DIVIGRAPH

VP Series 2000 User Guide

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General Safety

Receiving Inspection

Visually inspect the product for obvious shipping damage. If you detect shipping damage, file a claim with the carrier and submit a copy to Divigraph. Include all model numbers and serial numbers with the claim.

Handling and Storing Considerations

Proper handling of components, best practices for system installation, and diligent inspection procedures for the system will prolong the service life of the system. Additionally, procedures for dealing with system components replaced by maintenance are detailed to allow compliance with regulations relating to electronic waste.

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. More specific product safety warnings are described in **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001).

Potential Electrostatic Charging Hazard

! WARNING	
ELECTROSTATIC CHARGING HAZARD	
	RISK OF PERSONAL INJURY OR EQUIPMENT DAMAGE. Potential for electrostatic charging hazard.

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

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Hazardous Environment

! 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, or
- Removal or placement of an energized connection.

Lithium Batteries

! WARNING
LITHIUM BATTERIES
Do not use a device with a damaged battery. Using a damaged battery may further damage the device, cause it to fail, or in hazardous locations cause other unintended consequences.

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.
- Do not place lithium metal batteries on metal work surfaces.
- Avoid exposing lithium metal batteries to extreme temperatures.
- If you store an inactive VP Series 2000 device, remove the battery.
- Dispose of used or defective batteries in accordance with the applicable statutes and regulations, as well as site-specific safety requirements.

Lithium batteries typically last up to five years. Use the VP Series 2000 configuration software or network vendor application to monitor battery performance and replace batteries as needed.

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Safe Disposal

Replacing Device and Failure Analysis

Contact Divigraph for information on returning parts under warranty and/or requesting failure analysis.

Hazardous Materials

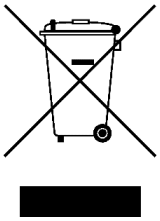
This device does not use hazardous materials outlined by RoHS or battery directive statutes. These regulations confirm that lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ether, and battery related materials such as lithium are limited to no more than trace 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. Divigraph is not responsible for product disposal at the end of its useful life. Visit www.weeerohsinfo.com for recycling information.



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Hardware

Intended Use

VP Series 2000 devices are intended for monitoring purposes only and should not be used in control or safety systems.

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: l

- 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 **VP Series2000 Datasheet** (20DD1974) and **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001) available from Divigraph.

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 complementaires à propos de la conformité et de l'approbation de cet appareil en zone dangereuse, veuillez consultez **VP Series2000 Datasheet** (20DD1974) et **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001) disponibles auprès du Divigraph.

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Description

VP Series 2000 sensors measures temperature, acceleration, and velocity. Ranger Pro sensors detect acceleration using piezoelectric ceramic sensing elements in the sensor base. The sensors derive velocity from the acceleration signal. The Ranger Pro sensors also measure surface contact temperature using a sensor in the device base. The sensor reports a single temperature per device. You can choose what units are used to measure the data.

Temperature	A sensor embedded in the device base measures contact temperature.
Acceleration Overall	Discrete, piezoelectric sensing elements measure acceleration in the Z-axis for single axis VP Series 2000 wireless sensors and in the X, Y and Z directions for tri-axial VP Series 2000 wireless sensors. Overall acceleration is calculated over 2.5 seconds.
Velocity Overall	Calculated from the acceleration waveform and the overall value is calculated over a 2.5 second duration.

There are various versions of the device:

VP2000-01 ISA100.11a Sensor	Detects velocity and acceleration in three axes (X, Y, and Z) and measures surface temperature.
VP2000-02-01 WirelessHART Tri-Axial Sensor	Detects velocity and acceleration in three axes (X, Y, and Z) and measures surface temperature.
VP2030 ISA100.11a Tri-Axial Sensor	Detects velocity and acceleration in three axes (X, Y, and Z) and measures surface temperature.
VP2010 ISA100.11a Single Axis Sensor	Detects velocity and acceleration in one axis (vertical, or Z) only and measures surface temperature.
NR1210 ISA100.11a Repeater	Enables you to extend the range between sensors and ISA100 backbone routers.

For ISA100 networks, both the tri-axial and single axis sensors can also act as routers, although using the router mode depletes the device battery more quickly.

If a VP Series 2000 ISA100 device cannot communicate with a backbone router, you can use the VP Series 2000 ISA100 repeater (NR1210) or a VP Series 2000 ISA 100 device with routing enabled to extend your ISA100 network. Although a VP Series 2000 ISA100 device can route up to 8 devices, we recommend no more than three.

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System Components Required

To install, configure and use the VP Series 2000 wireless devices, you need:

- Lithium-thionyl chloride batteries, one per device. For approved battery types, see **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001).
- Battery installation tool.
- VP Series 2000 devices with batteries installed.
- Mounting hardware (plus adapters, if needed).
- A compatible USB NFC reader. Contact Divigraph for a list of compatible readers.
- VP Series 2000 Configuration Software (available from Divigraph).
- Spot facing tool, if required. (Not provided by Divigraph.)
- Torque wrench with ¼ inch drive, capable of tightening devices in the 5-7 Nm range (44 to 62 in-lb). (Not provided by Divigraph.)

An installation kit is available from Divigraph. The installation kit can be ordered with or without a USB NFC reader. Contact Divigraph for ordering information.

VP Series 2000 Components

The VP Series 2000 device consists of seven parts:

- Device case. Contains vibration and temperature sensors and forms the device's housing (316 stainless steel body).
- Wireless e-module (glass-reinforced, impact-resistant PPS).
- Battery retaining ring (316 stainless steel).
- Two O-ring seals (35x1mm on the device case and 34x1mm on e-module).
- Battery (replaceable D size 3.6V lithium-thionyl chloride). (Not provided by Divigraph)

! NOTE
Use only approved D-sized lithium-thionyl chloride batteries for the VP Series 2000 devices. If you use the wrong battery, you can negatively affect device performance, produce inaccurate readings, and void the warranty. You can purchase approved batteries from third-party suppliers. For details, see **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001).

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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
Divigraph	NG1120 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 VP Series 2000 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	Access Point
Emerson‡	Wireless 1410/1420 Gateway	N/A
‡ Emerson gateway with firmware 4.7.84 or later is required.		

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Network Design

VP Series 2000 devices operate in the 2.4 GHz band used by ISA100.11a and WirelessHART networks. To enhance security, the devices use 128-bit AES encrypted packets.

! NOTE
The installation and configuration of wireless networks is beyond the scope of this user guide. For details, see your vendor's wireless network documentation.

