Masoneilan®
VECTOR* V1100 Wireless Adapter
Instruction Manual

Product description
- Wireless HART protocol
- Provides 24/7 monitoring
- One Port wireless adapter
- Local/Direct power option
About this Guide

In no case does this manual guarantee the merchantability of the hardware or the software or its adaptability to a specific client needs.

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Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the instrument.

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This section provides safety information and defines the documentation symbols.

**Documentation Symbols**

VECTOR instructions contain **WARNINGS, CAUTIONS** labels and **Notes**, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your instrument. Total compliance with all **WARNING**, and **CAUTION** notices is required for safe operation.

**WARNING**

*Indicates a potentially hazardous situation, which if not avoided could result in serious injury.*

**CAUTION**

*Indicates a potentially hazardous situation, which if not avoided could result in property or data damage.*

**NOTE**

*Indicates important facts and conditions.*
VECTOR V1100 Product Safety

General installation, maintenance or replacement

☐ Installed, put into service and maintained by qualified and competent professionals who have undergone suitable training for instrumentation used in such areas.

☐ Products must be installed in compliance with all local and national codes and standards by qualified personnel using safe site work practices. Personal Protective Equipment (PPE) must be used per safe site work practices.

☐ Ensure proper use of fall protection when working at heights, per safe site work practices. Use appropriate safety equipment and practices to prevent the dropping of tools or equipment during installation.

☐ This product is not intended as a lifting or climbing point and shall not be used to support the weight of personnel. During installation additional consideration may be necessary to ensure the device is not relied on for lifting, climbing, or supporting weight of personnel.

WARNING
Do not use damaged instruments.

Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

WARNING
See Masoneilan document ES-769 for special instructions for installation in areas where there is potential for explosive gas atmosphere or inflammable dust.
Overview

The VECTOR V1100 enables new and existing wired HART field devices to communicate with host applications by means of wireless HART technology. The VECTOR V1100 is permanently installed by attaching it directly into an available spare port of a HART field device using a short, right angle elbow conduit connector. The VECTOR V1100 can be inserted anywhere on the loop using a junction box or T-fitting. A wired HART field device retrofitted with an VECTOR V1100 communicates its PV over the existing wire and simultaneously communicates the PV, SV, TV and QV as well as diagnostic and alarm data over the wireless HART network to process control, asset management and other automation and engineering applications. The VECTOR V1100 power configuration options are either existing loop power (scavenging) or local/direct power. The VECTOR V1100, when loop powered, saves on long term cost of battery maintenance, replacement and disposal programs. The VECTOR V1100 Local/Direct power option can be used when the field device is powered either by a DC power supply or an external battery/solar system. In the case of external battery power, the VECTOR V1100 provides battery power management by cycling the field device power and taking periodic readings.

Typical use cases:

- Upgrade legacy wired HART or analog only field devices with wireless HART communication capability to communicate the PV and other device data and diagnostic information to the gateway and ultimately the host application.
- Access HART device diagnostic information in HART-enabled devices in order to lower maintenance cost and improve plant operations.
- Low cost wireless access to stranded monitoring and control data from improved
  - Asset management
  - Condition monitoring
  - Device diagnostics
- Connect up to eight HART devices using only one VECTOR V1100, making wireless HART more cost effective.
- Remote I/O applications of hard to reach locations.
Low cost / low risk means to test and evaluate wireless HART networks.
Substitute for multiplexers or legacy DCS upgrade to HART enabled I/O.
External Battery powered wireless remote I/O data collection.

Features:

- HART Registered - fully HART compliant for communication reliability.
- Universal connectivity - works with all registered HART devices
- Supports wireless HART MESH and STAR network configurations.
- Loop powered - no batteries or other power sources required.
- Connects directly to HART field device and optionally anywhere on the 4-20 mA control loop.
- StepVolt technology sets insertion voltage in steps from 1 to 2.5 V to manage the tradeoff between available loop power and wireless communication bandwidth.
- Direct Power option when local DC power is available: system power, external battery/solar system.
- In Direct Power mode, can switch field device on/off to take periodic readings to save power.
- Internal 250 Ohm loop current sense resistor provided, configurable by wireless HART command.
- Multidrop support for up to eight devices (maximum number depends on installation).
- 235 meters open air range (nominal).
- Rugged internal antenna design.

Basic Operation

The VECTOR V1100 wireless HART Adapter allows new and existing wired-HART devices to be integrated into a wireless HART network. This allows remote access to diagnostic data, digital process variables, and alarm data stored inside HART devices.

The VECTOR V1100 has both a wireless interface to communicate with the wireless HART network and a wired-HART interface to communicate to a traditional 4-20mA current loop device. The VECTOR V1100 communicates as a wired-HART master to connected HART devices on the loop, and can transmit and receive HART data from these connected HART devices to the wireless HART network. The VECTOR V1100 also supports configuration as a wired-HART slave device, so traditional HART configuration tools (such as HART Field Communicators and PCs with HART modems) can be used to configure the VECTOR V1100.
In wireless HART terminology, any wired-HART devices that can be communicated with a wireless HART adapter are known as a sub-device. A single VECTOR V1100 adapter can support up to eight (8) wired-HART sub-devices. The wireless HART gateway maintains a list of all of the devices in the wireless HART network, including sub-devices connected to wireless HART adapters. Host applications that communicate with the wireless HART gateway communicates in-directly with the wired-HART sub-device through the wireless HART adapter. The wireless HART gateway and wireless HART adapter transparently handle the message conversion between the Host application and wired-HART sub-device.

Wireless HART supports publishing of data from devices to the wireless HART gateway on a periodic basis. This is called burst mode in HART terms, but is much more advanced than the burst mode traditionally supported by HART devices. Data can be burst based on an user-defined update time or by a user-specified triggered event; such as a process variable alarm.

When the VECTOR V1100 is configured in burst mode, it supports all of these advanced modes on behalf of any connected wired-HART sub-devices. Burst mode is also very useful to publish device status data (such as malfunctions or alarms) to the gateway on a periodic basis or immediately when a critical event occurs.

Typical Usage

In most typical network configurations, the VECTOR V1100 is used in conjunction with a wired-HART sub-device and is configured to publish process data and device status data from the connected sub-device to the wireless HART network on a user-defined periodic basis (such as every eight seconds or every minute, etc).

The VECTOR V1100 adds several features to make this typical usage mode very easy to configure, such as the Automatic Sub-Device detection and Automatic Burst mode configuration.

Power

The VECTOR V1100 adapter has been designed to be extremely power efficient and flexible to allow for a wide variety of installation options. The VECTOR V1100 can be installed to be powered by one of two sources either a:

- Current loop denoted as LOOP POWER
- DC source denoted as DIRECT POWER
Loop Powered Mode

The VECTOR V1100 can be wired in series with devices on a 4-20mA loop and be powered from the loop. The VECTOR V1100 utilizes StepVolt technology, to allow you to set this insertion voltage drop between 1.0 - 2.5 V, in 0.5 V increments.

StepVolt allows you to select the best insertion voltage drop for the application. The higher the voltage drop setting used, the more wireless HART messages the VECTOR V1100 is able to transmit and receive.

