

TRAXX[®] Gen3 Mote Installation and Configuration Guide



- ⚠ TRAXX hardware and software must be installed by qualified technicians only.
- ⚠ It is recommended that all AC powered devices be connected to a UPS backup power supply, in addition to any backup power sources that may already be in place.
- ⚠ Safety Instructions:

Do not use this product for protection or as part of an automated emergency system or for any other application that involves protecting people and/or property. Customers and users of KLATU Networks products are responsible for making sure that the product is fit for the intended usage. Do not open the product enclosure except when performing an approved battery replacement procedure. There are no user-serviceable components inside the device other than the battery. Do not disassemble, modify, or attempt to repair internal components. If the device shows signs of improper operation, disconnect it immediately from its power source and contact KLATU Networks technical services.
- ⚠ Electrical warning for devices with AC adapter:

When using a TRAXX product with a [PoE \(Power Over Ethernet\)](#) or AC/DC adapter, always use the specific adapter provided by your supplier (same brand, same product reference). Do not open the adapter yourself and do not dismantle internal components or modify them in any manner. The adapter does not contain any user-reparable parts. If the adapter shows any sign of malfunction, unplug it immediately and contact KLATU Networks for repair or replacement. Do not connect the adapter to a device or peripheral other than the TRAXX product for which it was intended. Unplug the power cable from the electrical outlet when the adapter is not in use. Do not cause a short circuit with the electrical plug. Do not force either the AC or DC plug. Before removing the connector from any TRAXX hardware devices or unplugging power cables, first unplug the cable from the power outlet. Do not subject the adapter to physical shock, which could cause serious malfunction or damage. Do not use or place the adapter in a wet or humid location. This adapter is not waterproof.
- ⚠ Intended Use:
 - The system will collect, store, and provide analytical data. The data analytics collected from multiple assets (fleet) will provide the operator with supporting data for efficiency and cost reduction recommendations.
 - To monitor the performance of the asset to meet the asset's intended use and assess overall health using trending analysis from baseline and other comparable units.
 - Temperature alarm feature is for reference only and it is not intended for specific application requirements for critical sample protection, nor can it be used as a substitute for monitoring the critical temperature performance.

⚠ For reference only:

- The system will monitor overall asset health, detect and alarm on asset malfunction and degradation.
- Service vs. buy decisions
- Remote system health monitoring and troubleshooting for service providers.
- It is not stated nor implied that the system will uplift the intended use of the asset.

⚠ Battery Warning:

Some TRAXX products contain a lithium battery. Make sure you observe polarity (+/-) when inserting batteries into TRAXX devices. Reversing polarity by inserting the batteries incorrectly can cause the product to heat up and may lead to a battery liquid leak. Use only batteries recommended by KLATU Networks. Do not change battery types, such as alkaline and magnesium, or use batteries of different brands or even different types of batteries of the same brand. Incorrect batteries may cause the device to heat up and may result in a fire or battery liquid leakage. Please properly dispose of batteries. Never dispose of batteries in a fire. Do not charge regular batteries that are not specifically rechargeable. When batteries are low, or if the battery-operated device in question remains unused for a long period of time, remove the batteries from the device to avoid any risk of battery liquid leakage. Never leave batteries within reach of children. In case of a battery leak, avoid all contact with the liquid present on the batteries. Rinse with clear water immediately if the battery liquid comes into contact with the eyes, mouth or skin. Contact a doctor or emergency service immediately. Battery liquid is corrosive and can damage vision, or cause blindness or chemical burns.

- The TRAXX Gen3 Mote contains a Li-Ion battery which IATA regulations require be shipped via ground.
- As an additional safety precaution, the battery charge is limited to 20% - 50% of its capacity for shipment.
- Charging cycles and charge current are managed by a Power Management System (PMS). The charge rate is determined by system load, ambient temperature, battery temperature and battery charge state.

⚠ Battery Operating Temperatures

- Operating Temperature: Min 0°C; Typical 25°C; Max 40°C
- Storage and Shipping Temperature: Min -20°C; Typical 25°C; Max 45°C

⚠ Recommended maintenance and PM intervals for Li battery:

- Recommended to change the mote's back-up battery two (2) calendar years after installation.

⚠ Environmental operating limits:

- The mote is designed and intended for reliable operation at normal indoor ambient temperature and humidity.

- Motes and sensors shall not be placed in environmental conditions beyond recommended specifications.
- Neither the mote nor any sensors are submersible.
- Operating temperature range: 0°C to +40°C
- Operating humidity range: 0 - 85%RH, non-condensing

⚠ Environmental protection:

- Please respect local regulations concerning disposal of packaging, unused wireless devices and their accessories, and promote their recycling.

⚠ CO2 Sensor Configuration:

The Gen 3 Mote is shipped with its lithium battery in an undercharged state of between 25% and 50% of its capacity in accordance with DOT regulations. Although this low level of charge is sufficient for the Mote to operate on battery power for brief periods of time, it is not sufficient to support the attachment and configuration of high current sensors (e.g. CO2 sensor)—even if the Mote is plugged in to line power. The attachment of a CO2 sensor while the battery is undercharged, or while it is being charged, will cause the Mote to enter a reboot loop (indicated by a blinking Status LED), which will continue until the battery is fully charged and operating with line power—a process that could take 3-6 hours. Once the Mote is fully configured with a CO2 sensor and line power is subsequently removed, the system (Gen3 Mote + CO2 sensor) will function normally until the battery is exhausted, at which time the system will shut down. When line power is restored, the system will reboot and resume normal operation within approximately 90 minutes after line power is restored.

Upon delivery, the Gen3 Mote must be fully charged by an installation technician until the Mote's Status LED is solid green. While under line power and when the Status LED is solid green, the CO2 sensor can then be attached and configured per the instructions found in this document.

⚠ Disclaimer and limitation of liability:

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**FCC Compliance
Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information**

Unique Identifier: Gen3 Mote

Authorized Components Used in Assembly: Raspberry Pi 3B+ Module, FCC ID: 2ABCB-RPI3B

FCC Compliance Statement:

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

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

Responsible Party:

KLATU Networks, Inc.

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Compliance Information Statements for Raspberry Pi 3B+, FCC ID: 2ABCB-RPI3B:

FCC Compliance Statement:

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

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

FCC Caution: Any changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This device is installed to be operated with a minimum of 20cm distance between the antenna and user.

ISED Compliance:

English

This device complies with ISED's license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and

2. This device must accept any interference received, including interference that may cause undesired operation of the device.

This radio transmitter (IC: 20953-RPI3P) has been approved by ISED Canada to operate with the antenna on board (the antenna on board is a Dual band (2.4GHz and 5GHz) PCB niche antenna design

licensed from Proant with Peak Gain: 2.4GHz 3.5 dBi, 5GHz 2.3 dBi) with the maximum permissible gain indicated. Antenna not included in this list, having gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

The operation of the device in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems. This equipment complies with ISED RSS 102 radiation exposure limits set forth for an uncontrolled environment. This equipment installed to be operated with a minimum of 20cm distance between the antenna and the user.

Please note that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and these radars can cause interference and/or damage to LELAN (License Exempt Local Area Network) devices.

French

Cet appareil est conforme au(x) standard(s) RSS exemptes de licence d'Industrie Canada. Son exploitation est soumise aux deux conditions suivantes:

1. Cet appareil ne doit pas occasionner d'interférences, et
2. Cet appareil doit supporter toutes les interférences, y compris celles qui pourraient provoquer un mauvais fonctionnement de cet l'appareil.

Cet émetteur radio (IC: 20953-RPI3P) a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés (l'antenne intégrée est une conception d'antenne de niche pour circuit imprimé bibande (2,4 GHz et 5 GHz) sous licence de Proant avec gain de pic: 2,4 GHz, 3,5 dBi, 5 GHz, 2,3 dBi), avec le gain d'antenne maximal autorisé indiqué. types d'antennes non incluses dans cette liste ayant un gain est supérieur au gain maximal indiqué pour ce type, sont strictement interdites pour une utilisation avec cet appareil.

L'utilisation de l'appareil dans la bande de fréquences 5150-5250 MHz est uniquement valable en intérieur pour réduire le risque de brouillage nuisible au fonctionnement des systèmes mobiles par satellite partageant les mêmes canaux.

Cet appareil est conforme aux limites de la norme IC RSS-102 concernant l'exposition aux radiations dans un environnement non contrôlé. Cet appareil doit être installé et utilisé avec une distance minimale de 20 cm entre l'antenne et le corps de l'utilisateur.

Veuillez noter que les radars haute puissance sont définis comme utilisateurs principaux (i.e. utilisateurs prioritaires) des bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars peuvent causer des interférences et / ou endommager les appareils LE-LAN (réseau local exempt de licence).

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Gen3 Mote Installation Instructions

What You Need

- A laptop or desktop computer with a spare Ethernet port configured with a static IP address
- Two (2) Ethernet cables
- Gen3 Mote
- PoE injector, PoE switch, or PoE enabled wall outlet (for power and/or Internet connectivity)
 - ⚠ The PoE supply must be 802.3af compliant. Using non-802.3af compliant PoE will void the warranty and could result in damage to the mote.
- Supported USB, RS232, RS485 sensors and/or incubators
 - ⚠ For CO₂ sensors: Upon delivery, the Gen3 Mote must be fully charged until the Mote's Status LED is solid green. While under line power and when the Status LED is solid green, the CO₂ sensor can then be attached and configured per the instructions found in this document.
- Micro-screwdriver – flat head; 0.4 x 2.0 x 60 mm (for Smart Sensor cables only)
- RJ45 splitter cable (if connecting both Vaisala CO₂ and humidity/temp sensors)
- Web browser (Chrome, Firefox, Safari, IE)
- Multimeter

Step 1 – Physical Connection

1. Connect the sensor(s) and/or incubators to any available USB port and/or the RS232/485 port on the mote.
 - ⚠ **Sensors and incubators must be connected to the mote prior to configuration.**



Sensor connected to USB port



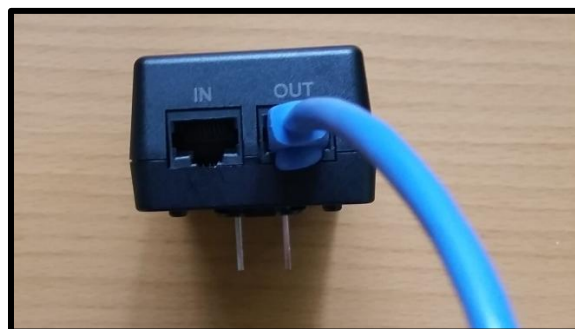
Sensor connected to RS232/RS485 port

2. Mote power connection for Wi-Fi installations:
 - a. Connect an Ethernet cable to the mote's PoE/LAN port and plug other end into the "OUT" port on the PoE injector. The PoE injector supplies power to the mote.

⚠ CAUTION: The PoE supply must be 802.3af compliant. Using non-802.3af compliant PoE will void the warranty and could result in damage to the mote.



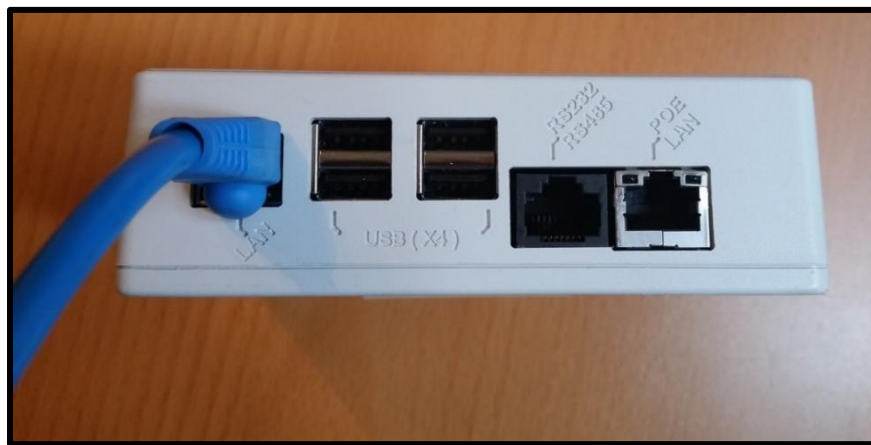
Ethernet cable connected to PoE/LAN port from PoE injector, PoE switch, or PoE-enabled outlet



Ethernet cable connected to PoE injector from mote's PoE/LAN port

3. Mote power connection for non-Wi-Fi installations (direct to LAN):
 - a. Method 1 (requires two Ethernet cables)
 - i. Connect an Ethernet cable between the mote's PoE/LAN port and the "OUT" port on the PoE injector. The PoE injector supplies power to the mote.

- ii. Connect a second Ethernet cable between the “IN” port on the PoE injector and an Ethernet port on the customer’s LAN. The LAN connection supplies Internet connectivity to the mote.
 - b. Method 2
 - i. As an alternative to the supplied PoE injector, the mote can also be powered by connecting the Ethernet cable from the PoE/LAN port directly to a PoE switch or PoE-enabled RJ-45 wall outlet. The switch or RJ-45 wall outlet supplies both power and Internet connectivity to the mote.
- ⚠ CAUTION:** The PoE supply must be 802.3af compliant. Using non-802.3af compliant PoE will void the warranty and could result in damage to the mote.
4. Connect the second Ethernet cable to the computer’s Ethernet port and plug the other end into LAN port on mote. This connection is for mote configuration purposes only.



Ethernet cable from computer connected to LAN port

5. Turn on the mote’s power using the OFF/ON switch. The mote’s Status and Network LEDs will turn solid green once the unit is powered up and configured correctly on the wireless network.
 - a. The solid green “Status” LED lights up immediately. This LED will turn red after approximately 30 seconds if the mote is running on battery power, not PoE.
 - b. The “Network” LED lights up after approximately 30 seconds. If the unit is configured to communicate on the customer’s wireless network, then the LED will be solid green. If the unit is not able to communicate on the customer’s wireless network, then the LED will blink red.
 - c. The “Sensor” LED is off by default, but blinks green (1x) when it samples the sensors.



Mote OFF/ON switch

Mote LED Definitions

During normal operation, the status LED and Network LED will be solid green. The Sensor LED blinks every time the sensors are being sampled.

LED	State	Meaning
Status	Solid green	Mote is powered on and receiving line power
	Flashing green	Mote is on line power; battery is charging
	Flashing once a minute	Mote is running on battery backup; check power connections
	Off	Mote is powered off; check power connections and power switch
Network	Solid green	Mote is online and connected to Wi-Fi and cloud
	Flashing green	Mote is sending a backlog of stored data; normal after an extended outage
	Alternating green/red	Mote is connected to Wi-Fi but cannot reach the cloud server
	Flashing red	Mote cannot connect to Wi-Fi; check network configuration
	Off (Status LED solid green)	Possible power loss or hardware failure
Sensor	Single periodic green flash	Normal; mote is sampling sensors

When external power has been lost and the mote is running on battery backup, all LEDs will shut off to conserve battery power. The LEDs will blink once a minute to indicate the status.

(Status LED will blink red and the network LED will blink green if the mote is still connected to the network or red if it is no longer connected to the network.)

⚠ CAUTION: When power cycling the mote, all LEDs must be dark before powering ON the mote. All LEDs should go dark within 10 seconds of powering the mote OFF. If the LEDs don't go dark after 10 seconds, use a paper clip to press the Reset button. The Reset button is located on the front of the mote, just to the lower left of the power switch. Pressing the Reset button will immediately force all LEDs to go dark. Once all LEDs are dark, the power can be switched on.



Mote Reset Button

Step 2 – IP Configuration

The computer used to connect to the mote must be configured an Ethernet port with a static IP address.

- ⚠ This typically requires Admin access to your computer, and you may need assistance from your company's IT department to complete this step.

Configure the following static IP on your computer's Ethernet port:

IP: 192.168.5.10

Netmask: 255.255.255.0

Gateway and DNS servers can be blank.

