

EDGE™

Wireless. Connected. Sensors.



W-200 Module

User Guide



temptimecorp.com

1 Notices and safety

1.1.1 Safety instructions

IMPORTANT NOTE: Do not use this product for protection or as part of an automated emergency system or as for any other application that involves protecting people and/or property. Customers and users of Temptime 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. Temptime 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 Temptime technical services.

1.1.2 Battery warning



This product contains a lithium battery. Make sure you respect polarity (+/-) when inserting batteries into Temptime devices. Reversing polarity by inserting the batteries incorrectly can cause the product to heat up, and may lead to battery liquid leakage. Use only batteries recommended by Temptime. Do not change battery types, such as rechargeable, 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 fire. Do not charge regular batteries that are not specifically rechargeable. When the battery is low, or in case the battery-operated device in question remains unused for a lengthy period of time, remove the battery from the device in order to avoid any risk of battery liquid leakage. Never leave batteries within the reach of children. In case of a battery leak, avoid all contact with the liquid present on the batteries. Rinse with clear water immediately in case 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.

1.1.3 FCC statements

FCC part 15 modular qualification



This paragraph pertains to 915 MHz EDGE™ wireless modules. 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 Part 15 §107 - §109 - §207 - §247 (Ed 2008).

FCC RF Radiation Exposure Statement

This paragraph pertains to 915 MHz EDGE™ wireless modules. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

1.1.4 Canada — Industry Canada (IC)

This paragraph pertains to 915 MHz EDGE™ wireless modules. This device complies with Industry Canada 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, including interference that may cause undesired operation of the device.

1.1.5 Conformity with European regulations



This paragraph pertains to 868 MHz EDGE wireless modules. The CE mark on this product indicates that Temptime declares that this product is compliant with Radio equipment and Telecommunications Terminal equipment (R&TTE) directive 1999/5/EC and the Low Voltage Directive (LVD) 2006/95/EC. The following standards were utilized to meet the essential requirements of these directives:

- EN 301 489-3 v1.4.1 (02)
- EN 300 220-2 V2.1.2 (R&TTE)
- EN 60950-1:2006/A11:2009 (LVD).

Caution: Any changes or modifications not expressly approved by Temptime could void the user's authority to operate the equipment.

1.1.7 WEEE compliance

This wireless device complies with the essential requirements and other relevant provisions of the Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE Directive).

1.1.8 Environmental protection



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

1.1.9 RoHS compliance



The wireless device is in compliance with the restriction of the use of certain hazardous substances in electrical and electronic equipment Directive 2002/95/EC (RoHS Directive). Do not dispose of this product with household trash. Temptime recycles this product under certain conditions. Please contact us for more information.

1.1.10 Disclaimer and limitation of liability

Temptime assumes no responsibility for any loss or claims by third parties which may arise through the use of this product. In particular, users must not use the product in any manner not specifically indicated by Temptime. Temptime shall not be held liable for improper use of this product. This document is non-contractual and subject to change without notice.

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2 Introduction

Congratulations and thank you for choosing the Temptime EDGE W-200 wireless monitoring solution.

This document presents an overview of the EDGE W-200 wireless module, followed by practical instructions to get your module up and running quickly as part of your overall EDGE LoRa solution. Detailed configuration instructions and software settings are provided in the documentation for EDGE W-200 companion software applications:

- *EDGEConnect Mobile*, a Temptime mobile app for iOS and Android used to setup EDGE W-200 modules
- *EDGEConnect*, an Temptime web application offering a complete sensor monitoring interface

This document focuses on the physical aspects of the module and compatible sensors. Please see the EDGEConnect web application user guide and the EDGEConnect Mobile application user guide for details on those parts of the solution.

2.1 Overview

The Temptime EDGE W-200 is a wireless temperature and humidity device that integrates LoRaWAN™ technology to offer very long range wireless connectivity – up to 9 miles (15 km) line-of-sight (dense urban settings may reduce this range). This module connects wirelessly to your LoRaWAN™ receiver installed at your site, which transmits locally collected sensor data via the Internet to the Cloud. The EDGEConnect web application is then used to view and manage sensors on an everyday basis, with the EDGEConnect Mobile application used to upload configurations.

