IQ2 GP-CEP-100P SETUP AND CONFIGURATION GUIDE

ENABLING IIoT

TABLE OF CONTENTS

Change Log:

Date	Author	Change	Version Number
Feb 2022	Matt Crites	Initial release	1.0
Feb 2022	Matt Crites	Appendix A added	3.0
Apr 2022	Matt Crites	Added Alarm Sampling	5.0
June 2022	Matt Crites	Added Software Upgrade	7.0

Section 1.0: General Overview

1.1:APP AND DEVICE OVERVIEW

The endpoints, known as iQ2 GP-CEP100P (General Purpose Cellular Endpoint), are configured by field technicians using a freely available mobile app for Android. The Android device i.e. cell phone, tablet, etc. utilizes built in Bluetooth technology to connect and communicate with the cellular endpoint.

The iQ2 GP-CEP100P is a low power, battery operated cellular device that activation ready. After completed a very simple set up in the field, the GP-CEP100P cellular endpoint will monitor pressure readings and compare those reading to user defined over and under pressure thresholds. When a threshold is reached or exceeded, the endpoint will dial out to the cellular network, alerting that an alarm has been reached. The GP-CEP100P will collect pressure readings on a regular timed interval, as defined by the user, and will report those readings to LEC's iQ2 web portal on a daily basis.

LEC's award winning software platform, iQ2, will collect those readings as well as alert subscribed users when an alarm threshold has been reached using SMS and/or email.
This guide will walk a field technician through the steps necessary to successfully connect, communicate, and set up iQ2 GP-CEP100P cellular endpoint.

1.2: SUPPORT INFORMATION

Setup Support

For support related materials, please use the link below:

https://lecinc.freshdesk.com/support/home

Section 2.0: Connection to iQ2 GP-CEP100P

Before the iQ2 GP-CEP100P can connect to the app, the Bluetooth mechanism must be engaged. To activate the Bluetooth connection, a magnet will be utilized to enable Bluetooth communication between GP-CEP100P cellular endpoint and the configuration app.

2.1: ACTIVATING TECHNICIAN COMMUNICATION

Place a magnet momentarily near the location shown below to initiate the technician communication mode. Once the technician communication mode is successfully activated, a green LED next to the external antenna port on the cap of the endpoint will illuminate.

LED Indicator   External Antenna Port   Meter/sensor Cable
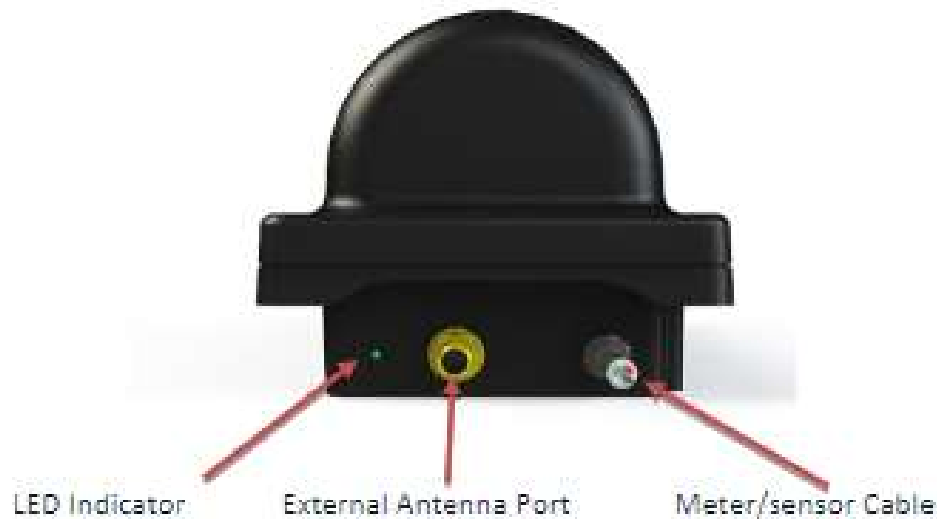
Upon activation of the technician communication mode, the field tech will have approximately 60 seconds to connect iQ2 GP-CEP100P to the app before the endpoint will return to normal operating mode at which time a magnet will need to be reapplied to continue with configuration and setup.

With the green LED illuminated, open the Technician's Configuration app on the Android mobile device.

IOT Int

2.2: MAIN MENU

Once the app opens, the field tech will have access to the app's main menu screen. Most of the options will be grayed out until a successful connection is made between the app and iQ2 GP-

CEP. Once an active connection is achieved, the remaining options will become active. The main menu options are as follows:
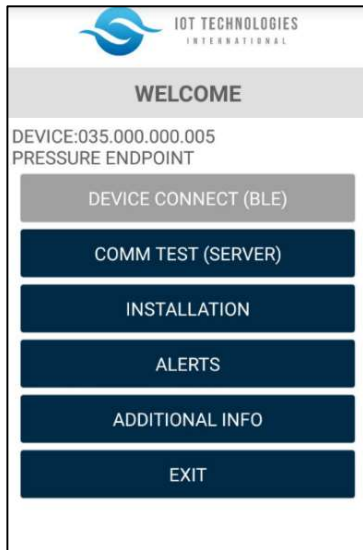

- **Device Connect**: Initiate Bluetooth connectivity
- **Comm Test**: Tests communications with the cellular network
- **Installation**: Enter installation parameters
- **Alerts**: Displays Alerts status, as well as menus to configure over and under pressure thresholds
- **Additional Info**: Provides known cellular network data i.e. cellular signal, etc and device related information i.e. battery level, detected pressure, etc.
- **Exit**: Exit the Configuration App

