



InSight Generation 3

Configuration and Installation Instructions

330896H01 • Revision C • May 2024

IMPORTANT Read this service manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION All internal adjustments and maintenance must be performed by qualified service personnel.

CAUTION InSight hardware and software must be installed by qualified technicians only.

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FCC Compliance

Supplier's Declaration of Conformity

47 CFR 2.1077 Compliance Information

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

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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 20 cm distance between the antenna and user.

47cfr15.19(a)(5) compliance information.

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

ISED Compliance:

English

This device complies with ICES-003 (Issue 6) of the ISED rules.

CAN ICES-003(A) / NMB-003(A)

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

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 (2.4 GHz and 5 GHz) PCB niche antenna design licensed from Proant with Peak Gain: 2.4 GHz 3.5 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 20 cm distance between the antenna and the user.

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 à la norme ICES-003 (édition 6) des règles ISED.

CAN ICES-003(A) / NMB-003(A)

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).

Revision History

DATE	Revision	DESCRIPTION
9/05/2019	A	Initial release for Insight Gen 3 Configuration and Installation
8/01/2020	B	Added DHCP or Static IP section.
5/08/2024	C	Updated FCC compliance info, information about battery replacement and related software tags

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Introduction

InSight Generation 3 (Gen 3) motes continue to use innovation to help improve Life Science companies proactively monitor their assets.

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.
- 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.
- These devices are not to be used for any medical purposes. It is intended for Research or General-Purpose use only.

Environmental Operating Conditions

- Modules and sensors shall not be placed in environmental conditions beyond recommended specifications.
- The mote or any sensors are not submersible.
- Operating temperature range: 0° C to +40° C.
- Operating humidity range: 0 to 85% RH, non-condensing.



CAUTION: Follow local regulations concerning disposal of packaging, unused wireless devices and their accessories, and promote their recycling.

Battery Operating Temperatures

Operating Temperature: Min 0° C; Max 40° C

Storage and Shipping Temperature: Min -20° C; Max 45° C.

Safety Considerations

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 Thermo Fisher Scientific products are responsible for making sure that the product is fit for the intended usage. Do not open the product casing and do not disassemble or modify internal components in any manner.
- Thermo Fisher Scientific products do not contain any internal components that require user intervention or repair. If the device shows signs of improper operation, disconnect it immediately from its power source and contact Thermo Fisher Scientific technical services.

Electrical Warning for Devices with AC Adapter

- When using an InSight™ 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-repairable parts. If the adapter shows any sign of malfunction, unplug it immediately and contact Thermo Scientific for repair or replacement.
- Do not connect the adapter to a device or peripheral other than the InSight 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 InSight hardware devices or unplugging power cables, 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.

Battery Warning

InSight products contain a lithium battery. Make sure you observe polarity (+/-) when inserting batteries into InSight 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 Thermo Fisher Scientific. 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. 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 remains unused for a long period of time, contact technical service for battery replacement. 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.



CAUTION: Follow your facility's safety guidelines and wear required Personal Protective Equipment (PPE) during installation and/or troubleshooting.

General Recommendations

The Insight Gen 3 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.

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.

It is recommended to change the mote's back-up battery annually. Contact technical service for battery replacement.

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.

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 or implied that the system will uplift the intended use of the asset.

Specifications

Mote Specifications

- Networking:
- Wi-Fi or Ethernet connectivity. Supports Wireless security protocols WPA2 and 802.1x.
 - 802.11n/ac Wi-Fi Radio - Contains FCC ID: 2ABCB-RP13BP/Contains IC:20953-RP13P.
 - DHCP or Static IP and 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 15.4 W.
 - IEEE Standards: Complies with 802.11af standard.
 - Safety Approvals: cUL/UL, SAA, CE, C-Tick.
 - The power supply must conform to the PoE (Power over Ethernet) 802.3af standard.
- Backup Battery:
- The InSight Gen 3 mote contains a standby rechargeable Li-Ion battery. In the event of power outage, the battery operates up to three hours of continuous operation and recharges in five hours or less.
 - 2600 mAh, 3.6 V
 - Compliant with UL 2054, second edition dated 10-29-2004, including revisions through 2-11-2011
 - The InSight Gen 3 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 of shipment. Storage for periods of more than 6 months without charging is not recommended.
 - Charging cycle 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, Max 40° C.
 - Storage and Shipping Temperature: Min -20° C, Max 45° C.
- Battery Care:
- Refer documentation for important information.

Mechanical Specifications:	<ul style="list-style-type: none"> • Material: ABS plastic • Dimensions: 4.821" x 3.776" x 1.496" (122.45 mm x 95.91 mm x 38.00 mm) (L x M x W)
Internal Sensors (2):	<ul style="list-style-type: none"> • Temperature: <ul style="list-style-type: none"> - System Accuracy: ± 0.1 to 0.2° C. - Operating Range: <ul style="list-style-type: none"> Mote with POE line power: 0° C to 70° C, 0% to 85% RH non-condensing; Mote with Battery Backup: 0° C to 40° C, 0% to 85% RH non-condensing. - Display Resolution: 0.1. - System Resolution: 0.01. • Relative Humidity (%RH) <ul style="list-style-type: none"> - System Accuracy: $\pm 1.5\%$. - Operating Range: 0-85% RH. - Display Resolution: 0.1. - System Resolution: 0.01.
LAN Ports (2):	<ul style="list-style-type: none"> • LAN (Port 1): 10/100 Ethernet. • LAN (Port 2): 10/100 Ethernet with PoE.
USB 2.0 Ports (4): USB sensors available from Thermo Fisher Scientific	<ul style="list-style-type: none"> • Temp/RH sensor. • Heracell 160i/250i incubator dataport. • Dataport integration with specific Haracell, 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 data port integrations currently available from Thermo Fisher Scientific	<ul style="list-style-type: none"> • Tethered Sensor (3-meter cable): CO₂ and/or extended range temp/RH sensors from incubators. • Data port integration with Heracell 150/240, 150i/240i and Infors incubators with compatible RS485/RS232 data ports. • Digital Input (3-meter cable): Door switch or equivalent contact closure.
Indicators and Buttons:	<ul style="list-style-type: none"> • LED Indicators (3 bi-color red/green): Power/Status, Network, Sensor. • Action Button: Manually sends sensor data to InSight. • Power Switch: Power mote off and on.