In applications where there is very little voltage overhead in the loop, such as transmitters on very long cable runs or with IS barriers, StepVolt allows the selection of a low insertion voltage drop. However, in typical applications there is adequate voltage overhead on the loop to allow for a higher insertion voltage drop from the VECTOR V1100.

A concern with a loop powered wireless HART adapter is being able to operate under low current conditions, since very little power is available for use by the adapter. The VECTOR V1100 is designed to operate at the worst case operating conditions at all power settings and responds to Wired or wireless HART commands.

The VECTOR V1100 operates as specified with reliable communications even under the following conditions:

- Loop current of 3.2 mA and 1.0 V insertion voltage drop
- Temperature Extremes (-40 to +85° C)
- Every wireless HART timeslot filled and transmitting.

**NOTE**

On power-up, the voltage drop is set to 1.0 V until the VECTOR V1100 has finished initialization. After initialization, the insertion voltage drop changes to the user specified value in the HART Device Description (DD).

The VECTOR V1100 cannot control the loop current, if connected in loop-powered mode there must be something controlling the loop current, such as a 4-20 mA transmitter.

**WARNING**

If the VECTOR V1100 has an internal failure and stops regulating to the specified StepVolt value, the maximum insertion voltage drop can rise to 4.935 VDC.
StepVolt Benefits

Using a high StepVolt setting enables the VECTOR V1100 to support a much higher rate of wireless HART packets transmission. Even if the particular device attached to the VECTOR V1100 is configured for a very low update rate, being able to support a high rate of wireless HART packets helps the overall wireless HART network operation.

Wireless HART is a mesh network - Each node in the network routes messages on behalf of other nodes in the network. This is done to expand the overall range of the network and also for network data reliability by forming multiple redundant paths. Setting the VECTOR V1100 to a high StepVolt enables more wireless HART packets to be routed through the VECTOR V1100 for other network nodes.

Another consideration from a wireless HART network standpoint is that many devices in a wireless HART network are battery powered and all wireless transmissions performed by these devices impact battery life. The more wireless HART devices that a battery powered node has to route messages for, the shorter its overall battery life.

The VECTOR V1100 is different - Since it is loop powered it can support wireless messages indefinitely without any concerns of battery life. By placing VECTOR V1100s at key locations in a wireless HART network, such as places that route messages for other wireless HART nodes, this routing function can be off loaded from battery powered nodes to the VECTOR V1100 and help to preserve the battery life of battery powered nodes.

<table>
<thead>
<tr>
<th>StepVolt Setting</th>
<th>Wireless HART Packets per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 V</td>
<td>4.25</td>
</tr>
<tr>
<td>1.5 V</td>
<td>12.65</td>
</tr>
<tr>
<td>2.0 V</td>
<td>19.66</td>
</tr>
<tr>
<td>2.5 V</td>
<td>26.66</td>
</tr>
</tbody>
</table>

NOTE

The value shown in Wireless HART Packets per second column is the value reported back in HART Command 777.

Plan on using the highest StepVolt setting possible to help the overall wireless HART network performance.
Direct Powered Mode

The VECTOR V1100 can be powered by an external DC power source such as; battery, solar panel or the DC power supply used to power the field device. The DIRECT POWER voltage range is 7 VDC to 32 VDC.

The DIRECT POWER connections are:

1. DIRECT POWER, black lead wire, to the positive potential (+) and
2. RETURN, white lead wire, to the negative terminal (-) of the external DC source.
Configuration

Perform the configuration issues in this section prior to VECTOR V1100 field installation.

Perform initial configuration using a HART Device Descriptor (DD) or Device Type Manager (DTM) for the VECTOR V1100 over the wired-HART connection. Once connected to the wireless HART network, make configuration changes using the DD/DTM over either the wired-HART interface or the wireless HART interface.

Configuration consists of:

"1. Bench Top Configuration”.

"2. Quick Setup” on page 17

"3. Detailed Settings” on page 20, if required.
1. Bench Top Configuration

Tools Required:

- 7-32 VDC to power supply
- HART modem/configurator (handheld or PC application)
- Wireless HART network settings - Network ID an Join Key

1. Adjust the power supply to a voltage between 7-32 VDC and turn off the power supply. Connect the VECTOR V1100, power supply and HART modem / communicator as per Figure 1.

![Figure 1 Bench Top Configuration Setup](image)

2. Power the VECTOR V1100 by connecting the bench power supply positive terminal (+) to the Direct Power black lead input wire and the power supply negative terminal (-) to the Return white lead wire.

3. Connect HART communicator or HART modem to the VECTOR V1100 by connecting one lead of the HART modem to the VECTOR V1100 Return wire and the other lead of the HART modem to the VECTOR V1100 HART wire. The VECTOR V1100's HART signal connections are polarity independent.

4. Ensure the Loop Power lead wire (RED) is not connected to any terminal of the power supply and or an earth grounding connection. Electrically isolate this lead wire from all potentials. Tie EGND, the green-yellow stripped lead wire, the earth grounding conductor, to the earth power supply grounding connection or leave unconnected for this test. Do not connect EGND to any other voltage potential.

5. Verify the test setup is configured per Figure 1 and then turn on the power supply.

6. Verify that the HART modem and PC or HART communicator is operating as expected and proceed to “2. Quick Setup” on page 17.
NOTE

By default, the VECTOR V1100 is at HART polling address 15.

By default, all wireless HART adapters are configured as a primary HART master. Configure the HART communicator used to configure the VECTOR V1100 in Secondary HART master mode.

CAUTION

The VECTOR V1100 can be damaged if the direct power source is greater than 32 VDC.

Table 2  Bench Top Configuration Wiring Connections

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green/Yellow</td>
<td>Internal Earth Ground</td>
</tr>
<tr>
<td>Black</td>
<td>Direct Power</td>
</tr>
<tr>
<td>Red</td>
<td>Loop Power</td>
</tr>
<tr>
<td>White</td>
<td>Return</td>
</tr>
<tr>
<td>Yellow</td>
<td>HART</td>
</tr>
<tr>
<td>Ground Screw</td>
<td>External Earth Ground</td>
</tr>
</tbody>
</table>

2. Quick Setup

Connect into the device using the DD.

A. Set the HART Tags for the VECTOR V1100:

1. From the main DD screen, select Configure... (In Simatic PDM, select Configure... from the Device menu at the top of the screen).

2. Select Manual Setup... V1100 Information...

3. Enter in the HART Tag.

4. Enter in the HART Long Tag.

5. Transfer the updated information to the VECTOR V1100 by clicking on the Send or Transfer button.
B. Set the Power Configuration for the VECTOR V1100:

1. From the main DD screen, select Configure... (In Simatic PDM, select Configure... from the Device menu at the top of the screen).
2. Select Guided Setup...
3. Select Configure Power Mode...
4. Follow the on screen instructions and select the proper power configuration for the application.

