User Guide

Wireless Temperature Sensor

Applies to: TES-2X

EPI-199-00

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Safety Information

Please read these instructions carefully before trying to install, operate, service or maintain the temperature sensor. The following special notes may appear throughout the user guide (or on the equipment labels) to warn of Electrical Installation

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by EpiSensor for any consequences arising out of the use of this product.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

- ➔ NEVER work alone.
- ➔ Use appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- ➔ Only qualified electrical workers should install this equipment. Such work should be performed only after reading the entire set of installation instructions.
- ➔ If the equipment is not used in a manner specified by EpiSensor, the protection provided by the equipment may be impaired.
- ➔ Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- ➔ When removing or installing metering or other equipment, do not allow it to extend into an energised bus.
- ➔ The successful operation of this equipment depends upon proper handling,
- ➔ Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Installation & Safety Notes

➔ EpiSensor equipment should be installed, operated, serviced and maintained only by qualified personnel. EpiSensor does not assume any responsibility for any consequences arising out of the use of this equipment.

➔ For detailed installation and safety information, consult the Install Sheet.

CONTAINS LITHIUM METAL BATTERY
For more information,
call +353 61 512 500

Intended Use

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit. Failure to follow these instructions can result in death, serious injury, or equipment damage.

Related Documents

Related installation and configuration documents are listed in the following table:

Document	Reference No.
EpiSensor TES-2x Datasheet	EPI-196-00
Install Sheet for TES-2X	EPI-094-00
Gateway User Guide	EPI-075-00
Gateway API User Guide	ESE-009-08

Introduction

EpiSensor's TES-2x Temperature Sensor is intended to measure the temperature of a probe. Various probe options are available allowing the probe to be immersed in a liquid, or connected to a pipe. The probe is also available with different lengths.

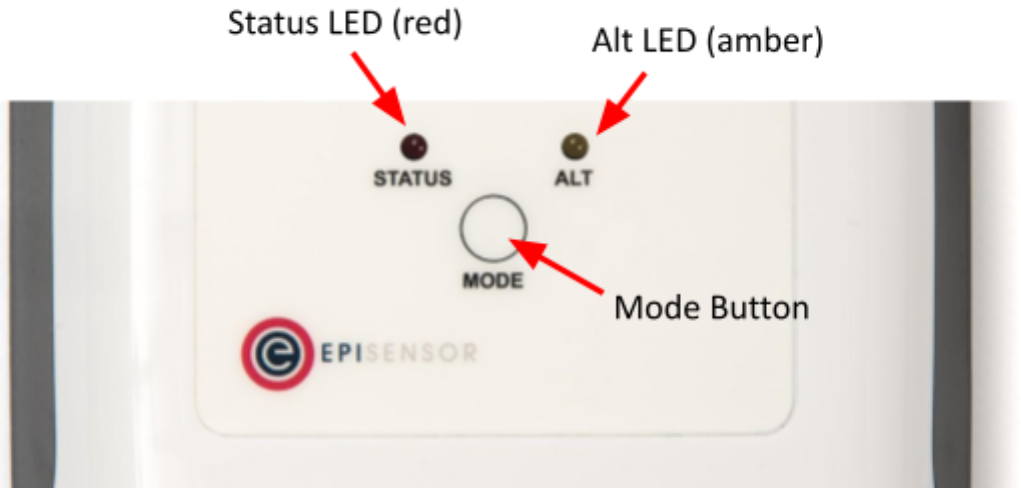
The TES-2x reports data in terms of the 'degrees Celcius'. It is possible to reconfigure the TES-2x temperature sensor to report in 'degrees Farenheit'. The following is the ordering information for the TES-2x.

SKU	Description

TES-21	Single Channel, Battery Powered Temperature Sensor
TES-22	Dual Channel, Battery Powered Temperature Sensor

User Interface

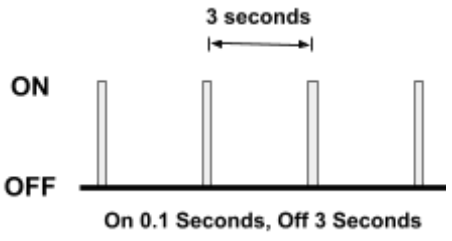
There are two LED's and one button on the front panel of the TES-2x product range that are used to show the status of the product and to issue commands. This section describes how to interact with user interface and what each state means.