Sensor Specifications

Table 1. 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).	Split Core Current Transducer with built-in transient voltage suppression.	Dry contact
System Accuracy	±0.5° C (0.0% 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

Table 2. Independent Sensors and Ports - Incubators

	Temperature/RH (Basic Range)	Temperature/RH (Basic Range)	CO ₂
Interface	USB (Type A)	RS485 (RJ45)	RS485 (RJ45)
System Accuracy	temp = ±1° C; RH = ±3% RH	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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

Table 3. Optional Data Port integration - Incubator

Optional Data Port Integration supported sensors listed by incubator makes and models	Form™ Series 3110	Heracell 150/240	Heracell 150i/240i	Heracell 160i/250i	Infors/ATR - Multitron & Minitron
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 (shaker)					x

- The Gen 3 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.

Configuration/Installation Instructions

Requirements

- A laptop or desktop computer with a spare Ethernet port configured with a static IP address
- Two (2) Ethernet cables
- Gen 3 mote
- PoE injector, PoE switch, or PoE enabled wall outlet (for power and/or Internet connectivity)



WARNING: 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
- 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)
- A web browser (Chrome, Firefox, Safari, IE)
- Multimeter

Step 1 – Physical Connection

1. For Cold storage assets: Connect provided sensor(s) to smart cable(s) (follow color coding) and then connect smart cable(s) to any available USB port and/or the RS232/485 port on the mote.

For Incubator assets: Connect the sensor(s) and/or incubators to any available USB port and/or the RS232/485 port on the mote.



Figure 1. Sensor connected to USB port



Figure 2. 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.



WARNING: 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.



Figure 3. Ethernet cable connected to PoE/LAN port from PoE injector, PoE switch, or PoE-enabled outlet



Figure 4. 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.



WARNING: 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.



Figure 5. 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 configured 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.



Figure 6. Mote OFF/ON switch

Step 2 – IP Configuration

Configure static IP on your computer's Ethernet port:

IP: 192.168.5.10

NetMask: 255.255.255.0

Gateway and DNS servers should be blank.

Instructions for configuring static IP:

- Windows: <http://www.howtogeek.com/howto/19249/how-to-assign-a-static-ip-address-in-xp-vista-or-windows-7/>
- OSX: <http://www.howtogeek.com/howto/22161/how-to-set-up-a-static-ip-in-mac-os-x/>

Step 3 – Web Interface

1. Open your web browser and navigate to:
<http://192.168.5.5:9292/insight>
2. 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

Figure 7. Sign In screen

3. 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+

Offline

Wifi

Cloud

NTP

DHCP

Sensors

Calibration

Multidrop

Quality Control

Logs

Save & Restore

User Profile

Logout

Wireless Network Down

The wifi network is currently down...

Configure Wifi

Advanced Mode

SSID

Authentication

Password

Figure 8. Web browser mote configuration interface

Step 4 – Configure Wifi

1. Enter the SSID, Authentication Type, and Password (if necessary).
2. Click Submit.
3. After a few seconds, if the network settings are “good” then the screen will update with wireless stats, refer **Figure 9**.

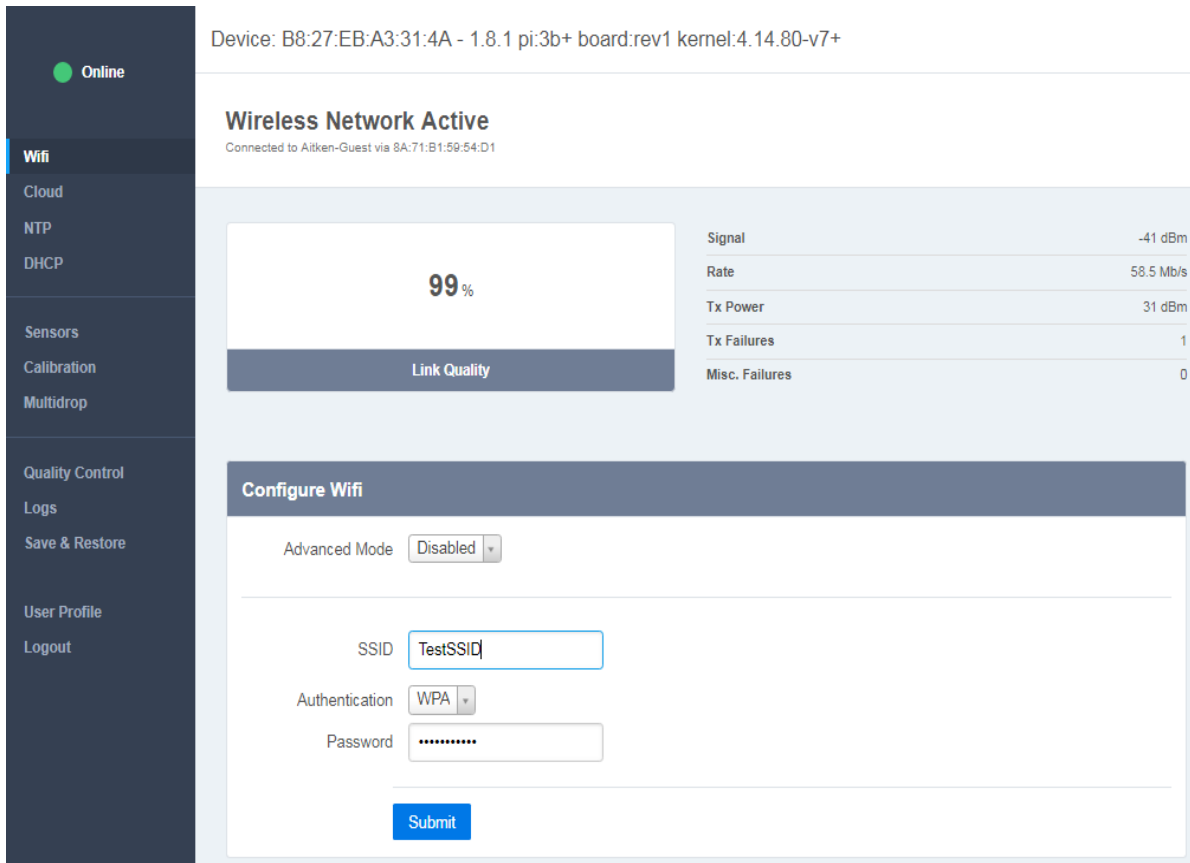


Figure 9. Configuring Wi-Fi

4. The network statistics will automatically update every 5 seconds.
5. Link quality of 50% or better is OK.
6. The Network LED on the front of the mote will turn solid green once the Wi-Fi has 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 attempting to connect to the Wi-Fi network.
 - c. Eventually the mote should connect and the LED will turn solid green.
7. For standard installations, set Advanced Mode to “Disabled.”

Advanced Mode



CAUTION: Advanced Mode is a specialized 802.1x security feature intended for IT professionals only.



CAUTION: Advanced Mode technical support from Thermofisher Scientific is only available if a InsightCare support contract has been purchased by the customer.



