

Installation Planning Guide Wireless Condition Monitoring EZDP-2154 Rev –

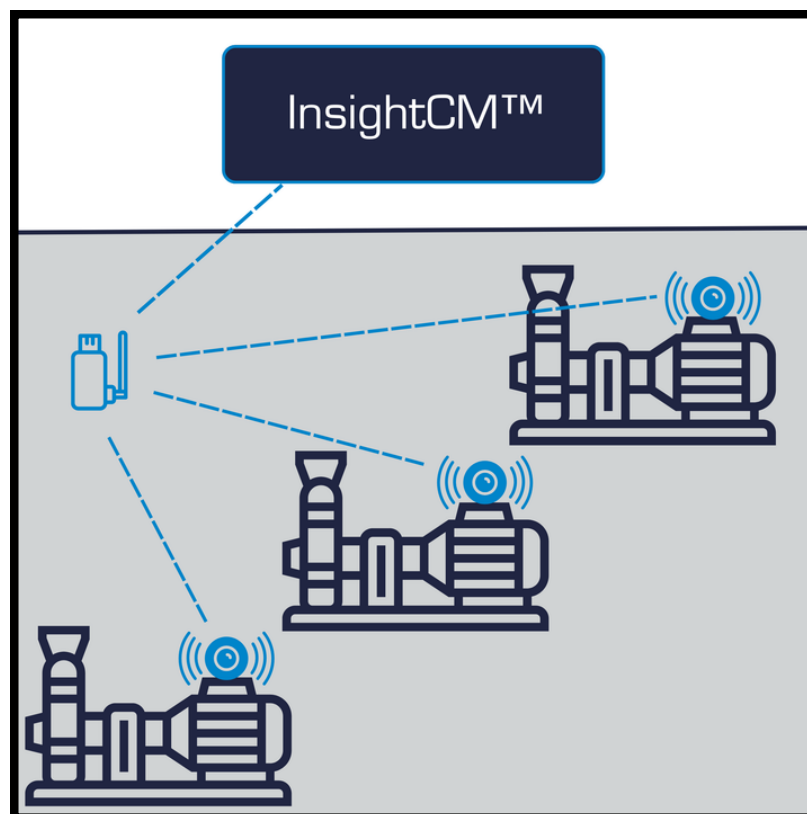


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Patents

Please send patent information requests to patents@cutsforth.com.

Safety Information

Safety Information [English]

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Safety Conventions



NOTE:

Additional information.



ELECTRICAL DANGER

Indicates an action or specific equipment area that can result in personal injury or death from an electrical hazard if proper precautions are not taken.



CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury or equipment damage.



WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.



ROTATING PART CAUTION

Indicates possible injury from rotating parts.



DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

General Safety Instructions



ELECTRICAL DANGER

Only qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury should work with Cutsforth products. Among the many considerations are the following:

- Avoid contact with energized circuits.
- Avoid contact with rotating parts.
- Never install any component that appears not to be functioning in a normal manner.



ROTATING PART CAUTION

High-voltage and rotating parts can cause serious or fatal injury. Installation, operation, and maintenance of this product must be performed only by qualified personnel, in accordance with all applicable safety regulations and guidelines.

Consignes de Sécurité [Français]

Les informations qui suivent sont essentielles afin d'assurer la sécurité de l'utilisateur lors de l'installation et de l'opération de l'équipement. Assurez-vous de bien lire et de comprendre tous les avertissements et mises en garde qui suivent.

Conventions de Sécurité



NOTE:

Informations supplémentaires.



RISQUES DE CHOC ÉLECTRIQUE

Indique que l'action ou la partie de l'équipement concernée peut mener à des blessures par électrisation ou à la mort par électrocution si les précautions adéquates ne sont pas prises.



MISE EN GARDE

Indique la présence d'une situation dangereuse qui, si elle n'est pas évitée, pourrait mener à des blessures mineures à modérées ou à des dommages matériels.



AVERTISSEMENT

Indique la présence d'une situation dangereuse qui, si elle n'est pas évitée, pourrait mener à des blessures sévères ou à la mort.



MISE EN GARDE : PIÈCE ROTATIVE

Indique la présence de pièces d'équipement rotatives pouvant causer des blessures.



DANGER

Indique la présence d'une situation dangereuse qui, si elle n'est pas évitée, pourrait mener à des blessures sévères ou à la mort.

Consignes de Sécurité Générales



RISQUES DE CHOC ÉLECTRIQUE

L'utilisation des produits Cutsforth n'est recommandée qu'aux professionnels qualifiés qui savent comment reconnaître la présence de risques de choc électrique ainsi que les consignes de sécurité à suivre pour éviter les blessures liées à ces risques. Lesdites consignes de sécurité incluent, sans s'y limiter :

- Éviter tout contact avec des circuits alimentés;
- Éviter tout contact avec des pièces d'équipement rotatives;
- Ne jamais installer de composante ne paraissant pas fonctionner normalement;



MISE EN GARDE : PIÈCE ROTATIVE

Les pièces d'équipement rotatives et sous haute tension peuvent causer des blessures sévères ou fatales. L'installation, l'opération et la manutention de ce produit ne doivent être faites que par des professionnels qualifiés et en respectant toutes les règles et consignes de sécurité applicables.