2.3: INITIATE CONNECTION FROM APPLICATION

Press the "Device Connect (BLE)" button at the top of the main menu to initiate a scan for any technician communication mode enabled cellular endpoint.
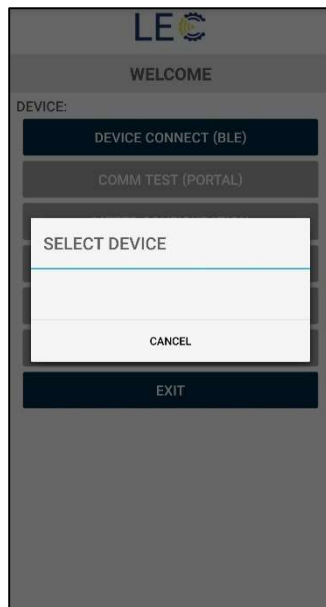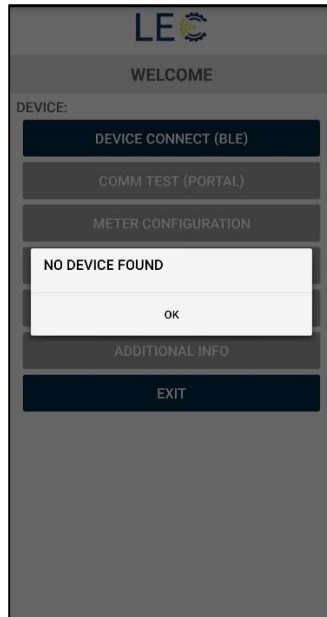

The iQ2 GP-CEP100P's unique identification number will display on the screen. Press the ID number on the screen to begin the connection or press **cancel** to return to the main menu.
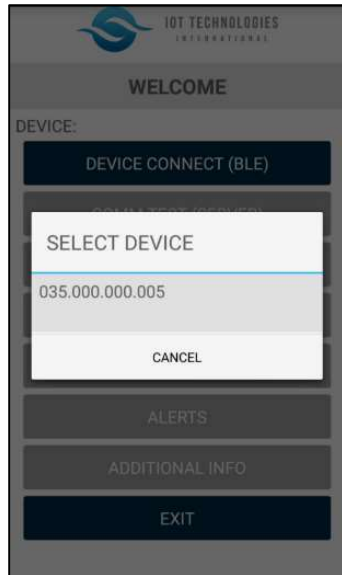
Once the ID number is pressed, the display will indicate a connection is in progress.
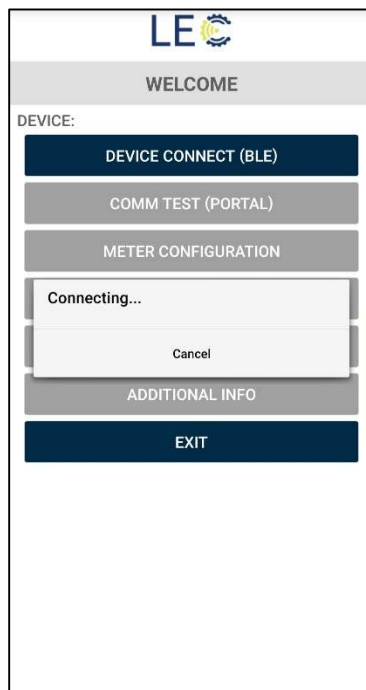
If the app displays the message **NO DEVICE FOUND**, check to ensure the green LED on the top of the cellular endpoints cap is still illuminated. If it is not, the GP-CEP100P has likely returned to normal operating mode and will require reinitializing technician communication mode. See section 2.1.

Upon successful connection, the iQ2 GP-CEP100P's green LED will begin to flicker to indicate the Bluetooth communication was completed. The iQ2 GP-CEP100P's unique ID number will be displayed on the app screen above the main menu and the once grayed out menu options should now be active and selectable.
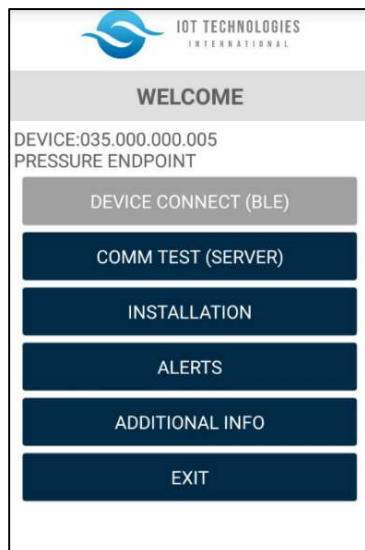

The green LED indicator will remain illuminated if there is an active Bluetooth connection. Please note that the iQ2 GP-CEP100P could timeout if the android mobile app goes inactive for an extended period of time which will then require reinitializing a Bluetooth connection. To ensure proper return to normal operating mode, the field technician should close the connection by clicking **Exit** on the main menu screen.