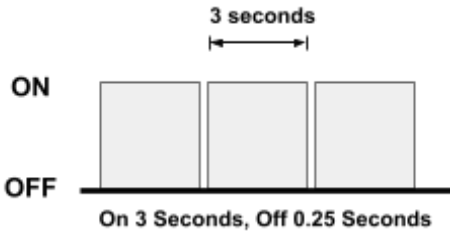
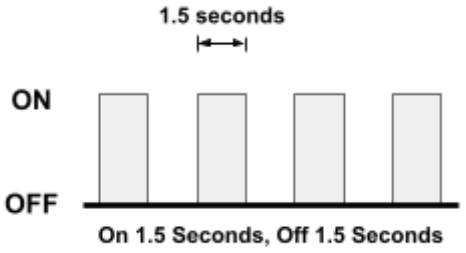


A node must be in "command mode" before users can interact with the product. To put the node in Command Mode, press and hold the "MODE" button for 2 seconds, then release. At this point, a battery powered node will switch the LED On Solid, while a mains powered node will flicker the LED and then switch the LED On Solid.

Status LED

The red status LED will flash in different sequences depending on the current state of the TES-2x. This table below lists all possible LED flash sequences and their meaning.

Flash Sequence	Description	Diagram
Heartbeat	The node is operating correctly and has successfully joined a wireless network.	

Inverse Heartbeat	The node is has received valid security keys, but is not connected to a Gateway.	
Square Wave	The node is operating correctly but has lost contact with the Gateway.	
On Solid, or Off	If the LED is On Solid, the node is searching for a Gateway to join. If it is Off, the node may not be powered, or there is a problem with the node. Check the battery, and if the problem persists, contact EpiSensor support.	

Alt LED

The Alt LED will flash when data is transmitted or received on the ZigBee wireless network. For mains powered nodes, it will always be active - but for battery powered nodes, it will only be active when in Command Mode.

Mode Button

The following options are available with Command Mode. The button should be pressed and then released to register a valid button press. If no further button presses are made, the device will terminate “command mode” 4 seconds after the last button press.

Press	Description
0	Send a PING message disable any active Install Mode or Range Test Mode. If the node is not joined, try and join a network.
1	Send a DATA message to the Gateway for any enabled sensors that are not reporting in ‘snap-to-clock’ mode.
2	Leave the current network. Mains powered Nodes will automatically try and join a new network once they have left and will periodically retry the join. Battery powered nodes will go to sleep.
4	Start “Install Mode”. Node sends a PING message every 15 seconds, with the LED pulse speed indicating the wireless signal strength of the reply. Automatically expires after 5 minutes.
6	Reboot the node. Security keys for the wireless network the node is joined to will not be erased, and all other settings will remain the same.

8	Factory-reset the node and perform a reboot. All settings and security keys will be lost. The node will be returned to its factory default state.
12	Start “Range Test” mode. Node will send a PING message every 5 seconds. The LED pulse speed indicates the wireless signal strength of the reply. Automatically expires after 5 minutes.

Install Mode

Issuing a press sequence on the Mode button of a powered node can enable either “Install Mode” or “Site Survey Mode” on that node. In this mode, the LED will flash at a rate that indicates the wireless signal strength (Link Quality Indicator) of that node, based on the following table:

Flash Rate	Flashes per Second	Wireless Signal Strength	LQI
Very Fast	10 flashes / second (Light on 50ms, off 50ms)	Very good Signal	> 200
Fast	2 flashes / second (LED on 250ms, off 250ms)	Good Signal	> 150
Slow	1 flash / 2 seconds (LED on 1 sec, off 1 sec)	OK Signal	> 100
Very Slow	1 flash / 6 seconds (LED on 3 sec, off 3 sec)	Poor Signal	< 100

For Battery Powered Devices such as the TES-2x, the Install Mode or Range Test Mode continue to operate for 30 seconds only.

Mechanical

This section describes how to wall-mount the TES-2x enclosure.

Enclosure & Label Material

The TES-2x is housed in an IP67 water and dust proof enclosure to provide maximum safety, flexibility and reliability. The enclosure material is polycarbonate plastic, which is resistant to a variety of chemicals, oils and detergents.

The front label is made from polycarbonate. There will be two or more labels on the back of the enclosure, depending on the model selected. The compliance label is made from PVC and the serial number label is made from polyethylene film.

Mounting Instructions

The TES-2x product range will have one (TES-21) or two (TES-22) cable glands at the bottom depending on the model.

The TES-2x requires 2 screws for mounting. These screws can be preinstalled on a vertical surface spaced 122mm vertically apart. The head of the screw should be less than 8.5mm in diameter and the screw thickness should be less than 4.5mm. The screws should be left unscrewed by more than 5 mm before installing the enclosure.