C. Configure Burst settings:

1. From the main DD screen, select Configure... (In Simatic PDM, select Configure... from the Device menu at the top of the screen).
2. Select Manual Setup... Burst Settings...
3. Set the Automatic Burst Mode to the desired update rate (recommended) or set this to disabled. If not using the Automatic Burst Mode, manually set the burst mode configuration for each Burst Message.

\[
\text{NOTE} \quad \text{Sub-devices must be detected before configuring the manual Burst Mode configuration.}
\]

4. Transfer the updated information to the VECTOR V1100 by clicking on the Send or Transfer button.

D. Configure Wireless HART network settings:

1. From the main DD screen, select Configure... (In Simatic PDM, select Configure... from the Device menu at the top of the screen).
2. Select Guided Setup...
3. Select Join Device to Network...
4. Follow the on screen instructions and enter in the wireless HART network ID and join key.
5. After accepting the settings, the VECTOR V1100 attempts to join the network if the wireless HART gateway is in range.
E. Monitoring wireless HART network join status:

1. From the main DD screen, select Service Tools... (In Simatic PDM, select Service Tools... from the Device menu at the top of the screen).

2. Select Communications... Wireless Status...

3. Monitor the progress of the wireless HART join. If Join Failed under Join Status becomes set, check the Network ID and Join Key that were used to see that they are correct.

At this point, the VECTOR V1100 is ready to be installed and commissioned in the field. For installation information and wiring drawings proceed to "Installation" on page 39.
3. Detailed Settings

HART Dynamic Variables

The VECTOR V1100 appears as a HART device on both the wired-HART and wireless HART networks, and supports four HART dynamic variables. These can be read using standard HART commands and are displayed in the VECTOR V1100 DD (Table 3).

<table>
<thead>
<tr>
<th>HART Variable</th>
<th>Wireless HART Packets per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Variable (PV)</td>
<td>Loop Current (mA)</td>
</tr>
<tr>
<td>Secondary Variable (SV)</td>
<td>Direct Power Voltage (V)</td>
</tr>
<tr>
<td>Tertiary Variable (TV)</td>
<td>Internal Temperature (°C)</td>
</tr>
<tr>
<td>Quaternary Variable (QV)</td>
<td>Storage Voltage (V) (DC Bus Voltage Direct Power)</td>
</tr>
</tbody>
</table>

Configure Power Mode (method)

The Configure Power Mode DD Method guides you through the selection of the proper power mode settings for their configuration.

Adapter Power

By default, the VECTOR V1100 is configured for loop powered operation with a 1.0 V insertion voltage drop. Through the DD, the power setting can be changed (Table 4) to set the insertion voltage drop to 1.0 V, 1.5 V, 2.0 V or 2.5 V. The power mode setting can also be set to several different direct power modes.

<table>
<thead>
<tr>
<th>Adapter Power Setting</th>
<th>Wireless HART Packets per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop Powered - 1.0 V</td>
<td>4.25</td>
</tr>
<tr>
<td>Loop Powered - 1.5 V</td>
<td>12.65</td>
</tr>
<tr>
<td>Loop Powered - 2.0 V</td>
<td>19.66</td>
</tr>
<tr>
<td>Loop Powered - 2.5 V</td>
<td>26.66</td>
</tr>
<tr>
<td>Direct Powered – Max Bandwidth</td>
<td>101.40</td>
</tr>
<tr>
<td>Direct Powered – Power Save</td>
<td>26.66</td>
</tr>
</tbody>
</table>
The value shown in Wireless HART Packets per second column is the value reported back in HART Command 777.

**Loop Powered**
This allows for different StepVolt settings to be selected when operating in a loop powered mode.

**Direct Powered – Max Bandwidth**
This allows for the maximum wireless HART bandwidth possible and assumes that the direct power source can supply maximum power.

**Direct Powered – Power Save**
This assumes that the direct power source is limited and limits the amount of wireless HART packets to a small amount to conserve power.

**Direct Powered - External Battery**
This assumes that the direct power source is an external battery, and this enables the built-in battery management functionality (battery life calculations, battery alerts) in the VECTOR V1100.

**CAUTION**
The VECTOR V1100 powers up and begins to operate with any valid power installation, regardless of what the configured Adapter Power setting. This allows you to change this setting even if it is configured incorrectly, however, perform any changes to this before the VECTOR V1100 has joined the wireless HART network. If this power setting is set different than how the VECTOR V1100 is actually powered (such as a Direct Powered setting is selected but the unit is actually loop powered), the system operation is not guaranteed and it is possible that the VECTOR V1100 resets due to insufficient power once connected to the wireless HART network. The unit can be both Direct Powered and wired in series with the loop. When configured in any of the Direct Powered modes, there is an insertion voltage drop of 1.0 V if the VECTOR V1100 is also wired in series with the loop.

**Field Device Power Control**
When used in a direct power configuration, the VECTOR V1100 can activate a switchable terminating resistor between the HART and the RETURN signal wires. This can eliminate the need for an external terminating resistor in some installations and also allows for the field device power to be switchable and controlled automatically by the VECTOR V1100.

The parameter **Field Device Power Control** can be set to three different states:

**Off**
The Field Device Power Control switch is never connected.

**On**
The Field Device Power Control switch is always connected.

**Switching**
The VECTOR V1100 automatically controls the operation of the Field Device Power Control switch.
Field Device Cutoff Enable

This option allows the VECTOR V1100 to cutoff power to the field devices when the direct power input drops below the voltage set in the Field Device Cutoff Voltage parameter. To use the cutoff, the Field Device Power control must set to either On or Switching. When this parameter is disabled, this cutoff will not occur and the Field Device Cutoff Voltage parameter is not used.

Field Device Cutoff Voltage

When enabled, defines the direct power voltage at which the Field Device Cutoff occurs. There is a built-in 0.5 V hysteresis in this to bring the VECTOR V1100 out of the Field Device Cutoff mode.

Field Device Power Control – Switching Mode

When the VECTOR V1100 is used in the Field Device Power Control Switching mode, the VECTOR V1100 controls this switch to power HART field devices on and off as needed by network operation. This is useful when running off a limited power source, such as an external battery or solar cell, and can be used to power off the HART field devices between measurements.

When used in combination with Burst mode, the VECTOR V1100 schedules measurements from the connected HART devices, and turns on the loop when a scheduled measurement is needed. After all the measurements have been read from the connected HART devices, the VECTOR V1100 removes power from the devices by turning off the Field Device Power Control switch.

For this mode to work properly, you need to determine and configure the Power On Time parameter for the connected wired HART field devices.

Field Device Turn On Time

The time in seconds that a HART field device needs to be powered on in order to obtain an accurate measurement.

NOTE

Improper selection of the Power On Time parameter can lead to a field device reporting measurements outside of the published tolerances for the device. Consult the field device documentation or contact the field device vendor to determine this information.

The Power On Time is different for every Field Device. If not specified in the Field Device data sheet, contact the Field Device manufacturer for this parameter.

Incorrect measurement reading from the Field Device can result if Power On Time parameter is not set properly. The Field Device may not have adequate time to power up, initialize and respond with a correct measurement value prior to power being removed.
Field Device Idle Time

The time in seconds that the field device remains powered after an unscheduled event. This event could be a HART query over the wireless HART handheld or detection of another HART master trying to communicate (such as a wired HART handheld). This parameter prevents the VECTOR V1100 from powering off a field device when some other master is attempting communication with the field device. This parameter is generally left at the default of 60 seconds.