CAUTION: For more information regarding 802.1x, please reference official WPA Supplicant docs on the Internet. See https://w1.fi/wpa_supplicant/

1. For networks that require 802.1x security authentication, set Advanced Mode to “Enabled.”
2. 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

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

Figure 10. 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 and TKIP
 - 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 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
 - oEAP-GPSK

Step 5 – Configure Cloud URL and HTTP Proxy

1. Contact Thermo customer support to obtain the InSight Link server URL.
2. Select “Cloud” from the menu in the left margin.
3. Paste the InSight 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 “Test Connection” button on the top right corner of the screen. If the InSight Link URL is correct, you will see a cloud connectivity successful message as shown in **Figure 11**.

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 and port (obtained from IT) in the “Proxy URL” box (e.g. https://170.24.76.125:2012).
3. Click Submit.
4. Click the “Test Connection” button at the top right corner of the screen. If the InSight Link URL is correct, then you will see a cloud connectivity successful message as shown in **Figure 12**.

Device: B8:27:EB:A3:31:4A - 1.7.4 pi:3b+ board:rev1 kernel:4.14.80-v7+



Cloud Connection
Status: Online, Queue Depth: 0, Latency: 510ms

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

Figure 11. Configuring the Cloud Connection

Device: B8:27:EB:A3:31:4A - 1.7.4 pi:3b+ board:rev1 kernel:4.14.80-v7+



Cloud Connection
Status: Online, Queue Depth: 0, Latency: 152ms

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

Figure 12. Configuring the Proxy URL

Step 6 – NTP

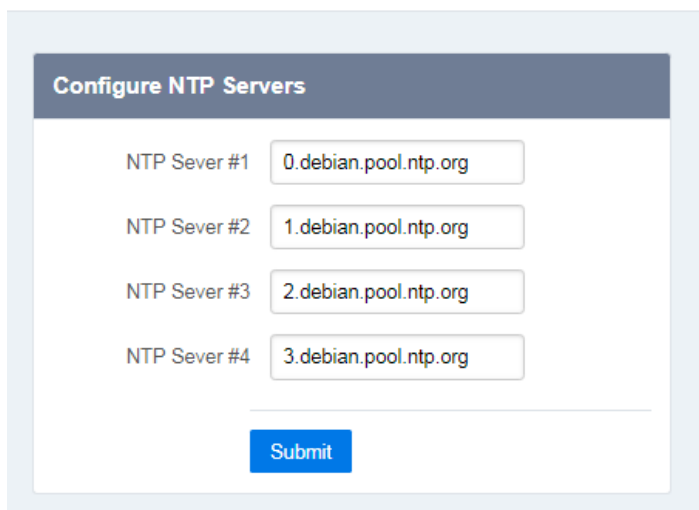
Network Time Protocol (NTP) is a networking protocol for clock synchronization between computer systems and devices. The mote needs to communicate with at least one NTP server in order to maintain the correct time. The default NTP server URLs built-in to the mote may work, or the customer IT group may 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 (refer **Figure 13**).
4. If the “Device Time” is incorrect, a simple workaround is to enter the InSight 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.

Note: NTP stands for Network Time Protocol, which synchronizes time with accurate clocks around the world.

Network Time Protocol

Device time is Fri Dec 21 2018 18:22:51 GMT-0800 (Pacific Standard Time)



The screenshot shows a web interface titled "Configure NTP Servers". It contains four input fields for NTP servers, each with a label and a value:

NTP Server #	Value
NTP Server #1	0.debian.pool.ntp.org
NTP Server #2	1.debian.pool.ntp.org
NTP Server #3	2.debian.pool.ntp.org
NTP Server #4	3.debian.pool.ntp.org

Below the fields is a blue "Submit" button.

Figure 13. Configuring NTP servers

Step 7 – DHCP or Static IP



CAUTION: The DHCP menu options are features intended for IT professionals only.

The mote is configured by default to acquire an IP address via the facility’s DHCP server. Most installations will not require any changes on this screen. Unless specifically directed by your IT department, keep both boxes checked.

In some instances, your IT department may request that motes be configured with a Static IP address.

1. If the mote is connecting via the Wi-Fi network, then uncheck the box directly under “Wlan Adapter Configuration.”
2. If the mote is connecting via an Ethernet connection, then uncheck the box directly under “PoE Adapter Configuration.”
3. When either box is unchecked, a form will appear with several blank fields.
4. The customer IT contact will provide the installer with all of the information needed to fill out the fields.
5. Click the “Submit” button when all fields have been filled out.
6. Go to the “Cloud” menu and click the “Test Connection” button to make sure the mote can connect to the InSight cloud servers.
 - a. If a **success** message is displayed, then everything is configured correctly and the mote is able to talk to the InSight cloud servers.
 - b. If a **fail** message is displayed, then the fields should be double-checked for accuracy.

