

Ranger Pro Wireless Condition Monitoring Device

User Guide

Cordant™

125M6113 Rev. H



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2. General Safety

2.1 Handling and Storing Considerations

To prolong the service life of the system, handle components carefully, use best practices during installation, and practice diligent inspection procedures. Follow prescribed maintenance procedures and dispose of obsolete components in compliance with applicable electronic waste regulations.

2.2 Personal Safety Warnings

Labels and markings are provided to guide the system integrator in the processes of choosing appropriate interface equipment, determining safe use conditions, and identifying recommended installation procedures. The format of these markings are governed by the standards that dictate safe use and environmental compliance in a variety of regions and regulated settings.



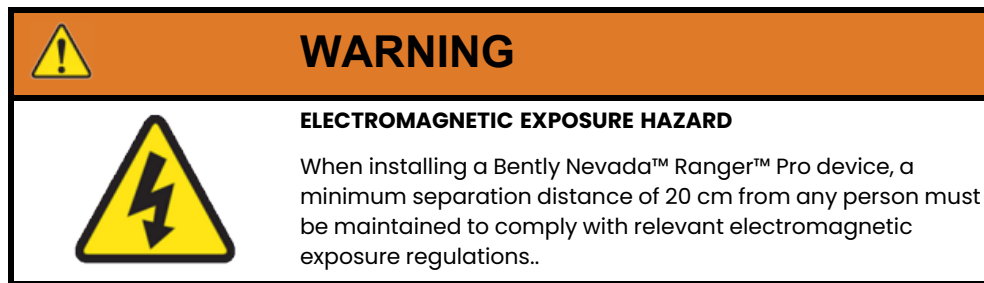
Read and understand manual before operation! / Lire et comprendre le manuel avant d'utiliser!

2.3 Product Safety Advisory

Ranger ProWireless Condition Monitoring Device use an accelerometer with a powerful magnet base that can interfere with implanted medical devices such as pacemakers, insulin pumps, and other magnetically programmable medical devices. Do not use the accelerometer if you have these medical devices.



Electromagnetic Exposure Hazard



Safe Operating Procedure

When using Ranger ProWireless Condition Monitoring Device, observe these precautions:

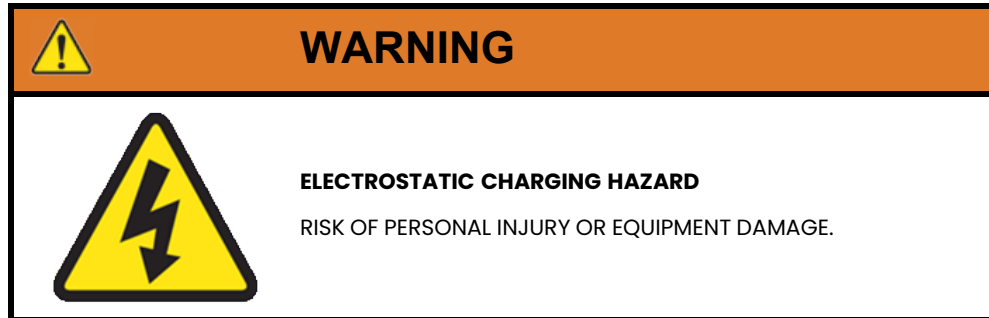
- If you have an implanted medical device such as a pacemaker, do not use or handle Ranger ProWireless Condition Monitoring Device.
- Keep personal medical devices away from the accelerometer magnet base at all times.



- If a personal medical device comes in close contact with the accelerometer magnet base, contact your physician immediately.

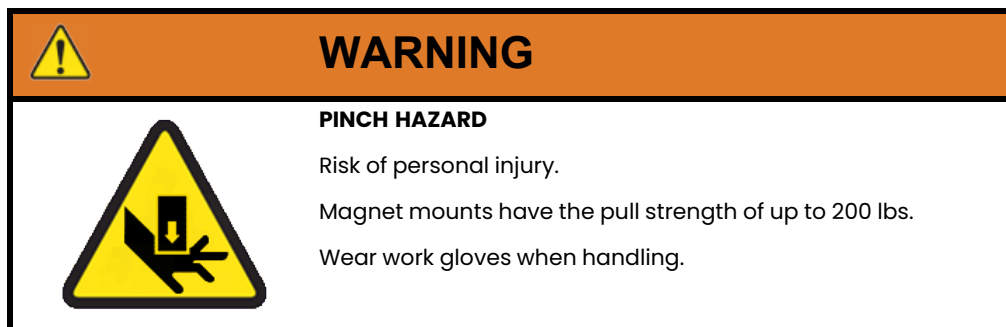
- Keep devices sensitive to magnetic fields away from the accelerometer magnet base. Such devices include but are not limited to credit cards, watches, and USB memory storage drives.

Potential Electrostatic Charging Hazard



- Electrostatic discharge could cause a spark that may ignite and cause an explosion. In addition, electrostatic discharge could damage the product.
- Use extra caution during dry weather. Relative humidity less than 30% tends to multiply the accumulation of static charges on any surface.

Pinch Hazard



The magnet mounting system uses a strong magnet for attaching the Bently Nevada™ Ranger™ Pro devices to ferrous metal surfaces. The mounting surface must be flat or larger in diameter than the magnet mount assembly. Use care and protect your hands from injury by wearing work gloves.

Hazardous Environment: Transducers

	WARNING
	HAZARDOUS ENVIRONMENT Risk of explosive atmosphere. Take precautionary measures to avoid electrostatic potential, especially on plastic components.

Installations and maintenance tasks performed in potentially hazardous areas must be performed only after the area has been verified to be free of hazardous materials, atmospheres, and conditions.

The following situations could cause a spark enough to ignite an explosion:

- Potential of electrostatic discharge on plastic components
- Removal or placement of an energized connection.

Lithium Batteries

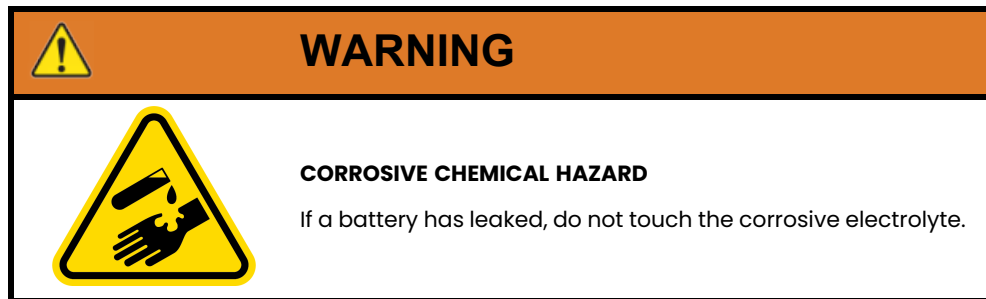
	WARNING
	USE ONLY ONE OF THE FOLLOWING BATTERIES Xeno Energy XL-205F, Tadiran TL-5930, Tadiran SL-2780. Do not use a device with a damaged e-module, O-rings, sensor module, or battery. Using a damaged battery may further damage the device, cause it to fail, or in hazardous locations cause other unintended consequences.

The Ranger Pro device uses 3.6V lithium-thionyl chloride D-cell batteries. Lithium batteries are volatile. When handling and storing lithium metal batteries, follow these precautions:

- Store and handle lithium metal batteries to avoid contact with other lithium batteries.
- Don't place lithium metal batteries on metal work surfaces.
- Avoid exposing lithium metal batteries to extreme temperatures.
- If you store an inactive Ranger Pro sensor, remove the battery.
- Dispose of depleted or defective batteries in keeping with applicable statutes and regulations as well as site-specific safety requirements.

The lithium batteries will typically last up to five years. Use the Ranger Pro software or your network vendor's application to monitor battery performance and replace batteries as needed.

Corrosive Chemicals



Inspect the battery for signs of impending failure, including:

- Swelling, deformation, or elongation
- Indentations or lifting of battery terminals
- Moisture or liquid on the battery surface
- Chemical corrosion or deposits on the battery terminals

Follow your site's hazardous materials handling procedures to dispose of damaged or leaking batteries.

2.4 Safe Disposal

Replacing Device and Failure Analysis

To return parts under warranty and request failure analysis, visit [Bently Nevada](#).

Hazardous Materials

This device does not use hazardous materials outlined by RoHS or battery directive statutes. These regulations confirm that lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ether, and battery-related materials such as lithium are limited to no more than trace amounts within the system.

Recycling Facilities

Decommissioning of instrumentation should endeavor to minimize the impact of the waste created by disposal of system material. Refer to local or regional waste removal administration to collect information on proper material collection, reuse, and recycling.

Product Disposal Statement

Customers or third parties who are not member states of the European Union and who are in control of the product at the end of its life or at the end of its use, are solely responsible for diligent product disposal at the end of its useful life. No person, firm, corporation, association, or agency shall dispose of the product in a way that is in violation of any applicable international, federal, state, or local regulations. For recycling information, visit weeerohsinfo.com.



3. Hardware

3.1 Intended Use

Bently Nevada™ Ranger™ Pro devices are intended for monitoring purposes only and should not be used in control or safety systems.

3.2 Compliance Information

This device complies with part 15 of the FCC Rules and contains license-exempt transmitter (s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not approved by the responsible party could void the user's authority to operate the equipment.

For complete compliance and hazardous location approval information, see the **Ranger Pro Wireless Condition Monitoring Datasheet** (125M5237) and **Ranger Pro Warning, Special Conditions and Additional Information Application Note** (document 126M6550) available from [Bently Nevada Technical Support](#).

3.3 Informations de conformité

Cet appareil est conforme aux dispositions de la section 15 des règles de la FCC et contient des émetteurs / récepteurs exempts de licence conformes aux CNR d'Innovation, Sciences et Développement économique du Canada (ISDE Canada) applicables aux appareils radio exempts de licence.

- Cet appareil ne doit pas produire de brouillage, et
- Cet appareil doit tolérer tout type de brouillage subi, y compris ceux susceptibles de perturber le fonctionnement normal de l'appareil.

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourrait annuler le droit accordé à l'utilisateur d'exploiter cet équipement.

Pour obtenir des informations complémentaires à propos de la conformité et de l'approbation de cet appareil en zone dangereuse, veuillez consultez **Ranger Pro Wireless Condition Monitoring Datasheet** (document 125M5237) et **Ranger Pro Warning, Special Conditions and Additional Information Application Note** (document 126M6550) disponibles auprès du [support technique de Bently Nevada](#).

3.4 Description

The Ranger Pro wireless sensor measures temperature, acceleration, and velocity. Acceleration is detected using sensing elements in the sensor base or sensing elements in tethered sensors. Velocity is derived from the acceleration signal. The Ranger Pro sensors also measure surface contact temperature using a sensor in the device base or in tethered sensors.

Temperature	A sensor embedded in the device base measures contact temperature.
Acceleration Overall	Sensing elements measure acceleration in the Z axis for Uni-Axial Ranger Pro Wireless Sensors and in the X, Y and Z directions for Tri-Axial and tethered Ranger Pro Wireless Sensors.
Velocity Overall	Calculated from the acceleration waveform.

There are various versions of the device:

Tethered sensor (70M503)	Detects velocity and acceleration in three axis (X, Y, and Z) and measures surface temperature.
ISA100 interface module (70M323)	Transmits velocity, acceleration and temperature detected and measured by tethered sensors.
WirelessHART interface module (70M423)	Transmits velocity, acceleration and temperature detected and measured by tethered sensors.
WirelessHART tri-axial sensor (70M403)	Detects velocity and acceleration in three axis (X, Y, and Z) and measures surface temperature.
ISA100 tri-axial sensor (70M303)	Detects velocity and acceleration in three axis (X, Y, and Z) and measures surface temperature.
ISA100 single axis sensor (70M301)	Detects velocity and acceleration in one-axis (vertical, or Z) only and measures surface temperature.
ISA100 repeater (70M300)	Enables you to extend the range between sensors and network access points.

For ISA100 networks, Ranger Pro sensors and interface modules can also act as routers, although using the router mode depletes the unit's battery more quickly.

If a Ranger Pro device cannot communicate with an backbone router, you can use the Ranger Pro ISA100 repeater or a Ranger Pro ISA100 device enabled as a router to extend your network. We recommend connecting no more than three Ranger Pro sensors to a Ranger Pro router, although you may be able to connect up to eight.

3.5 System Components Required

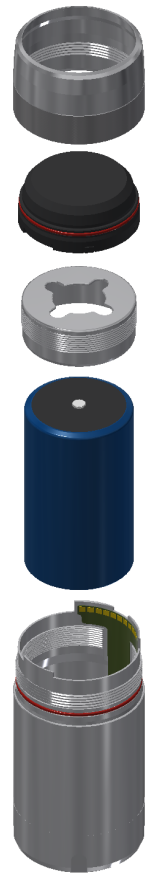
To install, configure, and use Ranger Pro integrated sensors, repeaters, or interface modules, you need:

- Lithium-thionyl chloride batteries, one per device. For approved battery types, see **Ranger Pro Warning, Special Conditions and Additional Information** (document 126M6550).
- Battery installation tool.
- Ranger Pro, either or both tri-axial and uniaxial devices, with batteries installed.
- (Optional) Ranger Pro repeaters with batteries installed.
- (Optional) Ranger Pro environmental protection cap for use in in high moisture environments.
- Mounting hardware (plus adapters, if needed).
- A compatible USB NFC reader. Contact [Bently Nevada technical support](#) for a list of compatible readers.
- Ranger Pro Configuration Software (121M7997, available from [Bently Nevada technical support](#)).
- Spot facing tool, if required. (Not provided by Bently Nevada.)
- Torque wrench with ¼ inch drive, capable of tightening devices in the 5–7 Nm (44 to 62 in lb) range. (Not provided by Bently Nevada.)

An Installation Kit (130M5452) is also available. The installation kit can be ordered with or without the USB NFC reader. For ordering information, see the **Ranger Pro Datasheet** (document 125M5237).

To install, configure and use tethered Ranger Pro sensors, you need:

- Appropriately configured Ranger Pro interface modules with batteries installed
- Ranger Pro tethered sensors
- Mounting hardware (plus adapters, if needed)
- Appropriate Ranger Pro sensor cables
- Spot facing tool, if required (Not provided by Bently Nevada)
- Torque wrench with $\frac{1}{4}$ inch drive and crowfoot wrench adapters, capable of tightening devices in the 5–7 Nm range (44 to 62 in-lb) (Not provided by Bently Nevada)



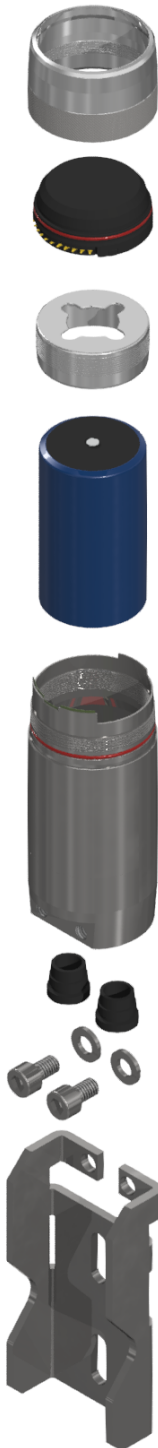
Ranger Pro Components

When removing Ranger Pro devices from their packaging, ensure that all components as described below except for the battery are present. Contact your sales representative regarding batteries that may be supplied separately.