Section 3.0: Comm Test (Portal)

The Comm Test is used during initial installation of the iQ2 GP-CEP100P cellular endpoint to perform a communication test with the cellular network. This step is necessary to determine if an external antenna maybe required or if the internal antenna is sufficient for communications. To begin, press the "Comm Test (Portal)" button on the main menu of the android app.
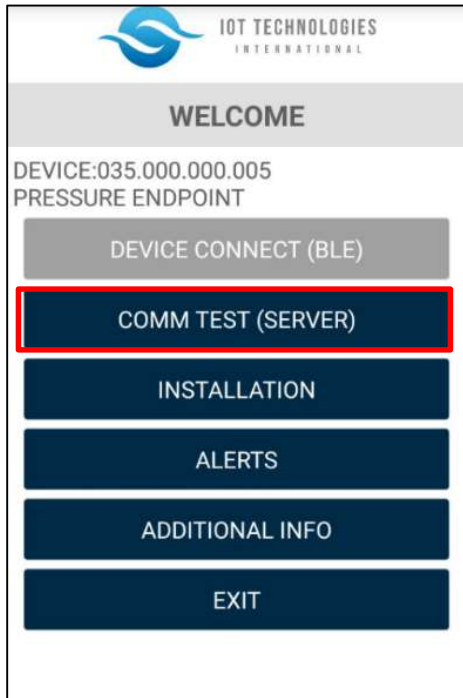
Once the process has begun, it could take upwards of 5 minutes before completing, depending on network coverage. Upon successful completion, the screen will indicate the test has completed and provide the measured signal strength (RSRP) and signal quality (RSRQ). The metrics of each can be found below:
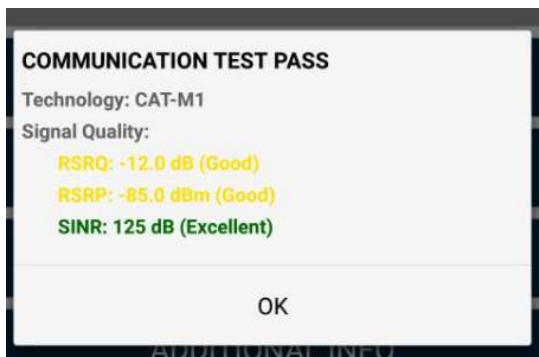
RSRP:
Excellent (Green)   >= -80 dBm
Good (Yellow) -80 dBm to -90 dBm
Medium (Orange) -90 dBm to -100 dBm
Cell Edge (Red) <= -100 dBm

RSRQ:
Excellent (Green)   >= -10
Good (Yellow) -10 dB to -15 dB
Medium (Orange) -15 dB to -20 dB
Cell Edge (Red) <= -20 dB

Press "OK" to return to the Main Menu.

NOTE: There could be times where the Comm Test may fail. This could be due to poor network coverage that may require the use of an external antenna, which will be covered in the next
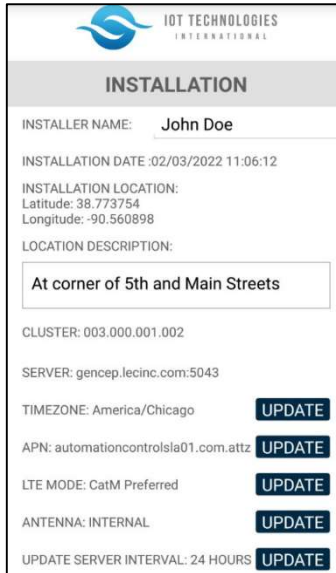
section or a low battery. It may be necessary to run a Comm Test more than once if the previous test fails.

Section 4.0: Installation

This section will outline the steps necessary to install and activate the iQ2 GP-CEP100P cellular endpoint.

SECTION 4.1: INSTALLATION INFORMATION

The Installation menu provides the following information:

- **INSTALLER NAME:** Enter Technicians Name, if desired
- **INSTALLATION LOCATION** (Lat/Long)
- **LOCATION DESCRIPTION:** Enter Site Description, if desired
- **CLUSTER**
- **SERVER NAME**
- **TIME ZONE** (Press Update to modify)
- **APN** (Press Update to modify)
- **LTE MODE**
- **ANTENNA TYPE** (Press Update to modify)
- **UPDATE SERVER INTERVALE** (Press Update to modify)
- **METER READING**

NOTE: Installer name and location can only be entered/altered when a device is deactivated from the iQ2 Web Portal.

The next sections will describe each of the above in greater detail.

SECTION 4.2: CLUSTER

The device cluster is related to activation and will be described in the next section, 4.2 Activation of the iQ2 GP-CEP100P Cellular endpoint.

SECTION 4.3: TIME ZONE

The device server is not noneditable. This relates to the database where the pressure readings and alarms will be sent. The Server should read "gencep.lecinc.com:5043". If the field reads anything other than that, please contact LEC support.

The time zone field is editable and a required field to ensure time stamps are recorded corrected. To change the time zone, click **UPDATE.** A list of time zones will populate into a

menu. Scroll through the menu to select the appropriate time zone for your area or search the time zone in the search area. Simply click on the correct time zone to change.
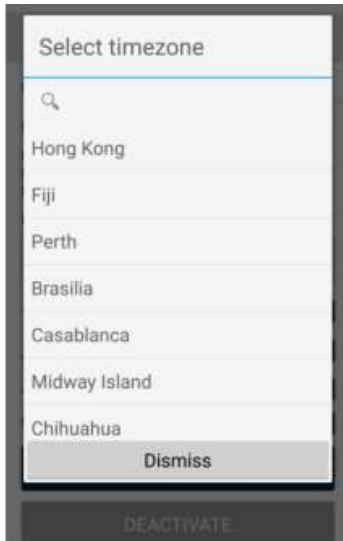
Press "Dismiss" to return to the Installation Information screen without changing the current time zone.

SECTION 4.4: APN

The APN field is network specific and is required to communicate with the cellular network. The device will come prepopulated with the correct SIM card, however If comm tests consistently fail, the APN for the SIM card may be incorrect. Contact LEC Support for further assistance on adding the appropriate APN.