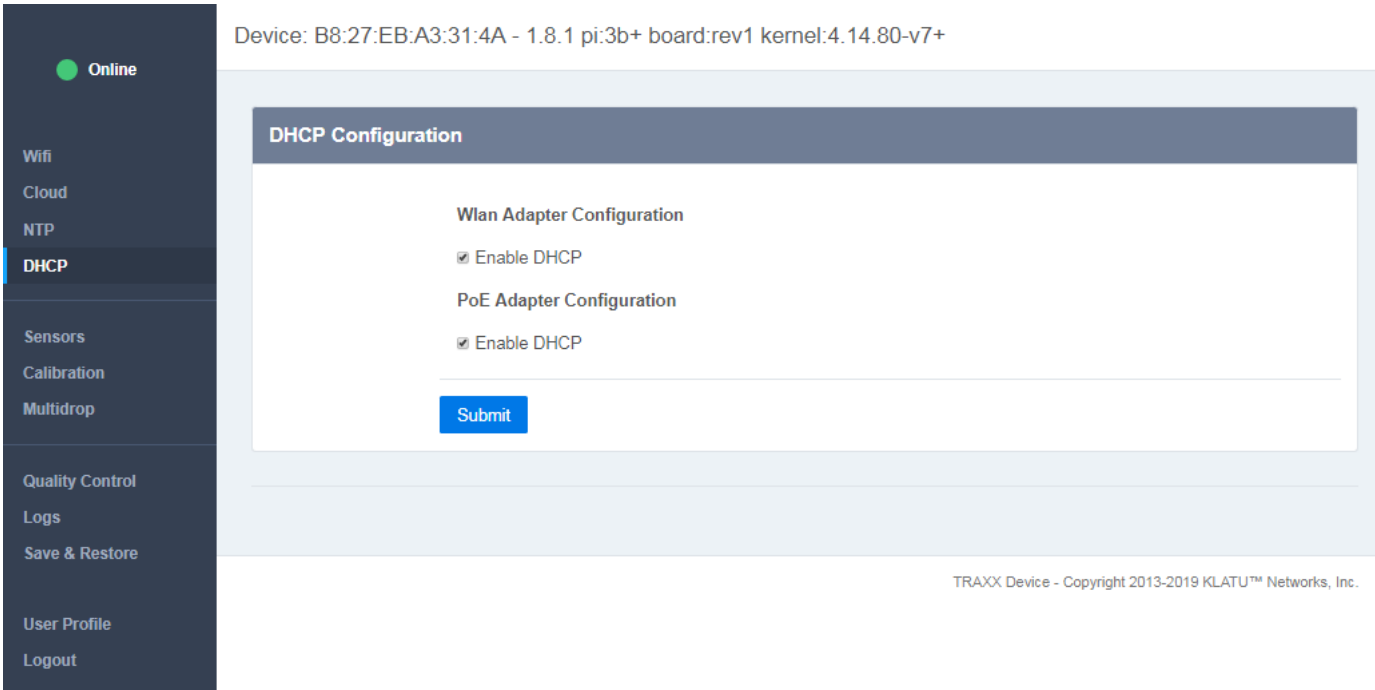


Figure 14. DHCP Menu

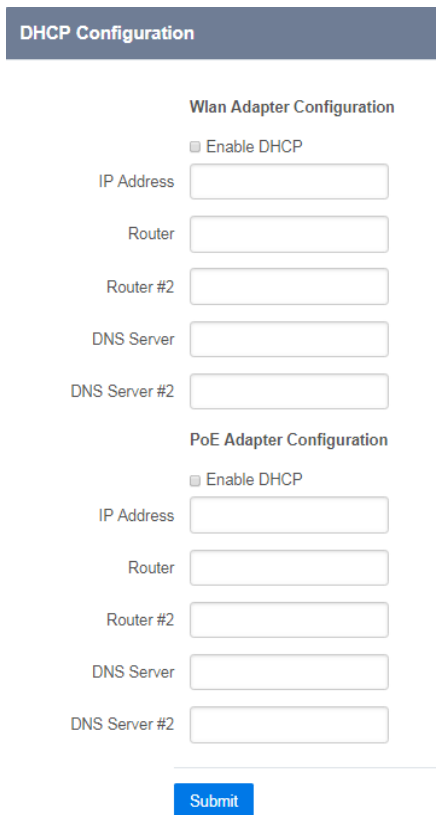


Figure 15. Static IP fields

Step 8 – Sensors

IMPORTANT: 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 USB ports on the mote may be used.

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 in **Figure 16**.

Gather Sample

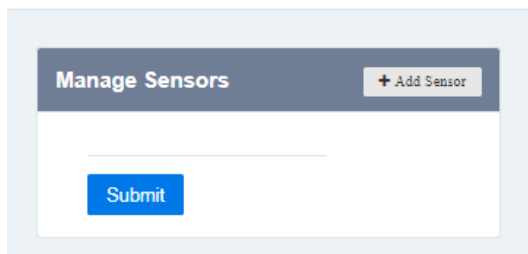


Figure 16. Configuring Sensors

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



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

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

Gather Sample

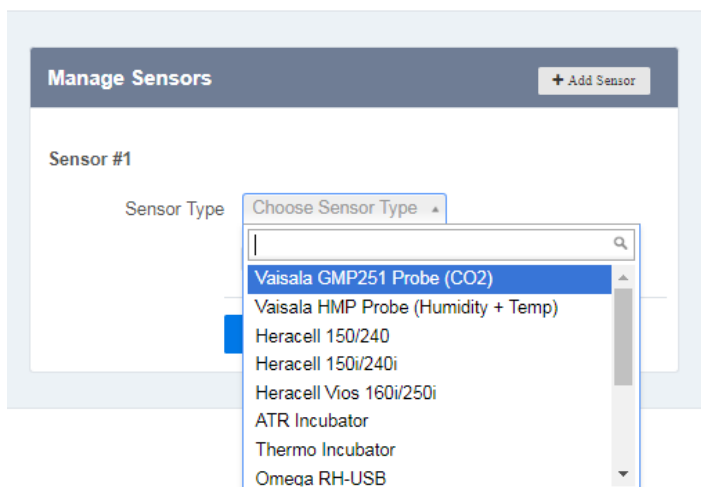


Figure 17. Configuring Sensor Type

5. If an RTD or CT sensor is connected to the mote via USB and “Smart Cable” 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 or SmartCT-0000998877).
 - a. Refer to **Smart Sensor Assembly** section for physical connection instructions.
6. 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.

- i. Vaisala GMP251 Probe (CO₂ sensor)
 - ii. Vaisala HMP Probe (humidity + temp sensor)
 - iii. Heracell 150/240 incubator
 - iv. Heracell 150i/240i incubator
 - v. ATR (Infors) incubator
 - vi. Thermo Forma 3110 incubator
 - vii. Digital Input (Serial Port) – Door sensor or any other DI sensor with smart cable adapter.
- b. Select the appropriate “USB” port for any sensor or device plugged into any of the mote’s four USB ports (upper left, lower left, upper right, lower right). The drop down menu will indicate “No USB device detected” next to any USB port that doesn’t have a sensor plugged in.
 - i. Omega RH-USB sensor (humidity + temp)
 - ii. Heracell 150/240 incubator
 - iii. Heracell 150i/240i incubator
 - iv. Heracell 160i/250i incubator
 - v. ATR (Infors) incubator
 - vi. Thermo Forma 3110 incubator
 - vii. DataQ DI-155
 - viii. DataQ DI-1120