1. System Overview

This manual is a guide for planning the installation of the Wireless Condition Monitoring system.



This manual does not cover all details or variations in equipment, nor does it consider every possible contingency for installation, operation, or maintenance. If you have questions or concerns that are not addressed in this manual, contact Cutsforth Engineering Support.

1.1. Wireless Condition Monitoring System Overview

The Cutsforth Wireless Condition Monitoring System provides a streamlined, cable-free approach to asset health monitoring, dramatically reducing installation complexity and retrofit costs. By using battery-powered wireless sensing devices, the system eliminates the need for running conduit, power cabling, and Ethernet infrastructure—making it significantly easier and more cost-effective to deploy across existing equipment and hard-to-reach locations.

Designed to monitor a wide spectrum of rotating and reciprocating machinery, the wireless platform supports condition assessment of motors, pumps, compressors, turbomachinery, generators, balance-of-plant equipment, and electrical cabinets. The system detects a wide range of mechanical failure modes, including imbalance, misalignment, bearing defects, looseness, gear wear, cavitation, and structural resonance—enabling early identification of issues before they escalate into equipment damage or unplanned downtime.

At the core of the solution is InsightCM™, Cutsforth's unified condition monitoring platform. InsightCM consolidates data from both wired and wireless sensors into a single, consistent interface. Operators can trend vibration, electrical, thermal, infrared, and process measurements using the same diagnostic, alarming, and visualization tools—regardless of how sensors are deployed in the field. This creates a scalable, flexible monitoring system that maintains analytical rigor even when installed in locations where traditional wiring is impractical.

The wireless ecosystem leverages industrial-grade monitoring hardware provided by Erbesd and integrates seamlessly with InsightCM for long-term data management and predictive-maintenance workflows. Whether used standalone or as a hybrid wired-and-wireless strategy, the system helps facilities improve reliability, reduce operational costs, and increase the reach of continuous monitoring without adding infrastructure labor burdens.

Some of the common assets monitored with wireless condition monitoring:

- Motors
- Pumps
- Compressors
- Turbomachinery

- Generators
- Balance of Plant Equipment
- Electrical Cabinets

Some of the common failure modes managed with wireless condition monitoring:

- Imbalance
- Misalignment
- Bearing defects
- Mechanical looseness
- Gear wear/eccentricity
- Cavitation
- Resonance or structure vibration
- Loose or corroded electrical connections
- Overloaded or imbalanced circuits

Some of the wireless measurement technologies available:

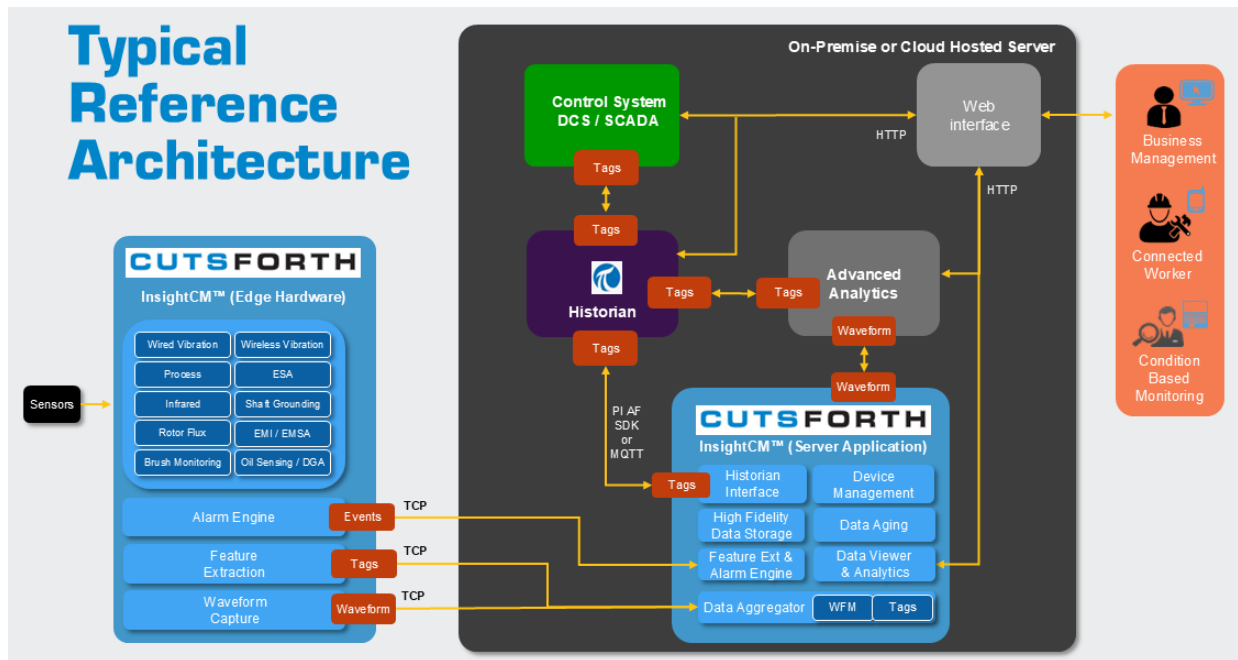
- Vibration (optional ATEX-rated sensors suitable for hazardous environments available)
- Temperature (thermocouple)
- Thermal Imaging
- Speed
- 4-20mA
- 0-10V
- Dry Contact