SECTION 4.5: LTE MODE

LTE Mode is the method by which the GP-CEP100P communicates with the cellular network. It is advised to not change this mode unless instructed by LEC Support.
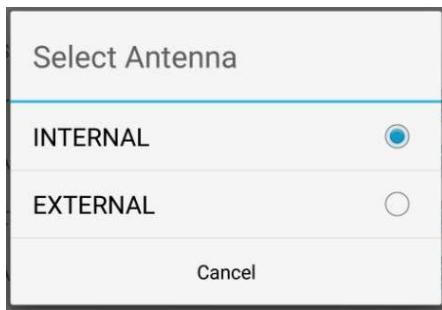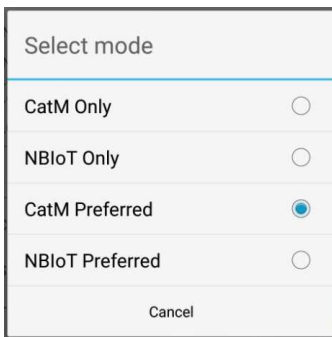
SECTION 4.6: ANTENNA TYPE

Each iQ2 GP-CEP100P cellular endpoint comes with an internal antenna for connection to the network. Depending on where it is installed and network coverage, it may be necessary during installation or at any point thereafter, to change the antenna type from using an internal antenna to an external.

Should an external antenna be required, unscrew the EMI cap from the SMA connector on top of the iQ Pulse GP-CEP100P's case and attach the external antenna. Mount the antenna as directed by LEC Support.

Antenna Mode is an editable field. To edit, click **UPDATE**. Choose the desired antenna type or press Cancel to return to the **INSTALLATION** main menu without making any changes.
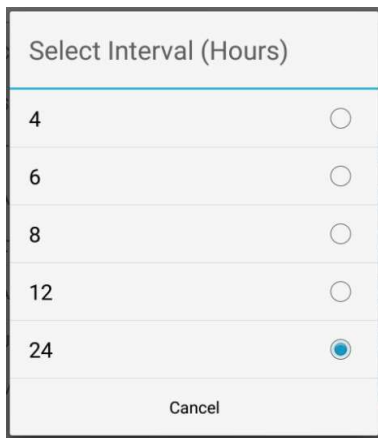

SECTION 4.7: UPDATE SERVER INTERVAL

The Update Server Interval option is the frequency the GP-CEP100P cellular endpoint delivers the collected pressure readings to iQ2 web portal. The default time frame is set to 24 hrs. This is a editable field however, changing the frequency interval could result in a shorter battery lifespan. To change, click **UPDATE**. Click the desired interval to return to the INSTALLATION main menu.
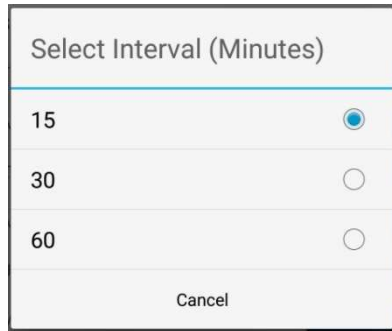

SECTION 4.8: METER READING

The Meter Reading field is how often the GP-CEP100P cellular endpoint samples a new reading from the connected pressure sensor. By default, the sensor is sampled every 15 min and are saved for updating to iQ2 for trending. This is an editable field. To change how often a sample is taken, click **UPDATE**. Click the desired interval to return to the INSTALLATION main menu.
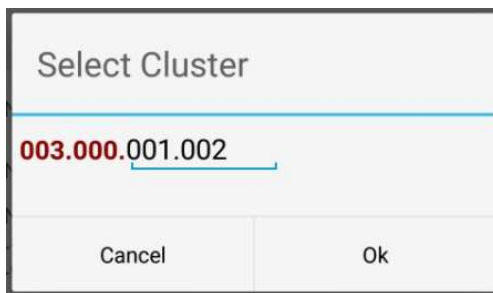

The frequency of regular sampling rates for pressure mapping can not be set any sooner than 15 min intervals due to memory constraints however record sampling can be set longer to 30 or 60 min intervals. These readings will be uploaded to iQ2 during the endpoints scheduled update interval default 24 hours.

SECTION 4.9: ACTIVATION OF IQ PULSE GP-CEP100P CELLULAR ENDPOINT

Before the GP-CEP100P cellular endpoint can monitor for over/under pressure alerts, it needs to be activated to the iQ2 web portal. Press the **ACTIVATE** button near the bottom of the app screen to register the cellular endpoint the iQ2Web portal. Activation could take upwards of 5 minutes to complete.

Enter the correct Cluster ID of 003.000.001.002. When done, click **OK**.

The GP-CEP100P endpoint will begin activating. If the activation was successful, a dialog box will appear on the screen indicating so. If unsuccessful, re-attempt to activate. If still unsuccessful, please contact LEC support.

The GP-CEP100P endpoint is now activated and monitoring for alarms. It could take upwards of 10 min before the GP-CEP100P cellular endpoint will display as "Online" in iQ2. To set up alarms and tags into iQ2, please refer to the below link for videos and documentation.

https://lecinc.freshdesk.com/support/home

To Deactivate an iQ Pulse GP-CEP, press the "Deactivate" button on the android app. Deactivation will cause the cellular endpoint to cease sending meter data including consumption and alarms to the iQ Pulse IIoT Web portal.

SECTION 4.10: DEVICE RESET

There may be times were a reboot of an endpoint is necessary to clear any communications issues. The only way to reboot an endpoint is through the technician's app.