Setup Overview

To add VP Series 2000 devices to your wireless network, complete these steps:

1. Survey your installation location.
2. Decide where to install VP Series 2000 devices and identify mounting points.
3. Locate and install backbone routers or access points as applicable.
4. Locate and install a device manager or gateway as applicable.
5. Install batteries in each device.
6. Provision VP Series 2000 devices.
7. Mount devices.
8. Test and verify your installation.
9. Monitor and maintain your devices and network.

Consider Sensor Range

A VP Series 2000 device can transmit data up to 150 meters (164 yards) to a router or access point when unimpeded by environmental influences. A device can typically transmit data to another device up to 100 meters (109 yards) or more, but greater distances may negatively affect performance.

The range of VP Series 2000 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 device 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.

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Consider Battery Life

Batteries for VP series 2000 devices have a typical life of five years under the following conditions:

- VP Series 2000 ISA100 sensors are configured as a I/O device (not router).
- Ambient temperatures under 40°C (104°F).
- Good quality radio frequency communications.
- Measurement interval of 30 minutes or more.
- Dynamic measurement intervals of 1 day or more.

To maximize VP Series 2000 device battery life:

- Minimize the number of hops between devices and backbone routers or 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 VP Series 2000 ISA100 sensors as both I/O and routers. Using a sensor as a router can reduce battery life to 18 to 24 months.
- Minimize the number of devices routed through VP Series 2000 ISA100 repeaters or sensors with routing enabled. Avoid connecting more than eight devices through a single VP Series 2000 ISA100 repeater, or more than five devices through a VP Series 2000 ISA100 sensor with routing enabled. Since VP Series 2000 ISA100 sensors with routing enabled are continually in listen and transmit mode, their battery life is less.
- Use the longest 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%.

Choose Network Topology

The most common network topologies are mesh and star-mesh hybrid topologies. ISA100 networks may also have a star topology 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 star and mesh topologies (hybrid topology), depending on your needs. Consult your network infrastructure documentation for details.

Star Topology

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

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Mesh Topology

A mesh topology creates redundant communication paths for devices on the network. Mesh topologies are suitable for networks that cover a large area. When planning a mesh network, it is 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 devices routed through a single device, creating a choke point.

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 500 mm (20 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.
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 VP Series 2000 device. (When connecting to a backbone router or an 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 are installing sensors in extremely congested plant areas or in areas with insufficient wireless connectivity, consider installing additional gateways, backbone routers or access points.
   - Add locations where you need to install additional gateways, backbone routers or access points. When placing gateways, backbone routers or access points, consider the location of line power and suitable connections to the existing plant network.

Place gateways, backbone routers or access points in locations so that as many devices as possible can connect directly to each gateway, backbone router or access point.

Refer to your network hardware vendor documentation for the maximum number of devices supported.

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! NOTE
Where possible, minimize the distance from the gateway, backbone router or access point to the furthest VP Series 2000 device.

4. Plan for multiple connections for each device.
    - Multiple communication paths in mesh networks 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 VP Series 2000 device, 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 VP Series 2000 ISA100 sensor with routing enabled, or more than eight devices through a single VP Series 2000 ISA100 repeater.
5. To extend the range of an ISA100 wireless network or to reach devices beyond the range of a gateway or backbone router, consider adding VP Series 2000 repeaters. Repeaters ought to be positioned:
    - Relatively high above other devices, preferably at least two meters (6 ½ feet) above ground. 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 a backbone router.
6. Plan for a maximum of four hops between each VP Series 2000 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 gateways, backbone routers or access points and VP Series 2000 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.

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Installation and Configuration

Install Battery

We recommend that you install batteries in Ranger Pro devices in an indoors equipment room or a similar environment. Do not replace batteries in a hazardous area.

! WARNING
HAZARDOUS ENVIRONMENT
RISK OF EXPLOSIVE ATMOSPHERE. Do not install batteries in a hazardous area. Use only approved battery types described in the **VP Series Warnings, Special Conditions and Additional Information** (DSDVP001) available from Divigraph.

! NOTE
To maintain the device's IP67 dust and water-resistant rating, assemble the device carefully.

To install a battery in a VP Series 2000 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.

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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.

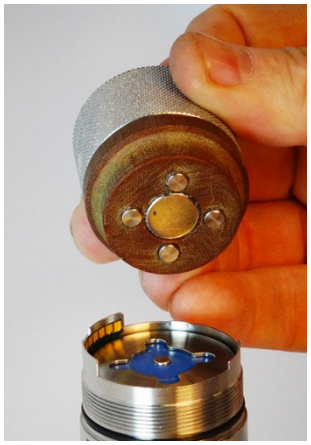
   - 34x1mm O-ring on the e-module
   - 35x1mm O-ring on the case

! NOTE
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 sensor case as well as the exterior threads of the battery retaining ring to be sure they are not damaged or contaminated.

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

! NOTE
Use only approved D-sized lithium-thionyl chloride batteries for the Ranger Pro sensors and repeaters. For ordering information, contact Divigraph.



7. Use the 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).

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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. Now 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 e-module in place with your finger.

10. 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.

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

12. To maintain the device's IP rating, be careful to avoid damaging the O-rings. Turn the e-module retaining ring clockwise until it seats against the O-ring before, fastening it with a reciprocating motion (¼ turn back every turn) until the ring is hand-tight.

13. Verify that the device is properly sealed - there should not be any gap between the e-module retaining ring and the case.

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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.

VP Series 2000 Configuration Software

The VP series 2000 Configuration Software is used to provision, configure, monitor, and maintain VP Series 2000 devices using either a USB NFC reader or over the air using an appropriately configured gateway.

VP Series 2000 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.

Provision Devices

Before installing VP Series 2000 devices, you must prepare each device to join your network. Depending on your network infrastructure, you can provision sensors over-the-air (OTA) using a gateway or individually using a supported USB NFC reader.

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

- The correct UTC adjustment
- A new network ID
- A new network join key

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 the "*Reboot the Device*" section.

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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.

If a VP Series 2000 device is not available to be provisioned or does not immediately join the provisioned network, it may be in a deep sleep state.

ISA100 Devices

VP Series 2000 ISA100 devices must be in an unprovisioned state to use over-the-air (OTA) provisioning and join the network.

! NOTE
If over-the-air provisioning fails, you may be required to use the NFC reader and VP Series 2000 configuration software to reboot or unprovision the device.

WirelessHART Devices

VP Series 2000 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

Device Sleep State

If a VP Series 2000 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*".

ISA100 Device Sleep State

Once you install a battery into a VP Series 2000 ISA100 device, it is ready to be provisioned over-the-air or join the provisioned network. To conserve battery power, if a VP Series 2000 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*".

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

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WirelessHART Device 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 an individual VP Series 2000 device, use the VP Series 2000 configuration software and a USB NFC reader. 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.

