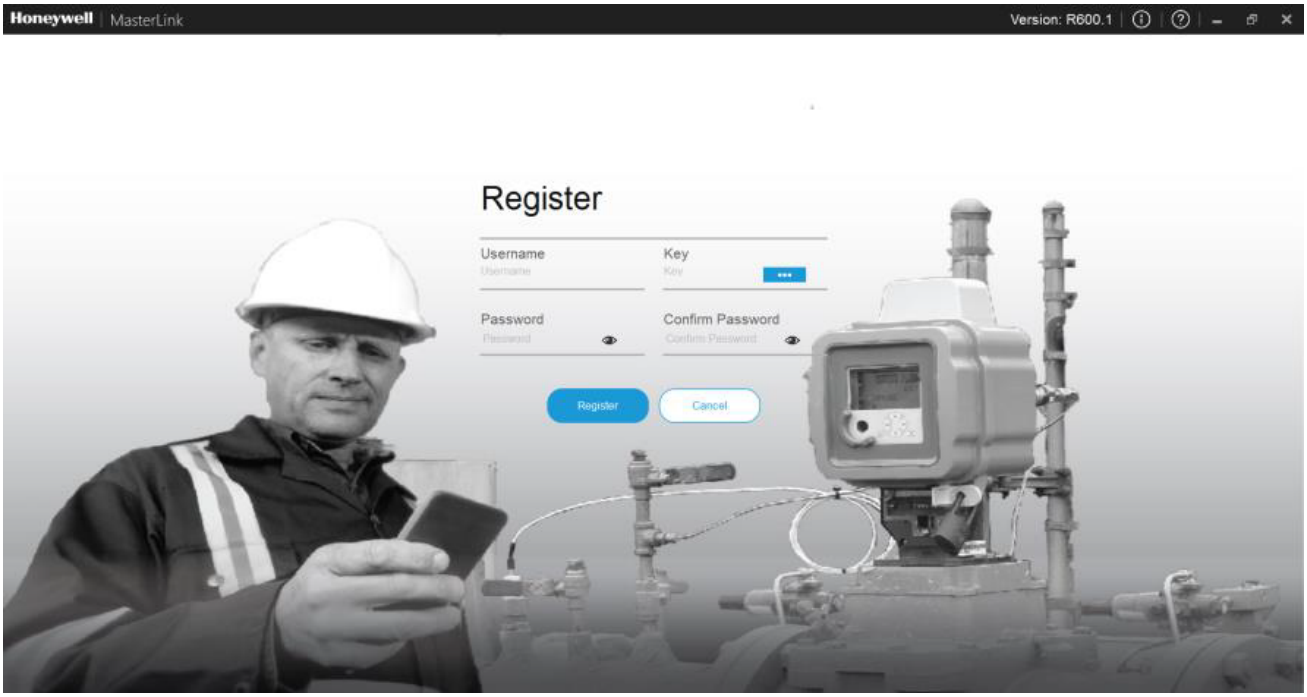
After you have installed the Masterlink application, you need a valid license key.

8.3.1.1 User Registration

For a first time user, click New User and register. User is required to register with license key provided by the site administrators. The username you enter while registering must match with the username used while creating the license key.

Enter the log-in details, browse and select the license key, and then click Register.

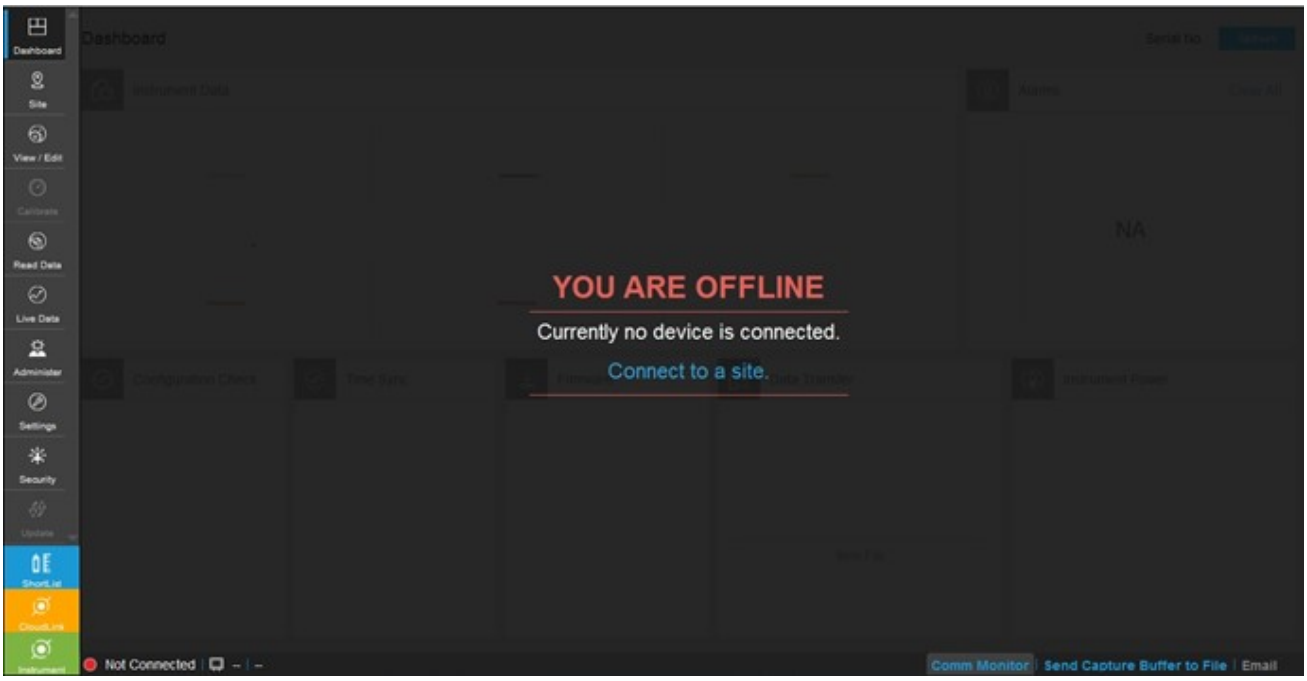
You can register with your username and password.



The Login screen appears.

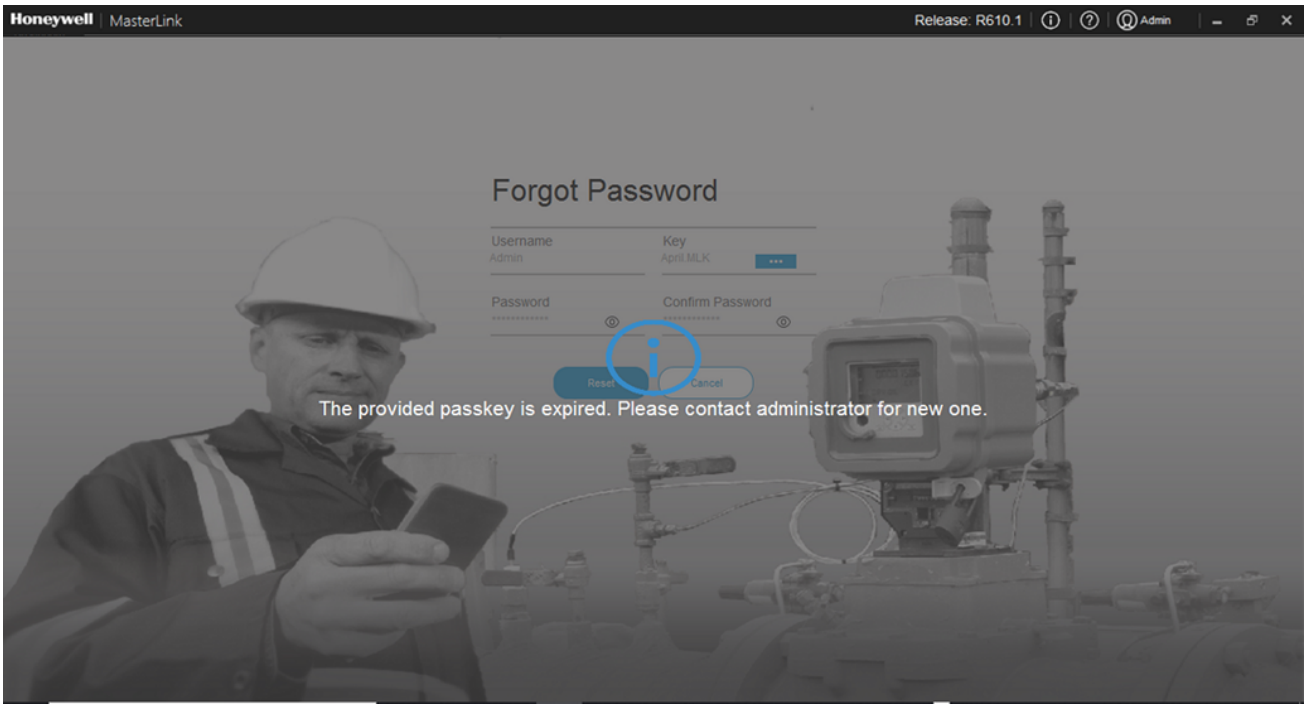
Log on with your credentials. Click Sign in.

The following screen is displayed:



Note: Refer MasterLink Installation Guide for understanding the prerequisites and installation instructions. MLK files (license key) generated with MasterLink old Release (R510.1, R510.2, R510.4 till build 11.1.39) will not work with Release R510.4 Build 11.1.41 onwards.

The following error appears if you are using the old license key.



8.3.2 Sites

The 'Sites' screen lists all sites configured in the MasterLink application. A Site refers to a field instrument such as:

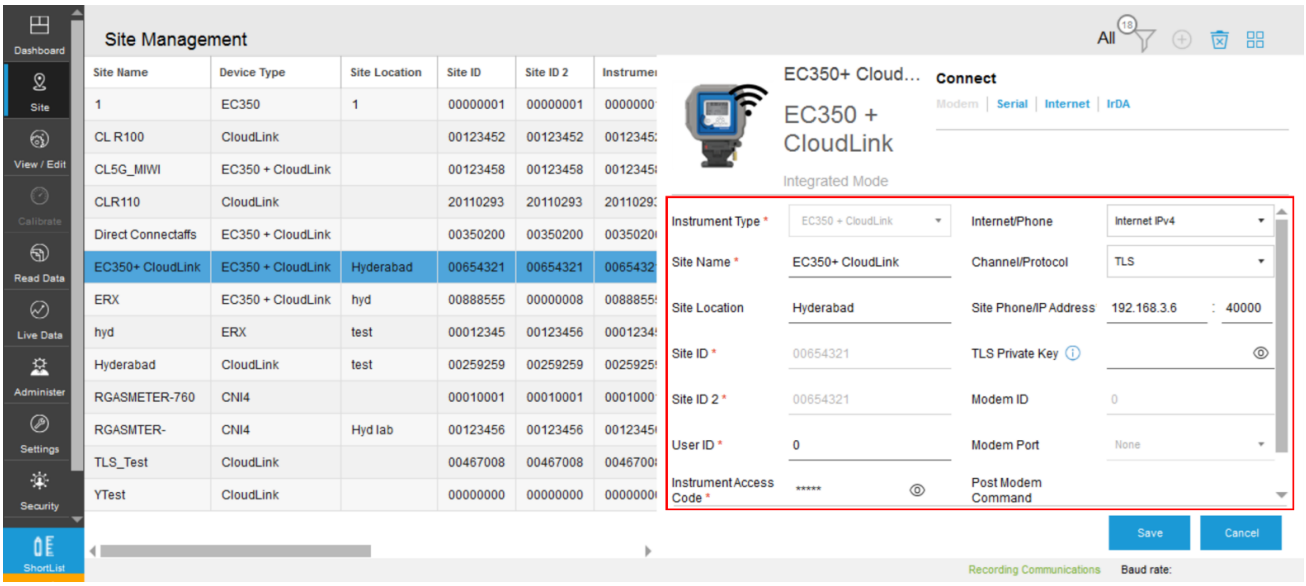
1. Accutest
2. CloudLink
3. CNI4
4. EC350
5. EC350 + CloudLink
6. ECAT
7. ER
8. ERX
9. ERX350
10. ERX350 + CloudLink
11. Mini
12. Mini-AT
13. Mini-Max
14. PT Modbus
15. Pulse Accumulator
16. TCI
17. Turbo Corrector
18. Turbo Monitor

The user can also add a new site, as well as edit or remove an existing site. From the 'Sites' screen, users can connect to a device deployed on the field.

This section describes the steps to configure and add a site to MasterLink. It also explains how to connect and communicate with existing sites.

8.3.3 Adding a New Site

In the 'Site Management' screen, you can configure and connect to site.



Site can be connected and configured over the following interfaces based on deployment (device type).

	Serial	IrDA	Modem	Internet*
Accutest	✓	×	✓	✓
CloudLink	✓	×	×	✓
CNI4	✓	×	×	✓

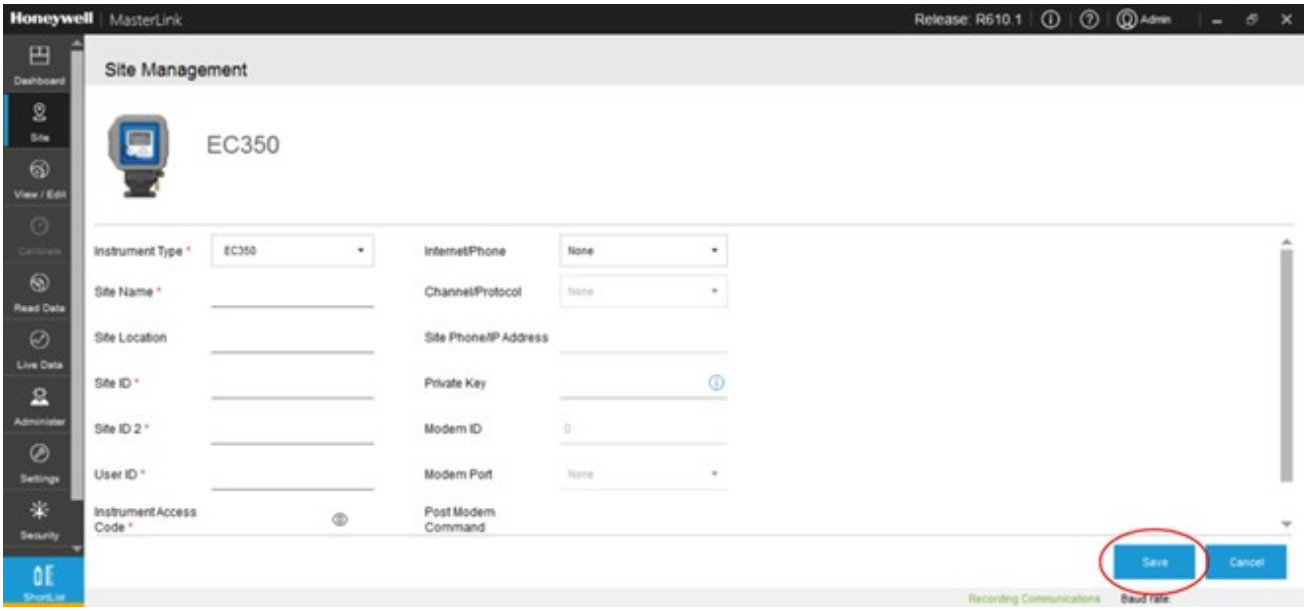
	Serial	IrDA	Modem	Internet*
EC350	✓	✓	✓	✓
EC350 + CloudLink	✓	✓	×	✓
ECAT	✓	×	✓	✓
ER	✓	×	✓	✓
ERX	✓	×	✓	✓
ERX350	✓	×	✓	✓
ERX350 + CloudLink	✓	✓	×	✓
Mini	✓	×	✓	✓
Mini-AT	✓	×	✓	✓
Mini-Max	✓	×	✓	✓
PT Modbus	✓	×	✓	×
Pulse Accumulator	✓	×	✓	✓
TCI	×	✓	×	×
Turbo Corrector	✓	×	✓	✓
Turbo Monitor	✓	×	✓	✓

*Assuming that a cellular modem is being used.

Note: Before adding a new site, ensure that you have configured your communication settings under Settings > Communications Setup.

Click the ⊕ icon on the top-right corner of the screen to create a new site or a field device. This function is used to add site information to the Site List.

Configure the site details and click **Save**.