1.2. InsightCM Features

InsightCM can extract a multitude of features from hardware installed in the field. The calculated feature data from InsightCM can be transmitted to plant historians for integration into advanced pattern recognition (APR) models or other advanced machine learning platforms. For more information on InsightCM features, visit the InsightCM user manual on the Cutsforth Support webpage at support.cutsforth.com.

2. IT System Requirements

2.1. Overall Architecture



2.2. Server Hardware Requirements



InsightCM requires a dedicated server. If NI SystemLink is present on the target machine (for example, from a previous NI deployment), install InsightCM on a different server, as the two products cannot share a machine.



Cutsforth recommends using solid state drives to improve disk throughput.

Proof of Concept	Standard Deployment	Enterprise
- Windows 11, 64-bit Professional 2.2 GHz, 4-core processor 16 GB RAM - One physical hard drive for OS, program installation, and storing data files—At least 500 GB disk space	- Windows Server 2016, 2019, 2022, or 2025 3 GHz, 16-core processor 32 GB RAM - Two physical hard drives: For OS and program installation—At least 250 GB disk space For storing data files—At least 2 TB disk space	Contact your Account Manager or put in a request here: cutsforth.com/contact-us/

2.3. Networking Requirements

A fast or gigabit Ethernet (100 Mbps or 1000 Mbps) local area network or business network connection is required between a PC/server running InsightCM and the data acquisition devices. It is also preferable for this PC/server to be connected through the network to the site data historian for ease of gathering process data.

3. Physical Installation Overview

3.1. Equipment List

To install the Wireless Condition Monitoring system, you need the equipment listed below. Please review this list thoroughly, taking care to note who is responsible for supplying each piece of equipment.

Equipment	Supplied by Cutsforth	Supplied by Plant	Supplied by Plant Electrical Contractor
Wireless Gateway	✓		
NEMA 4X rated gateway enclosure	✓		
Wireless Sensor(s)	✓		
Ethernet cable for connection from gateway to server			✓
600 volt rated power cable or Ethernet cable for PoE power			✓
Conduit			✓

3.2. Installation

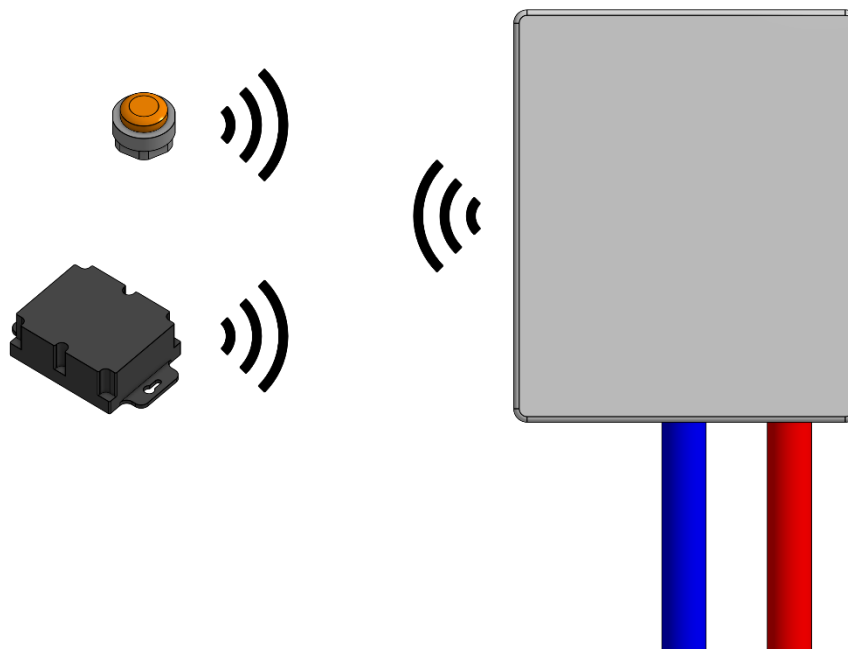
This section provides step by step instructions for installing the Wireless Condition Monitoring system.

1. Mount the Wireless Condition Monitoring system enclosure containing the gateway at the planned location.
2. Install the wireless sensor(s) at desired location(s) on equipment to be monitored.
3. Install the conduit and run cable for AC or PoE power input to the gateway enclosure. Minimum circuit size if using AC: 20A circuit free of non-linear loads. Consider a circuit with isolated ground.
4. Install the conduit and run cable for data connection to the gateway enclosure. Cutsforth recommends Cat6a or fiber connection (media converter required if using fiber).