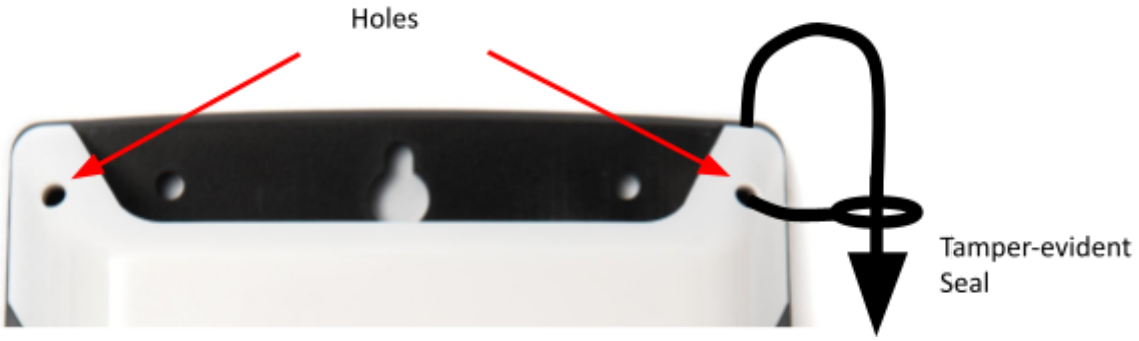
Opening the Enclosure

To replace the battery, it is necessary to open the lid of the enclosure. This is fastened with four screws that are accessible from the back of the enclosure. This should only be done by qualified personnel.

When closing the lid, take care to ensure that no wires or cable ties are obstructing the gasket of the enclosure, as this could interfere with the waterproof seal. When tightening the screws on the lid, apply pressure to the enclosure so the gasket is compressed, and tighten each screw gradually and in sequence.

Tamper Evident Seals

Some applications (particularly applications where data is used for billing purposes) will require tamper evident seals to be attached to the enclosure. These seals can be attached to two or more of the corners of the enclosure, as shown on the diagram below.



Compliance

There is a compliance label on the back of the enclosure that has important regulatory and node identification information.

The label material is gloss white PVC foil with permanent adhesive and gloss overlaminate. The following table lists the certification and safety symbols that appear on the certification labels of EpiSensor products. Please refer to it for a definition of each symbol.

Symbol	Name	Description
CE	**CE Mark**	This marking certifies that a product has met EU consumer safety, health or environmental requirements.
	WEEE Symbol	The directive imposes the responsibility for the disposal of waste electrical and electronic equipment on the manufacturers of such equipment.

	**Class II IEC Protection**	This certifies that this product has been designed in such a way that it does not require a safety connection to electrical earth/ground.
	**IP / NEMA Rating**	Water and dust ingress protection standard. IP67 / NEMA 4 means complete protection against contact with dust, and protected from ingress of water when immersed in up to 1 metre depth for up to 30 minutes. For more information, see IEC 60529.
	**RoHS Directive**	Restriction of Hazardous Substances Directive restricts (with exceptions) the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.
	**Safety Alert**	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	**Danger / Warning**	The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

EpiSensor products are not suitable or specifically designed, manufactured or licensed for use in military, aviation, powerplant, medical or in other inherently dangerous or safety critical applications.

Battery Life

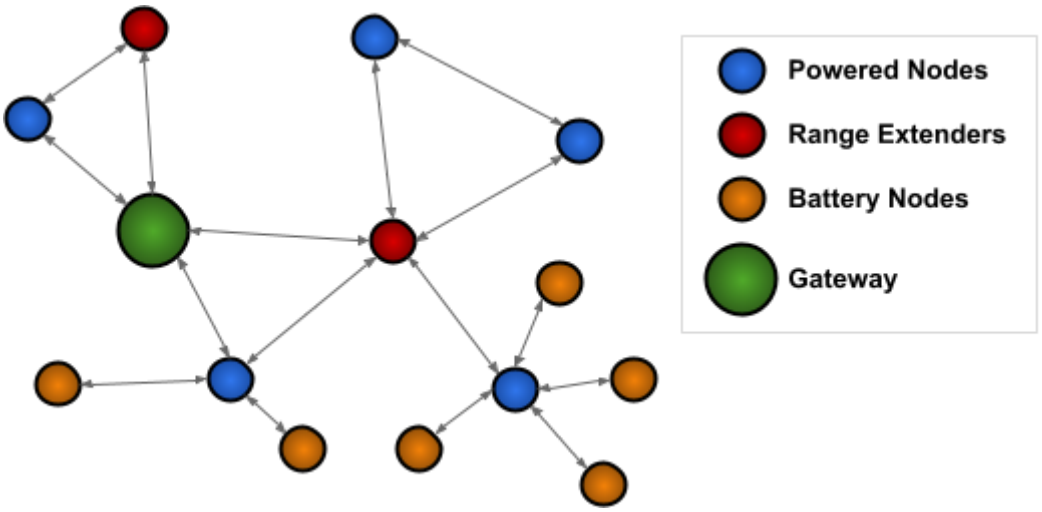
The following table estimates battery life for the TES-2x. There are other environmental factors that this table does not take into account, and the calculations are made assuming the wireless node is not logging data for long periods of time.