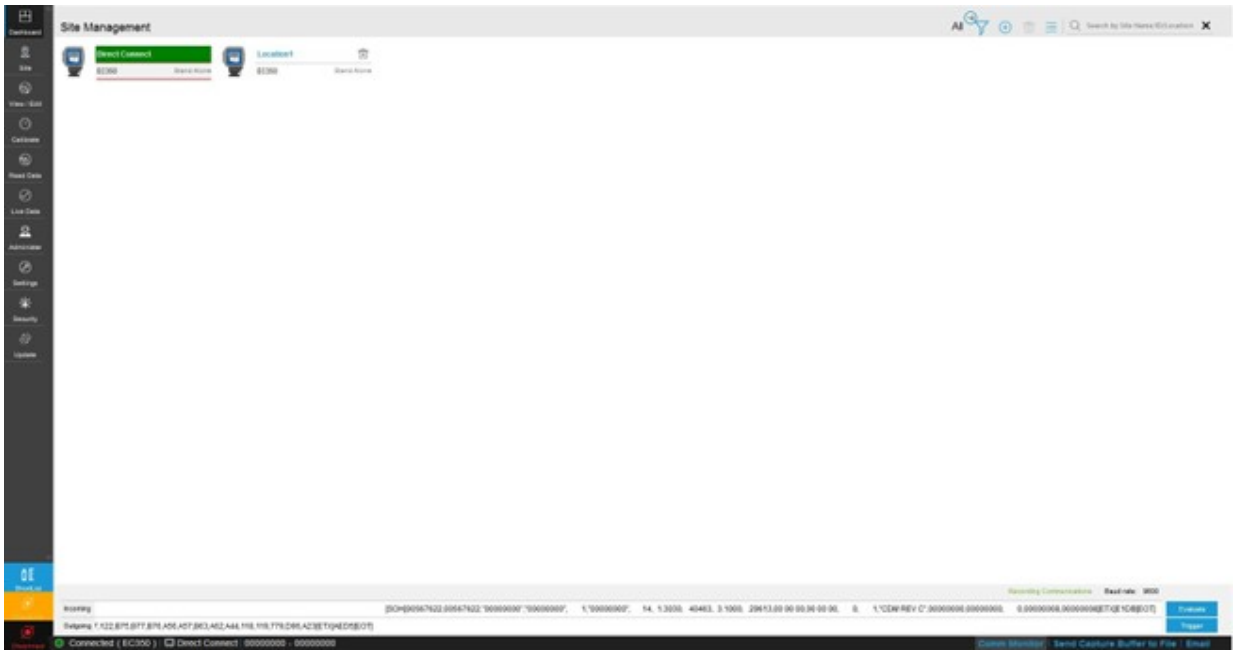
Attention: In integrated mode, Site IDs must be identical for device and modem. (If you are using EVC or Recorder's Site ID with 8 digits, then Modem ID should be last 6 digits).

Also, an integrated site must be added in 'Integrated' mode only. Otherwise only the CloudLink modem will be added as a site followed by a sync with the central server. A site once created and synced with the central server cannot be deleted from the server.

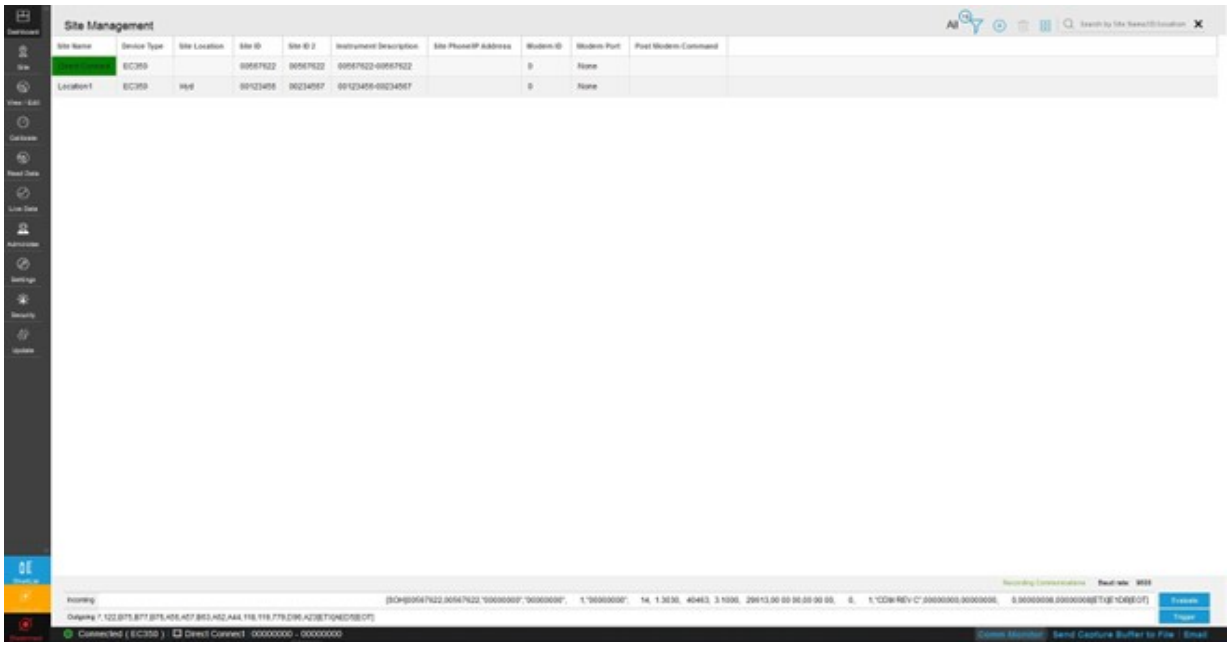
Attention: Site IDs must not be changed after it is synced with the central server. While adding an integrated site, the EVC or Recorder's site IDs will be shown as Site IDs of integrated sites. The CloudLink modem's Site ID will not be displayed as the Site ID of the integrated site. However, the Site ID of the CloudLink modem will still be used to scan and detect the integrated site.

The 'Site Management' screen has two views:

1. Tile View:

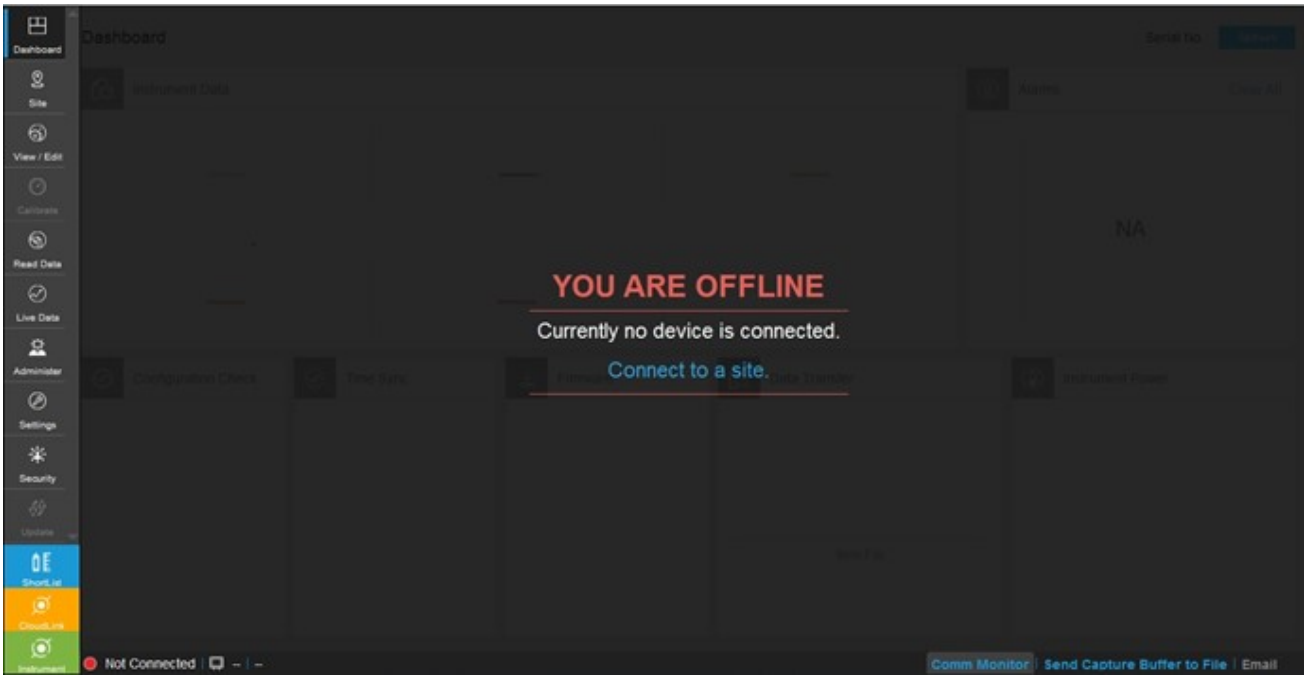


2. List View:

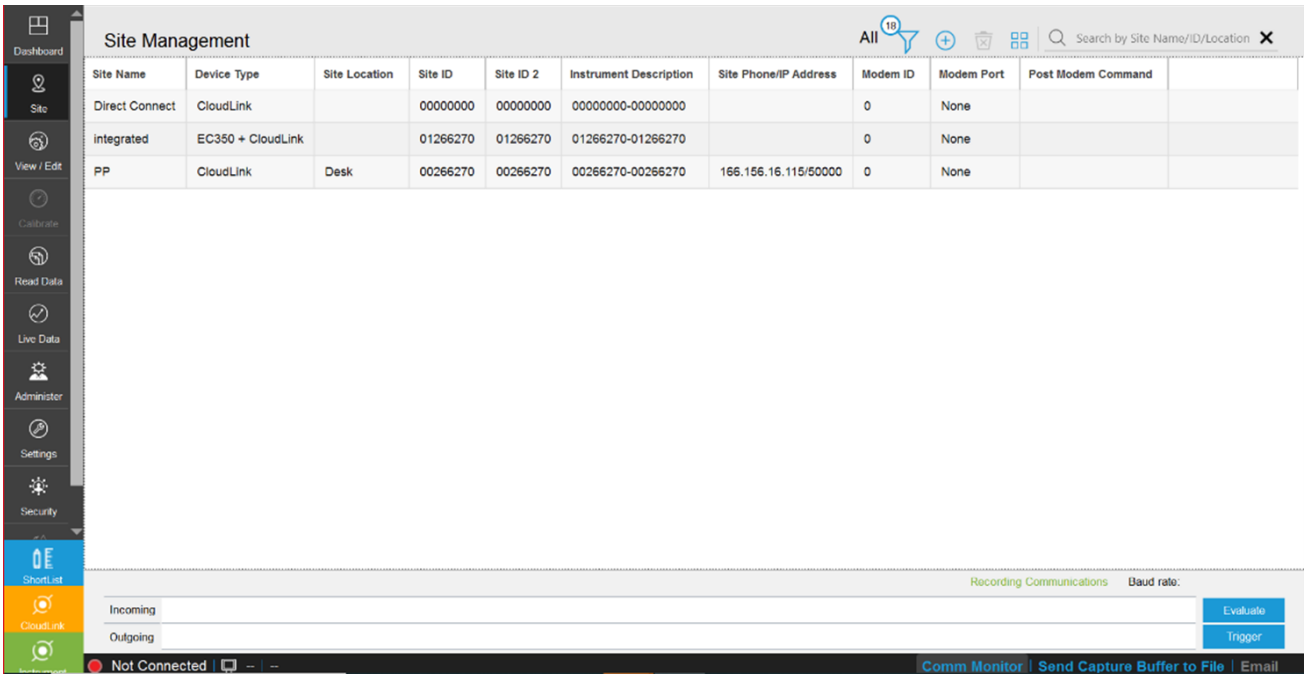


8.3.4 Connecting to Existing Site

When you log on to MasterLink and if you are NOT connected to a site or a device, you will see the following screen. CloudLink 5G Modem can be connected to MasterLink as a standalone device or in conjunction with EVC (Integrated) via Serial or TCP/IP connection.



When you click Connect to a Site, the following screen appears:



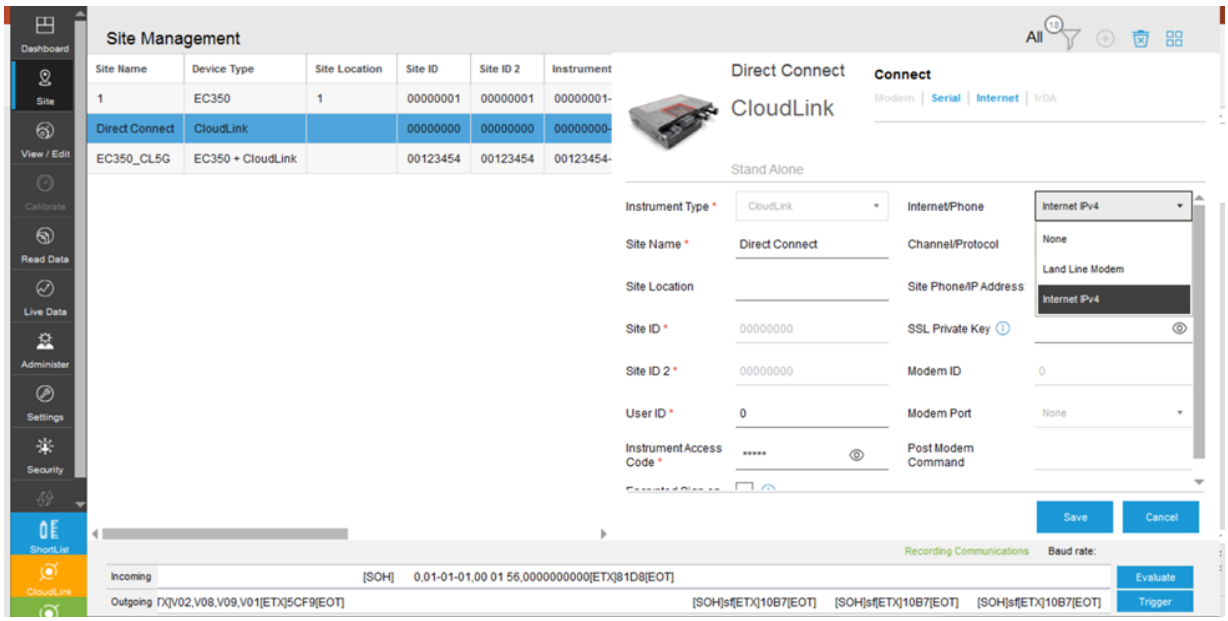
Choose the existing site to which you want to connect.

There are two modes of communication:

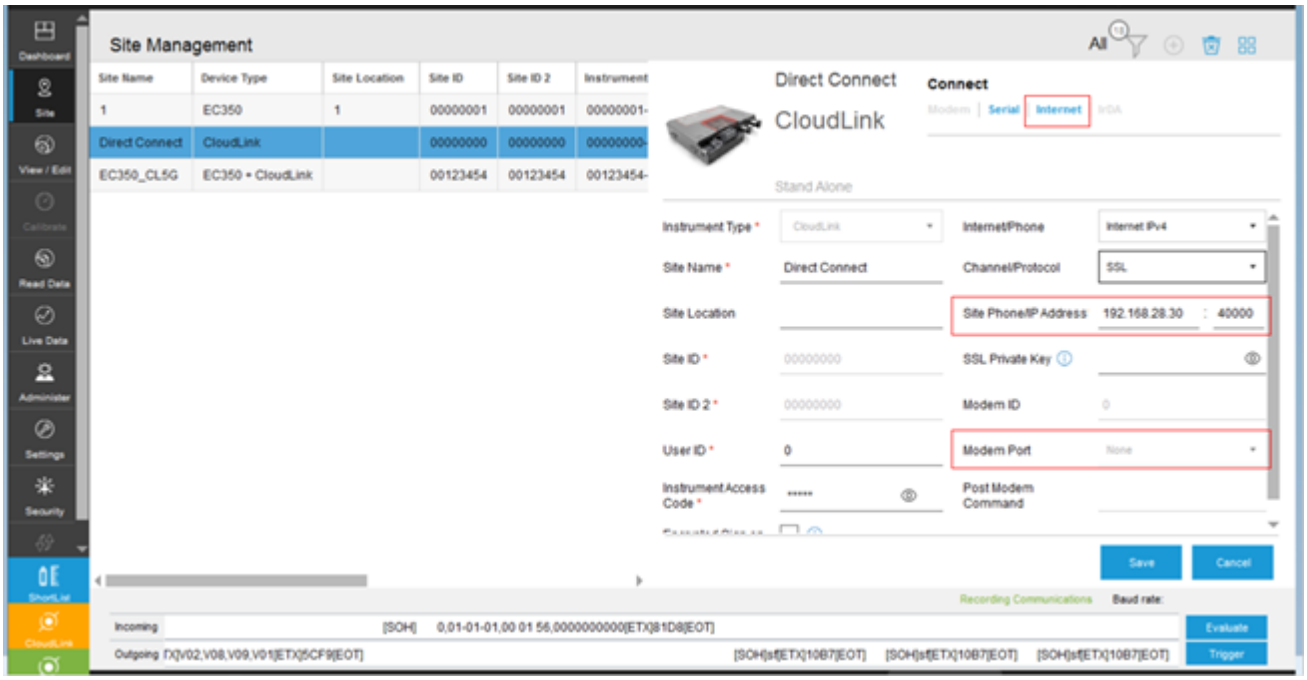
a. Serial: Serial will be the default option. When the user selects Serial, MasterLink will connect to the modem through serial interface.

> **Note:** To connect to a modem through serial interface, configure “CloudLink Serial port connection” in the Settings tab. For more details, see MasterLink User Guide Communications Setup section.

b. Internet: You need to select “Internet IPv4” against the option “Internet/Phone” to get the Internet mode of connection.