3.2.1. Conduit Layout

Color on Diagram	Conduit Run Description	Conduit Trade Size*	Wire Description	Purpose	Max. Cable Length	Wire Supplied By
Blue	Gateway Enclosure to InsightCM Server	¾ in (2 cm)	Cat6a or Fiber	Data to InsightCM Server	330 ft (100 m)	Plant Electrical Contractor
Red	Plant Power to Monitoring Enclosure	¾ in (2 cm)	120VAC or PoE Power	Power for the monitoring system	N/A	Plant Electrical Contractor

*Enclosures do not come with conduit holes pre-drilled. Conduit sizing and hole placement is customizable.



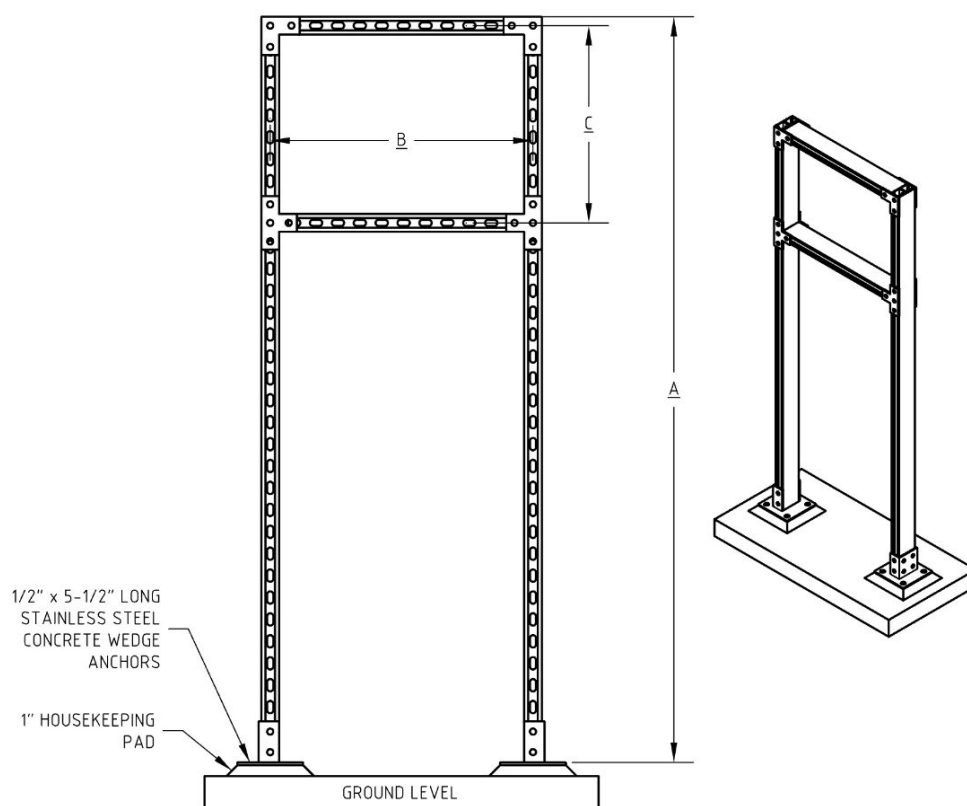
Up to 250 wireless nodes can be connected to each wireless gateway, provided that the line-of-sight distance between all nodes and the gateway stays within the specified limitations.

Part	Name
A	Erbessd wireless vibration sensor
B	Erbessd general wireless sensor module
C	Cutsforth Wireless Condition Monitoring System
D	Blue: Data Output to InsightCM Network
E	Red: Plant Power Input to Monitoring System Enclosure

3.2.2. Conduit and Strut Channel Recommendations

Component	Standard Recommendation	Recommendation for High-Corrosion Environments
Conduit type	Galvanized rigid metal conduit (RMC)	Rigid Aluminum Conduit (RAC)
Conduit fittings type	Malleable, NEMA 4X rated or greater	Aluminum
Strut channel type	Hot dipped galvanized, back-to-back	316 Stainless steel
Mounting hardware	316 Stainless steel	316 Stainless steel
Liquid flexible metallic conduit	Type HCX	Type HCX

3.2.2.1. Recommended Strut Rack Design



A in. (mm)	B in. (mm)	C in. (mm)
68 (1730)	24 (610)	Refer to enclosure mounting feet dimensions

3.3. Power Requirements

3.3.1. AC Power Supply Requirements

Plant-supplied power source	120 V, 60 Hz or 240 V, 50 Hz
Circuit breaker	Internal 120 V, 5 A
Maximum power consumption	10 W