Ranger Pro integrated sensors and repeaters are composed of these parts:

- E-module retaining ring (316 stainless steel body)
- 34 x 1 mm O-ring seal for the e-module
- Wireless e-module (glass-reinforced, impact-resistant PPS)
- Battery retaining ring (316 stainless steel body)
- Battery (replaceable D-sized 3.6 V lithium-chloride, Optionally supplied by Bently Nevada)
- 35x1 mm O-ring seal for the device case
- Case containing the vibration and temperature sensors and forms the device housing (316 stainless steel body)

The Ranger Pro interface module is composed of these parts:



- E-module retaining ring (316 stainless steel body). Case contains the vibration and temperature sensors and forms the device housing (316 stainless steel body)
- Wireless e-module (glass-reinforced, impact-resistant PPS)
- 34x1 mm O-ring seal for the e-module
- Wireless e-module (glass-reinforced, impact-resistant PPS)
- Battery retaining ring (316 stainless steel body)
- Battery (replaceable D-sized 3.6 V lithium-thionyl chloride, Optionally supplied by Bently Nevada)
- 35x1 mm O-ring onseal (for the device case sensor body and 34x1 mm on e-module)
- Case containing the vibration and temperature sensors and forms the device housing (316 stainless steel body)
- M12 connector dust caps
- Fasteners - 2x M6 Stainless Steel Socket Cap Screws
- Spring washers - 2x6 mm Stainless Steel
- Mounting bracket (316 stainless steel)



Use only approved D-size lithium-thionyl chloride batteries for the Ranger Pro sensors and repeaters. If you use the wrong battery, you can negatively affect device performance, produce inaccurate readings, and void the Ranger Pro warranty. You can purchase approved batteries from Bently Nevada or third-party suppliers. For details and ordering information, see the **Ranger Pro Datasheet** (document 125M5237).



Protect connectors by ensuring that the supplied M12 dust caps are in place before installing Ranger Pro Interface modules. Do not overtighten the dust caps as this may damaged the connector seal. Dust caps should be fastened to approximately 0.6 Nm

Network Requirements

Ranger Pro devices operate on compatible WirelessHART and ISA100.11a wireless networks and gateways. Additional licenses may be required to activate these gateways.

ISA100 Network requirements

Manufacturer	Gateway	Router
Bently Nevada	Ranger Pro Gateway	N/A
Yokogawa	YFGW410 (R2.01.04 or equivalent)	YFGW410 (R2.01.04 or equivalent)
Honeywell‡	WDM (R310.2-4 or later)	FDAP (OW 230 or later) CISCO 1552S

‡ Honeywell OneWireless Wireless Device Manager using firmware R310.2-4 limits the maximum number of Ranger Pro wireless devices to 140 per gateway. To increase the limit to 160 or more devices, upgrade to a newer version of the firmware when available.

WirelessHART Network requirements

Manufacturer	Gateway	Router
Emerson	Wireless 1410/1420 Gateway (4.7.84 or later)	N/A

4. Network Design

Ranger Pro sensors operate on the 2.4 GHz band on ISA100.11a and WirelessHART networks. To enhance security, the sensors use 128-bit AES encrypted packets.



Installing and configuring wireless networks is beyond the scope of this user guide. For details, refer to your vendor's wireless network documentation.

Setup Overview

The Ranger Pro Wireless Condition Monitoring Device operates on the ISA100.11a and WirelessHART wireless network protocols. To add Ranger Pro sensors to your network, complete these steps:

1. Survey your installation location.
2. Decide where to install Ranger Pro sensors and identify mounting points.
3. Locate and install access points.
4. Locate and install a device manager.
5. Install batteries in each sensor.
6. Provision Ranger Pro sensors (and repeaters, if needed).
7. Mount sensors.
8. Test and verify your installation.
9. Monitor and maintain your sensors and network.

4.1 Consider Sensor Range

A sensor can transmit data up to 150 meters (164 yards) to an access point when unimpeded by environmental influences. A sensor can optimally transmit data to another sensor up to 100 meters (109 yards) or more, but greater distances may negatively affect performance.

The range of Ranger Pro devices is affected by several factors, including:

- Device location
- Line of sight to routing devices or access points
- Proximity to routing devices or access points
- Routing devices or access point antenna type
- Orientation of the e-module
- Obstacles, including the density and type of materials nearby.

Generally, the denser the industrial environment, the weaker the signal.

You can mount devices in any orientation necessary to monitor the machine or connect to the network. However, the radio transmission is strongest above and around the device, and weakest below it. Generally, if you mount a device horizontally, we recommend aligning it with the X-axis horizontal and Y-axis vertical.

4.2 Consider Battery Life

Batteries for the Ranger Pro device have a typical life of five years under the following conditions:

- The Ranger Pro ISA100 sensors are configured as a I/O device (not a router).
- Ambient temperatures under 40°C (104°F).
- Good quality radio frequency communications.
- Static measurement interval of 30 minutes.
- Dynamic measurement interval of 24 hours.

To maximize Ranger Pro device battery life:

- Minimize the number of hops between devices and access points. Poor quality radio frequency communications increase packet retransmission and reduce battery life.
- Avoid environments with elevated temperatures. Temperatures above 40°C (104°F) cause the device to consume more power and the battery to discharge more quickly. Elevated temperatures can reduce battery life by up to 40%.
- Avoid using Ranger Pro ISA100 devices as both sensors and repeaters. Using a sensor as a router can reduce battery life to 18 to 24 months.
- Minimize the number of Ranger Pro ISA100 devices routed through Ranger Pro Repeaters. Avoid connecting more than eight devices through a single Ranger Pro ISA100 Repeater, or more than five devices through a sensor with router enabled. Since Ranger Pro ISA100 Repeaters are continually in listen and transmit mode, their battery life is less.
- Use the lowest reasonable measurement interval to monitor vibration and temperature. More frequent vibration measurements consume more power. For example, changing the interval from 30 to 10 minutes reduces battery life by about 30%.

4.3 Choose Network Topology

The two most commonly used ISA100.11a network configurations are star and mesh topologies while WirelessHART networks inherently form mesh topologies. Your existing network infrastructure may determine the number of devices you can connect to backbone routers (ISA100) or access points (WirelessHART) or the maximum number of hops permitted. A star topology is recommended for ISA100 networks, although you may use a combination of both, depending on your needs. Consult your network infrastructure documentation for details.

Star Topology

A star topology is the most efficient method for building a ISA100 network. It is suitable for smaller areas where all devices can directly communicate with an access point.

Mesh Topology

A mesh topology creates redundant communication paths for devices on the network. Mesh topologies are suitable for devices that cover a large area. When planning a mesh network, it's critical to avoid a choke point, where many devices attempt to connect to a single point. Avoid network topologies that require more than three hops and too many nodes routed through a single node, creating a choke point.

4.4 Plan Device Placement

We recommend a site survey and device placement plan for wireless installations. To plan device placement, obtain or develop an accurately scaled site plan detailing the placement of the machinery you need to monitor, including architectural details like walls and pillars. Then complete a site survey and plan.

To develop a survey and plan:

1. On the accurately scaled site plan, mark the locations where you need to install sensors.
 - Mount sensors as close as possible to the machine point being monitored.
 - To avoid destructive interference, install devices at least 18 inches apart.
 - Whenever possible, avoid obstructions such as machinery or walls that might “hide” devices from routing devices or access point antennae.
 - Allow clearance for mechanical installation and suitable clearance around the top (100 mm or 4 inches).
 - If possible, install devices at least two meters (6 ½ feet) above ground level with clear line of site to at least two other devices.
 - Consider using Ranger Pro tethered sensors connected to wireless interface modules in locations with limited clearance or that may compromise the wireless signal.
2. Determine the optimal wireless range for each device. Use the map scale and draw a circle representing the nominal radio frequency range around the proposed location of each Ranger Pro device. (When connecting to a backbone router or access point, the range is about 50% greater.)

When the device is placed among:	Draw a circle with:
Dense metal structures with no line-of-sight	25 m (82 ft) radius
Sparse metal structures with limited line-of-sight	50 m (164 ft) radius
Unobstructed, clear line-of-sight locations	100 m (328 ft) radius

3. Identify the locations of any existing gateways, routers, or access points.
 - If you’re installing sensors in extremely congested plant areas or in areas with insufficient wireless connectivity, consider installing additional gateways, backbone routers, and access points.
 - Add locations where you need to install additional gateways, backbone routers, and access points.
 - When placing gateways, backbone routers, and access points, consider the location of line power and suitable connections to the existing plant network.

Place gateways, backbone routers, and access points in locations where as many devices as possible can connect directly to each gateways, backbone routers, and access points. Refer to your network hardware vendor documentation for the maximum number of devices supported.



Where possible, minimize the distance from the access point to the furthest Ranger Pro device.

4. Plan for multiple connections for each device.
 - Multiple communication paths are required to increase network redundancy and prevent a single path failure that would result in a loss of communication.
 - Depending on the circle (short, medium, or long) that applies to the location of each Ranger Pro sensor, verify that each device is within range of at least two, and preferably three, routing devices or access points.
 - Avoid connecting more than five devices through a single Ranger Pro ISA100 sensor, or more than eight devices through a single Ranger Pro ISA100 Repeater.
5. To extend the range of an ISA100 wireless network or to reach devices beyond the range of a gateway or an backbone router, consider adding Ranger Pro repeaters. Repeaters ought to be positioned:
 - Relatively high above the sensors, preferably at least two meters (6 ½ feet) above grade. Higher placement dramatically increases signal strength.
 - To improve radio frequency transmission, we recommend you install the repeaters upside down and at least 33 cm (1 ft) from walls and pillars.
 - Within a clear line of sight to two other repeaters or access points.
6. Plan for a maximum of four hops between each Ranger Pro device and a gateway, backbone router, or access point, although we recommend a maximum of three hops.
7. If your installation is complex or likely to require additional gateways, backbone routers, or access points, consider temporarily installing your network access points and Ranger Pro devices to test your plan. Use temporary magnetic mounting adapters to test device placement.

To obtain optimal results, carefully plan your network. For complete information, see your network infrastructure documentation.

5. Installation and Configuration

5.1 Install Battery

We recommend that you install batteries in Ranger Pro devices in an indoor equipment room or a similar environment. Do not replace batteries in a hazardous area. Be aware that the battery removal tool contains a strong magnet.

**WARNING**

**HAZARDOUS ENVIRONMENT**
Risk of explosive atmosphere.
Take precautionary measures to avoid electrostatic potential, especially on plastic components.

**WARNING**

**USE ONLY ONE OF THE FOLLOWING BATTERIES**
Xeno Energy XL-205F, Tadiran TL-5930, Tadiran SL-2780. Do not use a device with a damaged e-module, O-rings, sensor module, or battery. Using a damaged battery may further damage the device, cause it to fail, or in hazardous locations cause other unintended consequences.

**WARNING**
STRONG MAGNETIC FIELD
MAGNETIC FIELD CAN INTERFERE WITH MEDICAL DEVICES.



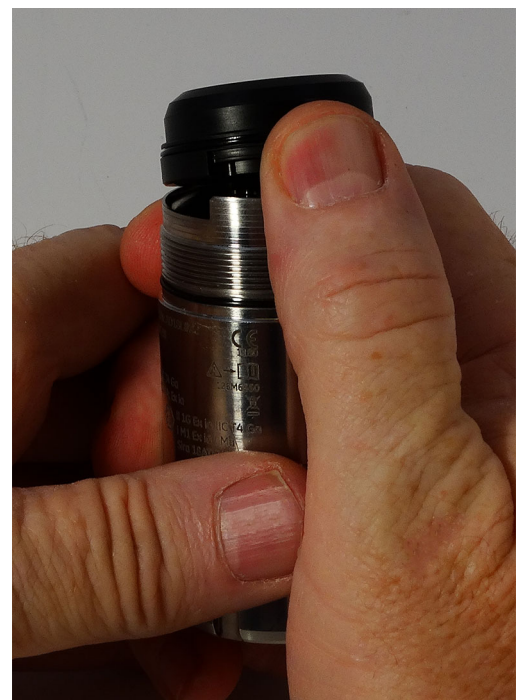
To maintain the device's IP67 dust and water-resistant rating, assemble the device carefully. There are several versions of the Ranger series device. Keep the retaining ring and e-module components matched to the body of the device to maintain its IP rating.

To install a battery in a Ranger Pro device:

1. Turn the e-module retaining ring counter-clockwise and stop when resistance decreases. Place the device on a flat surface. Use your index finger and apply firm pressure to the top of the e-module. Use your other hand and continue to unscrew and remove the retaining ring.



2. Hold the device and e-module as shown. Use your thumb to press against the e-module just above the metallic tab on the case. Apply a slight radial force and push upward until the e-module is separated from the case.



3. Use the battery installation tool to remove the battery retaining ring. Turn the ring counter-clockwise. Use the magnet in the tool to lift the ring from the device case.



4. Inspect the O-rings on the e-module and case to verify they are present, clean, and undamaged. Apply a very light coating of silicon-based O-ring grease to the O-rings. (When replacing the battery, always replace the O-rings.)

The Ranger Pro device uses two O-rings to seal the unit against dust and moisture.

A 34 x 1 mm O-ring on the e-module

B 35 x 1 mm O-ring on the case



To maintain the device's IP67 dust and water-resistant rating and prevent leaks, you must install and lubricate the O-rings properly.



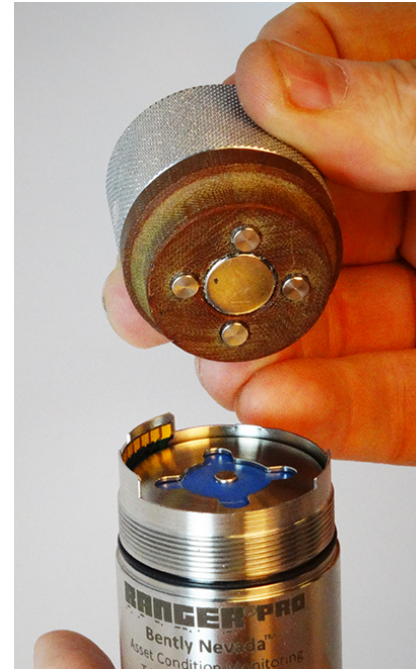
5. Inspect the interior threads of the e-module retaining ring to be sure they are not damaged.

6. Verify that the positive end of the battery is up and then insert the battery.



Use only approved D-sized lithium-thionyl chloride batteries for the Ranger Pro sensors and repeaters. For ordering information, see the **Ranger Pro Datasheet** (document 125M5237).

7. Use the magnetic Ranger Pro battery installation tool to tighten the battery retaining ring. Hand-tighten the ring until it contacts the battery, then torque to 5 N-m (44 in-lb).



8. To avoid damaging the e-module, you must first align the contact pins of the e-module with the contact points in the case. Angle the e-module and align the contact pins and back keyway.



9. Rotate the e-module downward to align the notch on the other side of the e-module with the notch in the case and press firmly. You can feel or hear a click when it is in place. If necessary, hold the sensor in place with your finger.

Inspect the exterior threads of the sensor case as well as the interior threads of the e-module retaining ring to be sure they are not damaged



10. Align the e-module retaining ring over the e-module. If needed, hold the sensor in place with your finger.



11. To maintain the device's IP67 rating, be careful to avoid damaging the O-rings. Turn the e-module retaining ring clockwise two to three turns, and then counter-clockwise about $\frac{1}{4}$ turn, and repeat until the ring is hand-tight.
12. Verify that the device is tightly sealed. There shouldn't be any gap between the e-module retaining ring and the case, as shown below.



5.2 Configure Network

Refer to your network infrastructure vendor documentation to configure gateways, device managers, backbone routers or access points as applicable. Configuration may include assigning IP addresses, wireless network IDs and wireless join keys.