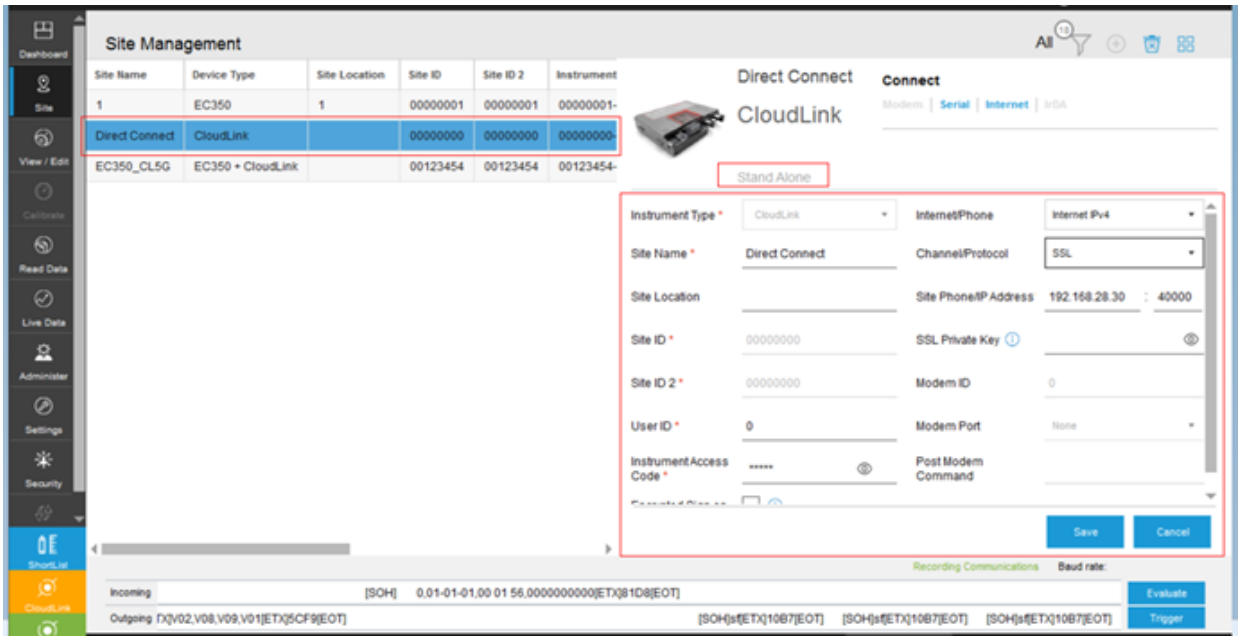


To connect to a modem through the Internet interface, configure “CloudLink IP address and Port number” as shown in below image:



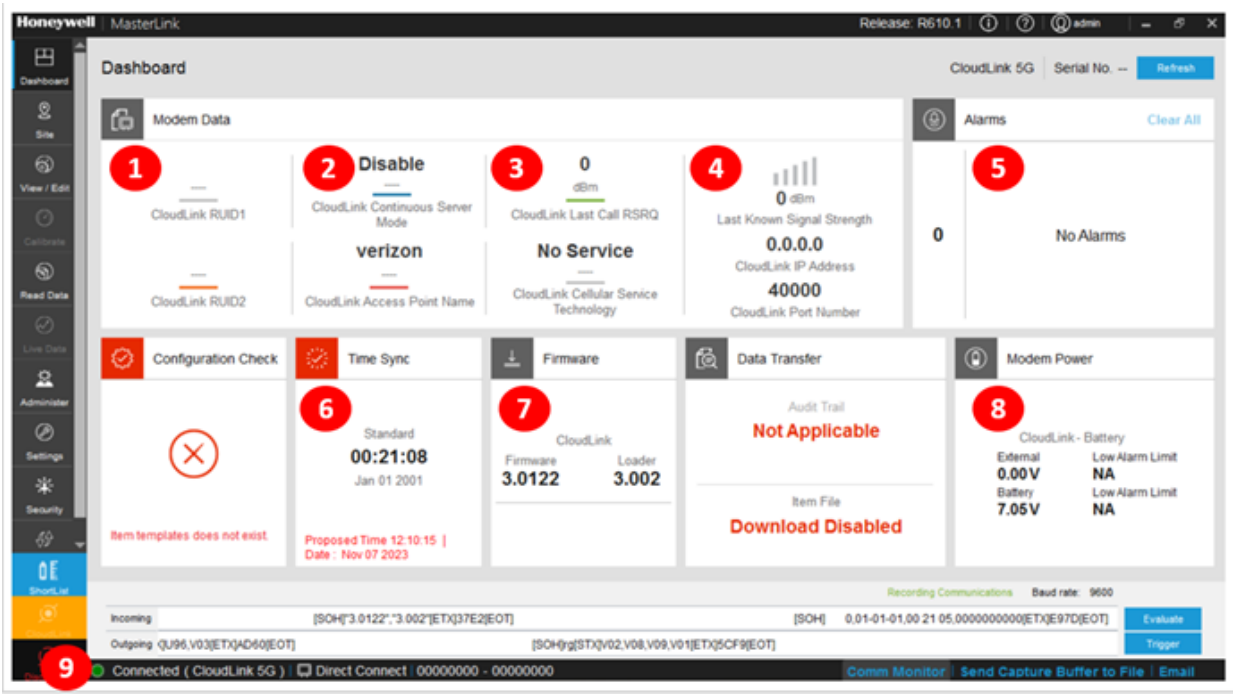
8.3.4.1 Standalone Mode of Connection

1. Click on the **Site** tab.
2. Configured sites can be connected using the **Site/Site Management** screen of MasterLink.



3. Provide the necessary information, such as Instrument Type, Site Name, Site ID, Site ID2, User ID, Instrument Access Code etc; and then click **Save**.
4. Based on the “communication mode” click on **Serial/Internet**, MasterLink will connect to the device.

5. After successful connection of MasterLink through Serial/Internet port connection, the following screen appears:



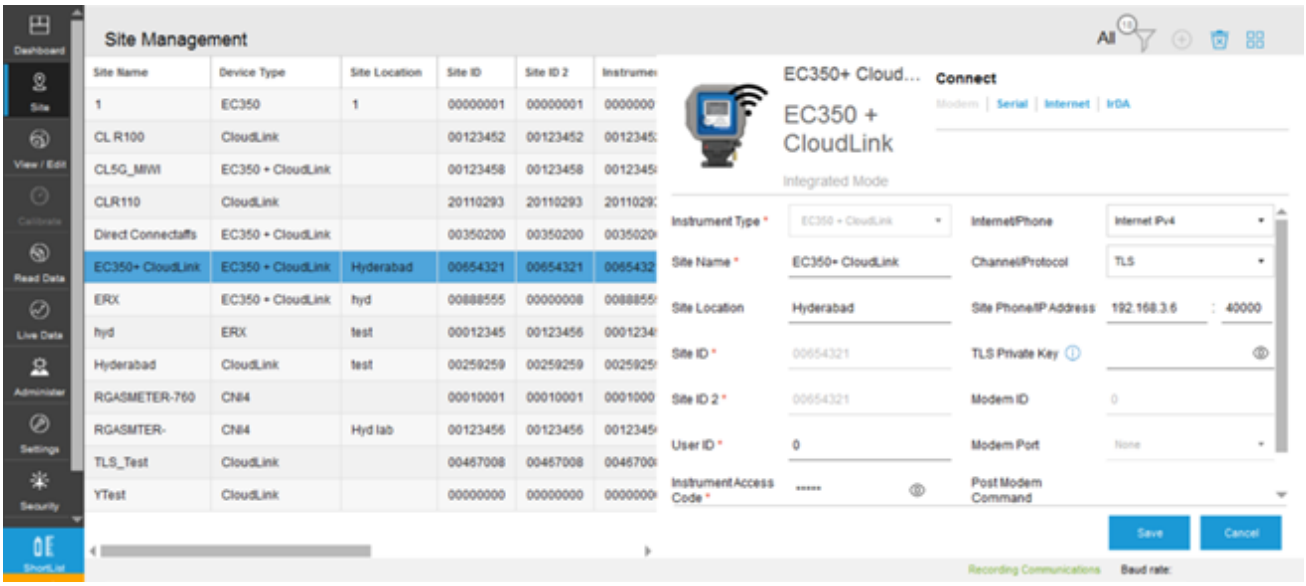
The numbers in the above image mentions about the standalone connection:

1. Mentions about the Device ID.
2. APN used in the device.
3. Signal strength of the modem and cellular service technology used in the modem.
4. IP address and port number of modem.
5. Dashboard alarms (if any errors are displayed like a low battery which needs immediate attention from the user. For example: No SIM).
6. Time sync: Date and time in the device.
7. Firmware versions running in the device (Application and Bootloader).
8. Modem Power (source of the power connected to the modem).
9. If it is a Standalone connection, it displays as “Cloudlink” only.

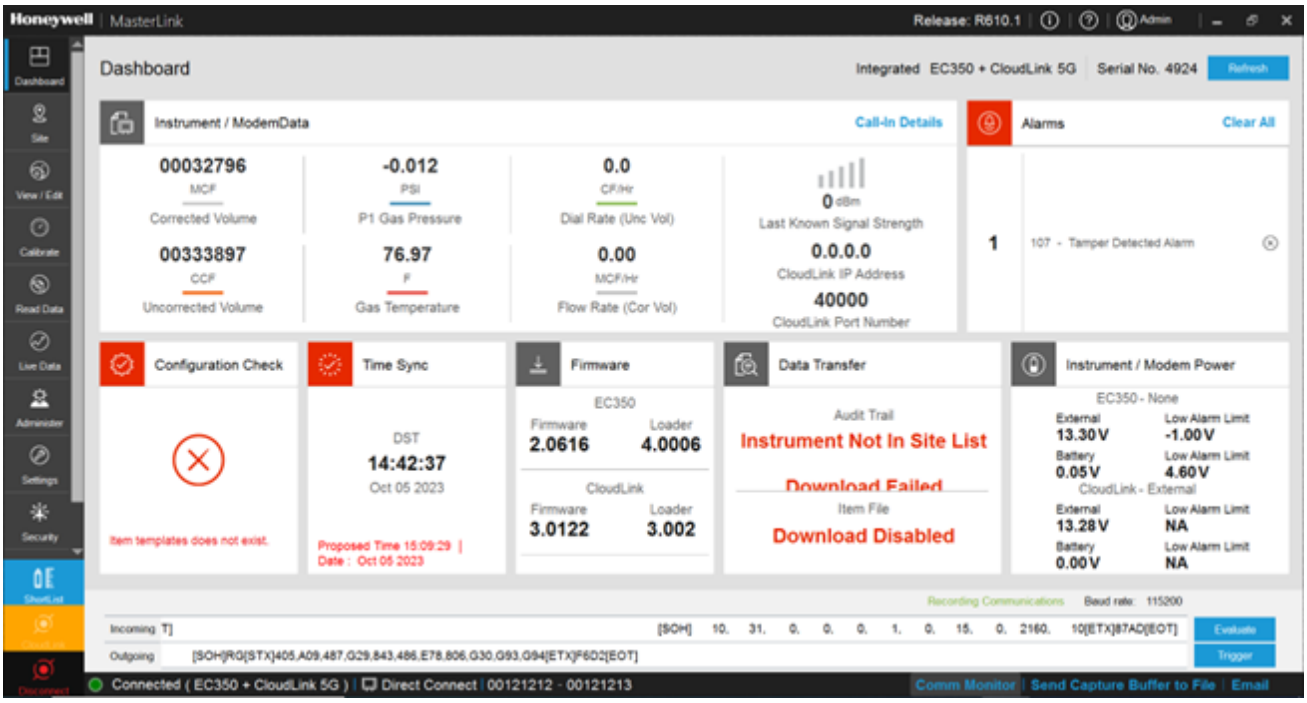
8.3.4.2 Integrated Mode of Connection

1. Click on the **Site** tab.
2. Configured sites can be connected using the **Site/Site Management** screen of MasterLink.

When using the Integrated Mode of connection, select the device type which has EVC+CloudLink as shown in the below image:



Based on the communication selected MasterLink will connect to the EVC+CloudLink as shown in below image:



Note: Connect the IN3 IrDA cable with the Serial interface selection instead of the IrDA interface. See the section **Communications Setup** in MasterLink User Guide to configure the IN3 IrDA cable settings.

8.4 Item Reference

ITEM Number	Parameter	Parameter Description
3002	CloudLink 4G Modem Serial Number	CloudLink 4G Modem Serial Number
3003	CloudLink 4G Modem Man-ufacturing Date DD:MM:YYYY:	CloudLink 4G Modem Manufactuting data
3004	Radio IMEI number	Radio identification number
3005	Change Battery	Reset Battery flag clears previously charge consumed data
3006	Advance Low Battery Indic-ation (in days)	Advance Low Battery Indication (in days): Maximum allowed is 255 days and Min allowed is 15
3007	Battery Type	SINGLE_BATTERY_PACK,DUAL_BATTERY_PACK,QUAD_BATTERY_PACK,ONE_BATT_ONE_SC_SEPARATE,EXT_PS_SINGLE_BATT_PACK,EXT_PS_DUAL_BATT_PACK,EXT_PS_ONLY,NO_SUFFICIENT_SUPPLY
3008	Battery Charge Capacity	Battery Charge Capacity: is based on battery type
3009	Super Cap Low voltage to drop the call	Super cap voltage reading
3010	Battery Voltage Critically low Threshold	Battery critically low Threshold value
3011	Available % battery life	Percentage battery life
3012	Super Cap Charge Availabilty (in sec)	Super cap voltage in seconds
3013	Battery Voltage	Battery voltage
3014	Supercap Voltage	Super cap voltage
3015	Battery Charge Consumed	Battery Charge Consumed
3016	Fetch radio parameters	0 - Disable 1 - Enable
3017	SSL enable / Disable	0 - Disable 1 - Enable
	Security - keys	
	Security Signed Certificate	
	Security - CA Certificate	
3018	CloudLink 5G Modem Display LED	0 - Disable 1 - Enable
3019	IP Security Cert Expiry Status	0 - Valid 1 -Expired
3020	SSL Security Cert Expiry Status	0 - Valid 1 -Expired
3021	Mobile or Simple Internet Pro-tocol	0 = Simple Internet Protocol (SIP) 1 = Mobile Internet Protocol (MIP)

ITEM Number	Parameter	Parameter Description
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#"
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.cingular
3024	PAP / CHAP Enable	0 = None 1= PAP only 2 = CHAP only 3 = CHAP first and then PAP as a fallback if CHAP fails.
3025	PAP / CHAP User Nam	
3026	PAP / CHAP Pass Word	
3027	SIM PIN Number	A numeric string (ex: "54311") that protects the SIM card from being used by unauthorized persons.
3028	Cellular Session Timeout	10 sec - 300 sec
3029	SIM Number	
3030	Mobile Directory Number	
3031	Carrier Name	Mobile Carrier name
3032	Internet Protocol Version 4 or 6 (IPv4 or IPv6)	0 = IPv4 1 = IPv6
3033	Source Port Starting Number	
3034	Source Port Ending Number	
3035	Maximum TCP/IP packet size	This defines the maximum data portion of the TCP/IP packet, which is usually referred to as the Maximum Segment Size, or MSS. Maximum is 65535 bytes. Legacy Ethernet v2 segment sizes were limited to about 1460 bytes.
3036	DNS or IP address	This parameter is to select IP address / DNS name 0- IP address 1- DNS
3037	Primary Destination IP Address (Client Mode) (Can be IPv4 or IPv6 address	ASCII form size based on IPv4 or IPv6 address
3038	Primary Destination Port Number (Client Mode).	Destination port number
3039	Alternate Destination IP Address (Client Mode)	ASCII form size based on IPv4 or IPv6 address

ITEM Number	Parameter	Parameter Description
3040	Alternate Destination Port Number (Client Mode)	Alternate destination port number
3041	Domain Name Server (DNS) #1	URL of DNS1
3042	Domain Name Server (DNS) #2	URL of DNS2
3043	Domain Name Server (DNS) #3	URL of DNS3
3044	Server Mode Friends (White) List Enable	0 - Disable 1 - Enable
3045-3054	Server Mode Friends (White) List(10 IP adress)	Server White list IP addresses 1 - 10
3055	Device Wakeup time	Device wakeup time after receiving AT commands
3056	Number of total Items	Total number of CloudLink 4G Modem item codes
3057	MI session timeout	BLE session timeout for both CloudLink 4G Modem & EVC connection
3058	Last call / Known Signal Strengthl	Last call known signal strength
3059	Last Known Source IP Address	Last call IP address
3060	Last Known Source Port	Last call IP Port
3061	Modem server timeout	Server mode timeout
3062	Modem Firmware Version	
3063	Radio Modem model	
3064	Select communication port to EVC	
3065	RS-232 / RS-485 Serial Port Baud Rate	
3066	CMOS Serial Port Baud Rate	
3067	RS-232 Serial Port Flow Control	
3068	CMOS Serial Port Flow Control	
3069	BLE Baud Enable	
3070	Include Baud in CONNECT Message	
3071	Always RING Port	
3072	Use Non-Verbose (Numeric) Response Codes	
3073	Serial Port Delay Before Sending Packet	

ITEM Number	Parameter	Parameter Description
3074	Verizon Dynamic IP SIM start-tup delay	Required when the SIM is changed.
3075	RS485 enable	
3076	BLE MAC Address	
3077	BLE Device Name	
3078	Advertisement interval(in msec)	
3079	BLE Module Status	
3080	BLE firmware version	
3081	BLE stack versionversion	
3082	BLE forget all bonds	
3083	BLE host White List Enable	0 - Disable 1 - Enable
3084	BLE Last RSSI	
3085	BLE Security type	1-Just works 2- Passkey entry
3086-3093	BLE white list	
3112	BLE conn interval	Advertisement interval max : data value in mSec
3094	CloudLink 4G Modem Mode	Integrated Mode - 0 Standalone Mode - 1
3095	Remote Unit ID (RUID)	Default Value : 000001
3096	Running / Existing Firmware Version	CloudLink 4G Modem firmware revision
3097	Running Firmware CRC check-sum	CloudLink 4G Modem firmware checksum
3098	Down Loading Firmware Ver-sion	
3099	Firmware upgrade max packet size	
3100	Firmware image max size allowed	
3101	Coordinated Universal Time (UTC)	When the CloudLink 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).
3102	Date format type	0 = MM_DD_YY 1 = DD_MM_YY 2 = YY_MM_DD