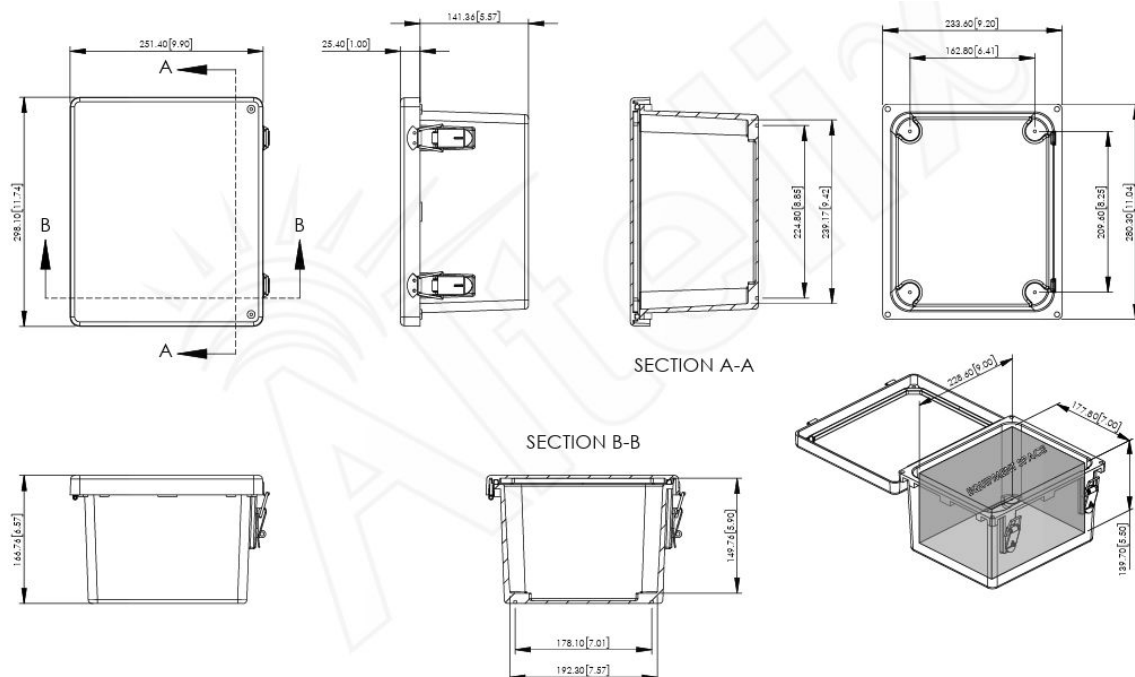
3.3.2. AC Power Specifications

Input Voltage Range	85 – 264 VAC
Input Frequency Range	47 – 63 Hz
Input Power Rating	36 W
Over Voltage Category	III; According to EN62368, EN61558, EN50178, EN60664-1, EN62477-1
Input Wire Connection Type	DIN, Screw-Down Terminal Block
Input Wire Size	26 – 10 AWG

3.4. Enclosure Specifications

3.4.1. Wireless Condition Monitoring System Enclosure

Catalog Number	Dimensions (in. (mm))
NF100806-DIN	10 x 8 x 6 (254 x 203.2 x 152.4)



Specifications:

- UL 508A Listed Type 1, 2, 4, 4X, 12, and 13 File No.
- IP Rating: IP65 and IP66
- Fiberglass Reinforced Polyester (FRP) enclosure
- Weatherproof, UV stable, and highly corrosion resistant
- Stainless steel quick-release latches with padlock hasps

3.5. Instrumentation Specifications

3.5.1. Wireless Gateway Specifications

Storage	100,000 recordings (embedded)
Wireless Nodes Supported	Up to 250
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Operating Temperature	-7 °C to 60 °C (20 °F to 140 °F)
Protection Rating	IP54
Wireless Range	100 m (Line of sight with no competing signals)

3.5.2. Wireless Vibration Sensor Specifications

Frequency Range	0.5 Hz – 10 kHz (x,y), 0.5 Hz – 5.1 kHz (z)
Dynamic Range	±8 / ±16 / ±32 g
Sensitivity	100 mV/g
Data Receiving Interval	As often as 1 min (configurable)
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	CR2477 Coin Cell Battery (Replaceable)
Battery Lifetime	Up to 100,000 Measurements

3.5.3. Wireless Thermocouple Module Specifications

Thermocouple Type	K
Number of Input Channels	4
Temperature Measurement Range	-100 °C to 1250 °C (-212 °F to 2282 °F)
Data Receiving Interval	1 min to 120 min (configurable)
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.5.4. Wireless Thermographic Camera Specifications

IR Resolution	32 x 24 pixels
Max Distance to Object	1 m
Field of View	110 deg x 75 deg
Target Temperature Range	-40 °C to 300 °C (-40 °F to 572 °F)
Accuracy	±1 °C (±1.8 °F)
Data Receiving Interval	5 min to 1440 min (configurable)
Operating Temperature	-40 °C to 75 °C (-40 °F to 167 °F)
Protection Rating	IP5X
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.5.5. Wireless RPM Sensor Specifications

Sensor Type	Hall Effect Sensor
Switching Speed	600 kRPM
Active Distance	5 mm to 15 mm
Data Receiving Interval	1 min to 120 min (configurable)
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.5.6. Wireless 4-20mA Sensor Specifications