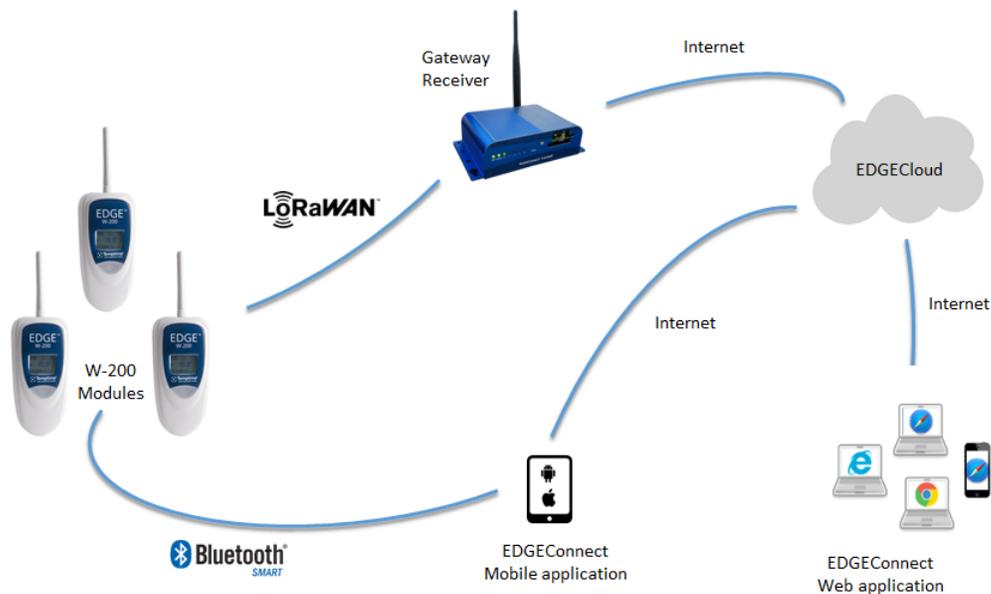


Figure 1 – W-200 modules communicate with the Cloud via a local receiver

2.2 Main module features

- EDGE W-200 wireless temperature and humidity datalogging module with LCD
- Unlimited data storage on EDGECloud; up to 4,000 readings in module memory
- LoRaWAN™ wireless connectivity
- Bluetooth Smart® wireless connectivity
- Various supported temperature and humidity ranges (details in next section)
- Calibration parameters embedded directly in EDGE Smart-Sensors (for ease-of-use and standard exchange for periodic calibration)
- ISO 17025 (COFRAC) calibration, Temptime certified calibration, or NIST traceable calibration upon request
- Automatic and spontaneous alarm transmission (transmitted as they occur)
- Configurable high/low alarm threshold, alerts, regular transmission interval
- Automatic wireless connection to LoRaWAN™ enabled EDGE W-200 receiver

2.3 Available sensor types

EDGE W-200 models are available with several different sensor options, as described below:

| Sensor type | Ranges | No. sensors | Cable | Application |
|--|---|---------------|---|---|
| Internal digital temperature sensor | 0°C to +50°C (32°F to 122°F) | 1 | n/a | Ambient temperature measurement |
| External digital temperature sensor | -40°C to +80°C (-40°F to 176°F) or -40°C to +120°C (-40°F to 248°F) | 1 | Round white cable (1m or 3.3ft in length) | Freezers, refrigerators, and cold rooms; ovens, incubators, and water baths |
| External digital temperature + humidity sensor | Temperature: -40°C to +100°C (-40°F to 212°F) Relative humidity from 0 to 99.9% | 1 dual sensor | Round white cable | Various storage, medical and traceability uses |
| Smart PT100 sensor | -100°C to +150° (-148°F to 302°F) | 1 | Round orange cable (3.5m or 11.5ft in length) | Ultra-low-temperature (ULT) freezers, typically -80°C |
| | -200°C to +50°C (-328°F to 122°F) | 1 | Round orange cable (1.4m or 4.6ft in length) | Liquid nitrogen (LN ₂) tanks |

Table 1 - EDGE W-200 sensor options

Please check the Temptime web site (www.Temptimecorp.com) or contact your authorized representative for up-to-date product information.



The sensors used with EDGE W-200 modules support a variety of temperature and humidity ranges. However, in all cases the W-200 module itself must be used within its supported operating range: 0° to +50° C (32°F to 122°F)

2.4 Package contents

- 1 EDGE W-200 wireless module (with or without Internal temperature sensor)
- 1 Lithium battery
- 1 Antenna
- 1 External sensor with cable (if applicable)
- 1 Calibration certificate per sensor (if purchased with calibration option)
- 1 mounting kit with plastic holder, magnet, screws, and Velcro®
- 1 set of plastic cable holders and cable ties
- 1 flat cable adaptor

3 Getting started

3.1 Requirements

- Temptime LoRa Gateway Receiver (P/N 20-5005) installed and setup for Cloud connectivity via EDGEConnect Web Application
- Temptime EDGEConnect Mobile™ application installed on a compatible mobile device (available for iOS and Android operating systems) and required for configuration
- Please read EDGEConnect™ and EDGEConnect Mobile™ User Manuals carefully.

3.2 Product description

EDGE W-200 modules are available either with internal temperature sensors, or external sensors as shown below. The modules themselves are identical in both cases (other than the external sensor cable). There are two variations of external sensors, Smart PT100 sensors and digital sensors. Both of which will be explained in the following sections.