Reporting Interval	Estimated Battery Life
1 minute	3 months
15 minutes	6 years
30 minutes	8 years
60 minutes	10 years

Wireless Communications

All EpiSensor products use IEEE 802.15.4 ZigBee Pro for wireless communications operating at 2.4GHz. This is a secure, scalable mesh networking communications protocol designed for transmitting small amounts of data reliably, and at low power levels.

There are two types of nodes in the EpiSensor wireless mesh network: powered nodes and battery nodes. Powered nodes on the wireless sensor network are capable of routing data from any other type of wireless nodes.



Range extenders are powered nodes where the main function is to route data. Any node with a mains power supply will act as a routing node in the network. Battery nodes do not route data – they spend most of the time in a low power mode.

Each powered node can have up to 32 ‘neighbours’ which are nodes with a mains power supply and can Route data back to the Gateway. They can also have up to 32 ‘children’ which are nodes that are battery powered and cannot participate in any routing in the network.

The range that can be achieved with ZigBee will depend mainly on two factors: the power level of the ZigBee radio module and the environment that the device is installed in. There are two types of ZigBee radio module used across the EpiSensor product range, a power amplified version, and non-power amplified version.

The TES-2x does not use a power amplified radio and the power output of TES-2x nodes is set to a maximum output power of +8 dBm.

All communications over the ZigBee wireless network is AES 128-bit encrypted. For more detailed information on ZigBee security features, contact EpiSensor support.

Sensors

The following is a list of all sensors available on the TES-2x range. The reporting mode, reporting interval and logging enabled columns refer to the factory default settings, these settings can be configured from the Gateway.

Sensor ID	Name	Description	Reporting Mode	Reporting Interval	Logging Enabled
380	Temperature T1	Temperature Sensor 1	Snap to Clock	15	Yes
381	Temperature T2	Temperature Sensor 2, TES-22 only	Snap to Clock	15	Yes
4096	Battery Level	Battery level in millivolts	Snap to Clock	1440	Yes

Ordering Information

EpiSensor products are available to order directly or via EpiSensor's distribution partners. The following tables describe the product code structure and list the available options.

Product Code Example:	TES -	2	x
Product Line	**TES:** Wireless Temperature Sensor		
Version	**2:** Version 2		
Probe Count	**1 or 2** probes		

SKU	Description
TES-21	Wireless Temperature Sensor, single external probe, battery powered
TES-22	Wireless Temperature Sensor, dual external probes, battery powered

Troubleshooting & Support

If you are experiencing problems with your temperature sensor or any other part of your EpiSensor system, or you notice something unusual - please contact EpiSensor support at the following email address, phone number or via live chat on our website.

- Email: support@episensor.com
- Website: http://episensor.com
- Tel: +353 61 512 500

For customers and partners who are deploying systems in business-critical environments, there are a number of support packages available that offer a higher level of service and response time. For more information on EpiSensor Premium Support, visit: http://episensor.com/premium-support/

Warranty

All EpiSensor products and provided with a 365 day limited warranty effective from the shipping/invoice date of an order. During the warranty period, under the conditions of normal use, EpiSensor will repair or replace any product that has a manufacturing defect.

Warranty can be extended by up to 4 years within 30 days of a purchase. For more information on warranty, visit: http://episensor.com/warranty/

Glossary

Definitions for terms and abbreviations used in this document are listed in the following table:

Term	Description
Sensor	Describes a feed of data within the EpiSensor system
Node	Used to describe a physical EpiSensor product
Gateway	The central computer that managed the EpiSensor system
ZigBee	IEEE 802.15.4 Wireless communications standard that EpiSensor nodes use
WSN	Wireless Sensor Network
Reporting Mode	Defines how an EpiSensor node should report data to the Gateway
Reporting Interval	The length of time between each data point produced by a node
Snap to Clock	Reporting mode where data is 'snapped' to the nearest 1 minute / 5 minute / 15 minute interval etc.
Interval and Delta	Reporting mode where data is produced when the reporting interval has elapsed, unless a change is detected
Allow join mode	A mode that can be enabled on the Gateway that allows new wireless nodes to join