Ranger Pro Configuration Software

The Ranger Pro configuration software is used to provision, configure, monitor, and maintain Ranger Pro devices using either a USB NFC reader or over the air using an appropriately configured gateway.

Ranger Pro configuration software functions include:

- Device provisioning
- Rebooting the device
- Unprovisioning

- Device configuration including:
 - Applying default configurations
 - Saving, loading, and applying custom configurations
- Device diagnostics including:
 - E-module status
 - Sensor status
- Device application firmware management

5.3 Provision Devices

Before installing Ranger Pro devices, we recommend that you prepare each device to join your network. Depending on your network infrastructure, you can provision multiple devices over-the-air (OTA) or individually using the Ranger Pro USB device NFC reader.

When you provision the device, you provide it as needed with:

- A new network ID
- A new network join key

Depending on the number of Ranger Pro devices and their current sleep state, provisioning can take up to several hours. If a device fails to join the network, [see Reboot the Device on page 38](#).

Before You Begin

If you are using a:

- Yokogawa or Honeywell ISA100 gateway, you must provision devices over the air.
- Bently Nevada Ranger Pro ISA100 gateway, [Provision Using a USB NFC Reader](#).
- WirelessHART gateway, [Provision Using a USB NFC Reader](#).

ISA100 Devices

Ranger Pro ISA100 devices must be in an unprovisioned state to use over-the-air (OTA) provisioning and join the network.



If over-the-air provisioning fails, you may be required to use the NFC reader and Ranger Pro software to reboot or unprovision the device.

WirelessHART devices

Ranger Pro WirelessHART devices are shipped with an assigned Network ID and Join Key. The default WirelessHART device values are:

- Network ID: 32498
- Join Key: 00001631 00001631 00001631 00001631

If a Ranger Pro device does not join the network, it may be in a sleep state. It periodically wakes from the sleep state to attempt to join the network. To reset the sleep cycle, [see Reboot the Device on page 38](#).

ISA100 Sleep State

Once you install a battery into a Ranger Pro ISA100 device, it is ready to be provisioned over-the-air or join the provisioned network. To conserve battery power, if a Ranger Pro ISA100 device is not provisioned within a certain period of time, it enters a sleep cycle. It periodically wakes from sleep mode to attempt to join the network. To reset the sleep cycle, [see Reboot the Device on page 38](#).

Interval after battery is inserted or sensor is disconnected from a network:	Sensor tries to connect every:
0 to 20 minutes	2 min
>20 min to 120 min	5 min
>120 min to 10 hours	15 min
>10 hours to 48 hours	30 min
>48 hours	60 min

WirelessHART Sleep State

The WirelessHART device radio listens for advertisements from the configured network for a one-hour period at periodic intervals. This is followed by a one-hour deep sleep period, after which the device reinitiates searching for the network as it did during the first hour. This cycle continues until it successfully joins the network or is rebooted.

Provision Using a USB NFC Reader

To provision ISA100 Ranger Pro device on other than a Yokogawa or Honeywell gateway, use the Ranger Pro Configuration Software. The software displays device details, including current provisioning and configuration, sensor values, hardware-model numbers, firmware version numbers, and enables you to perform maintenance and diagnostics tasks.

For WirelessHART devices, you can use the default the **Network ID** and **Join Key**, or use the USB NFC reader to modify them as needed.



Placing the NFC reader on a bare metal surface may cause interference. Insulate the NFC reader from the metal surface by placing a 2.5 cm (1 in.) thick book or similar material under the NFC reader.

To provision sensors using a USB NFC reader, you need:

- Ranger Pro Configuration Software (available from [Bently Nevada technical support](#)).
- Supported USB NFC reader:
 - Sony RC-S380
 - Identiv uTrust 3700F
- Ranger Pro sensors with batteries installed
- Network ID
- Join key
- Radio (device) tag

For details about your network's Network ID and Join Key, refer to the vendor's network documentation.

To provision sensors using Ranger Pro Configuration Software and a NFC reader:

1. Open the Ranger Pro configuration software.
2. Select the **NFC Manager** tab.
3. Connect the **NFC reader** to the computer running the Ranger Pro software. If necessary, install any drivers required. To obtain drivers, visit the website of the NFC reader vendor.
4. Select the appropriate USB NFC reader in the **NFC Manager** tab header.
5. Place the Ranger Pro device upside down on the USB NFC reader pad.
6. Verify that the NFC status in the footer is **Ready**.
7. Select **Configuration Manager > Live Configuration**.
8. Click **Provision** to open the Provision Sensor dialogue box. The dialogue box displays a sample value by default and does not show the current device join key or network ID. Join keys are encrypted for security purposes.
9. Enter the **Network ID** (decimal) and **Join Key** (hexidecimal).
10. Click **Provision Sensor**.

Provision Using the Ranger Pro Gateway

The Ranger Pro gateway does not currently support OTA provisioning. Use the configuration software and a USB NFC reader to provision Ranger Pro devices using the network ID and join key assigned for a Ranger Pro ISA100 gateway.

Provision Using the Yokogawa ISA100 Gateway

Before you can provision Ranger Pro devices on a Yokogawa gateway, you must first add the devices to the network configuration.

For more information and detailed instructions, refer to the Yokogawa documentation.

Add Devices to the Network Configuration

To add devices to a Yokogawa ISA100 network:

1. In the Yokogawa **Field Wireless Management Console**, open **Configurator**.
2. Add Ranger Pro devices to the Field Wireless Network on the **Field Devices** tab.
 - a. Set the **Device Tag**.
 - b. Check **OTA Provisioning**.
 - c. Select the **Device Role** as **IO**, **IO Auto**, or **IO+Router**.
 - d. (If applicable) Select the **Primary Router**.
 - e. (If applicable) Select the **Secondary Router**.
3. Click **Download** to apply the updated configuration to the gateway. When successful, a confirmation message is displayed.

Apply capabilities file

Configure the device **Sampling Data** before provisioning devices. The capabilities file (CF) required to configure devices is available from Bently Nevada Technical Support.

To apply a CF file to the Ranger Pro devices:

1. In the Yokogawa Field Wireless Management Console, open **Configurator**.
2. Select **Sampling Data**. The **Sampling Data** pane is displayed.
3. Click **Add**. The **Sampling Settings** dialog box is displayed.
4. In the **Device Tag** field, click browse and select the check box of the device you want to modify. You can select multiple devices of the same type. Click **OK**.
5. In the CF / DD pane, select **CF File**. If the CF file is not yet displayed:
 - a. Select **Load CF/DD**. The Windows **Open** dialog box is displayed.
 - b. Navigate to the Windows directory location of the device compatibility file you previously downloaded from Bently Nevada tech support. Select the capability file matching the device you want to upgrade. Refer to the firmware and CFF release notes for compatible versions.
 - c. Click **Open**. The CF file is displayed in the **CF File** field.
6. Select the CF file compatible with the devices displayed in the **Device Tag** field.

7. For each type of Ranger Pro device, modify these Concentrator OID:11 **Read Parameters**:

OID Concentrator Value	70M300 Repeater	70M301 Single Axis	70M303 Tri-Axial	70M323 Interface Module
Update policy	Periodic	Periodic	Periodic	Periodic
Publication period	0 (zero)	150	150	150
Stale limit	Default	12	12	12
Retry mode	Normal	Normal	Normal	Normal

8. For each type of Ranger Pro device, verify these additional Concentrator OID:11 **Read Parameters**:

OID Parameter	70M300 Repeater	70M301 Single Axis	70M303 Tri-Axial	70M323 Interface Module
UAPMO Diag_Status	To prevent session timeout, select the UAPMO Diag_Status parameter (if displayed) and click the "<" button. The parameter is moved to the list of Available Parameters .			
AI_01 AI_02 AI_03 AI_04 AI_05 AI_06 AI_07 AI_08	Not available	AI_01 - AI_05: available AI_06 - AI_08: unavailable	AI_01 - AI_08: available	AI_01 - AI_08: available

9. For each type of Ranger Pro device, configure the Concentrator OID:12 **Read Parameters**.

OID Concentrator Value	70M300 Repeater	70M301 Single Axis	70M303 Tri-Axial	70M323 Interface Module
Update policy	Default	Periodic	Periodic	Periodic
Publication period	Default	10	10	10
Stale limit	Default	10	10	10
Retry mode	Default	Normal	Normal	Normal

10. Select the **Download** button. The **Error Check** dialog box is displayed. If you are changing the capabilities file of an existing device, you need to restart the device that you have changed.

11. Click **OK**. The **Download Configuration** dialog box is displayed.
12. If needed, click the check box next to each device you need to restart. Click **Start Download**. Restarting a device may take one or five minutes.

Provision Devices

To provision Ranger Pro devices on a Yokogawa ISA100 gateway:

1. In the Yokogawa Field Wireless Management Console, open **Monitor**.
2. Choose **Tools > OTA Provisioning Manager**.
3. To allow unprovisioned devices to join, select **Enable Provisioning Network**. Wait for unprovisioned Ranger Pro devices to display in the **Provisioning Network** list. Wait time may be 5 to 30 minutes and depends on the 3rd party ISA network.
4. In the **Target Device** tag field, select the device tag assigned to the device.
5. Select the devices desired and choose **Start Provisioning**.
6. Wait for all devices to be provisioned and display in the **Operating Network** List.

Depending on the number of devices and their current sleep state, provisioning may take up to several hours. If a device fails to join the network, see reboot the device section (add madcap reference).

Verify Devices

1. Verify the status of any device(s) you provisioned or restarted.
 - a. In the Yokogawa Field Wireless Management Console, open **Monitor**.
 - b. In the tool bar, click the **Field Device List** button. The **Field Device List** dialog box is displayed.
 - c. For each type of device, verify that the status of each type of Ranger Pro device is:

	70M300 Repeater	70M301 Single Axis	70M303 Tri-Axis
Configuration Status	Not Published	Published	Published



If the status is **Session Timeout**, you must resolve the timeout issue before proceeding. Confirm that the correct CFF files were applied and that the correct parameters in the sampling data tab were downloaded to the gateway. Refer to CFF or DD release notes for additional details.

Provision Using the Honeywell ISA100 Gateway

Before you provision Ranger Pro devices using a Honeywell Gateway, we recommend you apply the correct device descriptor (DD) file required for each type of device. You must first obtain the ISA100.11a Device Description (DD) config file from [Bently Nevada Tech Support](#). You only need to add a DD file to the gateway once for each device type.

For more information and detailed instructions, refer to the Honeywell documentation.

To provision Ranger Pro devices on a Honeywell gateway:

1. Open Honeywell OneWireless Device Manager (WDM).
2. Select **Maintenance > Templates**. The **Load ISA100.11a DD / Modbus config file** dialog box is displayed.
3. Click **Load ISA100.11a DD / Modbus file**. The Windows **Open** dialog box is displayed.
4. Navigate to the Windows directory location of the DD file. Select it and click **Open**. The DD is listed in the dialog box.
5. Select an appropriate access point on which Ranger Pro devices have been installed.
6. Expand the **Property Panel**.
7. Select **ISA100 Over the Air Provision**.
8. Click **Enable for 60 Minutes**. Wait for the unprovisioned devices to display in the **Property Panel**. This may take five to ten minutes.
9. Select the un-provisioned devices and click **Accept**.
10. If a device fails to display in the **Property Panel**:
 - a. Delete the device from WDM and allow it to rejoin.
 - b. Select the device.
 - c. Select **Property Panel > Input Publication**.
 - d. Verify that the **Attribute** value is **PV**.

If a device fails to join the network, [see Reboot the Device on page 38](#).

After the Ranger Pro devices are provisioned, use the OneWireless device manager to configure each device's tag name, routing assignment, and join assignment.

5.4 Unprovision Devices

If you need to remove an ISA100 device from the network, move it to another network, or if you need to disable it for any reason, you can unprovision it.

When you unprovision a WirelessHART device, the radio status state is **Suspended**. You can then modify the **Network ID** and **Join Key** and the WirelessHART device will join the new network.

Unprovision Using the Yokogawa ISA100 Gateway

To unprovision Ranger Pro devices using the Yokogawa Field Wireless Management Console:

1. Open Yokogawa Field Wireless Management Console.
2. Select **Monitor**.
3. Select **Tools** > **OTA Provisioning Manager**. The **OTA Provisioning Manager** dialog box is displayed.
4. Click the check box of one or more devices that you want to unprovision.
5. Click **Reset Provisioning Information** and then click **Apply**. The device is removed from the channel and reset to its original mode.

Unprovision Using the Honeywell ISA100 Gateway

To unprovision Ranger Pro devices using the Honeywell OneWireless device gateway:

1. Open Honeywell OneWireless Wireless Device Manager.
2. Expand the **Selection Panel**.
3. Select one or more Ranger Pro device(s).
4. In the tool bar, click **Channel** > **Inactivate**. The **Inactivate Channels** dialog box is displayed.
5. Select the device(s) you want to inactivate and click **Inactivate**. The device is inactivated and its status is changed to out of service (OOS).
6. In the tool bar, click **Provisioning** > **Delete**. The **Delete Devices** dialog box is displayed.
7. Select the device(s) you previously inactivated.
8. Click **Delete**. The device is removed from the network. It is restarted and reset to its factory defaults.



When you inactivate a devices' IO channels on a Honeywell gateway, the device IO channel remain inactivated when the device is re-provisioned to the same or different network. You must reactivate the IO channels for data to publish from the device. Reactivate using the "activate" feature or by manually setting the IO channel mode to "Auto".

Unprovision Using a NFC Reader



Placing the NFC reader on a bare metal surface may cause interference. Insulate the NFC reader from the metal surface by placing a 2.5 cm (1 in.) thick book or similar material under the NFC reader.

To unprovision a single device using the Ranger Pro Configuration Software and a NFC reader:

1. Connect the NFC reader to the computer running the Ranger Pro software.
2. Open the Ranger Pro Configuration Software.
3. Select the **NFC Manager** tab.
4. Connect the USB NFC reader to the PC running the configuration software. If necessary, install any drivers required. To obtain drivers, visit the website of the USB NFC reader vendor.
5. Select the appropriate USB NFC reader in the **NFC Manager** tab header.
6. Place the Ranger Pro device upside down on the USB NFC reader pad.
7. Verify that the NFC status in the footer is **Ready**.
8. Select the **Configuration Manager > Live Configuration** tab and click on the Unprovision button.
9. Click **Unprovision**. Before removing the device from the NFC reader, wait 10 seconds.

Upon completing these steps for ISA100 devices, the Ranger Pro device is unprovisioned, disconnects from the network, and is ready to be provisioned for the same or a new ISA100 network.

Although not required when changing networks, WirelessHART devices can be unprovisioned using a USB NFC reader to place the device into a deep sleep state.

5.5 Reboot the Device

If after several hours the device fails to join the network, reboot the device. Remove the device from the field and reboot the device in an equipment room or similar environment.

To reboot a single device:

1. Open the Ranger Pro Configuration Software.
2. Connect the USB NFC reader to the computer running the Ranger Pro software.
3. Place the Ranger Pro device upside down on the NFC reader pad.
4. Select **NFC Manager** tab.
5. Verify that the NFC status is **Ready**.
6. Verify that the Ranger Pro device status is **Ready**.
7. Expand **Sensor Maintenance > Power Control**.
8. Click **Reboot**. The device is restarted.

5.6 Configure Devices

Use the Ranger Pro Configuration Software to configure devices using either the NFC or network manager options. You can save configuration settings as a file to your hard drive, share the settings file locally and remotely, and apply the saved settings to multiple devices over the network.