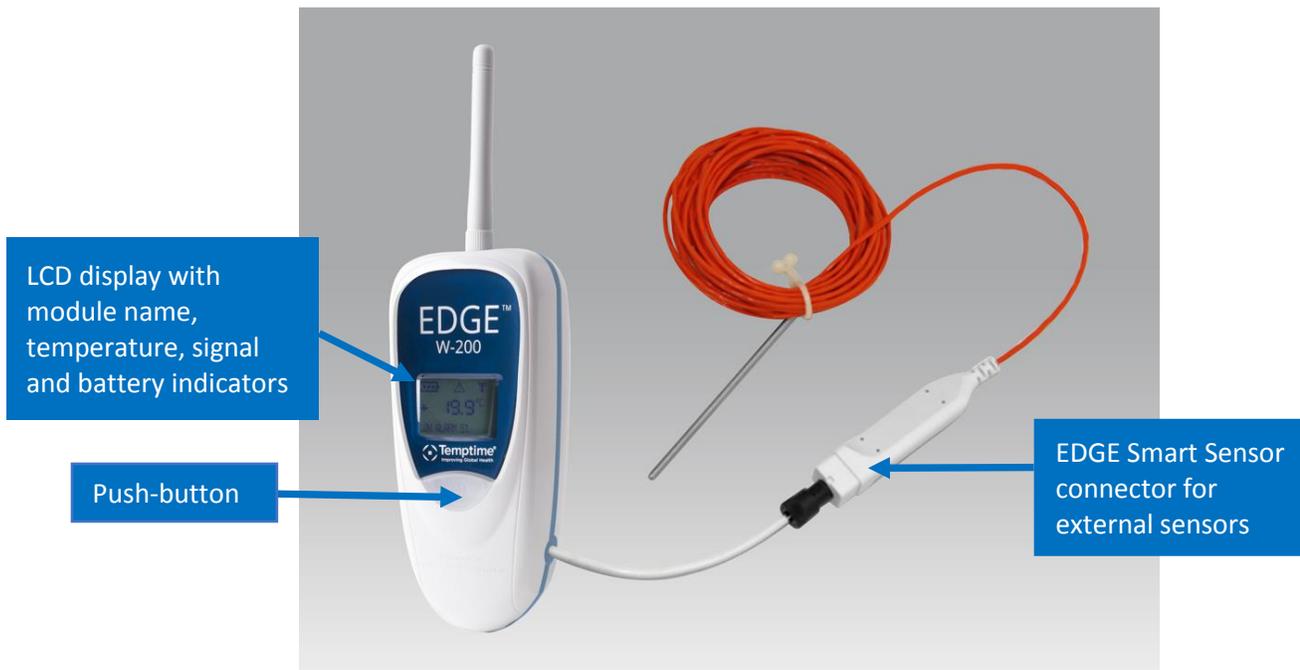


Figure 2 – EDGE W-200 wireless module (example with external PT100 sensor)

3.3 LCD display description

The EDGE W-200 LCD screen shows the following information:

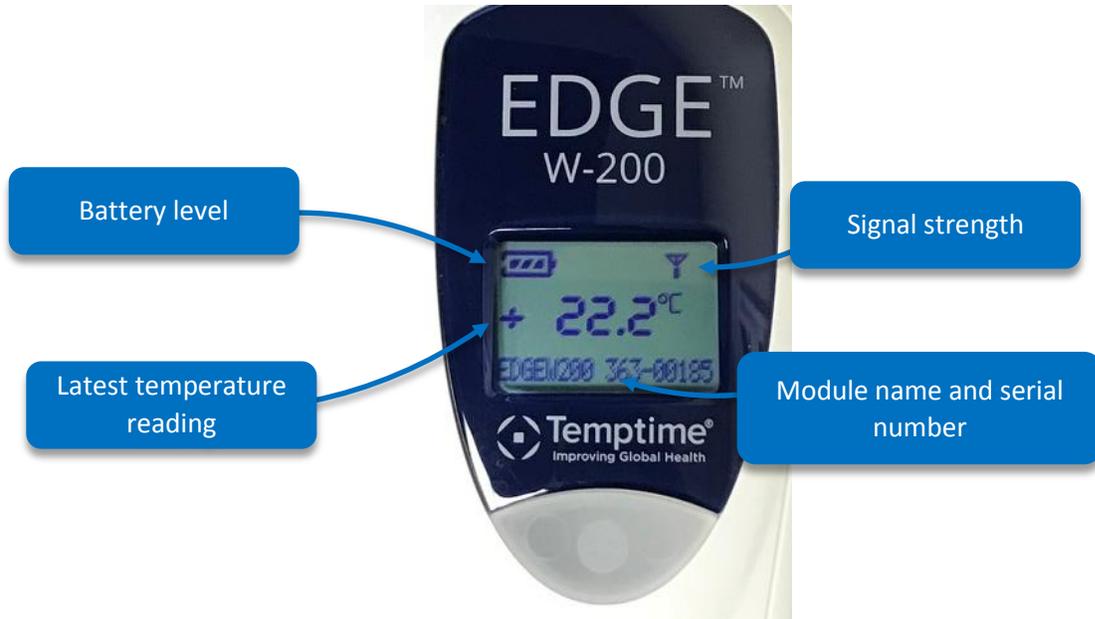
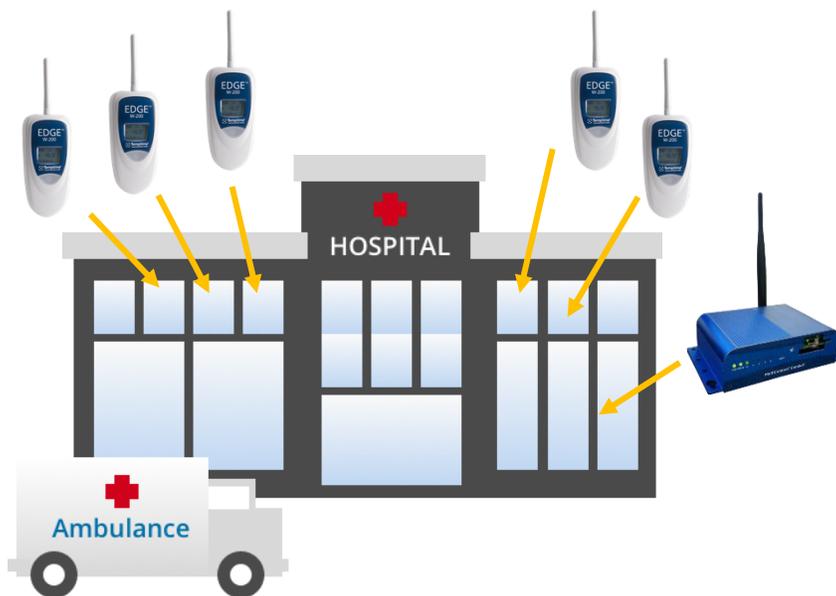


