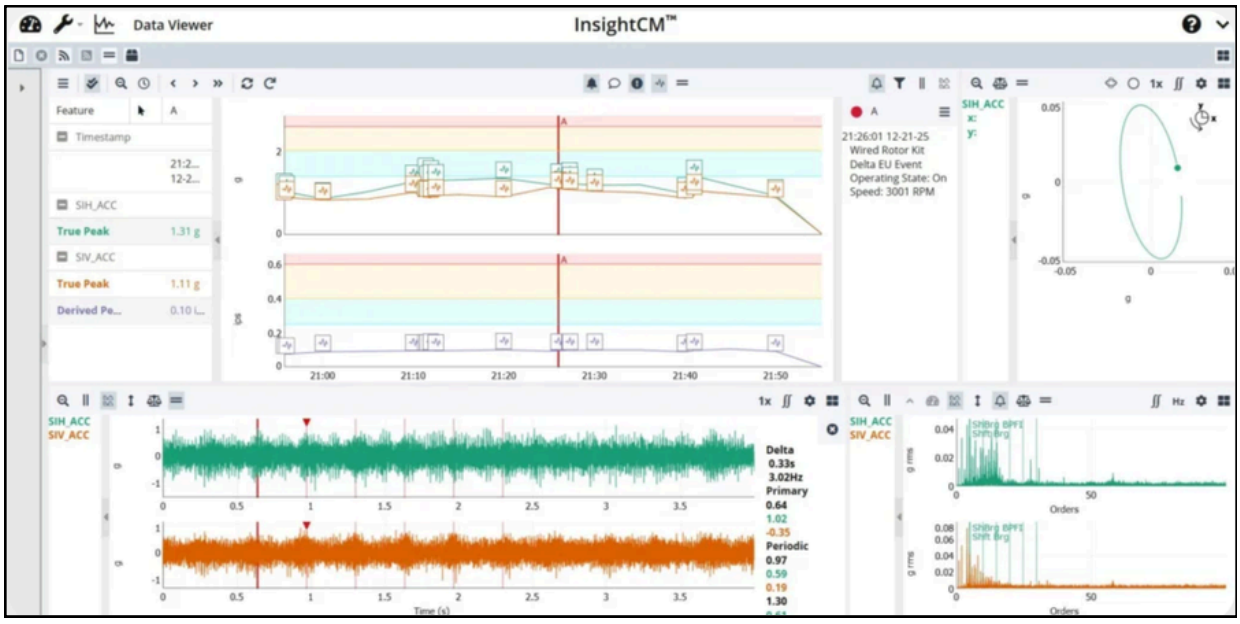
CUTSFORTH

Installation Planning Guide EZDP-2153 Rev A

Wired Vibration Monitoring



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1. About Cutsforth

Cutsforth specializes in developing innovative new technologies and services to support the power generation industry. Cutsforth's patented EASYchange® brush holder design, online truing service, InsightCM™ condition monitoring software, and patented shaft grounding and monitoring systems have been installed across the globe in generators of all sizes and in nearly every industry application, including nuclear, natural gas, coal, wind, and hydroelectric.

Cutsforth's knowledge and commitment to excellence drives our innovative solutions for the changing needs of the power industry. Whether it is a quick response to a critical situation or a new way of solving an old problem, our commitment to quality ensures that our customers receive best-in-class products and services—Cutsforth is the Power of Innovation.

Cutsforth started back in 1991 as a small company focused primarily on making replacement brush holders for generators and exciters. Today, after 30+ years in business, Cutsforth's experience and innovative designs have brought its best-in-class excitation brush holder and shaft grounding replacements and collector ring services to some of the world's largest power companies.

1.1. Cutsforth Products

- EASYchange® Removable Brush Holders
- EASYchange® Brush Condition Monitoring
- Cutsforth Shaft Grounding Systems
- Rotor Flux Monitoring
- Electro-Magnetic Interference Monitoring
- InsightCM™ Condition Monitoring Software

1.2. Cutsforth Field Services

Cutsforth provides comprehensive product installations for all product offerings as well as on-site training after the installation. We work efficiently during your outage to ensure a smooth upgrade to our innovative solutions such as Product Installations, Online Collector Ring and Commutator Truing, Spiral Groove Restoration, and Consulting and Emergency Services.

1.3. Cutsforth Automation and Control Services

Cutsforth provides comprehensive Automation and Control services which include data historian integration, InsightCM™ integration, DCS logic, engineered drawings and much more. This further complements our turnkey monitoring system installations.

2. Legal Information

2.1. Limited Warranty

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For a period of ninety (90) days from the date of invoice, Cutsforth warrants that (i) its software products will perform substantially in accordance with the applicable documentation provided with the software, and (ii) the software media will be free from defects in materials and workmanship. If Cutsforth receives notice of a defect or non-conformance during the applicable warranty period, Cutsforth will, in its discretion: (i) repair or replace the affected product, or (ii) refund the fees paid for the affected product. Repaired or replaced hardware will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. If Cutsforth elects to repair or replace the product, Cutsforth may use new or refurbished parts or products that are equivalent to new in performance and reliability and are at least functionally equivalent to the original part or product. You must obtain an RMA number from Cutsforth before returning any product to Cutsforth. Cutsforth reserves the right to charge a fee for examining and testing hardware not covered by the Limited Warranty.