Configuration files include:

- Configuration version
- Identification information
- Acquisition timing and scheduling settings
- Temperature measurement settings
- Vibration measurement settings

You can configure Ranger Pro devices two ways:

Network Manager Mode (over-the-air Configuration)	Configure one or many devices over the network using Ranger Pro Configuration Software.
NFC Manager Mode (using NFC reader)	Configure Ranger Pro devices one at a time at your desk or in a safe area.

Configuration Modes

You can use the Ranger Pro Configuration Software to define device settings using two modes:

Live Configuration	• View, modify and update device configurations in real-time. • Most often used to change device configuration on a single device.
Preset Configuration	• View, modify, save, and apply saved settings to multiple devices over the network. • Most often used with customer defined configuration templates.

Network Manager

To view or add a gateway:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager > Gateways** to display gateways that have been previously added.
3. Click **Add**. The **Add Gateway** dialog box is displayed.
4. Enter the **Site Name**, **Gateway Name**, **Gateway Address** and **Gateway Port**. For ISA100, the default for **Gateway Port** is 4901. For WirelessHART, the default is 5094. For more information, refer to the vendor's network infrastructure documentation.

5. Click **Add Gateway**. The new gateway is displayed. The gateway immediately begins to acquire a list of all devices on the network. The number of devices discovered and configured is displayed.

To modify a gateway:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager** > **Gateways**. Existing gateways are displayed.
 - To modify a gateway:
 - a. Select the gateway and click **Modify**. The **Modify Gateway** dialog box is displayed.
 - b. Modify the **Site Name** or **Gateway Name**.
 - c. Click **Modify Gateway**.
 - To remove a gateway:
 - a. Select the gateway and click **Remove**. The **Remove Gateway** dialog box is displayed.
 - b. Click **Remove Gateway**.
 - To reset gateways:
 - a. Select an individual gateway and click **Reset**.
 - b. Click **Reset All**.

To view available devices on the gateway:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager** > **Gateways**. Existing gateways are displayed.
3. In **Gateways**, select a gateway from the list.
4. Double-click on the gateway name. The **Sensors** pane displays all devices and their status.

If using System 1, to modify the gateway IP address, refer to the System 1 online help or user guide.

Configure Sensors Over the Network

To configure devices over the network:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager** > **Sensors** tab. Current devices are displayed.
3. Select **Configuration Manager** > **Live Configuration**.
4. Select a sensor device. Verify that the sensor status in the application footer is **Ready**.
5. Modify configuration options as needed.
6. Unsaved changes are highlighted in blue. To save the changes, click **Apply**. Pending changes are displayed in orange. Completed changes are displayed in black.

To save device configuration settings:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager** > **Sensors**. Current devices are displayed.
3. Select **Configuration Manager** > **Preset Configuration**.
4. Modify configuration options as needed. When complete, click **Save Preset**. The Windows **Save As** dialog box is displayed.
5. Enter a file name. Do not modify the file type (*.RPCFG). Note the directory location for future use. Click **Save**.

To apply preset device configuration settings to multiple devices:

1. Open the Ranger Pro configuration application.
2. Select **Network Manager** > **Sensors**. Current devices are displayed.
3. Select **Configuration Manager** > **Preset Configuration**. All sensors are displayed.
4. Click **Load Preset**. The Windows **Open** dialog box is displayed.
5. Navigate to the directory location where you saved the preset file. Select the file name.
6. Click **Open**. The **Preset Configuration** pane is updated with the saved preset configuration data.
7. Select the Ranger Pro device(s) to which you want to apply the preset configuration. To select multiple devices, press CTRL or SHIFT.
8. In **Network Manager** > **Sensors**, click **Apply**. The preset configuration is applied to the selected sensors. When the change is complete, the sensor status changes to green.
9. When you apply a preset configuration, or when you change the device unit / sub-units, you must click **Restart** or **Restart as Provisioned**.



The network manager can be used to change the tag name of a WirelessHART device by selecting the device in the network tree, changing the tag name, and then applying the change to the device by clicking on "Update". The network manager can not be used to change the tag name of an ISA100 device. The NFC manager can be used to change the radio tag name of an ISA100 device only if the device is in the unprovisioned state.

Configure Devices Using a NFC Manager



Placing the NFC reader on a bare metal surface may cause interference. Insulate the NFC reader from the metal surface by placing a 2.5 cm (1 in.) thick book or similar material under the NFC reader. The NFC reader displays additional detail about device status that is not available using Yokogawa or Honeywell network software.

To configure a Ranger Pro device using an NFC Reader:

1. Open the Ranger Pro Configuration Software.
2. Connect the USB NFC reader to the computer running the Ranger Pro software.
3. Place the Ranger Pro device upside down on the NFC reader pad.
4. Select the **NFC Manager** tab. All sensors and their current status are displayed.
5. Select a sensor device. Verify that the NFC status in the footer is **Ready**.
6. Choose a configuration mode:
 - To modify the existing device configuration, select **Configuration Manager > Live**.
 - To apply a default configuration or custom configuration template, select **Configuration Manager > Preset**.



Shorter vibration and temperature periods reduce battery life.

7. Unsaved changes are highlighted in blue. To save the changes, click **Apply**. Pending changes are displayed in orange. Completed changes are displayed in black.
8. If the sensor is currently publishing data, wait two measurement intervals for the new units to take effect.

For ranges and complete specifications, see the **Ranger Pro Datasheet** (document 125M5237).



The NFC manager can be used to change the radio tag name of WirelessHART devices before they are added to a System1 configuration. The NFC manager can be used to change the radio tag name of an ISA100 device only if the device is in the unprovisioned state.

5.7 System 1 Installation and Configuration

System 1 with the Ranger Pro plugin is used to configure, collect, and analyse dynamic data acquired by Ranger Pro devices connected to either ISA100 or WirelessHART industrial wireless networks. Contact Bently Nevada for additional information regarding the purchase, use and support of System 1.

Compatibility

Refer to the Ranger Pro compatibility matrix in the Ranger Pro firmware and System 1 Ranger Pro plugin release notes before you add devices to a System 1 installation.

System 1 supports running a mixture of Ranger Pro devices running old and current versions of the firmware under specific conditions.



You must upgrade the System 1 Ranger Pro plugin before you upgrade device firmware. If you upgrade device firmware first, System 1 may decommission the installed devices.

New System 1 Installation

Install System 1 and the Ranger Pro plugin before adding Ranger Pro devices as follows:

1. Install System 1 and appropriate hotfix and/or service packs.
2. Download the appropriate compatible Ranger Pro plugin from the Bently Nevada Flexera licensing server.
3. Install the System 1 Ranger Pro plugin.
4. Launch System 1 and create or open an existing System 1 database.
5. From the "Device" menu, right click and select add "Ranger Pro Wireless Gateway".
6. Configure and enable data collection.
7. (If needed) Wait for the **Configuration Out-of-Date** message to display.
8. (If needed) In the **General** properties tab, click **Synchronize** .
9. Click **Save**.



Configure device tag names using the configuration software or gateway interface before connecting to System 1 if you would like the System 1 device name field to inherit your allocated tag name. If you make any tag name changes after connecting devices to System 1, you will have to update the device name field manually if you would like it to match the tag name.

Existing System 1 Installations

If needed, first update System 1 and apply any hot fixes or service packs.

To upgrade the Ranger Pro plugin on System 1:

1. Back up your System 1 configuration.
2. Open the System 1 database on which the Ranger Pro plugin is running.
3. Disable data collection.
4. Close the database.
5. Use Windows **Add or Remove Programs** to uninstall the existing System 1 Ranger Pro plugin.
6. Confirm that the plugin uninstall was completed properly by checking that the plugin installation folder is empty (System 1\DevicePlugins\AddIns\RangerPro).
7. Download the compatible Ranger Pro plugin from the Bently Nevada Flexera licensing server.

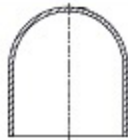
8. Install the plugin.
9. Open the System 1 database.
10. Enable data collection.
11. After several minutes, a configuration out-of-date message may appear. Synchronize and save the configuration.
 - a. (If needed) Wait for the **Configuration Out-of-Date** message to display.
 - b. (If needed) In the **General** properties tab, click **Synchronize** .
12. Click **Save**.
13. (If needed) Add an appropriate wireless gateway to System 1 and configure data collection .

5.8 Mount Devices

Ranger Pro integrated sensors are mounted directly to the point at which measurements are made. This may not be possible in some cases due to space or temperature constraints. In such cases a tethered Ranger Pro sensor connected to a Ranger Pro interface module can be used.



Ranger Pro tethered sensors have a higher temperature rating than Ranger Pro interface modules. Refer to the Ranger Pro Warning, Special Conditions, and Additional Information (126M6550) application note for additional information regarding maximum operating temperatures in hazardous locations.



For additional moisture protection, we recommend environmental boot (159M7787) is installed onto the Ranger Prodevice.

Mount Ranger Pro Integrated Sensors and Repeaters



To mount Ranger Pro integrated sensors and repeaters, you need:

- Ranger Pro C-spanner and flat wrench. Available as part of the installation kit, described in the **Ranger Pro Datasheet** (document 125M5237), available from [Bently.com](https://www.bentley.com).
- Spot facing tool 40 mm (1 ½ inches) diameter
- Steel wire brush
- Drill drill bits and thread-taps
- Medium strength thread locking compound, for example, Loctite Blue 242
- Non-curing silicone grease, for example, Dow Corning 4 Electrical Insulating Compound



WARNING



HAZARDOUS ENVIRONMENT

Risk of explosive atmosphere.

Take precautionary measures to avoid electrostatic potential, especially on plastic components.



WARNING



ELECTROMAGNETIC EXPOSURE HAZARD

When installing a Ranger Pro device, a minimum separation distance of 20 cm from any person must be maintained to comply with relevant electromagnetic exposure regulations..

Identify Location and Hardware

To select a machine mounting position and hardware:

1. Choose a mounting position on the machine housing.
 - a. Verify there is enough clearance to mechanically install the sensor when using the provided wrench.
 - b. Locate the device to obtain optimal vibration measurements.
 - c. Verify radio connectivity. To improve connectivity, we recommend at least 100mm (4 inches) clearance around the e-module on the top of the device. For more information, [see Consider Sensor Range on page 20.](#)
2. Determine what kind of mount you want to use.
 - a. We recommend you drill and tap a mounting hole.
 - Verify that the machine housing is suitable for drilling a mounting hole.
 - Refer to the machine warranty or other documentation.
 - Consider the type of Ranger Pro device you want to mount.
 - Consider placement on the machine relative to its axis.
 - b. If drilling a mounting hole is not feasible, use an adhesive mounting pad instead. See [About Using Adhesives](#) below.
 - c. Select either a standard stud, adhesive stud, or tri-axial alignment stud. For details and ordering information, see the **Ranger Pro Datasheet** (document 125M5237) available from [Bently.com](#).



If you are mounting a tri-axial Ranger Pro device, it can be difficult to align the device to the axis of the machine being monitored. We recommend you use the tri-axial alignment studs available as spare mounting adapters described in the **Ranger Pro Datasheet** (document 125M5237). Also see [About Using Adhesives](#).

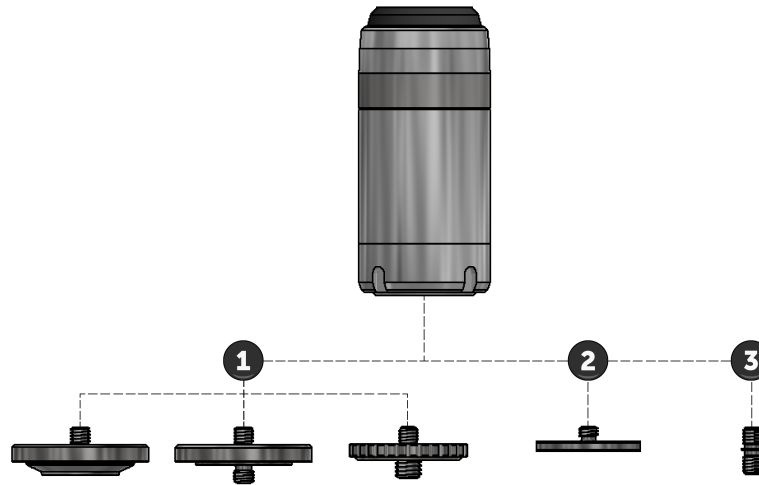


Figure 5 - 1: Mounting Options

1. Triaxial Alignment Mounting Adapters
2. Cementing Pad Mounting Adapter
3. Mounting Stud

Prepare for Mounting

To finish the mounting surface:

1. Prepare the mounting surface.
 - The mounting diameter should be a minimum of 40 mm (1 ½ inches) on the machine at the mounting point.
 - On curved surfaces, use a spot facing tool to provide a flat mounting surface.
 - Use a steel wire brush to remove all paint from the mounting surface.
2. Prepare the attachment point.
 - (Recommended) Drill and tap a suitable hole in the center of the prepared surface, perpendicular to the mounting surface.
 - (Alternative) Cement an adhesive mounting pad onto the prepared surface with a suitable bonding agent. See "About Using Adhesives" at right.

For machine manufacturers or when installing in a suitable environment, the surface finish for stud mounted devices should meet these specifications:

- Roughness: 32 micro inch rms
- Flatness: 0.001" TIR
- Spot face Diameter: 1.5 inch Hole
- Perpendicularity: $\pm 1^\circ$
- Hole Depth: mounting stud dependent



The mounting point hole and thread depth should be sufficient for the mounting stud to be seated against the prepared mounting surface.

About Using Adhesives

To prevent devices separating from the machinery they monitor and to obtain accurate high frequency response, it's important to choose an adhesive that provides excellent adhesion, temperature rating, gap filling properties, and rigidity. Many two-part epoxies and acrylic adhesives are suitable. Two examples are Loctite AA330 or ClickBond CB200.

If you're mounting a tri-axial sensor, it can be difficult to align the device to the axis of the machine being monitored. We recommend you first screw the pad onto the actual sensor. Then mark the sensor's X-direction on the pad. Remove the pad from the sensor before applying adhesive.

Apply 0.5 g to 1 g of adhesive to the center of the mounting pad, then position the pad on the mounting surface. Align the pad to sensor's X-direction if required. Rotate it back and forth until you feel slight metal-to-metal contact. Your goal is to force most of the adhesive out the sides, forming a slight band around the pad.

Attach the Device

1. Align the axis of the device as needed to the axis of the acceleration being monitored.
 - The vertical or z-axis of the Ranger Pro sensor is the most sensitive.
 - Where possible, mount the device in the axial or radial direction of the machine.
2. Apply a suitable medium strength thread locking compound to the machine side of the mounting stud. This is necessary due to vibration.
3. Apply a lower-strength thread locking compound to secure the Ranger Pro device to the mounting stud or pad.
4. To improve high frequency response and reduce transverse vibration, apply a very light amount of silicone grease to the base of the device.
5. Attach the device to the machine surface and use a torque wrench to tighten it to 5 Nm (44 in-lb). Do not exceed 6 Nm (53 in-lb).
6. (Optional) Secure the device by passing a 1 mm (.04 inch) lanyard (not provided by Bently Nevada) through the fall protection hole in the base. Secure the lanyard to a suitable retaining point.