Figure 3 – EDGE W-200 display

3.4 Typical installation

A typical installation therefore involves one or more EDGE W-200 modules and a LoRaWAN™ receiver.



Long-range wireless connectivity enables EDGE W-200 modules to be placed nearly anywhere in your building or site. In cases where the signal is not strong enough, a second LoRaWAN receiver may be required. Please contact Temptime service team for support.

3.5 How to check your module's wireless signal

Note This section assumes that your Temptime LoRaWAN™ receiver (20-5005) is installed, configured, and running properly. See *Temptime EDGE LoRa Gateway Receiver Configuration Guide* for more details on the receiver component.

To see whether an EDGE W-200 module is within wireless range of the receiver:

1. Press the pushbutton on the front of the module (short press).
2. If the module detects a receiver, the text “ACK_RECEIVED” (*acknowledgment received*) is displayed in the lower left-hand corner of the screen. Otherwise “ACK_NOT_RECEIVED” is displayed (see *Appendix - Troubleshooting* on page 29 of this document).



Figure 4 – Confirming connection with LoRa Gateway receiver

3. If required, test various ranges by placing your module at different locations around your site and repeating this test.

This informal site testing procedure will enable you to verify that all your modules are communicating correctly.

Excessive obstruction, interference, or harsh conditions can affect wireless performance. Please contact Temptime technical support for specific cases if you have a module that is having difficulty reaching the receiver.

3.6 Requirements and recommendations

- The EDGE Gateway receiver runs continuously, 24/7/365, and should be connected to an Uninterruptible Power Supply (UPS) that protects against power surges and provides power to back up the receiver.
- The EDGEConnect web application will show an alert clearly on the computer screen if a module is not communicating. You may also verify connections by pressing the pushbutton on the EDGE W-200 module and making sure “ACK_RECEIVED” is displayed.
- Recommended maintenance and calibration procedures should be followed.

3.7 Placing your EDGE module for best wireless performance

For optimal operation, follow these recommendations when physically placing your device:

- Do not place the module within 40 cm (16 in.) of another module.
- Make sure the wireless module is not placed on an electrical conduit or cable tray (such as for computer network cables).
- For best results, place the module so that it faces the general direction of the receiver.
- Keep about 20 cm (8 in.) of clear space around the module. For example, a module that is “stuck” between two refrigerators may not communicate effectively.
- Make sure all cables, if any, are firmly attached and that sensors are properly inserted in the appropriate chamber.

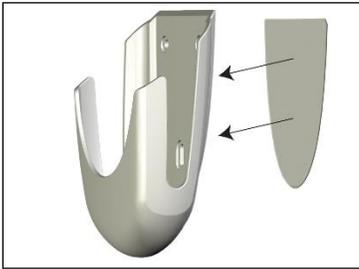
3.8 Preparing mounting kit with a magnet (optional)

Your EDGE W-200 module includes a plastic holder so you can mount the device easily on various surfaces. In addition to the provided screws, you will also find a magnetic pad with adhesive backing that you can attach to the holder and then adhere the holder to metal surfaces easily.