This Limited Warranty does not apply if the defect of the product resulted from improper or inadequate maintenance, installation, repair, or calibration performed by a party other than Cutsforth; unauthorized modification; improper environment; use of an improper hardware or software key; improper use or operation outside of the specification for the product; improper voltages; accident, abuse, or neglect; or a hazard such as lightning, flood, or other act of nature.

THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND THE CUSTOMER'S SOLE REMEDIES, AND SHALL APPLY EVEN IF SUCH REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE.

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CUTSFORTH DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE OF OR THE RESULTS OF THE USE OF THE PRODUCTS IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. CUTSFORTH DOES NOT WARRANT THAT THE OPERATION OF THE PRODUCTS WILL BE UNINTERRUPTED OR ERROR FREE. INCIDENTAL AND CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF USE, ARE SPECIFICALLY EXCLUDED FROM THIS WARRANTY; THE MAXIMUM VALUE OF A WARRANTY CLAIM CANNOT EXCEED THE ORIGINAL VALUE OF THE ASSEMBLY OR COMPONENT.

2.2. Copyright

2.3. Patents

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

3. Safety Information

3.1. 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.

3.1.1. 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.

3.1.2. 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.
- Always ensure proper installation of the holder assembly and shaft grounding rope.

ELECTRICAL DANGER

Before working on the generator, de-energize, lock out, and tag out all power sources to the generator, shaft, and accessory devices. Electric shock and death may result due to failure to heed this warning.

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.

3.2. 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.

3.2.1. 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.

3.2.2. 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;
- Toujours s'assurer que la structure de soutien et le câble de terre de l'arbre de la génératrice sont correctement installés.

RISQUES DE CHOC ÉLECTRIQUE

Avant de travailler sur la génératrice, désalimentez, cadenassez et étiquetez toutes les sources d'énergies liées à la génératrice, à l'arbre et aux appareils accessoires. L'opérateur s'expose à des risques de chocs électriques pouvant causer la mort s'il ne tient pas compte de cet avertissment.

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.

4. System Overview

This manual is a guide for planning the installation of the Wired Vibration 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.

4.1. Wired Vibration Monitoring System Overview

The Cutsforth Wired Vibration Monitoring System provides continuous, high-fidelity insight into the mechanical health of rotating and reciprocating assets. By capturing and analyzing vibration amplitude, frequency, and waveform patterns over time, the system enables early detection of developing faults such as imbalance, misalignment, bearing defects, looseness, gear wear, cavitation, and resonance. This makes vibration analysis one of the most proven and widely adopted condition-monitoring technologies in industrial environments.

Designed to monitor a wide range of equipment—including motors, pumps, compressors, turbomachinery, and generators—the system offers operators a detailed understanding of machine behavior during all operating conditions. This early visibility helps prevent failures, reduce unplanned downtime, and improve overall equipment reliability.

At the core of the system is InsightCM, Cutsforth's unified monitoring platform. InsightCM delivers high-resolution waveform capture, automated mechanical fault detection, and trend analysis, correlating vibration data with temperature, electrical, and process inputs to provide a comprehensive view of asset condition. Standard diagnostic tools include time waveform, spectrum, full spectrum, Bode and orbit plots, waterfall displays, envelope spectrum, and shaft-centerline analysis. These capabilities help maintenance teams quickly identify and interpret emerging issues.

The system supports a wide range of sensors—including accelerometers, velocity probes, and proximity probes—ensuring compatibility with diverse machinery types and applications. High-fidelity 24-bit acquisition and intelligent edge processing optimize data accuracy while minimizing bandwidth and storage requirements. Proven hardware and Cutsforth's engineering expertise further ensure reliable measurements and smooth integration into plant-wide monitoring strategies.

The Cutsforth Wired Vibration Monitoring System equips operators with precise, actionable insights into machine condition, enabling predictive maintenance, reducing operational risk, and extending asset life across critical industrial processes.

Some of the common assets monitored with vibration monitoring:

- Motors
- Pumps

- Compressors
- Turbomachinery
- Generators
- Balance of Plant Equipment

Some of the common failure modes managed with vibration monitoring:

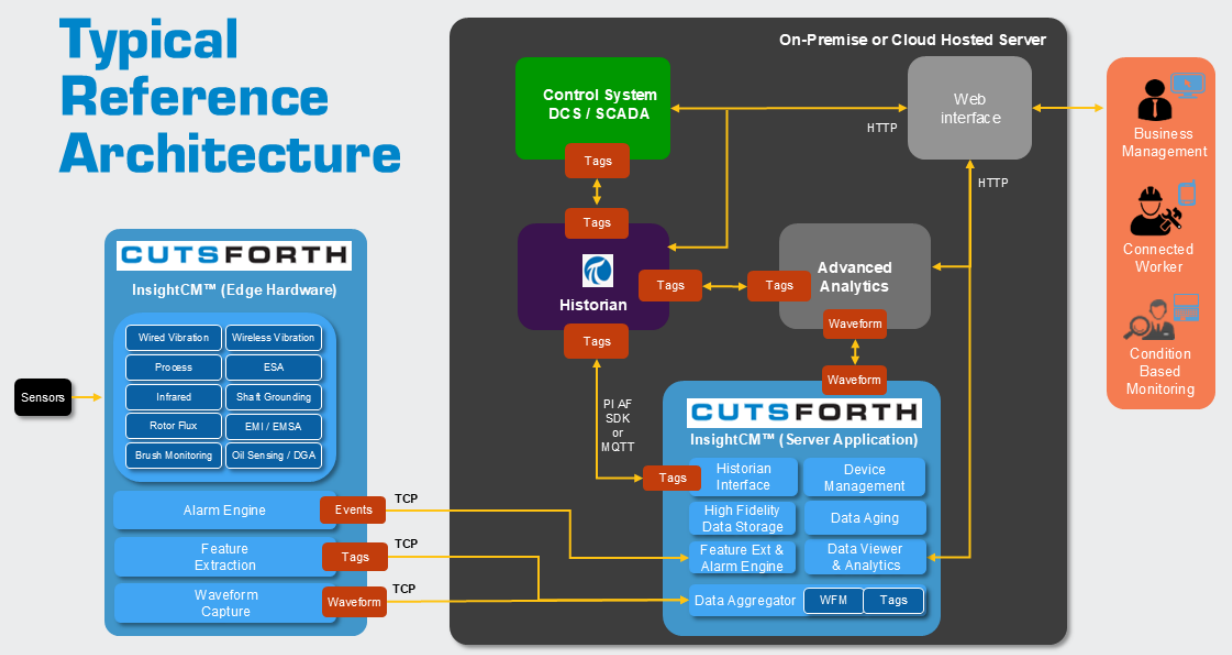
- Imbalance
- Misalignment
- Bearing defects
- Mechanical looseness
- Gear wear/eccentricity
- Cavitation
- Resonance or structure vibration

4.2. 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 https://support.cutsforth.com.

5. IT System Requirements

5.1. Overall Architecture



5.2. Server Hardware Requirements

The following sections describe the recommended specifications for the InsightCM Server. InsightCM and SystemLink are incompatible and should be installed on separate servers.

Cutsforth recommends using solid state drives to improve disk throughput.

Systems with fewer than 10 Monitoring Devices	Systems with fewer than 50 Monitoring Devices	Systems with more than 50 Monitoring Devices

▪ Windows 10 or 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, or 2022
	▪ 2.2 GHz, 8-core processor
	▪ 16 GB RAM
	▪ Two physical hard drives:
	  ▪ **For OS and program installation**—At least 250 GB disk space
	  ▪ **For storing data files**—At least 1 TB disk space
		▪ Windows Server 2016, 2019, or 2022
		▪ 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

5.3. 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.

6. Physical Installation Overview

6.1. Equipment List

To install the Wired Vibration 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
Controller – one or two of the following, depending on quantity and type of equipment being monitored: ▪ cRIO-9055 4-slot controller ▪ cRIO-9058 8-slot controller ▪ cRIO-9047 8-slot controller	✓		
Input card(s) – Depends on the signal type and quantity of signals being brought into the monitoring system: ▪ NI-9229 ▪ NI-9230 ▪ NI-9232	✓		
NEMA 4X rated enclosure	✓		
Sensors (accelerometers, velocity probes, proximity sensors, etc.)	✓*	✓*	
Shielded sensor signal cabling	✓*	✓*	
Ethernet cable for connection to server			✓
600 volt rated power cable			✓
Conduit			✓

*Either existing or new vibration sensors and cabling (supplied by plant or purchased from Cutsforth) can be integrated into the Cutsforth vibration monitoring hardware.

6.2. Installation

This section provides step by step instructions for installing the Wired Vibration Monitoring system.