Input Range	4-20 mA CC
Number of Input Channels	4
Data Receiving Interval	5 min
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.5.7. Wireless 0-10V Sensor Specifications

Input Range	0-10 VDC
Number of Input Channels	4
Data Receiving Interval	1 min to 120 min (configurable)
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.5.8. Wireless Dry Contact (0/1) Sensor Specifications

Input Range	Closed / Open Circuit
Number of Input Channels	4
Data Receiving Interval	5 min
Operating Temperature	-40 °C to 80 °C (-40 °F to 176 °F)
Protection Rating	IP67
Wireless Protocol	Bluetooth BLE 5.0 @ 2.4 GHz
Wireless Range	100 m (Line of sight with no competing signals)
Power Supply	5-24 VDC or 2x AA Batteries (Replaceable)
Battery Lifetime	12,000 Measurements

3.6. Integration and Infrastructure

The Cutsforth Wireless Condition Monitoring System is designed to be integrated into InsightCM software. For more information on InsightCM, including specific server requirements, visit the InsightCM README on the Cutsforth Support webpage at support.cutsforth.com.

The plant must provide a PC or Server for InsightCM meeting the requirements listed at the above link. Cutsforth is not responsible for the configuration of server-side deployment. Ensure the plant's InsightCM server is set up and ready for communication to field equipment in advance of system commissioning by Cutsforth.

4. Configuring InsightCM for Wireless Monitoring Assets

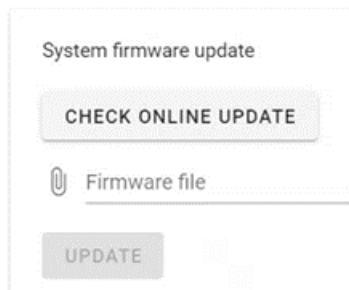
4.1. Configuring Phantom Sensors

InsightCM supports the following Erbesd Phantom wireless sensors: V10E, V11E, ATX15, ATX16, T20, T25, T70, and S40.

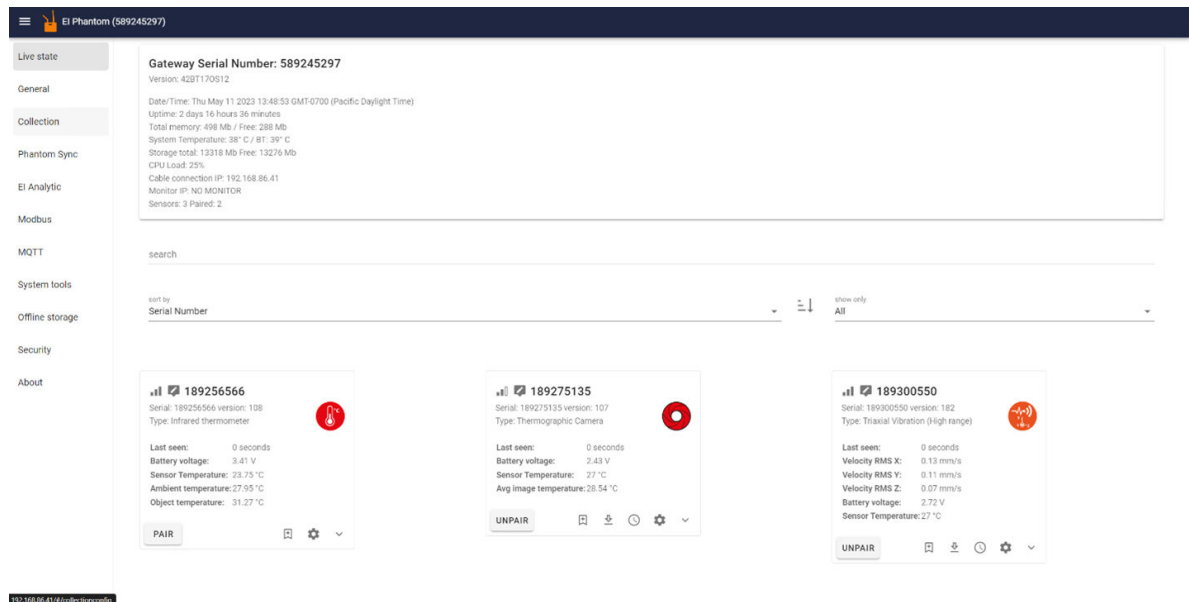
Commission Phantom Gateway

Before adding Phantom wireless sensor assets, commission the Phantom Gateway so it connects to InsightCM.