Gather Sample

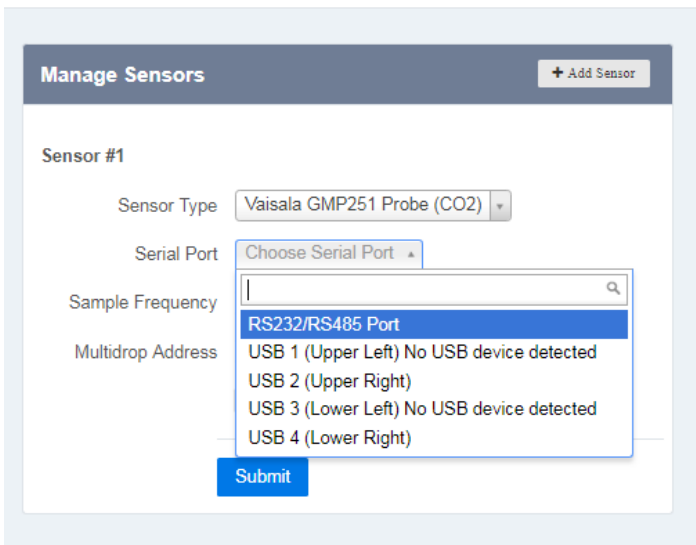


Figure 18. Configuring Serial Port

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

Gather Sample

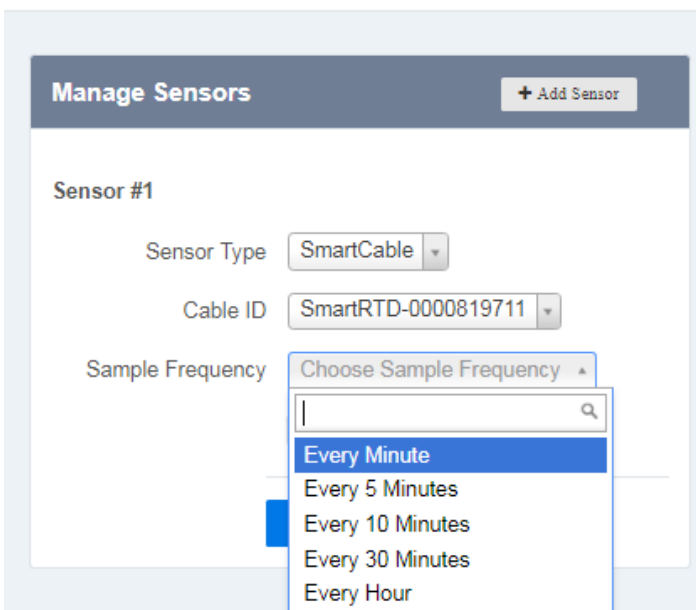


Figure 19. Configuring Sample Frequency

8. For a magnetic door switch sensor, use the “Switch Type” drop down menu to select “Normally Open.”
 - a. There is a “Normally Closed” option for other DI sensor types.

9. For Heracell 150i and 160i models, use the “Baud Rate” drop down menu to select 57600.
10. 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, Refer **Figure 20** and follow these instructions:
 - 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. Use this address in Step 8 above.



WARNING: 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.

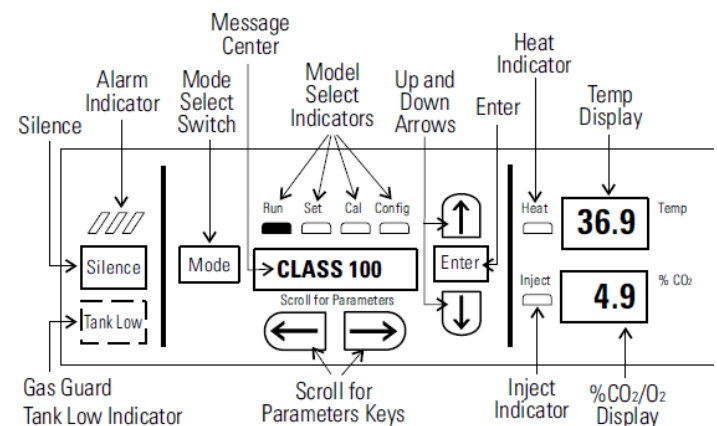


Figure 20. 3110 Operating Panel

11. For ATR/Infors incubators, use the “Cabinets” 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.

12. For each ATR/Infors incubator in a stack, use the “Address” drop down menu to select the address that is programmed into the incubator. There are two models of Multitron—Standard and Pro.

Multitron “Standard” Address Programming Instructions:

To program the address of a Multitron “Standard”, refer **Figure 21** and follow these instructions:

- 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. Refer **Figure 22**.
- c. Using the incubator’s Operating Panel, simultaneously press and hold the F and + buttons.

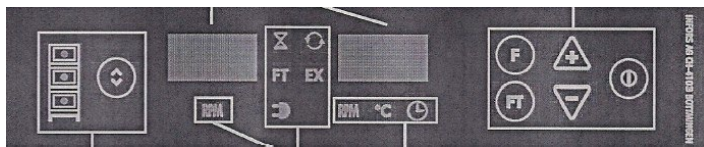


Figure 21. Multitron “Standard” Operating Panel

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

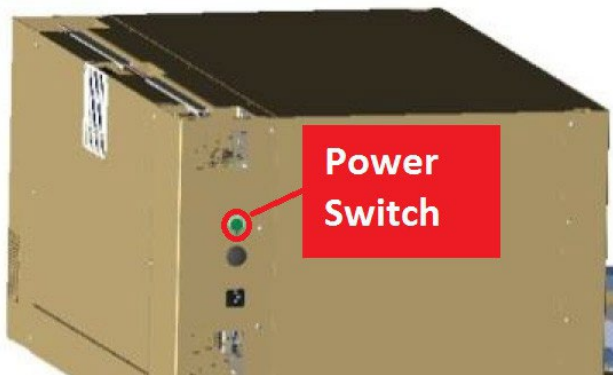


Figure 22. Multitron “Standard” Power Switch

- 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 (refer **Figure 23**).

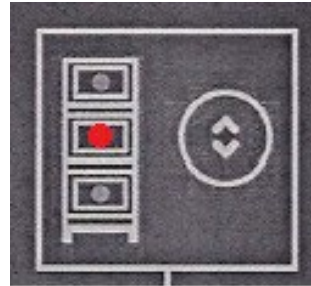


Figure 23. Unit Selector Button and Display – Middle LED Selected (Standard model)

- g. Press the + or – buttons to change the incubator’s address.



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

- i. We recommend setting the top unit in the stack to address = 1.
- ii. We recommend setting the middle unit in the stack to address = 2.
- iii. We recommend setting the bottom unit in the stack to address = 3.
- h. Press the **0** 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 steps 10a – 10i for all Multitron incubators in the stack.

Multitron “Pro” Address Programming Instructions:

To program the address of a Multitron “Pro”, refer **Figure 25** and follow these instructions:

- 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 (refer **Figure 24**).

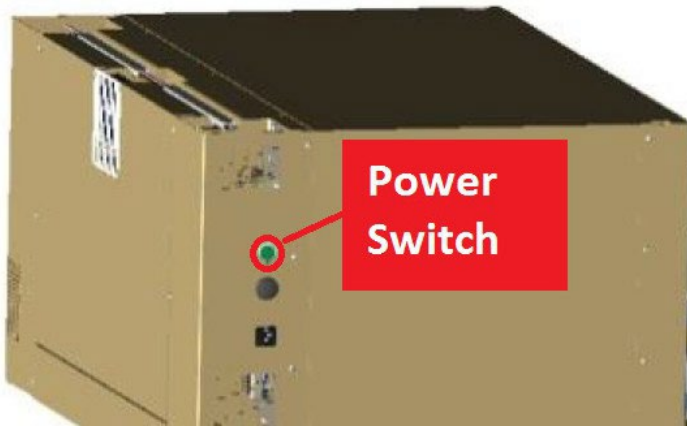


Figure 24. Multitron “Pro” Power Switch

- 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 (refer **Figure 25**).