Instructions for configuring static IP on your computer:

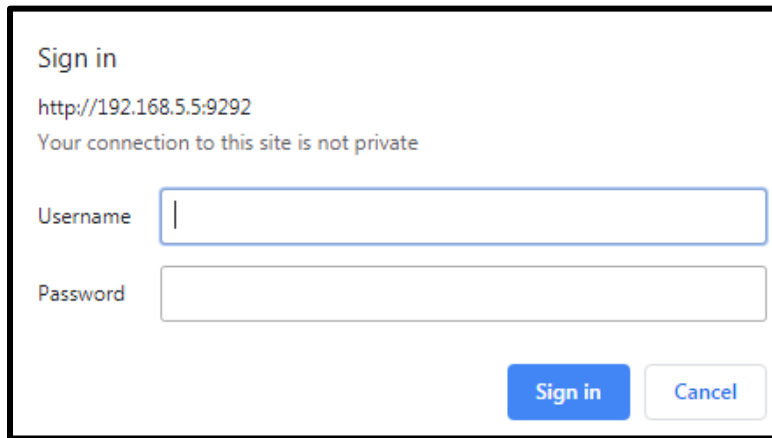
- Windows: [Change TCP/IP Settings \(Microsoft Support\)](#)
- macOS: [Change TCP/IP Settings \(Apple Support\)](#)

Instructions for configuring static IP on Windows 7, 8, and 10:

1. Click Start Menu > Control Panel > Network and Sharing Center -or- Network and Internet > Network and Sharing Center.
2. Click Change Adapter Settings.
3. Right click on Local Area Connection -or- Ethernet.
4. Click Properties.
5. Click Internet Protocol Version 4 (TCP/IPv4).
6. Click Properties.
7. Select Use the Following IP Address.
8. Enter the IP Address – 192.168.5.10
9. Enter the Subnet Mask – 255.255.255.0
10. The Default Gateway and DNS Server fields should remain blank.
11. Click OK.

Step 3 – Web Interface

1. Now that the computer has a static IP ([Step 2](#) above), it's time to configure the mote.
2. Open your web browser and navigate to: <http://192.168.5.5:9292>
3. Each mote's configuration screen is password protected, so you will need to login.
 - a. Username = admin
 - b. Password = password
 - c. The default username and password can be changed to something more secure (see [Step 11](#) below).



Sign in

<http://192.168.5.5:9292>

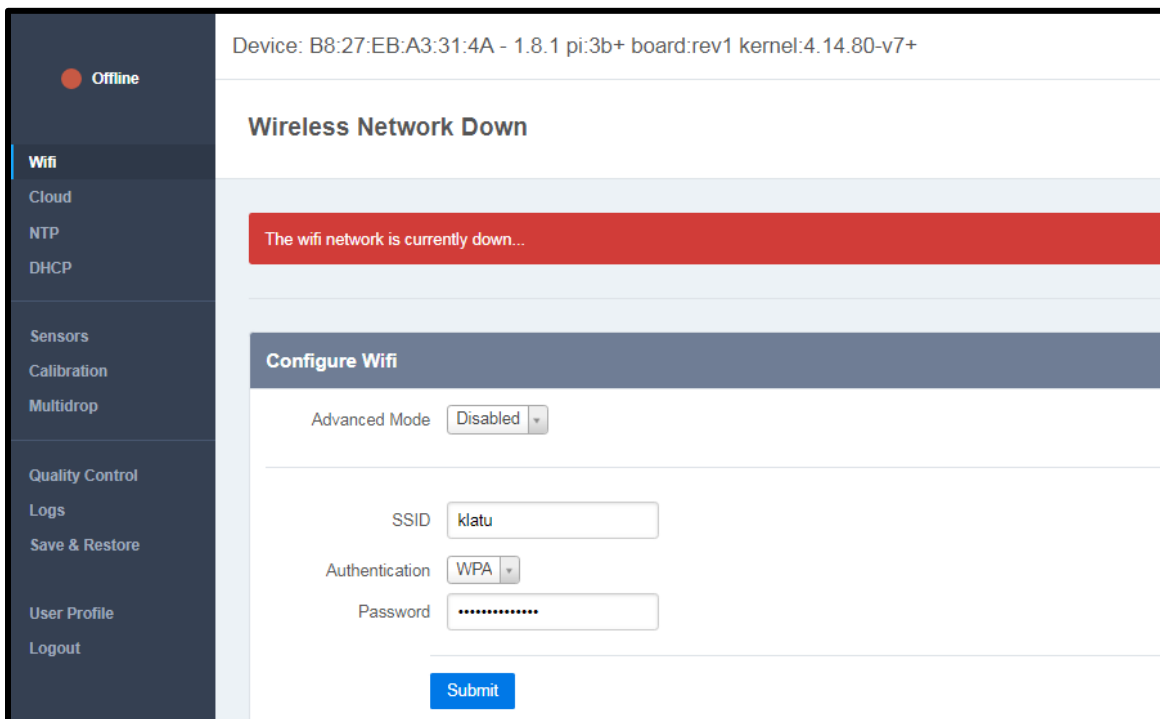
Your connection to this site is not private

Username

Password

Sign In screen

4. After logging in, you should see a page that looks like the following:



Device: B8:27:EB:A3:31:4A - 1.8.1 pi:3b+ board:rev1 kernel:4.14.80-v7+

Wireless Network Down

The wifi network is currently down...

Configure Wifi

Advanced Mode

SSID

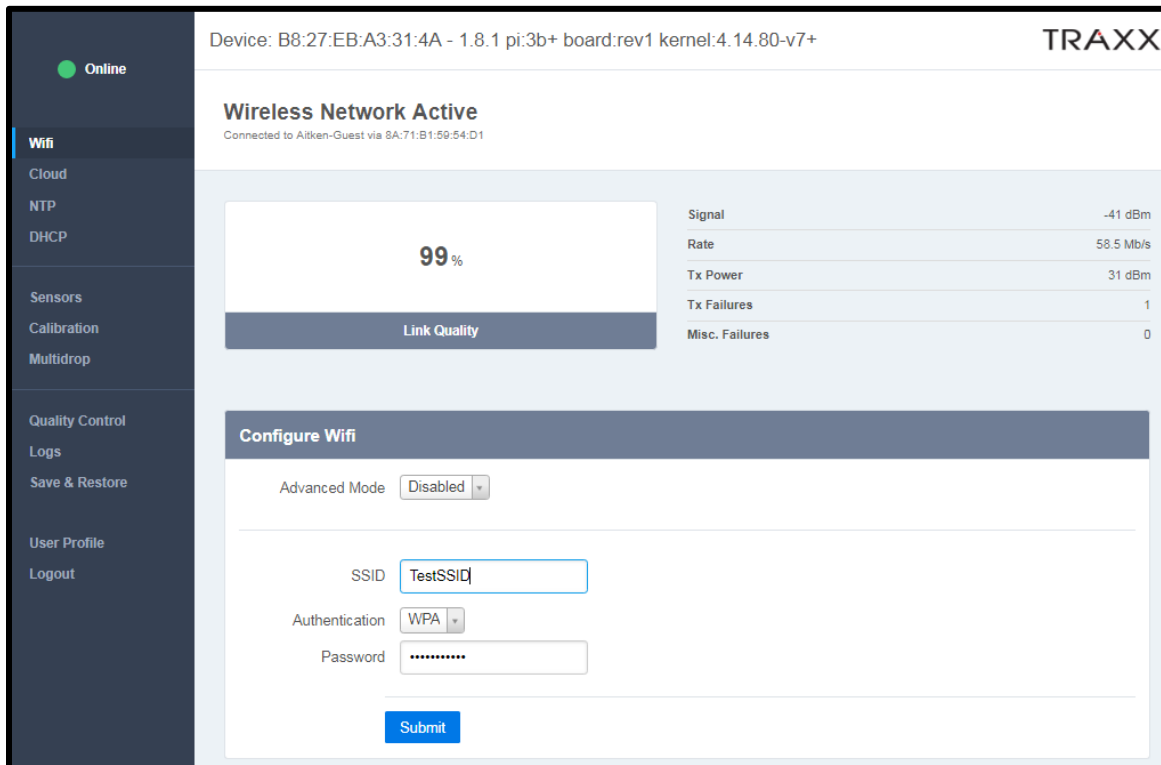
Authentication

Password

Web browser mote configuration interface

Step 4 – Configure Wi-Fi

1. Go to the “Wifi” menu. Enter the SSID, Authentication type, and Password (if necessary).
2. Click Submit.
3. After a few seconds, if the network settings are “good” the screen will update with “Online” in the top-right corner of the screen and new wireless stats, which look like the following:



The screenshot shows the TRAXX web interface. At the top, it says "Device: B8:27:EB:A3:31:4A - 1.8.1 pi:3b+ board:rev1 kernel:4.14.80-v7+" and "TRAXX". On the left sidebar, "Online" is indicated with a green dot, and the "Wifi" menu is selected. The main content area shows "Wireless Network Active" with a status of "Connected to Aikken-Guest via 8A:71:B1:59:54:D1". Below this, a "Link Quality" section displays "99 %". To the right, a table shows network statistics:

Signal	-41 dBm
Rate	58.5 Mb/s
Tx Power	31 dBm
Tx Failures	1
Misc. Failures	0

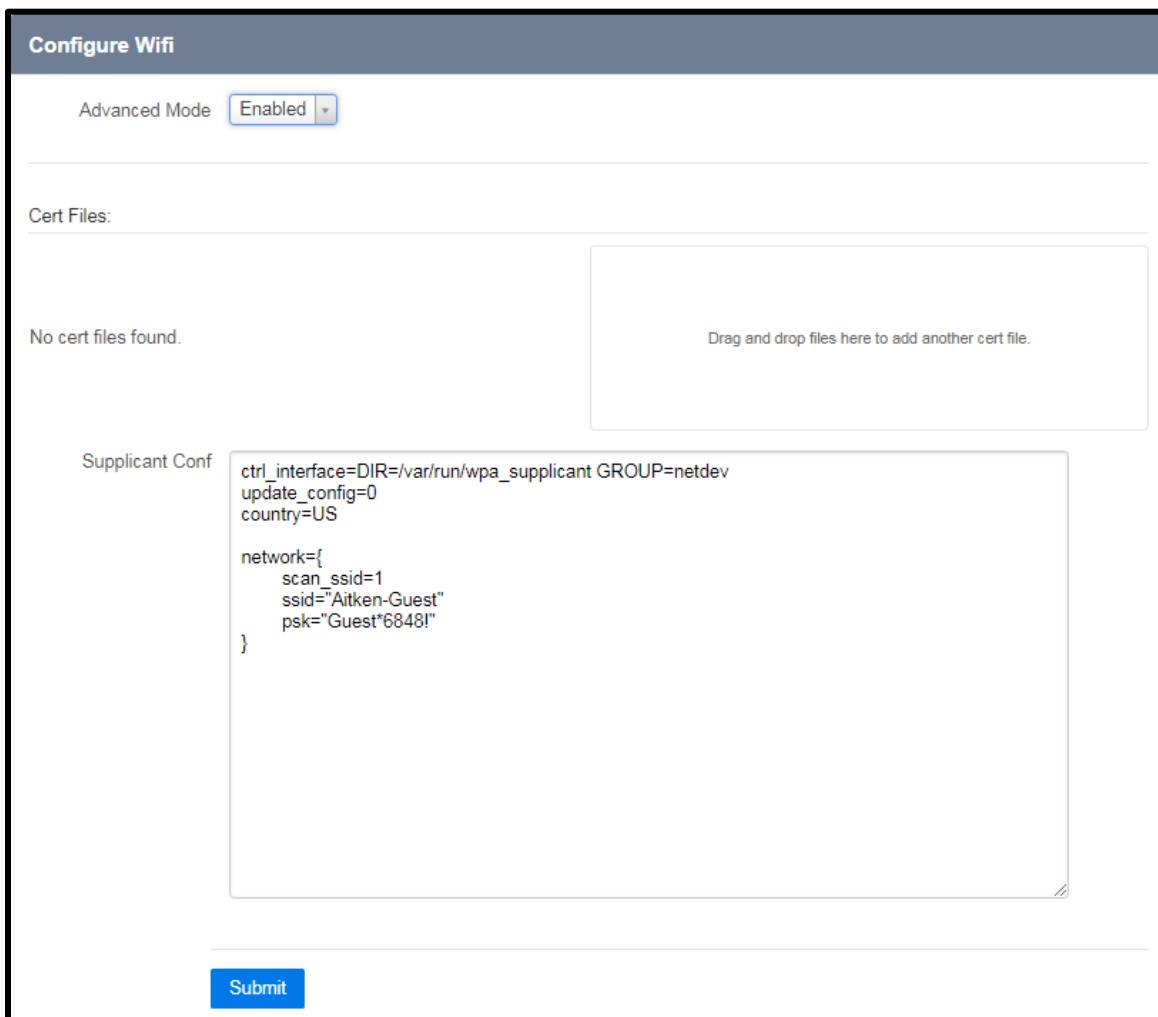
Below the statistics is the "Configure Wifi" section. It has a dropdown for "Advanced Mode" set to "Disabled". The "SSID" field contains "TestSSID", the "Authentication" dropdown is set to "WPA", and the "Password" field is masked with dots. A blue "Submit" button is at the bottom.

Configuring Wi-Fi

4. The network statistics will automatically update every 5 seconds.
5. Link quality of 50% or better is OK; Signal better than -70dBm (typically -40 to -70) is OK.
 - a. Wi-Fi connections with Signal worse than -69dBm are not supported. An Ethernet connection should be used if Wi-Fi signal strength cannot be improved.
6. The Network LED on the front of the mote will turn solid green only after the Wi-Fi and Cloud ([Step 5](#) below) have been configured correctly.
 - a. If the Network LED is flashing red, then the mote is unable to connect to the Wi-Fi network.
 - b. If the Network LED is flashing green, then the mote is either unable to connect to the cloud servers or is attempting to purge a large backlog of data. Go to the “Cloud” menu to see size of data backlog queue and to correctly set the cloud “URL” (see [Step 5](#) below).
7. For standard installations, set Advanced Mode to “Disabled.”

Advanced Mode

- ⚠ Advanced Mode is a specialized 802.1x feature intended for IT professionals only.
 - ⚠ Advanced Mode technical support from KLATU Networks is only available if a TRAXX Care support contract has been purchased by the customer.
 - ⚠ For more information regarding 802.1x, please reference official WPA Supplicant docs on the Internet. See https://w1.fi/wpa_supplicant/
-
- For networks that require 802.1x security authentication, set Advanced Mode to “Enabled.”
 - If the network requires 802.1x, then:
 - Certs can be uploaded. Use the Drag/Drop box to add a cert file.
 - The WPA Supplicant configuration can be edited in the “Supplicant Conf” box.



Configure Wifi

Advanced Mode Enabled ▾

Cert Files:

No cert files found.

Drag and drop files here to add another cert file.