ITEM Number	Parameter	Parameter Description
3103	CloudLink 4G Modem Boot-loader version	
3104	CloudLink 4G Modem Boot-loader CRC	
3105	Immediate Call on Low-Battery Condition Enable	
3106	Immediate Call on Alarm Active Enable	
3107	Immediate call on for wrong login failure	
3108	Date	
3109	Time	
3110	Server mode IP address	
3111	Server mode IP port number	
3113	Pulse count	
3114	CloudLink 4G Modem board temperature	
3115	CloudLink 4G Modem Configuration Change Event	
3116	CloudLink 4G Modem Firmware Upgrade Event	
3117	CloudLink 4G Modem Password Change Event	Password credential change
3118	CloudLink 4G Modem POR counter	CloudLink 4G Modem power on reset count Event
3119	Login Failure Event	CloudLink 4G Modem login failure Event
3120	Low Battery Alarm Event	0 - Not Active 1 - Active
3121	Emergency Callin Alarm Event	0 - Not Active 1 - Active
3122	BLE transmit power	BLE transmit power
3123	BLE enable	BLE enable
3124	Last call Cellular service	Last call Cellular service
3125	Last call cellid	Last call Cellular ID
3126	Last cal Loc ID	Last call location identifier
3127	Last cal RSCP	Last call RSCP(3G)
3128	Last cal RSRQ	Last cal RSRQ(4G)
3129	Last cal MCC	Last cal MCC
3130	Last cal RSRQ	Last cal RSRQ

ITEM Number	Parameter	Parameter Description
3131	Last cal Physical cell id	Last call physical cell id
3132	Last call Cellular RSRP	Last call Cellular RSRP
3133	Last call Cellular TAC	Last call cellular TAC
3134	Last call duration	Lats successful call duration
3135	Last call status	Last call status
3136	Pulse count enable	Pulse count enable
3137	Restore/Reset/Clear logs	Misc Item Action Input
3138	Modem server timeout	
3139	Remote Unit ID 2 (RUID)	
3140	Temperature units	
3141	BLE number of bonds	
3142	MIWireless Enable	0 = for 350 (default) 1 = MiWiress (When this item number is changed, the instrument must be restarted)
3143	BLE start time	
3144	BLE stop time	
3425	Factory test access number	Access code to enter into factory mode
3426	Factory test mode status	

ITEM Number	Parameter	Parameter Description
3427	Factory test item number	FT_MODEM_POWER_ON= 1, FT_MODEM_POWER_OFF= 2, FT_SIM_TEST= 3, FT_SRAM_TEST= 4, FT_DATA_FLASH= 5, FT_OTA_FLASH= 6, FT_SUPER_CAP_VOLTAGE = 7, FT_BATTERY_VOLTAGE= 8, FT_EXT_POWER_VOLTAGE = 9, FT_MAGNETIC_SWITCH= 10, FT_TEMPERATURE= 11, FT_BLE_MODULE= 12, FT_LED_TEST= 13, FT_SLEEP_TEST= 14, FT_MET_JUMPER= 16,
3428	Modem power ON Result	
3429	Modem power OFF Result	
3430	SIM test Result	
3431	BLE test Result	
3433	Test data flash Result	
3434	Test OTA flash Result	
3435	Test SRAM	
3436	Magnetic switch status	
3437	Metrology jumper status	
3148	CloudLink 4G Modem model number	
3149	PWA serial number	
3150	PWA revision number	
3151	IFT test result	
3152	FFT test result	
3153	Programming test result	
3154	EOL test result	
3155	FFT (Selective) Test Result	
3156	Last magnetic alarm time	

ITEM Number	Parameter	Parameter Description
3157	Last battery alarm time	
3145	BLE Passkey	
3146	External Voltage	
3147	Alarm Call Retries	
3158	Security certificate issue time	
3159	Security certificate expiry time	

8.5 Device Configuration

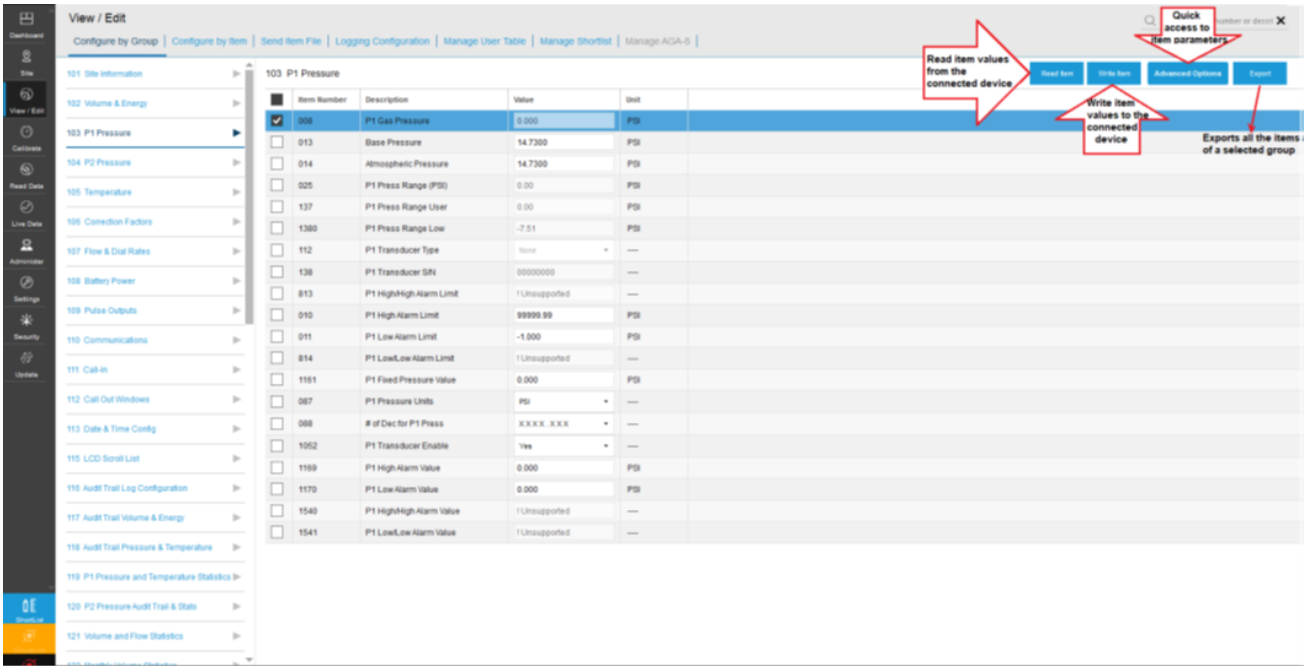
8.5.1 Configuration by Group

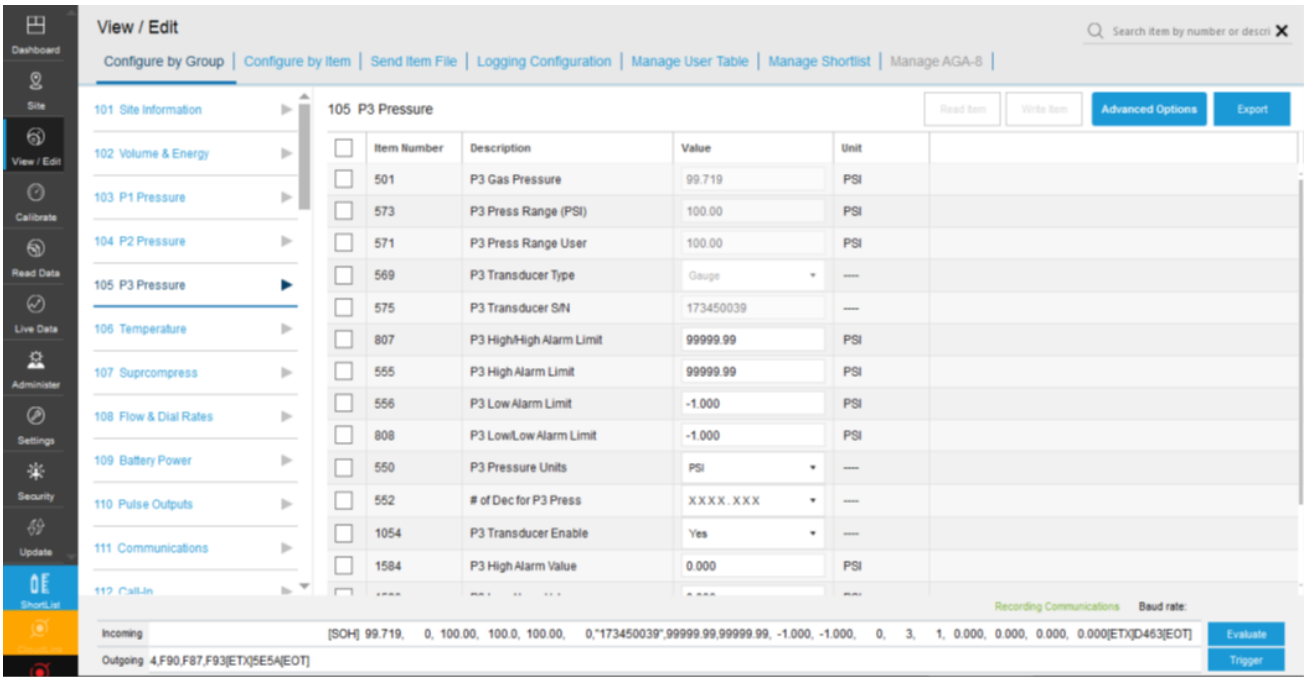
MasterLink must be connected to an instrument for this function to work. Configure by Group tab displays groups categorized by items corresponding to connected instrument. Instrument items (which vary per type of instrument) can be grouped by function. The Configure by Group tab displays the item values that apply to the type of connected instrument after grouping them by function. For example, all items related to pressure calibration are displayed on one screen.

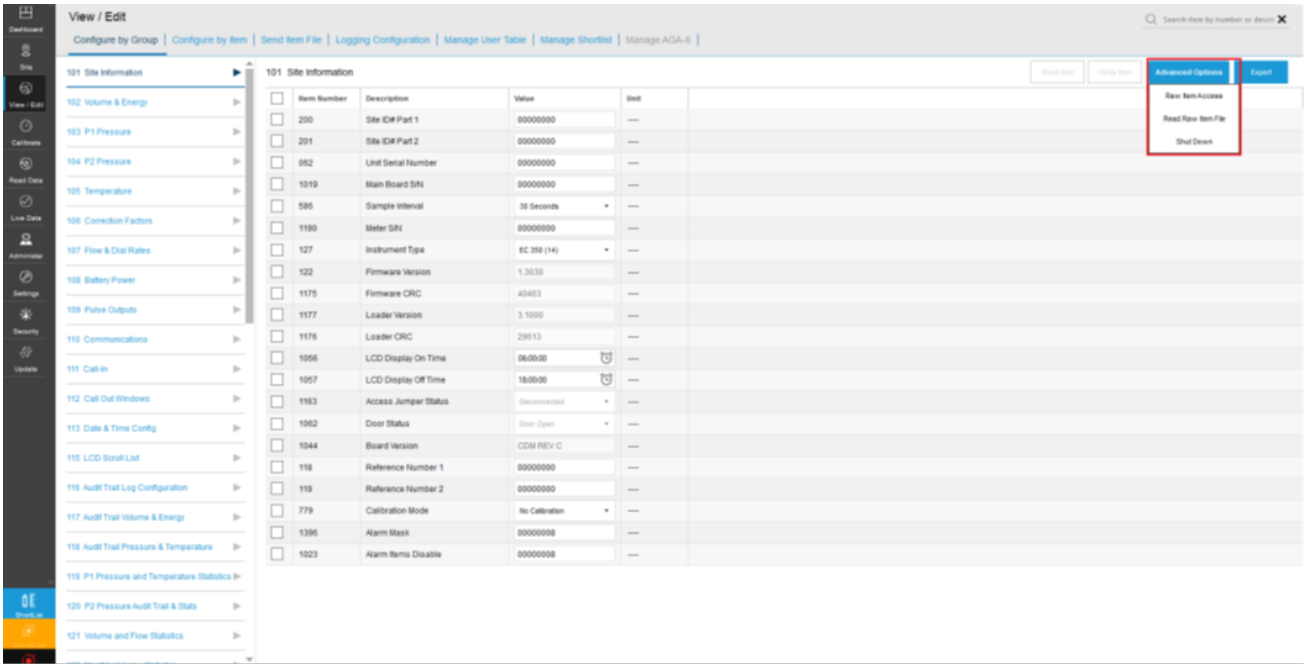
When connected to an instrument, you can click on the Read button to read item values from the connected instrument.

To change item values:

1. Click on the desired function group (panel on left) to see the group items (panel on right).
2. Select an item by clicking the check box next to it.
3. Enter a value for the selected item number, and click on Write Item button.







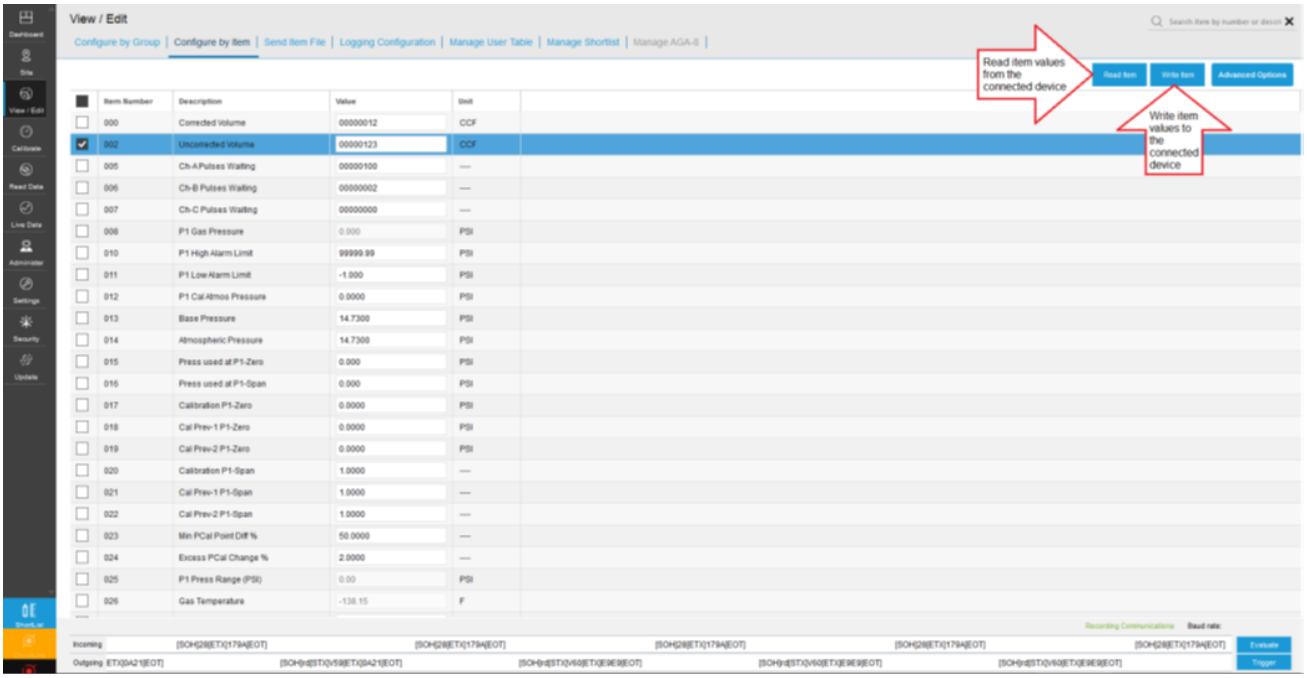
8.5.2 Configuration by Item

MasterLink must be connected to an instrument for this function to work as different instruments have different items and groups categorized. Configure by Item tab displays all items corresponding to connected instrument and by default, all items are sorted by item number.

An item can be searched with Item number or description. The check box must be checked in order to read/write value(s) of any item.