To provision devices using the software and a USB NFC reader, you need:

- VP Series 2000 Configuration Software
- Supported USB NFC reader
- VP Series 2000 devices with batteries installed
- Network ID
- Join Key
- Radio (Device) Tag

Refer to your network vendor documentation for additional information regarding the Network ID and Join Key allocation.

To provision sensors using the VP Series 2000 configuration software and a USB NFC reader:

1. Open the VP Series 2000 Configuration Software.
2. Select the "*NFC Manager*" tab.
3. 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.
4. Select the appropriate USB NFC reader in the "*NFC Manager*" tab header.
5. Place the VP Series 2000 device upside down on the USB NFC reader pad.
6. Verify that the device has been successfully read by verifying that all fields have been updated and the NFC status is "*Ready*" in the "*NFC Manager*" tab footer.
7. Select the "*Configuration Manager > Live Configuration*" tab and click on the "*Provision*" button.
8. Enter the "*Network ID*" and "*Join Key*".
9. Click on "*Provision Sensor*".

Provision Using a Divigraph ISA100 Gateway

The Divigraph NG1120 ISA100 gateway does not currently support OTA provisioning. Use the configuration software and a USB NFC reader to provision VP Series 2000 devices using the network ID and join key assigned for a Divigraph ISA100 gateway.

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Provision Using a Yokogawa ISA100 Gateway

To provision VP Series 2000 devices on a Yokogawa gateway you first need to add the devices to the network configuration before using OTA provisioning.

Refer to the Yokogawa user documentation for more information and detailed instructions.

To add devices to a Yokogawa network configuration:

1. In the Yokogawa *"Field Wireless Management Console"*, open "*Configurator*".
2. Add VP Series 2000 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. Select the Primary Router.
    e. Select the Secondary Router.
3. Apply the updated configuration to the gateway.

After completing the above steps, the devices can be provisioned. We recommend configuring the device "*Sampling Data*" before provisioning devices. The capabilities file (CF) required to configure VP Series 2000 devices is embedded in the device descriptor (DD) file and must be extracted from the relevant archive (".zip")file before it can be applied.

To apply a CF file to the VP Series 2000 devices and configure sampling data:

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 "*Open*" dialog box is displayed.
    b. Navigate to the directory location of the relevant VP Series 2000 device compatibility file. Select the capability file matching the device you want to upgrade, as shown below:

VP Series 2000 Device	DD File Name	Capability File Name
NR1210 Repeater		
VP2010 Single Axis		
VP2030 Tri-Axis		

    c. Click "*Open*". The CF file is displayed in the "*CF File*" field.

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6. Select the CF file compatible with the devices displayed in the "*Device Tag*" field.
7. For each type of VP Series 2000 device, modify these Concentrator OID:11 Read Parameters:

OID Concentrator Value	NR1210 Repeater	VP2010 Single Axis	VP2030 Tri-Axis
Update policy	Periodic	Periodic	Periodic
Publication period	0 (zero)	150	150
Stale limit	Default	5	5
Retry mode	Normal	Normal	Normal

8. For each type of VP Series 2000 device, verify these additional Concentrator OID:11 Read Parameters:

OID Parameter	NR1210 Repeater	VP2010 Single Axis	VP2030 Tri-Axis
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_8: unavailable	AI_01 - AI_08: available

9. For each type of VP Series 2000 device, configure the Concentrator OID:12 Read Parameters:

OID Concentrator Value	NR1210 Repeater	VP2010 Single Axis	VP2030 Tri-Axis
Update policy	Default	Periodic	Periodic
Publication period	Default	10	10
Stale limit	Default	10	10
Retry mode	Default	Normal	Normal

10. Restart the devices that you changed. Select the "*Download*" button. The "*Error Check*" dialog box is displayed.
11. Click "*OK*". The "*Download Configuration*" dialog box is displayed.
12. Click the check box next to each device you need to restart. Click "*Start Download*". Restarting a device may take one to five minutes.

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13. Verify the status of device(s) you 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 VP Series 2000 device is:

	NR1210 Repeater	VP2010 Single Axis	VP2030 Tri-Axis
Configuration Status	Not Published	Published	Published

! NOTE
If the status is Session Timeout, you must resolve the timeout issue before proceeding.

14. To verify the device status:
    a. In the Yokogawa *"Field Wireless Management Console"*, open "*Configurator*".
    b. Select "*Sampling Data*". The "*Sampling Data*" pane is displayed.
    c. Click "*Edit*". The "*Sampling Settings*" dialog box is displayed.
    d. Verify that the firmware version, CF file version, and OID parameters are correct for the device.

To provision devices on a Yokogawa network:

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 VP Series 2000 devices to display in the Provisioning Network list. Wait time may be 5 to 30 minutes and depends on the 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*".

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Provision Using a Honeywell ISA 100 Gateway

To provision VP Series 2000 devices on a Honeywell gateway:

1. Open the Honeywell OneWireless "*Wireless 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 to which VP Series 2000 devices will connect.
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 the "*Reboot the Device*" section.

After the VP Series 2000 devices are provisioned, use the OneWireless "*Wireless Device Manager*" to configure each device's tag name, routing assignment, and join assignment.

! NOTE
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.

Provision using an Emerson WirelessHART Gateway

Use the configuration software and an NFC reader to provision VP Series 2000 devices using the assigned network ID and join key for an Emerson WirelessHART gateway.

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Unprovision Devices

If you want to remove a VP Series 2000 device from the network, move it to a network with a different network ID, or if you need to disable it for any reason, you can unprovision it.

WirelesHART devices do not need to be unprovisioned in the same way as ISA100 devices to join a different network. If the device is in the "*Idle*", "*Operational*" or "*Suspended*" state as indicated by the VP Series 2000 configuration software, the network ID and join key can be changed so that the device can join a different network.

Unprovisioning a VP Series 2000 WirelessHART device results in the radio being placed into an ultra-low power "*Suspended*" state.

Unprovision Using a USB NFC Reader

To unprovision a single device using the VP Series 2000 configuration software and a USB NFC reader:

1. Open the VP Series 2000 Configuration Software.
2. Select the "*NFC Manager*" tab.
3. 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.
4. Select the appropriate USB NFC reader in the "*NFC Manager*" tab header.
5. Place the VP Series 2000 device upside down on the USB NFC reader pad.
6. Verify that the device has been successfully read by verifying that all fields have been updated and the NFC status is "*Ready*" in the "*NFC Manager*" tab footer.
7. Select the "*Configuration Manager > Live Configuration*" tab and click on the "*Unprovision*" button.

Upon completing these steps for ISA 100 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.

Unprovision Using a Divigraph ISA100 Gateway

VP Series 2000 devices can be unprovisioned from a Divigraph ISA100 gateway using the device reset to factory default option.

! Note
When unprovisioning a device using this method, the device will have to be re-provisioned using the configuration software and a USB NFC reader.