Supplicant Conf

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=0
country=US

network={
    scan_ssid=1
    ssid="Aitken-Guest"
    psk="Guest"6848!"
}
```

Submit

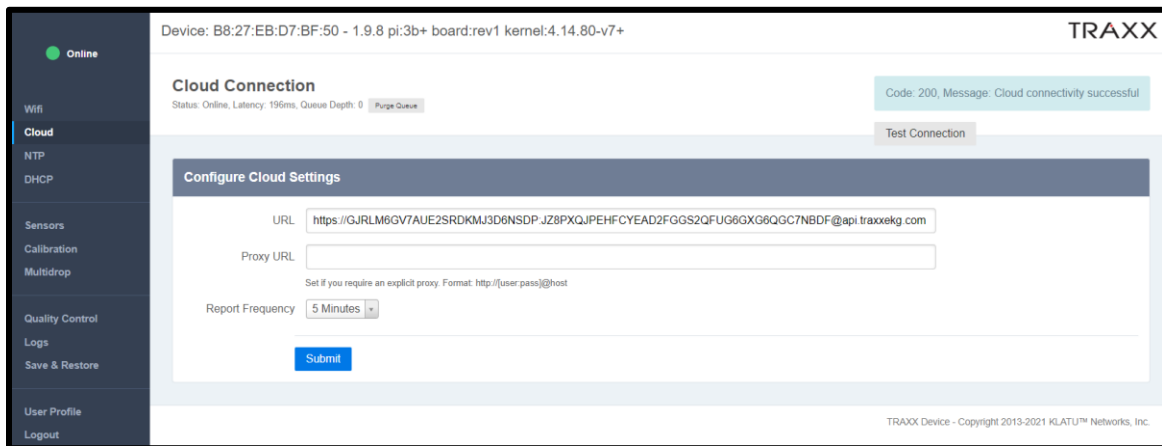
Wi-Fi Advanced Mode

- Supported WPA/IEEE 802.11i features:
 - WPA2-PSK
 - WPA with EAP (e.g., with RADIUS authentication server) (“WPA-Enterprise”)
 - Key management for CCMP, TKIP, WEP104, WEP40
 - WPA and full IEEE 802.11i/RSN/WPA2
 - RSN: PMKSA caching, pre-authentication
 - IEEE 802.11r
 - IEEE 802.11w
 - Wi-Fi Protected Setup (WPS)
- Supported EAP methods (IEEE 802.1X Supplicant)
 - EAP-TLS
 - EAP-PEAP/MSCHAPv2 (both PEAPv0 and PEAPv1)
 - EAP-PEAP/TLS (both PEAPv0 and PEAPv1)
 - EAP-PEAP/GTC (both PEAPv0 and PEAPv1)
 - EAP-PEAP/OTP (both PEAPv0 and PEAPv1)
 - EAP-PEAP/MD5-Challenge (both PEAPv0 and PEAPv1)
 - EAP-TTLS/EAP-MD5-Challenge
 - EAP-TTLS/EAP-GTC
 - EAP-TTLS/EAP-OTP
 - EAP-TTLS/EAP-MSCHAPv2
 - EAP-TTLS/EAP-TLS
 - EAP-TTLS/MSCHAPv2
 - EAP-TTLS/MSCHAP
 - EAP-TTLS/PAP
 - EAP-TTLS/CHAP
 - EAP-SIM
 - EAP-AKA
 - EAP-AKA
 - EAP-PSK
 - EAP-FAST
 - EAP-PAX
 - EAP-SAKE
 - EAP-IKEv2
 - EAP-GPSK

Step 5 – Configure Cloud URL and HTTP Proxy

⚠ CAUTION: If the mote has been powered on without being able to connect to the TRAXX cloud servers, then a large backlog of sensor data can start building up in the mote's memory. This is denoted by the "Queue Depth." A large Queue Depth number can delay the mote appearing in the TRAXX software application. Click the "Purge Queue" button to permanently delete the backlogged files and instantly reduce the Queue Depth to zero. Purged backlog files cannot be recovered.

1. Contact KLATU customer support to obtain the TRAXX Link server URL.
2. Select "Cloud" from the menu in the left margin.
3. Paste the TRAXX Link server URL into the "URL" box.
4. Select a time from the "Report Frequency" drop down.
 - a. This value specifies how often the mote sends data to the server.
 - b. Select 5 minutes unless otherwise instructed.
5. Click Submit.
6. Click the "Test Connection" button at the top right corner of the screen.
 - a. If an error is received after clicking "Test Connection" then check all configuration settings and try again. Contact your IT contact and/or KLATU customer support if you continue to have issues.
 - b. If the TRAXX Link URL is correct and Wi-Fi is online, then you will see a "Cloud Connectivity Successful" message like the following:

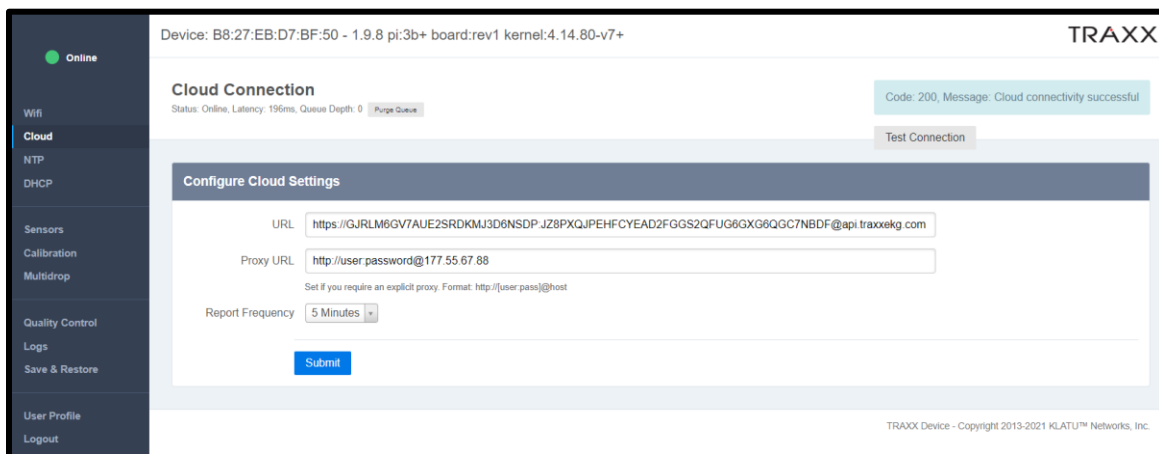


The screenshot shows the TRAXX web interface for configuring cloud settings. On the left is a sidebar menu with options: Online, WiFi, Cloud (selected), NTP, DHCP, Sensors, Calibration, Multidrop, Quality Control, Logs, Save & Restore, User Profile, and Logout. The main content area is titled "Cloud Connection" and shows the device status as "Online" with a latency of 196ms and a queue depth of 0. A "Purge Queue" button is available. Below this is a "Configure Cloud Settings" section with fields for "URL" (containing a long alphanumeric string), "Proxy URL" (empty), and "Report Frequency" (set to "5 Minutes"). A "Submit" button is at the bottom of this section. At the top right of the main area, a message box displays "Code: 200, Message: Cloud connectivity successful" and a "Test Connection" button. The footer of the interface reads "TRAXX Device - Copyright 2013-2021 KLATU Networks, Inc."

Configuring the Cloud Connection

In some organizations, HTTP and HTTPS traffic require an explicit proxy. If a proxy is required:

1. Select “Cloud” from the menu in the left margin.
2. Enter the HTTP proxy (obtained from IT) in the “Proxy URL” box
 - a. A common format is `http://user:password@177.55.67.88`
3. Click Submit.
4. Click the “Test Connection” button at the top right corner of the screen.
 - a. If an error is received after clicking “Test Connection” then check all configuration settings and try again. Contact your IT contact and/or KLATU customer support if you continue to have issues.
 - b. If the TRAXX Link and Proxy URL are correct, then you will see a cloud connectivity successful message like the following:



Device: B8:27:EB:D7:BF:50 - 1.9.8 pi:3b+ board:rev1 kernel:4.14.80-v7+

TRAXX

Online

Wifi

Cloud

NTP

DHCP

Sensors

Calibration

Multidrop

Quality Control

Logs

Save & Restore

User Profile

Logout

Cloud Connection

Status: Online, Latency: 196ms, Queue Depth: 0 [Purge Queue](#)

Code: 200, Message: Cloud connectivity successful

Test Connection

Configure Cloud Settings

URL

Proxy URL

Set if you require an explicit proxy. Format: http://[user:pass]@host

Report Frequency

[Submit](#)

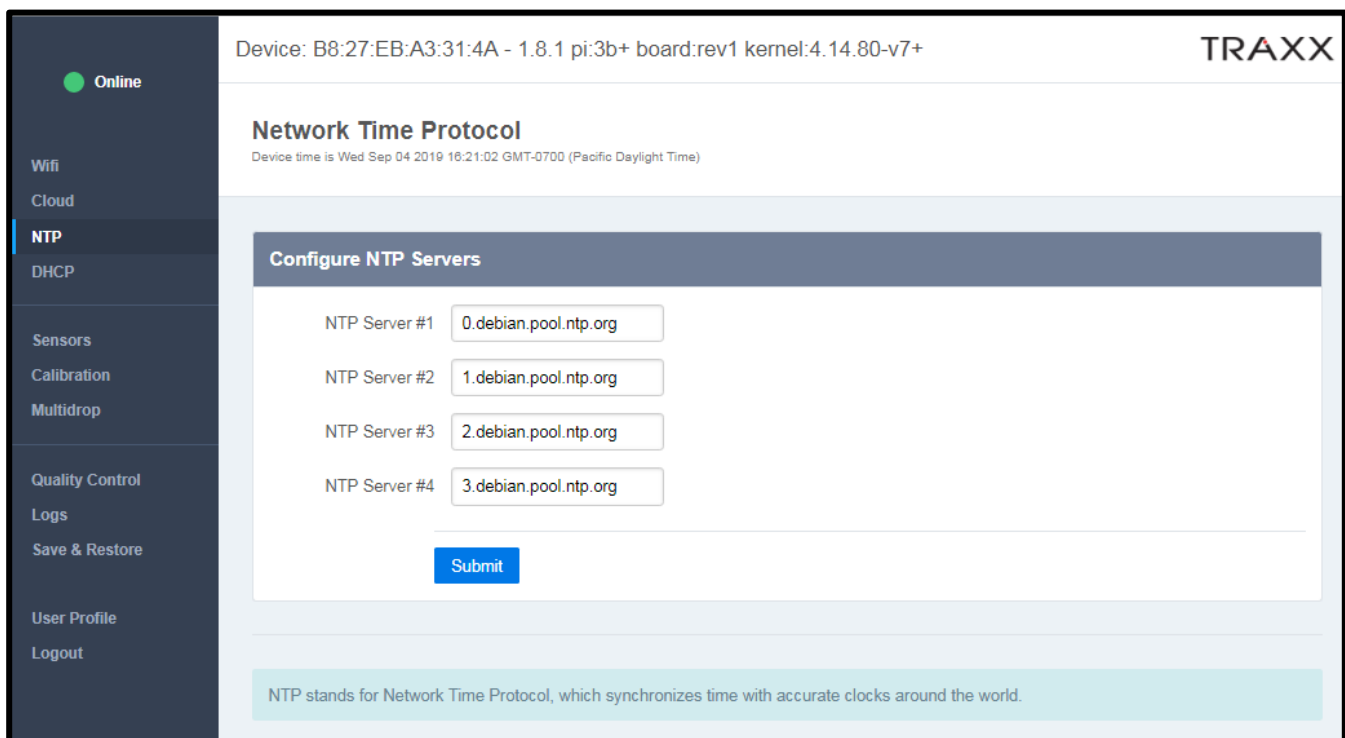
TRAXX Device - Copyright 2013-2021 KLATU™ Networks, Inc.

Configuring the Proxy URL

Step 6 – NTP

Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems and devices. The mote needs to communicate with at least one NTP server in order to maintain the correct time. The default NTP server URLs built-in to the mote may work, or the customer IT group may provide their own NTP server URL(s).

1. Select “NTP” from the menu in the left margin.
2. Click “Submit” to see if the default NTP server URLs will work.
3. Verify that the “Device Time” at the top of the screen is correct based on the local time zone.
4. If the “Device Time” is incorrect, a simple workaround is to enter the TRAXX Gateway Server IP address into the “NTP Server #1” field. Contact customer support if necessary.
 - a. Click the “Submit” button and verify that the “Device Time” updates to the correct local time.
 - b. If the “Device Time” is incorrect, the mote may fail to connect to the cloud servers and the “Test Connection” feature located in the “Cloud” menu may be unsuccessful.

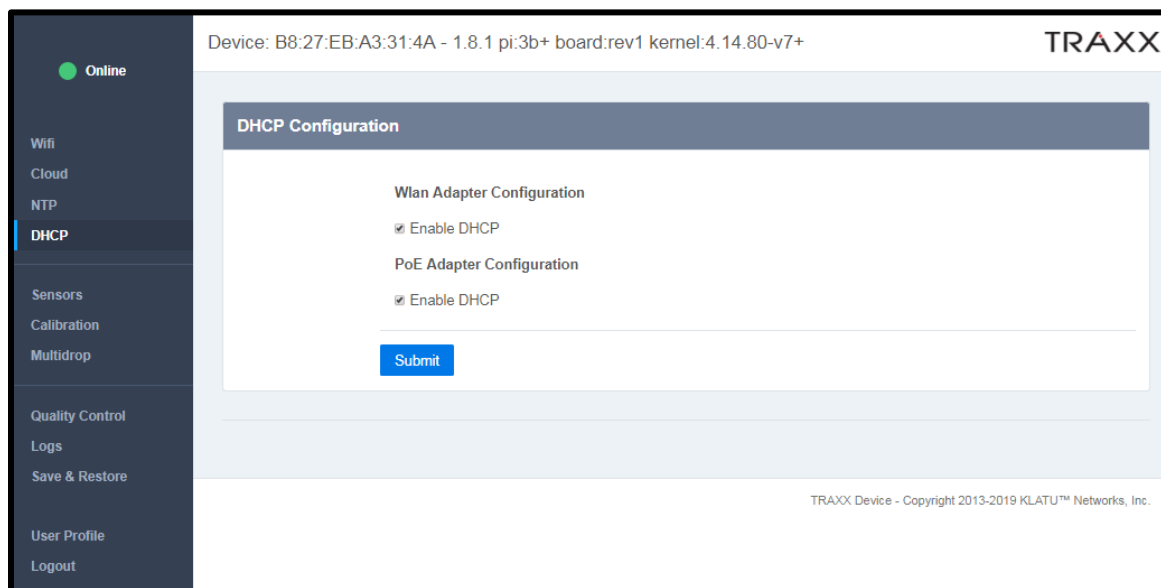


Configuring NTP servers

Step 7 – DHCP

The motes get their IP address by default via the customer's DHCP server. In rare cases, the customer's IT department may want to assign a static IP address to the mote. A static IP address can be assigned to both the Wi-Fi and Ethernet connections. To assign a static IP address to the mote:

1. Select "DHCP" from the menu in the left margin.
 - a. "WLAN adapter" is for connecting the mote via Wi-Fi to the Internet.
 - b. "PoE adapter" is for connecting the mote via Ethernet to the Internet.
 - c. DHCP is enabled for the specified network adapter if the "Enable DHCP" box is checked.
2. To assign a static IP address to the Wi-Fi network adapter:
 - a. Uncheck the box underneath the WLAN Adapter Configuration header.
 - b. Fill out the resulting form with the info acquired from the IT department.
3. To assign a static IP address to the PoE network adapter:
 - a. Uncheck the box underneath the PoE Adapter Configuration header.
 - b. Fill out the resulting form with the info acquired from the IT department.
4. Click the Submit button to save any changes.

The screenshot shows the TRAXX device configuration web interface. On the left is a dark sidebar with a menu: Online (with a green dot), Wifi, Cloud, NTP, DHCP (highlighted with a blue bar), Sensors, Calibration, Multidrop, Quality Control, Logs, Save & Restore, User Profile, and Logout. The main content area has a header "Device: B8:27:EB:A3:31:4A - 1.8.1 pi:3b+ board:rev1 kernel:4.14.80-v7+" and the "TRAXX" logo. Below this is a "DHCP Configuration" section with a blue header. It contains two sub-sections: "Wlan Adapter Configuration" and "PoE Adapter Configuration". Each has a checked checkbox for "Enable DHCP". At the bottom of the configuration area is a blue "Submit" button. A footer at the bottom right reads "TRAXX Device - Copyright 2013-2019 KLATU™ Networks, Inc."

Mote Configured for DHCP

DHCP Configuration

Wlan Adapter Configuration

☐ Enable DHCP

IP Address172.66.15.4/20

Router172.66.125.12

Router #2172.66.125.13

DNS Server156.23.14.77

DNS Server #2156.23.14.78

PoE Adapter Configuration

☒ Enable DHCP

Submit

Static IP Configuration on Wi-Fi Adapter

DHCP Configuration

Wlan Adapter Configuration

☒ Enable DHCP

PoE Adapter Configuration

☐ Enable DHCP

IP Address166.35.21.12/22

Router147.26.125.33

Router #2147.26.125.34

DNS Server188.127.3.2

DNS Server #2188.127.3.3

Submit

Static IP Configuration on PoE/Ethernet Adapter

Step 8 – Sensors

⚠ CAUTION: The sensors and incubators must be physically connected to the mote prior to configuration. Only supported sensors and incubators are compatible with the mote. If using a USB sensor, any of the four available USB ports on the mote may be used.

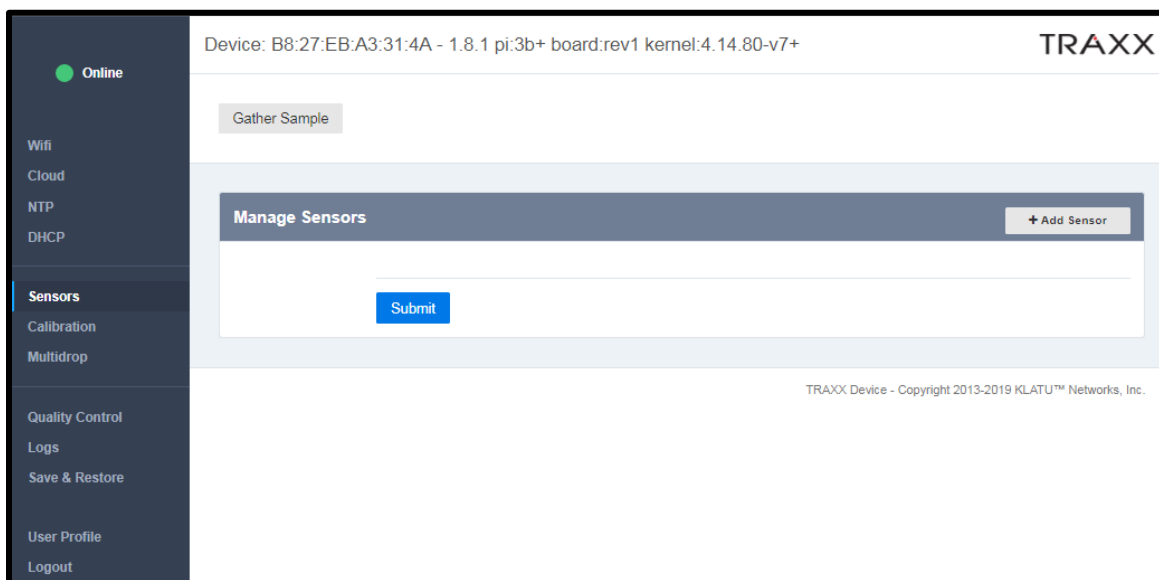
⚠ CO₂ Sensor Configuration Only:

The Gen 3 Mote is shipped with its lithium battery in an undercharged state of between 25% and 50% of its capacity in accordance with DOT regulations. Although this low level of charge is sufficient for the Mote to operate on battery power for brief periods of time, it is not sufficient to support the attachment and configuration of high current sensors (e.g. CO₂ sensor)—even if the Mote is plugged in to line power.