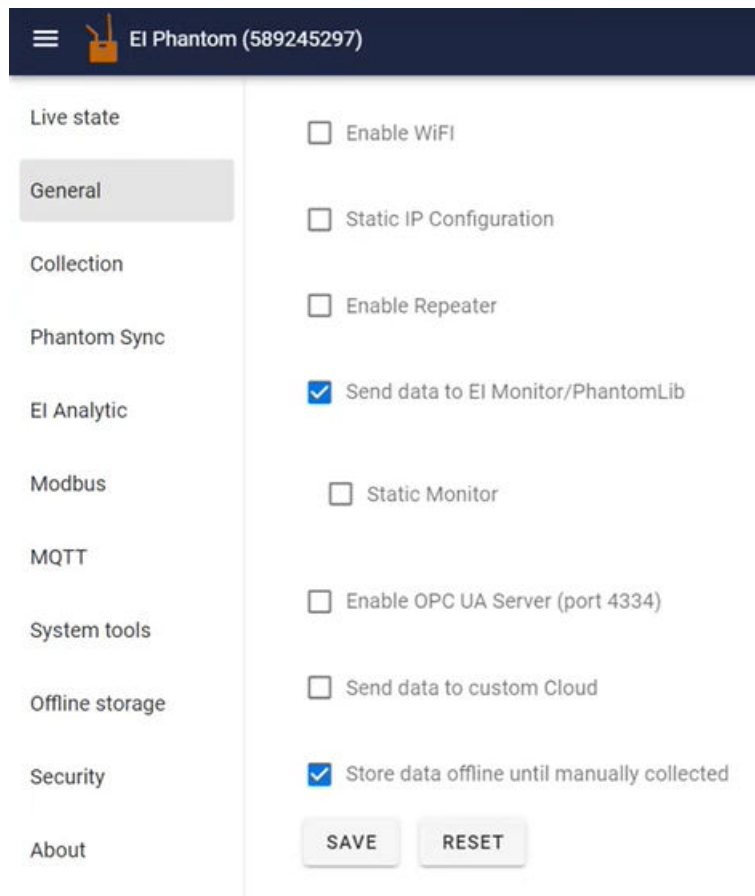
1. Plug an ethernet-wired connection into the Phantom Gateway.
2. Power on the Gateway.
3. Note the displayed IP address on the Gateway screen.
4. Open a web browser window and access the Gateway IP address.
5. Update the firmware of the Phantom Gateway:
 - Contact Cutsforth support to download the Phantom Gateway firmware officially supported by InsightCM.
 - Manually apply the firmware update on the System tools tab.



6. Pair Phantom Sensors to the Gateway using the **Live State** menu. Click the **Pair** button before configuring the sensor in InsightCM.



7. Within the **General** menu, ensure that “Send data to EI Monitor/PhantomLib” and “Store data offline until manually collected” are both checked.



Optional: Within the General menu one has the options to setup a static IP address, and enable Wi-Fi and unplug the ethernet-wired connection after Wi-Fi configuration.

Add Phantom Equipment Sensors

1. Click the **Configuration**  button and ensure that you are on the **Asset Configuration** page.



Ensure that the equipment asset is defined and the monitor type is configured as "Wireless (Phantom)" for the Phantom sensor you are adding.

2. In the right-side configuration panel, select the **Sensors** tab.
3. Enter the Gateway IP address in the IP address textbox.

Monitor	Sensors	Collection
Gateway		
IP Address:		
Password:		
Serial Number:		

4. Click Add, select Vibration » Phantom in the New Asset dialog box, select the desired Phantom sensor and click OK.

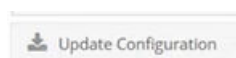
New Asset

- General
- Vibration
 - CMS
 - NI Wireless
 - Phantom
 - Phantom IR Camera (T70)
 - Phantom RPM (S40)
 - Phantom Thermocouple (T25)
 - Phantom Vibration (High Range)
 - Phantom Vibration (High Sensitivity)
 - Static
- ESA
- MCSA
- EMI
- Thermal Imaging
- Rotor Flux
- Salient Flux
- Shaft Grounding
- Data Sources
- Templates

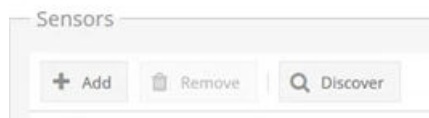
Name: Phantom IR Camera (T70) #: 1

OK Cancel

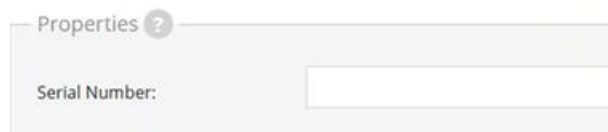
- Optionally enter the Gateway Password in the textbox, if the Gateway has a password previously configured using the **Security** menu on the Gateway configuration web page.
- Click on the **Equipment** node in the asset tree and within the Monitor tab in the right-side configuration panel click on **Update Configuration**. Please note that the Update Configuration button needs to be clicked anytime a change is made to Phantom sensors or equipment nodes to apply changes.
- In the **Sensors** tab, click on **Discover**.



8. Sensors within range of the Gateway will appear. Select a paired sensor and click **OK**.



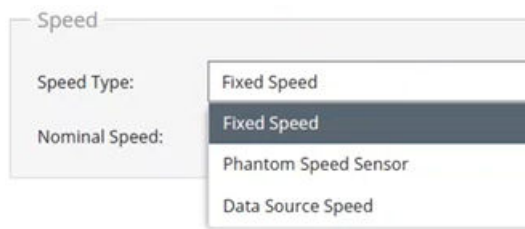
9. New sensor nodes will appear in the left asset tree.
 - a. Alternative: Instead of using Discover, users have the option to manually add sensors in the asset tree list first.
 1. Click **Add** and select **Sensors » Phantom** and select the appropriate sensor. Within the right **Properties** tab enter the Serial Number.