1. Mount the Wired Vibration Monitoring system enclosure at the planned location.

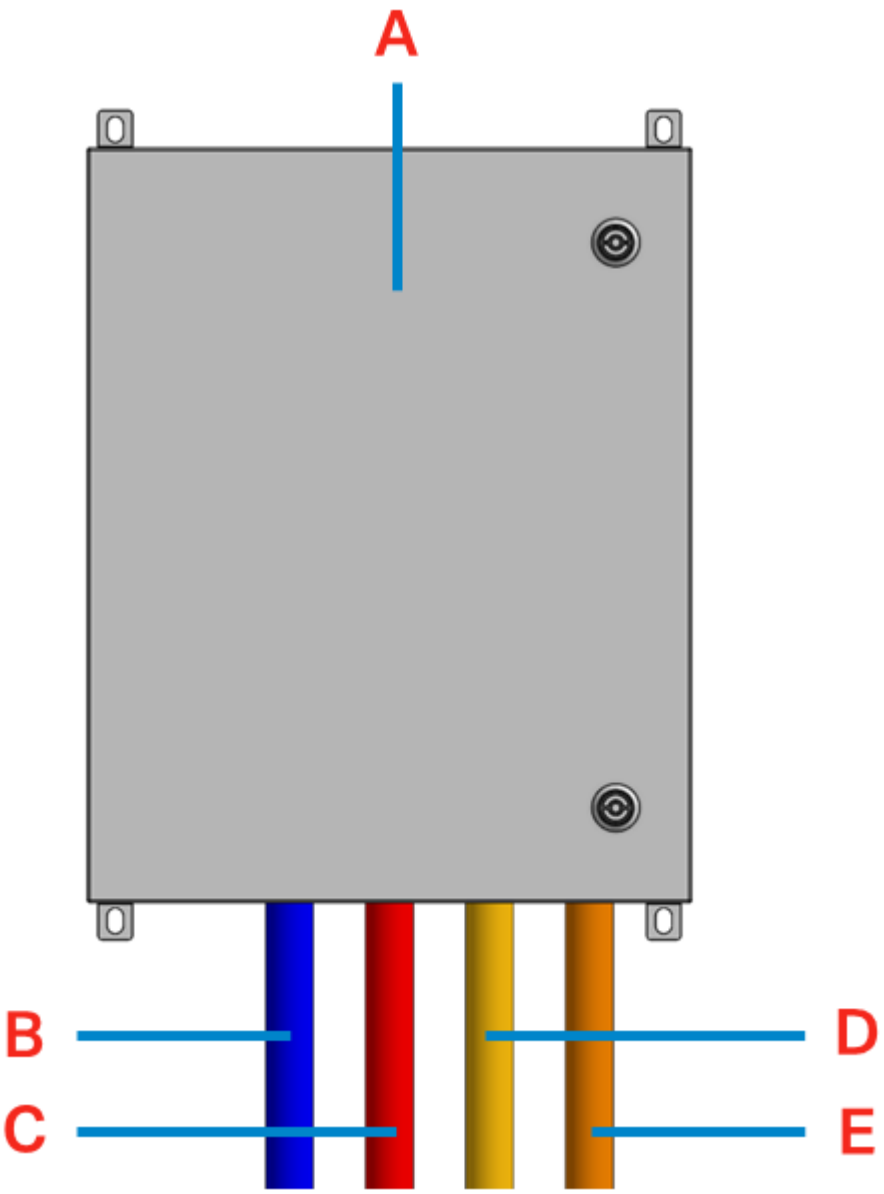
2. If not already installed, install vibration sensors at desired location(s) on equipment to be monitored.
3. Install the conduit and run cable between the vibration sensors and the monitoring system enclosure.
4. Install the conduit and run cable for AC power input to the monitoring system enclosure. Minimum circuit size: 20A circuit free of non-linear loads. Consider a circuit with isolated ground.
5. Install the conduit and run cable for data connection to the monitoring system enclosure. Cutsforth recommends Cat6a or fiber connection (media converter required if using fiber).

6.2.1. Conduit Layout

Color on Diagram	Conduit Run Description	Conduit Trade Size*	Wire Description	Purpose	Max. Cable Length	Wire Supplied By
Blue	Monitoring 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 Power (20A dedicated circuit – preferably with isolated ground)	Power for the monitoring system	N/A	Plant Electrical Contractor
Yellow	Vibration Sensor(s) to cRIO Enclosure	¾ in (2 cm)	Shielded signal cabling	Vibration sensor signals to cRIO	100 ft	Plant Electrical Contractor

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

Up to 48 signal inputs can be connected to a Wired Vibration Monitoring system, provided that cable lengths stay within the specified limitations.