To change item values:

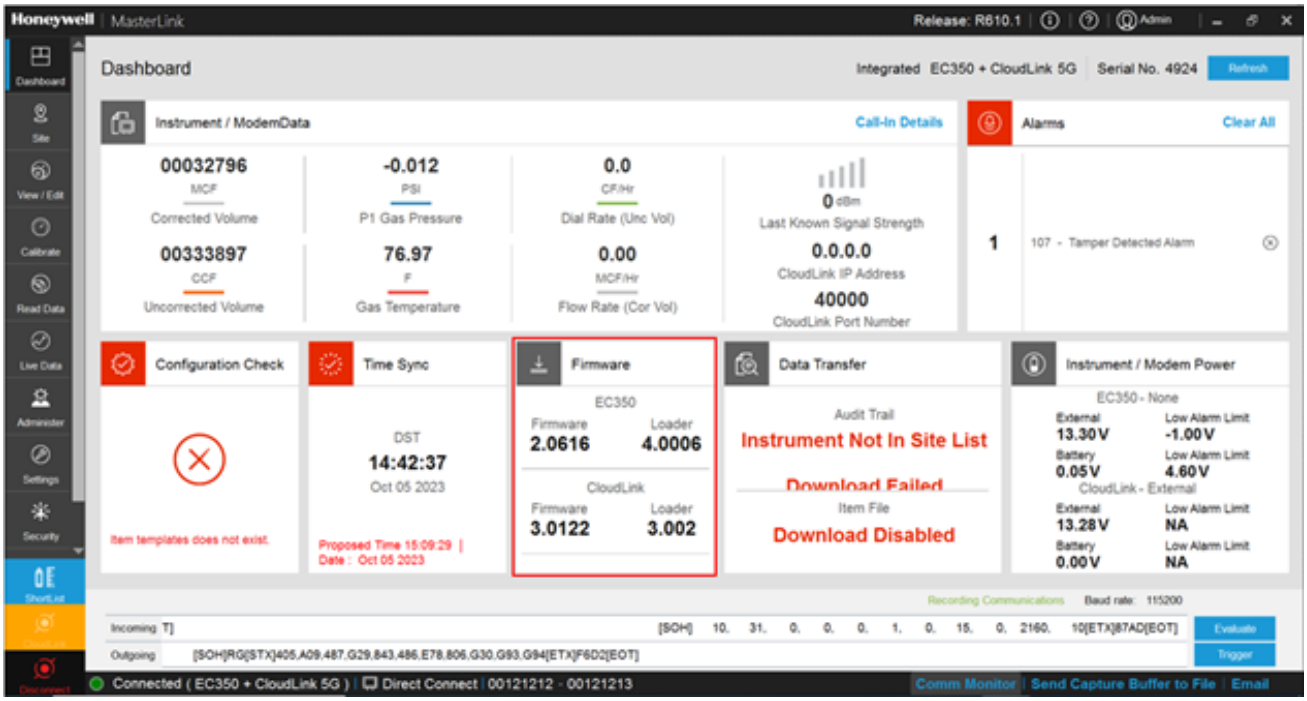
1. Select an item by clicking on the check box next to it.
2. Enter a value for the item number.
3. Click **Write Item** after making the changes. This will write the new item value to the connected instrument.



Sliding the mouse over the column divider until a cross is displayed, then dragging it to the desired width can re size the column widths. Use the up/down arrows or across arrows for full viewing of all data fields.

8.6 Firmware Upgrade

Dashboard reports the current firmware revision(s)/version(s) loaded in the instrument(s).



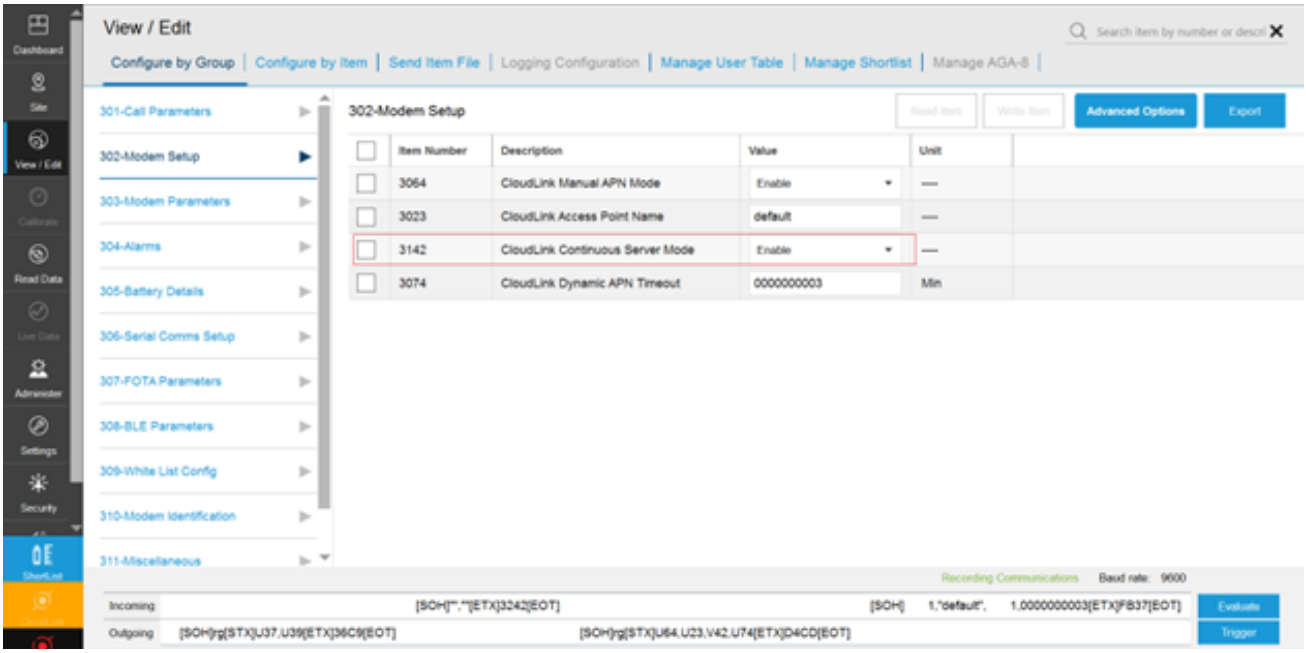
To upgrade the device firmware, see to “CloudLink Modem Firmware Update” section in “MasterLink User Guide” or see "Remote unit firmware tab" section in “PowerSpring User's Manual”.

Before proceeding the firmware upgrade of the device, enable item code as shown in below table using MasterLink or PowerSpring:

Item Code	Value	Description
3107	Enable	Allows firmware upgrade.
3107	Disable	Restricts firmware upgrade.

8.7 Server Mode

To configure server mode settings:



1. Go to **Config** > **Config by Group** > Select **Modem setup**.
2. Configure item code 3142 as shown in below table:

Item Code	Value	Description
3142	Enable	Server Mode enabled
3142	Disable	Server Mode disabled

3. Configure item code 3064 as shown in table below:

Item Code	Value	Description
3064	Enable	To write APN name in item number 3023 provided by the service provider.
3064	Disable	Write is restricted for APN name in item number 3023.

4. CloudLink 5G modem automatically reboots once you disconnect it from the MasterLink desktop application after doing the above changes (step 2)..
5. After powering on the device, connect it to the MasterLink. When the dashboard loads, you should see continuous server mode enabled, as shown below:

Number	Description
1	Device is in Server mode.
2	Check the APN name.

8.7.1 eDRX Mode

eDRX (Extended Discontinuous Reception) feature enables the user to put the Radio module in CloudLink 5G modem in a sleep state for a predefined period, during which the modem won't be available to receive any incoming data. Thus, the modem consumes less energy and thereby its battery life is extended. These sleep intervals are usually of shorter periods and would not increase the latency of the incoming data.

For more information on how to configure eDRX mode for CloudLink 5G modem in the MasterLink application, see *MasterLink User's Guide*.

8.8 Factory Reset

To perform a factory reset:

1. Push button/switch located near Configuration Port.

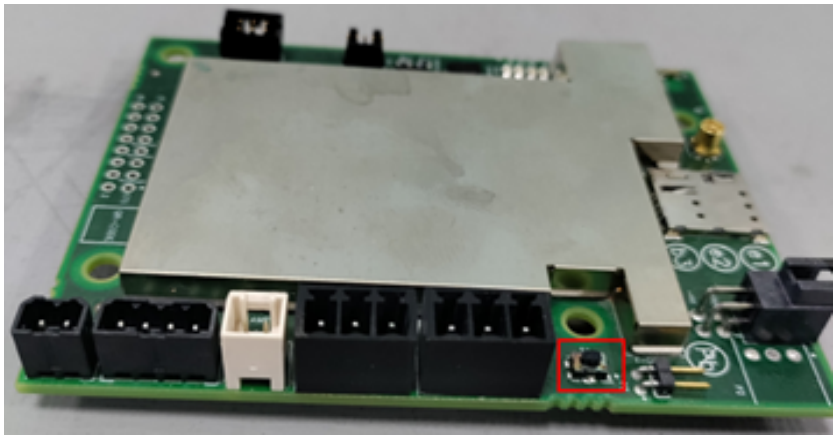


Figure 8.1 - Factory Reset Switch

2. Hold the switch and connect the Power Supply.
3. Continue to hold the switch for another 10 seconds.
4. Release the switch.
5. During this process, all LEDs blink serially thrice (i.e., First: LED 1 blinks green > Second: LED 2 blinks green > Third: LED 3 blinks green > Fourth: LED 4 blinks red, and this sequence repeats three times) indicating configuration is getting reset.

Long pressing the Reset to Default switch button and then powering up the CloudLink 5G will not erase the custom configurations which were done at factory before shipment. It will start functioning on power up using the customer configured parameters which got configured at factory before shipment.

Types of factory reset:

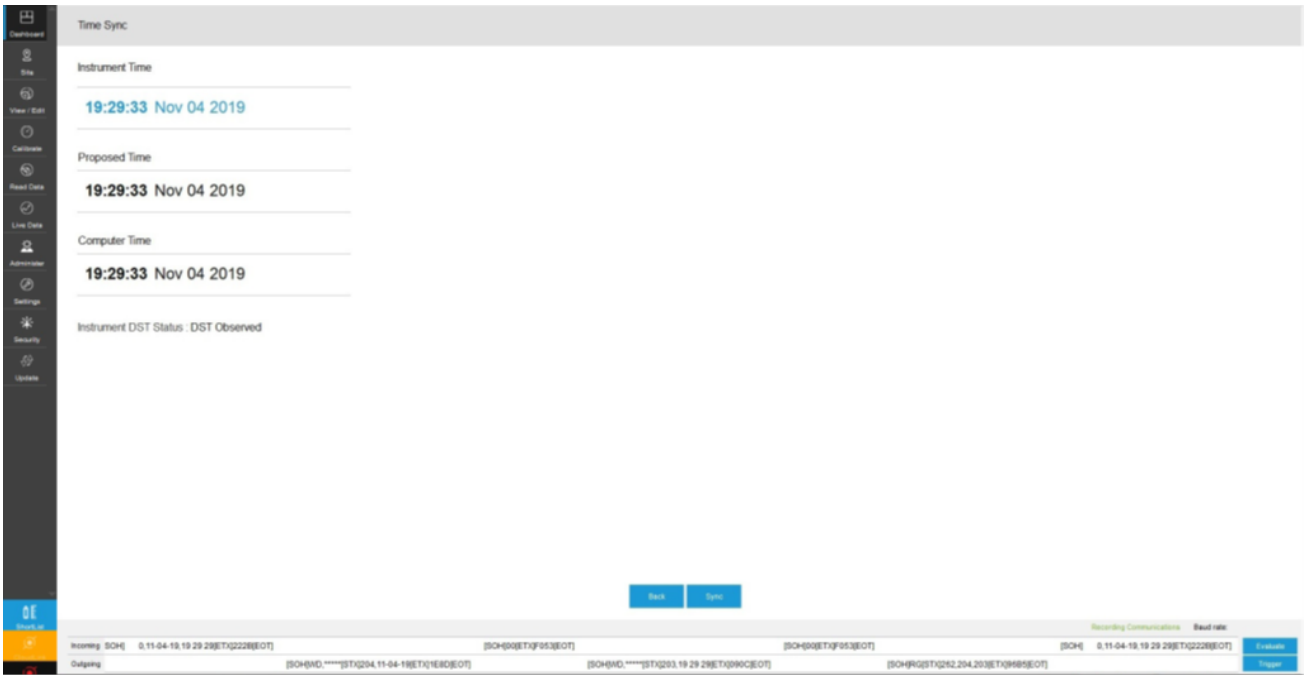
a. Hard Reset: Pluggin out the External or Battery connector will reset the Modem manually.

b. Soft Reset: Through MasterLink Desktop Application, i3137 value when selected as Modem Reset from the drop-down list then, Modem can be reset.

> **Note:** Site IDs must be restored using serial interface. These Site IDs must me non-zero value.

8.9 Time Sync

'Time Sync' page provides a user configurable option to enable/disable auto time synchronization of the connected device with your PC. Alternatively, time can be synchronized manually by clicking on **Sync**.



Time difference trigger point is taken into account when application reports time synchronization status.

Note:

a. In case of integrated devices, Time Sync for both device and modem are considered but user can see only Device's date and time in the Dashboard Time Sync panel. If device time is in sync but the modem time is not, the Time Sync panel shows an error.

b. The computer time displayed on the Time Sync is not dynamic. It is the actual PC time when the Time Sync tab is opened. It changes only when the Time Sync tab is refreshed. The computer time can be different from the actual PC time.

8.10 Secure Feature

8.10.1 Encrypted Sign On (TLS Communication)

CloudLink 5G Modem can be accessed through the following interfaces

1. Serial RS232
2. TCP/IP (Cellular)
3. IN3 IrDA (via 350s)

A valid user name and password are required for accessing the CloudLink 5G Modem. For encrypted sign-on, password is hashed using SHA256 encryption algorithm. The device supports different privilege levels like Read/Write, and Read Only.

The CloudLink 5G supports whitelisting for cellular communication. The user can configure up to 10 host IP addresses for device to allow specific hosts in case of CALLOUTS.

Note: A Strong Password must:
-Be at least 8 to 15 characters in length.
-Contain both upper and lowercase alphabetic characters (e.g. A to Z, a to z).
-Have at least one numerical character (e.g. 0 to 9).
-Have at least one special character (e.g. ~!@#$%^&*()_-+=).
Password is always hidden in all fields, Click the **View** icon to see the raw password.

Note: If the user enters the wrong password more than three times, the user will be blocked for 5 minutes. Again, if the user tries to enter the wrong password three times, then the time extends to 10 minutes or time is increased to 20 minutes, and so on upto 60 minutes.

To further enhance device security, a feature to disable firmware (application) upgrade over-the-air (FOTA) through cellular data using item code #3107 is available.

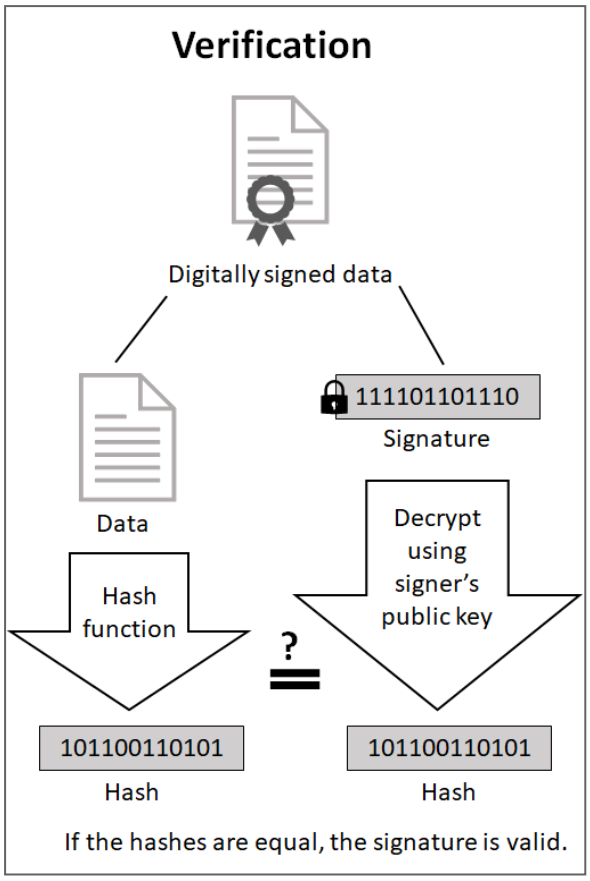
8.10.2 Secure Boot

During the boot process, secure boot will check for an embedded signature stored in the module. If the signature matches against a database of signature in Secure Boot, the module is allowed to execute the actual application (jump to application). Secure Boot functions similarly to a security gate.

The functions of the secure bootloader:

1. Checks for the any new firmware available in the external flash to upgrade the device.
2. It validates the signature of new image available in external flash.

3. It also checks the integrity of the currently running application, and if successful, it executes the application.



8.10.3 TLS Mode

Transport Layer Security (TLS) is an advanced encryption based secure communication protocol. It enables the user to secure their data transfer over a network by authenticating it using the certificates.

> **Note:** If the user performs the restore default activity or factory reset for the CloudLink 5G modem, then the user has to manually specify the expiry date (Item# 3159) for the root certificate in the MasterLink application.

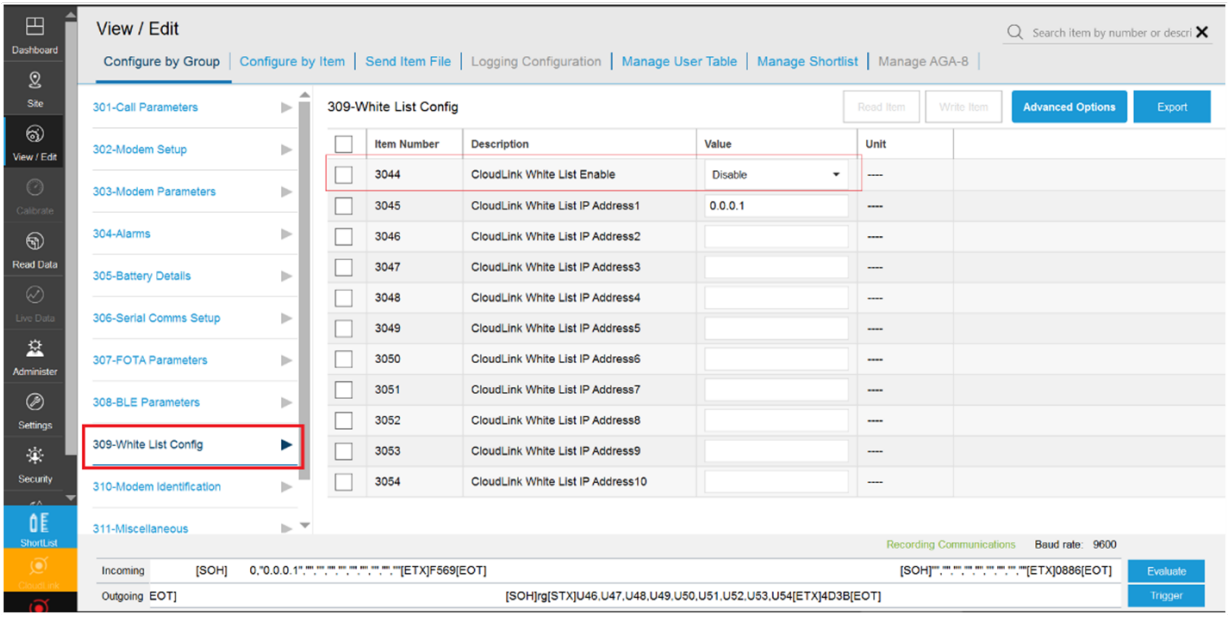
For more information on how to configure TLS mode for CloudLink 5G modem in the MasterLink application, see *MasterLink User's Guide*.