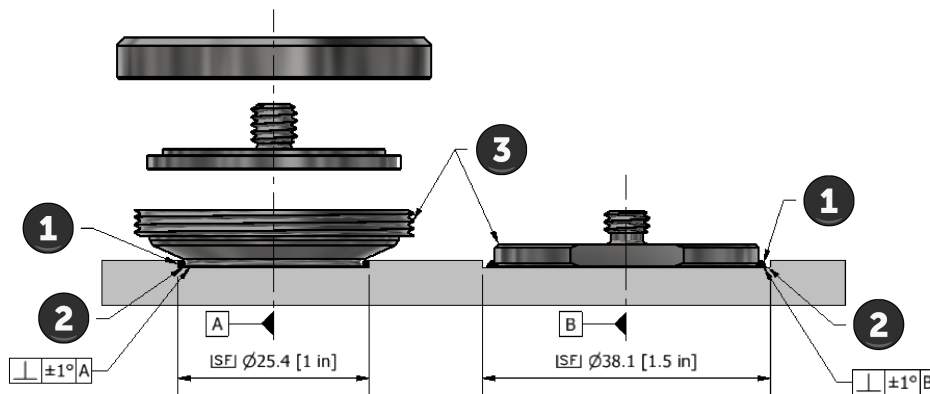


Figure 5 - 2: Cement Pad Installation

1. Adhesive
2. Spot Faced Mounting Area
3. Cement Mounting Pad

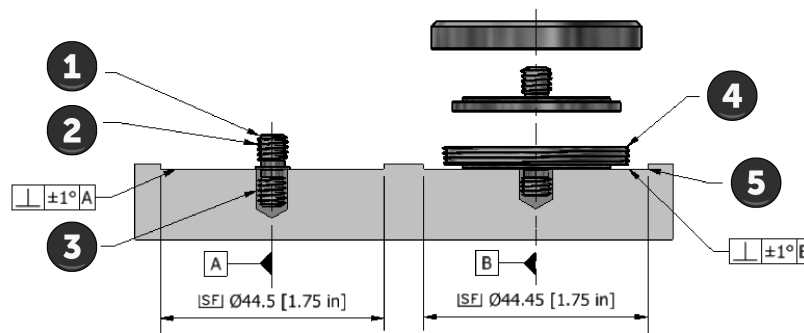
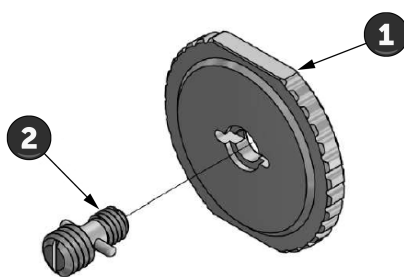


Figure 5 - 3: Threaded Mounting Adapter Installation

1. Mounting Stud
2. Apply Thread Locker to this thread
3. Apply light to medium strength thread locker to machine side thread
4. Threaded Mounting Adapter
(do not apply thread locker to this thread)
5. Spot Faced Mounting Area

Using the Alignment Stud 121M7986



1. Insert the stud (2) into the alignment disk (1) and thread the assembly into the bottom of the Ranger Pro sensor. Ensure that the assembly is tightened until the alignment disk makes contact with the base of the sensor (do not overtighten).
2. Drill and tap a M8 x 1.25 mounting hole in the machine case. It is important to note that the tapped dimension needs to be 10 to 13 mm deep to enable the stud to function and tighten.
3. Thread the Ranger Pro assembly with the alignment stud into the prepared hole in the machine case. All contact surfaces should be touching and not loose. Do not torque or over-tighten.
4. To align the X/Y axis of the sensor, position the flat wrench (121M7995) on the alignment disk to prevent it from rotating. Position the C-spanner (121M7994) on the Ranger Pro sensor near the base and turn the sensor body counter clockwise until the X/Y axis is aligned. Do not allow the alignment disk to rotate during this step and do not rotate the sensor more than 180° for alignment.
5. Once the X/Y axis are aligned, hold the aligned position of the Ranger Pro sensor with the C-spanner and turn the alignment disk clockwise, until the assembly is tightened. Do not allow the Ranger Pro sensor to rotate during this step. Torque to 5 Nm.



This is a two-step process and functions because of the differential pitch of the M6 and M8 threads. The machine-side stud must not bottom in the threaded hole during the adjustment and tightening process. If the tapped machine case mounting hole is not sufficiently deep, then the assembly will not tighten.



A medium strength thread locker should be used on the machine side thread of the stud and a medium to low strength thread locker should be used on the sensor side thread of the stud. Do not allow the thread locking material to cure before the assembly is aligned and torqued.

Mount Ranger Pro Interface Modules



Ranger Pro Interface Modules can be mounted to flat surfaces or to tubing using the supplied mounting accessories and you do not need any special tools when mounting the devices.

Tools and material required:

- Mounting bracket and fasteners (as supplied)
- Hex key wrench (Allen Key) – 6mm
- Stainless steel hose clamps – size depending on installation
- U-bolts – 6mm or 3/8", size depending on installation
- Fasteners and washers – 6mm or 3/8" suitable for surface mounting

Identify Location and Hardware

To select a mounting position and hardware:

1. Determine what kind of mount you want to use.
2. Choose a mounting position on the machine housing or surrounding structure.
 - a. Verify there is enough clearance to mechanically install the device.
 - b. Verify radio connectivity. To improve connectivity, we recommend at least 100 mm (4 inches) clearance around the e-module on the top of the device. For more information, see the "Consider Sensor Range" section.

Attach the Device

Before attaching the device to the mounting point, ensure that the device is secured to the mounting bracket using the supplied fasteners.

Secure the mounting bracket to the chosen position using suitable fasteners depending on the type of mount you are using.

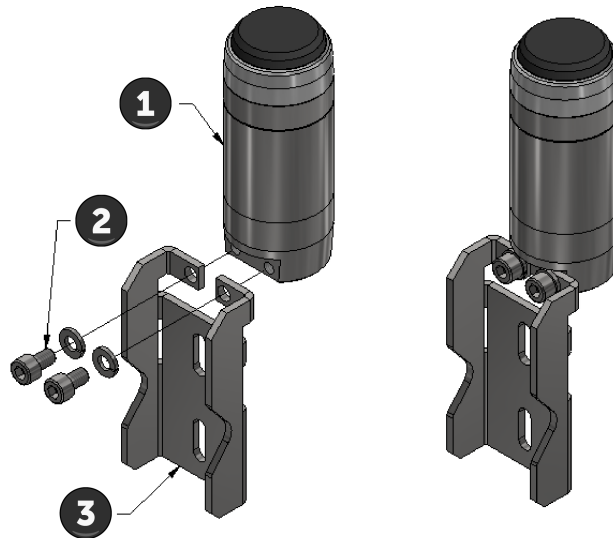


Figure 5 - 4: Attaching Ranger Pro Interface Module to Mounting Bracket

1. Ranger Pro Interface Module
2. Fasteners
3. Mounting Bracket

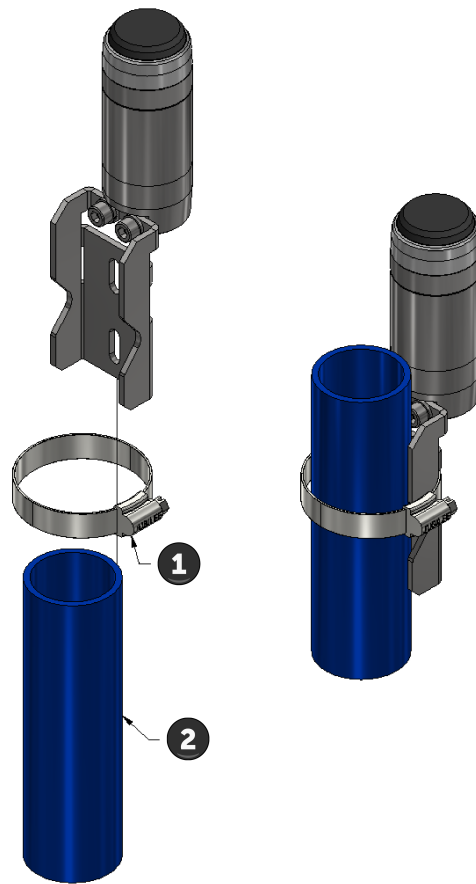


Figure 5 - 5: Attaching Mounting Bracket to a Vertical Pipe

1. Hose Clamp
2. Vertical Pipe

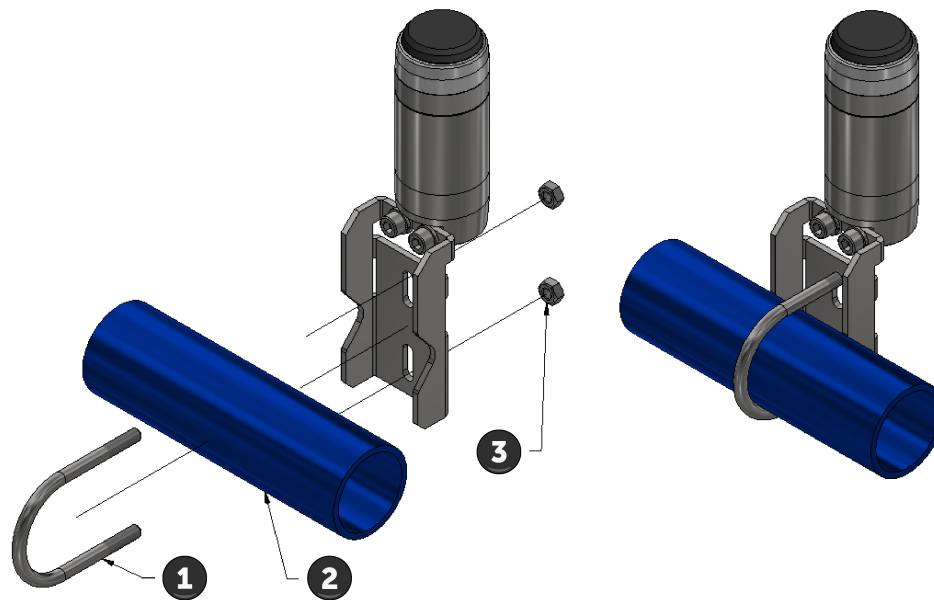


Figure 5 - 6: Attaching Mounting Bracket to a Horizontal Pipe

1. U-Bolt
2. Horizontal Pipe
3. Fasteners

Mount Ranger Pro Tethered Sensors



You need the following tools when mounting tethered Ranger Pro sensors:

- Steel wire brush.
- Thread locking compound, for example, Loctite Blue 242.
- Non-curing silicone grease, for example, Dow Corning 4 Electrical Insulating Compound.
- 4 mm hex key wrench (Allen Key).
- 22 mm crowfoot and torque wrench.
- 20 mm flat wrench.

When using studs to mount devices, you also need:

- Spot facing tool 25mm (1 inch) diameter.
- Drill, drill bits and thread-taps.



WARNING



HAZARDOUS ENVIRONMENT

Risk of explosive atmosphere.

Take precautionary measures to avoid electrostatic potential, especially on plastic components.

Identify Location and Hardware

To select a machine mounting position and hardware:

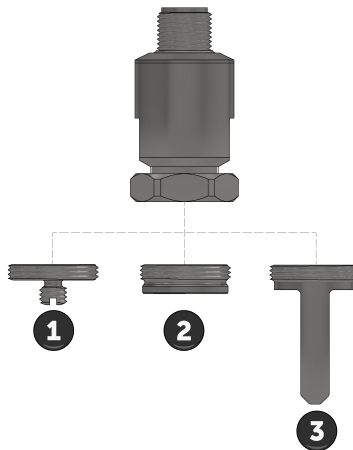


Figure 5 - 7: Ranger Pro Tethered Accelerometer Mounting Options

1. Mounting Adapter
 2. Cement Pad
 3. Motor Fin Mount
1. Choose a mounting position on the machine housing.
 - a. Verify there is enough clearance to mechanically install the sensor.
 - b. Locate the device to obtain optimal vibration measurements.
 2. Determine what kind of mount you want to use. Select either a mounting adapter, adhesive cement pad, or motor fin mount available from Bently Nevada.
 - a. We recommend you drill and tap a mounting hole for use with a mounting adapter.
 - Verify that the machine housing is suitable for drilling a mounting hole.
 - Refer to the machine warranty or other documentation.
 - Consider placement on the machine relative to its axis.

3. If drilling a mounting hole is not feasible, use an adhesive cement pad or motor fin mount instead. See [About Using Adhesives](#).

Prepare for Mounting

To prepare the surface and point to which a Ranger Pro tethered sensor is attached:

1. Prepare the mounting surface.
 - a. The mounting diameter should be a minimum of 25 mm (1 inch) for tethered Ranger Pro sensors on the machine at the mounting point.
 - b. Use a steel wire brush to remove all paint from the mounting surface.
 - c. On curved or uneven surfaces, use a spot facing tool to provide a flat mounting surface.
2. Prepare the attachment point.
 - a. (Recommended) Drill and tap a suitable hole in the center of the prepared surface, perpendicular to the mounting surface.
 - b. (Alternative) Cement an adhesive cement mounting pad onto the prepared surface with a suitable bonding agent. See [About Using Adhesives](#).
 - c. (Alternative) Use motor fin mounts if needed for tethered Ranger Pro sensors mounted onto motors. Ensure that the end of the mount is in contact with the motor casing when using motor fin mounts.

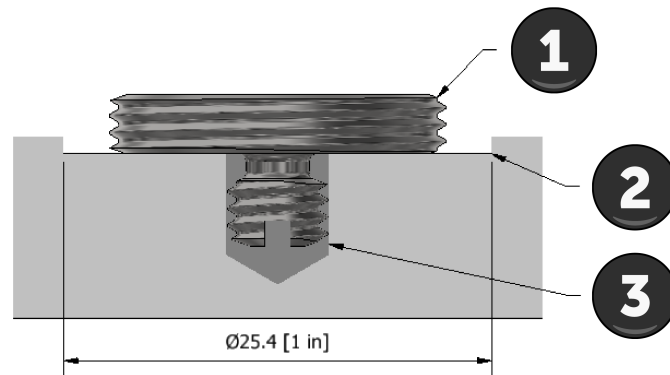


Figure 5 – 8: Mounting Adapter Installation

1. Mounting Adapter
2. Spot Faced Mounting Area
3. Tapped Hole

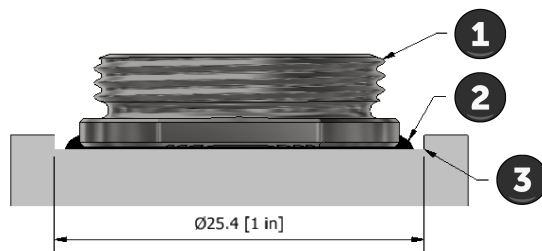


Figure 5 - 9: Cement Pad Installation

1. Cement Pad
2. Adhesive
3. Spot Faced Mounting Area



Figure 5 - 10: Motor Fin Mount Installation

- | | |
|-----------------------------|---------------------|
| 1. Motor Fin Mount | 4. Point of Contact |
| 2. Fill voids with adhesive | 5. Motor Casing |
| 3. Motor Fin | |

For optimal results the surface finish for stud mounted devices should meet the following specifications:

- Roughness: 32 microinch rms
- Flatness: 0.001" TIR
- Spotface Diameter: 1 inch (25mm)
- Hole Perpendicularity: $\pm 1^\circ$
- Hole Depth: mounting stud dependent



The mounting point hole and thread depth should be sufficient for the mounting stud to be seated against the prepared mounting surface.

Attach the Device

Sensor alignment considerations:

- Align the axis of sensors as needed to the axis of the acceleration being monitored.
- Where possible, mount sensors as close as possible to the bearing support in the axial or radial direction of machines.