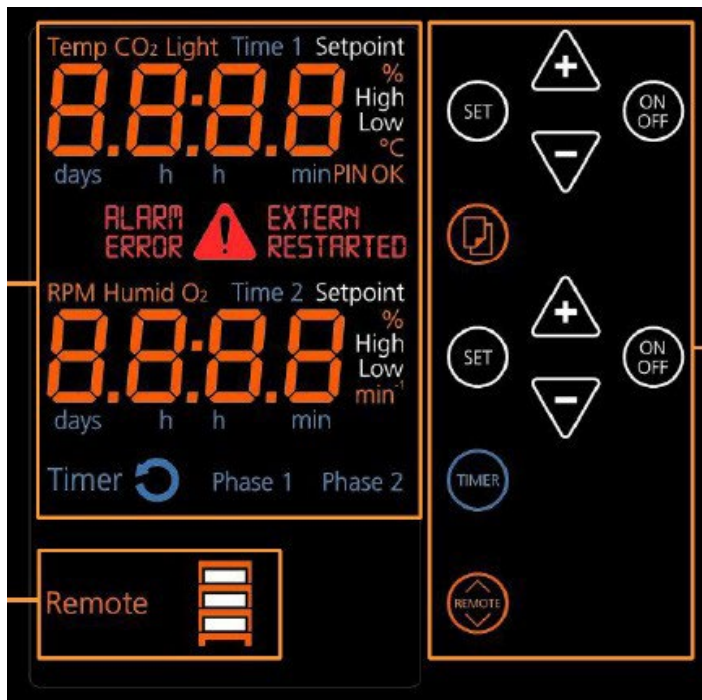


Figure 25. Multitron “Pro” Operating Panel

- 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 (refer **Figure 26**).



Figure 26. 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 (refer **Figure 27**).



Figure 27. 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.



WARNING: 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.
 - 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 steps 10a – 10k for all Multitron incubators in the stack
13. 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 **xiii**.

Figure 28. 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.

- 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 the mote on.
- 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.

Multidrop Configuration

Address assignment for probes which support assignment for multi-drop applications

Figure 29. 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 step [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 step [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. Click the “+ Add Sensor” button to configure the sensor that was originally connected to the splitter cable.
- xxxii. Use the “Sensor Type” drop down menu to select the sensor.
- xxxiii. Use the “Serial Port” drop down menu to select “RS232/RS485”.
- xxxiv. Use the “Multidrop Address” drop down menu to select “Address 1”.
- xxxv. Click “Submit” button.

14. Press the mote’s “Action” button for 1 second.



Figure 30. Action Button

- 15. Go to the web browser’s “Sensor” configuration screen and 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 InSight Online application.

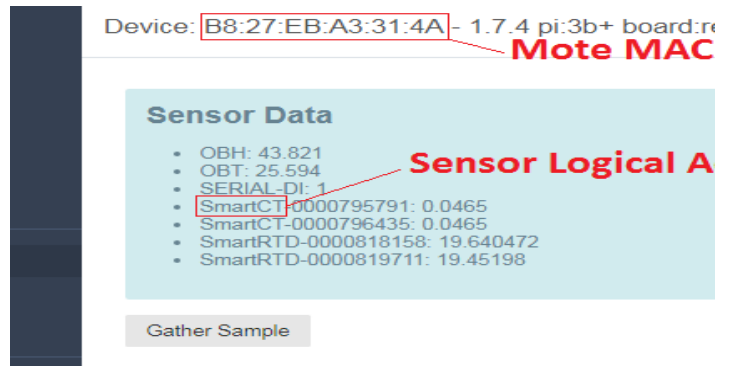


Figure 31. Mote MAC address and sensor logical addresses

Step 9 – Calibration

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

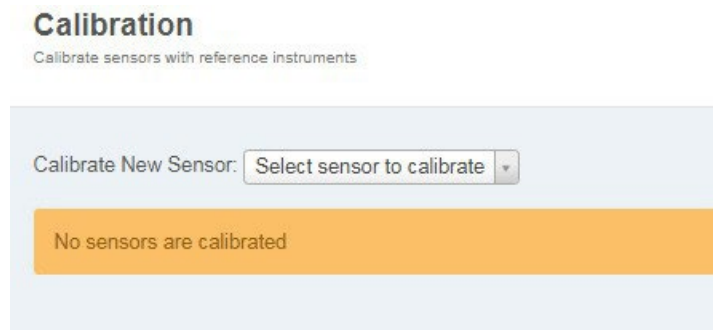


Figure 32. Mote Calibration

- 2. Use the “Calibrate New Sensor” drop down menu to select the sensor to calibrate.



CAUTION: The sensor must be connected to the mote.