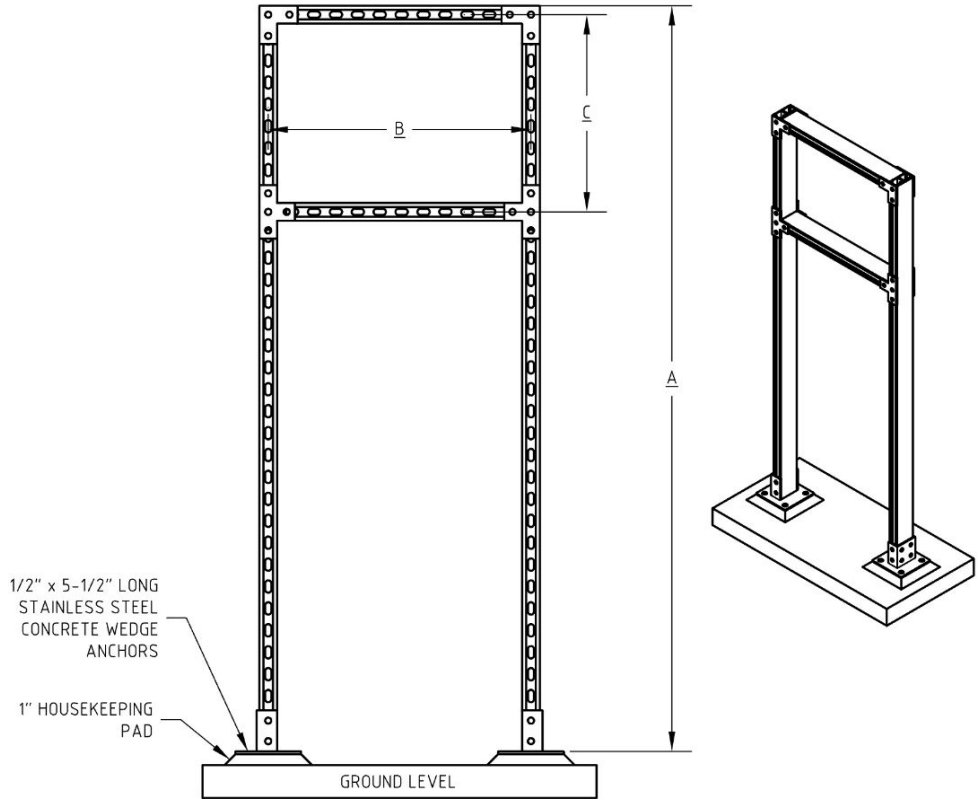


Part	Name
A	Cutsforth Wired Vibration Monitoring System
B	Blue: Data Output to InsightCM Network
C	Red: Plant Power Input to Monitoring System Enclosure
D	Yellow: Vibration Sensor Signal Input(s)
E	Orange: Additional Vibration Sensor Signal Input(s) as Required for Additional Assets

6.2.2. 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

6.2.2.1. Recommended Strut Rack Design

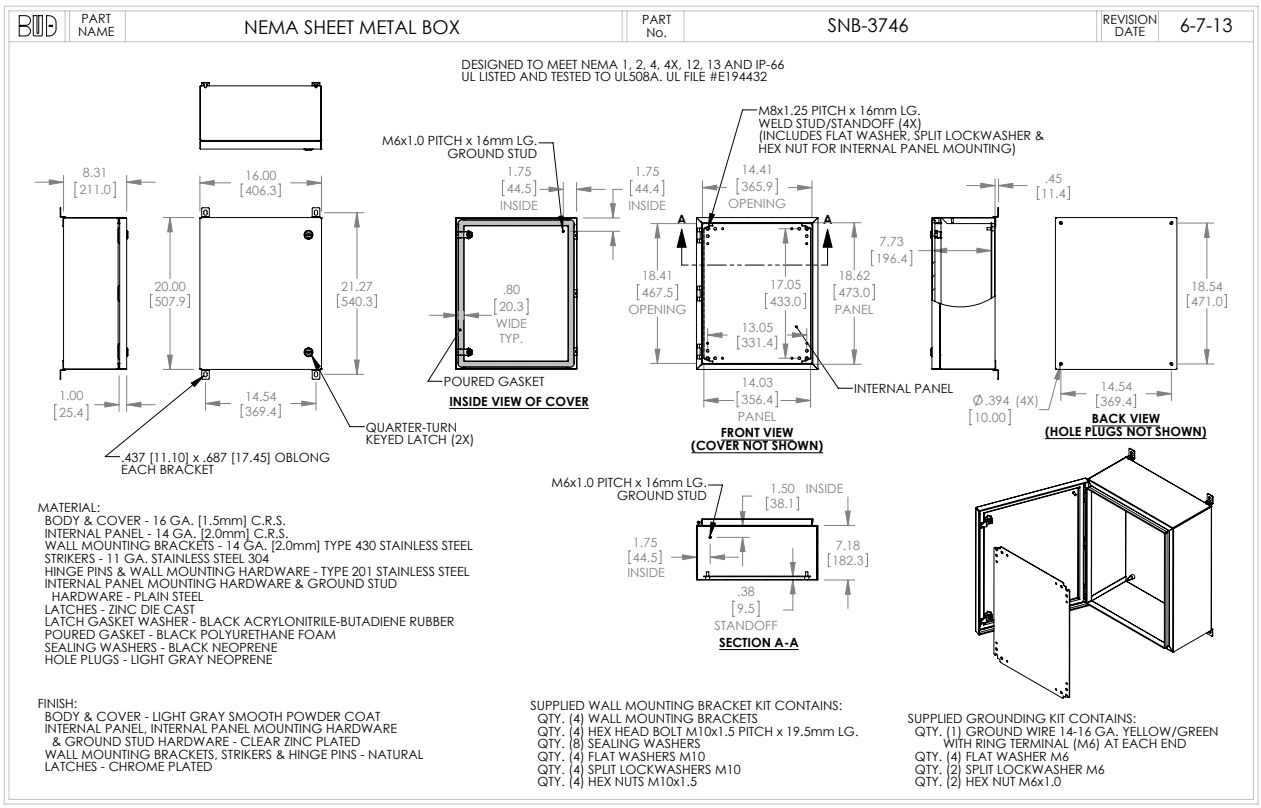


A in. (mm)	B in. (mm)	C in. (mm)
68 (1730)	24 (610)	Refer to enclosure mounting feet dimensions

6.2.3. Enclosure Specifications

6.2.3.1. Wired Vibration Monitoring System Enclosure

Catalog Number	Dimensions (in. (mm))
SNB-3746	20.0 (508) x 16.0 (406) x 8.0 (203)



Specifications:

- UL 508A Listed Type 1, 2, 4, 4X, 12, and 13 File No. E194432
- IP Rating: IP65 and IP66
- RoHS Compliant
- Powder Coated Steel

6.3. Power Requirements

6.3.1. 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	120 W

6.3.2. AC Power Specifications

Input Voltage Range	85 – 264 VAC
Input Frequency Range	47 – 63 Hz
Input Power Rating	150 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

6.4. Environmental Specifications

Storage temperature	-40 ˚C to 85 ˚C (-40 ˚F to 185 ˚F)
Operating temperature	-40 ˚C to 60 ˚C (-40 ˚F to 140 ˚F)
Storage humidity	5% RH to 95% RH, non-condensing
Operating humidity	10% RH to 90% RH, non-condensing
Maximum Altitude	5,000 m (16,400 ft)

6.5. Integration and Infrastructure

The Cutsforth Wired Vibration 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 https://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.

7. Configuring InsightCM for Wired Vibration Assets

7.1. Continuous Devices

Familiarize yourself with the following concepts to help you work with Cutsforth monitoring devices that are wired to sensors, the network, and a power source.

For more information regarding module types and compatibility, refer to Continuous Monitoring Device Hardware for InsightCM (page 22).

7.1.1. Device Models

Cutsforth Monitoring Devices are available in the following models:

- High-Performance Condition Monitoring Systems—Supports periodic and continuous file collection when equipment enters an operating state of interest, such as a run-up or coast-down. The CMS-9036 is an example of a Transient, Periodic, and Event Recorder system.
- General Purpose Monitoring Systems—Supports periodic file collection when triggered by time or data triggers. The CMS-9065 and CMS-9068 are examples of Periodic and Event Recorder systems.

7.1.2. Device Types

When you add a new device, InsightCM requires you to specify the device type. The device type describes the CompactRIO controller and the software application on the device. For example, the CMS-9068 is based on the cRIO-9068 and runs an application designed for monitoring systems.

Each device model has one or more device types that it supports. For example, High Performance Condition Monitoring Systems include device types based on the cRIO-9047 and the cRIO-9036; General Purpose Monitoring Systems include device types based on the cRIO-9068, cRIO-9065, cRIO-9055, and cRIO-9058. Each device runs a different application.

The device type also determines which arrangements of I/O modules within the device chassis are supported.

7.1.3. Device Types for High-Performance Condition Monitoring Systems

The application for High-Performance Condition Monitoring device types supports up to eight dynamic C Series I/O modules, such as the Cutsforth 9232. You must fill module slots in ascending order starting with slot 1. You must fill slots 1 and 2. You cannot skip any slots, but you do not have to use every slot.

These device types come in two formats: one that powers IEPE sensors via the physical connection to the channel and one that does not.

7.1.4. Device Types for General Purpose Monitoring Systems

InsightCM supports a set of arrangements for static and/or dynamic C Series I/O modules in the chassis. The following table lists the module types you can install under each arrangement, but does not represent all possible valid configurations.

You do not need to fill every slot, but you must fill slots in ascending order starting at slot 1.

CMS-9068

Chassis Slot Number	Supported Module Arrangements in CMS-9068			
1	Static	Dynamic	Dynamic	Dynamic
2	Static	Dynamic	Dynamic	Dynamic
3	Static	Static	Dynamic	Dynamic
4	Static	Static	Dynamic	Dynamic
5	Static	Static	Dynamic	Dynamic
6	Static	Static	Dynamic	Dynamic
7	Static	Static	Static	Dynamic
8	Static	Static	Static	Dynamic

Chassis Slot Number	Supported Module Arrangements in CMS-9065		
1	Static	Dynamic	Dynamic
2	Static	Dynamic	Dynamic
3	Static	Static	Dynamic
4	Static	Static	Dynamic

7.1.5. Guidelines for Chassis with Dynamic Modules

If the arrangement you choose contains any dynamic modules, such as the Cutsforth 9232, install dynamic input modules in adjacent slots beginning with slot 1. You must fill slot 1, but you do not need to fill every slot in the chassis.

7.1.6. Guidelines for Chassis with Only Static Modules

For a list of I/O modules that Cutsforth Monitoring Devices support, contact Cutsforth customer support.

7.1.7. Types of Software for Devices

Firmware
Cutsforth Monitoring Devices run preinstalled firmware, the permanent software on the device that performs lower-level operations than the device application. You do not directly interact with firmware unless you receive an updated or patched version. Use the Package Management page to upload the firmware so you can apply it to devices. Then, use the Software tab on the Device Configuration page to update the firmware on a device to the new version.

Applications for Devices
The Software tab on the Device Configuration page displays an overview of the application types and versions running on each device. Update device applications to the latest version and reset the firmware to the preinstalled version from the Software tab. You do not directly interact with the application unless you receive an updated or patched version. Use the Package Management page to upload the application so you can apply it to devices. The Package Management page refers to applications as system images.

Device Configurations
A *device configuration* is a collection of properties that controls how a device operates, including how and when it acquires data and collects files. Define the configuration for a device on its Device Configuration page in InsightCM. Click **Update Configuration** at the top of the Device Configuration page each time you make a change to a device's configuration to send the updated configuration to the device. The device might require several minutes after the last time you click Save to download the configuration and come online again.