To improve vibration coupling and high frequency response, apply a very light amount of silicone grease to the base of sensors before attaching them to a mounting point. When using the mounting adapter you should apply silicone grease to the machine side of the adapter as well.

Attach Ranger Pro tethered sensors as follows:

1. For adapter mounts;
 - a. Apply a suitable low to medium strength thread locking compound to the mounting adapter thread and fasten it into the prepared threaded hole. Thread locking compound is necessary due to vibration.
 - b. Tighten the adapter to 6 Nm (53 in-lb). Do not exceed 7 Nm (62 in-lb).
2. Attach and tighten the device to the mounting point.
 - a. Hand-fasten the sensor to the mounting adapter and align it to the axis to be measured.
 - b. Use the sensor mounting tool to maintain sensor alignment while tightening the sensor fastening collar using a 22 mm (7/8 in) flat wrench.
 - c. Tighten the sensor to 5 Nm (44 in-lb). Do not exceed 6 Nm (53 in-lb).

The mounting torque is important to the frequency response and mounting of the sensor:

- If the sensor is not mounted tightly enough, the high frequency response will be impacted and, in the case of tethered Ranger Pro sensors, may result in misalignment.
- The mounting pad or coupling fastener may fail if the sensor is over-tightened.



When using the 10-32 mounting adapter:
Countersink or counterbore the mounting hole by 2 mm (5/64 in) before.
Tighten the mounting accessory to a maximum of 5 Nm (44 in-lb).

Connect and Route the Cables

Tethered Ranger Pro sensors are connected to Ranger Pro Interface Modules using approved M12 connector cables. Only use M12 cables supplied by Bently Nevada for hazardous location installations.

You should tighten the connector to a torque of 0.6 Nm to ensure that the connection to the sensor is properly sealed. Use a torque wrench or hand-tighten the connector to ensure that it is

not over-tightened. Over- or under-tightening of the connector may compromise the IP rating of the sensor.



Ensure that dust covers are in place on unused connectors to prevent them from becoming damaged by dust or moisture.

When installing cables:

- Provide strain relief for the cable and connector by securing the cable to the sensor using and appropriate cable tie.
- Route cables in such a way that they cannot be caught up in any moving parts of the equipment being monitored.
- Support the cable at regular intervals to relieve strain and to prevent it from being caught up in moving parts of the equipment being monitored.

To reduce the effects of externally induced noise, the cables have an overall shield that is connected on the Ranger Pro Interface Module M12 connector only. When installing the transmitter and sensor, you should ensure that the transmitter and sensor cases are grounded as per the installation grounding diagram.

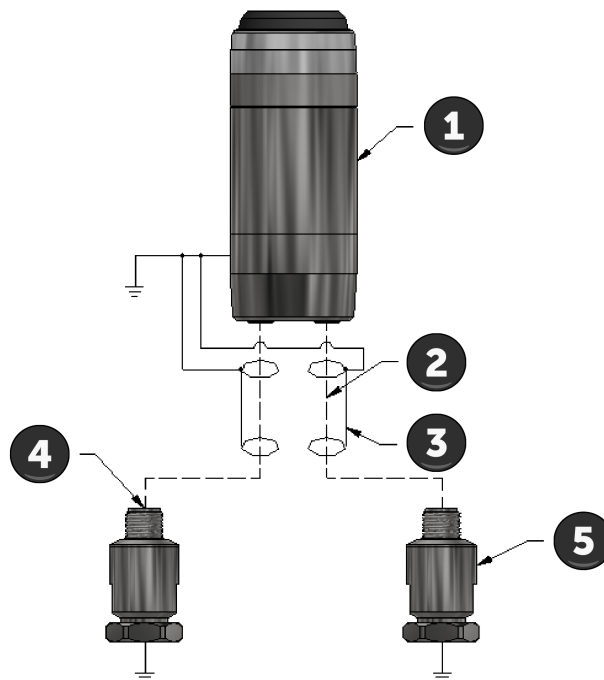


Figure 5 - 11: Grounding Installation

- | | |
|--------------------------------|--|
| 1. Ranger Pro Interface Module | 4. Internal Shield Isolated from Housing |
| 2. Signal Wires | 5. Ranger Pro Tethered Accelerometer |
| 3. Cable Shield | |

6. Verification

6.1 Verify Network Connectivity

Ranger Pro devices send data to a wireless network gateway. The data is then sent from the gateway to the user by means of one or more of the following:

ISA100 devices

- Modbus
- General Client Interface (GCI)

WirelessHART devices

- Modbus
- HART over IP (HART-IP)
- HART-IP Secure

To collect data from gateways using GCI, HART-IP or HART-IP Secure, the user must have the relevant versions of Bently Nevada System 1 and the Ranger Pro plugin installed. Furthermore, dynamic data is only sent to the user using GCI , HART-IP or HART-IP Secure.



To ensure compatibility between RangerPro devices and System 1, refer to the Ranger Pro firmware and Ranger Pro plugin release notes.

General Client Interface (GCI)

To connect System 1 to compatible ISA100 gateways:

1. Launch System 1 and create or open an existing System 1 database.
2. From the "Device" menu, right click and select add "Ranger Pro Wireless Gateway".
3. Enter the gateway IP address and Port 4901.
4. Click Add.
5. After the import process completes, Click Save.
6. Configure and enable data collection.
7. (If needed) Wait for the **Configuration Out-of-Date** message to display.
8. (If needed) In the **General** properties tab, click **Synchronize** .
9. (if needed) Click **Save**.

HART-IP

1. Launch System 1 and create or open an existing System 1 database.
2. From the "Device" menu, right click and select add "Ranger Pro Wireless Gateway".
3. Enter the gateway IP address and typically Port number as configured in the gateway. Typically this is port 5094 but it may be different.
4. Click Add.
5. After the import process completes, click Save.
6. Configure and enable data collection.
7. (If needed) Wait for the **Configuration Out-of-Date** message to display.
8. (If needed) In the **General** properties tab, click **Synchronize** .
9. (if needed) click **Save**.

HART-Secure

Hart-IP Secure data is encrypted and requires using Emerson Security setup tool to create a proxy between the gateway and System 1 resulting in a local IP (typically 127.0.0.1) and port number for System 1 to connect to the gateway. To function, the Emerson Security setup tool must be installed and configured on the System 1 server.

Refer to Emerson documentation for proper setup and configuration.

1. Launch Emerson Security setup tool.
2. Select Add HART-IP Proxy and enter the IP address, HART-IP Secure Server Port and host Local Port for the gateway.
3. Save and enter authentication credentials.
4. Launch System 1 and create or open an existing System 1 database.
5. From the "Device" menu, right click and select add "Ranger Pro Wireless Gateway".
6. Enter the localhost IP address (typically 127.0.0.1) and Local Port defined in step 2.
7. Click Add.
8. After the import process completes, Click Save.
9. Configure and enable data collection.
10. (If needed) Wait for the **Configuration Out-of-Date** message to display.
11. (If needed) In the **General** properties tab, click **Synchronize** .
12. (if needed) Click **Save**.

If additional compatible Emerson WirelessHART gateways are added to System 1 via the HART-IP Secure feature, use the localhost IP address (typically 127.0.0.1) with the unique local port number as configured in the Emerson security tool for that gateway.



We recommend updating your Emerson gateway firmware and security tool to the newest released versions

Verify Network Joining

To verify that your sensors have joined your network, use your network vendor's software. It can take several hours for a large number of Ranger Pro devices to join your network.

If a provisioned device fails to join your network after several hours, try these options:

Verify / Reboot the Device

- Verify the sensor is provisioned. Ranger Pro devices must be in an provisioned state to join the network.
- Verify the device's network connection. Dismount the device from the machine and position it closer to an access point or router.
- If possible, improve the device's radio frequency communication by relocating it or reorienting the device's axis or orientation relative to the access point or router.
- Reboot the device. This increases the frequency that the device attempts to join the network. ([See Reboot the Device on page 38.](#))

Add a device or Repeater

- In areas that have weak RF coverage (for example, where RSSI < -78 dB), configure a Ranger Pro device to enable routing or, for ISA100 networks, preferably add a Ranger Pro repeater device. Ranger Pro Repeaters must be set as IO/Router device types.
- Use your network vendor's software to verify, and if necessary, enable the router function of Ranger Pro devices. You may also need to enable the join property of each device for ISA100 networks.
- Verify that each device has a good network connection.
- Remember that using a Ranger Pro ISA100 sensor as a router decreases its battery life.
- Remember to stay within the recommended number of hops per device. ([See Plan Device Placement on page 22.](#))
- ISA network device managers limit the number of IO/Router enabled devices. Refer to the vendors documentation for details.

Move the Device, Backbone Router, or Access Point

Relocating a device or reorienting its axis or orientation relative to the router or access point as little as 6 cm (2 1/3 inch), or one-half of a 2.4 GHz wavelength, may improve signal strength. Ranger Pro devices are designed for optimal RF propagation when the device's x-axis is in the horizontal plane.

Change access points

- If permitted, use a higher gain antenna on the backbone router or access point. Verify that the resulting narrowly focused radio frequency distribution pattern meets your needs.
- Modify the antenna polarization of the backbone router or access point.
- Add a backbone router or access point

Verify Signal Strength and Packet Error Rates

Check that the devices' signal strength and packet error rate are within your network vendor's guidelines. Use your wireless network gateway to monitor device signal strength and packet error rates.

- Signal strength (RSSI) must be above -85 dBm, and preferably above -78 dBm.
- For ISA100 networks the packet error rate (PER) should be less than 50%, and preferably less than 20%.

6.2 Validate Device Data

Depending on the wireless management system you are using, there are several ways to validate that each device is transmitting data.



Initial publication of measurement data may take some time after devices have joined the network. After the initial period, during which the network is forming, measurements are published at the configured rate.

- **Bently Nevada Ranger Pro ISA100 Gateway device manager:** Verify that the publication status indicator (icon) is colored and the measurements are displayed in the **Readings** pane.
- **Honeywell OneWireless device manager:** Verify the measurements are displayed in the Honeywell user interface and verify that the "Input Publication" parameters are active.
- **Yokogawa YFGW410 device manager:** Verify that the operation status is **Published** (for sensors) or **Not Published** (for 70M300 repeater devices).



If a Ranger Pro ISA100 device displays **Session Timeout** is not publishing data in a Yokogawa system, verify that the correct CF has been applied and that the correct OID parameters are mapped. Ensure that the **Publication Period** and **Stale Limit** parameter values are correct. Refer to the CFF release notes for details on the proper settings

- **WirelessHART:** In the Gateway:
 - Select **Devices**. Verify that the dynamic device variables PV, SV, TV, QV (primary, secondary, tertiary and quaternary) are green (being published).
 - Select **System Settings > Network > Network Settings**. Modify the settings for **Stale Data Detection**:
 - **Missed updates.** 255
 - **Minimum timeout.** 90

A Ranger Pro ISA100 repeater will function correctly and repeat the data from other devices even with the operational status indicating "Session Timeout"; however, the battery status will not be reported to System 1.

Data Output

Static overall measurements can be transmitted using Modbus, GCI, HART-IP or HART-IP Secure. Honeywell gateways support OPC with additional licensing. Alternatively, you can use third party software to publish Modbus data using an OPC server.

To create or import a wireless configuration and enable data collection into System 1, use the Ranger Pro plugin interface to the device manager.

A valid System 1 device license and Ranger Pro plugin is required to acquire dynamic data. GCI, HART-IP and HART-IP Secure are the only methods that support sending sensor spectrum and time base data.



To avoid deleting historic data, do not change Ranger Pro units or sub-units after you begin collecting data in System 1.

Static Process Variable Data

Process Variable (PV) or direct data is used to trend the overall vibration and temperature. PV data can be sent to System 1 through GCI, HART-IP, HART-IP Secure, Modbus or OPC. PV data conforms to the ISA100, foundation fieldbus standard. Data sent by HART-IP conforms to the HART standard.

For ISA100 devices PV data is timestamped depending on the device firmware version. WirelessHART device PV data is timestamped by the device at the time of acquisition. Refer to the firmware release notes to determine which method is used and to determine which parameters are available

You can select the units, sub-units, time interval, F_{min} and F_{max} settings.

Dynamic Data

Dynamic data is measured at the interval and start date/time set by the user. You can select the number of samples, F_{min} , F_{max} , and time interval. Dynamic data is collected sequentially for each measurement axis and time stamped when the data collection occurs.

Advanced Features

Additional advanced measurement features are also available that can be enabled or disabled at your discretion. These features apply to both ISA100 and WirelessHART Ranger Pro devices and can be set using the configuration software either during configuration or over the air as required.

Data on Demand

Use Data on demand to collect additional data off the measurement schedule. Off scheduled measurements may be needed if the monitored asset is showing an increase in vibration or temperature.

From the Ranger Pro Configuration Software Live View, select the “Acquire” button to initiate a DoD. Once initiated, data is acquired data within 8 to 10 minutes upon request. The PV values will update within 10 minutes. The dynamic data, however, is a much larger dataset and may take more than 1 hour depending on the condition of the wireless network.

Data on demand requests cancel the most recently acquired scheduled measurements if they are still being transferred to the gateway. Subsequent scheduled measurements are inhibited for up to 90 minutes after a data on demand request.



For Honeywell, systems, you may initiate a data on demand from the Honeywell UI. Select the device vendor menu for the field device and select the “acquire now” and apply.

Data on Vibration (DoV)

Data on Vibration minimizes the Ranger Pro data acquisition to preserve battery life by only taking measurements when the vibration level is over a specified threshold. When enabled, the Ranger Pro will check once an hour relative to the acquisition start time if the measured vibration exceeds the user specified threshold along the selected axes.

For example, if acquisition is started at 14:22, the vibration threshold will be checked and if below the specified threshold “0.00” will be returned without any dynamic data. After an hour, at 15:22, the vibration level will be checked again and, if over the specified level, a measurement will be recorded, and the parameters will be published as configured.

The units for the threshold are inherited from the velocity PV setting. The subunit for DoV is RMS and may be different to the velocity PV setting.

Use Data on Vibration when machines are off for extended periods of time and when those machines operate, they run for periods longer than 1 hour. It is not recommended to use this feature with machines that operate intermittently and that are expected to start and stop for periods less than 1 hour.



Use a short overall measurement interval (e.g. 10 minutes) for machines that operate for short periods of time and that are expected to start and stop frequently or intermittently.

Data on Severity (DoS)

Data on Severity is used to acquire data more frequently based on the severity of the vibration level as defined by you. Data acquisition will be performed depending on the severity level as defined below:

- Green
 - Vibration is below defined limits.
 - Data is collected at the configured interval.
- Yellow
 - Vibration is between the lower and upper defined limits.
 - Acquire all enabled measurements immediately.
 - Revert to collecting data at the configured interval.
- Red
 - Vibration is above the upper defined limit.
 - Acquire all enabled measurements immediately.
 - Set overall measurements to be taken at the shortest allowed interval (10 minutes).
 - Set dynamic measurements to be taken at the shortest allowed interval (6 hours).
 - These shorter measurement intervals will remain active for at least 24 hours and until the overall velocity is below 90% of severity level 4.

The units for the severity limits are inherited from the velocity PV setting. The subunit for DoS is RMS and may be different to the velocity PV setting.

Use Data on Severity when you need to monitor equipment that is suspected to be deteriorating.

Modbus Settings

The Ranger Pro sensors publish vibration and temperature (process variable data) values as 32-bit, floating point data. You can output Ranger Pro static data like vibration and temperature using the gateway's Modbus interface.

To modify Modbus settings in the gateway, refer to the vendor's documentation.