8.10.4 White List

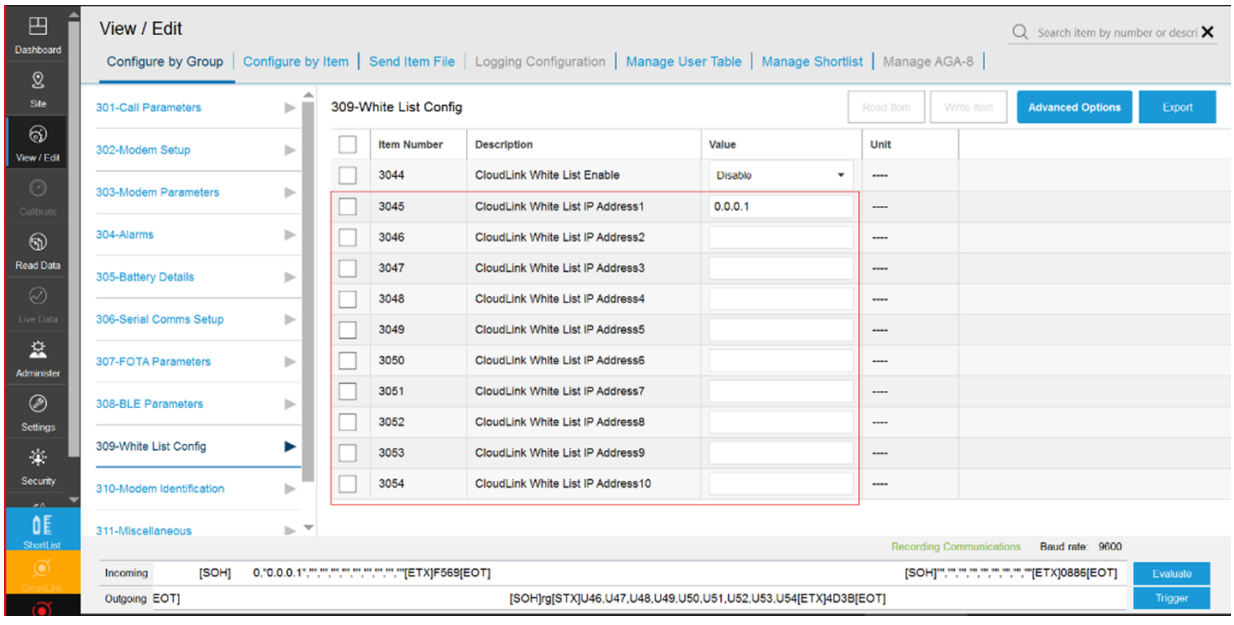
A whitelist in CloudLink 5G Modem is a feature that approves a selected list of all IP addresses, while denying all other IP addresses.

1. Select **Config** > **Config by Group** > Select **Whitelist Configuration**.
2. To enable/disable whitelisting, configure item code 3044 as shown below:

Item Code	Value	Description
3044	Enable	Whitelist enabled
3044	Disable	Whitelist disabled



3. Configure the item numbers from 3045 to 3054 with the IP addresses to whitelist in CloudLink modem.



Note: Client IP addresses can either be 'PowerSpring' or 'MasterLink' Software Application PC's IP address.

8.11 Device Diagnostics

CloudLink 5G Modem can generate Alarm, Event, Diagnostic and Cellular reports. Details descriptions are provided in the below sections:

8.11.1 Event Logs

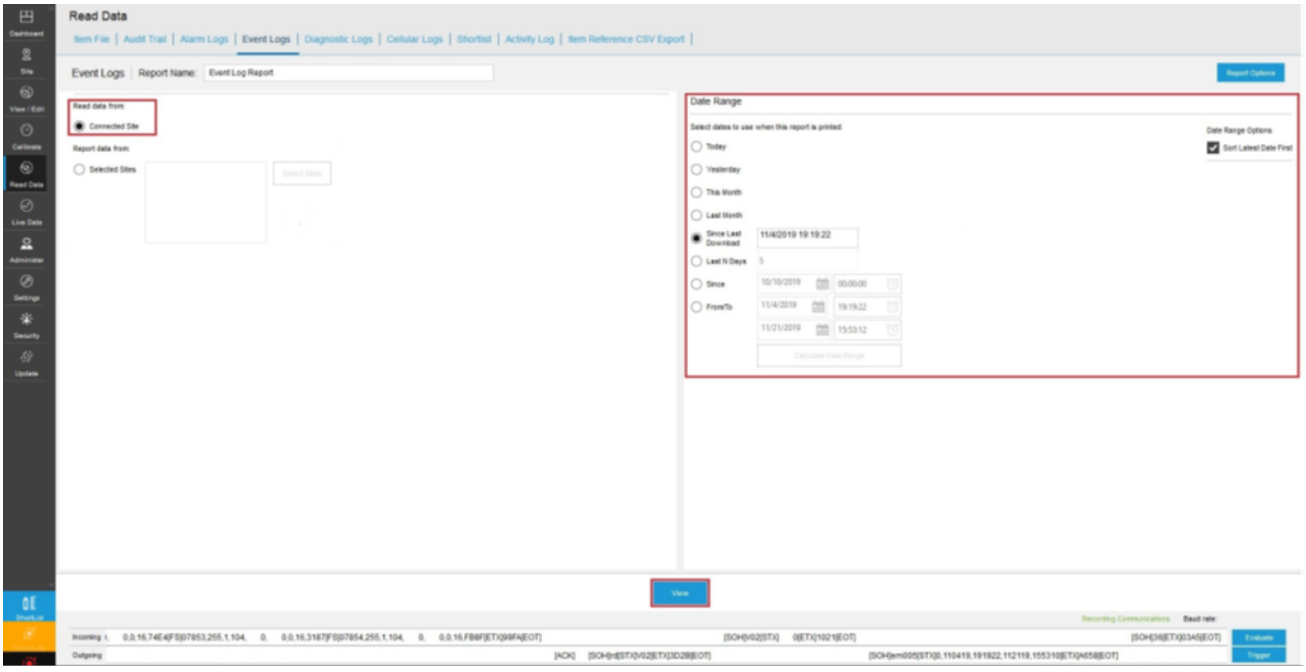
The Event Log records activity that is directly linked to and maintained within the instrument. An "event" documents is an item change in the instrument or an instrument download. Event Log activities include:

1. Calibration Changes
2. Access Code Changes
3. Shutdown
4. Item Code Changes
5. Event Log Downloads

Use the 'Event Logs' tab to read event data from a connected instrument.

> **Note:** This log is different from the Activity Log because that log mainly focuses on software activity (and some firmware activity) where the Event Log function records activity that is directly linked to and maintained by the instrument.

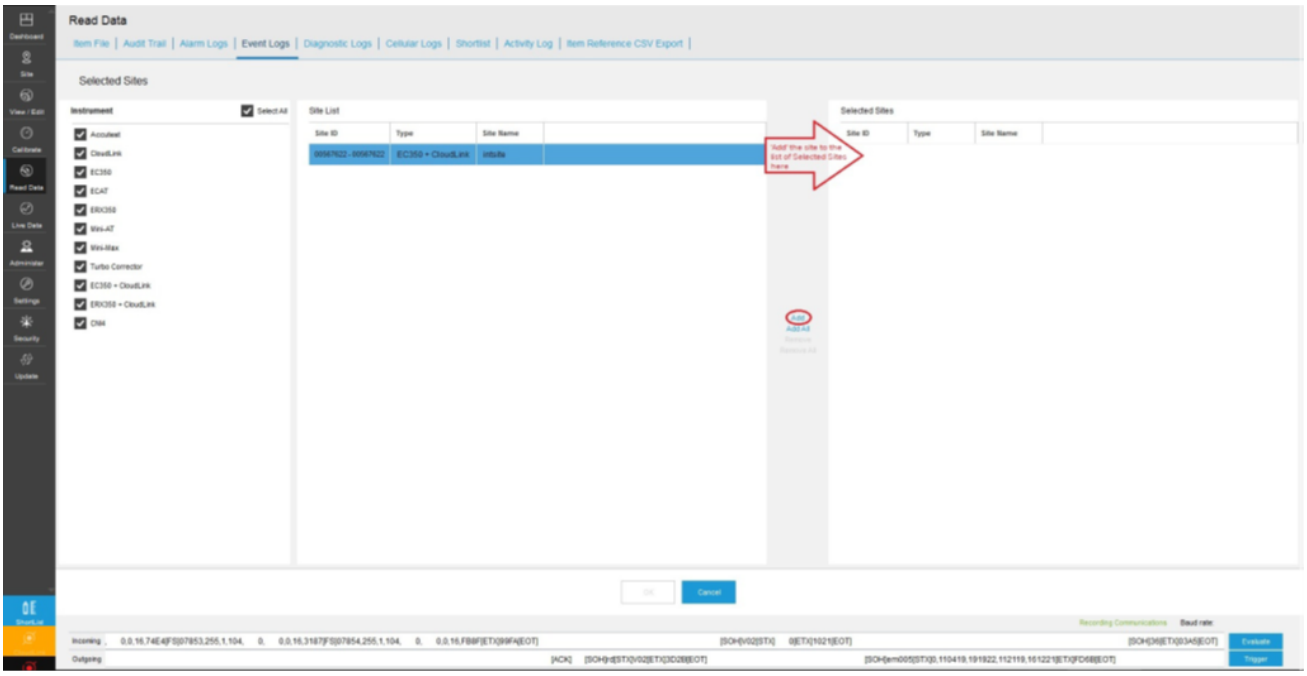
On checking the **Connected Site**, select a **Date Range** and then click **View** tab.



The Event log report for the connected site is seen here.

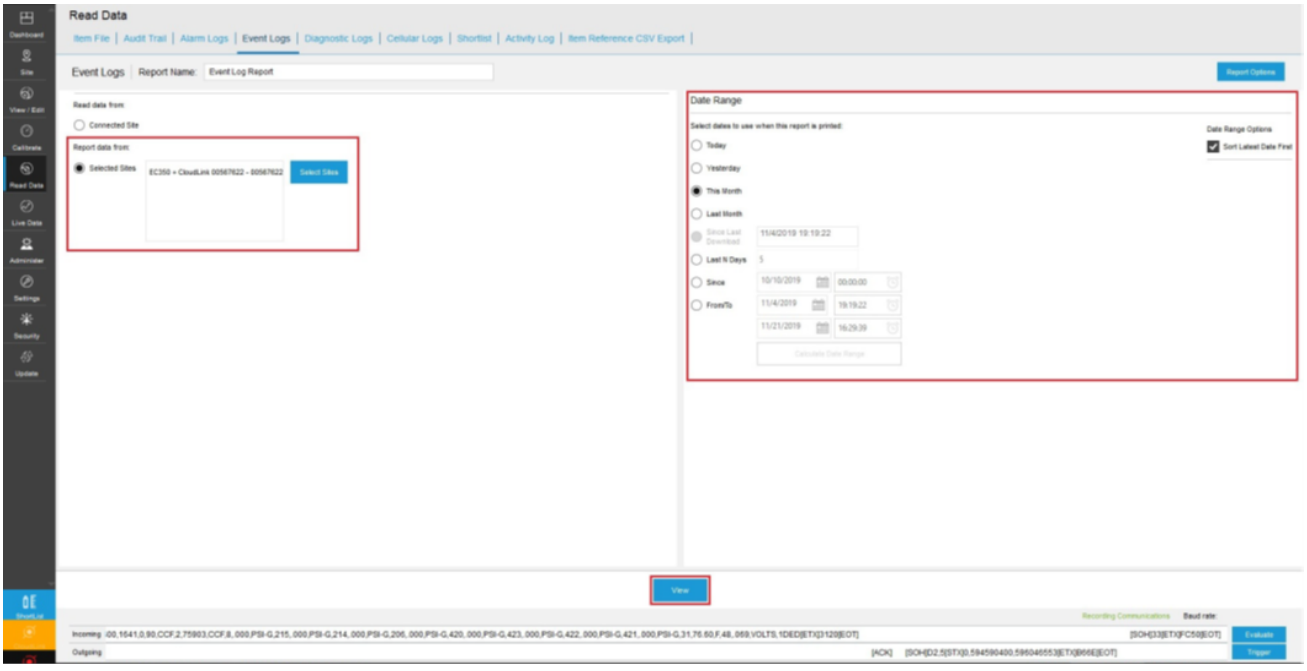
Alternatively, you can choose to select a list of sites and then generate a report.

Start by checking the **Selected Sites**, select a site from the **Select Sites** tab. A new window appears.

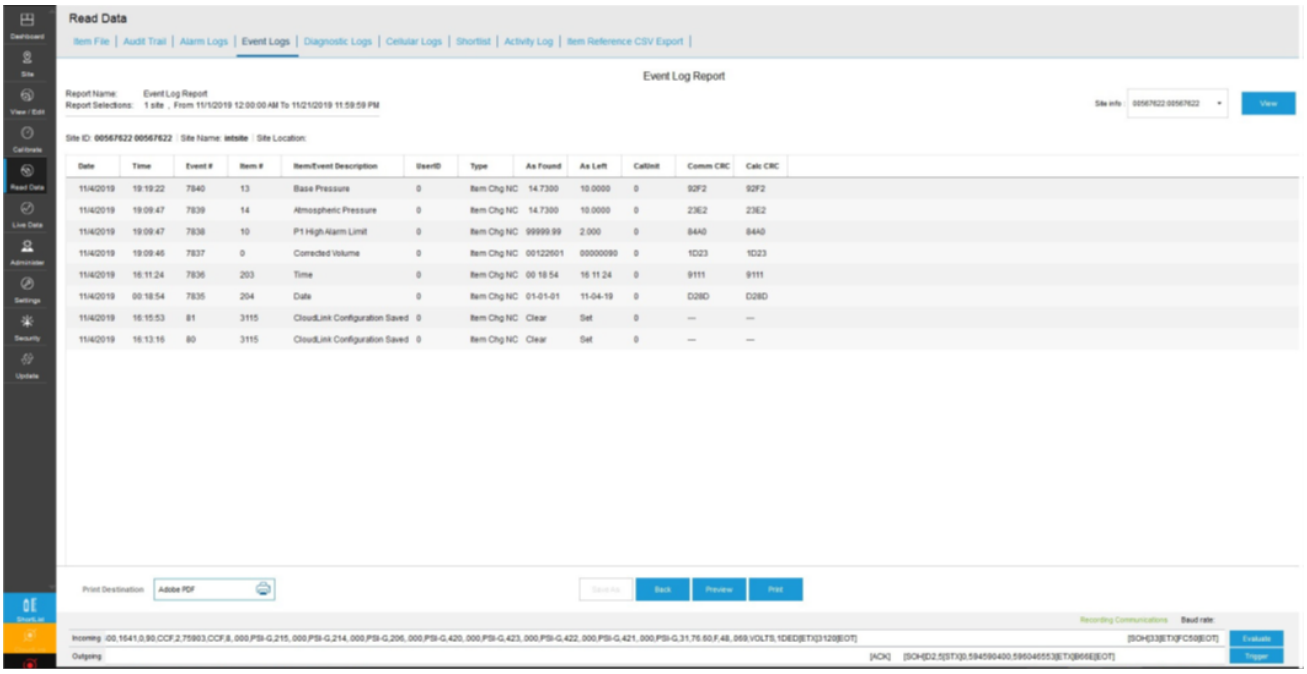


Click **OK**.

Next, select the date range of the report and then click **View**.



The Event Logs will appear based on your selected criteria.