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Unprovision Using a Yokogawa ISA100 Gateway

To unprovision VP Series 2000 devices using the Yokogawa *"Field Wireless Management Console"*:

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

Unprovision Using a Honeywell ISA100 Gateway

To unprovision VP Series 2000 devices using the Honeywell OneWireless "*Wireless Device Manager*":

1. Open the Honeywell OneWireless "*Wireless Device Manager*".
2. Expand the "*Selection Panel*".
3. Select one or more VP Series 2000 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.

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

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 it in an equipment room or similar environment.

To reboot a single device using the configuration software and a USB NFC reader:

1. Open the Ranger Pro configuration software
2. Connect the USB NFC reader to the computer running the configuration software.
3. Place the VP Series 2000 device upside down on the NFC reader pad.
4. Select the "*NFC Manager*" tab.
5. Verify that the senor has been successfully read by checking that all fields have been updated and the NFC status is "*Ready*" in the tab footer.
6. Expand "*Maintenance > Power Control*".
7. Click "*Reboot*" to restart the device.

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Configure Devices

Use the configuration software to configure sensor data. 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 sensors over the network.

Configuration files include:

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

You can configure VP Series 2000 devices using either:

NFC Manager (Using NFC)	Configure VP Series 2000 devices one at a time at your desk or in a safe area.
Network Manager (Over the air Configuration)	Configure one or many sensors over the network using VP Series 2000 Configuration Software.

You can use the VP Series 2000 configuration software to define sensor settings using either:

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

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Manage Gateways

To view Gateways:

1. Open the VP Series 2000 Configuration Software.
2. Select the "*Network Manager > Gateways*" tab to display gateways that have been previously added.

To add a gateway:

1. Click the "*Add*" button in the "*Network Manager > Gateway*" or right click on an empty space in the tab and select "*Add*" to display the "*Add Gateway*" dialog box.
2. Enter the "*Site Name*", "*Gateway Name*", "*Gateway Address*" and "*Gateway Port*". (Typical default values for "*Gateway Port*" are 4901 for ISA100 and 5094 for WirelessHART, refer to the network infrastructure vendor documentation for details).
3. Click "*Add Gateway*". The added gateway is displayed in the list of gateways. 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. Select the relevant gateway in the "*Network Manager > Gateway*" tab and click the "*Modify*" button or right click on the gateway and select "*Modify*" to display the "*Modify Gateway*" dialog box.
2. Modify the "*Site Name*" or "*Gateway Name*".
3. Click on "*Modify Gateway*".

To remove a gateway:

1. Select the relevant gateway in the "*Network Manager > Gateway*" tab and click the "*Remove*" button or right click on the gateway and select "*Remove*" to display the "*Remove Gateway*" dialog box.
2. Click on "*Remove Gateway*".

To reset gateways:

- Reset individual gateways by selecting the relevant gateway in the "*Network Manager > Gateway*" tab and clicking the "*Reset*" button or by right clicking on the gateway and selecting "*Reset*".
- Reset all gateways by right clicking in the "*Network Manager > Gateway*" tab and selecting "*Reset All*".

To view available devices connected to a gateway or a set of gateways:

1. Select the "*Network Manager > Gateway*" tab and select a gateway or a set of gateways from the list displayed.
2. Either double-click on a gateway or select the "*Network Manager > Sensors*" tab to display all provisioned VP Series 2000 devices and their status.

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Configure Sensors Using NFC Manager

To configure a VP Series 2000 device using the configuration software and a USB NFC reader:

1. Open the VP Series 2000 configuration software.
2. Connect the USB NFC reader to the computer running the configuration software.
3. Place the VP Series 2000 device upside down on the USB NFC reader pad.
4. Select the "*NFC Manager*" tab to read and display the device information and current configuration. The device configuration is displayed in the "*Configuration Manager*" tab.
5. Verify that the USB NFC reader status in the application footer is "*Ready*".
6. The configuration can be changed using either "*Live*" or "*Preset*" options:
    a. Select the "*Configuration Manager > Live View*" tab to modify the device configuration options as needed; or
    b. Select the "*Configuration Manager > Preset*" tab to apply a default device configuration or apply a custom configuration template. The device configuration can also be saved as a custom configuration template from the "*Configuration Manager > Preset*" tab.
7. Any changes made to the device configuration are indicated by blue text but are not applied to the device until the "*Apply*" button is clicked.
8. After clicking "*Apply*", pending changes are displayed in orange text and applied changes are displayed in black text.

! Note
• If the sensor is currently publishing data, wait two measurement intervals for changes to units to take effect. • Shorter vibration and temperature measurement periods reduce battery life.

Configure Sensors Over the Network

To configure sensors over the network:

1. Open the VP Series 2000 configuration software.
2. Select the "*Network Manager > Sensors*" tab to display current devices.
3. Select a sensor to display its configuration in the "*Configuration Manager > Live Configuration*" tab.
4. Modify configuration options as needed.
5. Any changes made to the device configuration are indicated by blue text but are not applied to the device until the "*Apply*" button is clicked.
6. After clicking "*Apply*", pending changes are displayed in orange text and applied changes are displayed in black text.

To save sensor configuration settings:

1. Open the VP Series 2000 configuration software.
2. Select the "*Network Manager > Sensors*" tab to display current devices.
3. The preset configuration is displayed in the "*Configuration Manager > Preset Configuration*" tab.
4. Modify configuration options as needed. When complete, click "*Save Preset*" to display the "*Save As*" dialog box.

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5. Enter a file name and note the directory location for future use. Click "*Save*". Do not modify the file type (*.RPCFG).

To apply preset sensor configuration settings to multiple sensors:

1. Open the VP Series 2000 configuration software.
2. Select the "*Network Manager > Sensors*" tab.
3. Select the "*Configuration Manager > Preset Configuration*" tab.
4. Click "*Load Preset*" to display the "*Open*" dialog box and navigate to the directory location where the preset file has been saved.
5. Select the preset file to be loaded and click "*Open*" to update the "*Configuration Manager > Preset Configuration*" tab with the saved preset configuration data.
6. Select the VP Series 2000 device or multiple devices to which you want to apply the preset configuration data - use the CTRL or SHIFT keys to select multiple devices.
7. Click "*Apply*" on the "*Network Manager > Sensors*" tab to apply the preset configuration to the selected device or devices. When the change is complete, the sensor status changes to green.

! Note
Devices require a "*Restart*" or "*Restart as Provisioned*" to publish data for the following: • After applying a preset configuration. • When changes to the unit / sub-unit configuration are made using a Divigraph ISA100 gateway.

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System 1 Installation and Configuration

System 1 with the Ranger Pro plugin is used to configure, collect and analyse dynamic data acquired by VP Series 2000 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.