1. Clean the back of the holder with a mild cleanser or alcohol.



2. Remove the protection from the adhesive pad on the magnet and place the magnet on the back of the holder



3. Place the holder and magnet down on a flat surface and press down strongly for 30 seconds to firmly attach the magnet.



4 External Smart Sensors

The procedures described in this document assume that your EDGE LoRa Gateway receiver is up and running, and that you have created an account on the EDGEConnect web application (with a voucher to authorize Cloud access). This section focuses on the physical aspects of the EDGE W-200 module.

This image shows a EDGE W-200 module with an external PT100 sensor, connected via EDGE Smart Sensor technology.



Figure 5 – EDGE W-200 wireless module with PT100 sensor

4.1 Connecting Smart Sensors™

The EDGE W-200 module and external PT100 sensors (and dual temperature/humidity sensors) provided by Temptime are independent of each other with respect to calibration. A calibrated external sensor stores its own calibration parameters directly, and thus can be used with any EDGE W-200 module.

EDGE W-200 modules with support for external sensors use a specially designed Temptime Smart Sensor technology that offers several key advantages with respect to conventional solutions:

- Calibration correction parameters are stored directly in the Smart Sensor
- Plug and play functionality with no special configuration on your part
- Module independence from sensor type: any supported Temptime sensor can be used with any given EDGE W-200 module, simplifying repairs, swaps/standard exchange, and calibration cycles

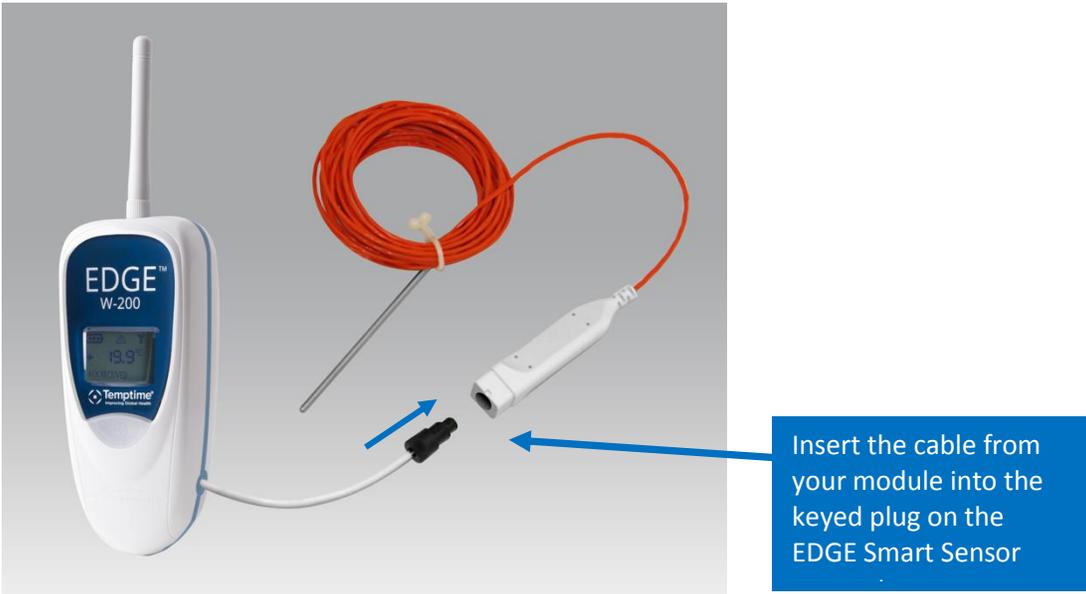


Figure 6 – Connecting your EDGE W-200 wireless module with an external sensor



This feature offers an effective way to handle sensors at calibration time (depending on your standard operating procedure) without leaving your equipment unattended. Simply have a calibrated sensor on-hand and swap it with the one that needs calibration.

4.2 Placing Smart Sensors™

4.2.1 General note about sensor placement

- Given the extreme temperature ranges typically handled by PT100 sensors, please be sure to use the PT100-compatible mounting system provided with your freezer, oven, nitrogen tank, or other equipment.

As mentioned earlier, the EDGE wireless monitoring system supports three different PT100 temperature sensors, each designed for a different application and temperature range. Placement of your PT100 sensor(s) depends on the equipment you intend to monitor, as described below.



In all cases described in this section, the plastic connector joining the module and the sensor must be in the same temperature space as the module, not the sensor.

Note When routing the cable for any EDGE sensor, avoid direct contact with or close proximity placement of the sensor cabling with any high voltage wiring. Cabling should be placed with no less than a minimum of 5 cm (2 inches) distance from high voltage components. Also, avoid running the sensor cable in parallel with high voltage wiring.

Your equipment may be different than that described here. Contact the manufacturer of your equipment for instructions regarding proper placement of the sensor.

4.2.2 PT100: -100°C to +150°C

When installing a PT100 sensor in an ultra-low-temperature (ULT) freezer, it is easiest to proceed with a thawed freezer.