For WirelessHART devices the device variable must be described in the format "Tagname.DeviceVariableID", where "Tagname" is the tag assigned to the device and "VariableID" is one of the device variable IDs listed. For example, the temperature variable will be described as "Tagname.0" or "Tagname.PV" and the battery life variable will be described as "Tagname.243".



For details about configuring single, tri-axial and repeater AIO objects for ISA100 devices, refer to DD or CF file release notes.



For detail about non-vibration and temperature attributes, refer to the device capability file (CFF) for the attribute definition and allowed values.

Ranger Pro ISA100 Integrated Sensors Using Firmware Version 01.01.06.03 or Earlier

Byte Order: Little Endian, 32-bit

Data type: float

- CH01_AI: Tagname.CH01_AI.PV = Temperature
- CH02_AI: Tagname.CH02_AI.PV = X-Accel
- CH03_AI: Tagname.CH03_AI.PV = X-Vel
- CH04_AI: Tagname.CH04_AI.PV = Y-Accel
- CH05_AI: Tagname.CH05_AI.PV = Y-Vel
- CH06_AI: Tagname.CH06_AI.PV = Z-Accel
- CH07_AI: Tagname.CH07_AI.PV = Z-Vel

Ranger Pro ISA100 Integrated Sensors Using Firmware Version 03.01.15.01, 04.01.12.03 or Later

Byte Order: Little Endian, 32-bit

Data type: float

- CH01_AI: Tagname.Temperature.PV
- CH02_AI: Tagname.Z-Axis-Accel.PV
- CH03_AI: Tagname.Z-Axis-Vel.PV
- CH04_AI: Tagname.Z-Axis-PkDemod.PV
- CH05_AI: Tagname.Y-Axis-Accel.PV
- CH06_AI: Tagname.Y-Axis-Vel.PV
- CH07_AI: Tagname.X-Axis-Accel.PV
- CH08_AI: Tagname.X-Axis-Vel.PV

Ranger Pro WirelessHART Sensors Using Firmware Version 03.01.02.07 or Later

Byte Order: Refer to WirelessHART network hardware vendor documentation.

Data type: float (4-bytes)

Device Variable IDs:

- 0 - TEMPERATURE - Primary Variable (PV)
- 1 - Z OVL ACC - Secondary Variable (SV)
- 2 - Z OVL VEL - Tertiary Variable (TV)
- 3 - Z PK DEMOD - Quaternary Variable (QV)
- 4 - Y OVL ACC
- 5 - Y OVL VEL
- 6 - X OVL ACC
- 7 - X OVL VEL
- 243 - BATTERY LIFE (DAYS LEFT)

Ranger Pro ISA100 Interface Modules Using Firmware Version 04.01.XX.03 or Later

Byte Order: Little Endian, 32-bit

Data type: float

- CH01_AI: Tagname.CH 1-Temperature.PV
- CH02_AI: Tagname.CH 1-Z-Axis-Vel.PV
- CH03_AI: Tagname.CH 1-Y-Axis-Vel.PV
- CH04_AI: Tagname.CH 1-X-Axis-Vel.PV
- CH05_AI: Tagname.CH2-Temperature.PV
- CH06_AI: Tagname.CH2- Z-Axis-Vel.PV
- CH07_AI: Tagname.CH2 -Y-Axis-Vel.Pv
- CH08_AI: Tagname.CH2 - X- Axis-Vel.PV



Ranger Pro ISA100 interface modules using firmware version 04.01.12.03 do not transmit Ch2 values.

Ranger Pro WirelessHART Interface Modules Using Firmware Version 04.01.X.02 or Later

Byte Order: Refer to WirelessHART network hardware vendor documentation.

Data type: float (4-bytes)

Device Variable IDs:

- 0 – PORT A TEMPERATURE – Primary Variable (PV)
- 1 – CH 1 Z OVL ACC
- 2 – CH 1 Z OVL VEL – Secondary Variable (SV)
- 3 – CH 1 PK DEMOD
- 4 – CH 1 Y OVL ACC
- 5 – CH 1 Y OVL VEL
- 6 – CH 1 X OVL ACC
- 7 – CH 1 X OVL VEL
- 8 – CH 2 TEMPERATURE – Tertiary Variable (TV)
- 9 – CH 2 Z OVL ACC
- 10 – CH 2 Z OVL VEL – Quaternary Variable (QV)
- 12 – CH 2 Y OVL ACC
- 13 – CH 2 Y OVL VEL
- 14 – CH 2 X OVL ACC
- 15 – CH 2 X OVL VEL
- 243 – BATTERY LIFE (DAYS LEFT)



Ranger Pro WirelessHART interface modules using firmware version 04.01.X.02 do not transmit Ch2 values.

7. Maintenance

The Ranger Pro device needs minimal maintenance. If a device fails, it may be due to a weak battery, environmental damage, or even a blocked wireless connection.

7.1 Monitor Battery Levels

To monitor your Ranger Pro device's battery status, use your network infrastructure software or the NFC reader and the Ranger Pro software. Depending on the device operating mode and configuration, the battery lasts up to five years.

Refer to the "Diagnose Device Status" section to identify the status of a Ranger Pro device.

Check the devices' battery status monthly. If a battery status is medium, be sure you have replacement batteries in stock or on order. However, for optimal device life, we recommend that you don't store batteries for more than 12 months. Under optimal conditions, we recommend replacing the battery within 3 to 6 months once it reaches the **Low** state.

Install only approved D-sized 3.6 V lithium-thionyl chloride batteries. For details and ordering information, see the **Ranger Pro Datasheet** (document 125M5237) available from [Bentley.com](https://www.bentley.com).

Battery Status Monitoring

Battery status is updated once per hour and may be trended. Battery status is affected by low temperatures. A new battery displays 75%. 100% is only used for line powered devices. There are three battery states:

- 75-100%: High
- 25-75%: Medium
- 0-25%: Low

To view battery status:

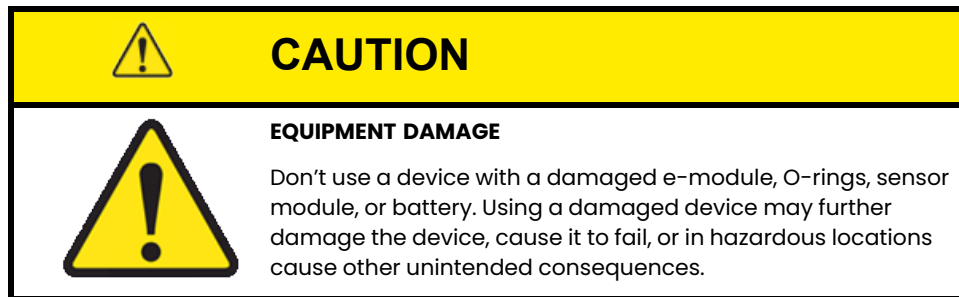
- Using the Yokogawa gateway:
 - a. Click the **Field Device List** button. The power supply status is displayed in the right column.
- Using the Honeywell gateway:
 - a. Select a device in the **Selection Panel**.
 - b. In the **Property Panel**, expand **Device Management**. The power supply status is displayed at the top.
 - c. Alternatively, the device Power_Supply_Attribute available in the Honeywell OPC and/or modbus output.
 - A. 1 - High
 - B. 2 - Medium
 - C. 3 - Low

- Using System 1:
 - a. Select **Display > Devices**.
 - b. In the **Device** hierarchy, select a Ranger Pro device. Expand the device and select **Health**.
 - c. In the **List** pane, the **Health** Point **Power Supply Status** Measurement value is displayed.
- Using a Bently Nevada Ranger Pro ISA100 gateway:
 - a. Select the **Devices** menu item.
 - b. Select a Ranger Pro device in the device tree.
 - c. Select **Device Information**.
 - d. The **Power Status** field indicates the device battery status.
- Using an Emerson WirelessHART gateway:
 - a. Select the relevant sensor.
 - b. View all published data.
 - c. Device variable ID 243 indicates the battery status in terms of days left.
 - d. System 1 software displays WirelessHART battery status by translating from days left to a percentage for the three different battery states:
 - > 1368 days - 75%: High
 - 456 - 1368 days - 50%: Medium
 - < 456 days - 25%: Low

7.2 Clean and Inspect Devices

To clean the exterior of the Ranger Pro devices in potentially hazardous environment, use a damp cloth.

Before cleaning or inspecting Ranger Pro devices in a potentially hazardous environment, verify that hazardous materials, atmospheres and conditions have been removed.



Clean the Exterior

When cleaning a Ranger Pro device in an equipment room or a similar environment:

- Use a clean, dry, non-abrasive, anti-static cloth to clean the exterior. Don't use solvents or solutions.
- To remove deposits from the exterior of the sensor, use an electronic contact or switch cleaner.

Open the Device

Open the device to replace or inspect the battery as well as to inspect the interior components such as the O-rings and device electronic contacts.



Before opening the device, remove it from the field and operating environment.

To prevent damage to the O-rings, turn the e-module retaining ring counterclockwise $\frac{1}{2}$ to one turn, and then clockwise about $\frac{1}{4}$ turn, and repeat until the sensor body O-ring is exposed. For more information on how to open Ranger Pro devices, see [Install Battery on page 24](#).

If you have trouble removing the retaining ring, the e-module may be rotating with the retaining ring. Turn the retaining ring clockwise slightly and press down lightly on the e-module to hold it in place. Then turn the retaining ring counterclockwise.

Inspect the e-module

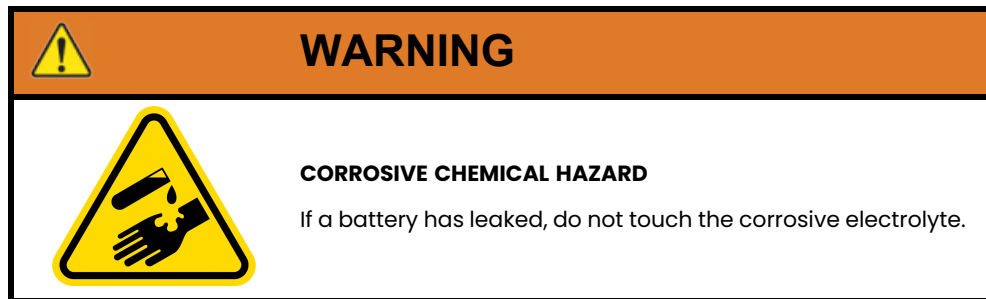
Remove the e-module by pressing upward lightly on the side opposite the module's contact pins.

To ensure that the e-module (top of the device) remains in good operating condition:

- Visually check that the enclosure, battery terminal spring, and contact pins are undamaged.
- Inspect the e-module positive battery terminal spring. Look for chemical corrosion or deposits.
- Verify that the e-module contact pins move freely when pressed against the sensor module contact pads.
- Visually check that the e-module housing is not cracked or otherwise degraded.

Inspect the Battery

Before removing the battery with the battery installation tool, look for signs of battery leakage.



Inspect the battery before removing it. Look for:

- Swelling, deformation, or elongation
- Indentations or lifting of battery terminals
- Moisture or liquid on the battery surface
- Chemical corrosion or deposits on the battery terminals
- If a battery leaks, do not touch the corrosive electrolyte

If the battery is damaged or is leaking, follow your site's hazardous materials handling procedures.

Inspect the Device Casing

Inspect the stainless steel device case (bottom of the device).

- Inspect the device negative battery terminal spring. Look for chemical corrosion or deposits.
- Visually check that the device contact pads at the top of the case are undamaged and free of deposits.
- Visually check that the reverse polarity protection pad is positioned on the inside and at the bottom of the device casing in the center of the negative terminal spring.
- Clean the interior of the device using a clean, dry, anti-static cloth.

Replace the Battery

To replace the battery, [see Install Battery on page 24](#). To dispose of used or partially-expended batteries, follow your site's or locality's hazardous materials handling procedures.

Inspect the O-rings

The Ranger Pro device uses two O-rings to seal the unit against dust and moisture.

- A** 34 x 1 mm O-ring on the e-module
- B** 35 x 1 mm O-ring on the case



Ranger Pro devices use different size O-rings on the sensor body and e-module. Proper installation and lubrication are required to maintain the IP rating and to prevent leaks.

To inspect the O-rings:

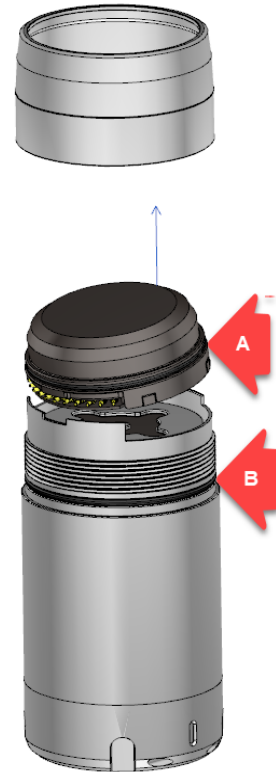
- Ensure that the O-rings are free from dust and debris.
- To remove dust and dirt, use a clean, dry cloth.
- When you install new O-rings, coat them very lightly with silicone grease.

If they're damaged, or if you're replacing the battery, always replace the O-rings. For details and ordering information, see the **Ranger Pro Datasheet** (document 125M5237) available from [Bently.com](https://www.bently.com).

Reassemble the Device

To reassemble the device, [see Install Battery on page 24](#).

After closing the device, it should be ready to join the configured network. If after several hours it fails to join the network, reboot the device. See the "Reboot the Device" section.



7.3 Update Device Firmware

You may on occasion need to update the sensor firmware. Download firmware updates from [Bently Nevada technical support](#). You can update firmware over-the-air or using the NFC reader. Each method has advantages and disadvantages.



If you are using System 1: Before upgrading firmware refer to the firmware update release notes for information regarding System 1 Ranger Pro plugin compatibility. Always upgrade the System 1 Ranger Pro plugin before attempting any device firmware upgrades. Incorrect device firmware updates may lead to undesired system behavior such as decommissioned and duplicated devices, connection errors, data loss or corruption of the System 1 database.

Depending on your network infrastructure, you can update device firmware using a USB NFC reader and the Ranger Pro configuration software over the air using the Ranger Pro configuration software or over the air using the gateway interface. Each method has advantages and disadvantages to take into consideration when deciding which to use.



As you upgrade the firmware, monitoring may be interrupted. When the firmware update is complete, the Ranger Pro device restarts. All nodes connected to the device are temporarily disconnected. Plan your upgrade to minimize disruption of your condition monitoring activities.

For USB NFC reader upgrades:

- Be sure you have downloaded and added current versions of the firmware to the Ranger Pro Configuration Software.
- Depending on the number of devices, using a USB NFC reader to update firmware can be a manually time-consuming process as the devices need to be removed from the field.
- Using a USB NFC reader to update firmware is quick and the firmware update is applied immediately.

For over the air upgrades:

- Ranger Pro devices do not need to be removed from the field but must be joined to a network.
- If you have many devices, updates can take many hours to apply.
- We recommend that you update no more than 10 sensors at a time, otherwise the remaining devices are likely to time out and fail.
- In multi-hop or mesh networks, we recommend you update the outer layer of devices on the mesh first.
- If you are using Ranger Pro devices with routing enabled, you can only update one child device at a time.

For more information, refer to the network vendor's documentation.

After updating the device firmware, you may have to update the Ranger Pro device descriptor (DD) file or capabilities file (CF) depending on your network infrastructure.

Manage Firmware Using the Ranger Pro Configuration Software

Before you use the Ranger Pro Configuration Software to update device firmware, you must download and add the fir72mware files to the **Firmware Manager**.