The attachment of a CO₂ sensor while the battery is undercharged, or while it is being charged, will cause the Mote to enter a reboot loop (indicated by a blinking Status LED), which will continue until the battery is fully charged and operating with line power—a process that could take 3-6 hours. Once the Mote is fully configured with a CO₂ sensor and line power is subsequently removed, the system (Gen3 Mote + CO₂ sensor) will function normally until the battery is exhausted, at which time the system will shut down. When line power is restored, the system will reboot and resume normal operation within approximately 90 minutes after line power is restored.

Upon delivery, the Gen3 Mote must be fully charged by an installation technician until the Mote's Status LED is solid green. While under line power and when the Status LED is solid green, the CO₂ sensor can then be attached and configured per the instructions found in this document.

1. Select “Sensors” from the menu in the left margin.
2. Initially there will be no sensors listed in the Manage Sensors section, as seen here:

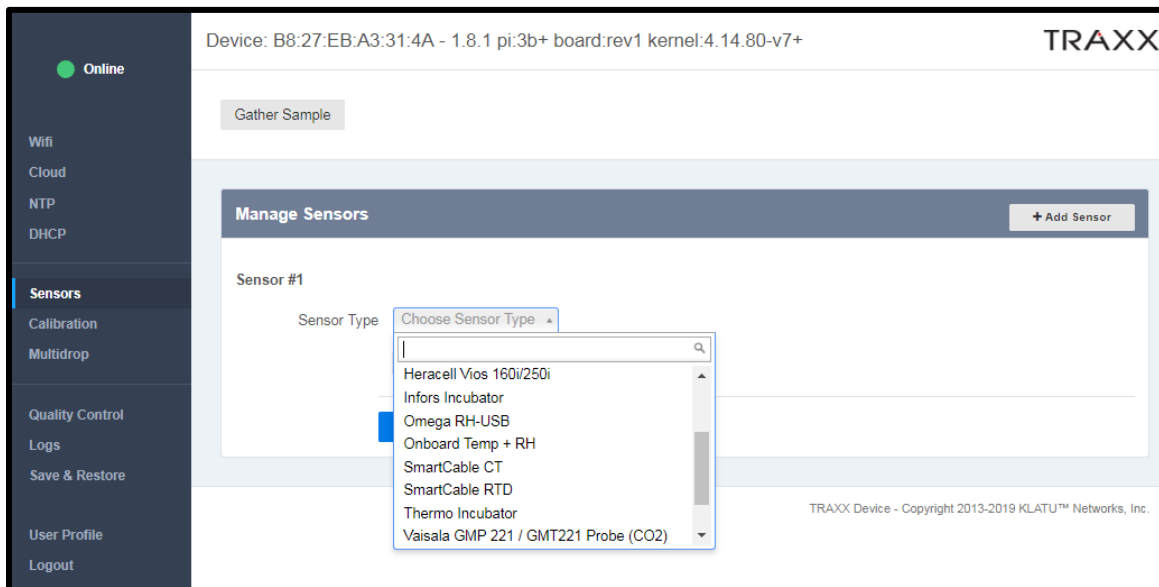


Configuring Sensors

3. Click the “+ Add Sensor” button to begin adding physically connected devices to the mote.

⚠ You will need to click the “+ Add Sensor” button and repeat the following steps in this section for each sensor/device connected to the mote.

4. Use the “Sensor Type” drop down menu to select a sensor or device connected to the mote. After the “Sensor Type” has been selected, the available options will change depending on the sensor type.



Configuring Sensor Type

5. Select the “Onboard Temp + RH sensor” to enable ambient temperature and relative humidity monitoring in the immediate vicinity of the mote.
6. If an RTD, CT, or door sensor is connected to the mote via USB and “SmartCable” is selected from the “Sensor Type” menu, then use the “Cable ID” drop down menu to select the specific cable ID printed on the cable’s label (e.g. SmartRTD-0000112233, SmartCT-0000998877, or SmartDI-0005724698).
 - a. See “Smart Sensor Assembly” section at end of doc for physical connection instructions.
7. Use the “Serial Port” drop down menu to select the physical port on the mote that the device is connected to.
 - a. Select “RS232/RS485” for any of the following sensors or devices plugged into the RS232/RS485 port.

⚠ **CAUTION** – if a Vaisala sensor is connected to the RS232/RS485 port, then you must connect any supported incubators to one of the USB ports.

⚠ **CAUTION** – A single mote can accommodate both one Vaisala GMP and one HMP probe via a splitter (included with the order). See bullet #15 below for “Multidrop” instructions.

 - i. Digital Input (Serial Port) – Door sensor or any other DI sensor terminated with an RJ-45 adapter.

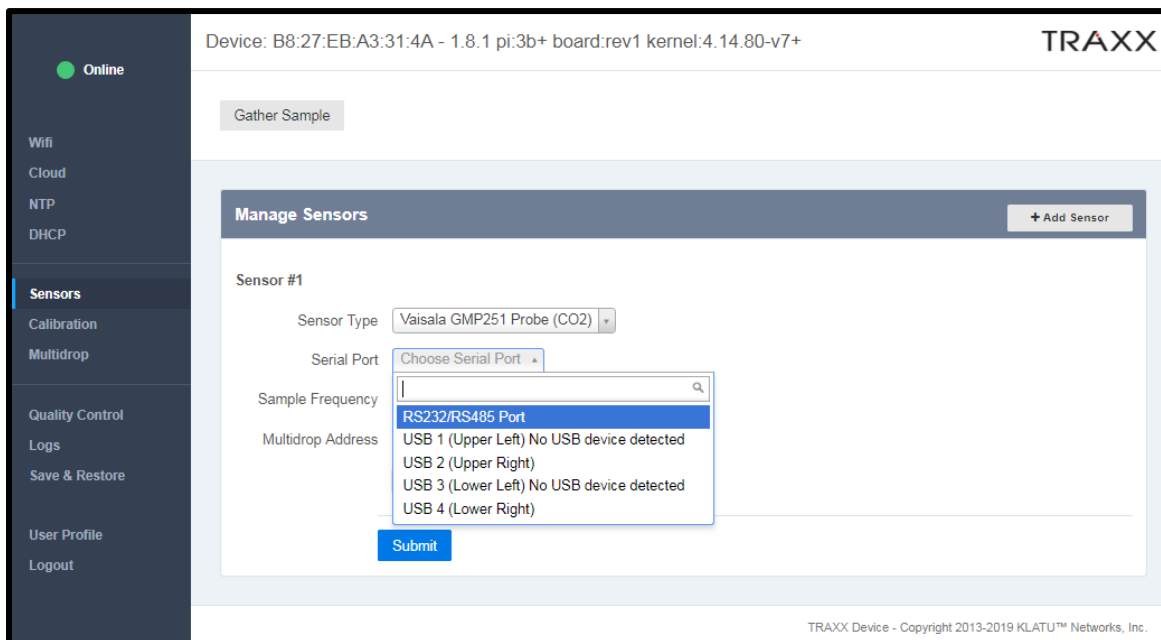
- ii. Heracell 150/240 incubator
- iii. Heracell 150i/240i incubator
- iv. Infors incubator (Standard and Pro Multitron and some Minitron models only)

⚠ Contact KLATU Customer Support for more information.

- v. Thermo Forma 3110 incubator
 - vi. Vaisala GMP 221 or 251 Probe (CO₂ sensor)
 - vii. Vaisala HMP Probe (humidity + temp sensor)
- b. Select the appropriate “USB” port for any sensor or device plugged into any of the mote’s four USB ports (upper left/UL, lower left/LL, upper right/UR, lower right/LR). The drop down menu will indicate “No USB device detected” next to any USB port that doesn’t have a sensor plugged in.
- i. DataQ (4-20mA) modules – See separate user manual specific to DataQ.
 - ii. Heracell 150/240 incubator.
 - iii. Heracell 150i/240i incubator.
 - iv. Heracell 160i/250i incubator.
 - v. Infors incubator (Standard and Pro Multitron and some Minitron models only).

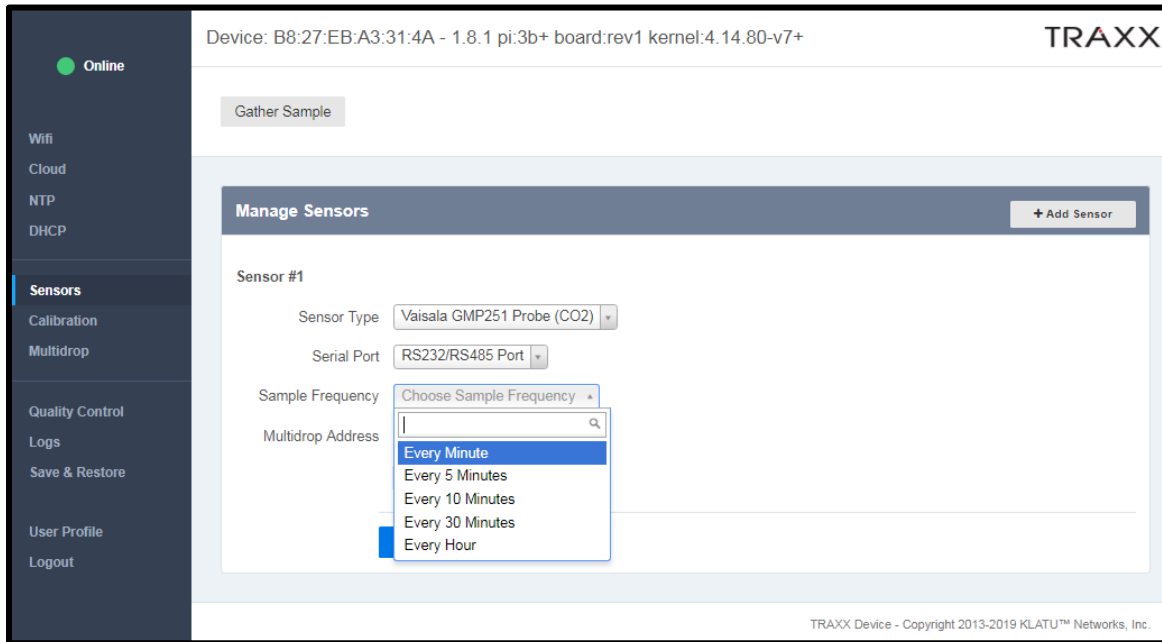
⚠ Contact KLATU Customer Support for more information.

- vi. Omega RH-USB sensor (humidity + temp).
- vii. Thermo Forma 3110 incubator.



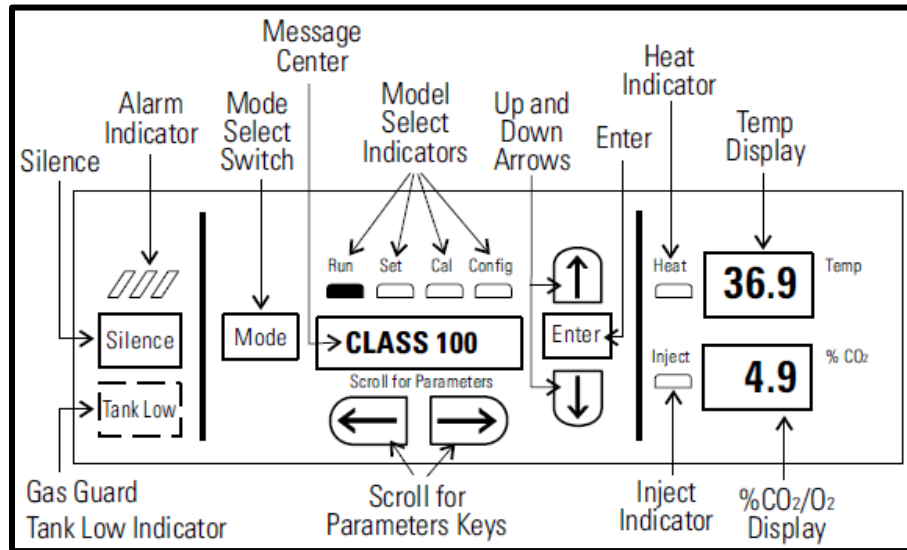
Configuring Serial Port

8. Use the “Sample Frequency” drop down menu to select how often the mote samples the sensor data. The recommended frequency is “Every Minute.”



Configuring Sample Frequency

9. For a magnetic door switch sensor connected to the RS232/RS485 port, use the “Switch Type” drop down menu to select “Normally Open.”
 - a. There is a “Normally Closed” option for other DI sensor types.
 10. For magnetic door switch sensor(s) connected to the USB port via the SmartCable DI, use the “Switch Type” drop down menu to select “Normally Closed.”
 - a. There is a “Normally Open” option for other DI sensor types.
 11. For Heracell 150i and 160i models, use the “Baud Rate” drop down menu to select 57600.
 12. For the Thermo 3110 incubator, use the “Addresses” drop down menu to select the address that is programmed into the incubator.
 - a. To program the address of a Thermo 3110 incubator, see diagram **3110 Operating Panel** and follow these directions:
 - i. Using the incubator’s Operating Panel, press the **Mode** key until the **Config** light is lit and the message center reads **SYS CONFIG**.
 - ii. Press the **Left Arrow** key once to enter the address configuration menu. The message center will read **485 ADDR XX** (XX is the address field).
 - iii. Press the **Up Arrow** key to set the address to **1**. Select this address from the “Addresses” field.
- ⚠ CAUTION:** Do not set the address to 0. If multiple Thermo 3110 incubators are plugged into the same mote, then set each incubator to a unique address.
- iv. Press the **Enter** key to save the address selection.
 - v. Press the **Mode** key until the **Run** light is lit.



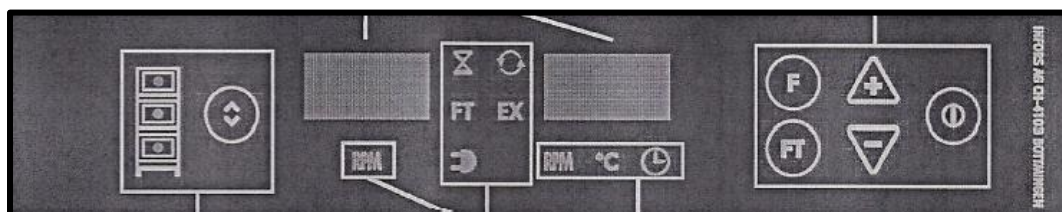
3110 Operating Panel

13. For Infors incubators, use the “Cabinet” drop down menu to:
 - a. Select “Minitron” if connecting to a Minitron incubator.
 - b. Select “Multitron Upper”, “Multitron Middle”, or “Multitron Lower” if connecting to a Multitron stack. Select the Multitron that corresponds to its placement in the stack.
 - i. Repeat this for each incubator in the stack by clicking the “+ Add Sensor” button.
14. For each Infors incubator in a stack, use the “Address” drop down menu to select the address that is programmed into the incubator. There are two supported Multitron models—*Standard* and *Pro*. Skip to page 28 for Multitron “Pro” address programming instructions.

Multitron “Standard” Address Programming Instructions:

To program the address of a Multitron “Standard,” see diagram **Multitron “Standard” Operating Panel** and follow these directions:

- a. Go to the specific incubator in the stack that you wish to program (e.g. top unit).
- b. Power OFF the Multitron incubator using the power switch on the left side of the unit. See diagram **Multitron “Standard” Power Switch**.
- c. Using the incubator’s Operating Panel, simultaneously press and hold the **F** and **+** buttons.



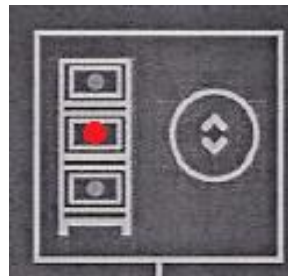
Multitron “Standard” Operating Panel

- d. While pressing the **F** and **+** buttons, power ON the Multitron incubator using the power switch on the left side of the unit.



Multitron “Standard” Power Switch

- e. Release the **F** and **+** buttons when “PRO” is displayed on the Operating Panel display.
- f. Press the Unit Selector button on the left side of the Operating Panel until the middle LED is selected (see diagram **Unit Selector Button and Display**).



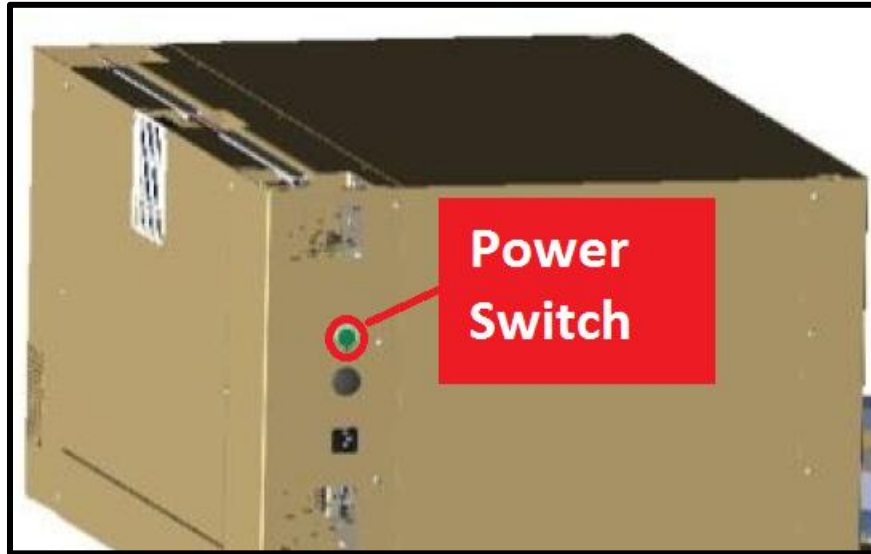
Unit Selector Button and Display – Middle LED Selected (Standard model)

- g. Press the **+** or **-** buttons to change the incubator’s address.
- ⚠ **CAUTION:** Do not set the address to 0. Each incubator in the stack must have a unique address.
 - ii. We recommend setting the top unit in the stack to address = 1.
 - iii. We recommend setting the middle unit in the stack to address = 2.
 - iv. We recommend setting the bottom unit in the stack to address = 3.
- h. Press the **Φ** button at the far right of the Operating Panel to save the changed address.
- i. Using the green power switch on the left side of the unit, power OFF the incubator, then power back ON again.
- j. Repeat bullets 10a – 10i for all Multitron incubators in the stack.

Multitron “Pro” Address Programming Instructions:

To program the address of a Multitron “Pro,” see diagram ***Multitron “Pro” Operating Panel*** and follow these directions:

- a. Go to the specific incubator in the stack that you wish to program (e.g. top unit).
- b. Power OFF the Multitron incubator using the green power switch on the left side of the unit (see diagram ***Multitron “Pro” Power Switch***).



Multitron “Pro” Power Switch

- c. Power ON the Multitron incubator using the green power switch on the left side of the unit, and then watch the unit’s front panel display (see diagram ***Multitron “Pro” Operating Panel***).



Multitron "Pro" Operating Panel

- d. When the Operating Panel displays "SERVICE", quickly use the incubator's Operating Panel to simultaneously press and release the orange-colored **OPTION** and **REMOTE** function buttons (see diagram **Option and Remote Function Buttons**).