When possible, route the sensor through the same access port used by the unit control sensor or an accessory port, such as that shown below in Figure 7.

When routing the PT100 sensor through the same port used by the control sensor, Temptime recommends installing the sensor only after the freezer has reached a thawed state.

To negate the possibility of condensation dripping on the electronics, avoid routing the cable in close proximity to any electrical enclosures.

Mount the PT100 sensor as close to the unit control sensor as possible. When possible, we recommend mounting the sensor within 5 cm (2 inches) of the control sensor.

When mounting the PT100 sensor, avoid direct contact with the wall of the freezer. This will ensure the sensor is mounted to permit measurement of air temperature only.



We do not recommend installing the sensor through the door gasket on a ULT freezer. This leads to excessive ice build-up and possible door damage as well as longer compressor run times that may result in other mechanical problems.

The orange cable, which supports temperatures from -200°C to $+50^{\circ}\text{C}$, may be placed inside the freezer. Make sure you attach the sensor using the provided cable-ties and reseal any openings you may have unsealed to insert the sensor using permagum sealant.

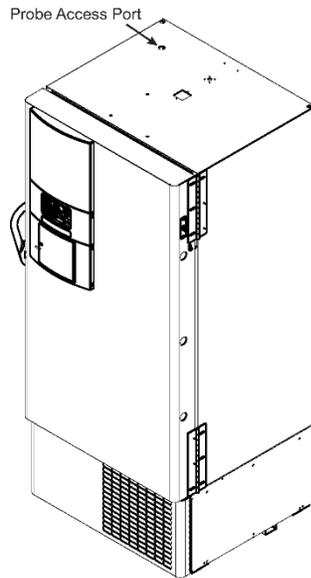


Figure 7 – Sample PT100 (-100°C to $+150^{\circ}\text{C}$) for ULT freezer

4.2.3 PT100: -200°C to +50°C

PT100 sensors for LN₂/cryogenic tanks must be mounted, when applicable, in close proximity to the unit display sensor.

To avoid temperature measurement discrepancies, Temptime recommends mounting the sensor at the same height as the display sensor.

As an example, some freezers have an access panel on the back of the unit in which you may route the sensor cable up the back wall. Place the cable under the tank gasket utilizing the notch at the 12 o'clock position. We recommend the installation of permagum sealant where the cable passes through the notch.

Depending on whether storing in vapor or liquid phase, place the sensor at a depth suitable for proper temperature monitoring.



Figure 8 – PT100 (-200°C to +50°C) for nitrogen/cryogenic tank

5 External digital sensors

This image shows a EDGE W-200 module with an external digital sensor.



External digital sensors do not connect to modules via the EDGE Smart Sensor solution. Therefore, calibration parameters must be managed using the EDGEConnect web application and EDGEConnect Mobile application for upload them to the module.



Figure 9 – EDGE W-200 module with external digital sensor (optional cable lengths)

Depending on the design of the space to be monitored, you may be able to pass the sensor through an access port or opening. We recommend that you use the access port or opening if one is available.

1. When installation permits routing the sensor cabling through an access port or opening, connect the male end of the sensor firmly into the female end of the EDGE wireless module.
2. When installation requires passage through the door gasket seal, connect the male end of the sensor into the female end of the provided flat cable adaptor by joining the connectors (without unscrewing them). Then connect the other end of the flat cable into the end of the EDGE wireless module.

5.1 Connecting the sensor

Simply join the sensor cable to the module cable as shown here:



Figure 10 – EDGE W-200 module with external digital sensor (optional cable lengths)

5.2 Placing the sensor

1. If you have an EDGE module with one or more external sensors, the best solution is to use the access port or opening to insert the sensor(s). Otherwise, run the temperature sensor into the enclosure via the door joint, taking care to place the flat cable flush with the joint.



Installation through the door gasket on freezers may cause ice build-up inside the freezer and/or on the freezer door. This may result in damage to the freezer door if not properly maintained. When used with incubators, use of the flat cable may cause condensation, which could potentially increase the risk of contamination.

2. Clean the surface for the sensor using alcohol to remove any grease or dirt.
3. Attach one of the plastic cable holders to the sensor, remove the protective strip from the adhesive, and place the holder on the clean spot inside the enclosure.

4. Place the sensor / flat ribbon cable connector on the inside of the chamber in the same manner, as shown here:



Figure 11 – Sensor inside refrigerator chamber (modules with external sensor only)

5. Your mounting kit includes a plastic holder that can be mounted using the provided magnet, screws or Velcro®. Choose the method that is most appropriate for your situation and place the EDGE module as described in section 3.7 *Placing your EDGE module for best wireless performance*.
6. For example:



Figure 12 – EDGE module mounted on the refrigerator door

7. Attach or coil the excess cable neatly.

6 Internal sensor

EDGE W-200 modules with integrated temperature do not have a cable protruding from the side of the module, and you do not have to connect a sensor yourself.