7.1.8. Adding a Continuous Device

Add and configure a Cutsforth monitoring device that is wired to sensors, the network, and a power source.

Before you begin, configure assets and monitors.

1. Click the **Configuration** pull-down ( ) and select **Devices**.
2. Click **Add**.
3. In the **New Device** dialog box, connect to an online or offline device.

Option	Description
Connect to an online device	1. Select **Connect to an online device** and enter the IP address in the textbox. If you do not know the device IP address, click **Browse** to see a list of devices on the same subnet as the server machine. 2. To check for common problems that prevent a device from connecting to InsightCM and coming online, click the **Connect** button. The web application opens the **Test Connection** dialog box and checks for problems. If the check fails, this dialog box provides troubleshooting information. You can continue to add an online device without resolving failed checks if the device passes the IP address check. 3. Click **OK**. 4. Select your device type from the **Device Type** pull-down menu. 5. Configure the slots to match the module configuration on your physical device. If you need to update the module configuration in InsightCM at a later time, navigate to the **Hardware** tab of the specific device's configuration page. 6. Click **Next**. 7. Enter the following names for the device. ▪ **Device Name**—The name you want to appear throughout the web application. Assign an easily identifiable name, such as one that indicates the physical device location or the equipment it monitors. ▪ **Hardware Name**—The hostname of the device, which is in the format of `NI-cRIO-ModelNumber-SerialNumber` by default. If the device is online, InsightCM automatically populates this name. Otherwise, find the two values printed on a label on the back of the device.
Connect to an offline device	1. Select **Create an offline device** option and click **Next**. 2. Select your device type from the **Device Type** pull-down menu. 3. Configure the slots to match the module configuration on your physical device. If you need to update the module configuration in the web application at a later time, navigate to the **Hardware** tab of the specific device's configuration page. 4. Click **Next**. 5. Enter a descriptive name in the **Device Name** text field. 6. Once you have added an offline device, transfer a connection file to your offline device (page 25).

4. Click **Finish** to add your device to the server.

Now that you have added continuous monitoring devices, map device channels (page 23).

7.1.9. Mapping Channels

Map sensors to device channels.

Ensure that you have added at least one equipment asset with sensor assets on the Asset Configuration page.

To map a Sensor to a Device and select a Hardware Channel:

1. Click the **Configuration** pull down ( ) and select **Assets**.
2. Expand the asset tree and select the equipment asset you desire to map channels.
3. Click on the name of the monitoring technology.
4. Click the **Sensors** tab.
5. Click the pencil icon in the Device section.
6. Click on the Device in the pop-up window list and click **OK**.
7. Click in the Hardware Channel cell for each sensor and select in the pull-down menu the hardware channel.

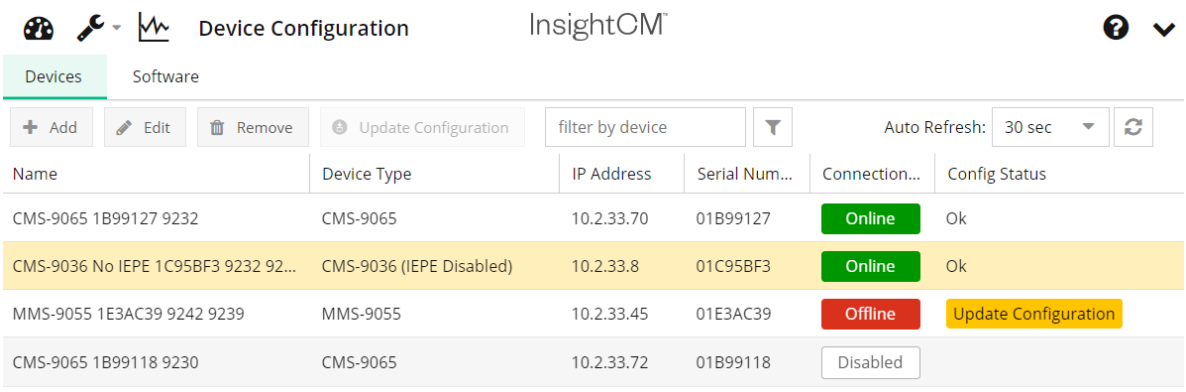
> Any changes you make on the Asset Configuration page will not be applied until you click Update Configuration.

7.1.10. Verifying Device Connectivity

After you send the connection information to the device, it automatically connects to the server.

Complete the following steps to verify that the device connects successfully.

1. In the web application, click the **Configuration** pull-down ( ) and select **Devices**.



2. On the **Devices** tab, verify that the Connection Status column for the device says Online, which means the device finished updated and connected successfully to the server.

> The device might require several minutes to download configuration files and reboot before it connects to the server and comes online. During this time, the device status might change multiple times. Click the **Refresh** button to see the latest status.

7.1.11. Transferring a Connection File to an Offline Device

Connect your offline device to the InsightCM Server by transferring a connection file to the device.