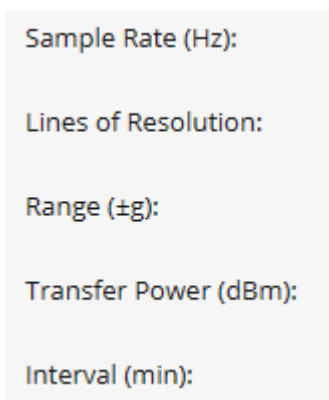
2. After specifying a serial number, click the **Add** button on the Sensors tab to add them to the equipment node.

Phantom Node Properties

- Rotating Equipment has three Speed Types available in the Monitor tab: Fixed Speed, Phantom Speed Sensor, and Data Source Speed.



- Phantom sensors have properties to configure their collection settings. Note, these settings may have an impact on sensor battery life. Please refer to the [Erbessd website](#) for Phantom sensor property details.



4.2. Acquiring Data for Wireless Devices

When the wireless gateway is online with all endpoints mapped to sensor assets, you can test your wireless device's ability to acquire data. Automatic acquisitions occur periodically, but you can force an acquisition at any time by using Force Trigger.

Complete the following steps to acquire data from one of your endpoints.



Acquiring data from all of a device's endpoints can create network congestion.

1. Click the **Data Viewer** () button.
2. Expand one of the wirelessly monitored equipment assets, select a sensor asset, and then select one of the features. By selecting a feature, you activate the Trend viewer chart.
3. In the Trend viewer chart, click the **Action** menu () and select **Force Trigger** to acquire data from the endpoint mapped to this equipment asset.
4. Wait several seconds for the acquisition to complete and click the **Refresh** button to confirm that your device received new data points.



If you force an acquisition for all endpoints, it could take several minutes for the wireless gateway to complete the acquisition.

5. Repeat the force acquisition several times to acquire multiple data sets.



Before the data is available, devices must finish performing the acquisition and the InsightCM server must receive and store the data. You can change the duration of force-triggered acquisitions on the **Operating States** tab for the equipment being monitored on the Asset Configuration page.

For a complete list of ways you can configure a device to perform acquisitions, refer to the *Adding Wireless Monitoring Devices and Endpoints* section in the InsightCM manual.

5. Glossary

AC (Alternating Current)	An electrical power supply in which current periodically reverses direction. Required for powering the monitoring system enclosures.
APR (Advanced Pattern Recognition)	A machine-learning or statistical modeling method that uses historical sensor data to detect abnormal asset behavior and predict developing failures. InsightCM can send feature data to plant historians for use in APR models.
asset tree	A hierarchical representation of plant equipment inside InsightCM. Used for organizing devices, configuring monitoring, and associating data with specific assets.
ATEX rating	Classifies equipment for use in potentially explosive/hazardous environments.
cavitation	A damaging condition in pumps caused by vapor bubble formation and collapse, detectable through high-frequency vibration patterns.
dry contact input	A simple open/closed electrical measurement, often used for status/ alarm indication.
gateway	The central device that receives wireless sensor data.
imbalance	A common rotating-equipment fault where mass is unevenly distributed around a rotor, causing elevated vibration at running speed.
InsightCM™ (ICM)	InsightCM™ is application software for condition monitoring with full access to waveforms, multiple sensor technology inputs, enterprise software connectivity, and analytics packages.
I/O	input/output
IP rating (ingress protection)	A standardized classification that describes an enclosure's resistance to dust and water.
line-of-sight range	The maximum unobstructed distance over which wireless sensors can maintain communication with the gateway—typically 100 m depending on interference levels.
misalignment	A fault occurring when coupled machine shafts are not properly aligned, causing elevated vibration at 1× and 2× running speed.

NEMA rating	A North American standard classifying enclosure protection levels against environmental conditions.
PoE (Power over Ethernet)	A method of powering devices through an Ethernet cable, eliminating the need for separate AC wiring.
sensor node (wireless node)	Battery-powered wireless sensing modules that collect vibration, thermal, temperature, speed, process, and status data. Up to 250 nodes can connect to a single gateway.
shaft-centerline plot	A polar chart used to visualize shaft orbit movement relative to bearing clearance; critical for large rotating machinery diagnostics.
structural resonance	A vibration amplification condition caused when operating frequencies match natural system frequencies; detectable via wireless vibration sensors.
thermal imaging (wireless)	A wireless low-resolution infrared camera used to detect hot spots on electrical and mechanical equipment, trending temperatures over time.
trending	The process of recording and analyzing changes in data over time to detect abnormal patterns or emerging failures.
wireless protocol	The 2.4 GHz BLE 5.0 communication layer supporting secure, low-power data transmission between sensors and the gateway.