OPTION and REMOTE Function Buttons

- e. The Operating Panel will display "PRO SET" after the **OPTION** and **REMOTE** buttons are released.
- f. Press the **TIMER** button until "Phase 2" is shown on the Operating Panel.
- g. Press the **REMOTE** button until the middle LED is selected on the Unit Selector display (see diagram **Unit Selector Display**).



Unit Selector Display – Middle LED Selected (PRO model)

- h. One of the readouts on the Operating Panel will now display “ID.” Press the **SET** button next to where “ID” is displayed.
- i. Press the **+** or **–** buttons adjacent to the “ID” field to change the incubator’s ID/Address.

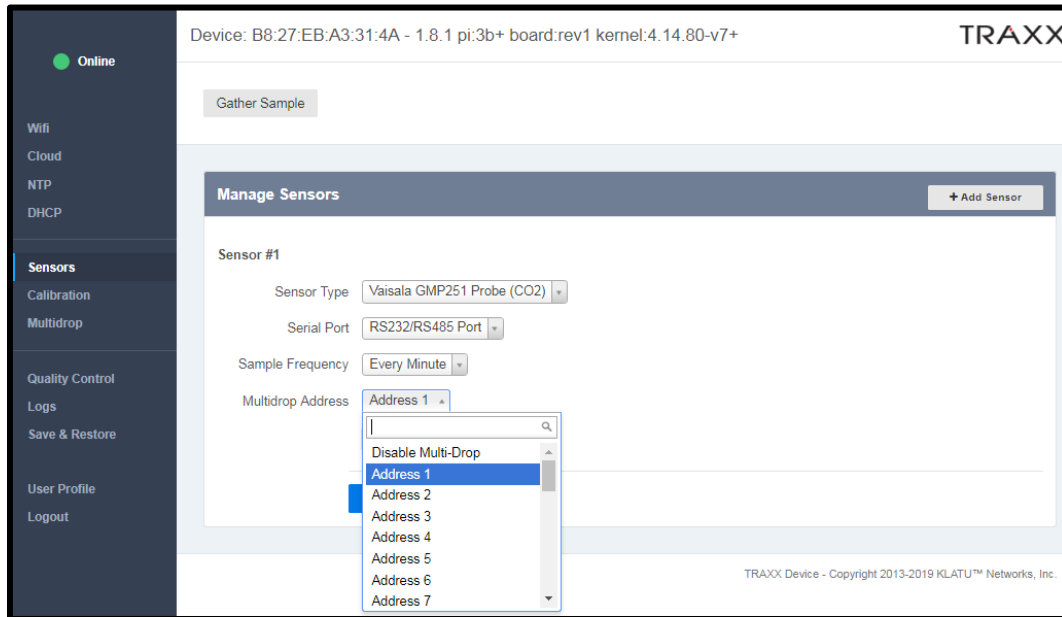
⚠ CAUTION: Do not set the address to 0. Each incubator in the stack must have a unique address.

- We recommend setting the top unit in the stack to address = 1.
- We recommend setting the middle unit in the stack to address = 2.
- We recommend setting the bottom unit in the stack to address = 3.

- j. Press the **ON OFF** button adjacent to the “ID” field to save the new ID/Address.
- k. Using the green power switch on the left side of the unit, power OFF the incubator, then power back ON again.
- l. Repeat bullets 10a – 10k for all Multitron incubators in the stack.

15. If “RS232/RS485” is selected for the Serial Port **and** more than one Vaisala sensor is physically connected to the RS232/RS485 mote input (via a splitter cable), then use the “Multidrop Address” drop down menu.

- a. If only one sensor is physically connected to the RS232/RS485 port, then select “Disable Multi-Drop” and click the “Submit” button. Skip to bullet #16 in this section.

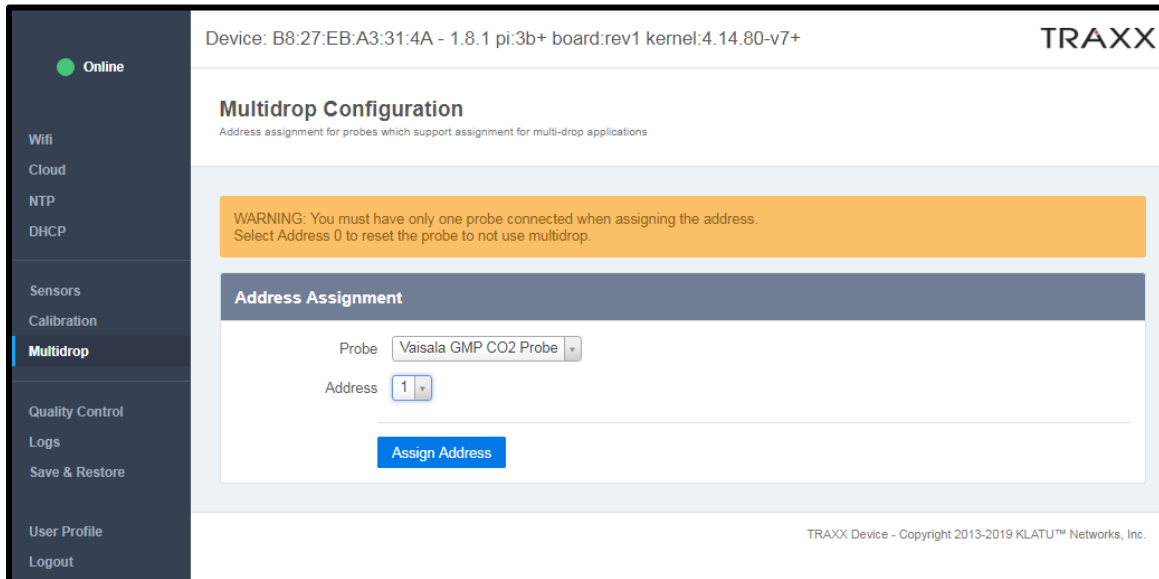


Configuring Multidrop Channel

- b. Multidrop provides the ability to add multiple sensors to the mote's RS232/RS485 port.

⚠ CAUTION: If there are two Vaisala sensors physically connected to the RS232/RS485 port, then special rules apply. Only one each of Vaisala GMP and HMP sensors may be connected to the same RS232/485 port.

- i. First, turn the mote off and plug the supplied splitter cable into the mote's RS232/RS485 port.
- ii. Make sure that only one sensor is connected to the RS232/RS485 port via the splitter cable.
- iii. Turn on the mote.
- iv. Select "Sensors" from the menu in the left margin.
- v. Click the "+ Add Sensor" button to configure the sensor that is connected to the splitter cable.
- vi. Use the "Sensor Type" drop down menu to select the sensor.
- vii. Use the "Serial Port" drop down menu to select "RS232/RS485".
- viii. Use the "Multidrop Address" drop down menu to select "Address 1".
- ix. Click "Submit" button.
- x. Select "Multidrop" from the menu in the left margin.



Assigning Multidrop Address

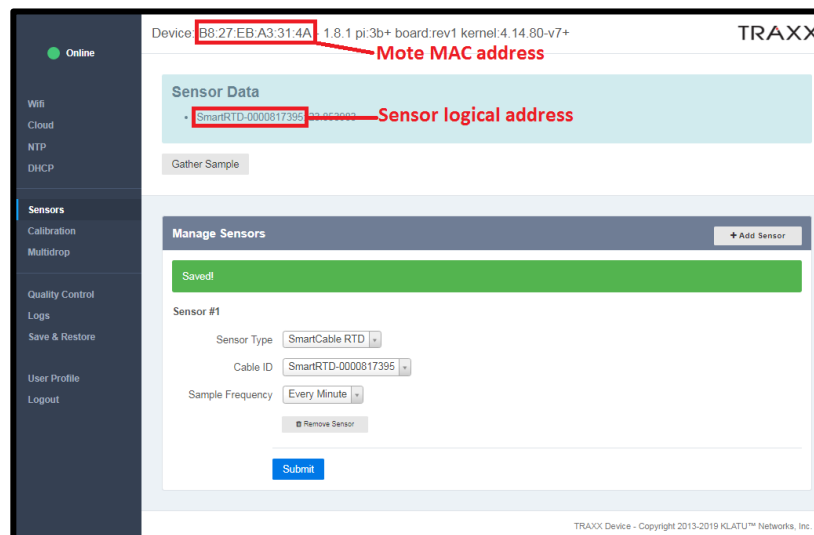
- xi. Use the “Probe” drop down menu to select the sensor connected to the RS232/RS485 splitter cable.
- xii. Use the “Address” drop down menu to select the unique address for the sensor (e.g. 1). This number must match what you selected in bullet [viii] above.
- xiii. Click the “Assign Address” button.
- xiv. Disconnect the first sensor from the RS232/RS485 port splitter cable.
- xv. Plug only the second sensor into the RS232/RS485 splitter cable’s second port.
- xvi. Select “Sensors” from the menu in the left margin.
- xvii. Click the “Remove Sensor” button located underneath the configured sensor.
- xviii. Click the “+ Add Sensor” button to configure the sensor that is now connected to the splitter cable.
- xix. Use the “Sensor Type” drop down menu to select the sensor.
- xx. Use the “Serial Port” drop down menu to select “RS232/RS485”.
- xxi. Use the “Multidrop Address” drop down menu to select “Address 2”.
- xxii. Click “Submit” button.
- xxiii. Select “Multidrop” from the menu in the left margin.
- xxiv. Use the “Probe” drop down menu to select the second sensor connected to the RS232/RS485 splitter cable.
- xxv. Use the “Address” drop down menu to select the unique address for the sensor (e.g. 2). This number must match what you selected in bullet [xxi] above.
- xxvi. Click the “Assign Address” button.
- xxvii. Unplug the splitter cable from the mote.
- xxviii. Plug both sensors into the splitter cable.
- xxix. Plug the splitter cable into the mote’s RS232/RS485 port.
- xxx. Select “Sensors” from the menu in the left margin.
- xxxi.

- xxxii. Click the “+ Add Sensor” button to configure the sensor that was originally connected to the splitter cable.
 - xxxiii. Use the “Sensor Type” drop down menu to select the sensor.
 - xxxiv. Use the “Serial Port” drop down menu to select “RS232/RS485”.
 - xxxv. Use the “Multidrop Address” drop down menu to select “Address 1”.
 - xxxvi. Click “Submit” button.
16. Click the “Submit” button after all changes have been made on the Sensors menu.
17. Press the mote’s “Action” button for 1 second.



Action Button

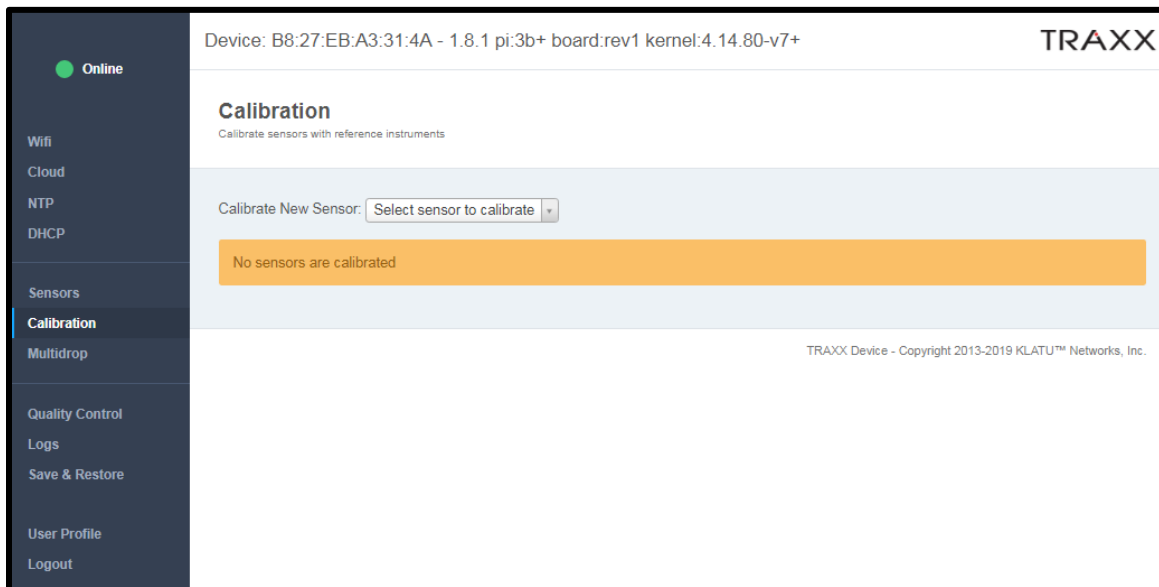
18. While still on the “Sensor” configuration screen, click the “Gather Sample” button.
- a. After a few seconds the screen will update with sensor sample readings from the connected devices. The sensor data is displayed in its native unit of measure (e.g. degrees Celsius).
 - b. Take note of the mote’s MAC address and the logical addresses assigned to each sensor. These will be used when configuring the TRAXX online application.



Mote MAC address and sensor logical addresses

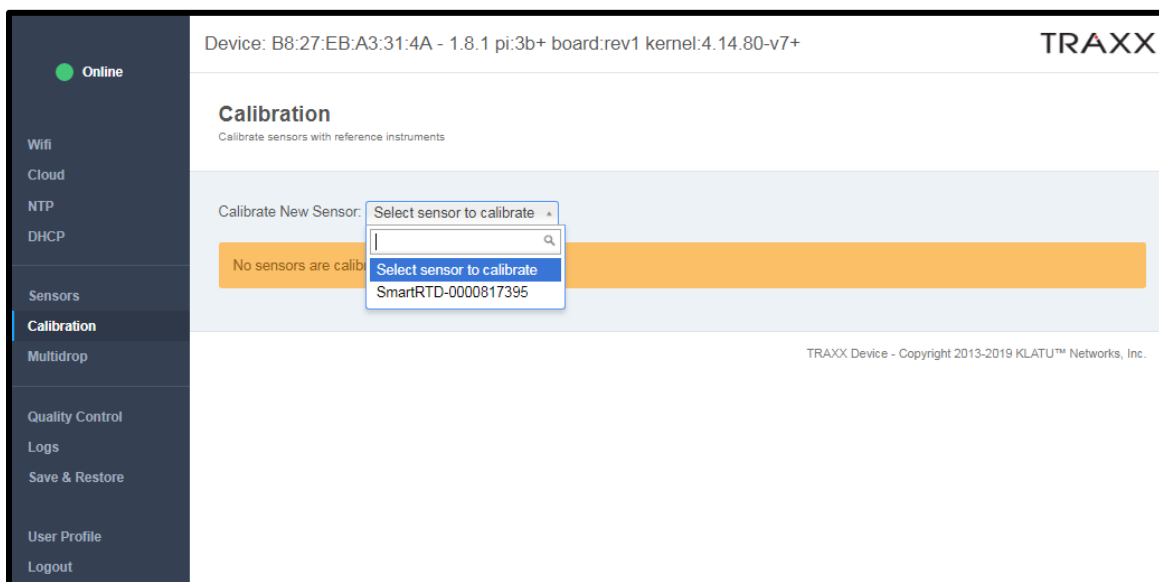
Step 9 – Calibration

1. Select “Calibration” from the menu in the left margin.



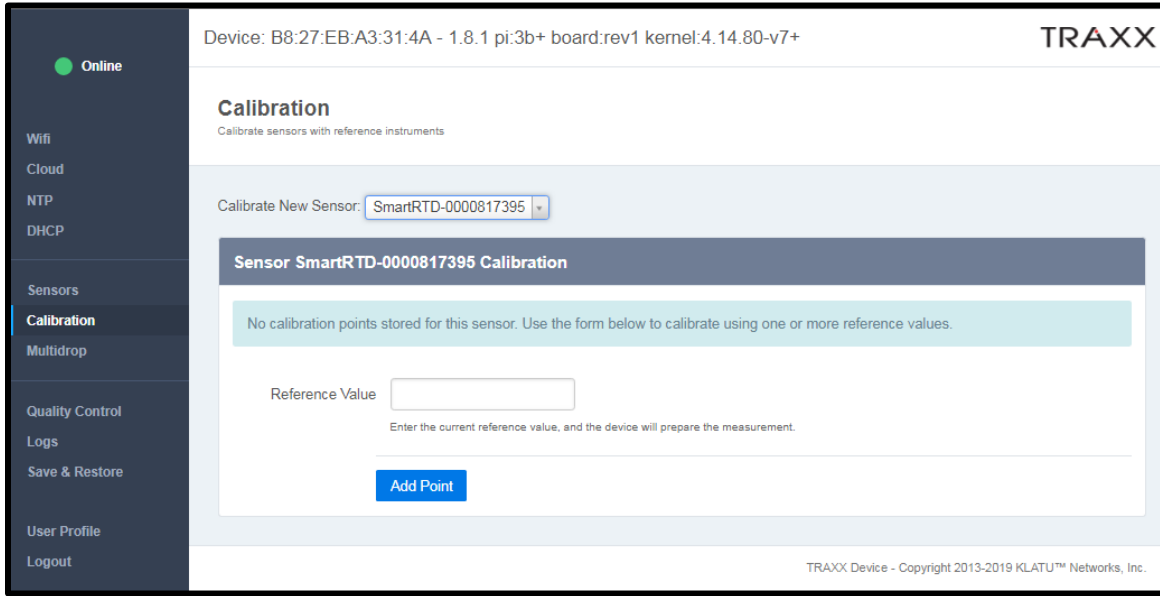
Mote Calibration

2. Use the “Calibrate New Sensor” drop down menu to select the sensor to calibrate.
⚠ CAUTION: The sensor must be connected to the mote.



Select sensor to calibrate

3. Using a reference sensor, enter the reference sensor reading in the “Reference Value” field.



Set the Reference Value

4. Click the “Add Point” button.
5. Repeat to add a second point of calibration (maximum two points per sensor).
6. Select a new sensor from the “Calibrate New Sensor” drop down menu to calibrate additional connected sensors.
 - a. Repeat bullets #4 – 5 in this section to add calibration points for the new sensor.
7. When finished calibrating all sensors, click the “Print” button to save a PDF file of the calibration certificate.

Step 10 – Save & Restore (optional, for configuring multiple motes at the same site)

The Save & Restore function allows the user to 1) save a mote's configuration and 2) load the saved configuration onto other motes. After mote configuration is complete, it is possible to export the wireless configuration in an encrypted file. This encrypted file can then be used to restore a different mote with the identical configuration settings by dragging and dropping the configuration file.

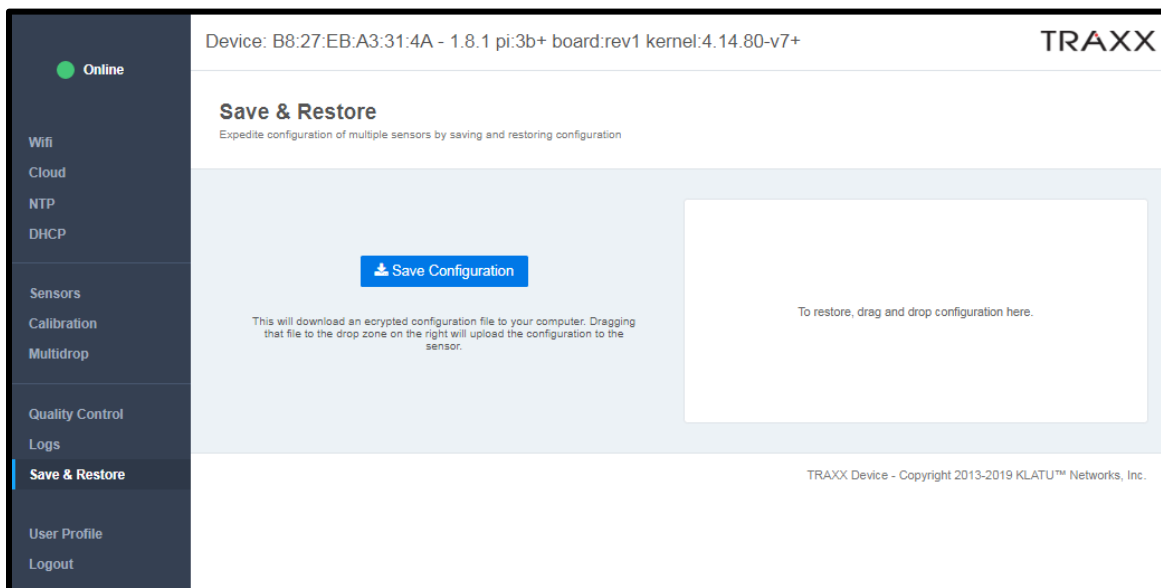
To save a mote configuration to use on other motes:

1. Select "Save & Restore" from the menu in the left margin.
2. After the mote's Wi-Fi, Cloud, NTP, and/or Sensors have been configured, click the "Save Configuration" button.

⚠ CAUTION: The following are not saved in the configuration file:

- i. Sensor calibration settings
- ii. SmartCable RTD cableID
- iii. SmartCable CT cableID
- iv. SmartCable DI cable ID
- v. DHCP settings

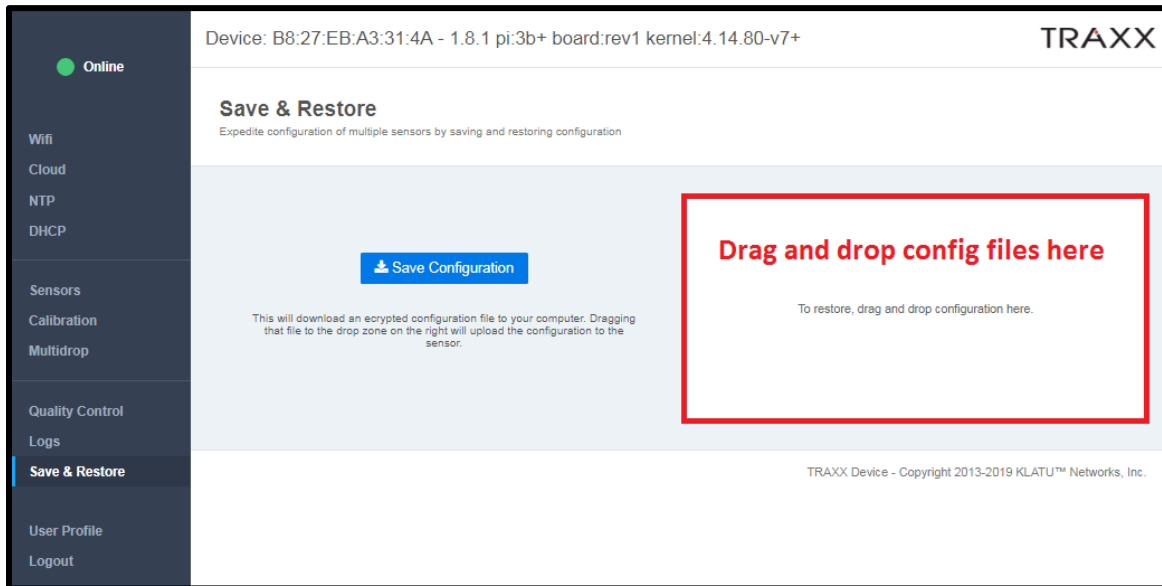
3. The user will be prompted to save the configuration file on their computer.



Save & Restore mote configuration file

To load/restore a mote configuration file on a new mote:

1. Select “Save & Restore” from the menu in the left margin.
2. Locate the previously saved mote configuration file on the computer.
3. Drag and drop the configuration file into the white box on the browser window.
4. Verify that all



Drag and drop configuration files to load onto new motes

Step 11 – User Profile

Mote configuration screen access requires users to login. The default credentials are:

- Username = admin
- Password = password

The default password can be changed by doing the following:

1. Select “User Profile” from the menu in the left margin.
2. Enter a new password in the Password field.
3. Enter the new password in the Confirm Password field.
4. Click the Submit button.
5. The new password is now updated and must be used when accessing the mote configuration menu in the future.

Step 12 – Finish

1. Turn off the mote's power using the OFF/ON switch.
 - a. The mote's Status and Network LEDs will turn off after approximately 10 seconds.
 - b. If the LEDs don't turn off, then unplug the mote from its power source and press the Reset button if necessary.
2. Note which USB port each sensor is plugged in to.

⚠ **CAUTION:** The sensors and incubator data port cables must be plugged into the same USB ports that they were assigned to during sensor configuration.

3. Disconnect the Ethernet cables and sensors from the mote.
4. Unplug the mote from the PoE power source.
5. Mount the mote on top of the asset to be monitored (e.g. incubator, freezer, etc).