Field Device on Estimated Percentage

This is the estimated time that the field device is powered during normal operation. This is a calculation based upon the Field Device Power On Time and the Burst mode settings of the VECTOR V1100. The lower this value is, the less amount of power used.

External Battery Settings

The VECTOR V1100 has internal circuitry to monitor battery consumption when an external battery is used for the Direct Power input. Since the battery is external, there are many possible battery options that you could employ, therefore the VECTOR V1100 battery measurement circuitry is very flexible and configurable.

There are two major variables measured to determine the remaining battery life - the battery voltage and the battery coulomb discharge rate. Both of these measurements are continuously being performed by the VECTOR V1100 on the battery, and both of these measurements are used to determine the remaining battery life and the power status

Power Status

Wireless HART defines three power status levels for battery powered devices:

- **Power Status: Nominal** - The power for the device is operating correctly.
- **Power Status: Low** - The power source for the device has under 25 days of life remaining. The power source should be exchanged when the low indication is set.
- **Power Status: Critical** - The power source for the device is critically low and loss of power will happen in the immediate future.

Battery Life Remaining

The amount of days of battery life that the system is expected to be able to run, based on the average battery consumption rate (from the previous one hour of operation).

Battery Capacity

This is the capacity of the battery in milliamp-Hours, and is used by the coulomb counter algorithm to determine the remaining battery life in days.
**Battery Low Voltage**

This is the battery voltage value below which the power status is set to *Low* and the battery life remaining is 25 days or less. This is an independent failsafe check for the coulomb counter remaining life calculation.

**Battery Critical Voltage**

This is the battery voltage value below which the power status is set to *Critical* and the battery life remaining is set to 0 days. This is an independent failsafe check for the coulomb counter remaining life calculation.

**Join Device to Network (method)**

This guides you through entering in the Wireless HART network ID and join key, and starting the wireless HART join procedure.

**Network ID**

This is the ID of the wireless HART network to join.

**Join Key**

This is a 32 character hexadecimal password (broken into four eight character blocks), which is used to get access to the wireless HART network.

**Radio Output Power**

The transmit power of the VECTOR V1100’s radio can be set to either 0 dBm or +10 dBm.

**HART Polling Address**

This is the HART polling address used to communicate to the VECTOR V1100 on the wired-HART interface using a HART capable host (such as a HART communicator or PC with HART modem).

By default, the VECTOR V1100 is at HART polling address 15. Through the DD, the polling address can be set to any value between 0 and 63.

**HART Master Mode**

This is the HART Master mode used by the VECTOR V1100 when it is communicating as a HART master with wired-HART devices.

By default, the VECTOR V1100 is configured as a HART primary master. Through the DD, the master mode can be changed to be either a HART secondary or primary master.
HART Retry Count

This is the number of retries the VECTOR V1100 attempts when communicating as a HART master to wired-HART devices.

By default, the VECTOR V1100 is configured to use 3 retries. Through the DD, the retry count can be set to 2, 3, 4 or 5.

HART Number of Response Preambles

This is the number of preambles the VECTOR V1100 uses when responding to HART commands sent by a HART master (such as a HART communicator or PC with HART modem) on the wired-HART connection.

By default, the VECTOR V1100 is configured to use 5 preambles. Through the DD, the response preamble count can be set between 5 – 20 preambles.

Write Protect

This setting allows the configuration inside of the VECTOR V1100 to be write protected. The write protect setting is controlled through the DD.

By default, the VECTOR V1100 is configured to have write protect disabled.

Sub-Device Time Synchronization

If a HART 7 or greater sub-device is detected and it supports a real-time clock, the VECTOR V1100 can synchronize the sub-device time with the wireless HART network time if this setting is enabled. If the sub-device does not support a real-time clock, this setting has no effect. This synchronization is performed when the VECTOR V1100 joins the wireless HART network and then once per day.

Sub-Device Scan on Power-up

When this is enabled, the VECTOR V1100 scans the 4-20 mA loop for attached HART devices on power-up or when the VECTOR V1100 is reset. These are added to the list of supported sub-devices for the VECTOR V1100 and are communicated with the wireless HART gateway.

Within the DD, Automatic Sub-device detection can be enabled or disabled. It is highly recommended that this mode always be left enabled.

If this mode is disabled, the host must support scanning for sub-devices in order for any sub-device to be detected or you must manually execute the Scan for Sub-Devices method. The list of sub-devices is not retained through a power-cycle or reset of the VECTOR V1100, so the host would need to detect this and rescan for sub-devices.
NOTE

The sub-device scan is only performed after a power-up or reset of the VECTOR V1100. If wired-HART devices are added to the loop after the VECTOR V1100 is powered, execute the Scan for Sub-Devices method or reset the VECTOR V1100 to detect them.

The VECTOR V1100 can support a maximum of eight sub-devices. If more than eight wired-HART devices are detected, only the first eight devices are used.

Scan Start Address

This is the first HART polling address that is used when a scan for sub-devices is performed.

Scan Stop Address

This is the last HART polling address that is used when a scan for sub-devices is performed.

Scan for Devices (method)

This method performs a scan for sub-devices connected to the VECTOR V1100, across the HART polling addresses defined.

This method allows for the existing sub-device list to be either retained or erased prior to the new scan.

4-20 mA Settings

The VECTOR V1100 has the ability to measure the loop current from field devices when wired in a loop powered mode. The VECTOR V1100 can be connected to analog only 4-20 mA field devices (with no HART capability) and report this loop current value to the wireless HART network.

The VECTOR V1100 can convert the 4-20 mA value read from a field device into engineering units that are reported to the wireless HART network as the Primary Variable (PV) of the VECTOR V1100. The VECTOR V1100 can also implement a lookup table to linearize this conversion.

PV Units

The engineering units that the VECTOR V1100 PV will be reported as.

PV Linearization Mode

This can be set to Linear or Special Curve. If set to Linear, the PV Upper Range Value and Lower Range Value is the values in engineering units that correspond to the 4 and 20 mA points, and a basic linear calculation is performed to convert the measured loop current to engineering units.
It this is set to Special Curve, you can enter in data pairs (a loop current value to a engineering unit value) into the PV Linearization Table. The table needs to have at least two data pairs and can have up to 32 pairs. When converting the loop current to engineering units, the VECTOR V1100 uses this lookup table to perform a more accurate linearization.

**PV Damping Value**

This is the damping value in seconds that is applied to the PV measurement.

**PV Upper Range Value (20 mA)**

When the Linearization Mode is set to Linear, this is the value in engineering units that corresponds to the loop current at 20 mA.

**PV Lower Range Value (4 mA)**

When the Linearization Mode is set to Linear, this is the value in engineering units that corresponds to the loop current at 4 mA.

**Upper Fault Current**

This is the value of the loop current in milliamps that above which sets a HART loop current alarm.

**Upper Limit of Proportional Range**

This is the value of the loop current in milliamps that above which sets a HART loop current warning.

**Lower Limit of Proportional Range**

This is the value of the loop current in milliamps that below which sets a HART loop current warning.

**Lower Fault Current**

This is the value of the loop current in milliamps that below which sets a HART loop current error.
**Automatic Burst Mode Configuration**

When this is enabled, the VECTOR V1100 automatically configures burst messages for VECTOR V1100 itself and all of the connected sub-devices.