Figure 13 – Module with internal temperature sensor

6.1 Placing modules with an internal sensor

Depending on your refrigerator or freezer model, it may be better to leave the module sitting on a shelf inside the chamber rather than sticking it to a side wall.

This is particularly relevant when you have carried out a mapping study and determined the ideal location for the sensor. In that case, make sure that the sensor does not interfere with loading and unloading your product(s) and that the location does not represent a risk for either your product(s) or the sensor.

7 Temperature/humidity Smart Sensors™

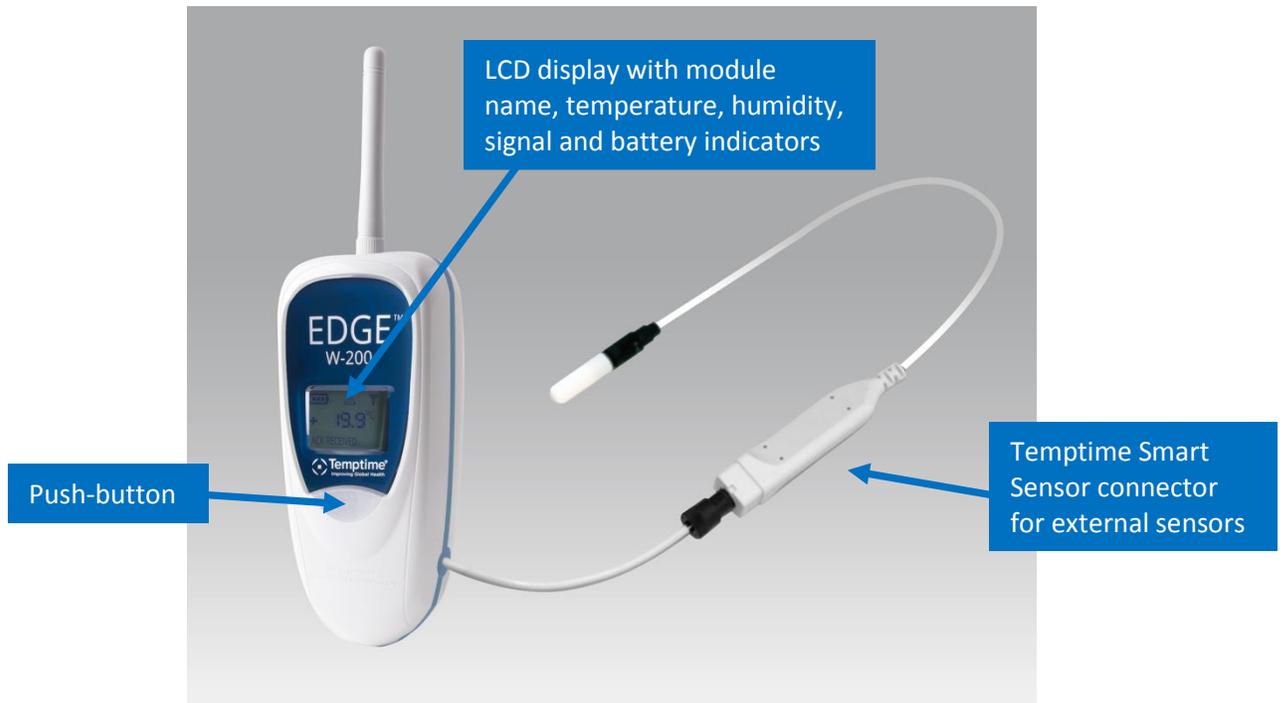


Figure 14 – Dual temperature & humidity sensor

The EDGE W-200 wireless humidity / temperature module monitors both relative humidity levels and temperature. This module is generally used in various types of storage, medical and traceability applications. The white sensor shown above contains both the humidity and temperature sensor.

This sensor connects via the EDGE Smart Sensor connector, and thus will contain calibration parameters directly if the sensor was calibrated by Temptime.

7.1 Connecting the sensor

Connect the sensor and wireless module by joining the connectors.

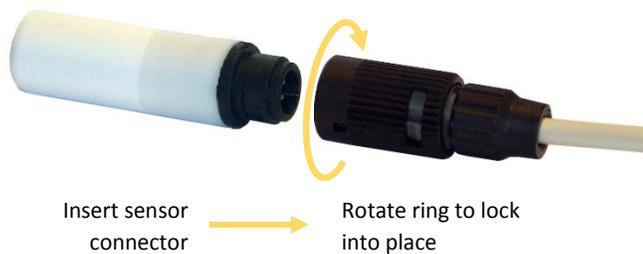


Figure 15 – Align and press firmly to join connectors

7.2 Placing the sensor

Mount the EDGE module in the desired location using the provided plastic holder, which you may attach using a magnet or Velcro[®] tape. Choose the method that works best for your location and place the EDGE W-200 module as described earlier in *3.7 Placing your EDGE module for best wireless performance*. Use the provided plastic cable holders to attach or coil the excess cable neatly.