To add the firmware to the Ranger Pro Configuration Software:

1. Visit [Bently Nevada Tech Support](#) and download the firmware files to your local machine.
2. Open the Ranger Pro configuration software.
3. Select the **Firmware Manager** tab.
4. Click **Add File**. The Windows **Open** dialog box is displayed.
5. Navigate to the directory in which you saved the downloaded firmware files.
6. Select the firmware file and click **Open**.
7. If the device firmware file is both valid and supported, it will be displayed in the list of **Available Firmware Upgrade Files** in the "Firmware Manager" tab with details as to its supported hardware and compatibility with any selected devices.
8. To remove a firmware file, select the file and click **Remove File**.

Firmware Update Precautions

Follow the procedures described and take note of the cautions outlined below to update a Ranger Pro device used in a System 1 configuration.

Ranger Pro devices with different firmware versions can co-exist in one System 1 enterprise provided the following pre-requisites are met:

- System 1 with appropriate service packs are installed.
- The latest System 1 Ranger Pro plugin is installed.

Check the firmware and plugin release notes for version compatibility.



DO NOT upgrade previously configured Ranger Pro device firmware before updating the Ranger Pro plugin to the latest version. Failure to adhere to this requirement will result in decommissioned devices.

Update Sensor Firmware Using the Ranger Pro Configuration Software

Either the USB NFC reader or over the air method can be used to update the device firmware using the Ranger Pro configuration software. The over the air method is used for updating WirelessHART devices connected to an Emerson gateway.

Remove the Ranger Pro devices to be updated from the field to update firmware using the Ranger Pro configuration software and a USB NFC reader.

To individually update the e-module firmware using a USB NFC reader:

1. Open the Ranger Pro Configuration Software.
2. Connect the NFC reader to the computer running the Ranger Pro Configuration Software.
3. Place the Ranger Pro device upside down on the NFC reader pad with the e-module in contact with the pad.
4. Select **NFC Manager > Firmware Manager**.
5. Select a valid firmware file for the upgrade – the **Compatibility** column will indicate whether it can be used with the selected device.
6. If the firmware is compatible and the device is ready, you will be able to click on **Upgrade** to update the firmware.
7. The update progress will be displayed in the **Software > Firmware Version** section of the **NFC Manager** tab.
8. Once complete, the Ranger Pro device automatically reboots. The version number displayed in **Firmware Version** is updated.

Update Device Firmware Over the Air Using the Gateway Interface

Refer to your network vendor's infrastructure documentation before you update Ranger Pro devices over the air using the gateway interface.

Update Sensor Firmware Using Bently Nevada Ranger Pro ISA100 Gateway

Before you can update sensor firmware, be sure you have downloaded current versions of the firmware.

To update firmware using the Bently Nevada Ranger Pro ISA100 gateway:

1. Verify that all Ranger Pro devices are provisioned, connected to the network, and joined to the gateway.
2. In the Bently Nevada gateway application, select **Firmware**. The **Firmware** tab is displayed.
3. Click **Upload**. The Windows **Open** dialog box is displayed.
4. Navigate to the directory where the firmware files are located.
5. Select the device firmware file. Click **Open**.

6. In the **Firmware Type** field, select **Device Application**.
7. In the **Version** field, enter the firmware version number.
8. In the **Description** field, enter a short description.
9. Click **OK** to upload the firmware.
10. Select **Device Application** as the firmware type to update.
11. Select the devices to which you want to apply the firmware upgrade.
12. Click **Execute**. Progress is displayed in the **Progress** tab.

Update Sensor Firmware Using Yokogawa Gateway

To update firmware using the Yokogawa Field Wireless Management Console:



When the firmware upgrade is complete, you must apply a capability file (CF) to the upgraded devices.

1. Download the CF and firmware files from [Bently Nevada technical support](#).
2. Verify that all Ranger Pro devices are provisioned, connected to the network, and joined to the gateway.
3. In the Yokogawa Field Wireless Management Console, open **Monitor**.
4. Choose **Tools > Firmware Download Manager**. The **Firmware Download Manager** dialog box is displayed.
5. Select the **Sensor Firmware** tab. Ranger Pro devices are listed.
6. Select the check box of the devices you want to upgrade.
7. Select **Download Firmware**. The **Update Sensor Firmware** dialog box is displayed.
8. Do not modify **TSAP** and **Object ID** default values. Click the **Firmware file** browse button. The **Open** dialog box is displayed.
9. Navigate to the location of the firmware file. Select it and click **Open**. The **Update Sensor Firmware** dialog box is displayed.
10. Click **Start Download**. When the download is complete, the **Firmware Download Manager** dialog box is displayed and the node is highlighted Yellow.
11. In the **Sensor Firmware** tab, select the Yellow highlighted devices and click **Apply**. The firmware upgrade is applied and the sensors are restarted.
12. [Apply capabilities file](#).
13. Restart the device and verify the device status.

Update Sensor Firmware Using Honeywell Gateway

Before you upgrade the device firmware, obtain the correct device descriptor (DD) file required for each type of Ranger Pro device from Bently Nevada [technical support](#). You only need to add a DD file to the gateway once for each device type.

To update the DD file on a Honeywell gateway, see [Provision Using the Honeywell ISA100 Gateway](#).

To update firmware using a Honeywell OneWireless Device Manager:

1. Verify that all Ranger Pro devices are provisioned, connected to the network, and joined to the gateway.
2. Open Honeywell OneWireless Device Manager (WDM).
3. In the **Selection Panel**, select the device you want to upgrade.
4. In the tools ribbon, click **Upgrade** and select **Application**. The **Application Firmware Upgrade** dialog box is displayed.
5. To add a firmware file, click **Add**. The Windows **Open** dialog box is displayed.
6. Navigate to the location of the firmware file. Select it and click **Open**. The firmware is listed in **Available Firmware Files**.
7. Select the Ranger Pro device to be updated and click **Upgrade**. The firmware update is automatically applied.
8. Refresh the list of Ranger Pro devices.
 - a. Delete the upgraded device(s) from Honeywell WDM.
 - b. Allow the device to rejoin.
9. Once loaded, Honeywell applies the correct device descriptor (DD) file to each device.

Update Sensor Firmware Using WirelessHART Gateway

Use the Ranger Pro configuration software to update devices on an Emerson WirelessHART gateway.

Before you can update sensor firmware, be sure you have downloaded and added current versions of the firmware to the application.

To update the device firmware over the air using an Emerson gateway:

1. Open Ranger Pro configuration software.
2. Select **Network Manager > Gateways** tab.
3. Select the Emerson gateway hosting the sensors you want to update.
4. Select the sensor(s) to update from the **Network Manager > Sensors** tab.
5. Select the **Firmware Manager** tab.
6. Select a valid firmware file for the update – the **Compatibility** column will indicate whether it can be used with the selected device or ALL the devices for multiple selections.

7. If the firmware is compatible with the device(s), you will be able to click on **Upgrade** to update the firmware.
8. Select **Network Manager > Sensors** tab.
9. Update progress is displayed in the **Firmware Version** field.
10. Once complete, the Ranger Pro device automatically reboots. The version number displayed in **Firmware Version** is updated.
11. When successful, you can clear the status message. Right-click on the status and click **Clear Firmware Upgrade Status**.

If the update fails, this will be indicated in red, and any conflicts or actions can be cleared or executed by right-clicking on the **Firmware Version** and selecting **Close Port** or **Ignore**.

Firmware updates can be canceled at any time by right-clicking and selecting "Cancel Firmware Upgrade". Cancellation progress will be indicated in orange with the text "Cancel Requested" and the completion status can be cleared by right-clicking on the "Firmware Version" and selecting "Clear Firmware Upgrade Status".

7.4 Update Radio Firmware

Radio firmware is rarely modified. If required, you can request radio firmware files from Bently Nevada technical support.

Ranger Pro ISA100 device radio firmware can be updated over-the-air by supported wireless gateways. WirelessHART radio firmware can not be updated.

Update Radio Firmware Using Honeywell Gateway

With one exception, the process to upgrade a Ranger Pro device radio firmware on a Honeywell gateway is the same as upgrading the sensor firmware. In the tools ribbon, choose **Radio**. Otherwise the steps are entirely the same. For details, [see Maintenance on page 71](#).

Update Radio Firmware Using Yokogawa Gateway

With one exception, the process to upgrade a Ranger Pro device radio firmware on a Yokogawa gateway is the same as upgrading the sensor firmware. In the **Firmware Download Manager** dialog box, select the Radio **Firmware** tab. Otherwise the steps are entirely the same. For details, [see Update Sensor Firmware Using Bently Nevada Ranger Pro ISA100 Gateway on page 79](#).

Update Radio Firmware Using the Bently Nevada Ranger Pro ISA100 Gateway

To update the radio firmware using the Bently Nevada Ranger Pro ISA100 gateway web interface:

1. Verify that all Ranger Pro devices are provisioned, connected to the network, and joined to the gateway.
2. In the gateway web interface, select the **Firmware** menu item.

3. Upload the required firmware by clicking on the **Upload** button on the **Firmware** tab:
 - a. Click on **Browse** to navigate to and select the relevant radio firmware file.
 - b. Select the **Firmware** Type to be uploaded as **Radio**.
 - c. Enter the firmware **Version** number and provide a short **Description**. Click **OK** to upload the firmware.
4. Select the **Devices to Upgrade** tab and select **Radio** as the firmware type to update.
5. Select the devices to which the firmware update must be applied and select **Execute**.
6. Monitor the update on the **Progress** tab.

Update Device Firmware Bootloader

The device bootloader enables the device to run updates to the device application firmware. Ranger Pro devices running firmware 03.01.12.XX or earlier will require application firmware 03.01.13.XX, 03.01.14.XX or 03.01.15.XX to be loaded. This will enable an update to bootloader 02.01.03.XX which is required for firmware releases 04.XX.XX.XX and above to be loaded.

Refer to 121M7997 and the firmware update files for compatibility and detailed installation instructions.



If an application firmware update is initiated with a non-supported bootloader, the download will be rejected immediately and the device will not be damaged.

7.5 Troubleshooting Ranger Pro Devices

If a Ranger Pro interface module fails, it may be due to a weak battery, environmental damage, or even a blocked wireless connection.

Diagnose Device Status

If a device fails, use a USB NFC reader to identify the fault. The USB NFC reader displays additional detail about device status that is not available using network software.

Diagnostic information can only be read if the device has a battery installed and the system firmware is running.

To diagnose a fault in a device:

1. Connect the USB NFC reader to the computer running the Ranger Pro configuration software.
2. Open the Ranger Pro configuration software.
3. Place the Ranger Pro device upside down on the USB NFC reader.
4. Select the "NFC Manager" tab. The device status and whether a fault is present is displayed in the "Diagnostics" "E-Module" and/or "Sensor" sections.

E-Module Status	
Boot Loader Running	The device can boot but is unable to start the application firmware. Use the Ranger Pro configuration software firmware manager to upgrade the firmware.
Internal Storage Status	
Good	The E-Module internal storage is working as expected.
Warning	A problem has occurred with the device internal storage. Contact Bently Nevada technical support for assistance.
Bootloader Status	
Good	The E-Module bootloader is working as expected.
Upgrade Error	An application firmware upgrade error has occurred. Upgrade the device application firmware.
No Upgrade Found	No application firmware found. Upgrade the device firmware.
Launch Error	Unable to start the device application firmware. Upgrade the device firmware.
Good	The sensor has been detected and is working correctly.
Read Warning (Identification)	The sensor identification data could not be read.
Model Unrecognized	The sensor identification data was successfully read but the model is not recognized.
Model Unsupported	The sensor identification data was successfully read but the model is not supported.
Bypass (Identification)	The sensor identification data was successfully read but the model has been detected as a legacy model.
Read Warning (Calibration)	The sensor calibration data could not be read.
Bypass (Calibration)	The sensor calibration data was successfully read but the model has been detected as a legacy model.
Read Warning (Diagnostics)	The sensor diagnostics data could not be read.
Bypass (Diagnostics)	The sensor diagnostics data was successfully read but the model has been detected as a legacy model.

Bootloader Status	
Read Warning (Temperature)	The sensor detected a temperature read fault.
Read Warning (Accelerometer)	The sensor detected an accelerometer read fault.

If any sensor warning occurs, contact Bently Nevada technical support for assistance.

Temperature Min, Max

If the sensor temperature has been read successfully the maximum and minimum detected temperatures are displayed.

Vibration Max X, Y, Z

If the sensor vibration values have been read successfully the maximum overall vibration recorded for each axis is displayed.

Harden the System

The security risk to your network when using Ranger Pro devices is like that in any distributed control system or industrial control system. You need to take all reasonable steps to properly secure these devices.

At a minimum, to secure Ranger Pro devices:

- Securely manage all device docking stations.
- Verify that the latest firmware is installed on all docking stations and device e-modules and sensors.
- Follow your site's standards or industry's best practices for strong passwords.
- Only install Ranger Pro configuration software on computers dedicated to that purpose and maintain appropriate physical security of those computers.
- When you complete provisioning on a Honeywell Gateway, verify that Over-The-Air-Provisioning is disabled in the System Manager menu on the gateway UI.
- When you complete provisioning on a Yokogawa Gateway, verify that OTA provisioning is disabled using the Yokogawa Monitor application OTA Provisioning Manager.

7.6 Troubleshooting System 1/Ranger Pro installation, setup and data collection

System 1 User cannot open a System 1 Ranger Pro database or receives a message "One or more generic device plugins are missing"

Solution:

- Confirm Ranger Pro plugin is installed. User may need to download and install newest released plugin.
- Locate the file IF.BentlyNevada.dll which by default is located in Program Files (x86)\System 1\DevicePlugins\AddIns\RangerPro.
- Open the properties of this file and go to the digital signature page and then to the details button.
- Select the entry under Countersignatures and select the details of the DigiCert Timestamp Certificate. This will probably tell you that there isn't enough information to verify the certificate.
- Download this certificate <https://cacerts.digicert.com/DigiCertAssuredIDRootCA.crt> and install this to the machines Trusted Root Certificate Authority Store.
- Recheck the properties of the DigiCert Timestamp certificate and verify that it shows that the digital signature is ok. Verify that System 1 will open and ensure that the Ranger Pro notes resume collecting data.

System 1 user cannot import gateway

Solution:

- Verify compatible Ranger Pro plugin is installed.
- Confirm IP address and port are of the gateway which is imported.
- Ensure communication interface is licensed and enabled using gateway User Interface.
- Confirm connection, such as Clients, sessions or leases, does not exceed the limits. There are some ways to release more resources for communication with System 1.
- Confirm CF files or DD files are the correct version and uploaded configured in the gateway (see the Apply Capabilities File section).
- Use gateway UI to confirm that the Ranger Pro devices are connected to the gateway.

System 1 is not collecting data or data is not updating

Solution:

- Refer to the release notes in 121M7997 for the product compatibility matrix and confirm all the versions are compatible. If they are compatible, disable/enable data collection and/or restart System 1 services.
- Verify that only one System 1 enterprise is connected to the gateway
- Verify the network connection
- Disable and re-enable data collection. Or restart service System 1 Server.

Software Attribution

Related to these Ranger Pro Products: 70M300, 70M301, 70M303, 70M320, 70M323, 70M403, 70M423

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Bently Nevada
Attn: Engineering General Manager
Development and Engineering
1631 Bently Parkway South
Minden NV, 89423

Your request should include:

- (i) the name of the covered binary,
- (ii) the version number of the product containing the covered binary,
- (iii) your name,
- (iv) your company name (if applicable) and
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