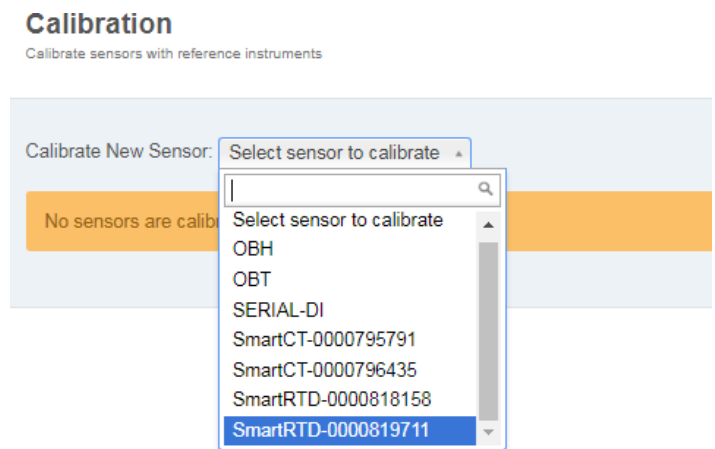


Figure 33. Select sensor to calibrate

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

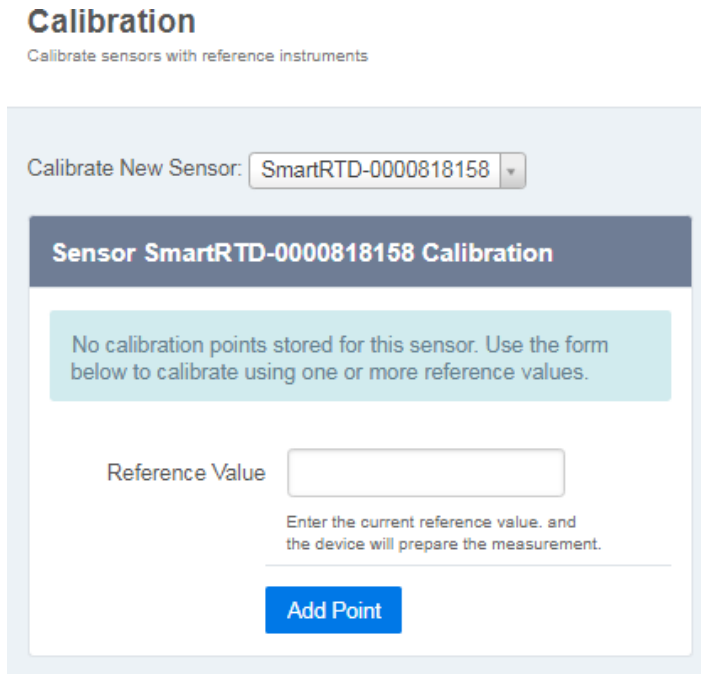


Figure 34. Set the Reference Value

- Click the “Add Point” button.
- Repeat to add a second point of calibration (maximum two points per sensor).

Step 10 – Save & Restore (optional, for configuring multiple motes at a customer 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’s possible to export the wireless configuration in an encrypted file. This encrypted file can then be used to “seed” or “restore” another mote’s configuration settings by dragging and dropping the configuration file.

To save a mote configuration to use on other motes:

- Select “Save & Restore” from the menu in the left margin.
- After the mote’s Wi-Fi, Cloud, NTP, and/or Sensors have been configured, click the “Save Configuration” button.
- The user will be prompted to save the configuration file on their computer.

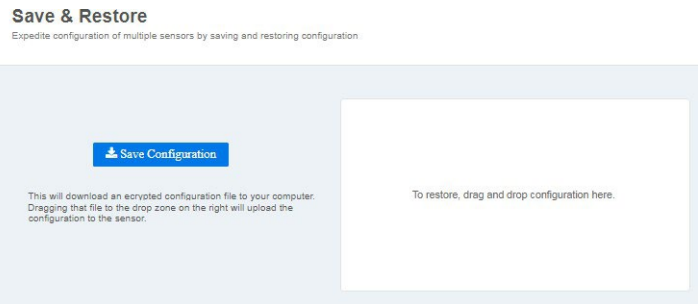


Figure 35. Save & Restore mote configuration file

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

- Select “Save & Restore” from the menu in the left margin.
- Locate the mote configuration file on the computer.
- Drag and drop the configuration file into the white box on the browser window as seen in **Figure 36**.

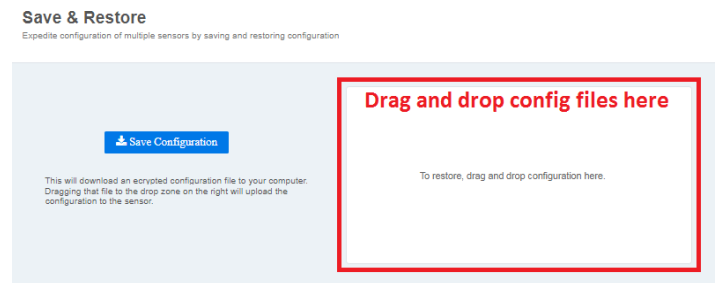


Figure 36. Drag and drop configuration files to load onto new motes

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:

- Select “User Profile” from the menu in the left margin.
- Enter a new password in the Password field.
- Enter the new password in the Confirm Password field.
- Click the Submit button.
- 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 several seconds.
 - b. If the LEDs don't turn off, then unplug the mote from its power source.
2. Note which USB port each sensor is plugged in to.
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.

6. Connect the sensor(s) to the appropriate port(s) on the mote.



CAUTION: The sensors must be plugged in to the same ports as 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.



Figure 37. Mote Mounting-Side View

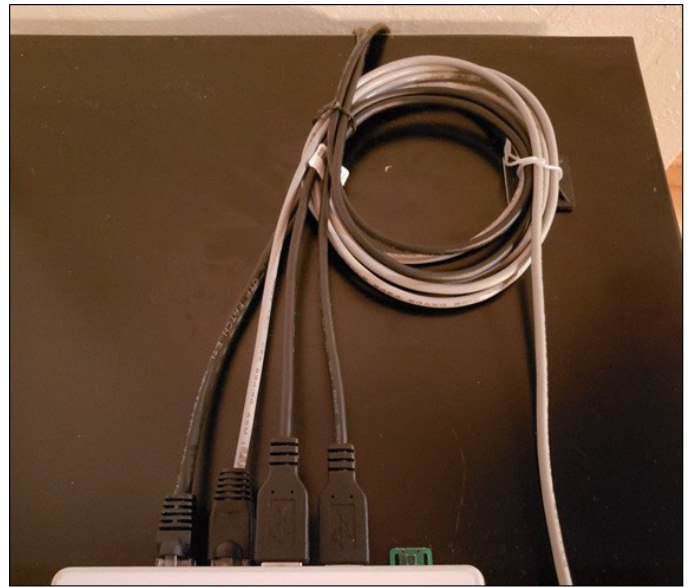


Figure 38. Mote Mounting-Top View

8. Turn the mote on using the OFF/ON switch.
9. Login to InSight to configure the new asset. Refer InSight User Manual for detailed instructions.
10. Contact Thermo Fisher Scientific customer support to verify install and confirm valid sensor data.



CAUTION: The sensors 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

Smart Sensor Assembly

This section describes how to connect analog sensor wires to the Smart Sensor Cable adapters. The Smart Sensor Cables have color coded ends, denoting the sensor compatibility:

- Blue = 3-wire PT100 RTD sensor
- Yellow = 2-wire CT sensor (3000:1 turns)

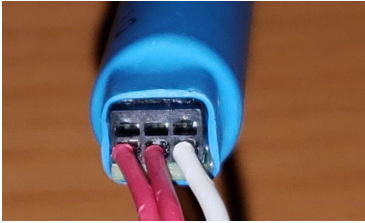


Figure 39. RTD Smart Sensor cable wiring

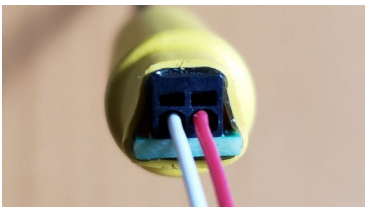


Figure 40. CT Smart Sensor cable wiring

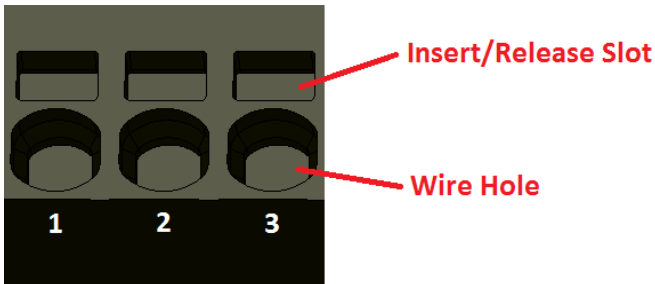


Figure 41. Smart Sensor cable terminal block (RTD)

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.