To perform a reboot, scroll to the bottom of the Installation page. Click the "Device Reset" button. To reboot an endpoint, a password will be required. Enter the following into the password field: **#Lecinc1#**
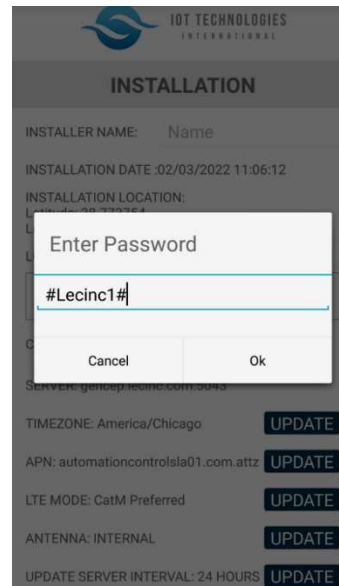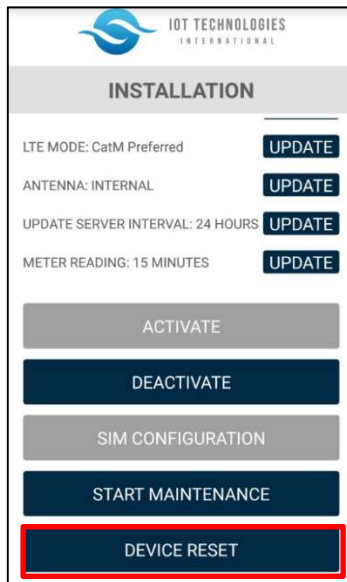
The endpoint will now reboot and connection to the app will be lost. To get reconnected to the app, Bluetooth communication will need to be reactivated.

Section 5.0: Pressure Threshold Configuration

This section is a walkthrough of how-to setup the GP-CEP100P to monitor for over and under pressure thresholds. For instructions on how to wire the iQ Pulse GP-CEP100P to a supported pressure meter, please see section 9.0.

SECTION 5.1: ALERTS

The Alerts Configuration screen will display the status of each over/under pressure. The GP-CEP100P can monitor two different thresholds for each under and over pressure. Each can be configured individually or and be disabled, per the user.

The GP-CEP100P cellular endpoint has two different displayed states. Those states are Disabled or OK. When disabled is displayed, this means that the endpoint is not being monitoring that pressure option and/or no pressure sensor has been connected to the sensor cable of the GP-CEP100P cellular endpoint. When OK is displayed next to a pressure option, it means that the endpoint is monitoring that pressure option.

In addition, there are also two different alarm states indicated by color. When displayed in green, the threshold is within normal levels as indicated by the users entered value. When displayed in red, the threshold has exceeded the user defined value.
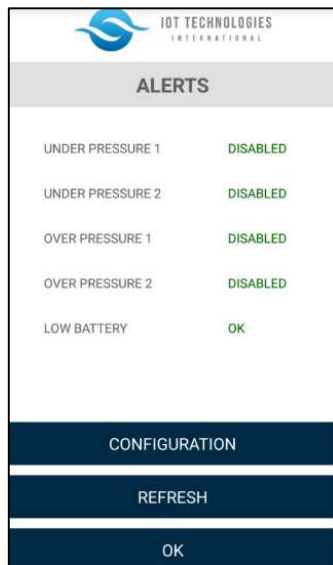
NOTE: There may be times that one of the pressure alarms could display as disabled and red. This will only happen if there if that pressure tag is enabled but no connection to a pressure sensor is detected after the 1st sampling interval. Otherwise, they should all display green when disabled.

SECTION 5.2: IQ PULSE ALARM SAMPLING

The endpoint takes a reading every 5 min and compares that reading to the over/high and under low user defined thresholds. If reading is within those ranges, it will disregard the reading. For ex. the overpressure threshold is set in the app to 123.5 psi and the reading is 110 psi.
After another 5 min, the endpoint will take a reading and compare again. If this time, it is found that the reading is beyond the alarm threshold, for ex., the reading is now 125 psi, the endpoint

will start a 60 sec holdoff timer. This is to ensure the pressure reading was not a temporary or a false alarm.

After the 60 sec holdoff timer has expired, the endpoint takes another reading. If reading has returned to normal levels, the endpoint will disregard the alarm and return to 5 min readings. If the reading is still at or beyond the alarm threshold, the endpoint will wake up and send the alarm to iQ2.

Once the alarm is detected by iQ2, a three min holdoff timer starts. This timer is to ensure the alarm doesn't clear after receiving an alarm clear message from the endpoint should the pressure readings go back to within normal ranges. After the three-minute timer expires and if there has not been an alarm clear message received, iQ2 will send the alarm notification to all those who are subscribed to receive them via their chosen medium.

SECTION 5.3: CONFIGURATION

To change/update the current pressure thresholds, press **CONFIGURTION** button. A list of the currently enabled/disabled pressure alerts as well as their pressure alarm values.

To enable a pressure alert, press the **ENABLE** button. This will place a green checkmark into the box to the left of the button. Enter the appropriate value to compare the sampling to determine if a pressure alert is active. When done, click **OK** to return to the **ALERTS** screen.
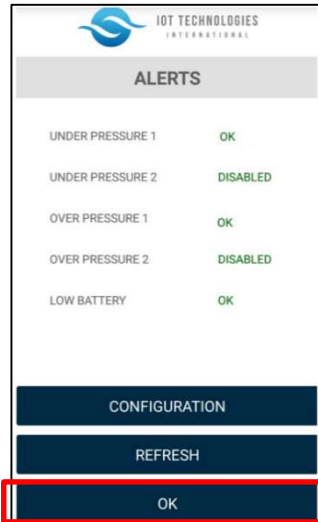

The screen will display **OK** for those alerts that are being monitored and **Disabled** for those that are not. Click **REFRESH** if they are not displaying correctly. Click **OK** to return to the main menu.