When routing the cable for the EDGE sensor, avoid direct contact with or close proximity placement of the sensor cabling with any high voltage wiring. Cabling should be placed with no less than a minimum of 5 cm (2 inches) distance from high voltage components. Also, avoid running the sensor cable in parallel with high voltage wiring.

For all other manufacturers' equipment, contact the manufacturer of the instrument for instructions regarding proper placement of the sensor.

8 Activating the EDGE W-200 module

This section assumes that your EDGE LoRaWAN™ receiver is up and running and within wireless range of the EDGE W-200 module you are trying to connect.

The EDGE W-200 temperature / humidity module runs on battery power. To activate your EDGE W-200 module and enable it to communicate via your EDGE Gateway receiver and the Cloud, follow these steps:

1. Insert the provided battery, if not already installed, making sure to respect the polarity (see image printed inside battery slot). We recommend that you use a manual screwdriver, being careful not to over-tighten the screws.



Figure 16 – Remove the back cover and insert battery

2. Wait during the boot sequence, while the device displays various information, such as the serial number, etc.
3. Once the boot is complete, press the pushbutton on the front of the EDGE W-200 module.
4. If a receiver is within wireless range, the module establishes the wireless connection automatically and **ACK_Received** is displayed on the screen.



5. See EDGEConnect and EDGEConnect Mobile documentation for more details on activation and settings.

8.1 Refreshing the module display with a short press

You may refresh the EDGE W-200 display with the latest sensor readings by performing a short press on the module's pushbutton. Press the button briefly to update and view the current reading.

8.2 Testing wireless signal reception

EDGE W-200 modules equipped with firmware 1.3.8 can be run in **Test** mode to verify the signal range with the LoRaWAN receiver.

Wireless signal testing is based on the LoRa Spreading Factor (SF), ranging from Level 6 (very good reception or conditions) down to Level 2 (very poor reception or conditions).

Use the **Test** mode to check the signal strength and determine optimal locations for EDGE W-200 sensors within the wireless coverage area.



The test mode is available on sensors equipped with firmware 1.3.8 and higher.

8.2.1 Activating Test mode

To set the sensor in **Test** mode, follow these steps:

1. If already installed, remove the battery and put it back into the module while pressing and holding the pushbutton on the front for several seconds.
2. Wait during the boot sequence, while the device displays various information, such as the serial number, etc.
3. Once boot is complete, **Test Mode** is displayed on the screen:



8.2.2 Testing wireless signal range

When your module is in **Test** mode:

1. Press the pushbutton on the front of the module to check the signal range with the LoRaWAN receiver.
2. The test starts with a signal at Level 6 (the optimal level). If transmission fails because of poor reception or conditions, **NO ACK** is displayed on the EDGE W-200 screen.
3. Press the pushbutton again. The module repeats the test by changing the power level (signal strength indicator changes on the screen).
4. If the transmission succeeds, a short acknowledgement message **ACK OK Level X** is displayed on the EDGE W-200 screen to confirm reception by the LoRaWAN receiver.



5. Repeat this process if necessary



A lower signal level value enables the module to communicate over a greater distance, but increases transmission time and impacts the battery life of your EDGE W-200 module.

8.2.3 Disabling Test mode

To exit **Test** mode and return to normal operation, remove the battery and put it back into the module.

9 Appendix - Troubleshooting

If you are having difficulties with your configuration, look at these frequently asked questions before contacting technical support.

There is nothing displayed on the EDGE module screen. What should I do? First, check to make sure the battery is installed and that it is inserted in the right direction (+/- according to the image in the battery slot). Try testing the unit with a battery that is known to be of the correct size and voltage (3.6V Lithium, 3600 mA). Contact technical support if the battery is OK and still nothing is displayed on the screen.

I press the button for 3 seconds but my EDGE W-200 module does not connect to my receiver; what should I do? If your module displays “ACK_NOT_RECEIVED” instead of “ACK_RECEIVED” when you press the button, try bringing the module closer to your receiver for a better wireless connection. Also, check to make sure the receiver is working properly.

The EDGE module is properly connected to the Cloud. Why don't I get any temperature readings?

This is usually due to a loose cable or improperly connected temperature sensor. Check the cable between the EDGE module and the sensor. Unplug the sensor and plug it back in. Make sure there are no exposed wires. Try a different sensor.

Can external sensors be submerged in glycol?

Yes, for all metal-tipped sensors, but not the dual temperature/humidity sensor (with the white Teflon/PTFE casing). To “absorb” sudden variations in temperature, such as those caused by opening and closing the chamber door, you may submerge the metal part of the sensor in glycol or glycerol. This limits inconsequential temperature variations recorded by the sensor. Check your laboratory's Quality guide for recommendations and make sure to use a volume of glycol that corresponds to the volume of product(s) you are monitoring. To achieve the same results, you may also delay the transmission of alarms via the software and leave the sensors exposed.

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