Before adding VP Series 2000 devices to a System 1 installation, ensure that that you are using the following software versions:

- System 1 version 19.2 or later with appropriate service packs and hotfixes installed.
- System 1 Ranger Pro plugin build 301xx or later

System 1 and the System 1 Ranger Pro plugin are compatible with the following devices:

- VP Series 2000 ISA100 devices with firmware v2.1.2.2 or 3.x.x.x or later.
- VP Series 2000 WirelessHART devices with firmware version 3.x.x.x or later.

New System 1 Installations

Install System 1 and the Ranger Pro plugin before adding VP Series 2000 devices as follows:

1. Install System 1 version 19.1 or later and appropriate hotfix and/or service packs.
2. Install System 1 Ranger Pro plugin build 301XX or later.
3. Add an appropriate wireless gateway to the System 1 configuration.
4. Add provisioned devices to the System 1 configuration.
5. Configure System 1 data collection and analysis.

Existing System 1 Installations

If needed, upgrade or update System 1 and install or update the Ranger Pro plugin as follows:

1. Disable System 1 online data collection.
2. Close the System 1 enterprise.
3. Exit System.
4. If upgrading System 1, run the System 1 setup and any relevant hotfix or service pack installations.
5. Uninstall the System 1 Ranger Pro plugin (Ranger Pro - core).
6. Install the updated System 1 Ranger Pro plugin build 301XX or later.
7. Start System 1.
8. Open System 1 enterprise and enable online data collection.
9. After several minutes, a configuration out of date may be enter. Synchronise and save.
10. Add an appropriate wireless gateway to the System 1 configuration.
11. Add provisioned devices to the System 1 configuration.
12. Configure System 1 data collection and analysis.

We recommend making a backup of your System 1 configuration before upgrading or updating System 1 or the Ranger Pro plugin.

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Mount Devices

Tools Required

To mount VP Series 2000 devices, you need a VP Series 2000 C-spanner and flat wrench available as part of the installation kit available from Divigraph.

You also need:

- Spot facing tool 40 mm (1 ½ inches) diameter.
- Steel wire brush.
- Drills and thread-taps.
- Marker pen.
- Thread locking compound, for example, Loctite Blue 242.
- Non-curing silicone grease, for example, Dow Corning 4 Electrical Insulating Compound.

Identify Location and Hardware

! WARNING
HAZARDOUS ENVIRONMENT
Before mounting Ranger Pro devices in a potentially hazardous environment, verify that hazardous materials, atmospheres, and conditions have been removed or that relevant risk mitigation measures have been implemented.

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 using the wrench provided in the installation kit.
   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 the "*Consider Sensor Range*" section.

! Note
If you are mounting a tri-axial VP Series 2000 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. Also see "*About Using Adhesives*".

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3. 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 VP Series 2000 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*".
   c. Select either a standard stud, adhesive stud, or tri-axial alignment stud available from Divigraph.

Prepare the Mounting Point

To prepare the mounting point to which a VP Series 2000 device is attached:

1. Prepare the mounting surface.
   a. The mounting diameter should be a minimum of 40mm (1 ½ inches) 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 mounting pad onto the prepared surface with a suitable bonding agent. See "*About Using Adhesives*".

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

- Roughness: 32 microinch rms
- Flatness: 0.001” TIR
- Spotface Diameter: 1.5 inch
- Hole Perpendicularity: +/- 1 °
- Hole Depth: mounting stud dependent

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

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About Using Adhesives
To prevent devices separating from the machinery they monitor and to obtain accurate high frequency response, it is 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 are 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 0.5g to 1g 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 to eliminate voids and form a slight band around the pad.

Attach the Device

Attach VP Series 2000 devices as follows:

1. Apply a suitable (medium strength) thread locking compound to the mounting stud. This is necessary due to vibration.
2. Apply a lower-strength thread locking compound to secure the VP Series 2000 device to the mounting stud or pad.
3. Attach and tighten the device to the mounting point.
   a. If using the M6x1 to M8x1.25 tri-axial alignment stud, tighten the device using a torque wrench to 6 Nm (53 in lb) maximum.
   b. For all other mounts, tighten the device to 6-7 Nm (53 to 62 in lb).
4. (Optional) Secure the device by passing a 1mm (.04 inch) lanyard (not provided by Divigraph) through the fall protection hole in the base. Secure the lanyard to a suitable retaining point.

Sensor alignment considerations:

- Align the axis of sensors as needed to the axis of the acceleration being monitored.
- The Z-axis of a VP Series 2000 sensor is the preferred measurement axis. It has the highest frequency response and capable of PeakDemod measurements.
- Where possible, mount sensors 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.

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Verification

Verify Network Connectivity

VP Series 2000 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)

To collect data from gateways using GCI or HART-IP, 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 or HART-IP.

! Note
Refer to the VP Series 2000 firmware and Ranger Pro plugin release notes to ensure compatibility between devices and System 1.

Verify Network Joining

To verify that your devices have joined your network, use your network vendor's software. It can take several hours for many VP Series 2000 devices to join your network.

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

Verify/ Reboot the Device

- Reboot the device. This increases the frequency that the device attempts to join the network. (See the "*Reboot the Device*" section).
- Verify the device is provisioned. VP Series 2000 devices must be in a provisioned state to join the network.
- Verify the device's network connection. Dismount the device 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.

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Add a Routing Device

- In areas that have weak RF coverage (for example, where RSSI < -78dB), configure a VP Series 2000 device to enable routing or, preferably, add a VP Series 2000 routing device.
- Use your network vendor's software to verify, and if necessary, enable the router function of each VP Series 2000 device.
- Verify that each device has a good network connection.
- Remember to stay within the recommended number of hops per device. (See the "*Plan Device Placement*" section).

! Note
VP Series 2000 ISA100 devices must be set as IO/Router device types and you may also need to enable the join property when routing is enabled. Using a VP Series 2000 ISA100 sensor as a router decreases its battery life. ISA100 network device managers may limit the number or 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. VP Series 2000 devices are designed for optimal RF propagation when the device's axial alignment is in the vertical plane. If unable to mount the device vertically, the preferred orientation is with the X-axis in the horizontal plane.

Change Backbone Router or 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 ISA 100 networks the packet error rate (PER) should be less than 50%, and preferably less than 20%.

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Validate Device Data

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

! Note
Initial publication of measurements may take some time after devices have joined the network. After the initial period, during which the network is forming, measurements will be published at the configured rate.