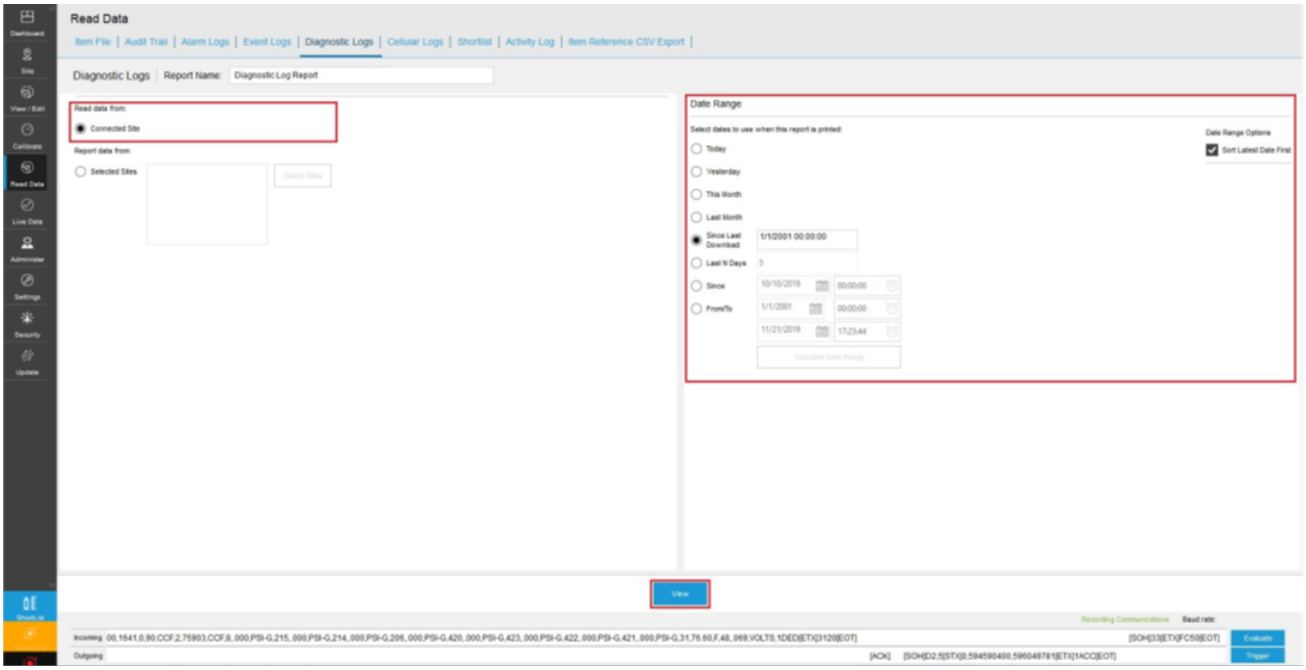
You can choose to export with **Preview** or **Print** the data.

8.11.2 Diagnostic Logs

Use the 'Diagnostic Logs' tab to read diagnostic data from a CloudLink 5G Modem. You can read Diagnostic logs from the currently connected site. Alternatively, you can choose to select a list of sites and then generate a report.

Diagnostic logs are applicable to CloudLink 5G Modem only and would be available when connected to CloudLink Modem or in integrated mode (EC350 + CloudLink 5G Modem).

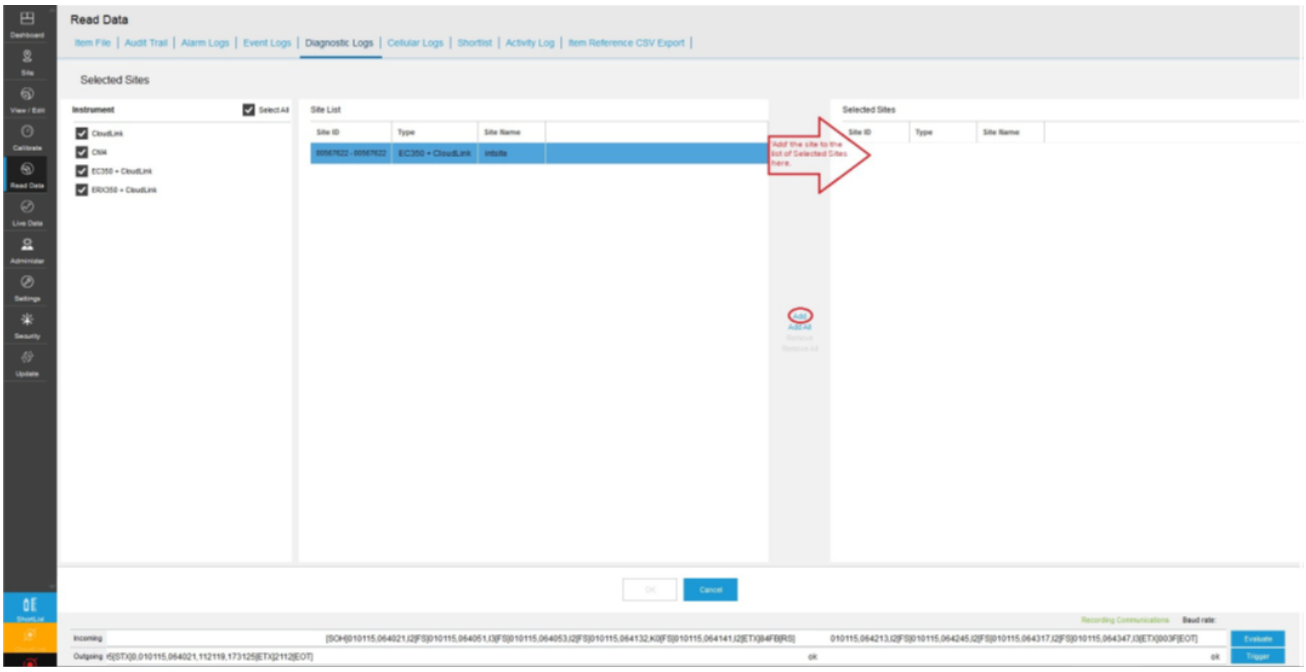
On checking the **Connected Site**, select a **Date Range** and then click **View** tab.



The Diagnostic Log report for the connected site is seen here.

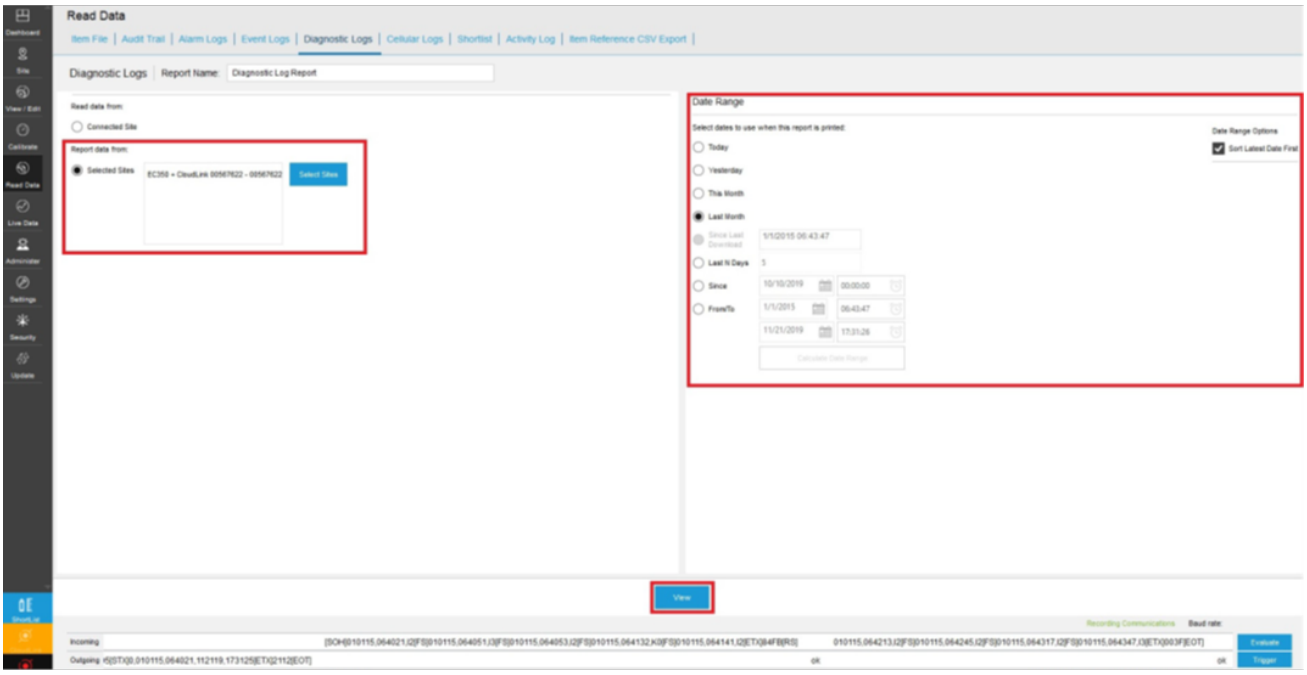
Alternatively, you can choose to select a list of sites and then generate a report.

Start by checking the **Selected Sites**, select a site from the **Select Sites** tab. A new window appears.



Click **OK**.

Next, select the date range of the report and then click **View**.



The Diagnostic Logs will appear based on your selected criteria.

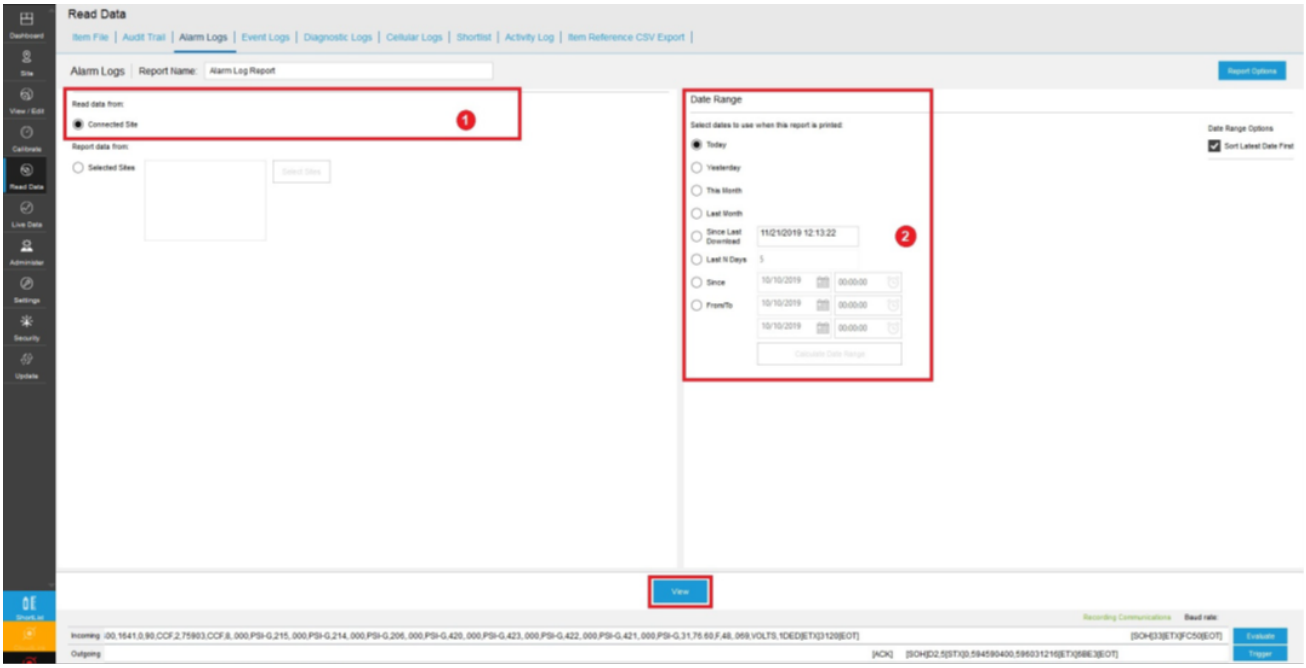
You can also choose to export with **Preview** or **Print** the data.

8.11.3 Alarm Logs

Use the 'Alarm Logs' tab to read and view all alarm activity data from a connected instrument. You can either read alarm logs from a connected site or select a list of sites to read logs from.

An Alarm Log record is defined as any alarm activity, which includes new alarms, alarms acknowledged as well as alarms that have been cleared.

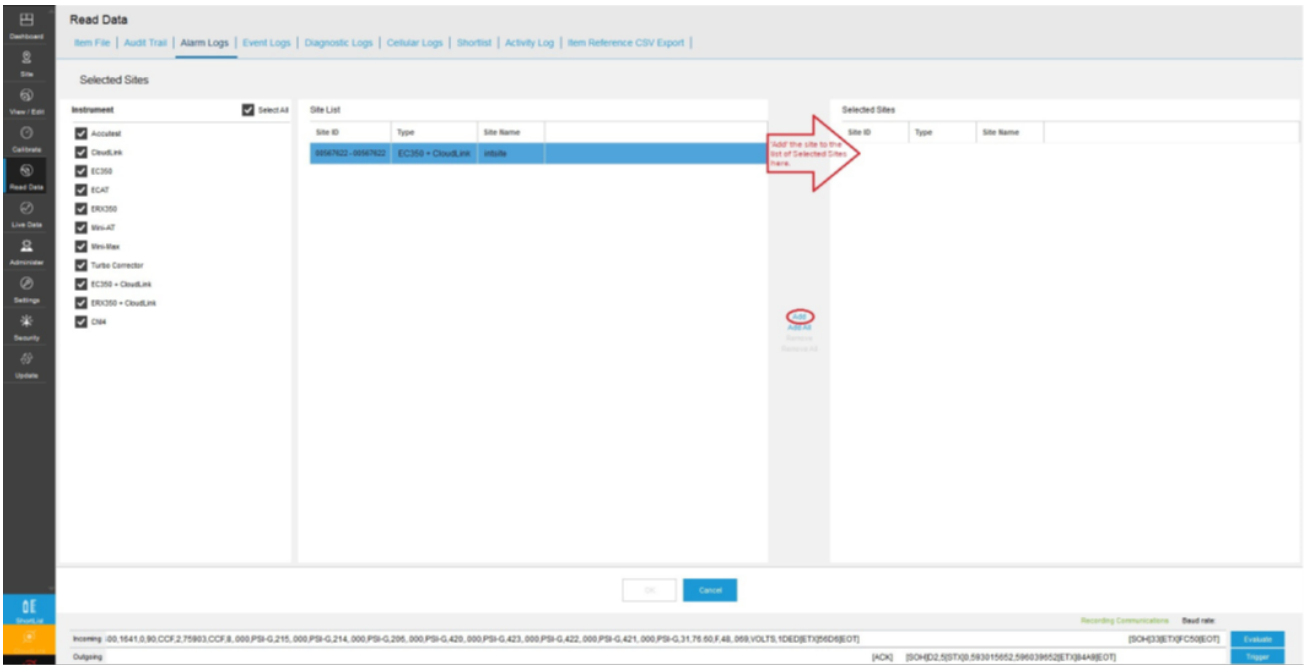
On checking the **Connected Site**, select a **Date Range** and then click **View** tab.



The Alarm report for the connected site is seen here.

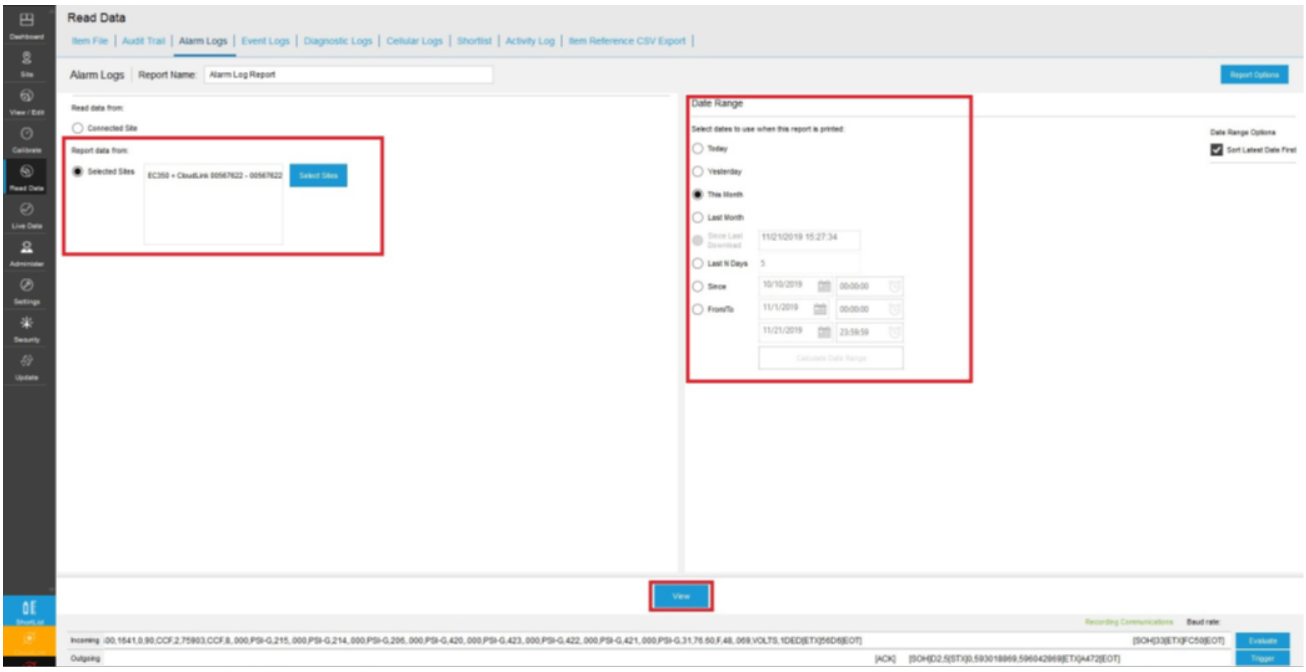
Alternatively, you can choose to select a list of sites and then generate a report.

Start by checking the **Selected Sites**, select a site from the **Select Sites** tab. A new window appears.