Pre-requisites:

- 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

Follow the Safety Precautions listed below for Temperature Sensor Installation:



CAUTION: Incorrectly or improperly connecting sensors to a mote can cause damage to the mote. Ensure you connect the sensors and power to the properly designated connections on the motes.



CAUTION: 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 the freezer wall.



CAUTION: Do not tie the temp sensor in a knot around the freezer rack, as this may break the sensing element inside the sensor tip.



CAUTION: Avoid mounting the temp sensor or running the sensor cable where it can be damaged by product sliding in and out of the freezer.



CAUTION: To ensure accuracy, the sensor should always be located near the control sensor.



CAUTION: The sensor should never be in contact with exposed metal inside the cabinet. This could result in false readings.



CAUTION: When installing sensors in cold cabinets, use the appropriate PPE to protect your skin from exposure to the very cold temperatures.



CAUTION: 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.



CAUTION: Temperature sensor-Mote pairs are not factory calibrated. Calibration is typically not necessary in non-validated environments, but if calibration is done follow instructions as needed.



CAUTION: 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 either on the back or top or 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).
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 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 RTD Smart Sensor Cable, insert and secure the sensor wires. 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.



CAUTION: Since this procedure requires thawing, 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.



CAUTION: 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.



CAUTION: 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 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 RTD Smart Sensor Cable, insert and secure the sensor wires. See instructions above.
14. Connect the sensor to the desired USB port on the mote.
15. 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.

Pre-requisites:

- 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. The color coding for CT is YELLOW.

1. Determine if the asset is rated for 115 V or 208 V.
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 208 V systems, choose either hot wire.
 - b. For 115 V 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.



CAUTION: Follow EHS guidelines and wear required PPE before taking diagnostic/test readings on live circuits.

- a. Enter this voltage in InSight (Refer to the InSight User Manual, 3.1.4.6).
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 Smart Sensor Cable.
10. Insert the CT Smart Sensor Cable into the USB port of the mote and secure all loose cables.



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.

Magnetic Door Switch Installation

The magnetic-type switch consists of several parts, such as:

- One threaded magnet
- Four locking nuts
- Two 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.

Pre-requisites:

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

Perform below tasks to install door switch 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.

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 (2.54 mm) apart.
 - f. When the asset door is closed, the two magnets should be as close to in-line with each other as possible.
4. Secure the magnets in the brackets by hand-tightening the supplied locking nuts.
 - a. Do not over tighten 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.

LN₂ Fill Line Monitoring – Temp Sensor Installation

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

Table 4. LN₂ Kit

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

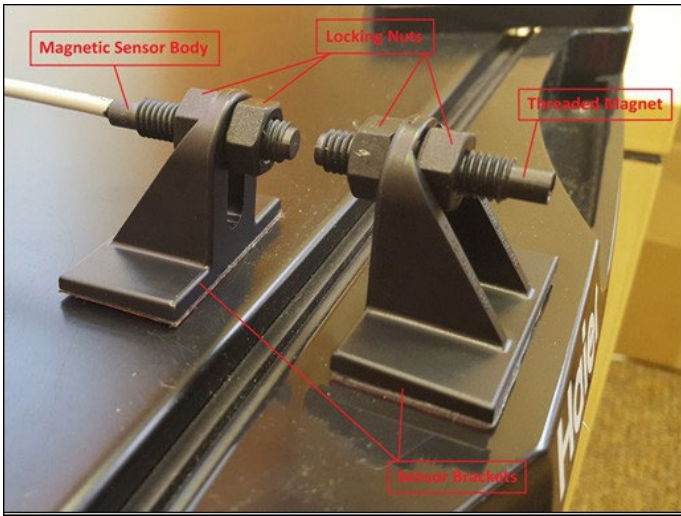


Figure 42. Magnetic door switch sensor installation

- Remove the tape backing on the second sensor bracket.
- 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.
- Run the door switch wire to the mote mounting location.
- Insert the RJ-45 connector of the door switch sensor into the mote's RS232/RS485 connector.

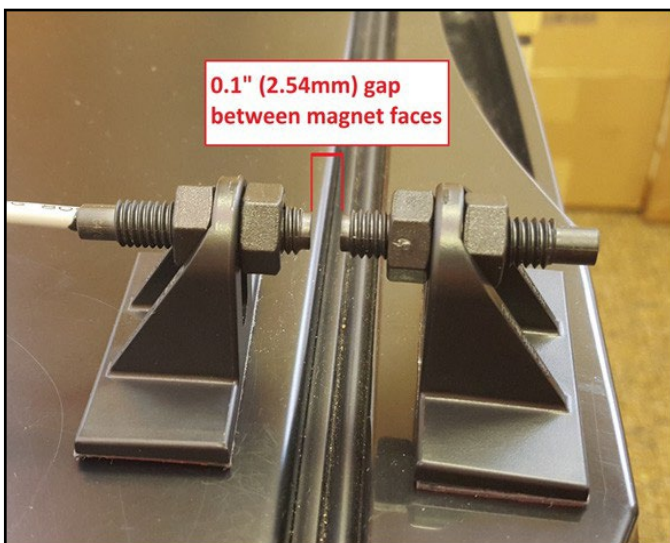


Figure 43. Magnetic door switch maximum magnet gap

Tools Required:

- Small straight blade screw driver
- 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.
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.



Figure 45. Center RTD sensor on Teflon tape



Figure 46. Wrap RTD sensor with Tyvek tape



Figure 44. Wrap Teflon tape around 3" Section of LN₂ fill line



Figure 47. 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 insuring 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 Smart Sensor Cable and plug the cables into available USB ports on the Mote.

- See Smart Sensor Cable sections above for RTD and CT wiring instructions.



CAUTION: There should be one CT sensor on each compressor, condenser fan, and evaporator fan associated with the walk-in room.



CAUTION: 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.

Walk-In Room Monitoring

InSight 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:

Table 5. Walk-In Kit

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

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.
 - a. 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.

Contact Information:

Thermo Fisher Scientific products are backed by a global technical support team ready to support your applications. We offer cold storage accessories, including remote alarms, temperature recorders, and validation services.

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