- Divigraph ISA100 Gateway device manager - in the user interface, verify that the publication status indicator (icon) is coloured and the measurements are displayed in the "*Readings*" section.
- Honeywell OneWireless gateway device manager - verify the measurements are displayed in the Honeywell user interface and verify that the "*Input Publication*" parameters are active.
- Yokagawa YFGW410 device manager - verify that the operation status is "*Published*" (for sensors) or "*Not Published*" (for NR1210 repeater devices).
- Emerson Wireless Gateway device manager - verify that the dynamic variables (primary, secondary, tertiary and quartenary device variables) are being published.

! Note
If a VP Series 2000 ISA100 repeater shows "*Session Timeout*" or a VP Series 2000 ISA100 sensor is not publishing data in a Yokogawa system: • Ensure that the correct CF has been applied. • Ensure that the "*Publication Period*" and "*Stale Limit*" parameter values are correct. A VP Series 2000 repeater will function correctly and repeat the data from other devices even with the operational status indicating "*Session Timeout*".

Data Output

Static overall measurements can be transmitted using Modbus, GCI, or HART-IP. Honeywell gateways support OPC with additional licensing. Alternatively, you can use 3rd party software to publish Modbus data using an OPC server.

To create or import a wireless configuration and enable data collection into System 1 18.2 or later, use the Ranger Pro plugin interface to the device manager.

! Note
To avoid deleting VP Series 2000 historic data, do not change measurement units or sub-units after you begin collecting data in System 1.

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

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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, Modbus or OPC. PV data sent by GCI conforms to the ISA100, foundation fieldbus standard. Data sent by HART-IP conforms to the HART standard.

For ISA100 devices PV data is timestamped by the gateway and not at the time of acquisition.

WirelessHART device PV data is timestamped by the device at the time of acquisition.

A user can select the units, sub-units, time interval, Fmin and Fmax settings..

Measurement Type	Default Mode	Measurement Units	Default Sub-units (RMS or Peak)	Default Fmin (high pass filter frequency)	Default Fmax (low pass filter frequency)
Temperature	Enabled	°F, °C	N/A	N/A	N/A
Acceleration Overall	Enabled	g, m/s^2 (default: g)	RMS	X: 5 Y: 5 Z: 5	X: 5000 Y: 5000 Z: 10000
Velocity Overall	Enabled	mm/s, inches/s	RMS	X: 5 Y: 5 Z: 5	X: 5000 Y: 5000 Z: 10000
PeakDemod Overall	Enabled	N/A	Peak	N/A	N/A

Dynamic Data

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

Measurement Type	Default Mode	Measurement Units	Default Fmin (high pass filter frequency)	Default Fmax (low pass filter frequency)	Other
Acceleration Waveforms	Enabled	g, m/s^2 (default: g)	N/A	N/A	Measurement samples used: 4096
Velocity Spectrum (rms only sub-units)	Enabled	mm/s, inches/s	X: 5 Y: 5 Z: 5	X: 1000 Y: 1000 Z: 1000	Lines Default FFT Points: 1600
PeakDemod Spectrum (Peak only sub-units)	Enabled (Z axis only)	g, m/s^2 (default: g)	X: 5 Y: 5 Z: 5	1000	Lines Default FFT Points: 1600

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Advanced Features

Additional advanced features are also available that can be enable or disabled at user discretion. These features apply both ISA100 and WirelessHART VP Series 2000 sensors and can be set using the configuration software either during configuration or over the air as required.

Data on Demand

Acquire data within 8 to 10 minutes upon request using the configuration software. Data on demand requests cancel the most recently acquired scheduled measurements if they are still being transferred to the gateway. Subsequent scheduled measurements are delayed by 90 minutes after a data on demand request.

Data on Vibration

Data on vibration is a threshold based scheduled data collection. The user sets a vibration threshold which must be exceeded to enable overall or dynamic measurement acquisition. This is useful for low vibration or machines that are not running.

- If vibration is below the threshold, overall values are published as zero and dynamic measurement transfers are skipped.
- If vibration is above the threshold, data is published and transferred as configured.

Data on Severity

Data is acquired depending on the severity of the vibration level as compared to user defined limits. The severity levels have been defined as follows:

- Green
    - Vibration is below defined limits.
    - Data is collected at the configured interval.
- Yellow
    - Vibration is between the lower and upper defined limits.
    - Acquire a dataset immediately.
    - Revert to collecting data at the configured interval.
- Red
    - Vibration is above the upper defined limit.
    - Acquire a dataset 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).

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Modbus Settings

The VP Series 2000 sensors publish vibration and temperature (process variable data) values as 32-bit, floating point data. You can output VP Series 2000 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.

! Note
Refer to DD file release notes for details on configuring single, tri-axial and repeater AIO objects for ISA100 devices.

Phase 1 VP Series 2000 Devices

Devices use 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

Phase 2 VP Series 2000 Devices

Devices use firmware version 02.01.02.02 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

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Phase 3 VP Series 2000 WirelessHART Devices

The device variable IDs listed below are used when mapping WirelessHART VP Series 2000 device variables to Modbus registers.

Devices use firmware version 3.1.2.1 or later.
Byte Order: Refer to WirelessHART network hardware vendor documentation.
Data type: float (4-bytes)

- Burst Message 0
    - [0] – TEMPERATURE - 0 - Primary Variable (PV)
    - [1] - Z OVL ACC - 1 - Secondary Variable (SV)
    - [2] - Z OVL VEL - 2 - Tertiary Variable (TV)
    - [3] - Z PK DEMOD - 3 - Quartenary Variable (QV)
    - [4] - Y OVL ACC - 4
    - [5] - Y OVL VEL - 5
    - [6] - X OVL ACC - 6
    - [7] - X OVL VEL - 7
- Burst Message 1
    - [0] - BATTERY LIFE (DAYS LEFT) - 243
    - [1] - NOT USED - 250
    - [2] - NOT USED - 250
    - [3] - NOT USED - 250
    - [4] - NOT USED - 250
    - [5] - NOT USED - 250
    - [6] - NOT USED - 250
    - [7] - NOT USED – 250

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Maintenance

VP Series 2000 devices need minimal maintenance. If a device fails, it may be due to a weak battery, environmental damage, or even a blocked wireless connection.

! WARNING
HAZARDOUS ENVIRONMENT
Before maintaining VP Series 2000 devices in a potentially hazardous environment, verify that hazardous materials, atmospheres, and conditions have been removed or appropriate safety risk mitigation measures have been taken.

Monitor Battery Levels

To monitor your VP Series 2000 device battery status, use your network infrastructure software or the configuration software and a USB NFC reader. Depending on the device operating mode and configuration, the battery may last up to five years.

Check the device battery status monthly. If battery status is medium, be sure you have replacement batteries in stock or on order. However, for optimal device life, we recommend that you do not 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.