⚠ **CAUTION:** The mote should be mounted and secured to horizontal surfaces only. See pictures below.

⚠ The mote's battery requires sufficient airflow for proper cooling. **Do not install the mote in locations where airflow is restricted** such as enclosed spaces, against walls without clearance, or blocked by equipment or obstructions. Inadequate ventilation causes heat buildup and may result in battery failure. Motes must be positioned with clear space around them and sufficient air circulation.

6. Connect the sensors to their assigned ports on the mote.

⚠ **CAUTION:** The sensors must be plugged into the same ports they were assigned to when they were configured.

7. Connect the PoE cable to the mote and plug into a PoE injector, PoE switch, or PoE enabled wall outlet.

⚠ **CAUTION:** The sensor(s) must be connected to the mote before powering up the mote. If the sensor is unplugged while the mote is powered, then:

1. *Disconnect power*
2. *Connect sensor*
3. *Connect power*

8. Turn the mote on using the OFF/ON switch. Verify that the Status and Network LEDs both turn solid green.
9. Login to TRAXX to configure the new asset. See TRAXX User Manual for detailed instructions.
10. Contact KLATU Networks customer support to verify install and confirm valid sensor data.

⚠ **NOTE:** The Gen3 Mote contains an 18650 Li-ion backup battery that requires periodic replacement to maintain monitoring reliability during power outages. Record the installation date and schedule battery replacement every **two (2) years** from the date of commissioning or most recent battery replacement. Battery replacement typically takes approximately 5 minutes and can be

performed by qualified facility maintenance personnel. For replacement instructions, see <https://youtu.be/qPOidEQG0kE>. Contact KLATU Customer Support to order replacement batteries.



Mote mounting – Side view

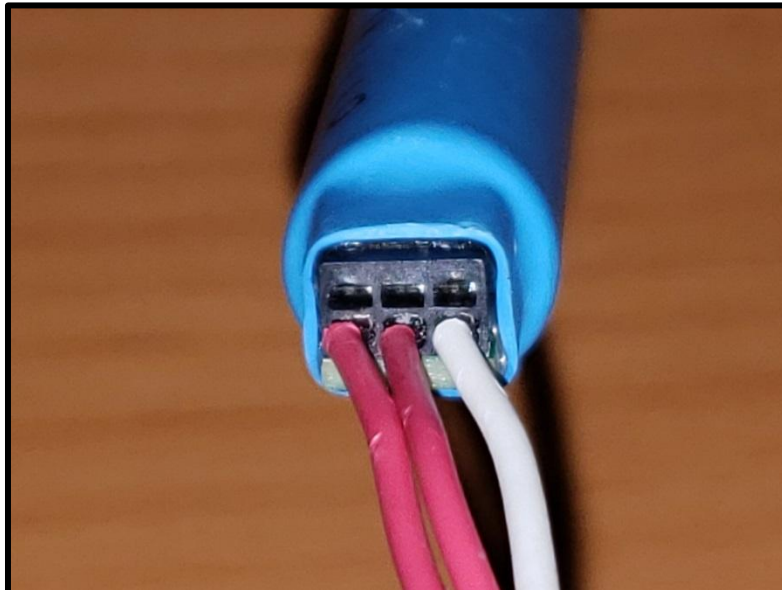


Mote Mounting – Top View

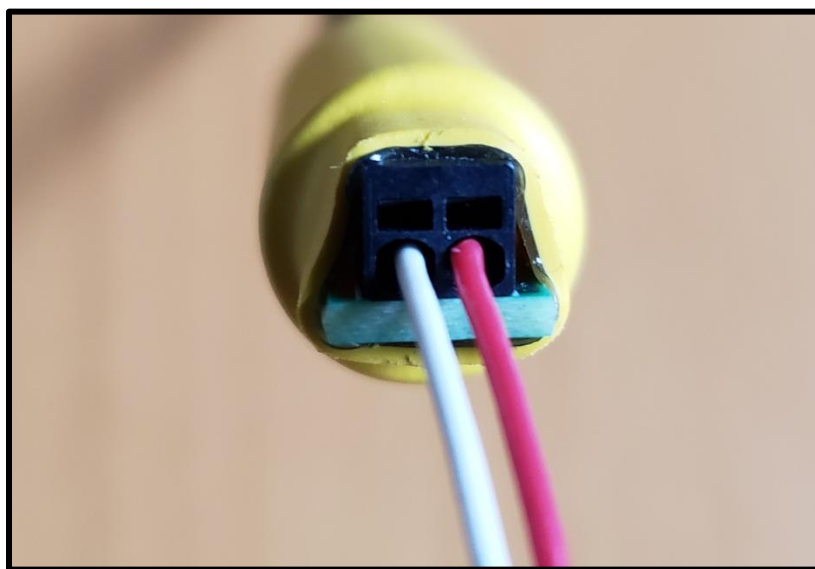
SmartCable Sensor Assembly

This section describes how to connect analog sensor wires to the SmartCable sensor adapters. The SmartCables have color coded ends denoting the sensor compatibility:

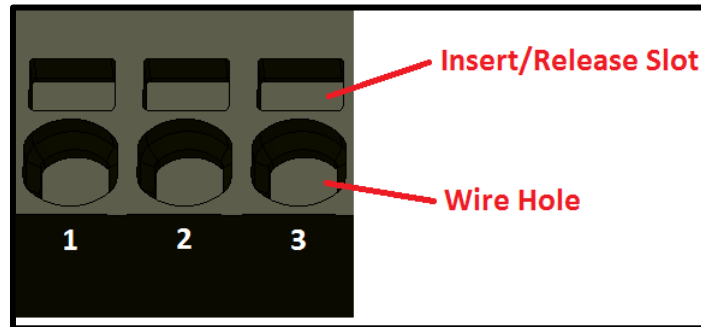
- Blue = 3-wire PT100 RTD sensor
- Yellow = 2-wire CT sensor (3000:1 turns)
- Green = 2-wire DI sensor (e.g. magnetic door switch or other contact alarm switch)



RTD SmartCable wiring



CT SmartCable wiring



Smart Sensor cable terminal block (RTD)

Wire Insertion:

1. The wires can be pushed in by hand. Place the wire fully into the circular Wire Hole. The wire should easily insert to a depth of about 7/16 of an inch.
⚠ CAUTION: If inserting stranded wire, ensure that all the strands are fully inserted into the hole and not allowed to float free. Loose strands could easily short to adjacent conductors.
2. Pull lightly on the wire to ensure that the wire is being retained by the terminal block.

Wire Removal:

- ⚠ CAUTION:** The Insert/Release slot can be easily damaged by using too much downward force or tweaking of the micro-screwdriver.
1. Insert the micro-screwdriver into the rectangular Insert/Release slot for the wire that you want to remove. Inserting the micro-screwdriver into the slot requires some additional downward pressure to actually open the wire clamp that retains the conductor. You will notice that the tool will bottom out when initially inserted; then with a small amount of additional applied pressure, penetrate into the slot an additional 10%. This additional penetration will open a clamp allowing for the easy removal of the conductor.
2. With the micro-screwdriver fully inserted, pull up on the wire to remove it. The removal of the wire should not require any significant pull force. After the wire is removed, remove the micro-screwdriver from the Insert/Release slot.

Temperature Sensor Installation

The mote is compatible with 3-wire RTD PT100 sensors. See table below for required temperature sensor specifications. Temperature sensor connections are color coded BLUE.

You will need the following tools:

- 3/32 flat head screwdriver
- PH1 Phillips head screwdriver
- PH2 Phillips head screwdriver
- Wire cutters/strippers
- Portable drill with 1/4" drill bit
- Silicone (or other) sealant rated for temperatures down to -86°C

- ⚠ Incorrectly or improperly connecting sensors to a mote can cause damage to the mote. Ensure you connect the sensors to the properly designated connections on the motes.
- ⚠ Sensors should never be routed through a door. Sensors should only be routed through access ports or through the port where the control sensor enters the cabinet. Never drill through a freezer, refrigerator, or incubator wall.
- ⚠ Do not tie the temp sensor in a knot around the internal racks, as this may break the sensing element inside the sensor tip.
- ⚠ Avoid mounting the temp sensor or running the sensor cable where it can be damaged by product sliding in and out of the cabinet.
- ⚠ To ensure accuracy, the sensor should always be located near the control sensor.
- ⚠ The sensor should never be in contact with exposed metal inside the cabinet. This could result in false readings.
- ⚠ When installing sensors in cold cabinets, use the appropriate PPE to protect your skin from exposure to the very cold temperatures.
- ⚠ Sensor installation will require the temporary relocation of product. Make prior arrangements with the facility to relocate the product during installation, and the return of product after installation.
- ⚠ Temperature sensor-Mote pairs are not factory calibrated. Calibration is typically not necessary in non-validated environments, but see [Step 9](#) above for temperature sensor calibration instructions as needed.
- ⚠ RTD sensors are not submersible beyond the stainless-steel sheath.

Access Port Installation

1. Examine the unit where the sensor is going to be installed to determine point of entry into the cabinet. Most units will have an access port on the back, side, or top of the unit. In the event no access ports are available, you will need to route the sensor through the port where the control sensor enters the cabinet (see [Control Sensor Port Installation](#) below).
2. For installation through an available access port, remove the access port caps and bore a 1/4" hole in the center of the access caps.
3. The access port in the cabinet will be plugged. You will need to either remove the plug or bore a 1/4" hole through the plug.
4. Route the sensor through the access port into the cabinet.
5. Route the sensor and wire down the backside of the cabinet, ensuring it will not be damaged during normal and expected access by the users.
6. Replace the interior access port cap.
7. Locate the control sensor and remove the protective cover.
8. Secure the temperature sensor next to the control sensor. In some units, use of rubber/plastic grommets may be necessary to ensure the sensor tip does not come in contact with exposed metal surfaces inside the cabinet.
9. Replace the control sensor protective cover (may not be applicable to all makes/models).
10. Coil and secure any excess sensor wire inside the cabinet, ensuring it will not be damaged during normal and expected access and by the users.
11. If you bored a hole in the access port plug, seal the both the interior and exterior holes with silicone or Permagum cord.
12. If you removed the access port plug, replace it or seal the access port with insulation.
13. Replace the access port caps.
14. Using the SmartRTD Sensor Cable, insert and secure the sensor wires.
 - a. See [instructions](#) above.
15. Connect the sensor to the desired USB port on the mote.
16. Secure any loose sensor cable to the exterior of the unit.

Control Sensor Port Installation

1. For installation through the control sensor port, you will need to gain access to the control sensor port location.
 - ⚠ Since this procedure may require thawing (freezers), it may result in water dripping near electrical components. To protect from electrical exposure and shock, arrange to have the unit disconnected from the main power source until installation is complete and the risk of electrical exposure and shock has been eliminated.
 - ⚠ This procedure will require the unit to be disconnected from the power source for a period of time; make prior arrangements with the facility to relocate the product during this procedure.
2. With the unit disconnected from the electrical source, use a heat gun to warm and thaw the Permagem cord sealing the control sensor access port.
 - ⚠ Use caution not to damage the existing sensor wires during the procedure.
3. Once thawed, remove the Permagem from the access port.
4. Route the temperature sensor into the cabinet.
5. Locate the control sensor and remove the protective cover.
6. Secure the temperature sensor next to the control sensor. In some units, use of rubber/plastic grommets may be necessary to ensure the sensor does not come in contact with exposed metal surfaces inside the cabinet.