Section 6.0: Additional Information

SECTION 6.1: ADDITIONAL INFORMATION

The additional information function provides specific information relating to iQ Pulse GP-CEP. From this menu, information such as RSSI, SIM ID, and battery status, etc. This information may be needed for troubleshooting purposes or to evaluate cellular communications:
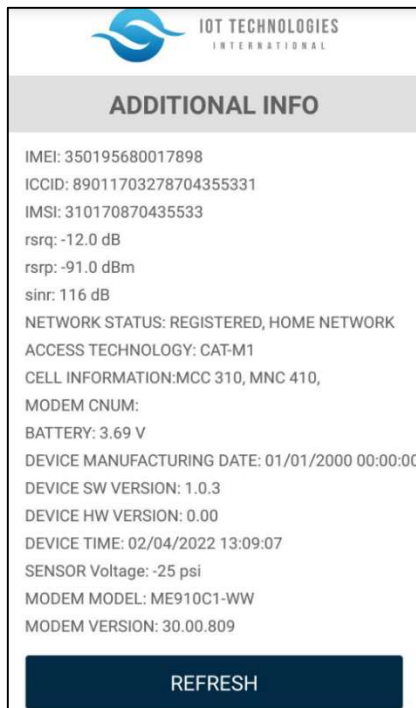
- **DEVICE ID**: Unique Identification number of iQ Pulse GP-CEP100P Cellular endpoint
- **IMEI**: Cellular Modem ID
- **ICCID**: SIM Card ID
- **IMSI**: Operator information
- **RSRQ**: LTE Signal Quality
- **RSRP**: LTE Signal Strength
- **SINR:** Single to Noise Ratio
- **NETWORK STATUS**: Registered statue, Roaming or Home network
- **ACCESS TECHNOLGY**: Type of access (e.g. 4G)
- **CELL INFORMATION**: MCC, MNC
- **BATTERY**: Battery status
- **DEVICE MANUFACTURING DATE**: Date device was manufactured
- **DEVICE SW VERSION**: Software version number
- **DEVICE HW VERSION**: GP-CEP hardware version number
- **DEVICE TIME**: Detected time and date of endpoint
- **SENSOR VOLTAGE**: Detected pressure (PSI)
- **MODEM MODEL**: Cellular module installed
- **MODEM VERSION**: The current FW loaded onto the cellular module

<u>SECTION 6.2: FIRMWARE UPGRADING</u>

There will be times when firmware may need be updated to unlock new features and functionality. Firmware can be uploaded locally via the technicians app. This section will walk through how to perform upgrades.

NOTE: You will need to download the firmware version. Please contact LEC support.

Navigate to the **Additional Information** page. The current firmware version is displayed here.

Scroll to the bottom of the page and click **Software Upgrade**

Select the desired FW version. The firmware file will have a .hex extension. For example, GP-CEP-DDC 1.0.4.hex.

The firmware file will start to download to the endpoint. This process could take several minutest to complete.

Once the download has completed, the endpoint will reboot. You will lose connection to the endpoint and the Bluetooth connection will need to be done to confirm the firmware upgrade is complete.

Once logged backed into the technician's app, navigate back to the Additional Information page to verify the upgrade.

Section 7.0: Pressure Sensor Connection

This section will outline how to physically wire a supported water meter to the iQ Pulse GP-CEP100P. A GP-CEP100P field installation kit is available from LEC.

The GP-CEP100P Field Installation Kit will provide the following:

Quantity	Description
1	GT-Splice Connector

GT-Splice Connector

Additional Recommended Tools:
- Phillips Screwdriver
- Punch down tool
- Wire Stripper
- Wire Cutters
- Zip Ties/brackets

SECTION 7.1: SPLICING THE WIRES

1. Using the wire stripper tool, strip off approximately 1 ½ inches of the outer insulation of the wire on the water meter. Use caution when removing as to not damage the internal signal wires within.

2. Remove the outer foil that surrounds the inner signal wires and discard. Be sure to inspect the inner signal wires to ensure there is not any damage to the insulation which could result in a short.
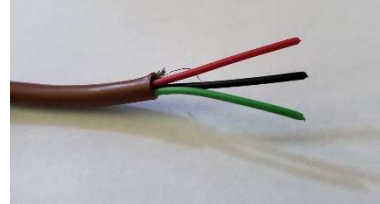
3. Remove the shield drain wire using wire cutters from the water meter as it will not be used. If using a two-wire meter, the green signal wire can be cut flush with the outer insulation sleeve as it is also not needed.
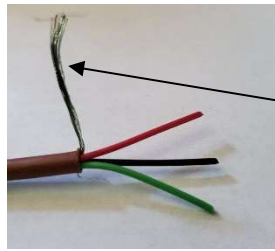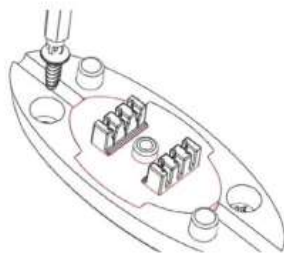

Shield Drain Wire

Exposed Drain Wire

Drain Wire Removed

NOTE: Do not strip any insulation from the inner signal wires.