Battery Status Monitoring

Battery status is updated periodically 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 to 100%: High
- 25-75%: Medium
- 25%: Low

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To view battery status:

- Using a Divigraph ISA100 gateway:
  1. Select the "*Devices*" menu item.
  2. Select a VP Series 2000 device in the device tree.
  3. Select "*Device Information*".
  4. The "*Power Status*" field indicates the device battery status.

- Using a Yokogawa ISA100 gateway:
  1. Click the "*Field Device List*" button. The power supply status is displayed in the right column.

- Using a Honeywell ISA100 gateway:
  1. Select a device in the "*Selection Panel*".
  2. In the "*Property Panel*", expand "*Device Management*". The power supply status is displayed at the top.

- Using an Emerson WirelessHART gateway:
  1. Select the relevant sensor.
  2. View all published data.
  3. Device variable ID 243 indicates the battery status in terms of days left.

- Using System 1:
  1. Select "*Display > Devices*".
  2. In the "*Device hierarchy*", select a VP Series 2000 device. Expand the device and select "*Health*".
  3. In the "*List*" pane, the "*Health Point Power Supply Status Measurement*" value is displayed.

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

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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.

! CAUTION
EQUIPMENT DAMAGE Do not use a device with a damaged e-module, O-rings, sensor module, or battery. Using a damaged device may further damage the device, cause it to fail, or in hazardous locations cause other unintended consequences.

Clean the Exterior

When cleaning a VP Series 2000 device in an equipment room or a similar environment:

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

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 VP Series 2000 configuration software.
2. Open the VP Series 2000 configuration software.
3. Place the VP Series 2000 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

Good	The E-Module processor is working as expected.
Boot Loader Running	The device can boot but is unable to start the application firmware. Use the VP Series 2000 configuration software firmware manager to upgrade the firmware.

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Storage Status

Good	The E-Module internal storage is working as expected.
Warning	A problem has occurred with the device internal storage. Contact Divigraph 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.

Sensor Status

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.
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 Divigraph 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.

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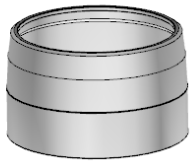
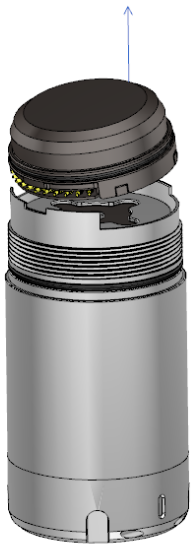
Open the Device

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.



! Note
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 ½ to one turn, and then clockwise about ¼ turn, and repeat until the sensor body O-ring is exposed.

Refer to the "*Install Battery*" section for more information regarding how to open VP Series 2000 devices.

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.

! CAUTION
CORROSIVE CHEMICAL HAZARD
If a battery has leaked, do not touch the corrosive electrolyte.

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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.

Inspect the Device Casing

To ensure that the stainless-steel device casing (bottom of the device) remains in good operating condition:

- 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.
- Verify that the reverse polarity protection pad in the center of the negative terminal spring is centered and positioned on the inside and at the bottom of the device casing.

Clean the interior of the device using a clean, dry, anti-static cloth.

Replace the Battery

If needed, replace the battery. See the "*Install Battery*" section. To dispose of used or partially expended batteries, follow your site's or locality's hazardous materials handling procedures.

Inspect the O-rings

VP Series 2000 devices use two O-rings to seal the unit against dust and moisture. Replace the O-rings if they are damaged or if you are replacing the battery.

To maintain the device's IP67 dust and water-resistant rating:

- Ensure that the O-rings are free from dust and debris.
- Remove dust and dirt using a clean, dry cloth.
- Coat new O-rings very lightly with silicone grease.

! Note
VP Series 2000 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. • E-module - 34x1mm • Device case - 35x1mm

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Close the Device

Refer to the “*Install Battery*” section for more information regarding how to close VP Series 2000 devices.

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.

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Update Device Firmware

You may on rare occasions need to update the device firmware available upon request from Divigraph technical support.

! Note
As you update the firmware, monitoring may be interrupted. When the firmware update is complete, the VP Series 2000 device restarts. All nodes connected to the device are temporarily disconnected. Plan your update to minimize disruption of your condition monitoring activities.

Depending on your network infrastructure, you can update device firmware using a USB NFC reader and the VP Series 2000 configuration software, over the air using the VP Series 2000 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.

For USB NFC reader upgrades:

- 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:

- VP series 2000 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 VP Series 2000 devices with routing enabled, you can only update one child device at a time.

After updating the device firmware, you may have to update the VP Series 2000 device descriptor (DD) file or capabilities file (CF) depending on your network infrastructure.

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Manage Firmware Using the VP Series 2000 Configuration Software

Before device firmware can be updated using the VP Series 2000 configuration software, the firmware files need to be added to the "*Firmware Manager*". Add the firmware as follows:

1. Open the VP series 2000 configuration software.
2. Select the "*Firmware Manager*" tab.
3. Click "*Add File*" to show the file open dialog and navigate to the device firmware file location.
4. Select the device firmware file to be applied and click on "*Open*".
5. 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.
6. Device firmware can be removed from the "*Firmware Manager*" by selecting the firmware in the "*Available Firmware Upgrade Files*" list and clicking on "*Remove File*".

Once the firmware update is complete, the VP Series 2000 device automatically reboots. The version number displayed in "*Sensor Information > E-Module > Firmware Version*" is refreshed and updated.

Update from Phase 2 Firmware

Follow the procedures described and take note of the cautions outlined below to update a VP Series 2000 device used in a System 1 configuration. Update from Phase 2 firmware applies to the following:

- VP Series 2000 ISA100 devices with firmware v2.1.2.2 upgrading to v3.X.X.X or later.
- System 1 versions 19.2 and 20.1.
- Ranger Pro plugin (Ranger Pro core) build 20226 upgrading to build 301XX or later.

! Note

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.
- Do not upgrade VP Series 2000 devices (firmware v2.1.2.2 or earlier) configured for use with System 1 prior to upgrading the System 1 Ranger Pro plugin.
- Incorrect device firmware updates may lead to undesired system behaviour such as decommissioned and duplicated devices, connection errors, data loss or corruption of the System 1 database.

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System Compatibility

VP Series 2000 devices with firmware v2.1.2.2 and 3.x.x.x can co-exist in one System 1 enterprise provided the following pre-requisites are met:

- System 1 version 19.2 or 20.1 with appropriate service packs are installed.
- System 1 Ranger Pro plugin build 301xx or later is installed.

! CAUTION
DO NOT upgraded previously configured VP Series 2000 devices to firmware v3.x.x.x or later before updating the Ranger Pro plugin from build 20226 or earlier to 3101XX or later. Failure to adhere to this requirement will result in decommissioned devices.