7. Coil and secure any excess sensor wire inside the cabinet, ensuring it will not be damaged during normal and expected access by the users.
8. Replace the control sensor protective cover.
9. Seal the control sensor access port with Permagem cord.
10. Route the sensor wire to the exterior of the cabinet.
11. Clean any residual water that may have resulted from thawing the control sensor access port.
12. Restore power and restart the unit.
13. Using the SmartRTD Sensor Cable, insert and secure the sensor wires (see [instructions](#) above).
14. Connect the sensor to the desired USB port on the mote and secure any loose sensor cable to the exterior of the unit.

Current Transducer (CT) Sensor Installation

The mote is compatible with 2-wire split core current transducer (CT) sensors. See table below for required CT specifications.

You will need the following tools:

- 3/32 flat head screwdriver
- PH1 and PH2 Phillips head screwdriver
- 90° (right) angle PH1 Phillips head screwdriver
- Wire cutters/strippers
- Multimeter

The following steps are for CT installation on an asset (freezer, refrigerator, etc.):

- ⚠ **CAUTION:** The CT sensor must be installed by qualified technicians only.
- ⚠ **CAUTION:** All units must be powered off, locked out, and disconnected from any power source before installation of the CT sensor.
- ⚠ **CAUTION:** Plugging a sensor or power into the wrong port can damage the mote. To ensure correct connection of sensor and power wiring to mote, match the color coding on the Smart Sensor Cable with the color coding on the sensor.
 - a. The color coding for CT is YELLOW.

1. Determine if the asset is rated for 115V or 208V.
2. Remove any panel(s) on the asset required to access the incoming power cord.
3. Find the area where the individual wires of the power cord have been exposed, immediately after the power cord enters the asset.
 - a. For 115V systems- there will be one ground wire (green), one neutral wire, and one 'hot' wire (colors vary). The hot wire carries the electrical current.
 - b. For 208V systems- there will be one ground wire (green) and two 'hot' wires (colors vary). The hot wires carry the electrical current.
4. The CT will be clamped around only one individual hot wire.
 - a. For 208V systems- choose either hot wire.
 - b. For 115V systems- choose the hot wire.
5. The CT must be attached to the hot wire after it enters the asset, but before it interfaces with the control board of the equipment.
6. To attach the CT:
 - a. Unlock the clasp on the CT.
 - b. Open up the CT. One side will remain attached via the hinge.
 - c. Carefully slide the CT around the hot wire.
 - d. Close the CT around the wire.
 - e. Make sure the clasp is securely closed.
7. Using a multimeter, take an instantaneous voltage reading of the outlet that the asset will be plugged in to. Follow instructions included with the multimeter to take this measurement.

- a. Enter this voltage on the Edit Asset screen in TRAXX (see separate document, TRAXX User Manual).
8. Run the CT wire out of the back of the asset to the wireless mote on top of the asset.
9. Insert the CT sensor wires into the SmartCT Sensor Cable. See [instructions](#) above for wire polarity.
10. Insert the SmartCT Sensor Cable into the USB port of the mote and secure all loose cables.

Magnetic Door Switch Installation

The magnetic-type switch consists of several parts:

- 3/32 flat head screwdriver
- One (1) threaded magnetic sensor body with two insulated lead wires
- One (1) threaded magnet
- Four (4) locking nuts
- Two (2) sensor brackets
- Alcohol pad for mounting surface prep

Both of the mounting brackets ship with industrial strength adhesive tape. The installation can be made more permanent by using Loctite® Epoxy Plastic Bonder. The mounting surface must be thoroughly cleaned and dried with the included alcohol pad prior to affixing the brackets to the asset.

You will need the following tools:

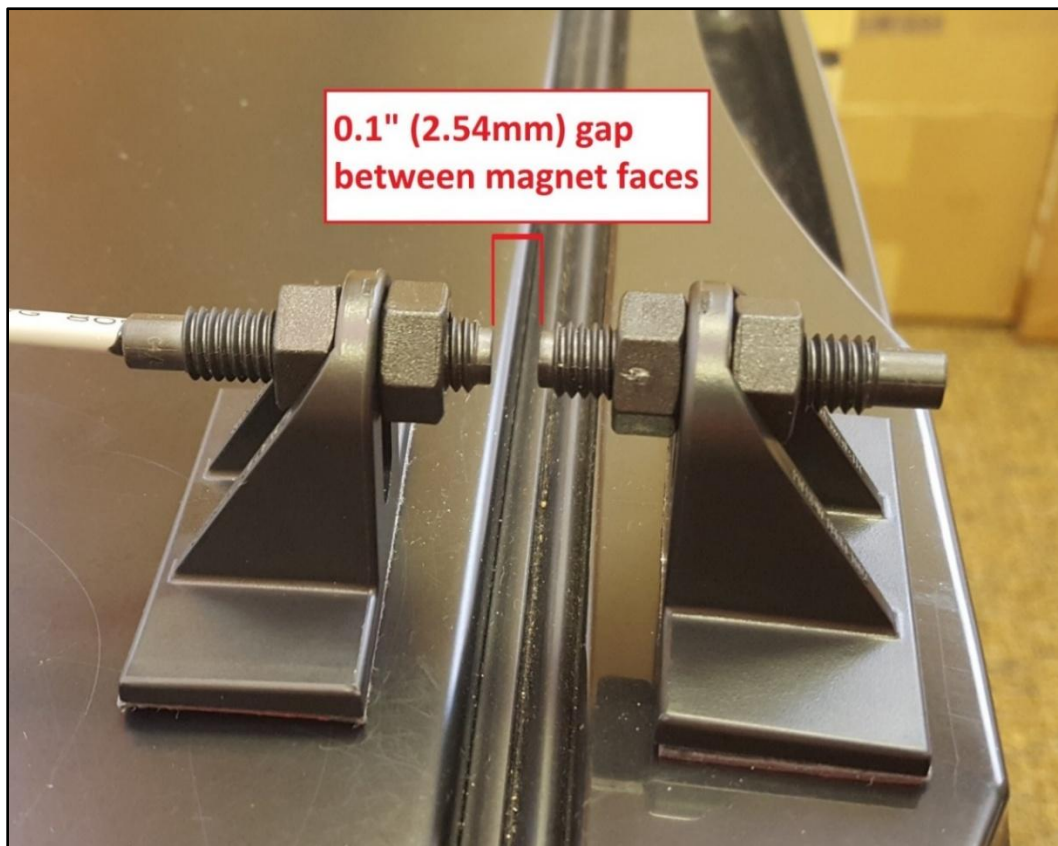
- Paper towels
- 70% alcohol solution in spray bottle or prep pads

The following steps are for door switch installation on any asset:

- ⚠ **CAUTION:** Plugging a sensor or power into the wrong port can damage the mote. To ensure correct connection of sensor and power wiring to mote, match the color coding on the label above the mote's ports with the color coding on the sensor and power wires.
- ⚠ **CAUTION:** Thoroughly clean and dry the mounting surfaces on the door and body of the asset. If the mounting surface is not clean and dry, the adhesive tape will fail.
- ⚠ **CAUTION:** The two magnets must be mounted as close to in-line as possible to ensure correct operation.
- ⚠ **CAUTION:** The ends of the magnets facing each other should be separated by no more than 0.1 inch to ensure correct operation.
- ⚠ **CAUTION:** The mounting brackets must be mounted so that the adhesive tape is in 100% contact with the mounting surface.
 - Do not mount the brackets such that either part overhangs the gap between the door and body of the asset. This will cause the adhesive tape to fail.

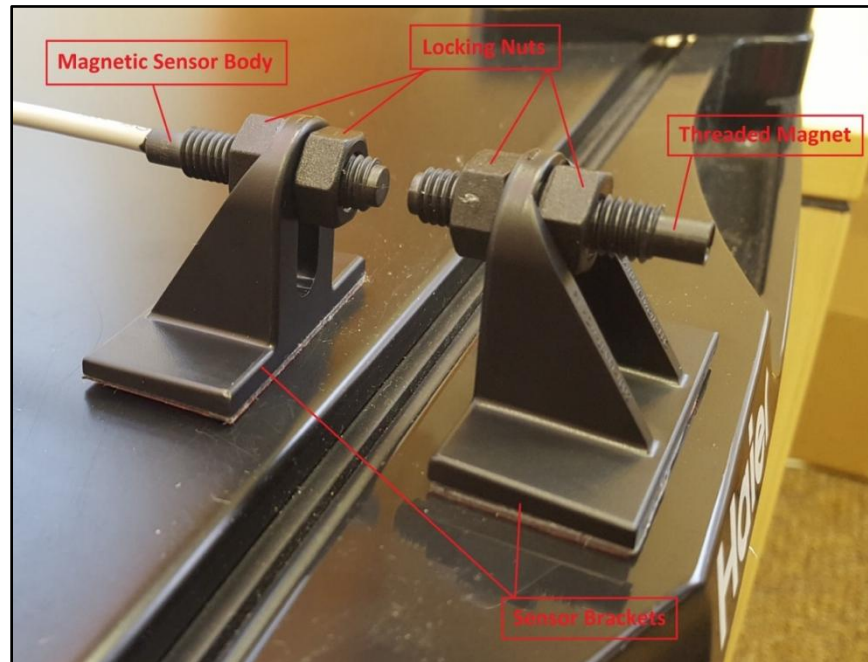
1. See figures below for sample installation of the door switch.
2. Determine the mounting location such that it does not interfere with normal everyday operation.
3. Simulate the door switch installation before removing the tape backing to ensure that the faces of the two magnets are separated by the correct distance of less than 0.1 inch (2.54 mm).
 - a. The flat vertical part of the brackets must face each other.

- b. The magnets are threaded, so loosen/tighten the nuts to adjust the horizontal distance between the two magnets.
- c. The magnets can be vertically adjusted in the bracket slot by loosening/tightening the nuts.
- d. The two magnets should never touch when the door is closed.
- e. When the asset door is closed, the two magnet faces should be no more than 0.1 inch (2.54mm) apart.
- f. When the asset door is closed, the two magnets should be as close to in-line with each other as possible.



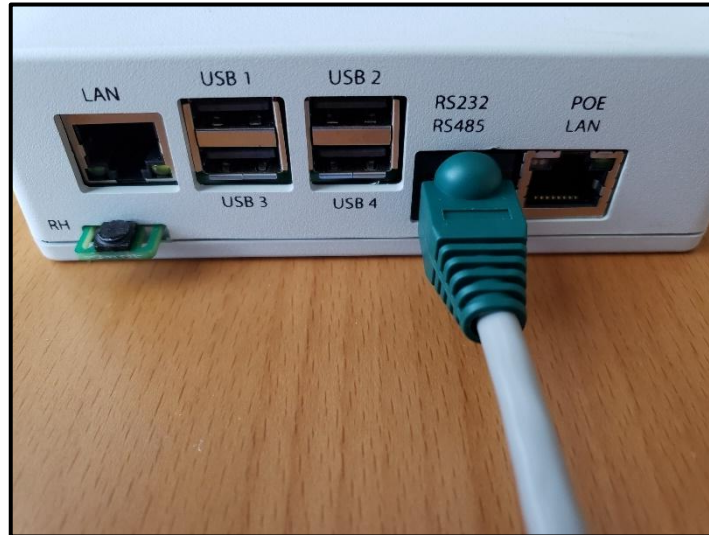
Magnetic door switch maximum magnet gap

- 4. Secure the magnets in the brackets by hand-tightening the supplied locking nuts.
 - a. Do not overtighten nuts to avoid stripping the magnet threads.
- 5. Thoroughly clean and dry the mounting surfaces with alcohol.
- 6. Remove the tape backing on one of the sensor brackets.
- 7. Mount the bracket to the asset door. Press down firmly with at least 15 psi for 30 seconds to make a good seal.
 - a. Top of the door is best.
 - b. All of the adhesive tape must be flush and in contact with the mounting surface.



Magnetic door switch sensor installation

8. Remove the tape backing on the second sensor bracket.
9. Mount the sensor bracket to the asset body. Press down firmly with at least 15 psi for 30 seconds to make a good seal.
 - a. All of the adhesive tape must be flush and in contact with the mounting surface.
10. Run the door switch wire to the mote mounting location.
11. *For door sensors with an RJ-45 connector:* Insert the RJ-45 connector of the door switch sensor into the mote's RS232/RS485 port.
 - a. Some installations call for two door switches (e.g. deli refrigerators and combo refrigerator/freezers), but there is only one RS232/RS485 port.
 - i. A specially wired door switch and splitter dongle is required to connect two door switches to the same RS232/RS485 port.
 - ii. This configuration will not specify which door sensor is open/closed. If either door switch is opened, then TRAXX will report that there is a door opened.
 - iii. The special door switch and dongle both have a green colored sheath over the RJ-45 connector.
 - iv. The switches and dongle must be connected to the mote as follows:



Double-door switch dongle connection to mote



Double-door sensor switch connection to dongle

12. *For door sensors with bare wires:* Insert the wires into the SmartCable DI. Wire polarity does not matter. Insert the SmartCable-DI into any USB port on the mote.
- a. Some installations call for two door switches (e.g. deli refrigerators and combo refrigerator/freezers).
 - i. Up to two door switches can be connected to a single SmartCable DI.
 - ii. This configuration allows the user to identify which of the two door switches is open/closed (e.g. left and right).
 - iii. Each switch can be identified in the TRAXX software by the port number that it is plugged into:



Two door switches connected to a SmartCable-DI

- iv. Note that the flat circuit board is located underneath the sensor wire inputs in the photo above.
- v. The sensor number (1 or 2) will be published in the TRAXX software (on the mote's Details screen or on the asset's Edit Asset screen), so make sure to note which sensor is assigned to each port. For example, the left door is assigned to port #1 and the right door is assigned to port #2.

LN2 Fill Line Monitoring – Temp Sensor Installation

TRAXX supports monitoring of a Liquid Nitrogen (LN2) fill line by using an RTD temperature sensor. The LN2 fill monitoring kit includes the following:

Qty	Description
1	Wi-Fi mote with 4 USB inputs
2	RTD temp sensors
2	RTD Smart Sensor Cables
1	Magnetic door sensor
1	Roll of ½" Teflon Tape
1	Roll of Tyvek Tape
2	¼" Stainless Steel Tie Wraps

Tools Required:

- Small straight blade screwdriver
- Angled needle nose pliers to tighten the stainless steel tie wraps
- End cutters to cut the stainless-steel tie wraps
- See video on how to install SS tie wraps: <https://youtu.be/ecS2ZwjWo-g?t=14s>

Installation process:

1. Locate a 3" section of fill line hard tubing that feeds into the LN2 tank that would be acceptable to attach the thermocouple sensor. It should be located on a straight length of tubing where the sensor can be attached to the pipe.
2. Wrap the hardline with two or three layers of Teflon Tape (20 or 30 turns around the LN2 tubing) over two inches of tubing length.



Wrap Teflon tape around 3" section of LN2 fill line

3. Position one RTD sensor on the layer of Teflon tape such that it is centered on the layer of Teflon tape. With the RTD laying against the tape, wrap one or two turns of Tyvek tape to hold the RTD in position.



Center RTD sensor on Teflon tape



Wrap RTD sensor with Tyvek tape



RTD sensor installed on LN2 fill line

4. With the RTD now held in place with the Tyvek Tape, position two stainless steel tie wraps such that they provide a rigid restraint holding the RTD in place.
5. Mount the Mote in a convenient location ensuring that the routing of the wire from the RTD will not interfere with service of the system.
6. Route the RTD sensor cable to the Mote. Use nylon tie wraps, if necessary, to secure excess sensor cable. If sensor cable runs along the LN2 fill line to mote location, use Tyvek tape to secure the sensor cable to LN2 fill line.
7. Install the second RTD sensor inside the LN2 tank at the LN2 low vapor level via the access port on top of the tank.
8. Connect each RTD's wires to a separate SmartCable-RTD and plug the cables into available USB ports on the Mote (see [instructions](#) above).

Walk-In Room Monitoring

TRAXX supports monitoring of walk-in rooms by using CT sensors to measure the amperage of the compressor(s), evaporator fan(s), and condenser fan(s). The walk-in room monitoring kit includes the following:

Qty	Description
1	RTD temp sensor with 14 ft. cable
1	RTD Smart Sensor Cable
1	Magnetic door sensor
1	80-amp CT sensor
2	50-amp CT sensors
3	CT Smart Sensor Cables
1	Wi-Fi mote with 4 USB inputs
1	110V mote power supply

No two walk-in rooms are alike, therefore the installation will be custom each time. In general:

- Install the RTD sensor inside the walk-in room, in a secure location near the room's control temp sensor.
 - Install the door sensor on the door leading into the walk-in room.
 - Install the 80-amp CT sensor on the compressor, condenser fan, or evaporator fan – whichever has the highest inrush current upon startup.
 - Install one 50-amp CT sensor on whichever pieces of equipment don't get the 80-amp CT.
 - For example, if the 80-amp CT is installed on the compressor, then the 50-amp CTs should be installed on the condenser and evaporator fans.
 - See SmartCable sections above for RTD and CT wiring [instructions](#).
- ⚠ There should be one CT sensor on each compressor, condenser fan, and evaporator fan associated with the walk-in room.
- ⚠ Some walk-in rooms have redundant decks (two independent sets of compressors, evaporator fans and condenser fans). In these cases, a second walk-in kit is required to monitor the room.

Mote Specifications

Networking	• Wi-Fi or Ethernet connectivity. Supports wireless security protocols WEP/WPA/WPA2. • 802.11(n) Wi-Fi Radio - Contains FCC ID: 2ABCB-RPI3BP/Contains IC: 20953-RPI3P. • DHCP or fixed IP, DNS. • NTP local or externally sourced. • Outbound access to api.traxxekg.com on port 80 (HTTP) or 443 (HTTPS). An explicit HTTP proxy is configurable. • Device transmits via HTTP(S) periodically, as configured by customer. Sampling is configurable at 1,5,10,30, and 60 minute intervals.		
Power Over Ethernet (PoE)	• DC Voltage: 56VDC; Load 0A Min, 0.275A Max; Regulation Line/Load 4%; Minimum supply power 15.4W. • IEEE Standards: Complies with 802.11af standard. • Safety Approvals: cUL/UL, SAA, CE, C-Tick.		
Backup Battery	• The TRAXX Gen³ mote contains a standby rechargeable Li-Ion battery. In the event of a power outage, the battery operates up to five hours of continuous operation and recharges in five hours or less. • IEC 62133:2012 compliant. • 2600mAh, 3.7V.		
	Battery Type, Safety	Battery Operating Temperatures	Battery Care
	• The TRAXX Gen³ Mote contains a Li-Ion battery which IATA regulations require be shipped via ground. • As an additional safety precaution, the battery charge is limited to 40%-65% of its capacity for shipment. Storage for periods of more than 6 months without charging is not recommended. • Charging cycles and charge current are managed by a Power Management System (PMS). The charge rate is determined by system load, ambient temperature, battery temperature and battery charge state.	• Operating Temperature: Min 0°C Typical 25°C Max 45°C • Storage and Shipping Temperature: Min -20°C Typical 25°C Max 65°C	See documentation for important information.
Mechanical Specifications	• Material: ABS plastic. • Dimensions: 4.821" x 3.776" x 1.496" (122.45mm x 95.91mm x 38.00mm) (L x W x H).		
Internal Sensors (2):	• Temperature. – System Accuracy: ±0.1 to 0.2°C. – Operating Range: Mote without Battery Backup: 0°C to 70°C, 0% to 85% RH noncondensing; Mote with Battery Backup: 0°C to 40°C, 0% to 85% RH noncondensing. – Display Resolution: 0.1. – System Resolution: 0.01. • Relative Humidity (%RH). – System Accuracy: ±1.5%. – Operating Range: 0-85 %RH. – Display Resolution: 0.1. – System Resolution: 0.01.		
LAN Ports (2)	• LAN (Port 1): 10/100 Ethernet. • LAN (Port 2): 10/100 Ethernet with PoE.		
USB 2.0 Ports (4) USB sensors available from KLATU	• Temp/RH sensor. • Heracell 160i/250i incubator dataport. • Dataport integration with specific Heracell, Infors, and Forma 3110 incubators when RS232/485 ports are occupied by independent CO₂ and extended range temp/RH sensors. • RTD/temp sensor. • CT/current transducer sensor.		
RS485/232 Port (1): Sensors and dataport integrations currently available from KLATU	• Tethered Sensor (3-meter cable): CO₂ and/or extended range temp/RH sensors for incubators. • Dataport integration with Heracell 150/240, 150i/240i and Infors incubators with compatible RS485/RS232 dataports. • Digital Input (3-meter cable): Door switch or equivalent contact closure.		
Indicators and Buttons	• LED Indicators (3 bi-color red/green): Power/Status, Network, Sensor. • Action Button: Manually send sensor data to TRAXX. • Power Switch: Power mote off and on.		

Sensor Specifications

INDEPENDENT SENSORS AND PORTS – COLD STORAGE ASSETS

	Temperature/ RTD sensor port	Amperage/CT sensor port	Auxiliary sensor port
Interface	USB (Type A)	USB (Type A)	RS485 (RJ45)
Type	3 wire, 100 ohm Platinum RTD (TC=3850 ppm/K). - Contact KLATU Technical Support for 2-wire, 1K/10K ohm RTD or Thermocouple.	Split Core Current Transducer with built-in transient voltage suppression.	Dry contact
System Accuracy	±0.5°C (0.05% full scale)	±2%	n/a
Operating Range	-200°C to + 600°C	0-50A or 0-80A	n/a
Display Resolution	0.1	0.1	n/a
System Resolution	0.01	0.01	n/a

INDEPENDENT SENSORS AND PORTS – INCUBATORS

	Temperature/RH (Basic Range)	Temperature/RH (Extended Range)	CO ₂
Interface	USB (Type A)	RS 485 (RJ45)	RS 485 (RJ45)
System Accuracy	temp = ±1°C; RH = ±3 %RH	- temp accuracy at temp +10 to +30°C = ±0.5°C - temp accuracy at temp -40 to +10°C, +30 to +60°C = ±0.6°C - RH accuracy at temp 0 to 40°C and 0-90 %RH = ±3 %RH - RH accuracy at temp 0 to 40°C and 90-100 %RH = ±5 %RH - RH accuracy at temp -40 to 0°C, +40 to 60°C and 0-90 %RH = ±5 %RH - RH accuracy at temp -40 to 0°C, +40 to 60°C and 90-100 %RH = ±7 %RH	- at 25°C and 1013 hPa @5 %CO₂ = ±0.1 %CO₂ - CO₂ @0 to 8 %CO₂ = ±0.2 %CO₂ - CO₂ @8 to 20 %CO₂ = ±0.4 %CO₂
Operating Range	temp = -17 to 49°C; RH = 2-95 %RH non-condensing	temp = -40 to +60°C; RH = 0-100 %RH	0 to 20 %CO ₂
Display Resolution	0.1	0.1	0.1
System Resolution	temp = 0.01; RH = 0.01	temp = 0.01; RH = 0.01	0.01

OPTIONAL DATA PORT INTEGRATION – INCUBATORS

Optional Data Port Integration supported sensors listed by incubator makes and models	Forma™ Series 3110	Heracell 150/240	Heracell 150i/240i	Heracell 160i/250i	Infors/ATR – Multitron & Minitron (Note 4)
Temperature	X	X	X	X	X
RH	X	X	X	X	X
CO ₂	X	X	X	X	X
O ₂	X	X	X	X	
RPM					X

- The Gen3 product line can integrate only with the data ports of the above incubator models. Other incubator models are not supported at this time. Data port integration with other cold storage assets classes (e.g. refrigerators and freezers) are also not supported at this time.
- Freezers, refrigerators, incubators, LN₂ storage, cold rooms, and other asset types can be monitored using any of the above independent sensors. Please contact sales or technical support for assistance.