The Automatic Burst Mode Configuration setting can be set from within the DD, and allows you to select several different fixed update rates (8 seconds, 16 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes) at which all of the burst messages are published to the wireless HART gateway.

If this mode is disabled, burst mode can be configured manually using the DD.

**NOTE**

If the Automatic Burst Mode Configuration setting is set, this overrides any manual configuration of the burst mode settings. If any manual burst mode settings are configured, Automatic Burst Mode is automatically turned off.

**Factory Reset**

Executing the factory reset resets the following VECTOR V1100 parameters and causes the VECTOR V1100 to reset (Table 5). The software controlled factory reset can be initiated by means of the HART Device Description (DD).

**Table 5  HART Dynamic Variables Defaults**

<table>
<thead>
<tr>
<th>VECTOR V1100 Parameter</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter Power Mode</td>
<td>Loop Powered - 1.0 V</td>
</tr>
<tr>
<td>Field Device Power Control</td>
<td>Off</td>
</tr>
<tr>
<td>Field Device Turn On Time</td>
<td>10.0 seconds</td>
</tr>
<tr>
<td>Field Device Idle Time</td>
<td>60.0 seconds</td>
</tr>
<tr>
<td>Field Device Cutoff Enable</td>
<td>Disabled</td>
</tr>
<tr>
<td>Field Device Cutoff Voltage</td>
<td>18.0 V</td>
</tr>
<tr>
<td>Battery Low Voltage</td>
<td>20.0 V</td>
</tr>
<tr>
<td>Battery Critical Voltage</td>
<td>18.0 V</td>
</tr>
<tr>
<td>Battery Capacity</td>
<td>10000 mAh</td>
</tr>
<tr>
<td>HART Network ID</td>
<td>1229</td>
</tr>
<tr>
<td>HART Join Key</td>
<td>44555354 4E455457 4F524B53 524F434B (hex)</td>
</tr>
<tr>
<td>HART Join Mode</td>
<td>Don’t Join</td>
</tr>
<tr>
<td>Radio Output Power</td>
<td>+10dBm</td>
</tr>
</tbody>
</table>
Table 5  HART Dynamic Variables Defaults (Continued)

<table>
<thead>
<tr>
<th>VECTOR V1100 Parameter</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the Air Upgrade</td>
<td>Enabled</td>
</tr>
<tr>
<td>HART Master Mode</td>
<td>Primary Master</td>
</tr>
<tr>
<td>HART Retry Count</td>
<td>3</td>
</tr>
<tr>
<td>HART Polling Address</td>
<td>15</td>
</tr>
<tr>
<td>HART Scan On Power Up</td>
<td>Enabled</td>
</tr>
<tr>
<td>HART Polling Scan Start Address</td>
<td>0</td>
</tr>
<tr>
<td>HART Polling Scan Stop Address</td>
<td>15</td>
</tr>
<tr>
<td>HART Sub-device Time Sync</td>
<td>Enabled</td>
</tr>
<tr>
<td>HART Response Preambles</td>
<td>5</td>
</tr>
<tr>
<td>Write Protect</td>
<td>Off</td>
</tr>
<tr>
<td>HART Lock State</td>
<td>Cleared</td>
</tr>
<tr>
<td>Electronics Temperature Units</td>
<td>degC</td>
</tr>
<tr>
<td>PV Linearization Mode</td>
<td>Linear</td>
</tr>
<tr>
<td>PV Units</td>
<td>mA</td>
</tr>
<tr>
<td>PV Damping Value</td>
<td>0.0 secs</td>
</tr>
<tr>
<td>PV Upper Range Value (20mA)</td>
<td>20.0 mA</td>
</tr>
<tr>
<td>PV Lower Range Value (4 mA)</td>
<td>4.0 mA</td>
</tr>
<tr>
<td>PV Upper Limit of Prop Range</td>
<td>20.5 mA</td>
</tr>
<tr>
<td>PV Lower Limit of Prop Range</td>
<td>3.8 mA</td>
</tr>
<tr>
<td>Upper Fault Current</td>
<td>21.0 mA</td>
</tr>
<tr>
<td>Lower Fault Current</td>
<td>3.6 mA</td>
</tr>
</tbody>
</table>
Alerts

The VECTOR V1100 detects and logs system events to alert you when something has occurred that could effect system operation.

**NOTE**

All Alerts are also mapped into HART Command 48 status bits.

Active Alerts

The condition that causes the alert is still present. Active alerts cannot be cleared - corrective action must be taken to eliminate the alert, such as modifying some external source of the event (such as the power supply) or by changing an incorrect VECTOR V1100 setting.

Alert History

The condition that caused the alert is no longer present, or the alert is a onetime event. The start timestamp indicates when this alert first occurred and the stop timestamp indicates when the alert stopped (or the last time the alert was detected).

Clear Alert (method)

This clears the current alert.

Clear All Alerts (method)

This clears the entire VECTOR V1100 alert history.

**ALERT – Direct Power Out of Range**

*Description:*

The VECTOR V1100 is configured for Direct Power Mode and the voltage on the Direct Power input is outside of the allowable VECTOR V1100 operating range.

*Corrective Action:*

Correct the Direct Power source supply.

*Timestamps:*

Start: Set when the alert is first detected.
Stop: Set when the alert state goes away.
ALERT – Loop Power Out of Range

Description:
The VECTOR V1100 is configured for Loop Power Mode and the current on the loop power connection is outside of the allowable VECTOR V1100 operating range.

Corrective Action:
Correct the loop power supply.

Timestamps:
Start: Set when the alert is first detected.
Stop: Set when the alert state goes away.

ALERT – Temperature Out of Range

Description:
The electronics temperature inside of the VECTOR V1100 is outside of the allowable VECTOR V1100 operating range.

Corrective Action:
Ensure that the VECTOR V1100 is installed in an environment within its environmental operating range.

Timestamps:
Start: Set when the alert is first detected.
Stop: Set when the alert state goes away.

ALERT – Power Mode Misconfigured

Description:
The power mode detected on the inputs for the VECTOR V1100 currently does not match the power mode configuration settings.

Corrective Action:
Check the Adapter Power mode setting to ensure it is the same as how the VECTOR V1100 is wired.

Timestamps:
Start: Set when the alert is first detected.
Stop: Set when the alert state goes away.
ALERT – Watchdog Reset

*Description:*
The microprocessor inside of the VECTOR V1100 has experienced a watchdog reset event.

*Corrective Action:*
Clear the alert – report the event.

*Timestamps:*
Start: Set when the alert is first detected.
Stop: Not Used

ALERT – Stack Overflow

*Description:*
The microprocessor inside of the VECTOR V1100 has experienced a stack overflow event.

*Corrective Action:*
Clear the alert – report the event.

*Timestamps:*
Start: Set when the alert is first detected.
Stop: Not Used

ALERT – Duplicate HART Master Detected

*Description:*
A HART Master has been detected that is configured as the same Master type as the VECTOR V1100. This prevents the VECTOR V1100 from communicating with connected sub-devices while the other HART master is present.

*Corrective Action:*
If there is another HART Master present, ensure that it and the VECTOR V1100 are configured for different HART Master types. When using a HART Handheld, ensure that it is not set for the same Master Type as the VECTOR V1100.