SECTION 7.2: INSERTING WIRES INTO THE CONNECTOR

1. Attach a GT-Splice Connector to a mounting surface with two provided screws. This will secure the connector to allow for easy punch down of the wires. This step is optional.
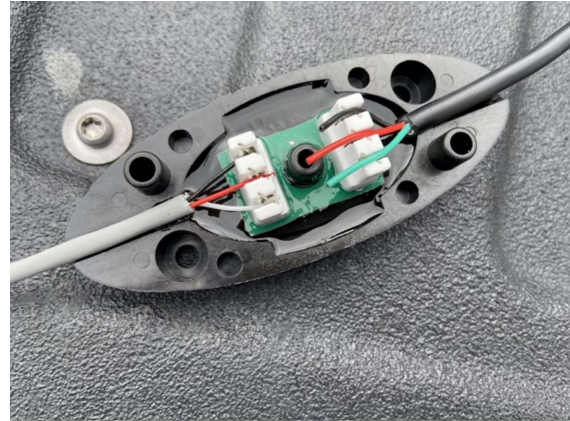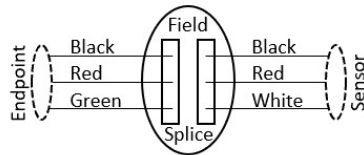

2. Using your finger, hold down the wires and seat each one into the connector and secure the wires using a punch down tool.
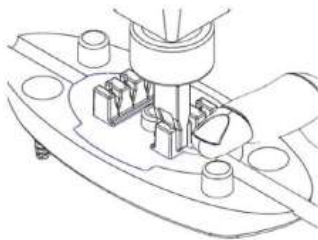
3. Ensure to match the color on the opposite side of the connector based on the wiring diagram below and secure the wires using a punch down tool.
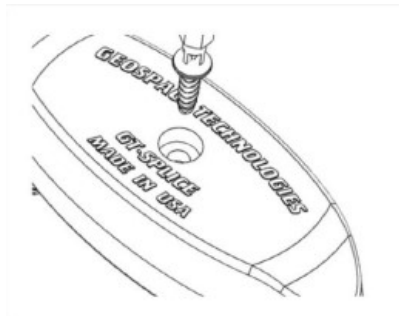

GP-CEP-100P
**Field Wiring Diagram**

Tools required for signal wire splicing:
1. Impact <u>Punchdown</u> Tool
   (reference Klein Tools part# VDV427-300 or equivalent)
2. Phillips Head Screwdriver

4. Complete the installation by placing the top portion of the connector over the wires and secure with Philips head screw.


5. The installation of the pressure sensor and the GP-CEP100P is now complete.
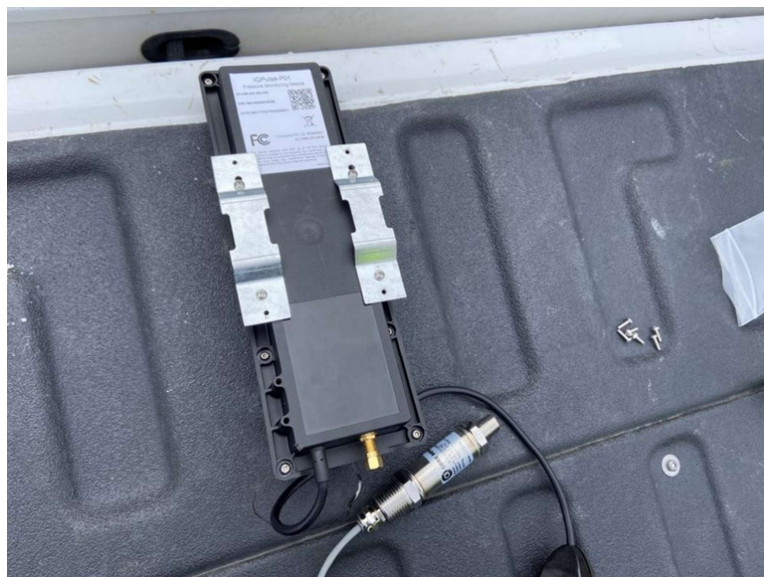
Appendix A: iQ Pulse GP-CEP100P Endpoint Installation Examples

The iQ Pulse pressure monitoring endpoint was designed for ease of installation. The endpoint can be installed on a wall, to the supply pipe using an adjustable collar, or inside a pit using a piece of ¾ in PVC pipe and the standard pit installation kits, provided by LEC.

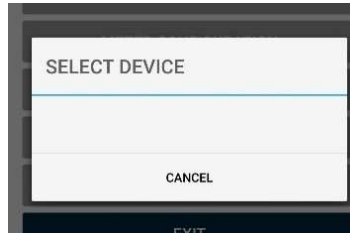Supply line install

Pit Install
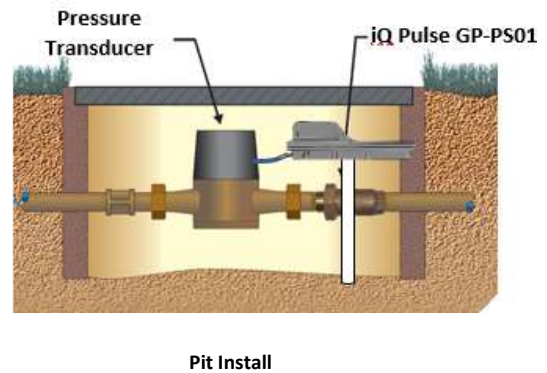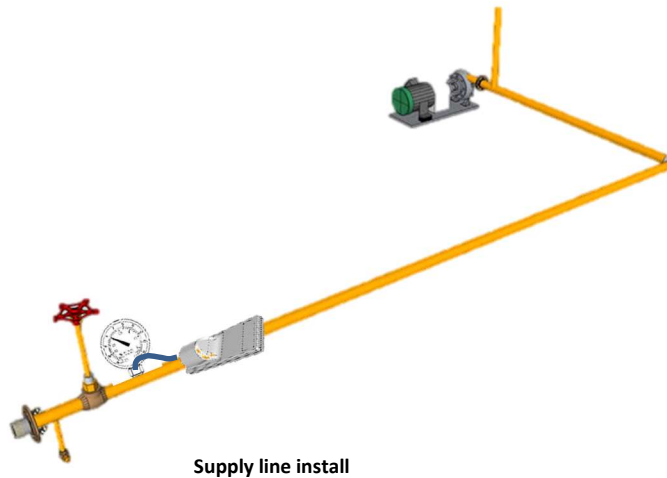
The iQ Pulse pressure monitoring endpoint can be used to monitor pressure on fire hydrants.