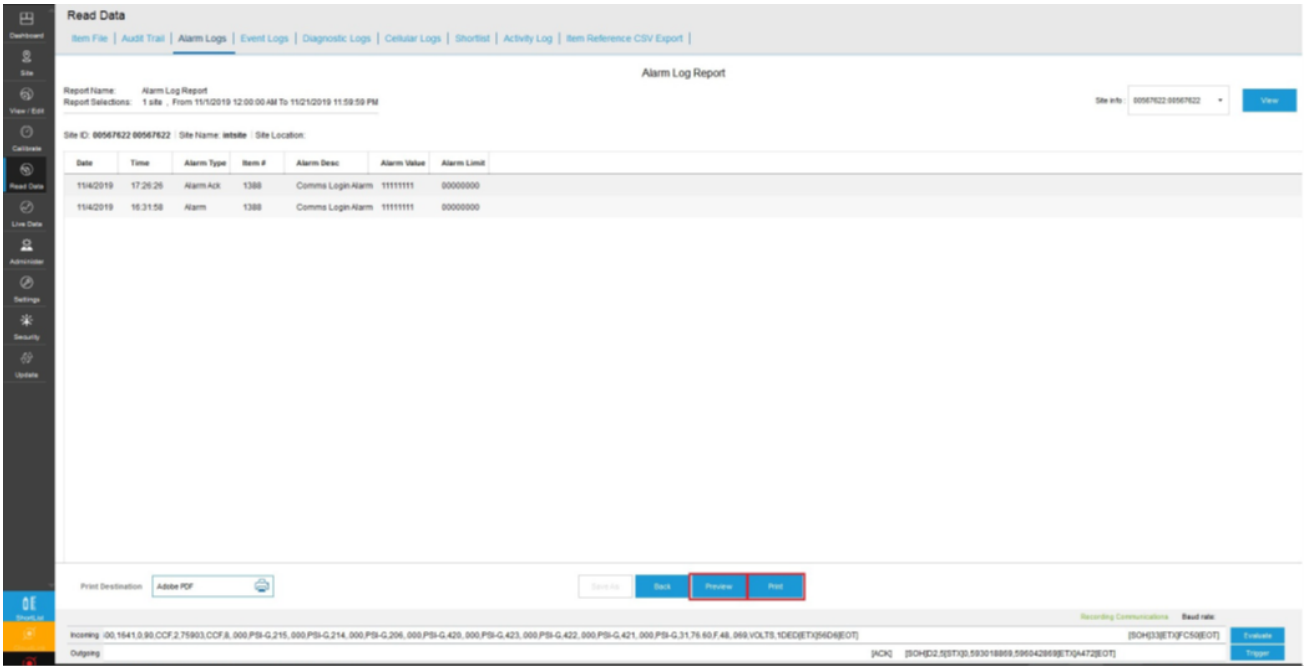


Click **OK**.

Next, select the date range of the report and then click **View**.



The Alarm Logs will appear based on your selected criteria.



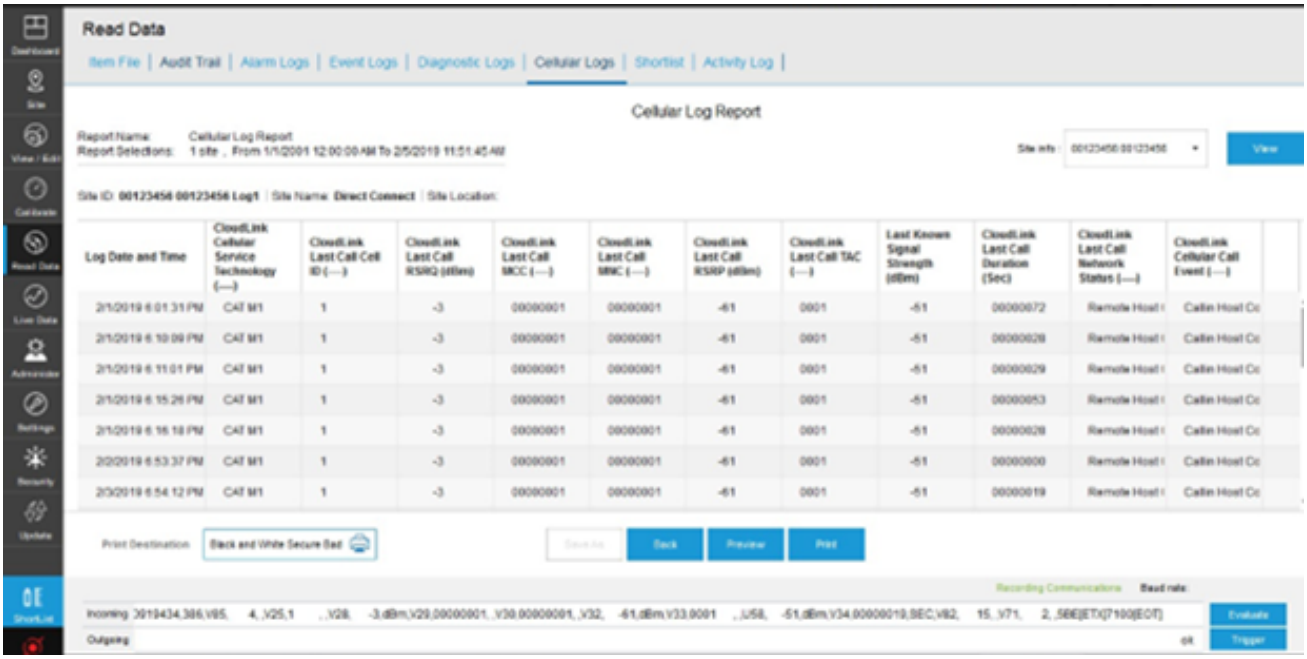
You can choose to export with **Preview** or **Print** the data.

8.11.4 Cellular Logs

CloudLink 5G Modem supports cellular logging. By default, the device shows the most recent cellular logs. These logs will have a record created when a data call is initiated by an instrument or host. One can view 22 logs in a single search filter.

Sl.No.	Cellular Statistics	Item Code
1	Access Technology	3185

Sl.No.	Cellular Statistics	Item Code
2	RSSI	3058
3	RSRP	3132
4	Call Event	3171
5	RSRQ	3128
6	Location ID / TAC	3133
7	Cell ID	3125
8	MCC	3129
9	MNC	3130
10	Last Call Duration	3134
11	Last Call Status	3182



9 Certifications

This section provides certification details including hazardous location and any other certifications as applicable to CloudLink 5G Modem.

9.1 Hazardous Location Certifications

CloudLink 5G is certified for various hazardous location standards and requirements. The tables below give a summary of the same.

Table 9.1 *North American Model Certification*

Certification	Standards / Ratings
Markings – Zone 0	Ex ia IIB Ga Class I Zone 0, AEx ia IIB Ga Class I Division 1, Group C, D
Markings – Zone 2	Ex ec [ic Gc] IIB Gc Class I Zone 2, AEx ec [ic Gc] IIB Gc Class I Division 2 Group C, D with Non-incendive field wiring connections
CAN/CSA C22.2 No. 60079-0:19	Explosive atmospheres – Part 0: Equipment – General requirements
CSA CAN/CSA-C22.2 NO. 60079-7:16 2nd Edition	Explosive atmospheres - Part 7: Equipment protection by increased safety “e”
CAN/CSA-C22.2 No. 60079-11:14	Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety "i"
CSA C22.2 No. 62368-1-2019, 3rd Edition	Audio/video, information, and communication technology equipment — Part 1: Safety requirements
ANSI/UL 60079-0-2020 7th Edition	Explosive atmospheres – Part 0: Equipment – General requirements
UL 60079-7-2017 5th Edition	UL Standard for Safety Explosive Atmospheres – Part 7: Equipment protection by increased safety "e"
ANSI/UL 60079-11:2013 6th Edition	Electrical apparatus for Explosive Gas Atmospheres - Part 11: Intrinsic Safety “i”
UL 62368-1-2019, 3rd Edition	Audio/video, information and communication technology equipment — Part 1: Safety requirements

Table 9.2 *IECEx Certifications*

Certification	Standards / Ratings
Markings	Ex ia IIB Ga Ex ec [ic Gc] IIB Gc
IEC 60079-0: 2017; Edition:7.0	Explosive atmospheres - Part 0: Equipment - General requirements

Certification	Standards / Ratings
IEC 60079-11: 2011; Edition:6.0	Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-7: 2017; Edition:5.1	Explosive atmospheres - Part 7: Equipment protection by increased safety “e”

Table 9.3 *ATEX Certifications*

Certification	Standards / Ratings
Markings	II 1G Ex ia IIB Ga II 3G Ex ec [ic Gc] IIB Gc
EN 60079-0: 2018	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079-11: 2012	Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-7: 2015 + AMD1: 2018	Explosive atmospheres - Part 7: Equipment protection by increased safety “e”

9.2 Other Certifications

Below is the list of other certifications as applicable to the CloudLink 5G Modem.

a. CE (EMC, RED, LVD, ATEX, RoHS Directives)

b. FCC Part 15 Subpart B & Subpart C

c. Industry Canada (ICES 003)

d. PTCRB

e. AT&T

f. Verizon

g. T-Mobile

h. Supports 3GPP Release 13 LTE CAT M1 & NB-IoT (Bands 3, 8, 20, 2, 4, 12 & 13)

i. RoHS Compliant

10 Troubleshooting

Log	Representation
LED Error	A
Diagnostic Log	B
Event Log	C
Cellular Log	D
Alarm Log	E
ML Error Code	F

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
223	Self Test Failure - Radio SoC malfunction or insufficient power supply	B	Flash memory Read/Write failure. 1. Check Power supply. 2. Allow supercap to charge at least 1 hour and then try rebooting the device.
224	Self Test Failure - Flash 1	B	1. Power Cycle the unit. 2. If the problem persists even after reboot, then replace the device.
225	Self Test Failure - Flash 2	B	Flash memory Read/Write failure. 1. Power Cycle the unit. 2. If the problem persists even after reboot, then replace the device.
11, 226	Self Test Failure - SRAM	A, B	SRAM memory Read/Write failure. 1. Power Cycle the unit. 2. If the problem persists even after reboot, then replace the device.

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
164	Watchdog reset	A, B	1. In case of exceptions like noise or spurious interruptions, watchdog resets the device. 2. All LEDs will blink twice at the time of reboot.
12, 195	Radio Power On Failure	A, B	Radio start up failed, not responding to AT commands from MCU. 1. Power cycle the device. 2. In case of multiple occurrences, replace the hardware.
12, 193	Radio communication failure	A, B	Radio start up failed. 1. Check power supply. 2. Allow supercap to charge at least 1 hour and then try rebooting the device. 3. In case of multiple occurrence, replace the hardware.
-	Radio registration failed	C, D	Radio start up failed or radio not responding or network signal issue or SIM issue. Check power supply, change SIM, check antenna connections, check if network is available using other CloudLink or cellular device.

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
13	Low battery voltage alarm	A, E	Low battery alarm is raised whenever we detect the battery going below a certain threshold and we have waited sufficient time (4 hours) to let the supercap inside the battery to get charged. For these 4 hours, the device will not wake up as we need to give time for super-cap to get charged from battery.
21, 182	SIM card Error.	A, B	SIM issue. 1. Reinstall SIM card and make sure SIM card touches the SIM card pads. 2. If problem reappears, change the SIM card.
-	Call failure - Host unreachable.	C, D	CloudLink could not connect to host. 1. Check host if its up and running. 2. Check SIM, antenna, RSSI. 3. Issue can also be due to incorrect IP and APN.
-	Call abruptly disconnected due to network issue.	C, D	CloudLink gets disconnected to host due to network issues. Check SIM, antenna connections, whether RSSI is in a good range or not.
-	No or Poor Cellular Signal	C, D	No or poor network signal. Check SIM and antenna.
-	Cellular session timed out event.	C	No data activity between CloudLink and Cellular network , hence cellular connection is terminated.
22	Data connection failure	A, C	CloudLink could not connect to host. Check MDM if it is set up, network signal and IP.

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
177	Configuration checksum fail		Configuration Flash Checksum Error. 1. If this Diagnostic Log is recurrent then Config B memory is treated as corrupted. 2. In case of multiple occurrences, perform Factory defaults. 3. And if it still persists, replace the hardware.
-	Configuration parameters change event	C	Event logged when configuration parameters get changed and logged into Flash.
-	Power supply change event.	C	Event logged when power supply type gets changed. For example: a. 0 Dual Battery Pack or b. 1 External Supply
-	Magnetic swipe trigger event.	C	Event logged when magnetic swipe detected.
-	Factory reset event.	C	Event logged when factory reset detected at power up through default switch.
-	Advance low battery capacity indication.	C	Event logged when advance low battery detected based on user configuration in i3006.
-	Network registration fail.	C	Radio could not register with network. Check SIM and antenna.
-	Event when remote host connects to CL.	C	Host connected during calling.
-	Remote host connected/disconnected.	C	Host connected/disconnected during callout window or continuous server mode.
-	Callin start time.	C	
-	Callin stop time.	C	
-	Callout Start/stop time.	C	
-	Firmware upgrade in progress.	C	Firmware upgrade in progress.

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
-	FOTA in progress.	C	Radio Firmware Over The Air upgrade in progress.
-	FOTA completed.	C	Radio Firmware Over The Air upgrade completed.
-	Firmware upgrade start event.	C	
-	Firmware upgrade successful event.	C	
-	Firmware upgrade failed event.	C	
-	OTA Firmware upgrade image size too high.	F	Size supported is < 1MB. Check firmware size.
-	OTA firmware upgrade sequence mismatch.	F	Firmware packet sequence mismatch. Start again to resume firmware upgrade.
-	OTA firmware upgrade application image checksum error.	F	
167	ADC inputs error.	B	Issue with internal ADC.
168	Temperature measurement error.	B	Error in measurement of internal temperature of device.
171	External Data Flash Segment erase fail.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device.
173	Data Flash write failure.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device
174	OTA Flash write failure.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device.
175	Data Flash Read failure.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device.
176	OTA Flash Read failure.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device.

MasterLink Error Codes	Issue/Error	Log	Troubleshooting Recommendations
194	Radio module echo off failure.	B	Flash failure. Power Cycle the unit if the problem persists even after reboot replace the device.
196	Data Attach Failure	B, C	CloudLink could not connect to host. Check MDM if it is set up, check network signal and IP.
-	ITEM code not supported.	F	Check whether supported item is read/written.
-	MasterLink packet format error.	F	MasterLink packet received is out of format.
-	MasterLink packet checksum not correct.	F	MasterLink packet got corrupted.
-	Internal Flash Error.	B, F	Internal flash data corrupted. If the problem persists, need to replace the device.
-	Firmware upgrade fail due to low battery.	F	
-	User table checksum error.	B	Internal user table got corrupted.
-	No Diagnostic records found.	F	
-	No Event records found.	F	
-	No Cellular records found.	F	
-	No Alarms records found.	F	
-	Due to the communication interface type changes between CloudLink 5G (UART) and CloudLink R100/R110 (RS232), the Integrated device type (350s +CL5G) reboots while loading an item file into the MasterLink application.	-	For Integrated device type (350s + CL 5G) configuration, it is advised to modify the modem type (i1458) to "CloudLink 5G" and save the changes for future usage or send it to integrated device type (350s + CL5G).
-	The upgradation to MasterLink R610.x fails if the existing MasterLink application is opened on your PC.	-	Close the existing MasterLink application if opened on your PC, before proceeding further with the upgradation to MasterLink R610.x, to avoid any error in the upgrading process.

11 Acronyms and abbreviations

ADC	Analog-to-Digital Converter
ANSI	America National Standards Institute
APN	Access Point Name
AT command	Attention Command
BATT	Battery
CAN	National Standard of Canada
Cat	Category
CL	CloudLink
CSA	Canadian Standards Association
CTS	Clear To Send
DIV	Division
EC350	Electronic Corrector 350
ERX350	Electronic Pressure Recorder 350
EVC	Electronic Volume Corrector
EXT-PWR	External Power
FCC	Federal Communications Commission
FOTA	Firmware Over-The-Air
FTP	File Transfer Protocol
FW	Firmware
HLC	Hybrid Layer Capacitor
HTTP	Hypertext Transfer Protocol
iXXXX	Item XXXX (Eg: i3107)
IC	Industry Canada
ID	Identification
IEC	International Electrotechnical Commission
IECEx	International Electrotechnical Commission Explosive
IMEI	International Mobile Equipment Identity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IrDA	Infrared Data Association
ISA	International Society of Automation
LAN	Local Area Network
LED	Light-Emitting Diode
LTE	Long-Term Evolution

MCC	Mobile Country Code
MCU	Microcontroller Unit
MDM	Mobile Device Management
MFR	Manufacturer
MID/MC	Measuring Instruments Directive/Measurements Canada
MNC	Mobile Network Code
ML	MasterLink
MPN	Manufacturer Part Number
NC	No Connection
NVM	Non-Volatile Memory
OTA	Over-The-Air
RF	Radio Frequency
ROHS	Restriction of Hazardous Substances
RS232	Recommended Standard 232
RSSI	Received Signal Strength Indicator
RSRQ	Reference Signal Received Quality
RTS	Request To Send
RUID	Remote Unit Identification
Rx	Receiver
SIM	Subscriber Identification Module
TCP	Transmission Control Protocol
Tx	Transmitter
UDP	User Datagram Protocol
UMB	Universal Mounting Bracket
VPN	Virtual Private Network
VZWINTERNET	Verizon Wireless Internet