*Timestamps:*
Start: Set the first time the duplicate HART Master was detected.
Stop: Set the last time the duplicate HART Master was detected.
ALERT – HART Devices Count Exceeded

Description:
More HART devices were detected on the wired connection that the VECTOR V1100 supports. Not all of the HART devices will be connected to the Wireless Network.

Corrective Action:
Remove HART devices from the wired connection to the amount supported by the VECTOR V1100.

Timestamps:
Start: Set the first time that too many HART devices were detected.
Stop: Same as the start time.

ALERT – HART Sub-Device Lost

Description:
A sub-device connected to the VECTOR V1100 has stopped communicating and has been dropped from the sub-device list.

Corrective Action:
If the sub-device was removed intentionally, clear the alert. Else, check the connection / power to the sub-device and verify communications with a wired-HART handheld or PC.

Timestamps:
Start: Set when the sub-device was lost.
Stop: Same as the start time

ALERT – Burst Packets are Being Dropped

Description:
One or more burst packets have been dropped from the VECTOR V1100 to the wireless HART network.

Corrective Action:
Check to ensure that the wireless HART network has granted the requested bandwidth for the burst settings. If not, either adjust the wireless HART network settings or adjust the VECTOR V1100 burst times.

If the burst messages being dropped are for a wired sub-device, ensure that there are no other HART masters on the connection, as these can cause burst message delays.
Timestamps:
Start: Set when the first HART Burst packet was dropped.
Stop: Set when the last HART Burst packet was dropped.

**ALERT – Field Device Power Control**

*Description:*
The Field Device Power Control mode is set to Switching, however the burst / event configuration keeps the device always powered on.

*Corrective Action:*
If the Field Device Power Control mode – Switching is not required, change this option.

Else, reduce the burst times for the wired sub-devices such that the system switches the power to the devices. Check the Field Device Estimate On Percentage for an estimated duty cycle that the field devices is powered on for. This alert is set whenever this value is 100% and the Field Device Power Control mode is set to Switching.

Timestamps:
Start: Set when the Field Device Power Control issue is first detected.
Stop: Set when the Field Device Power Control issue is corrected.

**ALERT – Wireless Capacity Denied**

*Description:*
The wireless HART network has denied a request for wireless bandwidth.

*Corrective Action:*
Check the burst mode settings for the device and reduce the requested bandwidth.

Timestamps:
Start: Set when the wireless HART network first denies bandwidth.
Stop: Set when the wireless HART network grants bandwidth.

**ALERT – Burst Message Configuration Issue**

*Description:*
A burst message is configured to a command that is not supported by the selected subdevice.

*Corrective Action:*
Change the command number of the burst message to a command that is supported by the sub-device.
**Timestamps:**

Start: Set when the configuration issue is first detected.
Stop: Set when the configuration issue is corrected.

**ALERT – Wired Device in Burst Mode**

*Description:*

A wired device is configured for wired burst mode, which may conflict with the VECTOR V1100 burst settings.

*Corrective Action:*

Change the configuration of the wired device to not be in wired burst mode.

**Timestamps:**

Start: Set when the wired burst mode message is first detected.
Stop: Set when the last wired burst mode message was detected.

**ALERT – V1100 Failed to Join the Network**

*Description:*

The VECTOR V1100 has failed to join the wireless HART network.

*Corrective Action:*

Check the Network ID and Join key set on both the VECTOR V1100 and the wireless HART network.

**Timestamps:**

Start: Set when the wireless HART network Join procedure failed.
Stop: Set when the wireless HART network Join procedure succeeds.

**ALERT – Radio Malfunction**

*Description:*

The radio module inside the VECTOR V1100 is malfunctioning.

*Corrective Action:*

Report this issue to the factory.

**Timestamps:**

Start: Set when the radio malfunction was detected.
Stop: Set when the radio malfunction clears.
ALERT – Variable Simulation

Description:

One or more of the device variables are being simulated.

Corrective Action:

Check the simulation settings for the variables.

Timestamps:

Start: Set when one of the device variables is put into simulation mode.
Stop: Set when all of the device variables are put into normal mode.

ALERT - Field Device Cutoff Occurred

Description:

The Field Device Cutoff function is enabled and the direct power voltage dropped below this setting, causing the field device power to be cutoff.

Corrective Action:

Ensure the direct power voltage is a high enough voltage.

Timestamps:

Start: Set when the field device cutoff occurs.
Stop: Set when the field device cutoff ends (by having a direct power voltage high enough).

ALERT - Low Battery

Description:

The VECTOR V1100 is configured to use an external battery, and the battery voltage has dropped below the Battery Low Voltage parameter, or the calculated remaining battery life is under 25 days remaining.

Corrective Action:

Replace the external battery.

Timestamps:

Start: Set when the external battery voltage or remaining life calculation passes the low battery threshold.
Stop: Set when the external battery voltage is above the low battery threshold or you clear the battery counters.
Figure 2  DD Menu Tree
This page intentionally left blank.
The VECTOR V1100 was designed to be extremely flexible and support a variety of installation options.

A typical VECTOR V1100 installation to a field device is shown in Figure 3. The VECTOR V1100 is attached to the field device using the standard, commercially available hardware as required by the installation requirements and area classification.

VECTOR V1100 Installation to Field Device

![VECTOR V1100 - Field Device installation](image)

**WARNING**

*Installations for ordinary locations must be performed only by qualified personnel trained in the required national, regional, local codes and practices.*

*Operating temperature range is 85° C. Caution in handling any potentially hot surfaces is required.*
Field Wiring

The following table describes the lead wire, and function of the lead wires exiting the VECTOR V1100 NPT port.

### Table 6  Wire Color

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Wire Gauge</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green / Yellow</td>
<td>14 AWG</td>
<td>Internal Earth Ground</td>
</tr>
<tr>
<td>Black</td>
<td>20 AWG</td>
<td>Direct Power</td>
</tr>
<tr>
<td>Red</td>
<td>20 AWG</td>
<td>Loop Power</td>
</tr>
<tr>
<td>White</td>
<td>20 AWG</td>
<td>Return</td>
</tr>
<tr>
<td>Yellow</td>
<td>20 AWG</td>
<td>HART</td>
</tr>
<tr>
<td>External Ground Screw</td>
<td>Accepts 10 AWG [4 mm²] wire</td>
<td>External Earth Grounding Connection</td>
</tr>
</tbody>
</table>

**Lead Wire Functional Description**

DIRECT POWER connections are between the black lead wire tied to the (+) positive source terminal and RETURN the white lead wire to the (-) negative source terminal.

LOOP POWER connections are between the red lead wire tied to the (+) positive current loop source terminal and RETURN the white lead wire tied to the (-) negative current loop terminal.

HART connections are between the yellow lead wire and the RETURN white lead wire. The VECTOR V1100 HART connections are polarity independent.

**WARNING**  
Terminate unused lead wires as required by national, regional and local electrical codes and practices.

**Conduit Entry**

The VECTOR V1100 ½” male NPT port allows direct connection into a spare field device enclosure port or a junction box. The VECTOR V1100 ½” NPT accepts adapters to interface into other entry thread types; such as, M20.