Appendix B: Troubleshooting

This section will walk through some common issues that can be found when setting up and/or using the iQ Pulse GP-CEP endpoint.

PROBLEM: Can't connect endpoint to technician's app

SOLUTIONS:

- The Bluetooth connection may not be active. Check the top of the endpoint to ensure the green LED is on. If not, please refer to section 2.1 Activating Technician Communication for more information.

- If the Bluetooth connection still will not connect, the battery may be dead, or Bluetooth sensor may be malfunctioning. Contact Support for RMA
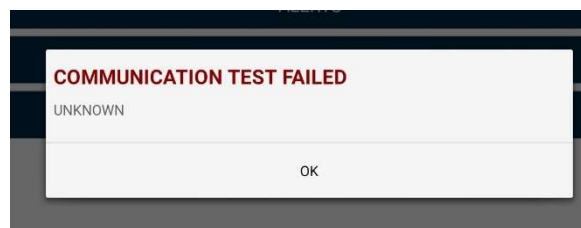
PROBLEM: Device Not Connected: App navigation works but cannot make any changes.
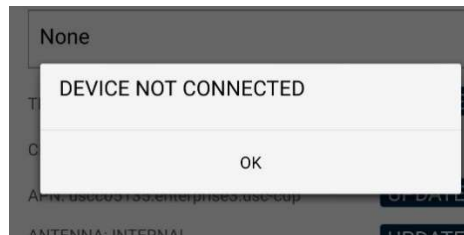
SOLUTION:

- The app is no longer connected to the endpoint. Reactivate the Bluetooth communication to regain connection. Refer to section 2.1: Activating Technician Communication for more information.

PROBLEM: Communication Test Failed: Running a Comm Test displays "unknown" message

SOLUTIONS:

- Endpoint may be in a poor coverage area. Move endpoint to a known good coverage area.

- Connect an external antenna, if available. Refer to section 4.6 Antenna Selection for more information.

- SIM card may not be active. Run a SIM configuration to ensure the SIM card is active with the cellular network. Refer to section 4.8: SIM Configuration for more information.

- SIM card may not being read by the endpoint. Check the Additional Info tab of the technician's app. Refer to the ICCID field. If CCID is present, the SIM is being read however, if the field says, "sim not inserted", the SIM card is not being recognized. Contact Support for RMA.


PROBLEM: Activation Error: Activating an endpoint to the iQ Pulse portal is unsuccessful.


SOLUTIONS:

- Low or no Signal
  - Move endpoint to another location that has known good cellular coverage
  - Add a known good external antenna, if using the internal. Refer to section 4.6 Antenna Selection for more information.
  - Run SIM Configuration, if not already done. Refer to section 4.8: SIM Configuration for more information.
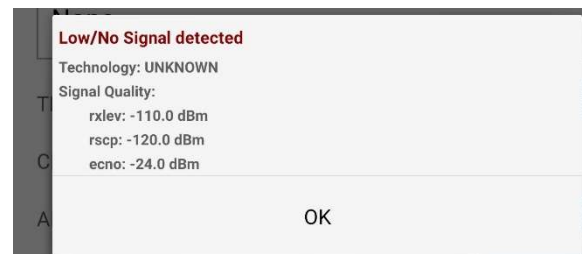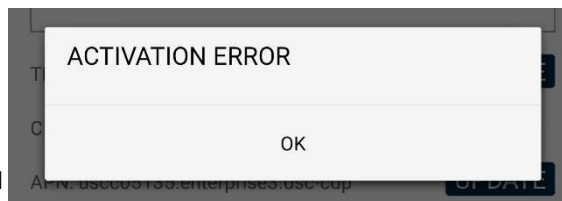

- Device unable to send data; check network:
  - Move endpoint to another location that has known good cellular coverage
  - Add a known good external antenna, if using the internal. Refer to section 4.6 Antenna Selection for more information.

- o Run SIM Configuration, if not already done. Refer to section 4.8: SIM Configuration for more information.
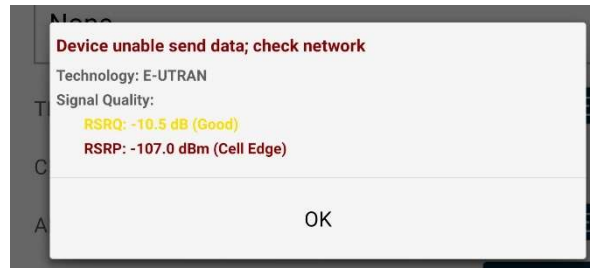
- Sim not inserted
  - o Reboot the endpoint. Refer to section 4.9: Device Reset for more information
  - o SIM is not being recognized. Contact Support for RMA
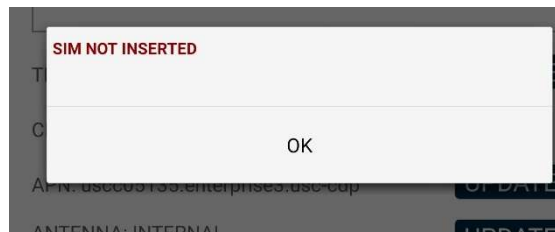
If none of the above fixes the problem, please refer to section 1.2 Support Information of this document to contact support for additional assistance.