Update Device Firmware Using the VP Series 2000 Configuration Software

Either the USB NFC reader or over the air method can be used to update the device firmware using the VP Series 2000 configuration software. The over the air method is used for updating WirelessHART devices connected to an Emerson gateway.

Remove the VP Series 2000 devices to be updated from the field to update firmware using the VP Series 2000 configuration software and a USB NFC reader.

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

1. Open the VP Series 2000 configuration software
2. Connect the USB NFC reader to the computer running the VP Series 2000 configuration software.
3. Place the VP Series 2000 device upside down on the USB NFC reader pad.
4. Select the "*NFC Manager*" tab.
5. Select the "*Firmware Manager*" tab.
6. Select a valid firmware file for the upgrade - the "*Compatibility*" column will indicate whether it can be used with the selected device.
7. If the firmware is compatible and the device is ready, you will be able to click on "*Upgrade*" to update the firmware.
8. The update progress will be displayed in the "*Software > Firmware Version*" section of the "*NFC Manager*" tab.

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Update Device Firmware Over the Air Using the Gateway Interface

Refer to your network vendor's infrastructure documentation before you update VP Series 2000 devices over the air using the gateway interface.

Update Device Firmware Using a Divigraph ISA100 Gateway

To update the device firmware using the Divigraph ISA100 gateway web interface:

1. Verify that all VP Series 2000 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 device application firmware file.
    b. Select the "*Firmware Type*" to be uploaded as "*Device Application*".
    c. Enter the firmware "*Version*" number and provide a short "*Description*".
    d. Click on "*OK*" to upload the firmware.
4. Select the "*Devices to Upgrade*" tab and select "*Device Application*" 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 Using a Yokogawa ISA100 Gateway

To update firmware using the Yokogawa *"Field Wireless Management Console"*:

1. Verify that all VP Series 2000 devices are provisioned, connected to the network, and joined to the gateway.
2. In the Yokogawa *"Field Wireless Management Console"*, open "*Monitor*".
3. Choose "*Tools > Firmware Download Manager*". The "*Firmware Download Manager*" dialog box is displayed.
4. Select the "*Sensor Firmware*" tab to show a list including VP Series 2000 devices.
5. Select the check box of the devices you want to update.
6. Select "*Download Firmware*". The "*Update Sensor Firmware*" dialog box is displayed.
7. Do not modify TSAP and Object ID default values. Click the "*Firmware*" file browse button. The "*Open*" dialog box is displayed.
8. Navigate to the location of the firmware file. Select it and click "*Open*". The "*Update Sensor Firmware*" dialog box is displayed.
9. Click "*Start Download*". When the download is complete, the "*Firmware Download Manager*" dialog box is displayed, and the node is highlighted yellow.
10. In the "*Sensor Firmware*" tab, select the devices highlighted in yellow and click "*Apply*". The firmware update is applied, and the sensors are restarted.

After you update the device firmware, you must apply the correct capability file (CF) to each VP Series 2000 device. Request the DD files containing the capability files from Divigraph. Refer to the "*Provision using a Yokogawa Gateway*" section for more information to apply a CF.

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Update Device Firmware Using a Honeywell ISA100 Gateway

Before you update the VP Series 2000 device firmware using a Honeywell ISA100 gateway, request the device descriptor (DD) files required for each type of device from Divigraph.

To add device descriptor (DD) files using the Honeywell OneWireless "*Wireless Device Manager*" (WDM):

1. Copy the DD zip file to the computer connected to the Honeywell OneWireless "*Wireless Device Manager*". Do not unzip the archives.
2. Open the WDM.
3. Select "*Maintenance > Templates*". The "*Load ISA100.11a DD / Modbus config file*" dialog box is displayed.
4. Click "*Load ISA100.11a DD / Modbus file*". The "*Open*" dialog box is displayed.
5. Navigate to the directory location of the DD file. Select it and click "*Open*". The DD is listed in the dialog box.
6. Click "*Close*".

To update firmware using the Honeywell OneWireless "*Wireless Device Manager*" (WDM):

1. Verify that all VP Series 2000 devices are provisioned, connected to the network, and joined to the gateway.
2. Open the WDM.
3. In the "*Selection Panel*", select the device you want to update.
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 "*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 VP Series 2000 device to be updated and click "*Upgrade*". The firmware update is automatically applied.
8. Refresh the list of VP Series 2000 devices.
    a. Delete the updated device(s) from using the WDM.
    b. Allow the device to rejoin.
9. Once loaded, the correct device descriptor (DD) file is applied to each device by the WDM.

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Update Device Firmware Using an Emerson WirelessHART Gateway

Updating of firmware over the air using an Emerson WirelessHART gateway is possible using the VP Series 2000 configuration software.

To update the e-module firmware over the air using an Emerson gateway:

1. Open the VP Series 2000 configuration software
2. Select the gateway through which to perform the firmware upgrade on the "*Network Manager > Gateways*" tab.
3. Select the sensor(s) to update from the "*Network Manager > Sensors*" tab.
4. Select the "*Firmware Manager*" tab.
5. 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.
6. If the firmware is compatible with the device(s), you will be able to click on "*Upgrade*" to update the firmware.
7. The update progress will be indicated in the "*Firmware Version*" column in the "*Network Manager > Sensors*" tab for the corresponding sensors.
8. If the update completes successfully, this will be indicated in green, the status can be cleared by right-clicking on the "*Firmware Version*" and selecting "*Clear Firmware Upgrade Status*".
9. 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 cancelled at any time be 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*".

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Update Radio Firmware

Radio firmware is rarely modified and if needed the radio firmware files can be requested from Divigraph technical support to update the radio firmware.

Updating of WirelessHART radio firmware is not supported.

VP Series 2000 ISA100 device radio firmware can be updated over-the-air by supported wireless network infrastructure gateways.

Update Radio Firmware Using a Divigraph ISA100 Gateway

To update the radio firmware using the Divigraph ISA100 gateway web interface:

1. Verify that all VP Series 2000 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*".
    d. Click on "*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 Radio Firmware Using a Yokogawa ISA100 Gateway

With one exception, the process to upgrade VP Series 2000 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. Refer to the "*Update Device Firmware Using a Yokogawa ISA100 Gateway*" section for details.

Update Radio Firmware Using a Honeywell ISA100 Gateway

With one exception, the process to upgrade VP Series 2000 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. Refer to the "*Update Device Firmware Using a Honeywell ISA100 Gateway*" section for details.

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Troubleshooting VP Series 2000 Devices

If a VP Series 2000 device fails, it may be due to a weak battery, environmental damage, or even a blocked wireless connection.

Refer to the "*Diagnose Device Status*" section to identify the status of a VP Series 2000 device.

Harden the System

The security risk to your network when using VP Series 2000 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 VP Series 2000 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 VP Series 2000 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.

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