**WARNING**  
To reduce the potential of aluminum galling, apply an electrically conductive thread lubricant to the NPT threads prior to assembly.
Grounding

The VECTOR V1100 provides an external and internal grounding connection. The external grounding connection accepts up to a 10 AWG [4 mm²] gage wire. The grounding conductor is secured by means of a stainless steel screw, #10-32, with a captive washer. The internal ground connection is attached to the metal housing and exits the threaded ½” NPT as a 14 AWG, (GREEN/YELLOW) lead wire. This grounding connection is typically tied to the internal earth grounding terminal of the field device or junction box.

WARNING  Ground equipment as required by national, regional, local electrical codes and practices.

Antenna Positioning

The VECTOR V1100 has an internal antenna which radiates out from top cap in a 360° pattern. Position the VECTOR V1100 vertically and approximately one meter from any metal or conductive material which could impact the wireless HART communications. The VECTOR V1100 can placed anywhere on the current loop and does not need to be positioned directly next to the field device. This allows positioning the VECTOR V1100 in an optimal location for RF coverage.

The operating range can be reduced by interference from other nearby devices transmitting in the 2.4 GHz ISM band. These external sources of interference can prevent the establishment of wireless HART connection and may result in intermittent loss of network connections causing HART network message retries. To maintain optimum antenna performance periodically remove any accumulated material from the dome; such as, dust, fiber, snow and ice. Use caution in removing any material off the resin dome so as not to damage the dome or mechanically stress the NPT threaded connection.

Figure 4  Antenna Positioning
Typical Options

The flowing sections describe several installation options for the VECTOR V1100. Contact the factory if you need help in determining how best to connect the VECTOR V1100 for your application.

VECTOR V1100 as a Standalone Wireless HART Router (Repeater)

In this installation option, the VECTOR V1100 is not attached to any field devices. It is strictly used at key points in a wireless HART network to help with the wireless HART routing of packets on behalf of other network connected devices. This is useful when it is identified in a wireless HART network that additional wireless HART devices located at key points improve the overall network robustness.

The VECTOR V1100 power is typically supplied by a DC power source. The VECTOR V1100 can be powered by an external DC power source such as; DC power supply, battery or solar panel. The DIRECT POWER specified input voltage range is 7 VDC to 32 VDC. For direct powered operation, connect the DC power source positive terminal DIRECT POWER Black lead wire, and the DC power source negative terminal to the VECTOR V1100’s RETURN white leadwire.

NOTE

In loop powered mode, the VECTOR V1100 cannot control the loop current. You must ensure that the loop current is limited to within the operating specifications.

CAUTION

The VECTOR V1100 can be damaged if the direct power source is greater than 32 VDC.

VECTOR V1100 with a 4-20 mA Analog Only Non-HART Field Device

The VECTOR V1100 is connected in series with 4-20 mA analog output only field device which does not support HART. The VECTOR V1100 is capable of monitoring and reporting the analog loop current to the wireless HART network.

VECTOR V1100 with a HART Enabled Field Device

The VECTOR V1100 is connected in series with a HART field device; such as a 4-20mA HART transmitter, which also controls the loop current. The VECTOR V1100 is capable of monitoring and reporting the analog loop current to the wireless HART network and also communicates wired-HART data with the connected wired-HART sub-device.
Connect the VECTOR V1100 and field device as shown in either Figure 5 or Figure 6. Figure 5 has the VECTOR V1100 inserted into the current loop between the power source positive terminal and the field device positive current loop terminal (L1). Figure 6 has the VECTOR V1100 inserted into the current loop between the field device negative current loop terminal (L2) and the power source negative terminal.

**Figure 5  Loop Powered Configuration HART Communication on Positive Current Leg**
Figure 6  Loop Powered Configuration HART Communication on Negative Current Leg
Figure 7 shows a configuration for direct power.

**VECTOR V1100 with HART Field Devices in Multi-Drop Mode**

The VECTOR V1100 can support up to a maximum of three (3) wired HART enabled field devices. These can be any combination of either input or output wired HART enabled field devices.

The maximum number of wired-HART field devices that any loop can support is installation dependent. The actual number of allowed field devices on any loop is restricted by the insertion voltage drop of all field devices, wire losses and minimum Loop Power Source voltage.
VECTOR V1100 with HART Field Devices in Loop Power Multi-Drop Mode

For proper HART communication the Wired-HART network requires a 250 Ohm terminating resistor. When configured for LOOP POWER, the terminating resistor must be hard wired into the system as shown in Figure 8. The HART terminating resistor must be located in series with either power source terminal. The location of the HART terminating resistor will not affect the wiring shown in Figure 8. To operate in this mode the Device Description (DD) parameter FIELD DEVICE POWER CONTROL must be set to the OFF position which is the factory default setting.

![Figure 8 Loop Power Multi-Drop Configuration](image)

Figure 8 is a simplified representation of this LOOP POWER multi-drop configuration. The DIRECT POWER, black lead wire, is not required for this configuration and is not shown. The EARTH Grounding connection is not shown.

VECTOR V1100 with HART Field Devices in DIRECT POWER Multi-Drop Mode

When configured for DIRECT POWER, the HART terminating resistor requirement can be met by either by physically wiring a resistor into the system or by using the VECTOR V1100 internal terminating resistor. The VECTOR V1100 provides a switchable resistor connecting a 250 Ohm resistor between the HART, yellow lead wire, and RETURN white lead wire. To use the VECTOR V1100 internal resistor you must properly configure the Device Description (DD) parameter FIELD DEVICE POWER CONTROL to the - ON setting.
Figure 9 is a simplified schematic representation of this DIRECT POWER multi-drop configuration with FIELD DEVICE CONTROL is set to the ON position. The LOOP POWER, red lead wire, is not required for this configuration and is not shown. The EARTH Grounding connection is not shown.

![Figure 9 DIRECT POWER Multi-Drop Configuration - FIELD DEVICE CONTROL - ON Position](image)

**VECTOR V1100 with a 4-20 mA Field Device with Battery Powered Operation**

In this installation option, the VECTOR V1100 is connected in series with an either an analog only or HART enabled field device and can be configured for either Loop Power or DIRECT POWER.

An external battery or other DC power source such as solar is used to power the VECTOR V1100 and field device.

Configured for:

- Loop power, the VECTOR V1100 and field device are continuously powered, which is not the optimum energy management configuration for battery operation.
- DIRECT Power, the VECTOR V1100 can control the power to the field device, which results in optimum energy management for battery operation.

To manage the battery power the VECTOR V1100 must be configured to use the FIELD DEVICE POWER CONTROL feature which allows you to specify the battery powered on and off time. This software controlled function is enabled by means of the HART Device Description (DD). You configure the FIELD DEVICE POWER on time as required by the application and or as required by the field device to operate properly.

The VECTOR V1100 has internal circuitry to monitor battery consumption when an external battery is used for the Direct Power input. Since the battery is external, there are many possible battery options that you could employ; therefore, the VECTOR V1100 battery measurement circuitry is very flexible and configurable.