If you added the device configuration without entering the IP address, the device cannot yet connect to InsightCM because it does not have the information needed to connect to the server. Complete the following steps to transfer credentials to the device.

1. Click the **Configuration** pull-down ( ) and select **Devices**.
2. Find the device connection file you exported when you added a device to the InsightCM Server.
3. If you did not export a connection file, return to the Device Configuration page.
    1. Select the device.
    2. Select the **Action** menu ( ) and hover over **Connection**.
    3. Select **Export Connection File**.
4. Copy the file to a USB drive folder named **upload** in the following directory: `<RootLevel>:\InsightCM`.

    If the **upload** folder does not exist, create it.

    The filename must be in the format of **DeviceHostname-SerialNumber.json** or the device will not read it.
5. Insert the USB into the USB port on the controller front panel and note that the USER1 LED light will switch from blinking to solid when the device is reading the connection file.
6. When the USER1 LED returns to blinking steadily, remove the USB drive.
7. From the Device Configuration page, select the device to which you manually transferred a connection file, click the **Action** menu ( ) and select **Reboot**.

7.1.12. Acquiring Data

When the device is online with all relevant channels mapped to sensors, test your device's ability to acquire data. Automatic acquisitions occur periodically, but you can force an acquisition at any time using Force Trigger.

Complete the following steps to test whether or not the channels in your device can acquire data.

1. Click the **Configuration** pull-down ( ) and select **Devices**.
2. On the **Devices** tab, select the device you added.
3. In the **Action** ( ) menu, select **Force Trigger** to perform an acquisition from all channels.

4. (Optional) Click the **Layout** () button on the viewer toolbar, hover over **Chart Type**, and select **Thermal Image** to change the viewer to one that can view thermal imaging data.

5. Wait several seconds for the acquisition to be complete before clicking the **Data Viewer** ( ) button to view the Data Viewer page. Click on a feature level asset for the equipment and confirm that data has been acquired.

   > Before data is available, devices must finish performing the acquisition and the InsightCM server must receive and store the data. The duration of a force-triggered acquisition is based on the file length of the equipment's Default operating state.

   For a complete list of ways you can configure a device to perform acquisitions, refer to Methods for Initiating Device Acquisitions.

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

8. Glossary

AC (Alternating Current)	An electrical power supply in which current periodically reverses direction. Required for powering the cRIO and camera enclosures.
acceleration	A measure of how quickly vibration velocity changes over time, commonly used in vibration analysis to assess fault severity in rotating machinery.
accelerometer	A sensor that measures vibration acceleration and is commonly used for monitoring high frequency machine faults such as bearing defects.
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.
Bode plot	A visualization showing vibration amplitude and phase relative to machine speed; used for diagnosing resonance, imbalance, and rotor dynamic behavior.
cavitation	A damaging condition in pumps caused by vapor bubble formation and collapse, detectable through high-frequency vibration patterns.
cRIO	NI Compact Reconfigurable I/O Controller.
displacement	A vibration metric representing how far a component moves from its resting position; often used for low-frequency machinery such as large turbines.
edge processing	Local (in-enclosure) computation that reduces network bandwidth and storage needs by filtering, compressing, or analyzing data before sending it to InsightCM™.
envelope spectrum	A specialized vibration analysis tool used for early detection of bearing faults by demodulating high-frequency impacts.
frequency	The number of vibration cycles per second (Hz). Changes in frequency patterns help detect imbalance, misalignment, and structural resonance.

full spectrum (2-channel spectrum)	A frequency-domain plot that includes both forward and reverse vibration components; essential for diagnosing rotating-equipment issues such as unbalance or oil whirl.
gear mesh frequency	A characteristic vibration frequency related to gear tooth engagement; deviations can signal gear wear or eccentricity.
IP rating (ingress protection)	A standardized classification that describes an enclosure's resistance to dust and water.
imbalance	A common rotating-equipment fault where mass is unevenly distributed around a rotor, causing elevated vibration at running speed.
InsightCM™	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
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.
orbit plot	A visualization showing the actual motion path of a rotating shaft using two orthogonal proximity probes; used for high-end turbomachinery diagnostics.
peak-to-peak (P-P)	A vibration measurement representing the total displacement between the maximum and minimum values of a waveform cycle.
proximity probe	A non-contact sensor used to measure shaft position and displacement in rotating machinery such as turbines and generators.
resonance	A condition where machine natural frequencies amplify vibration response; often revealed through frequency sweeps and Bode plots.
sensor bias / bias voltage	A constant voltage applied to certain vibration sensors (e.g., IEPE accelerometers) to power internal circuitry.
spectral analysis	The process of converting vibration waveforms into frequency-domain plots to identify characteristic fault signatures.
shaft-centerline plot	A polar chart used to visualize shaft orbit movement relative to bearing clearance; critical for large rotating machinery diagnostics.

time waveform	A raw, time-domain vibration signal used to identify impacts, looseness, and transient machine behavior.
trending	The process of recording and analyzing temperature changes over time to detect abnormal patterns or emerging failures.
velocity	A vibration measurement representing the speed of movement over time; commonly used to assess overall machine health and compliance with ISO 10816/20816 guidelines.