There are two major variables measured to determine the remaining battery life - the battery voltage and the battery coulomb discharge rate. Both of these measurements are continuously being performed by the VECTOR V1100 on the battery, and both of these measurements are used to determine the remaining battery life and the power status.
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Commissioning

On VECTOR V1100 power-up in the field, the VECTOR V1100 attempts to identify any connected HART devices (if the Automatic Sub-device Detection option is enabled).

Verify operation using the VECTOR V1100 HART DD via a HART communicator or PC with HART Modem, or via the wireless HART gateway interface.

With the DD, verify that the correct HART sub-device(s) have been detected by the VECTOR V1100. Also verify that the VECTOR V1100 is attempting to join or has joined the wireless HART network.

With the wireless HART gateway, verify that the VECTOR V1100 has been detected and that all of the connected wired-HART sub-devices have been detected.

**NOTE**

*Install the VECTOR V1100 after the wireless HART gateway has been installed and is verified to be working.*

**NOTE**

*To speed the wireless HART joining procedure, turn on the Active Advertising mode of the wireless HART gateway whenever new devices are added.*
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Troubleshooting

Does Not Detect Wired-HART Sub-Devices

1. Verify the VECTOR V1100 wiring for the mode of operation in use.
2. Verify HART communication with the VECTOR V1100 with a HART Communicator or PC with HART modem. Once this is working, without moving the HART connections on the modem, verify HART operation with the HART sub-device.

If the HART Communicator is able to communicate with both the sub-device and the VECTOR V1100, the VECTOR V1100 should be able to communicate with the sub-device.

Cannot Connect to the Wireless HART Network

Check the wireless HART gateway for the correct Network ID and Network Join Keys.

Using the VECTOR V1100 HART DD, both of these settings are entered in with a decimal format. It is possible that either of these settings are shown in a hexadecimal format on the wireless HART gateway. If so, convert these values into a decimal format before entering them into the VECTOR V1100.

Resetting the VECTOR V1100

Soft Reset – Via DD

Through the DD, a reset command can be performed.

Soft Reset – Via Power connections

1. Disconnect all power sources to the VECTOR V1100 for five seconds.
2. Reapply power and the VECTOR V1100 resets.
Hard Reset

Since the VECTOR V1100 has a large internal energy store, to perform a true Hard Reset (complete power loss):

1. Disconnect all power sources to the VECTOR V1100 for five minutes.
2. Reapply power to the VECTOR V1100. VECTOR V1100 resets to factory default setting.
Certificates and Approvals

Telecommunication Compliance

FCC and IC

The device complies with FCC 47 CFR, Part 15 rules and IC specification RSS-210. This device:

(1) will not cause harmful interference and

(2) accepts any interference received, including interference that may cause undesirable operation.

To help ensure FCC & IC compliance, this device is to be used as configured from the factory. No modifications to either the radio or antenna are allowed.

European Union Directives

The EC declaration of conformity statement for all applicable directive(s) for this device can be requested from the factory.

This device conforms to the requirements of the following directives Radio and Telecommunications Terminal Equipment (R&TTE: 1999/95/EC)

Telecommunication Compliance

All wireless devices require certifications of compliance to ensure that they meet applicable regulations regarding to the RF spectrum. This type of certification is required by most countries. GE Oil & Gas is seeking certification in the countries of use as required by national regulations to provide a fully compliant product.
Certifications

Ordinary Locations Certifications

As requirement of the R&TTE Directive and Hazardous Location approval process this product has been examined and tested to meet basic electrical, mechanical and fire protection requirements of EN61010-1 and ANSI/UL 61010-1.

RADIO / EMC

FCC Part 15, IC, R&TTE

Electro Magnetic Compatibility Directive (EMC)

(2004/108/RC)

Rohs (2002/95/EC)

Restricted materials not used

Housing

NEMA 6P IP68
## Technical Specifications

**Table 7  Technical Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td></td>
</tr>
<tr>
<td>Platform</td>
<td>Wireless HART capable network</td>
</tr>
<tr>
<td>Compliance</td>
<td>Fully compliant HART 7.1 device, complies with HART 7.1 Wireless Adapter</td>
</tr>
<tr>
<td></td>
<td>device type. Backward compatible to HART 5 devices</td>
</tr>
<tr>
<td>HART Sub-Devices</td>
<td>Supports 6 to 8 Wired HART sub-devices with a single VECTOR V1100</td>
</tr>
<tr>
<td><strong>RF</strong></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>235 meters (open air nominal)</td>
</tr>
<tr>
<td>Operating Frequency</td>
<td>2.4 GHz</td>
</tr>
<tr>
<td>RF Output Power</td>
<td>10 dBm</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
</tr>
<tr>
<td>Series Loop Voltage Drop</td>
<td>1.0 V – 2.5 V, user settable in 0.5 V steps.</td>
</tr>
<tr>
<td>Series Loop Operating Current</td>
<td>3.2 to 25 mA operating; Protected against overvoltage, over-current, and reverse connections.</td>
</tr>
<tr>
<td>Ext Power Operating Voltage</td>
<td>+7 V to +32 V, Reverse voltage protection</td>
</tr>
<tr>
<td>Ext Power Operating Current</td>
<td>Typical &lt; 1mA, Max: 20 mA</td>
</tr>
<tr>
<td>HART Output Level</td>
<td>Fully HART compliant trapezoidal wave @ 1200/2200 Hz</td>
</tr>
<tr>
<td>Multi-Drop (Direct Power)</td>
<td>32 mA DC maximum, 8 devices at 4 mA DC</td>
</tr>
<tr>
<td>Multi-Drop (Loop Power)</td>
<td>24 mA DC maximum, 6 devices at 4 mA DC</td>
</tr>
</tbody>
</table>
Table 7  Technical Specifications (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop Current Monitoring and Accuracy</td>
<td>3.2 mA to 22 mA DC</td>
</tr>
<tr>
<td></td>
<td>0.25% FSR: -40° C to +85° C</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40° C to +85° C</td>
</tr>
<tr>
<td>General Purpose Location</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Temperature Class T5: -40 °C to +85 °C</td>
</tr>
<tr>
<td>Hazardous Location</td>
<td>Temperature Class T6: -40 °C to +75 °C</td>
</tr>
<tr>
<td>Humidity: relative</td>
<td>100%</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 ° to +85 °C</td>
</tr>
<tr>
<td><strong>Physical Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>Height: 100 mm (3.9&quot;), Diameter: 60.8 mm (2.4&quot;), Weight: 0.46 kg (1lbs)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Housing: Aluminum alloy, RoHS complaint corrosion coating polyurethane enamel paint. Dome: propriety resin</td>
</tr>
<tr>
<td>Connection</td>
<td>One, Male ½&quot; NPT</td>
</tr>
<tr>
<td>Field Termination</td>
<td>5 lead wires x 600 mm (24&quot;) long extend from male ½&quot; NPT opening 5 leads: 4 signal and 1 internal earth grounding connection Enclosure: 1 external earth grounding screw: SS #10-32 with captive washer</td>
</tr>
</tbody>
</table>
Mechanical Dimensional Drawing

Dimensions are in inches (millimeters)

Figure 10  VECTOR Dimensions
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DIRECT SALES OFFICE LOCATIONS

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Brisbane
Phone: +61-7-3001-4319
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Fax: +1-281-884-1010

Houston, Texas
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Fax: +1-281-671-1735

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